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INVESTIGATION OF RELATION BETWEEN STOCK RETURNS, TRADING VOLUME, AND RETURN VOLATILITY

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ABSTRACT

We use a bivariate GJR-GARCH model to investigate relationship between trading volume and stock returns. We apply our approach on Pakistan stock exchange on data from January 2012 to March 2016. Our major findings include that negative shock has a greater impact on volatility and investors are more prone to the negative news whereas according to GJR-GARCH good news has greater impact on stock return and there is a strong relationship exist between the trading volume, stock return and stock volatility.

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1. INTRODUCTION

Stakes of publicly alleged enterprises are allotted and transacted in the stock market as well known as the equity market; the stock market is a unique dynamic module of a free-market economy, as it delivers companies with access to funds in exchange for giving investors a percentage of possession in the firm. Stock market works as the face of economy and Results revealed that economic growth can be attained by increasing the size of the stock markets of a country (MianSajidNazir et al, 2010).If market is growing and generating returns it helps to attract the investment from foreign which further leads to reduction in the un-employment. The liberal economy has higher chances to get the high stock returns (Umutlu, M. Akdeniz, Salih A.A, 2009)..The growth of the stock market is totally depends on the government policies as well as investors who plays their role as back bone of market The main purpose of investment from investor is to generate returns with minimum risk. Returns also depends on the information available to investor usually semi strong market plays a smart role in generating the dramatic

returns and where investor is not competent to get information, they follow other investors which is lead to high volatility and additional risk factor (PetrosMessis and Achilleas Zapranis, 2014).Daily closing prices also plays significant role for checking the return on the stock (Joel Hasbrouck, 2009). Trading volume is a feature realted to stock market. Researchers have used the flow of information (Gong MengChen, 2015) ,turnover (Tarunchordia, 2000)number of stock market transactions (Markus,Glaser,2003) as a proxy for trading volume . These trading could be in large or small in volume which cause to create the expectations in the mind of investors and they predict the stock according to their knowledge which plays important role in the market (MelikeBildiric,Ozgur Omer Erison 2009) which also leads to overconfidence where investors think that they have knowledge about forecasting the returns (Richard Deaves, Erik Luders, Michael Schroder ,2010) and enhances the trading volume and move the stock towards the expectations of high returns (Markus Glaser & Martin Weber, 2003).Whereas volatility plays important role in determining the returns and trading volume. Main factors that are largely focused by the researcher in the line of stock volatility, are – information that an investor gets, trade volume and the volatile nature. (Charles M. Jones, GautamKaul*, Marc L. Lipson, 1993). Investment decision has an impact on the volatility of the stock(AmalAouadi, Mohamed Aruri, 2015) and it cannot be linked directly to the information that has been reached to the market. The actual cause of volatility to the open time spam can be because of the circulation of the private information or may be because of non-synchronizing of liquid trade (Robert E. Whely, 2015).Price and volatility in some way related and contributes to some extent to persist volatility.(Bwo-NungHuang, Chin -Wei Yang 2001).Trading volume and reyurn volatility is negatively correlated (MbodjaMougoué, Raj Aggarwal 2011).Further researches rejects the results and contributed that number of trades is the most important variable driving realized volatility.(Hassan ShahzadHuuNhan Duong Petko S. KalevHarminder Singh 2014), (OmidSabbaghi 2011).Volatility and volume share share common short term movements but different in long term (Thierry An´e, Loredana Ureche-Rangau 2008).

The main purpose of this paper is to examine the relationship between stock market returns; stock volatility and trading volume of Pakistan stock exchange over the period of January 2012 to March 2016 with total daily observations of 1035.we have used EGARCH and GJR-GARCH approach to examine the relationship.

The continuing section of study is structured as follows. Section 2 deals with data sources and the empirical methodology used in the study. Section3 presents empirical results. Lastly, Section 4 includes conclusion.

2. EMPERICAL METHODOLOGY

This chapter is divided into three sections. The first section provides data and sources of Data. The second section describes the list of variables. The third section describes the methodology used for the analyses.

DATA DESCRIPTION

This study uses Daily time series data covering the time period from January 2012 to March 2016.Data have been collected from the Pakistan Stock Exchange website. All the data of stock

market is taken daily and it is in local currency in terms of Rupees and trading volume in terms of number of shares traded. The data for stock price and trading volume consist of 5 working days from Monday to Friday.

Daily return
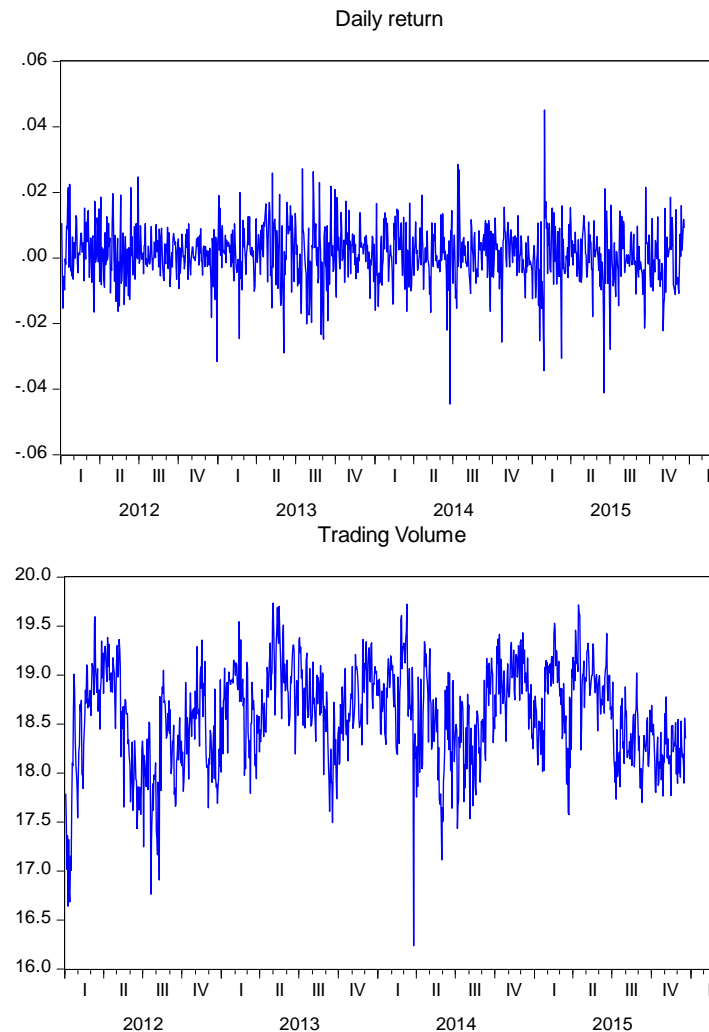
Trading Volume

3. METHODOLOGY

There are many tools available to test the long run relationship between variables. The long run relationship between different variables is checked by using the daily closing stock prices and trading volume. For this purpose this study uses the daily stock prices indices. The indices are converted into normality to test the relationship. So the log arithmetic transformation is made to the data.

Descriptive statistics includes all those techniques and methods that help in describing or explaining the given situation through the data collected and in this research it is used to express the statistical data pattern. Descriptive statistics is the most useful technique to examine the distribution of data to quantify the Mean, Median and maximum, minimum value of the data. It represents the information about values of Skewness, Kurtosis and Variance along with jarque-

bera. Standard deviation represents the volatility of the data i.e. it shows that how much data is dispersed from the mean. Skewnesstells us whether the data is positively or negatively distributed. Kurtosis shows the flatness or peakness of the data and Jarque-Bera represents the normality of data. In this study we will use descriptive statistics to know about the behavior of the stock return and trading volume of the Pakistan stock market.

For measuring the long run relationship between variables co-integration technique is followed. But the co-integration requires that all the variables are to be stationary of same order. The stationarity of the data is examined through the unit root test. There are two types of test Augmented Dickey Fuller Test and Phillip Perron Test. But in this study we have used the augmented Dickey Fuller Test.

Augmented Dickey Fuller (ADF) (1979) test requires the estimation of regression. Augmented Dickey Fuller (ADF) examines the unit root of the variables in the presence of the autoregressive model. The following equations is followed by ADF test

$$\Delta X_t = \beta_1 + \beta_2 t + \delta X_{t-1} + a_i \sum_{i=1}^{m} \Delta X_{t-1} + \mu_t \ \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where Δ represents differences, α, β and δ are coefficients and X is variable to be estimated

The volatility, daily return and trading volume is aimed to be explored by the ARCH family framework. The ARCH framework provided the framework for analyses of time series models. There are wide ranges of tests in ARCH family. The drawback of ARCH test is that it uses moving average rather than auto regression Engle (1995). For this purpose Generalized Auto regressive conditional Heteroscadasticity (GARCH) model is applied which is considered to be better than ARCH. The GARCH model is used by many studies to test the relationship between stock return, trading volume and volatility. The GARCH model however only captures the shocks that are symmetric and ignores asymmetric shocks in volatility. This implies that the volatility shocks may have different effect as good or bad news on volatility. So this defect of GARCH model is fulfilled by Exponential GARCH (EGARCH) model. This model is capable of measuring asymmetric shocks. This study uses EGARCH model for measuring the volatility stock return and trading volume. EGARCH model can only be applied to data which is stationary at level.

The EGARCH (1, 1) equation can be written as

$$\ln h_{t(SP)} = \omega_0 + \beta_1 \ln h_{t-1} + \alpha_1 \left| \frac{\epsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \phi \frac{\epsilon_{t-1}}{\sqrt{h_{t-1}}} + \psi \ldots\ldots\ldots\ldots\ldots.(1)$$

$$\ln h_{t(TV)} = \omega_0 + \beta_1 \ln h_{t-1} + \alpha_1 \left| \frac{\epsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \phi \frac{\epsilon_{t-1}}{\sqrt{h_{t-1}}} + \psi \ldots\ldots\ldots\ldots.(2)$$

Equation (1) and (2) represents EGARCH (1, 1) volatility spillover equation for stock price and trading volume. In these equations"**Ln h_t**"is the log of conditional variance, **ω_0** is the constant of volatility, **$\beta_1 \ln h_{t-1}$** is the consistence and is a function of volatility, the coefficient of **α_1**is the reaction to change in news while **ϕ**explains the relationship of volatility to both good and bad news. The coefficient **"ψ"**is the volatility spillover coefficient. In equation (1) the residuals are

extracted from EGARCH model estimated from trading volume and in equation (2) the residuals are extracted from the EGARCH model estimated for stock prices.

GJR-GARCH model is used to measure the impact of good and bad news .If error term is positive there is a good news impact if it is negative bad news impact exists further we can say that if error term is less than zero it shows bad news effect whereas if error term is greater than zero there is good news impact.we can explain the GJR GARCH through following equation.

$$\sigma_{R,t}^2 = \omega_R + \sum_{n=1}^{N} \delta_{n,p}\sigma_{R,t-n}^2 + \sum_{o=1}^{O} \kappa_{R,o}(\varepsilon_{R,t-o})^2 + \lambda_R S_{R,t-1}^{-}(\varepsilon_{R,t-1})^2 + \sum_{l=1}^{L} \theta_{R,l}V_{t-l},$$

$$\sigma_{V,t}^2 = \omega_V + \sum_{p=1}^{P} \delta_{V,p}\sigma_{V,t-p}^2 + \sum_{q=1}^{Q} \kappa_{V,q}(\varepsilon_{V,t-q})^2 + \lambda_V S_{V,t-1}^{-}(\varepsilon_{V,t-1})^2,$$

4. RESULTS & DISCUSSION

This Chapter is divided into two parts. The first part discusses the integration of stock markets. The first part is further divided into 5 sections. The first section is Descriptive statistics which is carried out to know about behavior of data. The second section consists of unit root test that is carried out to know about stationarity of the data. The second part describes the volatility spillover between stock prices and trading volume. The second part is divided into two sections. The first section is unit root analyses. The second section describes EGARCH and GJR GARCH methodology for measuring volatility spillover between stock prices and trading volume.

It is carried out to know about the behavior of the data. Table 1 represents the descriptive statistics of Stock returns and trading volume. The analysis reveals that maximum average daily return is given by Pakistan stock exchange which is 0.0105. While the minimum average daily trading is18.58. The results show that all the data is negatively skewed. All the data is found to be normally distributed.

Table 1: Descriptive Statistics

	Mean	Maximum	Minimum	Std. Dev	Skewness	Kurtosis	Jarque-Bera
Daily Return	0.001058	0.045177	-0.044556	0.008615	-0.333095	5.718793	337.9121
Trading Volume	18.58067	19.73619	16.23758	0.498344	-0.574625	3.665057	76.03266

The long run relationship between the equity markets is aimed to be explored using cointegration analysis. But the first step is to check the stationarity of all the variables. Cointegration test is applied on the data which is stationary at same order either at first difference or second difference. The stationarity of the data is checked by using unit root analyses. Tests are applied to know about the stationarity of the data.

Table 2: Augmented Dickey-Fuller test statistic

Variables	ADF			
	Level	Prob*	1st Diff.	Prob*
Daily Return	-27.58986	0.0000	-17.91389	0.0000
Trading Volume	-6.590426	0.0000	-23.90777	0.0000
Critical Values	Daily Return	Trading Volume	Daily Return	Trading Volume
1%	-3.436456	-3.436480	-3.436511	-3.436480
5%	-2.864124	-2.864135	-2.864149	-2.864135
10%	-2.568198	-2.568203	-2.568211	-2.568203

Table 2 represents the analyses of unit root tests for the natural logarithms of stock prices. The analysis confirms that all the variables are stationary at first difference and at level.

EGARCH

The co-efficient C(5) indicates the last period (t-1) volatility. C(6) indicates impact of long term volatility and C(7) indicates the leverage effect.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	832.3080	78.13038	10.65281	0.0000
C	-0.018540	0.010566	-1.754698	0.0793
DAILY_RETURN(-1)	0.297034	0.033065	8.983465	0.0000
TRADING_VOLUME(-1)	-0.000379	0.000591	-0.641181	0.5214
	Variance Equation			
C(5)	-12.32257	0.966180	-12.75391	0.0000
C(6)	-0.008217	0.033460	-0.245581	0.8060
C(7)	0.005214	0.029652	0.175823	0.8604
C(8)	-0.217761	0.035699	-6.099883	0.0000
C(9)	-0.021676	0.056280	-0.385152	0.7001
C(10)	35.55922	1.200003	29.63261	0.0000

The calculated R-squared value is 87.36% and durbin Watson stat shows 1.85 which means there is no auto correlation exist in data. Here the asymmetry term is negative which shows that negative shock has a greater impact on volatility rather than the positive shocks of the same magnitude. The significance of negative shocks persistence or the volatility asymmetry indicates that investors are more prone to the negative news in comparison to the positive news. This implies that the volatility spill over mechanism is asymmetric.

GJR GARCH

The results of the GJR-GARCH are shown in a table below where the p value is positive which shows that there is a different effect of good and bad news on market whereas coefficient is positive which shows that there is a greater impact of good news on the stock return .

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	-136.8447	16.06557	-8.517886	0.0000
C	0.025404	0.011731	2.165546	0.0303
DAILY_RETURN(-1)	-0.063534	0.034286	-1.853073	0.0639
TRADING_VOLUME(-1)	-0.000659	0.000627	-1.050346	0.2936
Variance Equation				
C	0.000205	3.84E-06	53.19669	0.0000
RESID(-1)^2	0.101936	0.019589	5.203800	0.0000
RESID(-1)^2*(RESID(-1)<0)	-0.046226	0.027376	-1.688573	0.0913
GARCH(-1)	0.419564	0.048300	8.686621	0.0000
TRADING_VOLUME	-8.64E-06	8.25E-08	-104.8299	0.0000
DAILY_RETURN	-0.002475	0.000226	-10.95817	0.0000

According to the results the calculated value of R-squared is 49.59 %, whereas the calculated value of Durbin Watson stats is 1.68 which is also low but it can be accepted for no serial auto correlation in the data.

To decide about which model is better in explaining the relationship between stock return ,stock volatility and trading volume we will use the values of Akaike info criterion and Schwarz criterian. The calculated value of Akaike info criterion and Schwarz criterian in EGARCH model is -8.207 and -8.160 respectively whereas in case of GJR-GARCH the calculated values are -7.141 and -7.093, which shows that GJR-GARCH is better in explaining the relationship between stock return, stock volatility and trading volume.

5. CONCLUSION

Stock market plays integral part in determining the worth of economy. In this paper we have analyzed the daily closing prices of stock using 1035 observation for determining the relationship between stock return, stock volatility and trading volume. We have used the data from January 2012 to March 2016 of Pakistan stock exchange we have applied EGARCH and GJR GARCH methodology for decision making and according to over results of EGARCH bad news has significant impact on investor decision whereas GJR GARCH results suggested that

good news has greater impact on stock return. On comparison of these models we have used AIC and SIC criteria which shows that GJR –GARCH model is better is predicting the volatility of stock.

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