© *Amity Management Analyst*
2011 Vol VI, No I & II, 09-19

Causal Relationship Between Trading Volume and Stock Return in Indian Stock Market

***Mahender **H L Verma**

This paper examines the contemporaneous and causal relationship between trading volume and stock return in Indian stock market by using daily data of the S&P CNX Nifty during the period from April 2001 to March 2011. The Serial Correlation test, Augmented Dickey Fuller test of Unit Root and Granger Causality test have been employed to obtain the serial and cause-effect relationship between trading volume and stock return. The empirical results provide negative and insignificant correlation between trading volume and stock return and positive and significant results found in previous day return and current volume that is indicative of the both mixture of distribution and sequential arrival hypothesis of information flow. The Granger Causality test fitted in VAR frameworks empirically proves that return cause volume but volume does not cause return which shows one way Granger causality. This findings support the proposition that return and previous day return strongly supports the movement in current trading volume.

Introduction

Stock market plays an important role in the economic development of a country. Trading volume and stock return volatility is a subject which has been researched in emerged markets as well as in emerging markets since more than half a century. A number of studies have been conducted on the causal relationship between trading volume and stock return volatility in developed markets. But in developing countries this subject of study is coming out of its nascent stage. Trading volume and stock return are two major pillars of the stock market which have explanatory power to provide the transparent map of the microstructure of the capital market in more depth. However, these factors may contain valuable information about securities and provide guidelines to investors for taking rational investment decisions.

Return reflects upon the difference between the changes in price (ΔP) in a particular time period. Therefore, it reflects investors' expectations on the future performance of the particular stock indices. Volume shows the total turnover of securities in particular stock indices. Therefore, trading volume highlights the position of the markets in terms of buy and sell of securities. The investor should have the full understanding of these two indicators for measuring the volatility in stock markets. Almost every interesting financial decision revolves around these two indicators of the stock market. As a concept, volatility is simple and intuitive. It measures variability or dispersion about a central tendency. Volatility always creates challenging environment in front of investors for taking their investment decisions. Since volatility is a standard measure of financial vulnerability, it plays a key role in assessing risk/return trade-offs.

The main objective of this research is to find out the basis which should be chosen by the investors for taking rational investment decision. Investors have some expectation from their investment decision and wish to fill up the gap between expectations and actual return from the securities held by them. The arrival of new information always causes the movement in stock prices. All investors are heterogeneous in their nature and always take position as per their interpretations. Therefore, interpretation may be different by various investors as per their understanding. When all investors observe similar kinds of signal, good or bad, trading volume will be relatively low because all investors have same perception about the trading volume of the stock. However, when investors have different observation signals then trading volume will have movement as per their observation. Whenever the information is positive then stock price will have upward movement and vice-versa. Therefore, analyzing the

*Research Scholar, Haryana School of Business, Guru Jambheshwar University of Science &Technology, Hisar
**Professor, Haryana School of Business, Guru Jambheshwar University of Science &Technology, Hisar

stock return and trading volume is essential to know the causal relationship between these two indicators.

Stock exchange performance has attained significant role in global economies and financial markets, due to its direct impact on capital market. There are various factors which reflect the stock market of a country. Managing risks in the stock market is difficult task for investors because it has movement as per the information flows into the market. Risk management is the process of assessing risk and then developing strategies for increasing the profit at their expected level of risks. India is a developing country wherein both the factors have national as well as international influence. The achievement of objective of an investor thus depends upon the rationality behind microstructure of the capital market. Therefore, in order to succeed, grow and survive, they have to adopt various strategies regarding trading volume and stock return volatility. Trading volume and stock return must be studied together in order to improve the understanding of the microstructure of stock market functioning. A good knowledge of the relationship between trading volume and stock return is necessary for gaining profit in the era of globalization. Thus, trading volume and stock return results allow investors to take more rational decisions by shifting their positions. For this reason, causal relationship between trading volume and stock return need to be analyzed by investors. Causal relationship provides sound information for taking rational decisions. Moreover, determination of both causal and linear relationship among them is useful for the minimization of the financial market risks.

Karpoff (1987), Jain and Joh (1988), Richard et. al. (1993), Weigand (1996) and Gunduz et. al. (2005) examined the causal relationship between trading volume and stock return volatility. They have found that strong link exists between trading and stock return volatility. In two related papers, Admati and Phleiderer (1988) and Foster and Viswanathan (1990) provides a model to explain how information is impounded in prices and how different groups of investors may influence prices. Herbert (1995) and Ciner (2002) found that lagged trading volume contains predictive power for current price volatility. They have employed Granger Causality test to examine the causal relationship between trading volume and stock return volatility. A detailed review of some important related studies on this subject has been discussed below.

Review of Related Studies

The objective of this section is to provide a comprehensive picture of the empirical studies conducted for a time frame from 1998 onwards to the latest study available at national and international levels. A brief description of the various studies in chronological order has been discussed here.

Saatcioglu and Starks (1998) examined price- volume relationship in six Latin American stock markets- Argentina, Colombia, Mexico, Brazil, Chile and Venezuela by using monthly data for the period from Jan. 1986 to April 1995. They have used monthly data for analyzing six emerging markets which have at least $5 billion of market capitalization. They have used dollar return over the local currency return because local currencies were different among six selected markets. Brazil, Mexico, and Chile had the largest market capitalizations which represents 85 percent of total market value of all six countries. They have found that volume is relatively heavy in bull market and low in bear market and also highlighted that volume makes price changes. All the five markets had positive significant correlation except Mexico, which has an insignificant correlation.

Bremer and Hiraki (1999) highlighted that trading volume appears to be a useful signal for predictor of subsequent stock returns. They had taken data from Tokyo stock exchange on average basis. This study revealed that a complex relation between lagged trading volume and stock return correlation. However, lagged trading volume contains important information about price changes.

Chen et. al. (2001) examined a comprehensive study to investigate the causal relation among trading volume, stock returns and volatility. They used daily data for nine major markets- New York, Tokyo, London, Paris, Toronto, Milan, Zurich, Amsterdam and Hon Kong. They found strong evidence that return Granger causes volume but not vice versa. They also pointed out that F-Statistics are significant for eight out of the nine markets investigated.

Lee and Rui (2002) researched three largest stock markets which are New York, Tokyo, and London. They have found two notable features. First, they pointed out that both domestic and cross country spillover effect return and volume. Second, they examined the impact of the 1987 market crash on the volume- return causality. The domestic causal relationship found for the full period indicated that trading volume did not have significant predictive power for future returns in the presence of current and past returns. They have found the causality effect between stock return and trading volume in the US and Japanese markets. They also pointed out that stronger causality after the 1987 market crash between them.

Darrat et al. (2003) found that no significant contemporaneous correlation exists between trading volume and return volatility, in which data was taken from individual DJIA stocks. Moreover, their causality tests indicated that for 12 out of 30 stocks analyzed, a significant causality flowed from trading volume to return volatility.

Ravindra and Wang (2006) examined the relationship of trading volume to stock indices from Asian markets. They have analyzed six developing markets in Asia over the 34 months period ending in Oct.2005. They have found the causality extends from the stock indices to trading volume in South Korean market while the causality was in reverse order in the Taiwanee market.

Khan and Rizwan (2008) highlighted that the dynamic relationship exists between stock return and trading volume. They pointed out that the positive contemporaneous relationship between trading volume and return preserves after taking hetroskedasticity in to account. They also found through VAR model that a feedback relationship exists between stock return and trading volume i.e. volume cause return and return causes volume which is consistent with the theoretical models that imply information content of volume affects future stock returns. They used daily closing value and the trading volume series from Karachi Stock Exchange (KSE-100) Index from 1st Jan., 2003 to 23rd may, 2007. The main focus of this paper has been whether information about trading volume is useful for improving estimation of returns in a dynamic environment. They found that there is a feedback relationship between trading and volume stock returns, which is consistent with the theoretical models that imply information content of volume affects future returns.

Sabri (2008) examined the relationship of trading volume and stock indices for eight of 15 Arab monetary fund databases. It has used monthly data from 1994 to 2006 for 144 observations. It highlighted the correlation coefficients between the volume and index for each stock market. It has found the highest correlations in Saudi, Muscat, Amman, and Kuwait stock markets. Moreover, the correlation coefficients were higher in the oil Arab states compared to the non-oil Arab states.

Malabika, Srinivasan and Devanadhen (2008) pointed out the empirical relationship between stock return, trading volume and volatility for selected Asia-Pacific stock market in which included seven national stock markets. They have used data from Ist Jan, 2004 to 31st March 2008. They employed Granger Causality test and found that volume cause return and return cause volume. They found that the sign and size of new information shocks have conditional and similarly affects on trading volume. They also obsereved that the feedback system existed between trading volume and stock return in Hong Kong, Indonesia, Malaysia and Taiwan.

Fauzia and Attiya (2009) have examined that there is a significant effect of the previous day trading volume on the current return and this implies that previous day returns and volume have explanatory power for explaining the current market return. They have found that fluctuation in stock market and trading volume are directly influenced by the flow of new information. Therefore, stock prices are usually influenced by positive trading volume through the available set of relevant information in the market. The results of Granger Causality test suggest that there is feedback relationship between trading volume and market return. However, in case of individual stock returns the evidence indicates stronger return causing volume than volume causing returns. The empirical results verify that there is a significant interaction between trading volume and return changes when volume is entered into variance equation of GARCH-M model.

Kumar, Singh and Pandey (2009) have examined that there is contemporaneous and asymmetric relation between stock price and volume. They also pointed out that the dynamic relationship exists between returns and volume using VAR, Granger causality, Variance Decomposition (VD) and Impulse Response Function (IRF). Therefore, the results show that there is asymmetric and positive relation exists between volume and price changes. They also found that through VAR and Granger Causality there is a bi-directional relation exists between return and volume. However, in case of unconditional volatility and trading volume they highlighted that positive contemporaneous relationship between trading volume and unconditional volatility. They indicated that the trading volume is a better proxy of arrival of information flow into the market. Therefore, in Indian stock markets, the daily number of transactions may be a better proxy of information rather than the total number of shares traded or the total value of shares traded.

Objectives of the Study

The main objective of the present study is to assess the relationship between trading volume and stock return volatility in Indian stock market. To achieve this objective, the following two sub-objectives of the study are identified:

1) To examine the causal relationship between trading volume and stock return.
2) To assess the causal relationship between previous day volume and current market return.

Hypothesis of the Study

Keeping in view the above mentioned objectives, the following hypotheses have been formulated:

H1 : Returns does not Granger cause Volume

H2 : Volume does not Granger cause Return

H3 : Previous day Volumes does not Granger cause current Return

H4 : Previous day Returns does not Granger cause current Volumes

Data Base and Research Methodology

To analyze whether the causality relationship exists or not between trading volume and stock return in the Indian stock market, S&P CNX Nifty has been taken as a proxy for the market. The turnover of NSE is more as compared to other stock indices in Indian stock market. Therefore, S&P CNX Nifty is considered as a representative Index of the Indian stock market, wherein it includes fifty most liquid stocks. The study makes use of secondary data for the period of 10 years ranging from 1st April, 2001 to 31st March, 2011. The data has been collected from PROWESS database maintained by the Centre for Monitoring Indian Economy (CMIE).

The present study makes use of descriptive statistics (standard deviation, co-efficient of variance, skewness and kurtosis), Correlation, Augmented Dickey Fuller test, and Granger Causality test. All these techniques have been explained briefly in the paragraphs that follow.

Standard deviation is the most important and widely used measure of studying variation. Therefore, it shows how much volatility or variability exists in the present sample. If all the numbers in the sample are very close to each other, the standard deviation will be closed to zero. Standard deviation is also known as root mean square deviation for the reason that it is the square root of the means of square deviation from the arithmetic mean. Thus, if we have small standard deviation it means high degree of uniformity of the observations as well as less volatility of a series, a large standard deviation means just the opposite. Skewness shows the symmetrical distribution of the series. When a distribution is not symmetrical it is called a skewed distribution. The measures of skewness indicate the difference between the manners in which the observations are distributed in a particular distribution compared with a symmetrical distribution. The values of mean, median and mode are always different in a skewed distribution. In a positively skewed distribution, mean is greater than the mode and the median. But in case of negatively skewed distribution, mode is greater than the mean and the median lies in between mean and mode. The measure of kurtosis shows the degree of flatness or peakedness in the region about the mode of a frequency curve. When the curve is more peaked than the normal curve it is called leptokurtic; if it is flat-topped than the normal curve, it is called playtykurtic. The normal curve is known as mesokurtic.

Correlation results provide the degree of linear relationship between two or more variables but it does not provide anything about cause-effect relationship. Therefore, a high degree of correlation does not necessarily mean that a relationship of cause and effect exists between the variables. The measure of correlation called the coefficient of correlation which is denoted by the symbol 'r'. Therefore, correlation analysis measures the closeness of linear relationship between variables.

In order to avoid a spurious regression situation, the variables in a regression model must be stationary. Therefore, in the first step, the study performs unit root tests on trading volume and stock return series whether they are stationary or not. The Augmented Dickey Fuller (ADF) test has been employed for determining unit root. The ADF unit root test is a common method for this purpose. The DF unit root test regression equations are:

Without Constant and Trend

$$\Delta Y_t = \delta Y_{t-1} + u_t$$

With Constant

$$\Delta Y_t = \alpha + \delta Y_{t-1} + u_t$$

With Constant and Trend

$$\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + u_t$$

The hypothesis is:

Ho: $\delta = 0$ (Unit Root)

H1: $\delta \neq 0$

Augmented Dickey Fuller Test is represented as under:

$$\underline{\triangle} Y_t = \alpha + \beta T + \delta Y_{t-1} + \gamma_i \Sigma \triangle Y_{t-i} - e_t$$

If the calculated DF and ADF statistic is less than their critical values (1%, 5% & 10%) then we can reject null hypothesis i.e. unit root exists and vice-versa. When the series does not exist in unit root then it needs to transform into unit root through using first level difference and second level difference.

There are various methods on the basis of which lag-length can be selected for running Granger Causality test.

a) Akaike Information Criterion (AIC)

b) Schwarz Information Criterion (SIC)

c) Hannan-Quinn Criterion (HQC)

d) Final Prediction Error (FPE)

e) Bayesian Information Criterion (BIC)

The well known method Akaike Information Criterion (AIC) has been applied in the present study for choosing optimal lag length.

The Granger Causality test is a statistical hypothesis test which is helpful for determining whether one time series is useful in predicting another time series or not. Therefore, Granger Causality test is based on regression analysis. Sometimes investors would like to know whether changes in one variable will have an impact on changes other variables. Granger Causality test have power to explain such type of relationship. Engle-Granger (1969) causality model has been used in the present study to test the causality between the trading volume and stock return volatility. The following model has been adopted in the study to empirically examine the aforesaid hypothesis. Let's start by defining Granger's concept of causality. X is said to be Granger cause Y if Y can be predicted with greater accuracy by using past values of X. It is represented by the following equation:

$$Yt = \alpha_0 + \alpha_1 Y_t\text{-}1 + \beta_1 X_{t-1} + u_t$$

If $\alpha 1 = 0$, X does not Granger cause Y. If, on the other hand, any of the α coefficients is non-zero, then X does Granger cause Y. The null hypothesis that $\alpha 1 = 0$ can be tested by using the standard F-test of joint significance.

Data Analysis and Results

The analysis of trading volume and stock return volatility provides valuable information regarding the microstructure functioning of capital market. Therefore, the results give guidelines to investors for taking rational investment decision. The data analysis and discussions thereon have been presented hereunder from Tables 1 to 8 by using of different statistical tools for analysis:

A) Descriptive Statistics Results

Table 1 discusses the descriptive statistics to examine the distribution properties of return and volume series.

Standard deviation shows the volatility which is more in case of volume series. It shows the deviations from the mean values. Both the indicators of volume and return are highly volatile, which is indicated by the results of standard deviation. Skewness shows the symmetrical distribution of the series. The empirical distribution of the volume series is positively skewed, indicating a right tail of distribution, which shows asymmetry. Return series is negatively skewed which is the indicators of asymmetrical distribution of the series. Moreover, the excess kurtosis estimated for return is large, which is clear sign of more peaked (leptokurtic) than the normal curve.

Fig 1 and Fig 2 below plots the return and volume trend of the S&P CNX Nifty.

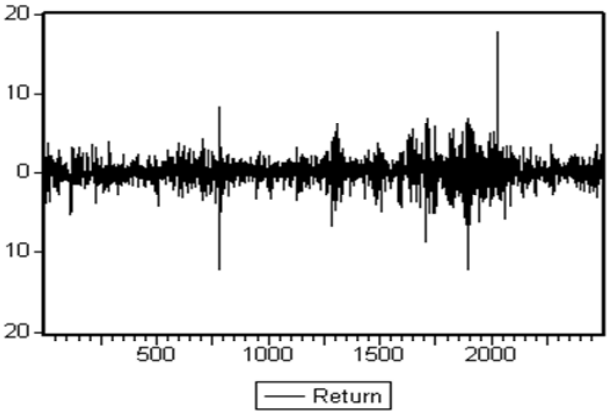

Fig 1

Table 1: Descriptive Statistics in respect of Volume and Return Data

Mean	Std. Dev.	Variance	Skewness	Kurtosis	Prob.	Obs.	
Volume							
(Rs. Crore)	8374.51	5720.30	32721785.32	0.85	0.19	0.000	2497
Return							
(%)	0.08	1.67	2.78	-0.02	9.34	0.000	2497

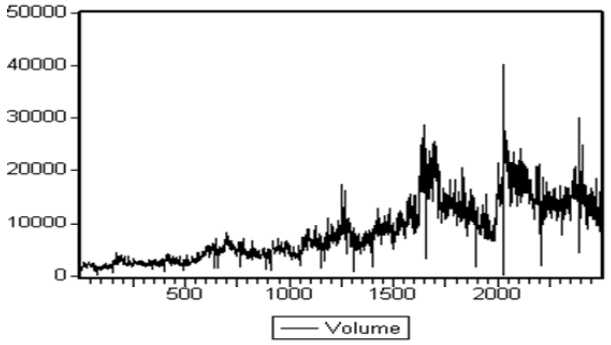

Fig 2

The above figure indicates that the volatility in volume series is higher than the return. The studies of these graphs are important to view the volatility in time series. This broadly suggests that change in return series is smaller than the volume series. These graphs also helpful to know the trend in time series.

B) Correlation Analysis Results:

Table 2 discusses the linear Karl Pearson correlation between trading volume and stock return.

Table 2: Correlation between Trading Volume and Stock Return

Variables	**Trading Volume**	**Stock Return**
Trading Volume	1	-0.016* (0.437)
Stock Return	-0.016* (0.437)	1
Note: *Correlation is insignificant at the 5% level (Two-tailed).		

Figures in parentheses show p values

It is found that trading volume and stock return are negatively correlated to each other. This result reveals that the value of P is greater than 0.05, and indicates there is insignificant negative correlation at 5% level of significance. Some other researchers do not find a contemporaneous relation between volume and returns on equity markets, see Karpoff (1987), Ciner (2002) and Lee and Rui (2002). The analysis here does not indicate the cause and effect relationship. It provides only the linear relationship between volume and return and shows how much variables are closely related to each other. So investors should not make assumption on the basis of correlation test about the future direction.

Table 3, below, highlights the correlation between previous day trading volumes and current stock returns.

Table 3: Correlation between Previous Day's Trading Volume and Current Stock Return

Variables	Previous Day's Trading Volume	Current Stock Return
Previous Day's Trading Volume	1	-0.008* (0.682)
Current Stock Return	-0.008* (0.682)	1
Note: *Correlation is insignificant at the 5% level (Two-tailed).		

Figures in parentheses show p values

It is found that these two indicators are negatively correlated to each other. The analysis also reveals that P value is greater than the 0.05, which means that insignificant negative correlation exist at 5% level of significance.

Table 4 highlights the positive correlation that exists between previous day returns and stock market returns.

Table 4: Correlation between Previous Day's Return and Current Stock Return

Variables	Previous Day's Return	Current Stock Return
Previous Day's Return	1	0.070**(0.000)
Current Stock Return	0.070**(0.000)	1
Note: **Correlation is significant at the 0.01 level (Two-tailed).		

Figures in parentheses show p values

The P value is less than the 0.01, which means that these indicators have significant positive correlation at 1% level of significance.

Table 5 discusses the linear relationship between previous day returns and current trading volumes.

Table 5: Correlation between Previous Day's Return and Current Trading Volume

Variables	Previous Day's Return	Current Trading Volume
Previous Day's Return	1	0.044*(0.029)
Current Trading Volume	0.044*(0.029)	1
Note: *Correlation is significant at the 0.05 level (Two-tailed).		

Figures in parentheses show p values

It is found that significant positive correlation at 5% level of significance. The P value is less than 5%, which is significant only at 5% level of significance. The table also highlights that the relationship is positive but not strongly supported. The significance correlation between previous day returns and current trading volumes is 0.044, which is less than the results of the correlation between previous day returns and current stock returns.

Table 6 hereunder indicates the relationship between previous day volumes and current volumes.

Table 6: Correlation between Previous Day's Volume and Current Volume

Variables	Previous Day's Volume	Current Volume
Previous Day's Volume	1	0.935**(0.000)
Current Volume	0.935**(0.000)	1
Note: Correlation is significant at the 0.01 level (Two-tailed).		

Figures in parentheses show p values

The above table shows the positive correlation at 1% significance level. These two variables are strongly correlated to each other than to others.

C) Augmented Dickey Fuller Test: -

Table 7 below shows the results of ADF Unit Root Test.

The computed Augmented Dickey Fuller test-statistics (-46.4799 and -4.910385) are smaller than the critical values (-2.5742, -2.873 and -3.4592 at 10%, 5% and 1% significant levels, respectively). Therefore, we can reject H0. It means that the return and volume series do not have unit root problem and both series are stationary at 1%, 5% and 10% significant level. In case of return series unit root strongly exists rather than the volume series.

D) Granger Causality Test: Table 8 presents the results of Granger Causality Test as under:

Table 8: Granger Causality Test

Null Hypothesis	F-Statistic	Probability
Return does not Granger Cause Volume	16.6196*	0.00000
Volume does not Granger Cause Return	0.90737	0.50916
Previous day Volume does not Granger Cause Current Return	0.74531	0.65143
Previous day Return does not Granger Cause Current Volume	6.08552*	8.8E-08

* Significance at 1% level

Granger Causality test is sensitive to the number of lags used in the analysis which has been determined on the basis of AIC criteria in the present study. Therefore, the optimal lag length eight has been

Table 7: Augmented Dickey Fuller Test (ADF) Unit Root Test

Series Name	ADF Statistic	Critical Value 1%	Critical Value 5%	Critical Value 10%	Interpretation
Return	-46.47991	-2.5666	-1.9395	-1.6157	Stationary
Volume	-4.910385	-2.5666	-1.9395	-1.6157	Stationary

employed to run the Granger Causality test. Based on the probability values reported in the Table 8, the hypothesis that return does not Granger cause volume and previous day return does not Granger cause current volume can be rejected. But, the hypothesis that volume does not Granger cause return and previous day volume does not Granger cause current return cannot be rejected. Thus, it appears that causality runs one way but not other way. However, bi-directional causality does not exist.

Concluding Remarks

The study has analyzed the causal relationship between trading volume and stock return in Indian stock market by using daily data of the S&P CNX Nifty during the period from April 2001 to March 2011. Granger Causality test is very sensitive for predicting one variable by employing another variable of time series. The study has employed Granger Causality Test for knowing the causal relationship between trading volume and stock return volatility. The movement in stock market can be decided only when trading volume and stock return are studied simultaneously. Trading volume and stock return are two major pillars of stock market. The study of both the variables was required together to know the transparent map of the movement in the stock market. The study of one indicator always conveys vague information about stock market activity and cannot be used as an information signals. The past literature pointed out that the movement in stock market is affected by the arrival of new information into the market. Whenever the information is positive it takes upward direction and vice-versa. The strong relationships have always been found by various researchers between trading volume and stock return, whenever the flow of information is most volatile.

To know the relationship between trading volume and stock return volatility in stock markets is very important for investors, brokers, researchers, policy makers and portfolio managers for shifting their positions as per the movement of market. It provides guidelines for taking rational investment decisions to meet their expectation level with actual return from the securities held by them. Investors, brokers, policy makers and portfolio managers will benefit in modeling and forecasting short-run returns and volatility. The dependence of return on past returns, past volume and current volume always raise questions for investors' decisions. The dynamic and causal relationship between trading volume and stock return volatility help to understand the future movement of the market.

The results of the present analysis have been found to be mixed and ambiguous as there is undoubtedly strong correlation between previous day volume and current volume (0.935), previous day return and current trading volume (0.044), previous day return and current stock return (0.070), but not among the previous day trading volume and current stock return (-0.008), current trading volume and current stock return (-0.016). Correlation results provide the degree of linear relationship between two or more variables, but it does not tell anything about cause-effect relationship. Correlation results have found that asymmetric relationship exists between trading volume and stock return which means that the change in one indicator does not have equally impact on other variable.

Granger causality test provide the causal relationship between the variables. Granger causality test pointed towards a different story where return undoubtedly Granger cause volume and previous day return Granger cause current return but volume does not Granger cause return and previous day volume does not Granger current return. Therefore, it shows that causality runs only one way but not the other way. On the basis of above stated Granger Causality results, the investor, brokers and portfolio managers can make previous day return and current return base for taking their rational decisions and shifting the positions.

As mentioned above one way causal relationship has been observed in trading volume and stock return, but not bilateral. This means that returns

results can be used to predict the movement in stock market volume but not vice-versa. Previous day return can also be used for predicting movement in current stock market volume.

Further, the study provides for a vast scope future research studies on this subject on different aspects of trading volume and stock return volatility along with investors' perceptions on such relationship issues.

References

1. Admati, A. and Pfleiderer, P. (1998), "A theory of intraday patterns: Volume and price Variability", The Review of Financial Studies, Vol.1, pp.3-40.
2. Bremer, M. and Hiraki, T. (1999), "Volume and Individual Security returns on the Tokyo Stock Exchange", Pacific-Basin Finance Journal, Vol.7, pp. 351-370.
3. Chen, G., Firth, M and Rui, O.M.(2001), " The Dynamic relation between stock Returns,
4. Trading Volume and Volatility," Financial Review, Vol.36, pp.153-173.
5. Ciner, C. (2002), "The Stock Price-Volume Linkage on the Toronto Stock Exchange: Before and After Automation," Review of Quantitative Finance and Accounting, Vol.19, No.4, pp 335–349.
6. Darrat, A.F., Rahman, S. and Zhong, M. (2003), "Intraday Trading Volume and Return Volatility of the DJIA Stocks. A note", Journal of Banking and Finance, Vol.27, pp.2035-2043.
7. Fauzia, M. and Attiya, Y.J. (2009), "Relationship between Stock Return, Trading Volume and Volatility: Evidence from Pakistan Stock Market." Asia Pacific Journal of Finance and Banking Research, Vol .3, No.3. pp. 01-17.
8. Foster, F.D. and Viswanathan , S. (1990), " A Theory of intraday variations in volumes variances and trading costs in securities markets" The Review of Financial Studies, Vol.3, pp.593-624.
9. Gunduz, L. and Hatemi, J. (2005), "Stock Price and Volume relation in Emerging Markets", Emerging Markets Finance and Trade, Vol.41, pp.29-44.
10. Herbert, J., (1995), "Trading Volume, Maturity and Natural Gas Price Volatility," Energy Economics, Vol.17, No.4, pp 293-299.
11. Jain, P.C. and Joh, G.H. (1988), "The Dependence between hourly Prices and Trading Volume", Journal Financial and Quantitative Analysis, No.23, pp.269-283.
12. Karpoff, J. M. (1987), "The relation between Price changes and Trading Volume: A Survey", The Journal of Financial and Quantitative Analysis,Vol.22, No.1, pp 109-126.
13. Khan, S. U. and Rizwan, F. (2008), "Trading Volume and Stock Returns:
14. Evidence from Pakistan's stock Market", International Review of Business Research Papers, Vol.4 No.2, pp151-162.
15. Kumar, B., Singh, P. and Pandey, A. (2009), "The Dynamic Relationship between Price and Trading Volume: Evidence from Indian Stock Market", Indian Institute of Management, Ahmedabad.
16. Lee, B.S and Rui, O.M. (2002), "The Dynamic relationship between stock return and trading volume: Domestic and Cross Country Evidence", Journal of Banking and Finance, Vol.26, pp.51-78.
17. Malabika, D., Srinivasan, K. and Devanadhen, K. (2008), "The Empirical relationship between stock return, Trading Volume and Volatility: Evidence from select Asia-Pacific stock market", European Journal of Economics, Finance and Administrative sciences, Vol.12, pp.1450-2275.
18. Ravindra, K. and Wang, Y. (2006), "The Causality between stock index returns and volumes in the Asian equity markets", Journal of International Business Research, Vol.5 pp. 63-74.
19. Richard Y.k., Ho, C., Yan, L. and Cheung, Deniel, W.W. (1993), "Intraday prices and trading volume relationship in an emerging Asian market-Hong Kong", Pacific-Basin Finance Journal, Vol.1, Pp.203-214.
20. Saatcioglu, K. and Starks, L. T. (1998)," The Stock Price-Volume relationship in Emerging Stock Markets: The Case of Latin America", International Journal and Forecasting, Vol.14, No.2, pp.215-225.
21. Sabri, N.R. (2008), "The Impact of Trading Volume on Stock Price Volatility in the Arab economy", Journal of Derivatives Hedge Funds, Vol.14, pp.285-298.
22. Weigand, R. A. (1996), "Trading Volume and Firm Size: A Test of the Information Spillover Hypothesis", Review of Financial Economics, Vol.5, No.1, pp.47-58.

Appendix

Table 9: Lead –Leg relationship between return and volume
Vector Autoregression Estimates
Standard errors in ( ) & t-statistics

	RETURN	VOLUME
Return(-1)	0.076129 [3.79294] 192.0767	(0.02007) (20.8096) [9.23021]

Return(-2)	-0.058293 [-2.85089] 97.22399	(0.02045) (21.1993) [4.58619]
Return(-3)	0.008256 (0.02055) [0.40185]	68.32809 (21.3016) [3.20765]
Return(-4)	0.006643 (0.02047) [0.32445]	53.37339 (21.2279) [2.51431]
Return(-5)	-0.030977 (0.02041) [-1.51806]	17.05902 (21.1560) (21.1560)
Volume(-1)	2.66E-05 (1.9E05) [1.39439]	0.399861 (0.01975) [20.2474]
Volume(-2)	-3..04E-05 (2..0E-05) [-1.48782]	0.161432 (0.02115) [7.63193]
Volume(-3)	2.13E-05 (2.1E-05) [1.03643]	0.080692 (0.02134) [3.78116]
Volume(-4)	-2.07E-05 (2.0E-05) [-0.01100]	0.142067 (0.02117) [6.71203]
Volume(-5)	-2.09E07 (1.9E-05) [1.77862]	0.195499 (0.01974) [9.90165]
C	0.107439 (1.9E-05) [1.77862]	151.9988 (62.6277) [2.42702]
R-squared Adj. R-squared Sum sq. resids S.E equation F-statistic Log likelihood Akaike A/C Schwarz A/C Mean dependent S.D. dependent	0.010590 0.006602 6851.933 1.661855 2.655418 - 4796.256 3.858150 3.883844 0.079839 1.667368	0.909539 0.909174 7.37E+09 1722.985 2494.505 -22100.40 17.74591 17.77160 8388.800 5717.107
Determinant resid covariance (dof adj.) Determinant resid covariance Log likelihood Akaike information criterion Schwarz criterion		8193937 8121759 -26895.92 21.60347 21.65486