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Stock market liquidity and firm performance

Tarika Singh[a*], Monika Gupta[b] and Ms. Anju Sharma[c]

[a]*Associate Professor, Prestige Institute of Management, Gwalior, India*
[b]*Research Scholar, Jiwaji University, Gwalior, India*
[c]*Alumnus, Prestige Institute of Management, Gwalior*

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A B S T R A C T

This paper investigates the relation between stock liquidity and firm performance. Liquidity plays an important role on performance of firms listed in Stock Exchange. When there is a good flow of trading stocks, people could expect more financing through absorbing investors on the market. This study examines the relationship between stock market liquidity and firm performance. The sample of the study was the continuously NSE listed top ten indices over the period 2005-2014. To check the relationship between stock market liquidity and firm performance, the ordinary least sequence and general linear models were applied on Gretl and SPSS, respectively. The results of this study showed positive relationship between independent variables, return and age on dependent variable Tobin's Q. Further relationship between stock market liquidity and firm performance was also check and it was found that stock market liquidity was correlated with higher firm performance as measured by Tobin's Q.

1. Introduction

Stock market is the place to trade shares in market and also includes the securities listed on various stock exchanges as well as those only traded privately. Stock markets involves capital mobilization and provides secondary market to the investors. It also helps financial institutions buy and sell securities. Stock market liquidity normally includes large securities, which are liquid, efficient and can continue to receive the required foreign investments for economic growth. Participants in the stock exchange range from small individuals, who purchase shares of different firms to network of computers where trades are made electronically by some programs. Liquidity describes the degree to which an asset or security can be quickly purchased or sold on the market without affecting the asset's price. Liquidity is corporation to short-term obligations and it can be measured with the help of various liquidity ratios i.e. current ratio, quick ratio and case ratio. Liquidity is associated with the process buying and selling the property quickly. The liquidity that an exchange affords the investors enables the shareholders to

* Corresponding author.
E-mail address: tarika.singh@prestigegwl.org (T. Singh)

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quickly and easily sell their securities in any firms. Stock market liquidity plays an important role on measuring market growth and efficiency. Market liquidity is a market's ability to facilitate an asset being sold quickly without having reduced price and it has a positive impact on stock market. Stock market increases the firm's performance and efficiency of manager pay-for-performance sensitivity. Firms with liquid stocks have better performance as measured by the market-to-book ratio. The relationship between liquidity and performance has received considerable attention in financial economics from different perspectives. This study considers the effect of liquidity on performance as well as the dependence of liquidity on firm performance. The study does not evaluate any evidence that liquidity improves firm performance through block holder investors as the relation between liquidity on firm performance. Firm performance is the same for stocks with high and low levels of outside block holdings as well as for stocks with high and low levels of firms' holdings. Evaluation in situation of the market liquidity of the firm's shares/stocks declines due to conceder ownership. The purpose of this study is to understand the basics of stock market and the effect of market liquidity on the firm performance.

2. Literature review

In their seminal work, Miller and Modigliani (1961) formally developed the dividend irrelevance hypothesis. In perfect capital markets populated by rational investors, a firm's value was a function of the firm's investment opportunities and was independent of the firm's payout policy. Stange and Kaserer (2009) stated that market liquidity facilitates trading of an asset. Its risk was the potential loss, because a security can only be traded at high or prohibitive costs.

Different stock market researchers have shown different results like Fang et al. (2009) found out how the market liquidity influences on firm performance and relation between stock liquidity and firm performance. They assessed the effect of the market liquidity on firm performance as measured by a firm's Tobin's Q ratio. Similarly, Amihud and Mendelson (2006) showed that liquidity was an important factor on capital asset pricing and reported that expected asset returns depend on liquidity in addition to risk. Kanasro et al. (2009) studied the position of stock market liquidity on Karachi Stock Exchange (KSE) during the period from 1985 to 2006. They found some evidence of less stock market liquidity at Karachi Stock Exchange during the sample period. They also reported that less liquidity causes less synchronicity in prices attracting fewer inventors and results in low size of market. They measured liquidity in a stock exchange. Dalvi and Baghi (2014) analyzed that the relationship between performance and liquidity of shares listed on the Tehran Stock Exchange and reported a positive relationship.

Arabsalehi et al. (2014) examined the impact of stock market liquidity on companies' economic performance on 97 selected firms listed on Tehran Stock Exchange (TSE) from 2003 to 2012. They found that stock liquidity had a significant positive impact on two criteria of firm performance, EVA and Tobin's Q while they found no evidence that liquidity had any significant impact on ROA. Dass et al. (2011) found that innovative firms had higher liquidity and took different actions that help keep stocks more liquid. Uno and Kamiyama (2010) analyzed that a firm's ownership structure influenced both its liquidity and value. They found that the latent investment horizon explains differences in liquidity and firm value among firms listed on the Tokyo Stock Exchange.

Blum and Keim (2012) showed that institutional participation in the US stock market played an ever increasing role in explaining cross-sectional variation in stock market illiquidity. Banerjee et al. (2007) found some evidence that sensitivity of firm value to innovations in aggregate liquidity declines after dividend initiations. Indeed, Baker and Wurgler (2004) presented significant evidence that the payout policy of the firm was related to the liquidity of its common stock. Prasanna and Bansal (2014) analyzed Indian stock market and the empirical results indicated that foreign institutional trading significantly influences market liquidity in a negative direction.

2. The proposed study

2.1. Objectives

- To find out market to book value ratio for the firms under study,
- To calculate Tobin's Q ratio for the firms under study,
- To find out the market returns for the firms under study,
- To find out the different constructs of liquidity for the firms under study,
- To find out the relationship between liquidity and firm performance.

2.2. Methodology

The study is empirical in nature and secondary data have been used to complete this research. All the companies listed on any of the stock in India will form the population. All the companies listed on National Stock Exchange have acted as the sample frame. Individual companies listed on Nifty was the sample elements. 35 companies listed continuously on NIFTY for the study time period has form the sample size over the period 2005-2014. Non probability judgmental sampling was used and secondary resources have been used for collecting the data on the variable study (like NSE india.com, moneycontrol.com)\

2.3. Tools used for data collection

1. Access returns were using the formula= $\frac{\text{Today Returns-Previous Returns}}{\text{Previous Returns}} \times 100$,
2. Market to book value= $\frac{V_d + V_e}{\text{Assets}}$,

where V_d and V_e represent market Value of debt and market value of equity respectively. Market-to-book ratio (alternate calculation) is also calculated as follows,

$$\text{Market-to-book}=\frac{V_d + V_e}{\text{Assets}} = \frac{V_d + V_e}{\text{OI}} \times \frac{OI}{\text{Assets}} = \frac{V_e}{OI} \times \frac{V_e + V_d}{V_e} \times \frac{OI}{Assets} = POIR \times LR \times OIA.$$

Here, *OI* represents operating income; *OIR* represents operating income ratio; *POIR* represents price to operating income ratio, *OIA* represents operating to asset ratio and finally, *LR* represents leverage ratio;

3 .Tobin's Q is calculated as follows,

$$\text{Tobin's Q}=\frac{MBV + BVA - CEDT}{\text{BVA}}.$$

Here *MBV* represents market to book value; *BVA* represents book value assets; *CEDT* represents common equity differed tax.

4. Ordinary Least Square regression was used to find out relationship between firms performance and liquidity.

3. Results and discussion

To fulfill the objectives of study, different tests were applied. The normality tests all report a P value. In this case, the null hypothesis is that all the values were sampled from a population that follows a Gaussian distribution.

Table 1

The results of the implementation of Doornik-Hansen, Shapiro-Wilk W, Lilliefors and Jarque-Bera test

Variable	Doornik-Hansen test	Shapiro-Wilk W	Lilliefors test	Jarque-Bera test
Return	13862.8 (0.000)	0.301713 (0.000)	0.359901 (0.000)	471677 (0.000)
MBV	881.915 (0.000)	0.631048 (0.000)	0.236955 (0.000)	11058.8 (0.000)
Tobin Q	16776.7 (0.000)	0.20622 (0.000)	0.403757 (0.000)	183489 (0.000)
LZR	44400.6 (0.000)	0.0556686 (0.000)	0.523769 (0.000)	777234 (0.000)
Index Return	920.052 (0.000)	0.584268 (0.000)	0.436205 (0.000)	64.3095 (0.000)
Log Age	45.2838 (0.000)	0.936035 (0.000)	0.122341 (0.000)	55.7627 (0.000)

As we can observe from the results of Table 1, all components are normally distributed. Table 2 also shows the summary of some basic statistics associated with the proposed study of this paper.

Table 2

The summary of some basic statistics

	"R"	MBV	Q	LZR	INDEX	LOGAGE
Mean	1967.5	1278.1	1.08E+05	-5.88E-05	0.31429	3.7569
Median	446.29	770.45	15516	0	0	3.8712
Minimum	-9890.5	0	0	-0.01212	0	1.9459
Maximum	1.06E+05	18318	5.46E+06	0	1	4.6728
Standard deviation	6538.6	1784.7	4.42E+05	0.0007212	0.4649	0.56977
C.V.	3.3232	1.3964	4.1045	12.275	1.4792	0.15166
Skewness	11.668	4.039	9.896	-14.623	0.80009	-0.848
Ex. kurtosis	178.32	26.326	110.41	230.68	-1.3598	0.97331

To find out the impact of stock market on firm performance, linear regression was applied. Table 3 demonstrates the results of the implementation.

Table 3

The summary of regression technique

Relationship	(R^2)	Independent variables				
Tobin's Q	EQUATION	RETURN	MBV	LZR	INDEX	LOGA
	Linear	.426	.000	.000	.001	.005
	Quadratic	.441	.001	.000	.001	.008
	Cubic	.444	.001	.000	.001	.008
	Best fit	CUBIC	Q/CUBIC			Q/CUBIC

The results of Table 3 indicate that either cubic or quadratic is the best fit. This suggests that linear regression cannot be applied. Generalized Linear model is the best test to check the relationship between dependent and independent variables. Still OLS regression was applied as quadratic and cubic models are comparatively difficult to interpret and to check the extent of relationship. Table 4 demonstrates the results of the regression analysis where Tobin Q is a function of different variables.

Table 4

The summary of measuring the effects of different variables on Tobin Q

	Coefficient	Std. Error	t-ratio	p-value
Constant	72863.2	134183	0.5430	0.58747
R	28.9973	2.39859	12.0893	<0.00001
MBV	9.0621	11.7805	0.7692	0.44228
LZR	1.88138e+06	2.78004e+07	0.0677	0.94608
Index	33436.7	44857.1	0.7454	0.45654
Logage	-15564.3	35365	-0.4401	0.66014
Mean dependent variable		107588.5	S.D. dependent variable	441597.0
Sum squared residuals		4.74e+13	S.E. of regression	371372.5
R-squared		0.302891	Adjusted R-squared	0.292759
F(5, 344)		29.89338	P-value(F)	3.26e-25
Log-likelihood		-4982.339	Akaike criterion	9976.678
Schwarz criterion		9999.825	Hannan-Quinn	9985.891

According to the results of Table 4, the intercept does not seem to be statistically significant (i.e. the population parameter is not different from zero at 10% level of significance), while the slope parameter (the coefficient of the area) is significant at even 1%. The R^2 is also high (0.302891) signifying a positive relationship between the stock market and their firm performance indicators. The Generalized Linear Model (GLM) is a model which can be specified to include a wide range of different models. Table 5 demonstrates the results of the implementation of GLM method.

Table 5
The summary of GLM method

		N	Minimum	Maximum	Mean	Std. Deviation
Dependent Variable	Q	345	.00	5463515.35	108942.6617	4.44650E5
Covariate	R	345	-9890.54	105509.24	1990.2345	6583.10755
	MBV	345	.00	18317.84	1277.8975	1796.46266
	INDEX	345	.00	1.00	.3043	.46080
	LOGA	345	1.95	4.67	3.7583	.57379

Table 5 provides fit statistics calculated across all of the models. It provides a concise summary of how well the models, with estimated parameters, fit the data. For each statistic, the table provides the mean, standard error (SE), minimum, and maximum values. It also contains percentile values that provide information on the distribution of the statistic across models. For each percentile that percentage of models has a value of the fit statistic below the stated value. For instance, 95% of the models have a value of Max that is less than 18317.84. Table 6 presents the summary of GLM model fit.

Table 6
The summary of statistics of fitness

	Value	df	Value/df
Deviance	3.197E13	326	9.806E10
Scaled Deviance	345.000	326	
Pearson Chi-Square	3.197E13	326	9.806E10
Scaled Pearson Chi-Square	345.000	326	
Log Likelihood[a]	-4845.543		
Akaike's Information Criterion (AIC)	9731.086		
Finite Sample Corrected AIC (AICC)	9733.678		
Bayesian Information Criterion (BIC)	9807.957		
Consistent AIC (CAIC)	9827.957		

According to the SPSS output the Deviance for the log linear model for the number of companies due to performance of equals Deviance = 3.197E13, df=326. It is hard to judge this value, without knowing the distribution of the deviance. A better measure is Deviance/df=9.806E10, measures “close” to one indicate good model fit. Here the score is not close to one and can be interpreted as lack in model fit. According to the results of Chi-Square, we can reject H_0, and find that the saturated model fits significantly better than the proposed model. Table 7 also shows the results of Omnibus test as follows.

Table 7
The summary of Omnibus test

Likelihood Ratio Chi-Square	Df	Sig.
260.460	18	.000

Likelihood Ratio Chi-square (LRX) was developed more recently than the Pearson chi-square and is the second most frequently used Chi-square. It is directly related to log-linear analysis and logistic regression. The LRX has the important property that an LRX with more than one degree of freedom can be grouped into a number of smaller tables each with its own (smaller) LRX and (lower numbers of) degrees of freedom. The sum of the partial LRXs and associated partial degrees of freedom, as found in the smaller tables, equals the original LRX and original number of degrees of freedom.

If the resulted chi-square value is significant, stick with the unconstrained model; if insignificant then the constraints can be justified. The likelihood ratio test statistic is Chi-Square =260.460 with a P-value=.000 Hence, we have relatively strong evidence in favor of rejecting H_0. Table 8 also presents the results of regression analysis.

Table 8

The summary of regression analysis

Source	Type III		
	Wald Chi-Square	Df	Sig.
(Intercept)	3.164	1	.075
LZR	.002	3	1.000
R	3.640	1	.056
MBV	.631	1	.427
INDEX	.000	1	.991
LOGA	4.914	1	.027
R × MBV	.095	1	.758
R × INDEX	1.170	1	.279
R × LOGA	5.258	1	.022
MBV × INDEX	.097	1	.756
MBV × LOGA	.575	1	.448
INDEX × LOGA	.000	1	.990
R × MBV × INDEX	.077	1	.781
R × MBV × LOGA	.292	1	.589
R × INDEX × LOGA	1.133	1	.287
MBV × INDEX × LOGA	.085	1	.770
R × MBV × INDEX × LOGA	.082	1	.774

Model: (Intercept), LZR, R, MBV, INDEX, LOGA

The likelihood ratio test statistic is x^2 =3.164 with a p-value=.075 Hence, we have relatively strong evidence in favor of hypothesis are not rejecting. LZR test statistic is x^2 = .002 with a p-value=1 Hence, we have relatively strong evidence in favor of hypothesis are not rejecting. Return test statistic is x^2 = 3.640 with a p-value= .056 Hence, we have relatively strong evidence in favor of hypothesis are not rejecting. Market to book value test statistic is x^2 =.631 with a p-value=.427 Hence, we have relatively strong evidence in favor of hypothesis are rejecting. Index test statistic is x^2 = .000 with a p-value=.991 Hence, we have relatively strong evidence in favor of hypothesis are not rejecting. Log age test statistic is x^2 = 4.914 with a p-value=.027 Hence, we have relatively not strong evidence in favor of hypothesis are rejecting. Returns and market book value are relationship with test statistic is x^2 = .095 with a p-value=.758 Hence, we have relatively strong evidence in favor hypothesis are not rejecting. Returns and index are relationship with test statistic is x^2 =1.170 with a p-value= .279 Hence, we have relatively not strong evidence in favor hypothesis (Ho) are rejecting. Returns and log age are relationship with test statistic is x^2 =5.258 with a p-value= .022 Hence, we have relatively not strong evidence in favor hypothesis (H_0) are rejecting. Other findings can be similarly observed from Table 8.

Finally, Table 9 shows the results of parameter estimation. The parameter estimates table summarizes the effect of each predictor. While interpretation the signs of the coefficients for covariates and relative values of the coefficients for factor levels can gives insights into the effects of the predictors in the model. For covariates, positive (negative) coefficients indicate positive (inverse) relationships between predictors and outcome. An increasing value of a covariate with a positive coefficient corresponds to an increasing rate of damage incidents. For factors, a factor level with a greater coefficient indicates greater impact on Tobin's Q. The sign of a coefficient for a factor level is dependent upon that factor level's effect relative to the reference category. One can make the following interpretations based on the parameter estimates:

The highest coefficient is for variable LOGA(-91412.563) and the sign is negative. The lowest coefficient is for × MBV × LOGA (-39.611) hence, hypothesis are significant.

Table 9
The summary of parameter estimation

Parameter			95% Wald Confidence		Parameter	Hypothesis Test		
	B	Std. Error	Lower	Upper		Wald Chi-Square	Df	Sig.
(Intercept)	367344.01	155799.14	61983.312	672704.71	(Intercept)	5.559	1	0.018
[LZR=-.01]	-7170.177	305466.76	-605874.03	591533.68	[LZR=-.01]	0.001	1	0.981
[LZR=.00]	0[a]	.	.	.	[LZR=.00]	.	.	.
R	-58.058	30.4301	-117.7	1.584	R	3.64	1	0.056
MBV	-104.077	131.0485	-360.928	152.773	MBV	0.631	1	0.427
INDEX	-7478.122	670863.99	-1322347.4	1307391.1	INDEX	0	1	0.991
LOGA	-91412.563	41238.463	-172238.47	-10586.661	LOGA	4.914	1	0.027
R × MBV	-0.029	0.0954	-0.217	0.158	R × MBV	0.095	1	0.758
R × INDEX	-541.488	500.5156	-1522.481	439.504	R × INDEX	1.17	1	0.279
R × LOGA	23.039	10.0475	3.346	42.732	R × LOGA	5.258	1	0.022
MBV × INDEX	81.066	260.7338	-429.963	592.094	MBV × INDEX	0.097	1	0.756
MBV × LOGA	24.987	32.9587	-39.611	89.584	MBV × LOGA	0.575	1	0.448
INDEX × LOGA	2113.506	174674.18	-340241.59	344468.6	INDEX × LOGA	0	1	0.99
R × MBV × INDEX	0.103	0.3702	-0.623	0.828	R × MBV × INDEX	0.077	1	0.781
R × MBV × LOGA	0.017	0.0306	-0.043	0.076	R × MBV × LOGA	0.292	1	0.589
R × INDEX × LOGA	133.081	125.0199	-111.953	378.116	R × INDEX × LOGA	1.133	1	0.287
MBV × INDEX ×	-19.634	67.3019	-151.543	112.275	MBV × INDEX ×	0.085	1	0.77
R × MBV × INDEX × LOGA	-0.027	0.0936	-0.21	0.157	R × MBV × INDEX × LOGA	0.082	1	0.774
(Scale)	9.27E+10	7.06E+09	7.98E+10	1.08E+11	(Scale)			

Dependent Variable: Q
Model: (Intercept), LZR, R, MBV, INDEX, LOGA, R.

Dependent variable (tobin's Q) = (367344.012)×loga+(-7170.177)×LZR+(-58.058)×R+(-104.077)×MBV+(-7478.122) × INDEX + (91412.563)LOGA(0.029)×R×MBV + (541.488)×R×INDEX + (23.039)×R×LOGA+(81.066)×MBV×INDEX + (24.987)×MBV×LOG(2113.506)×INDEX×LOG + (0.103)×R×MBV×INDEX + (0.017)×R×MBV×LOG + (133.081)×R×INDEX×LOGA + (-19.634)× MBV × INDEX × LOGA + (-0.027)× R × MBV × INDEX × LOGA

Since $\beta > 0$, this means the higher the total score the higher the probability an independent variable affecting dependent variable. The intercept means, that the probability for a stock to have attended an academic program having a total score of 0 equals $\pi(0) = F(367344.01) \approx 0.018$ hence, result are significance. The intercept means, that the probability for a stock to affect Tobin's Q equals $\pi(0) = F(-91412.563) \approx 0.027$ hence, result are not significance. The variables for which B value is statistically significant, contributes more towards Tobin Q. In this study following variables contribute significantly return, market to book value, zrlog, index, log age.

4. Conclusion

This study has examined the relationship between stock market liquidity and firm performance on NSE listed top ten indices from 2005 to 2014. To check the relationship of stock market liquidity and firm performance the ordinary least sequence and general linear model were applied. The dependent variable of the study was Tobin Q and independent variable were returns, market to book value, index, zrlog and log age. Normality tests provide the null hypothesis of normality of statistical model. After making the data stationary, the data was checked for linearity of relationship between dependent and independent variables. Based on the type of data, Generalized Linear model was considered as the best test to check the relationship between dependent and independent variables. The result of this study has shown positive relationship between independent variables, return and age on dependent variable Tobin's Q. Further relationship between stock market liquidity and firm performance was also checked and it was found that stock market liquidity was correlated with higher firm performance as measured by Tobin Q. Dalvi and Baghi (2014) and Uno and Kamiyama (2010) calculated stock market liquidity and firm performance relationship using the same methodology and found that independent variables return, market to book value, zrlog. index, log age depend on Tobin Q .

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