USING STOCK MAKET PAST RETURNS AS A FORECASTING DETERMINANT OF LIQUIDITY ON VIETNAM STOCK MARK

Nguyen Minh Phuong[*]

Abstract

This paper examines the causal relationship between stock market past returns and stock market liquidity in Vietnam. This research employs time series analysis and ARCH models to analyze daily, weekly and monthly data obtained from Vietnamese stock market. Expectedly, the findings of this research confirm a strong and positive relationship between market past returns and market liquidity for daily, weekly and monthly intervals. As well, the research identifies three forecasting models which can be used to predict stock market liquidity on daily, weekly and monthly basis from market past returns. This research finds out the feasibility of those models in predicting the change in market liquidity from market past return in Vietnamese stock market with a high level of precision.

Key words: *Vietnam, stock market, stock return, stock liquidity*

1. Introduction

This research focuses on identifying the relationship between stock market return and stock market liquidity in Vietnamese stock market. Specifically, this research examines whether or not stock market return in the past has an impact on stock market liquidity at present.

The time period which was selected to be investigated is from 24 February 2009 to 31 July 2012. 24 February 2009 marked the lowest level of Vn-Index due to the 2007 financial crisis and the burst of stock market bubble; and after that Vietnamese stock market began to improve and remained more stable. The chosen time period after that date helps eliminate influence factors which were generated by shocked events such as financial crisis and stock market bubble burst. Since those events rarely occur and the outcome of this research is not affected by those events, the applicability of this research would be more

general and this research can be applied to the market when it is in normal condition.

In order to achieve the overall aim of this research on Vietnamese stock market, all research objectives are identified and will be dealt with during the paper as follows:

- *Explore* the causal relationship, if it exists, between market past return and market liquidity.

-*Identify* a model in forecasting the daily liquidity from lagged daily returns of up to five days.

[2] MA, (Correpoding Email: mpforck@gmail.com))

- *Identify* a model in forecasting the weekly liquidity from lagged weekly returns of up to four weeks.

- *Identify* a model in forecasting the monthly liquidity from lagged one month market monthly return.

With those objectives presented above, the outcome of this research is expected that there exists a relationship between the current liquidity and past returns in Vietnamese stock market, where the changes in stock market past returns have an impact on stock market liquidity. Furthermore, that relationship is anticipated to fit in several forecasting models, by which the volatility of stock market liquidity can be quantitatively predicted from the change in market past returns on daily, weekly and monthly basis.

2. Literature review

2.1. Stock market liquidity

Issue of liquidity in financial market has been at the center of many economic researches. There are numerous papers studying financial market liquidity in a variety of geographic markets which ranges from well-developed markets in United States, United Kingdom, Japan, China, European countries to newer ones such as Indian, Russian and other Asian and African developing countries. A number of papers and journals which were concerned with the issue of financial market liquidity have been published since very early time; for example, Keynes (1930), Black (1971), Martin (1975), Amihud and Mendelson (1980), Harris (1990) and O'Hara (1995). Those papers helped establish and develop the notion of liquidity in financial market and other related issues.

Generally, it can be understood that asset liquidity indicates how easily the asset can be changed into cash (Lippman and McCall, 1986). And in stock market, a stock is more liquid if stock holders can buy or sell large number of the stock without making a large change in its price. There have also been various definitions of liquidity. In a very early research, Keynes (1930) considered asset liquidity is how easily it is to be realizable without loss. Since then, the notion of liquidity has not changed much in its nature; liquidity has been perceived in different aspects. Mainly, many researchers such as Black (1971), Harris (1990) and O'Hara (1995) identified different dimensions of liquidity. There are four elements that were identified by Harris (1990); they are: width, depth, immediacy and resiliency. "Width" refers to the ask-bid spread. "Depth" is the number of shares traded at a certain price. "Immediacy" refers to the speed of transaction or how quickly a certain number of shares are sold or bought at a certain price. And "resiliency" illustrates how quickly prices of a stock revert to previous level after their change as a response to a large order flow on the stock exchange. Based on those dimensions, models to measure liquidity have been proposed.

According to Benic and Franic (2008), there are five levels of liquidity in the stock market: The first is the ability to trade. This level assumes if there is no liquidity there would be no trade at all. At the second level, traders can buy or sell a certain amount of an asset with an impact on the price. Next level provides the ability to buy or sell a certain amount of an asset without any impact on price. Forth level of liquidity allows traders to buy and sell an asset at the same price at the same time. And the last level enables the activity in forth level immediately.

2.2. Volume-based measure of liquidity in stock market

This method is used to measure the depth aspect of liquidity. Commonly, the turnover ratio is employed in this approach. It was calculated in Levine (1997) to be the ratio of trading volume over market capitalization. The higher the ratio is, the higher the market liquidity is. Later on, turnover ratio, as a proxy of liquidity, has been applied by Datar, Naik and Radcliffe (1998), Rouwenhorst (1999), Chordia et al. (2001) as well as Jun, Marathe and Shawky (2003). This method is quite easy to use as information can be easily retrieved from public sources.

The equation below was provided by Sarr and Lybek in calculating the turnover ratio through trading volume:

$$V = \sum P_i x Q_i \qquad (1)$$

V: dollar volume traded

P_i: prices of the i trade during a specific period

Q_i: quantities of the i trade during a specific period

$$T_n = V / (S * P) \qquad (2)$$

T_n: turnover rate

V: defined in (1)

S: outstanding stock of the asset

P: average price of the i trades in (1)

In addition, "liquidity ratio" model is another method to evaluate liquidity based on trading volume. It is the ratio of average dollar volume over per percent price change. This method was used by Martin (1975) in his study about liquidity of NYSE stock market. Liquidity ratio method was also employed in Cooper, Groth and Avers (1983) and Dubofsky and Groth (1984). In this approach, the higher the ratio associates with the more liquid stock. However, this approach was criticized by Grossman and Miller (1988) that it failed to distinguish different causes of price volatility as well as justify how a sudden larger-than-average order would influence price.

Wyss (2004) used time related liquidity measures for stock market liquidity. In this approach, number of transactions in a unit of time was observed to illustrate how often transactions take place. And the higher value indicates higher level of liquidity. In addition, the number of orders in a unit of time can also proxy stock liquidity.

2.3. Stock market return as a determinant of stock market liquidity

One element which was proved to have a significant influence on stock market liquidity is market return. A considerable number of empirical researches considered the contemporaneous relationship between stock market liquidity and return, such as Crouch (1970), Karpoff (1987) and Ngugi (2003). Crouch (1970), which studied on NYSE; and they explored the co-movement of trading volume of securities market and the change in market absolute value of price. Karpoff (1987) reviewed other researches and came to the conclusion of the existence of correlation between stock price and trading volume. It implied a relationship between stock market return and its liquidity. In addition, Karpoff synthesized that a price increase had a bigger impact in volume than a price decrease. Taking the case study of Nairobi stock exchange, Ngugi (2003) demonstrated that trading activities were affect significantly by the level of stock returns. However, it was added that there is a need of quality of information and efficiency of the market to achieve market depth and market resiliency. Although stock returns did not have an entire influence on all aspects

of market liquidity, it was still a considerable determinant to stock market liquidity in terms of transaction activities.

Besides those research studies, there are a few related current market liquidity and past return; for example Wyss (2004), Chordia et al. (2005), Kang et al. (2007), Goyenko and Ukhov (2009) and Soderberg (2008a). Wyss (2004) studied the relationship between daily return and stock market daily liquidity. A relationship between market returns and market liquidity was found in Swiss stock exchange. However, his findings indicated that market returns significantly influence market liquidity on some but not all of the lagged values of up to seven days of market returns which were investigated.

Chordia et al. (2005) employed time series models on daily data to analyze stock market liquidity and return in US stock market. They found that day-to-day movements in stock market liquidity are affected by market returns and other variable such as order imbalance. And this causal relationship between liquidity and return is correlative.

Kang et al. (2007) studied New York Stock Exchange and concluded that stock liquidity was positively related to market returns. In their study, bid-ask spread as a proportion of stock price was used as a proxy for stock liquidity. This value was found to be strongly impacted by negative market returns. In Kang et al. (2007) the time series models were built including control variables such as lagged individual stock return, stock turnover, sell-buy order imbalance and change in volatilities. Those control variables were the advantage of their models; they helped discover that the impact of market declines on liquidity is stronger for higher volatility stock.

In investigating the Scandinavian stock markets from January 1993 to June 2005, Soderberg (2008a) discovered that stock market returns had a positive impact on stock market liquidity in Stockholm, Copenhagen, and Oslo stock exchanges. The data in the research was analyzed on monthly basis. Sorderberg found that market returns significantly Granger-caused illiquidity as a rise in return predicted a decrease in illiquidity. It presents that market return have the positive relationship with market liquidity; and furthermore, the Granger-causality mentioned in the research indicates that the time series value of monthly return can be used to predict monthly liquidity (Granger, 1980).

Goyenko and Ukhov (2009) studied US stock and bond market from 1962 to 2003. Their findings discovered that monthly stock return had causal relationship with monthly stock illiquidity and "an innovation in stock returns results in a reduction in stock illiquidity" (Goyenko and Ukhov, 2009 p199).

3. Research methodology

3.1. Data collection

In this research, VN30 index will represent the whole stock market. VN30 index was established on 6th February 2012, comprising 30 Vietnamese companies which have the biggest market capitalization value and the highest level of liquidity. Those 30 companies account for 80% of the whole stock market capitalization and 60% of total transaction value of the entire market (Nhat Binh, 2012). VN30 index, therefore, can represent for the whole Vietnamese stock market in terms of liquidity condition. This approach of selecting stock for researching was applied by Wong and Fung (2001) in their study about liquidity of Hong Kong stock market. In their study, the aggregate liquidity of 33 stocks which account for 80% of the market capitalization value was chosen

to represent liquidity of the whole Hong Kong stock market. Moreover, this approach can be considered as "judgment sampling" where the target participants are selected on an expert's judgment that they are the representative of the population (Burns and Burns, 2008 p204). Therefore, in this research the sample was selected in the same way since the liquidity in question is also the aggregate value of the whole market.

All daily data which is related to stock market will be obtained from 24th February 2009 to 31st July 2012 because the period under investigation of this research is from the date VN index reached the bottom to present. The reason for choosing that period was mentioned in the earlier section of this research.

However, the time period which is examined in this paper is from February 2009, at that time some of the VN30 stocks had not been quoted on HOSE. Therefore, those stocks are omitted for the period that they did not exist on HOSE. Moreover, this collection of 30 companies is updated every six month period in January and July. Thus, the number of stocks to be examined can be less than 30 and the stocks in this collection may vary during time.

The statistics stock trading volume and stock market capitalization statistics are obtained from website www.Vietstock.vn. The statistics of VN30 index are obtained from the website of Ho Chi Minh stock exchange www.hsx.vn (Hose, 2012)

3.2. Data analysis

Measure of stock market liquidity

For the convenience of obtaining data, stock liquidity will be calculated through turnover rate. The turnover rate which indicates the relationship between stock trading volume and outstanding volume demonstrates the number of times the stock change owners.

For a single stock, the daily turnover rate is calculated as follows:

$$TR_d = \frac{\sum_{i=1}^{N_i} P_i \times Q_i}{S \times P} \quad (3)$$

With is the turnover rate of day d; P_i is the price in transaction i; Q_i is the number of stock traded in transaction i; is the number of transaction in day d. S is the number of outstanding shares of the stock and P is the average price of that stock trade in day d.

In this research, the stock market will be presented as a whole. Therefore, the turnover rate of the whole market will be the aggregate turnover rate of every single stock, which is the aggregate turnover rate of 30 stocks in VN30 index. For that reason, the turnover rate of the whole market will be evaluated through the following equation:

$$TRM_d = \frac{\sum_{k=1}^{n} TR_k}{n} \quad (4)$$

With TRM_d represents the turnover rate of the whole market on day d. TR_k is the turnover rate of stock k. n is the number of stocks in VN30 index.

Time series models

There have been many studies about the relationship between stock market past return and its liquidity. Few of them tested the influence of return on liquidity while the others tested the reverse relationship. Kang et al. (2007) applied time series analysis to find out the relationship between stock liquidity and market past return. In their models, they calculated the change in weekly stock spread to measure the change in stock liquidity. Those statistics were then regressed on the lagged market return which was the return of the previous week. In Kang et al. (2007), the effect of up to four lags of

weekly returns was examined. In Fujimoto (2003) and Soderberg (2008b) the same models were built to examine the effect of one month lag of monthly market return on stock illiquidity.

In this research, three regression models based on time series analysis will be established. The first will test the relationship between the daily stock market liquidity and the lagged return of the stock market up to five days. The second and third model will examine the same effect however based on weekly and monthly measures. Therefore, the second model will investigate the influence of up to four lags of stock market weekly return on weekly stock market liquidity. And the third model will analyze the influence of one month lag of stock market monthly return. Additionally, lagged changes in liquidity will be added to the models to account for any serial correlation. This method follows Kang et al. (2007)'s method.

Basically, the first model is as follows:

$$LIQ_d = \alpha_d + \sum_{k=1}^{5}\beta_k LIQ_{d-k} + \sum_{k=1}^{5}\gamma_k R_{d-k} + \varepsilon_d \quad (5)$$

In this model, stock market liquidity LIQ_d is measured on daily basis. LIQ_d is then regressed on two types of daily variables which are the historical daily return of the stock market and its own lagged value. R_{d-k} is the return of the stock market on day d-k. LIQ_{d-k} represents stock market liquidity on day d-k.

R_{d-k} is calculated through the VN30 index:

$$R_{d-k} = (VN30_{d-k} - VN30_{d-k-1}) / VN30_{d-k-1} \quad (5.1)$$

LIQ_d = *TRMd* (defined in (7) (5.2)

In (8), the lagged daily return is examined up to five days in order to find out the influence of daily return on daily liquidity of the preceding one working week.

The second model is based on weekly statistic:

$$LIQ_w = \alpha_w + \sum_{i=1}^{4}\beta_i LIQ_{w-i} + \sum_{i=1}^{4}\gamma_i R_{w-i} + \varepsilon_d \quad (6)$$

LIQ_w represents the stock market liquidity of week w. It is the average value of LIQ_d in week w from Monday to Friday.

$$R_{w-i} = (VN30_{w-i} - VN30_{w-i-1}) / VN30_{w-i-1} \quad (6.1)$$

With the VN30 index of one week is the index of the last working day of that week.

The third model is based on monthly statistics:

$$LIQ_m = \alpha_m + \beta LIQ_{m-1} + \gamma R_{m-1} + \varepsilon_m \quad (7)$$

LIQ_m represents the stock market liquidity of month m. It is the average value of the sum of LIQ_d with d is from the first to the last day of the month.

$$R_{m-1} = (VN30_{m-1} - VN30_{m-2}) / VN30_{m-2} \quad (7.1)$$

These three models are run on E-Views program and will be tested under Least Square and ARCH models. Least Square model tests the influence of changes of variables on changes in other variables. And since this research analyzes financial data in time series, it is useful to employ ARCH models in analyzing data as ARCH models have successfully been employed to predict return volatility of asset and it also "provides a good fit for many financial return time series" (Lamoureux and Lastrapes, 1990 p221).

4. Finding and discussion

4.1. Data analysis

Analysis of daily data

Table 1 illustrates the result of ARCH model running with daily data. All values of lagged daily liquidity are significant. However, for past value of stock returns, only lagged one day, lagged two day and lagged four day returns are significant in the model; it means that in predicting the stock market liquidity, it is only

Table 1. ARCH model – lagged daily data up to 5 days

Dependent Variable: LIQ				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 03/11/13 Time: 00:34				
Sample (adjusted): 3/04/2009 5/25/2012				
Included observations: 843 after adjustments				
Convergence achieved after 64 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(13) + C(14)*RESID(-1)^2 + C(15)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.153840	0.126042	-1.220541	0.0223
C	2.192168	0.910906	2.406581	0.0161
LIQ(-1)	0.471766	0.039147	12.05105	0.0000
LIQ(-2)	0.163569	0.041805	3.912618	0.0001
LIQ(-3)	0.087958	0.042556	2.066886	0.0387
LIQ(-4)	0.125124	0.046176	2.709725	0.0067
LIQ(-5)	0.150471	0.036272	4.148417	0.0000
RE(-1)	319.5557	31.39532	10.17845	0.0000
RE(-2)	79.32572	40.46163	1.960517	0.0499
RE(-3)	57.33217	40.02491	1.432412	0.1520
RE(-4)	82.83747	38.22587	2.167053	0.0302
RE(-5)	-8.963912	38.79306	-0.231070	0.8173
	Variance Equation			
C	4.990537	1.177540	4.238103	0.0000
RESID(-1)^2	0.164504	0.019349	8.502091	0.0000
GARCH(-1)	0.842040	0.013061	64.47042	0.0000
R-squared	0.820910	Mean dependent var		73.45206
Adjusted R-squared	0.818539	S.D. dependent var		56.03837
S.E. of regression	23.87133	Akaike info criterion		8.634111
Sum squared resid	473537.2	Schwarz criterion		8.718399
Log likelihood	-3624.278	Hannan-Quinn criter.		8.666411
Durbin-Watson stat	2.153914			

useful to take into account the past value of stock market return of the previous one and four days. And these lagged values have the positive relationship with liquidity as the coefficients are positive. The result indicates that the lagged one day returns have the biggest influence on liquidity; when it changes one unit, the stock market liquidity change 319.5 unit and in the same direction; when this figure is just 85 for lagged four week value. There is serial correlation of the liquidity as its own lagged values affect its value with significant level of less than 5%.

The significant value of @SQRT(GARCH) and the negative value of coefficient for @SQRT(GARCH) means that the volatility of daily liquidity has the inverse relationship with market daily liquidity. It illustrates that when volatility of liquidity goes

up, liquidity goes down and vice versa. Although not all independent variables are significant in the model, in general, from value of R-squared, Durbin-Watson statistic, this model is highly fit in forecasting LIQ with the value of independent variables, and more than 80% change in market liquidity can be explained by change in those significant independent variables.

From Table 1, it is proved that the forecasting model of stock market daily liquidity is presented by equation (8), with the coefficients values are displayed in Table 2.

$$LIQ_d = 2.192 + \sum_{k=1}^{5} \beta_k LIQ_{d-k} + \sum_{k=1}^{5} \gamma_k R_{d-k} + \varepsilon_d \quad (8)$$

LIQ_d: stock market liquidity day d

R_{d-k}: stock market return on day d-k

LIQ_{d-k}: stock market liquidity day d-k

Table 2. Value of coefficients - time series model for daily data

Coefficient	Value	Coefficient	Value
β_1	0.4717	γ_1	319.5
β_2	0.1635	γ_2	79.3
β_3	0.0879	γ_3	0
β_4	0.1251	γ_4	82.8
β_5	0.1504	γ_5	0

Analysis of weekly data

The ARCH model results for weekly data are displayed in Table 3. Only values of one week lag returns and liquidity are significant in predicting the stock market liquidity. Table 3 also explains that when lagged one week returns change 1 unit, market liquidity changes 136.7 unit in the same direction. Different from the result of daily data, weekly model shows no relationship between market liquidity and its volatility. Besides, this ARCH model results also confirm the decreasing level of significant with longer lag. With value of R-squared and Adjusted R-squared of more than 0.84, it indicates that more than 84% change in liquidity are explained by change in the significant independent variables.

Equation (9) and Table 4 below illustrate the forecasting model of stock market weekly liquidity with the corresponding coefficient values.

$$LIQ_w = 3.627 + \sum_{i=1}^{4} \beta_i LIQ_{w-i} + \sum_{i=1}^{4} \gamma_i R_{w-i} + \varepsilon_d \quad (9)$$

LIQ_w: stock market liquidity week w

R_{w-i}: stock market return on week w-i

LIQ_{w-i}: stock market liquidity week w-i

Table 4. Value of coefficients - time series model for weekly data

Coefficient	Value
β_1	0.702
γ_1	136.7
$\beta_2, \beta_3, \beta_4, \gamma_2, \gamma_3, \gamma_4$	0

Analysis of monthly data

Table 5 displays ARCH model run on monthly data with dependent variable is the stock market liquidity and independent variables are the lagged values of liquidity and returns in one month. Since all the Prob values of independent variables are significant and coefficients are positive, it can be concluded from the result that in time series analysis, lagged one month returns and liquidity have the correlated impact on market liquidity. When lagged return changes one unit, liquidity changes 177 unit and when lagged value of liquidity changes one unit, market liquidity change 0.58 unit. @SQRT(GARCH) value is 0.95 which is not significant; it means that monthly volatility in liquidity has no relationship with liquidity and it cannot help in predicting change in liquidity in time series model. The value of R-squared and adjusted R-squared indicates that the model help explained about 70% of the change in dependent variable.

Table 3. ARCH model – lagged weekly data up to 4 weeks

Dependent Variable: LIQ				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 03/11/13 Time: 00:25				
Sample (adjusted): 3/31/2009 7/03/2012				
Included observations: 171 after adjustments				
Convergence achieved after 43 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(11) + C(12)*RESID(-1)^2 + C(13)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.096464	0.347574	0.277535	0.7814
C	3.627652	2.854194	1.270990	0.2037
LIQ(-1)	0.702518	0.101804	6.900672	0.0000
LIQ(-2)	0.009651	0.114957	0.083955	0.9331
LIQ(-3)	0.144125	0.101700	1.417150	0.1564
LIQ(-4)	0.041040	0.097628	0.420377	0.6742
RE(-1)	136.7048	28.81619	4.744028	0.0000
RE(-2)	60.68643	35.12651	1.727653	0.0841
RE(-3)	-31.25840	29.72978	-1.051417	0.2931
RE(-4)	-2.403631	35.59841	-0.067521	0.9462
	Variance Equation			
C	5.871067	5.975856	0.98246	
RESID(-1)^2	0.186073	0.056750	3.278842	0.0010
GARCH(-1)	0.802875	0.047947	16.74522	0.0000
R-squared	0.850884	Mean dependent var		73.35567
Adjusted R-squared	0.842549	S.D. dependent var		52.95866
S.E. of regression	21.01406	Akaike info criterion		8.580297
Sum squared resid	71096.12	Schwarz criterion		8.819137
Log likelihood	-720.6154	Hannan-Quinn criter.		8.677208
Durbin-Watson stat	2.037099			

The findings from stock market monthly data propose a forecasting model of stock market monthly liquidity as shown in equation (10) below:

$$LIQ_m = 25.965 + 0.5812 LIQ_{m-1} + 177.15 R_{m-1} + \varepsilon_m \quad (10)$$

LIQ_m: stock market liquidity of month m

R_{m-1}: stock market return of month m-1

LIQ_{m-i}: stock market liquidity of month m-1

4.2. Comparative analysis

The outcome of the research has proved a strong and positive relationship between stock market past returns and its liquidity. This relationship is remained from daily value to weekly and monthly value of all the variables. In general, these findings are consistent with previous researches.

For daily results, this research is consistent with Wyss (2004) and Chordia et al. (2005). It was explained in Wyss (2004) that the daily liquidity of stock market was correlatively influenced by the lagged returns of the market. However, in seven daily lagged values, it was significant for the lagged one day, two days, three days and seven days. While in this research, the lagged value of one day, two and four days are significant in the model. Although, the two results are different in the order of influence lagged days, they share the same characteristic that the level of significance decreases considerably after the first lag value.

The findings of this research from daily data is in line with Chordia et al. (2005) as confirmed the correlative impact of stock market lagged liquidity and stock market lagged returns to stock market liquidity. Chordia et al. (2005, p101) indicated that there was a rise of 0.02 standard deviation units in stock spread on the first day as a response to its own decreasing shock; and the response diminishes gradually from day-two to day-ten as the lagged ten days values were investigated. In Chordia et al. (2005) models, stock spread represented stock illiquidity, therefore it can be understood that market liquidity decreased when there is a decrease in liquidity of the previous day. Besides, in terms of cross-sectional relation between return and liquidity, Chordia et al. (2005, p101) concluded that "an innovation in stock

Table 5. ARCH model – lagged monthly data up to 1 month

Dependent Variable: LIQ				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 03/11/13 Time: 00:05				
Sample (adjusted): 2009M04 2012M07				
Included observations: 40 after adjustments				
Convergence achieved after 61 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.026397	0.521316	-0.050635	0.9596
C	25.96559	9.709833	2.674154	0.0075
LIQ(-1)	0.581236	0.054797	10.60713	0.0000
RE(-1)	177.1512	56.53721	3.133355	0.0017
	Variance Equation			
C	529.9665	187.9030	2.820426	0.004
RESID(-1)^2	0.490838	0.234495	2.093170	0.0363
GARCH(-1)	-0.485932	0.333810	-1.455713	0.1455
R-squared	0.694925	Mean dependent var		74.03530
Adjusted R-squared	0.669502	S.D. dependent var		50.62575
S.E. of regression	29.10420	Akaike info criterion		9.394872
Sum squared resid	30493.96	Schwarz criterion		9.690425
Log likelihood	-180.8974	Hannan-Quinn criter.		9.501735
Durbin-Watson stat	1.947868			

returns forecasts a reduction in the stock spread" which means stock returns and stock liquidity have causal positive relationship. This conclusion is in agreement with the findings illustrated in this research for daily data.

For weekly data, ARCH model results show a consistency with Kang et al. (2007) where the lagged weekly market returns were found to have inverse impact on change in bid-ask spread - the proxy of market illiquidity; it means that they had positive correlation with market liquidity. Alternatively, in Kang et al. (2007) all the lagged four weeks returns were proved to be significant when in this research only the lagged return of the first week was. However, the level of significance in Kang et al. model also decreases rapidly for longer lags, which is similar to this research's finding.

Regarding monthly results, this research is consistent with other prior studies in Goyenko and Ukhov (2009) and Soderberg (2008b) when verifying the causal impact that past return has on liquidity. In these all three researches, it was found that market return Granger-caused market liquidity in a correlative relation. However, in terms of serial correlation, Soderberg (2008b) and Goyenko and Ukhov (2009) explored that the lagged value of market monthly liquidity had inverse relationship with current value of market liquidity when this research found a correlative relationship.

5. Conclusion and limitation

5.1. Conclusion

In response to the first objective, the findings confirm strong and positive relationships between stock market liquidity and its past return for daily, weekly and monthly intervals. Moreover, those relationships are causal, when the changes in market returns affect the changes in market liquidity.

For daily, weekly and monthly intervals, the following formulas can be applied to predict the change of market liquidity from lagged value of market return. Level of confidence: 95%.

$$LIQ_d = 2.192 + 0.4717LIQ_{d-1} + 0.1635LIQ_{d-2} + 0.0879LIQ_{d-3} + 0.1251LIQ_{d-4} + 0.1504LIQ_{d-5} + 319.5R_{d-1} + 79.3R_{d-2} + 82.8R_{d-4} + \varepsilon_d \quad (11)$$

$$LIQ_w = 3.627 + 0.702LIQ_{w-1} + 136.7R_{w-1} + \varepsilon_d \quad (12)$$

$$LIQ_m = 25.965 + 0.5812LIQ_{m-1} + 177.15R_{m-1} + \varepsilon_m \quad (13)$$

5.2. Limitation

Firstly, the period of time in investigation should be longer. However, the data was taken after the financial crisis and the stock market bubble burst in order to eliminate the effect of those two market shocks; and this research was carried out in July 2012. Therefore, the period of time was just around forty months from 24/2/2009 to 31/7/2012.

6. Recommendations for future research

Instead of using turnover rate as a proxy of stock liquidity, bid-ask spread can be used; however, it is recommended that researchers find access to order books in stock exchange companies where the bid and ask prices are recorded. Researchers can also investigate the intraday data. Besides, surveys and interviews can be applied to carry out the research with the same objectives. Alternatively, future researches can study the reverse relationship such as the effect of stock market liquidity to stock market return.❑

References

1. Dubofsky, D. and Groth, J. (1984) Exchange Listing and Stock Liquidity, *The Journal of Financial Research,* Vol 7, No 4.
2. Fujimoto, A. (2003) *Macroeconomic Sources of Systematic Liquidity*, Working Paper, Yale University.
3. Goyenko, R. and Ukhov, A. (2008) Stock and Bond Market Liquidity: A Long-run Empirical Analysis, *Forthcoming in Journal of Financial and Quantitative Analysis*.
4. Granger, C. (1980) Testing for Causality: A Personal Viewpoint, *Journal of Economic Dynamics and Control*, Vol 2, pp329-52.
5. Grossman, S. and Miller, M. (1988) *Liquidity and Market Structure*, Working paper No.2641, National Bureau of Economic Research, Cambridge.
6. Harris, L. (1990) Liquidity, Trading Rules, and Electronic Trading Systems, *New York University Salomon Center Monograph Series in Finance*, Monograph # 1990-4.
7. HOSE (2012) VN30-index statistics from 02/01/2009 to 03/02/2012 (Thống kê chỉ số Vn30 từ ngày 02/01/2009 đến ngày 03/02/2012), available from http://www.hsx.vn/hsx/Modules/News/NewsDetail.aspx?id=76871, accessed 27 Aug 2012.
8. Jun, S., Marathe, A. and Shawky, H. (2003) Liquidity and Stock Returns in Emerging Equity Markets, *Emerging Markets Review*, Vol 4, Iss 1, pp1-24.
9. Kang, W., Hameed, A and Viswanathan, S. (2007) Stock Market Declines and Liquidity, *Journal of Financial*, AFA 2007 Chicago Meetings Paper.
10. Karpoff, J. (1987) The Relation between Price Changes and Trading Volume: A Survey, *Journal of Financial and Quantitative Analysis*, Vol 22, pp109-126.
11. Keynes, J. (1930) *Treatise on Money,* Macmillan, London.
12. Lamoureux, C. and Lastrapes, W. (1990) Heteroskedasticity in Stock Return Data: Volume versus GARCH Effects, *The Journal of Finance,* Vol 45, No 1, pp221-9.
13. Levine, R. (1997), Financial Development and Economic Growth: Views and Agenda, *Journal of Economic Literature*, Vol 35, Iss 2, pp688-726.
14. Lippman, S. and McCall, J. (1986) An Operational Measure of Liquidity, *The American Economic Review,* Vol 76, No 1, pp43-55.
15. Martin, P. (1975) *Analysis of the Impact of Competitive Rates on the Liquidity of NYSE Stocks*, Economic Staff Paper 75-3, Securities and Exchange Commission.
16. Nhat Binh (2012), *Is VN30 More Accurate Than VN-Index?(VN30 Có Thực Sự Chuẩn Hơn VN-Index?)*, VnEconomy, available from http://vneconomy.vn/20120202073657400P0C7/vn30-co-thuc-su-chuan-hon-vnindex.htm, accessed 23 July 2012.
17. Ngugi, R. (2003) *What Defines Liquidity of the Stock Market? The Case of Nairobi Stock Exchange,* KIPPRA Discussion Paper No. 29, Macroeconomic Division, Kenya Institute for Public Policy.
18. O'Hara, M. (1995), *Market Microstructure Theory*, Basil Blackwell, Cambridge, MA.
19. Rouwenhorst, K. (1999) Local Return Factors and Turnover in Emerging Stock Markets, *Journal of Finance*, Vol 54, Iss 4, pp1439-1464.
20. Soderberg, J. (2008a) *Do Macroeconomic Variables Forecast Changes in Liquidity? An Out-of-Sample Study on the Order-Driven Stock Markets in Scandinavia,* Conference on Liquidity: Concepts and Risks, Deutsche Bundesbank.
21. Soderberg, J. (2008b) *Liquidity on the Scandinavian Order-driven Stock Exchanges*, CAFO Working paper, School of Business and Economics, Linnaeus University.
22. Wong, J. and Fung, L. (2001) *Liquidity of the Hong Kong Stock Market since the Asian Financial Crisis,* Working paper, Hong Kong Monetary Authority.
23. Wyss, R. (2004) *Measuring and Predicting Liquidity in the Stock Market*, doctoral dissertation, St. Galleon University.