MEASURING LIQUIDITY ON STOCK MARKET: IMPACT ON LIQUIDITY RATIO

Siniša Bogdan

Suzana Bareša

Saša Ivanović

Abstract

The purpose – It is important to emphasize that liquidity on Croatian stock market is low, the purpose of this paper is to test empirically and find out which variables make crucial role in decision making process of investing in stocks.

Design – This paper explores the impact of various liquidity variables on liquidity ratio since it is still insufficiently researched topic.

Methodology –This research uses secondary and primary data available from Croatian stock market. Considering primary data this paper use daily data from Zagreb stock exchange for 196 stocks traded in one year, with the purpose of finding the key variables that make up some stocks more attractive to investors. Liquidity is measured with Amihud's liquidity ratio, which shows the amount of capital sufficient to change price by 1%.

Approach – With more than 61.035 input data, using the method of multiple regression, this paper examined the influence of different variables on the stock liquidity on Croatian capital market.

Findings – Key findings of this paper indicate that size of firm measured by market capitalization, number of issued stocks and achieved volume affects liquidity ratio. This paper uses multiple regression, and correlation matrix to show dependence among liquidity variables. There is strong correlation coefficient among liquidity variables and liquidity ratio, results are statistically significant.

The originality of this research – The originality of this work rises from the obtained research results and the fact that this is first paper that studies problem of stock liquidity on Croatian capital market.

Keywords Liquidity, Zagreb stock exchange, Amihud's liquidity ratio, Turnover

INTRODUCTION

This paper researches liquidity on Croatian equity market of individual stocks and impact of liquidity variables that affect liquidity. Liquidity can be defined as ability of continuously transforming asset from one form into another (Ivanovic 1997). Liquidity is complex concept. The most accepted definition of liquidity is ability to convert stocks into cash and vice versa without affecting the price or with minimal impact on price. Liquidity is the ease of trading a security (Amihud, Mendelson, and Pedersen 2005) that just makes it one of the key elements upon which the investor will decide whether or not to invest, very important is quick execution of orders and ability to convert in cash at lowest costs. Selling an illiquid stock quickly can be difficult or even impossible without accepting the lower price. One of the basic questions how can liquidity be measured in emerging markets? There are four aspects or dimensions that

are important to distinguished (Wyss 2004). Trading time, the ability to instant execution of the transaction at the current price. Tightness the ability to buy and sell stocks at the same time at the same price. Depth, the ability to buy or sell stock without effect on growth or decline in stock price and fourth, resiliency the ability to buy or sell certain amount of stocks without affecting the price. In first part there is word about liquidity on Croatian equity market and importance of free float factor. Second part explains how can liquidity be measured, third part is empirical research, with detailed description of data and methodology. In conclusion are briefly described the results of research.

1.   LIQUIDITY AND CROATIAN EQUITY MARKET

It is very important to notify that Croatian capital market belongs to emerging markets. The table below is showing the average daily stockKuna volume[1] in the last ten years. Arithmetic mean of daily Kuna volume in last ten years is 29.553.960 HRK. Main characteristics of illiquid markets are large daily fluctuations in price, with low levels of daily transactions in contrast to the high level and small impacts on price which are main characteristic of liquid markets.

Advantage of less liquid market is that it provides higher returns because of the volatility of prices, but carries a higher risk. More about stocks risks in Bogdan, Baresa and Ivanovic (2010).

Table 1: **Kuna turnover last 10 years**

| year	Annual Kuna volume (in '000)	working days	average daily kunaturnover (in '000)
2010	5.777.097	250	23.108
2009	7.434.324	248	29.977
2008	16.842.298	249	67.639
2007	22.000.747	247	89.071
2006	10.459.100	250	41.836
2005	4.729.900	251	18.844
2004	2.619.400	251	10.435
2003	1.495.100	248	6.028
2002	1.171.400	248	4.723
2001	968.500	250	3.874

Source: Author's research

Regarding traded days to create a better perception of stock trading following text is describing situation. Number of securities traded in 2010 was 250, for the work purposes it was taken sample of 196 stocks which are divided by the number of trading days in several classes; in first class there are 40 stocks that have number of trading days in range of 100-80%, in the second class there are 15 stocks that have number of trading days in range of 79,9-60%, in third class there are 18 stocks that have number

---

[1] Kuna turnover is related to volume multiplied by price of stocks

of trading days in range of 59,9-40%, in the fourth class there are 28 stocks that have number of trading days in range of 39,9-20% in the fifth class there are 95 stocks that the number of trading days are less than 19,9%, on the market there are many stocks that are highly illiquid.

Chart 1: **Sample of 196 stocks allocated to the liquidity classes according to the number of trading days**
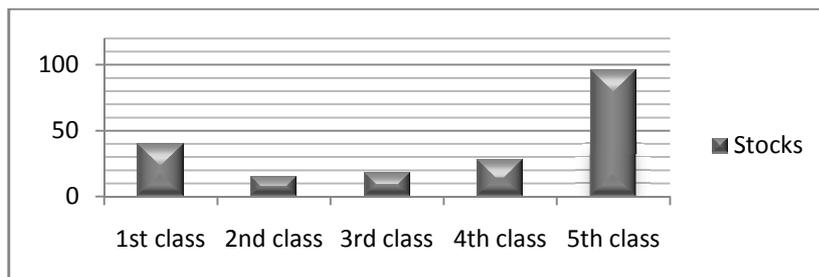
Source: Author's research

There are many reasons of stock illiquidity (except macroeconomic) here are enclosed some:

- Transaction costs as: brokerage fees and order-processing costs, taxes are excluded on Croatian capital market because there is no tax on capital gain. In a process of trading stocks traders must pay transaction costs. Spreads are not the only cost in trading stocks, all investors must also pay brokerage commissions. Considering by case studied Charles M. Jones (Jones 2002) in a period 1926-2000 where complete transactions costs are available from NYSE coefficient of correlation between annual NYSE dollar turnover and one-way transaction costs was -0.80, this result is not surprising—higher costs lower turnover;

- Hard to find other counterparty which is able and wish to do transaction on agreed price and quantity;

- If investors are locked into their holding of particular stock;

- High spread between bid–ask price of the stock; etc.

Free float factor is very important indicator in assessing the liquidity of stocks.

Before explaining importance of free float factor it is very important to distinguish types of investors. Despite the large division of investor types, in this paper it will be said about two basic types: strategic investors and speculators. Strategic investors represent long term investors, they are carefully analyzing company thorough fundamental, technical and other types of analysis but fundamental analysis is spine of their decision. More about fundamental analysis (see Karanovic, Baresa and Bogdan 2010). They are important to determine free float factor. Speculators often called as short–term traders because excessive speculation and volatility but they are still playing a positive role in efficient functioning of financial market (Berkman i Eleswarapu 1997). Speculators have a positive influence on the value of securities—they are adding liquidity to the market. Free float factor is percentage of stocks which are available for

trade to investors—main purpose of this factor is to ensure more accurate representation of available stocks in the market. Free float market capitalization can be defined as certain amount of stocks—which are available for trading at the moment multiplied by current stock price. Free float factor can also serve as a measure of stock liquidity, it must exclude stocks held by strategic stockholders. Typical strategic stockholders are: directors or acquirers who held stocks as a control of company, government, corporations, employers or other individuals with "controlling interest", on Croatian market excluded from free float are also stocks which make over 5% of the total number being issued and treasury stocks. Free float factor is much more important for smaller companies which have several strategic stockholders or less than larger companies. Most difficult is to identify which stockholders should be regarded as strategic, other words it is impossible accurately find out ownership motives across thousands of securities. Kalok Chan, Yue-Cheong Chan and Wai-Ming Fong showed that the government buying 33 Hang Seng Index (HSI) component stocks as a strategic stockholder has affected the liquidity, reducing the free float factor (Chan, Chan i Fong 2004).

2. MEASURING LIQUIDITY

Natural measure of liquidity is the spread between the bid and ask price. On well developed capital markets, market makers as companies or individuals are quoting buy and sell price trying to gain profit on the bid–ask spread. If market makers set the price too high they will accumulate stocks, in they set price too low there will be shortage of stocks. Spread must be large enough to cover costs and provide a reasonable profit to market maker. Purpose of specialist is to increase the liquidity of individual stocks that investors get more confidence when they decide to invest such securities. There are no market makers on Zagreb stock exchange, except Erstesecurities Zagreb d.o.o. for Atlantic group and Raiffeisenbank Austria for Uljanikplovidba. Quantifying the statistical features of the bid–ask spread offers the possibility of understanding some aspects of market liquidity (Plerou, Gopikrishnan i Stanley 2005), spreads as a percentage of rate are negatively correlated with the level of prices, volume and number of market makers and positively with volatility (Damodaran 2006).

According to Amihud one of the best measures of liquidity is the bid–ask spread (quoted or effective), comparing spreads across firms with different market structures, with purpose collecting information about liquidity—unfortunately it is not available on Croatian stock market. There are also some measures with which it is possible to measure liquidity:

Trading volume—past trading volume can give important information about stock. Trading volume measure is trying to capture the quantity of shares per time to measure the depth dimension of liquidity it is also an increasing function of liquidity. Stocks with a higher volume are more liquid, they also have lower spreads. In this work it is calculated volume for each of 196 stocks for every day in year 2010, trading volume is not highly correlated with firm size on our sample it is calculated coefficient of correlation 0,44 which confirms earlier work of Lee and Swaminathan (2000), they

find also that measures as past returns and trading volume can be strong predictive power for future returns.

Turnover (VK) or Kuna volume[2] is calculated for every day for each stock in 2010 year by given equation:

$$VK = \sum_{n=1}^{N_t} p_n \cdot v_n$$

VK is equal to price p_n in transaction *n* in time *t* multiplied by number of traded stocks v_n in transaction *n*, N_t is the number of transaction in time *t*.

Turnover is sometimes calculated as – the total number of stocks traded divided by the total number of issued stocks, it is called *aggregate turnover AT* (Lo i Wang 2000), where v_{it} is the traded stock volume of stock *i* at the time *t* and I_i is the total number of issued stocks of stock *i*. Higher value of this indicator, higher the liquidity is.

$$AT_{it} = \frac{v_{it}}{I_i}$$

This measure also shows us the free float of each stock other words which part of the total issued stocks is traded daily during the year, or we can calculate for one year. Higher percentage we get, stock is more liquid.

Other Amihud illiquid measure is called ILQ—it is daily ratio of absolute stock return to its kuna volume, averaged over some period, it serves as a rough measure of price impact (Amihud 2002).

$$ILQ_{iy} = 1/D_{iy} \sum_{t=1}^{Diy} |Ridy|/VK_{idy}$$

R_{idy} is the return on stock *i* on day *d* of year *y*, VK_{idy} represents daily volume in kunas. D_{iy} is the number of days for which data are available for stock *i* in year y.

Next measure is liquidity ratio called Amivest measure of liquidity or liquidity ratio (LR) associated with a unit change in stock price, higher liquidity ratio implies greater market liquidity or depth (Amihud, Mendelson i Lauterbach 1997). Amivest ratio captures the notion that large amounts can be traded in a liquid stock without any significant changes in the stock price (Nielsson 2009).

$$LR_i = \sum_y VK_{id} / \sum_y |R_{id}| = \frac{\sum_{n=1}^{N_t} p_n \cdot v_n}{\sum_y \left| \left(\frac{p_{id}}{p_{i(d-1)}} - 1 \right) \cdot 100 \right|}$$

---

[2] Kuna volume is equal price of stock multiplied by volume. The kuna (HRK) represents the official currency used in Croatia.

VK$_{id}$ represents daily kuna volume, *R$_{id}$* is return of stock *i* on day *d*. Main purpose of this measure of liquidity is to explain turnover associated with 1% change in price of stock or compare traded volume to the absolute price change during period, other words how much kuna trading volume is needed to make a stock's price one percentage positive or negative change. If R$_{id}$ is zero for some time than liquidity ratio is also set to zero, calculated on daily base. In this paper we interpret Amivest as an annual indicator of liquidity.

Liquidity ratio 2 (LR2) according to Ranaldo (2000) he calculated stock's capitalization and the number of equities owned by the firm. It is shown by next formula:

$$LR2_i = \frac{LR_i}{(I - I_c)} = \frac{\sum_{i=1}^{N} p_i \cdot q_i}{\sum_y |R_{id}| \cdot (I - I_c)}$$

(I-I$_c$) represents difference between total number of shares and number of shares owned by the firm, rest of the variables are the same as in previous formula. This formula is corrected by free float, but we must take into account that there are also other strategic investors but the company itself.

3. DATA AND METHOLODY

For measuring liquidity as mentioned in the text above, there are many indicators that measure different aspects of liquidity like: the trading time, depth, resiliency, tightness etc. In the beginning of this paper liquidity is defined as the ability to convert the shares into the most liquid form of asset which is money, without affecting the price or with very little influence on price change.

The indicator LR exactly supports the definition which is defining the average amount of capital that causes a movement in stock price by 1%. In this research it is calculated an indicator of liquidity LR (known also as Amihud's liquidity ratio) for 196 stocks from Zagreb Stock Exchange[3]. Stocks are used daily ranging from 01.01.2010 to

---

[3] www.zse.hr , list of 196 stocks(ticker symbols are used) underlying the research (ACI-R-A, ADPL-R-A, ADRS-R-A, ADRS-P-A, AGMM-R-A, AMDN-R-A, ARNT-R-A, ATGR-R-A, ATLN-R-A, ATLS-R-A, ATPL-R-A, AUHR-R-A, BCIN-R-A, BD62-R-A, BDMR-R-A, BLKL-R-A, BLSC-R-A, BLJE-R-A, BPBA-R-A, BRBA-P-A, BRBA-R-A, BRIK-R-A, BRIN-R-A, BRNK-R-A, BRST-R-A, BZJK-R-A, CEBA-P-A, CEBA-R-A, CHAG-R-A, CKML-R-A, CRAL-R-A, CRLL-R-A, CROS-P-A, CROS-R-A, DDJH-R-A, DIOK-R-A, DKVS-R-A, DLKV-R-A, EHOS-R-A, ELKL-R-A,ELKP-R-A, ELPR-R-A, ERNT-R-A, EXCL-R-A, EXPD-R-A, FMPS-R-A, FNVC-R-A, FRNK-R-A, GBRT-R-A, HBEL-R-A, HBRL-R-A, HBVD-R-A, HCRC-R-A, HDBK-R-A, HDEL-R-A, HEFA-R-A, HGSP-R-A, HIMR-R-A, HMAM-R-A, HMDN-, -A, HMNS-R-A, HMST-R-A, HOMS-R-A, HPB-R-A, HPDG-R-A, HRBC-R-A, HRDH-R-A, HTCP-R-A, HTPK-R-A, HT-R-A , HUPZ-R-A, HVDC-R-A, HZVG-R-A, IGH-R-A, IKBA-R-A, ILRA-R-A, IMZV-R-A, INA-R-A, INDG-R-A, INGR-R-A, IPKK-R-A, IPKO-R-A, ISTR-R-A, ISTT-R-A, JAKT-R-A, JDBA-R-A, JDGT-R-A, JDKM-R-A, JDOS-R-A, JDPL-R-A, JDRA-R-A, JDRN-R-A, JDTC-R-A, JMNC-R-A, JNAF-R-A, KABA-P-A, KABA-R-A, KBZ-R-A, KMKA-R-A, KNZM-R-A, KODT-P-A , KODT-R-A, KOEI-R-A, KOES-R-A, KOKA-R-A, KORF-R-A, KOSN-P-A, KOSN-R-A, KRAS-R-A, KSST-R-A, KTJV-R-A, LANO-R-A, LANT-R-A, LCDS-R-A, LEDO-R-A, LKPC-R-A, LKRI-R-A, LPLH-R-A, LRH-R-A, LURA-R-A, LVCV-R-A, MAIS-R-A, MDKA-R-A, MDPL-R-A, MGMA-R-A, MIV-R-A, MLNR-R-A, MMTZ-R-A, MNDS-R-A, NVBA-R-A, OLVD-R-A, OPTE-R-A, PBZ-R-A, PDBA-R-A, PIKR-R-A, PIVK-R-A, PKMI-R-A, PLAG-R-A, PLJK-R-A, PODR-R-A, PSMR-R-A, PTKM-R-A, PUNT-R-A, PURI-

01.01.2011. For each stock it is calculated average daily price which is compared with the price of the previous day in order to obtain the natural logarithm for each day. The sum of the total kuna volume VK_{iy} is divided by the sum of the absolute daily price changes $|R_{iy}|$ based on a period of one year to get the average amount of capital that is needed to cause increase or decrease price for 1% Higher liquidity ratio implies greater market liquidity or depth. The aim was to show whether there is influence of other liquidity variables in the LR and quantify the power of influence. The following study is using the method of multiple regression. For the dependent variable Y is used indicator of liquidity LR. For independent liquidity variables are used: market capitalization (MCap), issued stocks (I) and volume of stocks (Vol). Market capitalization is measured as the number of issued stocks multiplied by closing price. To obtain the average Market capitalization in this paper, the average price is multiplied by the number of issued stocks. Below it is shown the results of regression which is calculated with 95% confidence level.

Table 2: **Summary output, results of regression**

Regression Statistics	
Multiple R	0,88248408
R Square	0,77877815
Adjusted R Square	0,77532155
Standard Error	424731,33
Observations	196

. ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1,21931E+14	4,06438E+13	225,3023403	1,24484E-62
Residual	192	3,46362E+13	1,80397E+11		
Total	195	1,56568E+14			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-71329,62735	31828,88082	-2,24103473	0,026169118
MCap	0,000135692	1,00924E-05	13,44505213	1,79E-29
I	0,022523221	0,005267017	4,276276811	2,99301E-05
VOL	0,678573786	0,07787899	8,713181641	1,37E-15

Source: Author's research

R-A, RIVP-R-A, RIZO-R-A, RZVI-R-A, SAPN-R-A, SDBA-R-A, SEM-R-A, SLDM-R-A, SLPF-R-A, SLRS-R-A, SM86-R-A, SMNS-R-A, SNBA-R-A, SNHO-R-A, SSNC-P-A1, SUNH-R-A, TDZ-R-A, TEP-R-A, THMT-R-A, THNK-R-A, TIMT-R-A, TISK-R-A, TKPR-R-A, TLM-R-A, TNER-R-A, TNPL-R-A, TNSA-R-A, TOZ-R-A, TRFM-R-A, TRMD-R-A, TSHC-R-A, TUHO-R-A, ULPL-R-A, ULJN-R-A, UNPP-R-A, VART-R-1, VDKT-R-A, VERN-R-A, VIRO-R-A, VIS-R-A, VJSN-R-A, VLBT-R-A, VLDS-R-A, VLEN-R-B, VLHO-R-A, VPIK-R-A, VZIO-R-A, ZABA-R-A, ZLAR-, -A, ZPKL-R-A, ZTNJ-R-A, ZVCV-R-A, ZVZD-R-A)

Multiple R is 0,88 which shows the high correlation between dependent and independent variables. The coefficient of determination R^2, which is used as a qualitative method, and which describes the strength of linear relationship between the independent variables $X_{1,2,3}$ and the dependent variable Y is $R^2=0,79$. Other words 79% of the variance LR indicator in sample of 196 stocks was interpret by the: market capitalization, number of issued stocks and stock volume. This model is considered to be representative. In the table ANOVA, empirical F-value is greater than the critical limit of zero separation from alternative hypotheses, and it is falling in the area of rejection of the null hypothesis, and the null hypothesis is not accepted, other words it can't be accepted that the first, second, third and fourth member in the regression formula insignificant for the model F_α< F-ratio (F=225,30).

$$Y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \varepsilon_i$$
$$Y_i = -71329,63 + 0,0001 x_1 + 0,0225 x_2 + 0,6786 x_3 + \varepsilon_i$$
$$H0: \beta_1 : \beta_2 : \beta_3 = 0$$
$$H1 \ldots \exists \; \beta_j \neq 0$$

The last table contains coefficients from: market Capitalization (MCap), number of issued stocks (I) and volume of stocks (Vol). Coefficients present $\beta_{1,2,3}$ through which explains the influence of independent on dependent variable.

$\beta_1 = 0,0001357$ shows if there is company with a Market capitalization of $X_1 = 300.000.000$ kn expected LR or Y= 40.710 HRK, with every $X_1 = 7.369,6$ - Y is higher for 1 HRK. From this conclusion can be drawn, to make price change of 1% in companies with larger Market capitalization it is necessary to engage a larger amount of capital.

$\beta_2 = 0,0225232$ is calculating for every $X_2 = 45$ issued stocks LR is rising for 1 HRK. Average number of issued stocks in our 196 stock large portfolio is $X_2 = 2.400.000$ for this number LR is rising on level of Y=53.33 HRK per 1% movement in price.

$\beta_3 = 0,6785738$ is showing for one traded stock LR is increasing for 0,68 kn which would mean the average volume of observed portfolio is X3= 122 annual average of traded stocks, indicator LR would then be 83.13 HRK.

Regression coefficients β1,2,3 as partial regression coefficients measure changes in mean Y for a unit change in the variables X1,2,3. The assumption of this model is when β shows some independent variables were the independent variables are isolated. Since all three betas are positive, each unit change of variable $X_{1,2,3}$ variable Y is increasing.

P-value is the smallest level of significance with which it is possible to reject the null hypothesis. P-value is referred to a significance level of 5%. $PX_1 = 1,79E-29 < 0,05$ it can be concluded that independent variable affects the dependent variable. $PX_2 = 0,0000299301E-5 < 0,05$ it can be concluded that independent variable affects the dependent variable. $PX_3 = 1,37E-15 < 0,05$ it can be concluded that independent variable affects the dependent variable.

Covariances are important analytical tool to obtain information about statistical linear relationship between two variables. Covariance of standardized values forms the elements of correlation matrix. The correlation coefficients are standardized values of the strength of statistical relationships among phenomena. The table below presents correlation matrix which is consisted of five liquidity variables: liquidity ratio (LR), market capitalization (Mcap), issued stocks (I), volume (Vol), number of traded transactions (Trans), total turnover (TTn). All correlations which lie between 0,5 and 1 are large, especially between LR and turnover where correlation is 0,95 nearly perfect. Smallest correlation is between Market capitalization and Volume 0,35 this correlation is characterized as moderate.[4]

Picture 2: Correlation matrix between liquidity variables
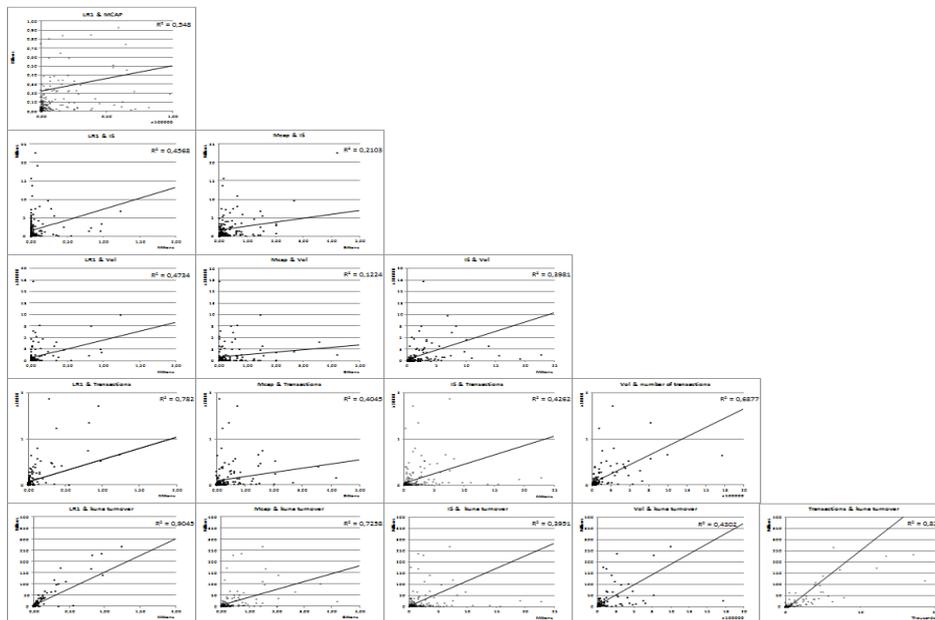
Source: Author's research

Table 3: **Correlation matrix between liquidity variables**

	LR	Mcap	I	Vol	Trans	TTn
LR	1					
Mcap	0,74024	1				
I	0,67590	0,45856	1			
Vol	0,68803	0,34987	0,63099	1		
Trans	0,88432	0,63598	0,65282	0,82930	1	
TTn	0,95105	0,85196	0,62853	0,65586	0,91044	1

Source: Author's research

---

[4] All correlations are described by Cohen's scale

All correlations have "positive relationship" other words higher scores of one variable are paired with higher scores of the other variable. Graphically speaking below is scatter matrix made by the preceding table with prominent coefficient of determination R^2.

CONCLUSION

This research shows that the large companies (according to market capitalization) are more liquid than companies with lower market capitalization; this statement was tested with multiple regression between the independent variables (market capitalization) and the dependent variable (LR). P-value is referred to a significance level of 5%, for PX_1= 1,79E-29 < 0,05 it can be concluded that independent variable affects the dependent variable, β_1= 0,0001357 simplified — to change price of stock for only 1% on company that has market capitalization 736.919.676,00 HRK it is necessary to trade with 100.000 HRK while other independent liquidy variables are isolated.

Companies that have larger number of issued stocks are more liquid, this statement is also tested $PX_2 = 0,0000299301E-5 < 0,05$ it can be concluded that independent variable (issued stocks) affects the dependent variable (LR) . β_2=0,0225232 for every X_2=45 issued stocks LR is rising for 1kn while other independent liquidy variables are isolated.

Stocks that have larger traded volume during year have larger LR ratio. $PX_3 = 1,37E-15 < 0,05$ it can be concluded that independent variable (traded volume)affects the dependent variable. β_3= 0,6785738 company that have 147,368 volume of traded stocks needs 100.000 HRK to change price for 1% while other independent liquidy variables are isolated. Correlation matrix shows positive values among liquidity variables such as are: liquidity ratio (LR), market capitalization (Mcap), issued stocks (I), volume (Vol), number of traded transactions (Trans), total turnover (TTn). Very strong correlation measures are among: LR&Mcap =0,74; LR&Trans=0,88; LR&TTn= 0,95; Mcap&TTn= 0,85; Vol&Trans= 0,83; Trans &TTn= 0,91.

REFERENCES

Amihud, Y. (2002), "Illiquidity and stock returns: cross-section and time-series effects", *Journal of Financial Markets* 5 (1), 31–56.

Amihud, Y., Mendelson, H. and Lauterbach, B. (1997), "Market microstructure and securities values: Evidence from the Tel Aviv Stock Exchange", *Journal of Financial Economics* 45 (3), 365–390.

Amihud, Y., Mendelson, H. and Pedersen, L.H. (2005), Liquidity and asset prices, Vol. 1, now Publishers Inc., Hanover.

Berkman, H. and Eleswarapu, V.R. (1997), "Short-term traders and liquidity: a test using Bombay Stock Exchange data", *Journal of Financial Economics* 47 (3), 339–355.

Bogdan, S., Baresa, S. and Ivanovic, S. (2010), "Portfolio analysis based on the example of Zagreb stock exchange", *UTMS Journal of Economics* 1 (1), 39–52.

Chan, K., Chan, Y.C. and Fong, W.M. (2004), "Free Float And Market Liquidity: A Study Of Hong Kong Government Intervention", *Journal of Financial Research* 27 (2), 179–197.

Damodaran, A. (2006), *Damodaran o valuaciji,* MATE, Zagreb.

Ivanovic, Z. (1997), *Financijski menadžment*, Sveučilište u Rijeci, Rijeka.

Jones, C.M. A century of stock market liquidity and trading cost, *Social science research network*
    http://dx.doi.org/10.2139/ssrn.313681.
Karanovic, G., Baresa, S. and Bogdan, S. (2010), "Financial analysis fundament for assessment the value of
    company", *UTMS Journal of Economics* 1 (1), 73–84.
Lee, Charles M.C. and Swaminathan, B. (2000), "Price momentum and trading Volume", *Journal of finance*
    55 (5), 2017-2069.
Lo, A.W. and Wang, J.W. (2000), Trading Volume: Definitions, Data Analysis, and Implications of Portfolio
    Theory. NBER Working Papers. HYPERLINK http://www.nber.org/papers/w7625
    http://www.nber.org/papers/w7625 (accessed 02.12.2011).
Nielsson, U. (2009), "Stock exchange merger and liquidity: The case of Euronext", *Journal of Financial
    Markets* 12 (2), 229-267.
Plerou, V., Gopikrishnan, P. and Stanley, H.E. (2005), "Quantifying fluctuations in market liquidity:
    Analysis of the bid-ask spread", *Physical review* 71 (4), 1-8.
Ranaldo, A. (2000), Intraday Trading Activity on Financial Markets: The Swiss Evidence. PhD diss.,
    University of Fribourg, Fribourg.
Rubin, A. (2007), "Ownership Level, ownership Concentration and Liquidity", *Journal of Financial Markets*
    10(3), 219-248.
Wyss, R. (2004), Measuring and Predicting Liquidity, PhD diss., Universitat St. Gallen, Zurich.

Siniša Bogdan, MA, Assistant
University of Rijeka
Faculty of Tourism and Hospitality Management, Opatija
Primorska 42, P.O.Box 97, 51410 Opatija, Croatia
Phone: + 385 51 294 682
E-mail: sinisab@fthm.hr

Suzana Bareša, MA, Assistant
University of Rijeka
Faculty of Tourism and Hospitality Management, Opatija
Primorska 42, P.O.Box 97, 51410 Opatija, Croatia
Phone: + 385 51 294 193
E-mail: suzana.baresa@fthm.hr

Saša Ivanović, MSc, PhD Student
University of Rijeka
Faculty of Tourism and Hospitality Management, Opatija
Primorska 42, P.O.Box 97, 51410 Opatija, Croatia
E-mail: sasa.ivanovic@fthm.hr