International Business Management 10 (12): 2337-2346, 2016
ISSN: 1993-5250

Traders and Their Trading on Changing Economic Conditions

Bramantyo Djohanputro
PPM School of Management, Jl. Menteng Raya No. 9, Jakarta, Indonesia

Abstract: This study attempts to explore the way stock traders explore the information that may be available in the stock trading volume. They may use current and past stock trading volume together with past returns and daily dummies to understand the current return and, at the same time, current and past trading volume together with past volatility and daily dummies to understand the current volatility. This study employs daily data on two different periods, i.e., crisis period and post or non crisis period. To explore those relationships, TARCH or Threshold Autoregressive Conditional Heteroskedasticity is employed. This study reveals that traders exploit information differently from trading volume toward return and volatility in different periods. They also behave differently to positive against negative information in both periods.

Key words: Return, volatility, trading volume, TARCH, crisis period, non-crisis period

INTRODUCTION

Countries in South East Asia, known as ASEAN, experienced economic crisis. The greatest crisis hit the region took place at the end of 1990s and beginning of 2000s. Indonesia, Malaysia and Thailand are the most suffering countries in the region together with other countries around the world including South Korea. The recovery needed around 3 years to make financial sector, including financial market were back into their effective function to support economic development and to link between investors as fund surplus parties and investees as fund users. Another crisis hit the region again on year 2008 as the effect of subprime mortgage crisis starting from the United States. This last crisis needed a shorter period for the region to recover and back to the normal condition.

The first and second crises mentioned above were responded through not only economic policies but also political and structural policies. In the case of Indonesia, for example, there has been a very significant change in the structural aspect. The regulation on the establishment of Financial Service Authority, FSA or well known as OJK and come into reality on 2010s. This new institution combines some units from Bank of Indonesia as the Indonesia's central bank and from the Ministry of Finance. Capital Market Supervisory Agency and Financial Institution is one of the unit originally under the Ministry of Finance that has been moved to FSA.

Before, during and after crisis in 1990s up to know witnesses some developments in the Indonesia's capital market. Firstly, some companies went public within that period to make the capital market are becoming more attractive. There we some companies went private within the period. However, the number is very low and their impact on the capital market is not significant. Secondly, the evolution of the regulating institutions such as the Ministry of Finance, the central bank and FSA is expected to improve the effectiveness and efficiency of the capital market. Information becomes more freely and cheaply to flow to concerning parties. The improvement of information technology and paperless system is expected to ease and to accelerate the trading. Thirdly, investors in the capital become more informed and expert to trade. They explore most information available in the market to exploit investment opportunities and if possible to beat the market.

Investors explore data and information contained in the trading activities as long as they believe that trading activities contain valuable or material information. Data and information of trading activities include trading volume, share prices, market indices and others derived from those trading activities such as stock returns and volatility. Brown *et al*. (2009) argues that trading volume may contain some factors important to conduct trading activities. The factors include liquidity, momentum. Those factors are valuable to enhance the knowledge of investors and hence, improve the quality of trading decisions. The decision quality may be indicated by the excess returns and risk-adjusted returns gained by the investors.

There are three important variables in the market that attract traders as well as researchers. The variables are trading volume, returns and volatility. The concern of investors is to maximize gain and if possible to beat the market, at the tolerable risk level. The gain is expressed by returns and the risk is expressed asvolatility. Based on the principle of high return-high risk, investors may tolerate

high risk as long as the risks are compensated by high return. Some investors formally measure their performance on risk-adjusted return while other investors focus on the achievement of return and use risk only as the warning on their portfolio. Which ever approach used by investors, return and risk need to be considered in tandem as the lag indicators in order for investors to make proper decision on their investment. For this reason, investors need to employ market data to explore any factor that affects return and risk.

The relationship of market return, volatility and trading volume has been under scrutiny. Sabri (2004), for example, studies such relationship. Rompotis (2009) finds that trading volume is an important factor, even though not the only factor that influence market return as well as volatility. His finding is in accordance with the studies by Lamoureux and Lastrapes (1990), Chowdhury *et al.* (1993), Andersen (1996), Hrazdil (2009), Kiymaz and Girard (2009) and Yen and Chen (2010), stating that trading volume influences returns and the studies by Gerety and Mulherin (1992), Lee *et al.* (1994) and Sabri (2004) proposing that trading volume influences volatility.

Smart investors may be able to extract information from trading volume and its history. The more valuable information is gained from trading volume time series, the better is the quality of trading to gain returns and to push risks down. Investors may be able to separate expected and unexpected information contained in the trading volume. Expected trading volume which reflects the expected information may influence stock price movement permanently while unexpected trading volume results in temporary price movement. However, investors sometimes do not attempt to separate expected and unexpected trading volume. Instead, they use total trading volume as the source of information. If the trading contains unexpected trading volume, the price will reverse in the future days. For example, if the trading volume encourages price to move up while the trading mainly contains unexpected component, the price will go down in a couple of days. The opposite also applies in the case that trading volume causes the price moves down.

The length of price reversal depends on several factors. Some factors include) the amount and quality of information contained in the trading) the trading infrastructure available) the behavior of investors whether they are confident with the information acquired or they are occupied with worries that encourage them to trade as soon as investors feel unsecured with their position. In relation to the behavior of investors, the trading activities may be different if the trading takes place within crisis period compared to the trading that takes place during normal period.

The trading behavior within crisis period against normal period still does not receive attention from researchers. This is the main idea of this paper. Crisis is assumed as a bad condition. Every investor tends to watch trading activity closely. They also react quickly to any information or news. They may behave differently under normal market condition. Therefore, the behavior may be different in those two different periods. In other words, the relationships between return and volume are different for crisis period compared to normal period. The relationships between volatility and volume are also different for those two types of periods.

In relation to the above issue, this study raises two main questions. Firstly, how market returns are affected by trading volume and past market returns in both within crisis period and normal crisis period. Secondly, how market volatility is affected by trading volume and past market volatility within crisis period and normal period?

To answer those questions, this research separates the data into two different periods, i.e., normal or recovery period and crisis period. Economic crisis hit ASEAN, including Indonesia in year 1997 until 1999. The recovery starts in year 2000. Economic condition is assumed to be normal afterward until 2007 when the second crisis takes place. Therefore, this research employs the data from January 1st, 2000 to December 31st, 2007 as the normal period. For the crisis period, this research employs data within the year 2009. This study chooses the crisis period of 2009, not 1997-1999 because it is assumed that the 2009 crisis takes place within the period in which regulation and infrastructure in this crisis period and in the normal period are equal. Therefore, this study may focus on the investor behavior in trading activities as the point of concern.

It is important to note that investors may behave differently to positive and negative information. Under risk averse behavior, investors tend to react more significantly to negative information than to positive information. This phenomena is also found by some researchers (Bierens, 1993; Kim and Schmidt, 1993; Faff and McKenzie, 2007).

Therefore, this research employs TARCH (Threshold Autoregressive Conditional Heteroskedasticity) Model in order to extract different responses to negative and positive information. This study finds that different relationships between return and past return and volume and between volatility and past volatility and volume exist.

Previous studies: Traders always trade in every market condition and smart traders can make profit or beat the market in those conditions. They attempt to scrutinize the market data as the sources of information to tap the

market through buy, hold or sell decisions. Trading volume, returns and volatility are data most frequently used by traders and have been under study for a couple of years. Lamoureux and Lastrapes (1990) study the importance of market trading volume on the market returns. Their study are followed and in congruent with other studies such as those by Chowdhury *et al.* (1993) and Hrazdil (2009). While the definition of market return is clear and similar among researchers, the definition and the use of trading volume may differ. Trading volume may be defined as the total trading volume, even though some studies attempt to split the total trading volume into expected and unexpected trading components. The market trading volume may also be separated into local versus foreign trading or between block versus regular trading volume.

Most researchers argue that trading volume contains information and the information influences traders on buying and selling decisions. Suppose trading volume contains positive information, i.e., traders believe that information of good current and expected performance is contained in the trading volume. As a result, traders tend to buy stocks. The buying decisions of certain traders may influence buying decision of other traders. This encourages trading volume to increase. In short, the increase in trading volume under buying conditions tends to increase the price further. The increase in price continues until all information contained in the trading volume is exhausted.

The opposite condition also applies. If trading volume is believed to contain negative information, i.e., information on bad current and expected condition of a company, traders are encouraged to sell stocks. This decision encourages further other traders to sell their stocks. The increase in trading volume then encourages the decrease in the stock prices or return. The decrease in price continues until the negative information contained in the trading volume is exhausted.

Some studies focus not only on the relationships among those three trading variables but also on the periods under studies. Some studies attempt to explore the relationships within normal economic conditions while some others are concerned on certain economic types such as crisis periods. Memcha and Sharma (2006), for example, explore the existence of the relationships after India's economic crisis. Assan and Thomas (2013), also conduct the similar study by focusing on the volume return relationship at post crisis period in India stock market. They conclude that the relationship does not exist. In other words, trading volume does not indicate any information that leads to the price movements or returns. Ananzeh *et al.* (2013) studies the similar thing but for after crisis period and focus their study on evaluating the relationship between trading and volatility at stock level, not market level.

Some studies focus on certain period. The purpose is to explore the existence between trading volume as the main independent variable against return and volatility as the dependent variables. They also employ past return and volatility as the explanatory variables. Ananzeh *et al.* (2013), for example, apply their research for after crisis period. Assan and Thomas (2013) explore the relationship between volume and return India stock market and focus the study for the post crisis period. Memcha and Sharma (2006) conduct their research by employing India stock market with the set of data extracted after the economic liberation in India.

Zheng *et al.* (2014) examine the use of absolute daily return and intraday realized volatility as daily volatility. Absolute daily return is common to be used.

MATERIALS AND METHODS

Market return, $Return_t$ is defined as the change in daily:

$$Return_t = \frac{Index_t}{Index_{t-1}} \quad (1)$$

Theoretically, return consists of capital gain and dividend yield. However, in terms of daily returns, dividend yield is not significant because dividend is distributed only twice a year. By eliminating dividend yield in calculating return, only two inaccurate return data in each year of time series of daily return. Therefore, the calculation shown in Eq. 1 is acceptable.

Trading volume, volume$_t$ is defined as the total daily trading volume. The volume here is meant as the trading currency value. An alternative of defining trading volume is the number of stocks traded. The value in money, however is better because stock trading is something to do with investment and investment decision is mainly based on the value of money not the number of stocks traded.

Volatility may be defined in several ways. The statistical approach may use variance or standard deviation. However, daily volatility of return may be defined in a simpler way because daily return is assumed or approaching to zero. Therefore, volatility is defined as the squared return. Another approach commonly used to represent volatility is the absolute value of return. This research employs the squared return to represent volatility (Zeng *et al.*, 2014).

The traders may behave in the following ways. A trader may buy stocks in serial transactions or in one

transaction with a large number of stocks. A serial transactions cause partial and serial release of information from the trading activities if traders perceive the existence of such information. His (her) persistence on trading will result in the increasing trading volume and every transaction may reveal valuable information that influence market return or volatility (Andersen, 1996; Easley *et al*., 1996). Serial transactions lead to the price discovery. Every trader learns and extracts information from every single transaction. When traders agree on the price discovered through the process, the price spread becomes at minimum level and the price reaches equilibrium.

Crisis and normal conditions may be perceived differently by traders. Crisis condition leads traders tend to be pessimistic while normal conditions may lead traders to be more optimistic. The level of pessimistic or optimistic is not only caused by the market condition but also risk preference of traders. Under risk avoidance behavior, it is possible that a trader behave differently between negative and positive information. That is why asymmetric behavior toward information may exist in capital market. Note that informed and uninformed traders exist together in the market. Informed traders are those who trade stocks on the basis of information. On the other hand, uninformed traders are those who trade stock without information in their hand. As a consequence, they trade on the basis of random or become free riders, i.e., they just follow what other traders do. This creates noise in the capital market.

What happens to the return-volume relationship? There are some studies that attempt to explore such a relationship. Epps (1975) and Copeland (1977) do the research on the relationships and then followed by Campbell *et al*. (1993) and Kim *et al*. (2006). They find that the relationship is reveal not only on the return-volume but also on the return-squared volume. The last relationship reveals that squared volume positively affect the price movement, even though not significant.

While Campbell *et al*. (1993) and Kim *et al*. (2006) fail to reveal the return-volume relationship (Epps, 1975; Lakonishok and Smidt, 1986) find the asymmetric response of price movement as a result of the trading volume. This leads to attempt to explore the buying-pressure versus selling-pressure condition. Buying pressure is a market condition in which buyers are more aggressive to buy than the sellers to sell. Under this condition, it is possible that the increase of trading volume is responded by high price movement. Selling pressure is a market condition in which seller intention to sell is higher than buyers intention to buy. Under this condition, large trading volume may be responded by large decrease in market price. This study develops a return-volume model as follows:

$$\text{Return}_t = a + \sum_{i=1}^{n} b_i \,\text{Return}_{t-i} + \sum_{j=0}^{m} c_j \,\text{Volume}_{t-j} + \sum_{k=1}^{4} d_k D_k + \sum_{l=0}^{o} f_l \sigma_{i-l} + e_t \quad (2)$$

$$\sigma_t^2 = \omega + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{k=1}^{r} \gamma_k \varepsilon_{t-k}^2 I_{t-k} + \zeta_t \quad (3)$$

with $I_t = 1$ if $e_t<0$ and 0 otherwise. Equation 2 shows that current return is influenced by its past returns, current and past trading volume and daily dummies. It is possible that past returns contain valuable information to be accommodated into the current return. In practice, analysts may employ lag 20 or t-20 to explore information contained in the return last 1 month. The number of lags depends on how informed traders trade. If the tend to trade in large number of stock all at once, the number of lags become small. Uninformed traders will follow them but their actions are not significant and their noise will result in price reversal. However, if informed traders trade in small number of stock and they transact in serial transaction, the number of lags become larger. However, they will limit the number of serial transactions otherwise they will lose the chance to gain abnormal returns.

Furthermore, spontaneous and lagged volumes become the second categories of explanatory variables. If trading volume contains information, their coefficient will be significantly different from zero. If trading volume and past return contain information, the relationship between trading volume and current return may be similar with the relationship between past return and current return. The number of lags depends on how informed traders trade, whether in large number all at once or in serial transactions.

Daily dummy variables are represented by Dt are employed in this study. The purpose of putting the daily dummies is to explore the difference in return behavior among trading days. This refers to other studies that reveal the day of the week effect. This means that return of a certain day within a week may be different from the other days due to unexplained variables. These variables may be related to behavioral aspects. The above model expect the existence of the return volume relatipnship.

Hypothesis 1: Trading volume significantly influence current market return in both within crisis and post crisis periods.

Volatility-volume relationship is the second aspect of this study. Previous studies such as those conducted by Amihud and Mendelson (1991), Blume *et al.* (1994), Sabri (2004), Yen and Chen (2010) and Zeng *et al.* (2014) explore such a relationship. Similar to the return-volume relationship, noise may exist together with information in the trading volume. While information that is delivered by informed traders may cause the volatility, noise contained in the trading volume may not have significant impact on the market volatility. The equation employed in this study is as follows:

$$\text{Volatility}_t = a + \sum_{i=1}^{n} b_i \text{Volatility}_{t-i} + \sum_{j=0}^{m} c_j \text{Volume}_{t-j} + \sum_{k=1}^{4} d_k D_k + \sum_{l=0}^{o} f_l \sigma_{i-l} + e_t \quad (4)$$

$$\sigma_t^2 = \omega + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{k=1}^{r} \gamma_k \varepsilon_{t-k}^2 I_{t-k} + \zeta_t \quad (5)$$

With $I_t = 1$ if $e_t<0$ and 0 otherwise. Note that both models as shown in Eq. 2 and 4 employ TARCH Model. employ TARCH Model (Threshold Autoregressive Conditional Heteroskedasticity) as shown in Eq. 3 and 5. The purpose is to improve the efficiency of the volatility in Eq. 2 and 4. This models employ conditional variance, h2 to explore the possible condition of the variance that may change through times. If this happens, the homeoskedasticity assumption is violated. The benefit of employing TARCH is to catch the asymmetric effect of information on traders' behavior, i.e., between positive and negative perception on the information. Such differences will be captured by coefficients on Eq. 2, especially by γt.

Equation 4 is similar to model Eq. 2 except the independent variables of Volatility_{t-i} replace Returnt_i and the dependent of Volatility_t replaces Return_t. Equation 4 shows that trading volumes are expected to influence the current volatility.

Hypothesis 2: Trading volume significantly influence current market volatility in both within crisis and post crisis periods.

RESULTS AND DISCUSSION

Data and analysis: This study attempts to explore the trading behavior in Indonesia capital market. There two different periods employed, i.e., post crisis and within crisis period. This study employs the data from 1st January, 2000 as the beginning of the post crisis period. As it is well known, Indonesia faced economic, severe crisis in year 1997. The crisis hit not only Indonesia but also some other countries such as Malaysia, Thailand and South Korea. The crisis takes place until year 1999, from when Indonesia starts to recover the pain of the crisis. For this reason, the period of 1997-1999 is excluded from the definition of post crisis period.

Indonesia also faces another crisis in year 2008 as the impact of the crisis that starts from the United States as known as sub-prime mortgage crisis. The crisis starts from the mid of 2008. However, for the convenience of the study, it is safe to avoid using data from 1st January, 2008 to be defined as the non crisis period. As a result, this study employs data from 1st January, 2000 to the end of year 2007 to represent the data of post crisis period.

As also mentioned above, Indonesia faces at least the crisis periods, i.e., 1998-1999 crisis period and 2008-2009 crisis period. This study does not employ 1998-1999 crisis period. The reason is because within this period, the impact of the crisis is so severe that almost all aspects are in trouble, not only economic but also social, political and other aspects. This kind of crisis may not happen again in the near future. This may happened in the far future. Therefore, the use of this period does not provide significant lessons. On the other side, 1998-1999 crisis hits mostly only on economic sector without much influences on other aspects such as social and political sectors. This kind of crisis also more frequently takes place. Therefore, this crisis era is used to represent the crisis period for this study.

More specifically, this study employs data from the beginning to the end of working days of year 2009. Even though the crisis starts from the mid of 2008, the impact of the crisis to Indonesia economy takes place quite slowly and starts to be realized in year 2009. Therefore, it is safe to employ data from the first working day of year 2009 as the starting point of the crisis period. This study employs only 1 year period is because the economy of Indonesia starts to rebound from the beginning of year 2010. Most companies werevery optimistic that business was much better in year 2010.

The data of the Jakarta Composite Index and trading volume are extracted from yahoo.com. The index has been adjusted for every corporate action related to the amount of stock, stock price and the index (Pinfold and Qiu, 2007, for the comparison). However, there are a lot of missing data of the index provided by yahoo.com. This data provider eliminates the index for the working days without any trading activities. To overcome this problem, the indexes on the missing days are filled with the indexes that are equal to the indexes of their previous day. This

Table 1: The regression of return as the dependent variable against lags of return, trading volume, dummies with TARCH Model for variance equation

Independent variable	Regression results during crisis	Regression results post crisis
Main regression		
C	0.002	0.003
$Return_{t-1}$	0.003	0.132***
$Return_{t-2}$	-0.038	-0.019
$Return_{t-3}$	0.000	0.022
$Return_{t-4}$	-0.039	0.028
$Return_{t-5}$	0.029	-0.016
$Return_{t-10}$		-0.020
$Return_{t-15}$		-0.028
$Return_{t-20}$		0.019
DUM1	-0.003	-0.004
DUM2	- 0.002	-0.002***
DUM3	-0.001	-0.002*
DUM4	-0.001	-0.002**
$Volume_t$	0.000	1.13E-12**
$Volume_{t-1}$	0.000	-1.48E-12
$Volume_{t-2}$	-0.000	2.97E-12
$Volume_{t-3}$		-4.67E-14**
$Volume_{t-4}$		-9.47E-13
$Volume_{t-5}$		9.91E-13
Variance regression		
C	0.000*	3.11E-05***
$Resid_{t-1}^2$	0.054*	0.014
$Resir_{t-1}^2$ x [$Resid_{t-1}$<0)]	0.083*	0.240***
$TARCH_{t-1}$	0.955***	0.677***

Return as the dependent variable is represented by the daily index return; the volume is the value of daily volume trading; the dummies are daily dummies of working days. All coefficients are rounded to three decimals as a result, some coefficients which are very smalls are shown as 0.000, even though they are actually not zero. The sign of significance level: ***means significant at 1%; **means significant at 5%; *means significant at 10%

Table 2: The regression of volatility as the dependent variable against lags of return, trading volume, dummies with TARCH Model for variance equation

Independent variable	Regression results post crisis	Regression results during crisis
Main regression		
C	0.002	7.84E-05***
$Volatility_{t-1}$	0.166*	0.068***
$Volatility_{t-2}$	-0.066	0.149***
$Volatility_{t-3}$	0.072	0.088***
$Volatility_{t-4}$	0.076	-0.004
$Volatility_{t-5}$	-0.051	0.052**
$Volatility_{t-10}$		0.039*
$Volatility_{t-15}$		-0.006
$Volatility_{t-20}$		-0.031
DUM1	0.000***	0.0001***
DUM2	0.000	6.43E-06
DUM3	0.000	4.16E-05
DUM4	0.000**	1.99E-05
$Volume_t$	-0.000	3.54E-14
$Volume_{t-1}$	0.000*	-2.78E-14
$Volume_{t-2}$	-0.000**	4.65E-14
$Volume_{t-3}$		-1.70E-14
$Volume_{t-4}$		-2.59E-14
$Volume_{t-5}$		-9.96E-15
Variance regression		
C	0.000***	2.04E-05***
$Resid_{t-1}^2$	0.113**	0.150***
$Resir_{t-1}^2$ x [$Resid_{t-1}$<0)]	-0.524***	0.050
$GARCH_{t-1}$	0.406**	0.600***

Volatility as the dependent variable is represented by the squared return; the volume is the value of daily volume trading; the dummies are daily dummies of working days. All coefficients are rounded to three decimals as a result, some coefficients which are very smalls are shown as 0.000, even though they are actually not zero. The sign of significance level: ***means significant at 1%; **means significant at 5%; *means significant at 10%

approach is common to be implemented in capital markets. Trading volume for the missing days are filled with zero.

This study employs the closing index. It is based on an assumption that all information coming to within the trading days into the market are immediately absorbed by traders into the pricing of the assets on the same day. The closing price, therefore, reflected all information available. Any event taking place overnight is accommodated into next day's price.

Table 1 and 2 show the result of the regressions. Table 1 summarizes the regression results with the market returns as the dependent variable and $Return_{t-i}$, Dummy and $Volume_{t-i}$ as explanatory variables. Column (2) of Table 1 shows the regression results for the data within crisis period while column (3) shows the regression results for the data of the post crisis period. Table 2 summarizes the regression results with the market volatility as the dependent variable against $Volatility_{t-i}$, Dummy and $Volume_{t-i}$ as explanatory variables. Column (2) of Table 2 shows the regression results for the data within crisis period while column (3) shows the regression results for the data of the post crisis period.

Return-trading volume: Let see the trading behavior within the crisis period with return as dependent variable as shown in column (2) Table 1. The regression is run with Eviews program with maximum 500 iterations. The variable $Volume_{t-i}$ here is the total daily trading volume. This regression does not separate the trading volume into expected and unexpected trading volume. The use of total trading volume implies that the information that may contain in the trading volume mixes between expected movement and noise. The number of lag of trading volume is adjusted to the significance of the information available in the trading volume that is exploited into market pricing. In this case, the lags of total trading volume are only maximum five trading days that potentially influence asset price. Therefore, $Volume_{t-5}$ is the maximum lags applied here.

The lags of returns may behave differently. Many practitioners employ data of one month behind to explore information contained in the price movement. Some of them apply 5, 10 and 20 days moving average in their analysis. The 20 days moving average represents the monthly movement of asset prices. For this reason, it is reasonable to implement $Return_{t-20}$ in the model.

Before coming to the decision on the length of lags of both trading $Volume_{t-i}$ and $Return_{t-i}$, this study has tried to include long lags until $Volume_{t-20}$ and $Return_{t-20}$. Based on the maximum likelihood, Akaike information criteria and Schwarz criteria, together with the fulfillment of the stationary and normality requirements, the number of lags for both variables are as shown in the table.

Column (2) of Table 1 shows how past returns, trading volume and daily dummies influence the current return. It is interesting that none of independent variables has significant influence on the current market return, even though at 10% significant level. Only dynamic variance influence the return. The variance equation with TARCH Model indicates the existence of asymmetric response to different types of information coming to the capital market. The coefficient of e_t-12 I_{t-1} is positive and significantly different from zero at 10% significance level.

There are some possibilities of this relationship. The first possibility is that traders do not care much on trading volume within the crisis period. Within the crisis, huge trading volume tends to indicate a selling pressure, i.e., selling activities are so aggressive that lessen sellers' bargaining power against buyers. This leads to the price decrease. However, if there are many noises in trading, i.e., trading that is based not on calculation and prediction but merely on fear or cash demand, this trading volume does not influence other traders, especially the rational ones to reduce the price. If this is true, the buyers focus on the movement of expected trading volume.

To find the evidence on this argument, this study also try to separate expected from unexpected trading volume using moving average model. The results of the analysis using expected and unexpected trading volume as independent variables separately are not reported here. However, it can be stated here that expected trading volume has significant influence on the current trading volume while unexpected tradingvolume does not have significant influence. This, then, supports the above argument.

The second possibility is that traders are more concerned with other economic variables than trading volume. Some investors, mainly long term investors, do not consider significantly to the downturn of prices within the crisis period. As long as they believe that the economy will recover in the near future and the prices go down only temporary and underlying assets are considered to be prospective, they keep the assets and wait at least until the prices reverse and provide gain to investors.

The explanation of the second possibility is also in line with the findings that none of $Return_{t-i}$ as independent variables does not provide any information for trading activities. This also supports the first possibility that most trading activities are based on psychological motives and the need for cash, not based on rational expectation.

The finding on the trading behavior for the data post crisis is different. The regression results are shown in column (3) of Table 1. Some of the $Return_{t-i}$, dummies and $Volume_{t-i}$ as independent variables significantly influence the current return as the dependent variable. $Volume_{t-2}$ significantly influences the current return with positive coefficient at 5% significant level. This indicates the quick response to the traders because the information contained in the trading volume is absorbed and translated into trading activities only within 2 days. The positive sign of the coefficient of $Volume_{t-2}$ means that higher trading volume tends to push the return in the next 2 days up. This supports the argument that trading volume on post crisis period tends to be dominated by buying pressure. The buying pressure condition means that the demand from buyers is dominant compared to the supply from the sellers. This enhances the bargaining power of sellers and on the opposite side, reduce the bargaining power of buyers. This leads to the increase of asset prices. The stronger the buying pressure, the higher the price increase.

The positive and significant influence of total trading volume on returns may also indicate that rational and emotional traders tend to have similar behavior on trading decisions. They watch the trading volume as one of information sources. Once they believe that the trading contains certain information, they trade accordingly. Note that the sign of the coefficient of $Volume_t$ is positive while the sign of the coefficient of $Volume_{t-1}$ is negative and both coefficients are not significant. In essence, the coefficients of $Volume_{t-2}$, $Volume_{t-1}$ and $Volume_t$ are positive, negative and positive consecutively. This may indicate the mixed behavior of traders. Buying pressure on the last 2 days encourage the returns to increase. However, some traders may consider the increase in prices is too high. As a result, the return goes down or at the extreme case, the prices moves down. However, the traders o not reach consensus in this matter. This may be the reason that the coefficient of $Volume_{t-1}$ is not significant.

The similar argument also explains why the coefficient of $Volume_t$ is positive. Some traders may consider the decrease of return or price reversal at time t-1 is too large. At the same time, the current trading volume immediately evaluated by traders to transact in the same day. As huying pressure is dominant at post crisis period, this condition encourages the increase in return when trading volume increases. This assumption encourages traders push the return up again. However, the coefficient

is not significant. This indicates that traders do not reach the consensus on how much the increase of the return.

The above explanation is also valid when trading volume decreases. For example, the low trading volume encourages the return on the next 2 days to slow down. This because buying pressure is not strong. However, the reverse condition takes place in the next day and then, the correction takes place again in the second day.

The relationship between $Return_{t-i}$ and $Return_t$ for the post crisis is as follows. Returnt-1 is highly significant in influencing $Return_t$. The positive influence of $Return_{t-1}$ to $Return_t$ indicates that today's return strengthens the tomorrow's price movements. The strong, or 1% significant level of the coefficient of $Return_{t-1}$ suggests that traders closely pay attention to the price movement or return. Once the return increases, they rush to the market to buy. As a result, the price moves up further, leading to the high return. This also happens in the opposite direction. Once the return is slowing down, they retain their intention to buy. As a result, the price acceleration of return increase is also slowing down. On the extreme movement, when the price decreases or under negative return condition, traders tend not to buy but instead, some traders intend to sell. As result, the price goes down.

By considering the coefficient of $Return_{t-i}$ with i above 1 up-20, the coefficients are mixed with positive and negative signs. However, all of them are not significant. This may indicate that traders do not have strong confidence on the long effect of returns. However, the information is finally accumulated on the last day before trading, i.e., on $Return_{t-1}$ and traders are strongly confident on what happen on tomorrow's return by considering today's return (Table 1).

It is important to briefly put some note on the variance regression. Both models show that the threshold components of TARCH are positive and significantly different from zero at 1% significant level. These strong significance levels suggest the existence of different response made by traders on positive from negative information. Traders respond more strongly on negative information than on positive information for the equal level of information content.

Volatility-trading volume: Table 2 shows the regression results with volatility as the dependent variable and $Volatility_{t-i}$, daily dummies and $Volume_{t-i}$ as independent variables. Column (2) of Table 2 shows the regression results for the crisis period while column (3) of Table 2 show the results of the regression of post crisis period. Similar to the regressions in Table 1, the regressions shown in Table 2 also employs TARCH Model.

Let see column (2) of Table 2. The coefficient of $Volatility_{t-1}$ is significantly positive at 10% significant level. Volatility represents risks and worries. The increase in volatility means the increase of risks and worries by traders. Under this condition, traders become more worries in the next day. As a result, worries encourage other worries. However, there are at least two important notes to underlie. Firstly, the significance at 10% indicates that traders do not have strong consensus on this positive relationship. Even though majority of traders behave in such positive relationship, other traders do not strongly follow that behavior. As a result, the relationship is not so strong. Secondly, the coefficients of $Volatility_{t-i}$, with i above 1 are mixed of positive and negative and those coefficients are not significantly different from zero. This indicates that traders may confuse on how the market volatility influences its future volatility.

The low significant level of past volatility on the current volatility also suggests that traders do not care much on market volatility and its impact on future volatility or worries. Similar to the analysis on return as shown in Table 1, they may pay their attention more on other variables than on volatility. They scrutinize information from various sources other than the data or information of market trading itself.

$Volume_{t-i}$ seems to have stronger impact on $Volatility_t$ than $Volatility_{t-i}$ does. There are at least two coefficients of $Volume_{t-i}$ that are significantly different from zero. The coefficient of $Volume_{t-1}$ is positive and significant and 10% significance level while the coefficient of $Volume_{t-2}$ is negative and significant and 5% significance level. The negative and positive signs of those coefficients may suggest that traders tend to overreact to the information available in the trading volume. Once they realize that they overreact, the price then reverse in the next day. However, the reversal at t-1 is not as significant compared to the price movement from t-2. In total, there is still quite significant impact of the price movement influenced by the trading volume from t-2.

The coefficients of dummies are all positive with dummy for Monday is significant at 1% significance level and with dummy for Thursday is significant at 5% significance level. The lesson from the dummies is that the lowest volatility is on Friday. This may be due to the weekend, the pressure on trading goes down and as a result, volatility also goes down. The first trading day of the week, i.e., on Monday, traders start with worries in the crisis period. This results in the high and significant volatility. While the volatilities are mixed within the weekdays, the volatility become significant again when the trading day is approaching the weekend.

The impact of trading volume on market volatility is different from the impact of trading volume on market return within the crisis period. Column (2) of Table 2 shows that there are two coefficients of $Volume_{t-i}$ that are significantly influence the market volatility. The coefficient of $Volume_{t-1}$ is positive and significant at 10% significance level and the coefficient of $Volume_{t-2}$ is negative and significant at 5% significance level. This may indicate the reversal event of volatility from lag 2 days to lag one day. The increase in trading volume from the last 2 days is followed by the decrease in volatility, then the volatility increase again in the next day.

However, the coefficient of $Volume_t$ is negative and not significant. This suggests that in the near future and spontaneous condition, trading volume tends to have the opposite movement against volatility. One possibility is that most traders perceive that the increase in trading volume within this particular crisis may indicate that traders are ready to jump again into the market. If this is true, they believe that the crisis may come to the end soon. As the result, their worry is declining and as a result, volatility decreases. This also explains the opposite movement. When the trading volume decreases, traders may perceive that the crisis still exists. As a result, most of them still hold their effort and retreat from trading. This reduce the price movement because of low enthusiasm of traders.

The way traders learn from trading activities are different between both periods under this study. Column (3) of Table 2 provides the regressions results for the post crisis period. Most coefficient of $Volatility_{t-i}$ are significant while none of the coefficients of $Volume_{t-i}$ are significant. The coefficients of volatiltity with lags 1, 2, 3, 5 and 10 are all positive and significant. Even more, the coefficients of volatility with lags 1-3 are strongly significant and 1% significance level. The coefficients of volatility with lags 4, 15 and 20 are negative but not significant.

This clearly indicates that high volatility tends to persuade high volatility within the next week and low volatility tends to calm the volatility down within the next week. The reversal on volatility take place in the long term but the reversal is not significant. In other words, there is no consensus among traders whether reversal is needed or not. They still attempt to explorethe information of past 20 trading days or 1 month on volatility.

The coefficient of dummies that is significant is only Dummy for Monday. This coefficient is positive at 1% significance level. This indicates that the volatility of Monday tends to be higher than the volatility of other trading days. This may be the result of a lot of information coming into the market within the weekend. Because of the absence of trading day within the weekend, all information is accommodated into price movement and volatility on the first trading day within the week, i.e., Monday.

Another interesting finding here is that none of the coefficients of $Volume_{t-i}$ are significant. This is different from the condition within the crisis period in which traders attempt to extract a lot of information from trading volume. Positive and negative coefficients, yet not significant of $Volume_{t-i}$ at least indicate that traders are not sure how to extract information from trading on volatility even though they are able to extract from trading volume for the sake of market return within post crisis period as explained above.

CONCLUSION

The way traders behave within a crisis period is different from the way they behave outside a crisis period. For the crisis period, they seem not to exploit trading volume and past return as the sources of information. It is possible because the trading is mixed between rational and emotional traders. Rational traders create expected trading volume while emotional traders and free riders tend to create unexpected trading volume. It is very likely that traders pay mote attention on expected trading but not on unexpected trading. Furthermore, traders may be concerned with economic factors or indicators than past trading activities. As long as they believe that the economy will recover in the near future and the prices go down only temporary while the underlying assets are considered to be prospective, they keep the assets and wait at least until the prices reverse and provide significant gain for investors.

While traders do not extract information on past trading to determine market return, they consider past trading activities on the perception on market volatility within a crisis period. Past volatility, daily dummies and trading volume become the sources of information for traders to anticipate future volatility. In essence, within the crisis period, worries create other worries, volatility strengthens future volatility. High volatility causes high volatility in the next day. Trading volume provides a mixed impact on volatility. High trading volume tends to dampen the market for the next 2 days but this impact is revised in the next day.

Monday is the most volatile than other trading days and Friday is the day with the lowest volatility. This is possible because all information and worries that are accumulated within the weekend are transferred into the market at the first trading day, i.e., Monday.

Non crisis period provide different story of trading behavior. Past trading activities become valuable

information on predicting future return as well as volatility. In terms of return behavior, past returns, daily dummies and past trading volume can used as the sources of information. Yesterday's return immediately gives effect on today's returns. Yesterday's high return encourages today's high return and yesterday's low return encourages today's low return. In addition, dummy variable provide daily return effect. Friday provides the highest return among all trading days while Monday provides the lowest return. Furthermore, trading volume of last 2 days provide information on today's return. The increase in today's trading volume is followed by the increase in the return next 2 days and the decrease in today's trading volume is followed by the decrease in the return next 2 days.

In terms of volatility for non crisis period, traders extract a lot of information from past volatility. The impact of volatility still remains until 10 days. High volatility within 10 days tends to result in high volatility and low volatility within 10 days tends to result in low volatility. However, traders are mixed in interpreting trading volume and the do not come to the consensus. Therefore, trading volume do not significantly influence the market volatility.

It is interesting to consider macroeconomic indicators such as interest rate to be put into model. The purpose is to make sure whether in certain cases traders do not give a significant attention to past trading activities. Instead, they try to explore other sources of information to conduct trading activities that influence either return or volatility. This could be the future research.

REFERENCES

Ananzeh, I.E., Q.M. Jdaitawi and A.M. Al-Jayousi, 2013. Relationship between market volatility and trading volume: Evidence from Amman stock exchange. Int. J. Bus. Soc. Sci., 4: 188-198.

Andersen, T.G., 1996. Return volatility and trading volume: An information flow interpretation of stochastic volatility. J. Finance, 51: 169-204.

Assan, A. and S. Thomas, 2013. Stock returns and trading volume: Does the size matter? Financial Manage. Financial Innov., 20: 76-88.

Bierens, H.J., 1993. Higher-order sample autocorrelations and the unit root hypothesis. J. Econ., 57: 137-160.

Brown, J.H., D.K. Crocker and S.R. Foerster, 2009. Trading volume and stock investments. Financial Anal. J., 65: 67-85.

Campbell, J.Y., S.J. Grossman and J. Wang, 1993. Trading volume and serial correlation in stock returns. Q. J. Econ., 108: 905-939.

Chowdhury, M., J.S. Howe and J.C. Lin, 1993. The relation between aggregate insider transactions and stock market returns. J. Financial Quant. Anal., 28: 431-437.

Copeland, T.E., 1977. A probability model of asset trading. J. Financial Quant. Anal., 12: 563-578.

Easley, D., N. Kiefer, M. O'Hara and J. Paperman, 1996. Liquidity, information and infrequently traded stocks. J. Finance, 51: 1405-1436.

Epps, T.W., 1975. Security price changes and transaction volumes: Theory and evidence. Am. Econ. Rev., 65: 586-597.

Faff, W.F. and M.D. McKenzie, 2007. The relationship between implied volatility and autocorrelation. Int. J. Managerial Finance, 3: 191-196.

Gerety, M.S. and J.H. Mulherin, 1992. Trading halts and market activity: An analysis of volume at the open and the close. J. Finance, 47: 1765-1784.

Hrazdil, K., 2009. The price, liquidity and information asymmetry changes associated with new S&P 500 additions. Manage. Finance, 35: 579-605.

Kim, J., A. Kartsaklas and M. Karanasos, 2006. The volume-volatility relationship and the opening of the Korean stock market to foreign investors after the financial turmoil in 1997. Asia Pac. Financial Market, 12: 245-271.

Kim, K. and P. Schmidt, 1993. Unit root test with conditional heteroskedasticity. J. Econ., 59: 287-300.

Kiymaz, H. and E. Girard, 2009. Stock market volatility and trading volume: An emerging market experience. IUP J. Applied Finance, 15: 5-32.

Lakonishok, J. and S. Smidt, 1986. Volume for winners and losers: Taxation and other motives for stock trading. J. Finance, 41: 951-974.

Lamoureux, C.G. and W.D. Lastrapes, 1990. Heteroskedasticity in stock return data: Volume versus GARCH effects. J. Finance, 45: 221-229.

Lee, C.M.C., M.J. Ready and P.G. Seguin, 1994. Volume, volatility and New York stock exchange trading halts. J. Finance, 49: 183-213.

Memcha, L. and L.J.K. Sharma, 2006. Stock price changes and trading volume in context of India's economic liberalization and its emergent impact. Finance India, 20: 99-118.

Rompotis, G.G., 2009. Performance and trading characteristics of iShares: An evaluation. IUP J. Applied Finance, 15: 24-39.

Sabri, N.R., 2004. Stock return volatility and market crisis in emerging economies. Rev. Accounting Finance, 3: 59-83.

Yen, S.M. and M.H. Chen, 2010. Open interest, volume and volatility: Evidence from Taiwan futures markets. J. Econ. Finance, 34: 113-141.

Zheng, Z., Z. Qiao, T. Takaishi, H.E. Stanley and B. Li, 2014. Realized volatility and absolute return volatility: A comparison indicating market volatility. PLOS One, Vol. 9. 10.1371/journal.pone.0102940.