Investigate the Factors Affecting Share Liquidity: Evidence from Istanbul Stock Exchange (ISE)

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Abstract

The paper aims to investigate the factors affecting share liquidity of industrial companies in Turkey. the annual ranking data of 199 industrial companies listed on Istanbul Stock Exchange (ISE) were used for this study which covers a period of 8 years from 2005-20012. A regression analysis model is applied to test the relationship between factors such as "Liquidity ratio (LQR), debt ratio (DR), earnings per share (EPS), market capitalization (MAKCAP), book to market ratio (BV/MV), return on assets (ROA), and return on equity (ROE)" and share liquidity ratio (LQR).The result shows that there is an insignificant relation with each of debt ratio, earning per share, and return on equity, and shows positive relation with each of firm size, book to market ratio, and return on assets.

Keywords: Liquidity, Share Liquidity, Liquidity measures.

1. Introduction

In capital markets, liquidity means the ease of dealing in securities, whether stocks, bonds, options, warrants, and other instrument, and converted them into cash. In another word it means, how easily can the stocks be sold or bought without big change or impact in the price? Liquidity is relating the quickness and ease way to convert assets or stocks to cash without a significant price change or big loss in value, Ross et al (2008). That refers to four aspects which are: Timing, Tightness, Depth, and Resilience[1]. In generally, large companies, which have huge amount of stocks in issue and large numbers of stocks changing owners every day, have a good liquidity. On the other hand, small firms with few stocks in issue and little trading volumes can have very small liquidity. The spread is the concept associated with liquidity defines as the difference between the bid price and ask price quoted by market makers. The bid price refers to the biggest price that a shareholders or buyers are willing to pay for a share. The ask price is the lowest quoted price at which a market maker or seller is willing to sell a share. The liquid share has narrow spread which refers to a good trend. The illiquid share has wide spreads which refers to a bad trend. So investors are willing to invest their money in liquid shares, because liquid shares are safer than illiquid ones, and that makes them able to get out of the investment at any time.

This paper aims to searches liquidity on Istanbul stock market of individual shares and impact of liquidity variables that influence liquidity.

The paper will include five sections, section-1 present the introduction, Section-2 presents the theoretical framework, Section-3 discusses review of literature, Section-4 discusses the research methodology, hypothesis, data, and variables, Section-5 discusses data analysis and results and Section-6 offers findings and conclusions.

2. Theoretical framework and Literature review:
2.1. Theoretical framework:
2.1.1. Definition of liquidity:

Liquidity has been defined by many authors and scholars. However, it is not easy to define or measure liquidity because liquidity is not only a one-dimensional concept, but it also a multi-dimensional concept. Von Wyss (2004). In generally we can say that *"an investment (asset, share, and bond) is liquid if it can easily be turned into cash by selling it immediately at a competitive market price"* Berk et al, (2012).

Or *"Liquidity is a broad and elusive concept that generally denotes the ability to trade large amounts quickly, at the low cost, and without big moving in the price"* Pastor & Stambaugh, (2003)

2.1.2 Dimensions of market liquidity:

Liquid market is a market with low spreads, high level of stability, many bid and ask offers. In liquid market, it is easy to implement a trade quickly and at an eligible price because there are large numbers of buyers and sellers. In a liquid market, variation in supply and demand has small impact on price, Investopedia, (2013).

Usually the following four aspects or dimensions are distinguished:

1. Trading Time: The ability to execute a transaction immediately at the prevailing price. The waiting time between subsequent trades or the inverse, the numbers of trade per time unit are measures for trading

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[1] Timing means the ability to implement a trade transaction at the required time, Tightness means the ability to sell and buy without big change in price, Depth means the ability to sell or buy certain volume without big influence on the price, Resilience means the ability to sell and buy big amounts without incurring big change in price.

time. Wyss, (2004).

2. Market depth: the market ability to execute large market order without influencing prices of security. Crockett, (2008).

3. Tightness: the ability to buy and sell without big difference in price. Tightness shows the cost of transacting at the given moment, or in other words, the cost of immediacy. It is usually measured by the size of the spread. Ivanchuk, (2004).

4. Resilience: the ability to buy and sell large volumes without incurring large change in price. Ivanchuk, (2004)

2.1.3 Liquidity measures:

For an overview of liquidity measures, they are separated into one-dimensional and multi-dimensional ones: One-dimensional liquidity measures take one variable only into consideration, whereas the multi-dimensional liquidity measures try to take more than one variable in one measure.

2.1.4.1 One-dimensional liquidity measures:

One-dimensional liquidity measures use one variable to measure share liquidity into consideration, the one-dimensional liquidity measures could be almost divided into four aspects: they may take the size of the firm, the volume traded, the time related, and the spread liquidity measures. Wyss, (2004).

- **Size of the company related liquidity measures:**

Company size is one of the key determinants of asset allocation and risk-return parameters for stocks and stock mutual funds. Size of firm liquidity can be measure by market capitalization which is a way to use the stock price to determine the value of a firm, and how likely it is growing.

$$Mktcap_i = S_i \cdot P_i$$

Where $Mktcap_i$ is market capitalization of the stock i, S_i is the number of outstanding shares minus treasury shares and P_i is the price of the stock i. Benic & Franic, (2008).

- **Volume-traded liquidity measures:**

There are several measures that are based on volume dimension of trade and their reflection measures which calculate the time needed to recognize that volume dimension. Teodorovic, (2008).

- *Trading volume:* The volume (Q_t) measures the number of stocks traded in a certain period interval. The volume is calculated from t-1 to time t. q_i indicate each observed transaction in the market. Bundgaard & Ahm, (2012)

$$Q_t = \sum_{i=1}^{N_t} q_i$$

- *Turnover:* Turnover (TO_t) for a specific time interval is calculated as follows: Krishnan & Mishra, (2012)

$$TO_t = \sum_{i=1}^{N_t} p_i \cdot q_i$$

Turnover as a liquidity measure is more meaningful when it is in coupling with market capitalization which call "turnover rate" that explains how many times shares change owners. The equation is: Benic & Franic, (2008)

$$Turnover\ Rate\ (TOR) = \frac{TO}{Mktcap}$$

- **Time-related liquidity measures:**

Measure how often the transactions or quotes revisions take place. Hence, the higher are the values of these measures, the higher is the liquidity. Ivanchuk, (2004).

- *Number of transactions per time unit:* counts the N_t, number of transactions during a time interval t_i-t_{i-1}.

- *Number of orders per time unit:* Similar to the number of transactions per time unit, the number of orders (NO_t) counts the orders inserted into the limit order book within the time interval from t - 1 until t. Wyss, (2004).

- **Spread-related Liquidity Measures:**

The difference between bid and ask price. It is related measure to determine the cost incurred while trading including the fees paid to the brokers and taxes related with executing a transaction. Ivanchuk, (2004).

There are many types of spread measures like as absolute "quoted" spread, log absolute spread, relative

and effective spread.[1]

- The absolute spread measures: is the difference between the lowest ask price and the highest bid price. $Sabst = P_t^A - P_t^B$

- *Log absolute spread measures:* This measure is used just to improve the distributional properties. $LogSabst = \ln(P_t^A - P_t^B)$

- *Relative spread measures*: is calculated by dividing the absolute spread on the mid-price of the bid and ask price(P_t^M). $SrelMt = \frac{P_t^A - P_t^B}{P_t^M}$.

- *Effective spread:* The effective spread calculated by measuring the absolute difference between the mid-price and the most recent trade. $Sefft = |Pt - P_t^M|$

2.1.4.2 Multi-dimensional liquidity measures:

Multi-dimensional liquidity measures Take into account all the characteristics of one-dimensional liquidity measures. In addition multi-dimensional liquidity measures try to take more than one variable in one measure. There are many model to measure the multi-dimensional liquidity, these are such as follow:

- **Quote slope:** the equation of quote slope can represent by dividing the absolute spread by the logarithm depth yields.[2] A high quote slope denotes low liquidity. Krishnan & Mishra, (2012).

$$QSt = \frac{Sabst}{Dlogt} = \frac{P_t^A - P_t^B}{\ln(q_t^A) + \ln(q_t^B)}$$

- **Liquidity ratio 1 (LR1):** compares the turnover to the absolute price change in a certain time period. The higher the turnover, the more prices change can be realized. High liquidity ratios indicate high liquidity. Benic & Franic, (2008).

$$LR1t = \frac{TOt}{|rt|} = \frac{\sum_{i=1}^{Nt} pi \cdot qi}{|rt|}$$

Where, LR_{1t} indicates liquidity ratio in time t, r_t is the return of share from period t - 1 to t, which is the percentage change in price express as the absolute value.

- **Liquidity ratio 2 (LR2):** Building on (*LR1t*) , liquidity ratio 2 (*LR2t*) divides by the term (*Ne - No*) which refers to the difference between the total number of stocks (*Ne*) and the number of stocks owned by the firm (*No*). Bundgaard & Ahm, (2012).

$$LR2t = \frac{LR1t}{Ne - No} = \frac{TOt}{(Ne - No).|rt|} = \frac{\sum_{i=1}^{Nt} pi \cdot qi}{(Ne - No).|rt|}$$

- **Amihud's illiquidity ratio (ILLIQ):** the absolute value of daily stock return scaled by the dollar trading volume of the stock on that day.

$$Amihudi, t = \frac{1}{Ni,t} \sum_{\tau=1}^{Ni,t} \frac{|Ri,\tau|}{DVOLi,\tau}$$

Where Ni, t is the number of days with positive trading volume for stock *i* in month *t*, $|Ri, \tau|$ is the absolute value of the return of stock *i* on dayτ, and $DVOLi, \tau$ is the dollar trading volume of stock *i* on dayτ. Fu et al, (2012).

2.2. Literature review

Gopalan et al, (2012) the study aims to find the relationship between asset liquidity and stock liquidity, to achieve this aims they a created a new model depends on both the structure of the firm's assets today and on the expectations regarding future investments. To measure liquidity they use four measures such as, Amihud's illiquidity ratio, bid-ask spread, the annual average effective bid-ask spread, Pastor-Stambaugh measure. They found a positive and economically large relation between asset liquidity and stock liquidity.

Bogdan et al, (2012) this study discussed the impact of many liquidity variables on liquidity ratio, they used daily data for 196 shares listed in Zagreb stock exchange traded in one year from 01.01.2010 to 01.01.2011, they measured liquidity by Amihud's liquidity ratio or (LR liquidity indicator) as dependent variable, market

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[1] See Ivanchuk (2004), Wyss (2004), Benic & Franic (2008), and Bundgaard & Ahm (2012)
[2] See Hasbrouck and Seppi (2001)

capitalization, volume traded of stocks, and issued stocks, they found that size of firm affects liquidity ratio beside number of issued shares listed in ZSE.

Krishnan & Mishra, (2012) This study tries to examine the liquidity patterns and discover any common denominator between liquidity measures; they used one year intraday data for twenty stocks from India's national stock market, they found the most of volume and spread have related liquidity measures exhibit a U-shaped pattern on the intraday, In addition they found a weak directory of co-movement in liquidity measures, and that mean the market factors has insignificant effect on the liquidity of individual stocks.

Minovic, (2012) this study aimed to analyses liquidity of Croatian stock exchange, the author used the Zero Rates Return, turnover ratio, and Price Pressure of non-trading to measure liquidity in Croatian stock market, she selected data from all shares listed in Zagreb stock exchange between 2005 to 2009. She found that the level of liquidity for the Croatian stock exchange was very low, and the lowest illiquid year was the pre financial crises which is 2007, whereas the most illiquid one was 2009, In addition she claimed that the Croatian stock market is less illiquid than the Serbian stock market.

Batten & Vinh, (2010) the paper discusses the impact of liquidity on stock returns in the Vietnam stock exchange during financial crisis, it used a data of all listed companies in Ho Chi Minh stock market between 2007 to 2010, the study used the turnover rate of an asset and others like firm size, book to market ratio, Beta to measure liquidity, it found that the liquidity positively affects stock returns.

Zhang & Kang, (2010) the paper suggests a new model to measure liquidity called Illiq_Zero which mixing between trading frequency and price impact of liquidity, He used data from 20 emerging markets from 1996-2007. He found that the Illiq_Zero shows a high level of correlation with the liquidity indicators.

Naes et al, (2010) they studied the relationship between the stock market liquidity and business cycle, they compared between common stocks listed in the New York stock exchange (NYSE) from 1947 – 2008, and common stocks listed in the Oslo stock exchange from 1980 – 2008. They used two measures (1) simple market model, (2) Amihud model; they found a strong relation between stock market liquidity and business cycle.

Cui & Wu, (2007) this study aims to determine the size and liquidity effect on stock return, they used the data for all A-shares from 1993-2004, and to measure the size effect they used the market value of tradable A- shares, the book value of tradable A-shares and non-tradable shares, and the total book value of the firm's equity. To measure liquidity they used the average monthly turnover, the trading volume, and liquidity ratio. They found that the size of tradable shares has impact on stock return more than liquidity.

Pastor& Stambaugh, (2003) this study discusses if the market -wide liquidity is an important variable to asset pricing in capital markets, they used the daily data during the month of individual shares listed on the NYSE and AMEX to build a model of market liquidity in a certain month which equally weighted the average of the liquidity measure, they found that there is a positive relationship between expected stock return with aggregate liquidity is characterized by cross-sectional.

Amihud, (2002) This study refers that expected market illiquidity has a positive effects on Stock expected return, as confirming the positive relationship between return and illiquidity, that mean the stock return has negative relation with unexpected illiquidity. He measured the illiquidity by the average across stocks of the daily ratio of stock return to dollar volume. He found that illiquidity has a strong effect of small firm's stock.

3. Methodology and Data collection

To measure liquidity as discussed in the previous section, there are several factors that measure various aspects of liquidity such as: market capitalization (Mktcapi), Trading volume (Qt), Turnover (TO), absolute spread (Sabst), quote slope (QS), Liquidity ratio 1 (LR1), Liquidity ratio 2 (LR2), Amihud's illiquidity ratio (ILLIQ), and other. At the start of this study we defined liquidity as the quickness and ease way to convert assets or stocks to cash without a significant price change or big loss in value, which mean how easily can the stocks be sold or bought without big change or impact in the price? Therefore, the dependent variable Y in this case will be the liquidity ratio (LR1), and for independent variables will use, book to market ratio (Bv/Mv), size of firm (Mktcapi), rate of return (ROA), rate of equity (ROE), earnings per share (EPS), and debt ratio (DR) the X variables. The following table shows the factors and measurement methods

Table 1. Determinants of variables:

No	Variables	Measurement
1	liquidity ratio (LR1)	$LR1t = \dfrac{TOt}{|rt|} = \dfrac{\sum_{i=1}^{Nt} pi \cdot qi}{|rt|}$
2	Book to market ratio (Bv/Mv)	Dividing book value at the end of each year on the market value of the end of each year.
3	size of firm	log of the market capitalization (Mktcapi) of the firm at the end of each year.
4	rate of return (ROA)	$\text{Return on Assets (ROA)} = \dfrac{\text{Net Income}}{\text{Total Assets}}$
5	rate of equity (ROE)	$\text{Return on Equity (ROE)} = \dfrac{\text{Net Income}}{\text{Equity}}$
6	earnings per share (EPS)	$EPS = \dfrac{(\text{net income} - \text{dividends on preferred stock})}{\text{Average outstanding share}}$
7	debt ratio (DR)	$\text{Debt Ratio (DR)} = \dfrac{\text{Total Debt}}{\text{Total Assets}}$

3.1 Data collection:

For measuring the dependent and independent variables, the study uses the annual ranging data of the period from 2005 to 2012, the sample of 199 companies have been selected from 290 of industrial companies listed under (XUSIN-BIST INDUSTRIAL) index in Istanbul stock exchange (ISE). The data collected from two online sources which are Fin net program[1] and stockeys website[2]. The sample was selected according to the following criteria:

The sample of firms are selected on the basis of following criteria.

- Firms with missing data for any factor in the model during study period are dropped.
- Firms having extremist values for any of capital structure are also dropped.
- Firms having extremist values for any of performance variables are also dropped.

4. Hypotheses and Empirical Model:

4.1. Hypotheses:

H_0: There is a negative significant relationship between liquidity ratio (LR) and each of; book to market ratio (BV/MV), size of firm (MKTCAP), rate of return (ROA), rate of equity (ROE), earnings per share (EPS), and debt ratio (DR).

H_1: There is a positive significant relationship between liquidity ratio (LR) and each of; book to market ratio (Bv/Mv), size of firm (MKTCAP), rate of return (ROA), rate of equity (ROE), earnings per share (EPS), and debt ratio (DR).

4.2. Empirical Model:

$LR_{i,t} = \beta_0 + \beta_1 BV/MV_{i,t} + \beta_2 \text{Ln MKTCAP}_{i,t} + \beta_3 ROA_{i,t} + \beta_4 ROE_{i,t} + \beta_5 EPS_{i,t} + \beta_6 DR_{i,t} + \varepsilon_{i,t}$

5. RESULTS AND DISCUSSIONS:

5.1. Descriptive Statistics:

Table 2 gives the detail of descriptive statistics of the variables used in this paper. First row of the table shows the mean of the variables including: Liquidity ratio (LQR), debt ratio (DR), earnings per share (EPS), market capitalization (MAKCAP), book to market ratio (BV/MV), return on assets (ROA), and return on equity (ROE). The respective mean values are 14.65, 44.46, 0.74, 18.93, 2.17, 3.68, and 4.87.

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[1] Fin net program is a financial program has all information about the companies, indexes, markets listed on Istanbul stock exchange. This program is freely available for students in the library of Marmora University.

[2] http://www.stockeys.com/ it is a fundamental analysis platform.

www.iiste.org

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Table 2. Descriptive Statistics

	LQR	DR	EPS	MAKCAP	BV/MV	ROA	ROE
Mean	14.65166	44.46635	0.741941	18.93653	2.171181	3.682994	4.873113
Median	9.630446	42.95125	0.19	18.83054	1.3625	3.615	7.245
Maximum	95.96862	98.9975	63.56	23.63833	93.92	57.6025	84.8125
Minimum	0.226319	1.195	-22.605	14.89624	0.18	-52.295	-92.7125
Std. Dev.	15.04884	21.97428	3.667079	1.679316	3.870721	10.87464	20.60847
Jarque-Bera	3374.221	49.66213	1313025	48.67545	3770152	1620.91	868.5469
Probability	0	0	0	0	0	0	0
Observations	1592	1592	1592	1592	1592	1592	1592

5.2. Correlation Analysis:

Correlation is concern describing the strength of relationship between two variables. In this study the correlation co-efficient analysis is under taken to find out the relationship between stock liquidity ratio (LQR) and many factors such as debt ratio (DR), earnings per share (EPS), market capitalization (MAKCAP), book to market ratio (BV/MV), return on assets (ROA), and return on equity (ROE). It shows the degree of relationship exist between stock liquidity ratio and these factors.

Table 3. Correlation result between LQR and DR, EPS, MAKCAP, BV/MV, ROA, ROE

	LQR	DR	EPS	MAKCAP	BV/MV	ROA	ROE
LQR	1						
DR	0.02779	1					
EPS	-0.01742	-0.14709	1				
MAKCAP	0.22641	0.01449	-0.00712	1			
BV/MV	0.076051	0.173801	0.020915	0.073703	1		
ROA	0.049997	-0.36577	0.361747	-0.01569	-5.9E-05	1	
ROE	0.027505	-0.30212	0.291801	-0.05402	-0.054333	0.847011	1

The table above shows the relationship between the factors may affect share liquidity and share liquidity ratio. There are weak positive relationships between independent variable (liquidity ratio) and all dependent variables except earnings per share (EPS) since the relationship between them is weak and negative.

5.3. Regression Analyses:

Regression analysis model is used to investigate the factors affected share liquidity of the sample of listed industrial companies traded in Istanbul stock exchange.

Table 4. Regression result between LQR and DR, EPS, MAKCAP, BV/MV, ROA, ROE

Variables	The factors affecting stock liquidity						
	Constant	DR	EPS	Makcap	Bv/Mv	ROA	ROE
LQR	-25.052	0.0272	-0.169	1.992	0.205	0.130	-0.009
Sigfor variables	0.000	0.1360	0.1141	0.0000	0.0344	0.0515	0.7697
R2	0.060551						
F value	17.02650						
Sig for model	0.0000						

The table above shows the regression result used to verify the association between independent variable (LQR) and dependent variables (DR, EPS, MAKCAP, BV/MV, ROA, and ROE). The result indicates a negative insignificant relation between LQR and EPS, ROE which means that earning per share EPS and return on equity ROE of firm do not affect firm's stock liquidity. While debt ratio DR has insignificantly positive relation with stock liquidity, which means also that there is no effect of debt ratio DR on firm's stock liquidity. In another hand firm size (MAKCAP), book to market ratio (BV/MV), and rate of return (ROA) have a positive significant relation with stock liquidity (LQR) that means MAKCAP, BV/MV, and ROA are affecting firm's stock liquidity. R^2 is 6.05%; means only 6.05% of variance of dependent variables is accurate by these factors. But, remaining 93.95% of variance with dependent variables is attributed to other factors.

6. Findings and conclusion

The empirical results of this study, which investigate the factors affecting shares liquidity applied on sample consist of 199 firms listed as industrial sector under (XUSIN-BIST INDUSTRIAL) index in Istanbul stock exchange (ISE), suggest that firm size, book to market ratio, and return on assets are positively related with stock liquidity, which indicate that we accept H_1 hypothesis with regard to firm size (MAKCAP), book to market ratio (BV/MV), and rate of return (ROA), and reject it with regard to other dependent variables. And we reject H_0

which refer to "a negative significant relationship between liquidity ratio (LR) and each of; book to market ratio (BV/MV), size of firm (MKTCAP), rate of return (ROA), rate of equity (ROE), earnings per share (EPS), and debt ratio (DR)", Since the results of the study showed insignificant relation with each of Dr, EPS, and ROE, and showed positive relation with each of MAKCAP, BV/MV, and ROA.

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