On the Relationship between Stock Returns and Trading Volume: A Case Study

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Abstract

This article focuses on the experiment about the causality relationship between the stock returns and the trading volume of the member companies at Tehran Stock Market. Accordingly, the seasonal data from these companies within the years 1996 to 2009 are used to estimate the vector error correction model. The results obtained from the Philips–Perron Unit Root Test demonstrated that the above mentioned variables are integrated of the order one and thus there is a long run equilibrium relationship between them. The estimation from the error correction model proved that there is a positive and bidirectional relationship between these variables. However the stock returns has a stronger effect on the trading volume. Therefore, through a psychological analysis, the *"Mass Behavior"* hypothesis in the said stock market is not approved. Moreover, the estimation of the error correction coefficient indicated that balancing the said variables towards the long run equilibrium volumes, is slow.

Keywords: Stock Returns, Trading Volume, Error Correction Model.

Introduction

In the literature of economy, investment is called the development and growth engine. The financial markets undoubtedly play a significant role in supplying the financial resources for the institutions for investment. Amongst the various kinds of financial markets, the stock market is privileged of this advantage so it can provide the financial resources required by the institutions and the governments in a non-inflammatory condition. Moreover, the stock market is deemed as an efficient channel for promoting the privatization plans and establishing the democratic economy. In this regard, the trading volume of the stock market is counted as a sign. The trading volume of the stock market is usually declined before the economical stagnancy period. Also the trading volume of the stock market is increased before the economical prosperity; therefore some researchers have focused on the factors affecting the stock trading volume. The stock return is one of these factors. Lamoureux and Lastrapes (1990) proposed that random information flow causes the price to move, and at the same time changes trading volume. Although information flow cannot be observed, trading volume can be used as a proxy variable. If trading volume is used as explanatory variable for heteroskedasticity[1] of return rate sequence, it will absorb heteroskedasticity of variability of return

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[1] In statistics, when the standard deviations of a variable, monitored over a specific amount of time, are non-constant. Heteroskedasticity often arises in two forms, conditional and unconditional. Conditional heteroskedasticity identifies non-constant volatility when future periods of high and low volatility cannot be identified. Unconditional heteroskedasticity is used when futures periods of high and low volatility can be identified. (http://en.wikipedia.org/wiki/Heteroscedasticity, 2011).

sequence. Therefore in the GARCH model with trading volume introduced, the ARCH effect and the GARCH effect which represent the persistence of the heteroskedasticity of the return variability will decrease or even disappear; and the coefficients on the trading volume should be greater than 0. They chose 20 stocks of which options were traded in the Chicago Board Options Exchange as a sample to conduct an empirical research, and their results showed that the sum of the estimated coefficients for the ARCH term and the GARCH term changed from the previous value of about 1 to nearly 0 for all selected stocks. Later, the similar results were obtained in different security markets of different countries or regions. For example, Brailsford (1996), Phylaktis et al. (1996), Sharma et al. (1996), Omran and Mckednzie (2000), Pyun et al. (2000), Bohl and Henke (2003), Ramaprasad and Hamori (2004), Wu and Guo (2004) and etc. Some researchers further studied positive relationship between return variability and trading volume in terms of financial economy. For example, Lo and Wang (2000), Llorente et al. (2002), Vicentiu and Lilian (2004), Fleming et al. (2006) (Wen and Yang, 2009). Hiemstra and Jonathan (1994) [15] investigated the causality relationship between the stock returns and the trading volume of New York Stock Market. The findings demonstrated that there was a nonlinear and bidirectional relationship between the stock returns and the trading volume in the said market. Fung and Patterson (1999) investigated the dynamic reactions between the returns fluctuations, the trading volume, using the Vector Automated Regression model. According to their findings, the bidirectional effect between the return and the trading volume was statistically approved. Silvapulle and Choi (1999) used the used Grangers' (1969) Causality Test to investigate the relationship between the trading volume and the stock returns in the South Korea's Stock Market. The empirical evidences of this research demonstrate the bidirectional relationship between the stock price and the trading volume. Ghysels et al. (2000) investigated the causality relationship between the trading volume and the returns using the data related to Alcatel Stock. The results showed that the direction of the causality relationship is variable in different time intervals. It has been the basis for many researches in the field of Financial Economics. Karpoff (1987) called the financial market structure comprehension (Especially regarding the way of information transferring) and feasibility of the technical analyses as the main reasons of investigating the relationship between the above said variables. Chordia and Swaminathan (2000) conducted a research which indicated that the trading volume affect the stock returns meaningfully after a time interval. Gunduz and Hatemi (2005) investigated the dynamic relationship between the stock price and the trading volume in the countries Czech, Hungary, Poland, Russia and Turkey. Granger Causality Tests based on the method of Toda and Yamamoto (1995) demonstrated that there weren't any causality relationship amongst the investigated variables of Czech country. There is bidirectional causality relationship in Hungary. There is a unidirectional causality relationship from the trading ratio to the stock price in Poland. In Turkey and Russia, the stock price has a unidirectional causality relationship with the trading volume and the trading ratio. Lee and Rui (2002) surveyed the dynamic–causality relationship between the trading volume and the return (fluctuation) for the internal markets of the US and the markets of the other countries, using the daily data of the three great stock markets of New York, London and Tokyo. The results indicated that the trading volume was not the cause of Granger of the stock return in the three markets and there is a positive feedback relationship between the trading volume and the feedback fluctuation in the three markets. McMillan and Speight (2002) studied the relationship between the stock trading volume and the security bonds in Britain. These researchers found that there is a bidirectional relationship between the trading volume and the stock returns. The studies conducted by Mestel et al. (2003) indicated a bidirectional relationship between the stock returns, stock returns fluctuation and the trading volume in the stock market of Australia. Pisedtasalasai and Gunasekarage (2007) studied the dynamic and causality relationship between the stock returns and

the trading volume in five newfangled markets of Indonesia, Malaysia, Philippine, Singapore and Thailand. They used the VAR (Vector Automated Regression Model) in this research to estimate the Asia's financial crisis and the effect of Monday on the volume. The results of this research indicated a causality relationship from the return to the trading volume in the markets of Indonesia, Malaysia, Singapore and Thailand. The researchers conducted by Nguyen and Daigler (2006) demonstrated that the trading volume was meaningfully under the influence of stock return. Rashid (2007) studied the relationship between the stock return index and the percentage of the trading volume at Karachi's stock market. He concluded that there was a unidirectional relationship from the stock return to the trading volume. Gurgel et al. (2005) surveyed the relationship between the stock return and the trading volume. They investigated the data related to the daily stock returns of twenty companies with high levels of liquidity as members of the stock market. The researches indicated that there was a simultaneous and meaningful relationship between the return fluctuation, stock and the trading volume. As a case-study, in this research the causality relationship between the return and the trading volume of shares of the companies registered at Tehran Stock Exchange is investigated. Accordingly, this article is offered in four sections. Initially the research methodology is introduced. Then the research findings are elaborated on in section three. The final section is designated to conclusion and offering the proposals. Jun et al. (2003) employ monthly data for the period 1992-1999 on 27 emerging markets (including China) and examine the relationship between stock returns and liquidity where the latter variable is measured in several ways: turnover, trading value and the ratio or turnover to volume. They find that each of the three measures of liquidity significantly influences returns and there is a positive relation between return and turnover in the panel data set. In summary, the return and volume are strongly related contemporaneously but there is little evidence that either can be used to predict the other. Huang and Heian (2010) examine the risk adjusted high value premium based on all firms listed on NYSE and AMEX from August 1963 to December 2005. They use the conventional method widely used by momentum literature (Jegadeesh and Titman, 1993) to test the strategy. Formation period is 26 weeks and the holding period varied from 1 week to 52 weeks. They find statistically significant abnormal returns for high volume minus low volume portfolio for holding periods 1-4 weeks. However, they further to find that as the holding period increase beyond 8 weeks, abnormal returns decrease significantly (Pathirawasam, 2011).

Methodology

In this research the seasonal data (1996–2008) related to the stock market and trading volume of 220 companies admitted in Tehran Stock Exchange, is used. In order to study the causality relationship between the said variables, first the stationary test is performed on these variables. On the basis of stock and Stock and Watson's (1989) findings, the traditional Engle and Granger (1987) causality tests are sensitive to the stationary of the time series. Hence, Co integration test has been used. The present paper utilizes Johnson and Juselius (1990, 1992) maximum likelihood procedure for Co integration test using maximum eigenvalue statistic. Hence, Schwarz–Bayesian (1978) criterion (SBC) is employed to determine the lag length. However, in the first step, Phillips–Perron (1988) unit root test is used to verify the degree of integration if the presence of co integration is confirmed by Johnson test, The Error Correction Model (VECM) can be used to show the direction of causality relationship. According to Engle and Granger (1987), the VEC Model will be:

$$\Delta R_t = a_{11}(L)\Delta V_{t-1} + a_{12}(L)\Delta R_{t-1} + \lambda_R * ECT_{t-1} + \varepsilon_{1t} \quad (1)$$
$$\Delta V_t = a_{21}(L)\Delta V_{t-1} + a_{22}(L)\Delta R_{t-1} + \lambda_V * ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

Where, V_t, R_t and ε are respectively, trading volume, stock return and error term. Also, $\Delta(L)$ and

ECT are difference operator, polynomial in the lag operator "L" and the co efficient of the lagged error correction term, similarly, "λ" shows the derivation of the dependent variable from the long run equilibrium. The non-significance of explanatory variable coefficients (a_{11} and a_{22}) is referred to as a short run-causality. In this case, if no causality in either direction is fund, the neutrality by Hypothesis will be supported. In fact, the absence of long run causality is found from the non-significance ECT coefficients. In this case, the deven Jent variable is weakly exogenous. Tnus, if the ECT variables are non-significant, we will find the strong exogenous of the dependent variable.

Results

The results of the Philips–Perron unit root test for levels and first difference are shown in table 1. As the table shows, all variables are non-stationary in levels and stationary in first difference. Thus, they integrated of order I (1).

Table 1. Results of Philips–Perron Unit Root Test

Variables	Levels	First Difference
V_t	-2.2	-5.9*
R_t	-2.1	-4.7**

Source: Authors Calculations * Significant at 1 percent ** Significant at 5 percent

Table 2. Johansen Co-Integration Test Results

Series	Likelihood Ratio *
V_t , R_t	26.12

Source: Authors Calculations

* The critical value for 1 percent and 5 percent are 24.6 and 12.92 respectively.

Table 3. The Results of the VEC Model Estimation

	D (Vt)	D (Rt)
CoINT Eq	-0.2	- 8.4 E-04
	(-2.2)	(-2.6)
D (Vt (-1))	0.11	6.6 E -04
	(0.48)	(1.8)
D (Vt (-2))	0.002	1.6 E – 06
	(0.005)	(2.33)
D (Vt (-3))	0.21	1.2 E -06
	(0.8)	(2.5)
D (Vt (-1))	156298	0.02
	(1.7)	(1.2)
D (Vt (-2))	157852	0.0007
	160519	(0.004)
D (Vt (-3))	160519	0.34
	(1.9)	(2.38)
C	-1.8 E + 09	-5638
	(-9.1)	(-1.6)
GDP_t	21118	0.063
	(1.92)	(1.7)

Source: Authors Calculations; Values in parentheses are T statistics

Table 2 shows the co-integration test results. The table shows that the value of the calculated test statistics is greater than the critical value which denotes the rejection of the hypothesis of non-co-integration, as well as long run neutrality hypothesis.

The results of the error correction model estimation are showed in table 3. Table 3 demonstrates that the stock return and the trading volume with one term, two term and three term intervals, have positive and meaningful effects on each others. However the coefficient of the returns effect of the stock is greater in the equation of the trading volume. For example, increasing the stock returns. For example, the increase of the stock return up to one percent, within a three month interval, may increase the trading volume to an average of 156298 shares. The above table also demonstrates that the equilibration speed in this stock market is too low. As an instance, fifteen months are required to settle the complete effects resulted from the shocked trading volume. In other words, only 20 percent of the fluctuations occurred to the trading volume are settled in the next three months.

Conclusions

The stock return and the trading volume are two important indexes for evaluating the stock market operation (Darrat et al. (2003)). In this paper the causality relationship between the trading volume and the stock returns are surveyed using the data related to 220 member companies of Tehran Stock Exchange. According to the results obtained through the Philips – Perron Test, the said variables are integrated of order one. Also the Johansen's Co-Integration Test was used which resulted that there was a long run equilibration relationship between the stock returns and the trading volume. The findings of the Vector Error Correction Model confirmed a bidirectional causality and meaningful relationship between the said variables regarding which the level of effectiveness of the stock returns are more on the trading volume. In fact this research demonstrated that although the trading volume and the stock return explain each others' changes, the mass behaviors are not approved psychologically in the above mentioned market. In other words increase in the stock returns increases the stock supply and demand more in comparison to the trading volume increasing the stock returns.

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