AN EMPIRICAL ANALYSIS OF THE IMPACT OF COMPANY CHARACTERISTICS ON THE LIQUIDITY OF STOCK MARKET

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Abstract: This paper attempts to investigate the stock market liquidity in the sample companies on the basis of industry sector, size and company specific characteristics. Using a sample of 187 companies for the period 2012-16, parametric tests viz, independent sample t-test and logistic regression; and non-parametric test, Mann Whitney U-test have been employed to analyse the stock market liquidity. Empirical evidence put forth that there is significant variation in stock market liquidity in large companies vis-à-vis small companies. Further, results reveal that size of the company and stock market return volatility are dominant features of company having high stock market liquidity.

Keywords: Stock market liquidity, BSE 500 Index.

Introduction: The liquidity of stocks, that is, the relationship between volume of trading and changes in the market price, has gain escalating recognition as an element of investment strategy in recent years. Investors select securities based on anticipated liquidity needs (Amihud and Mendelson, 1986). The extent of liquidity or illiquidity of a market is very pertinent to investors in analyzing the operational function of the market (Mahama, 2013). Increase in liquidity can lead to improved sharing of financial risks by influencing investors' trading decisions due to reduction in transaction costs associated with making portfolio changes (Aggarwal, 2009). For emerging economies like India, having a liquid market is essential. Its sudden erosion in even a single market segment or in an individual instrument can stimulate disruptions that are transmitted through increasingly interdependent and interconnected financial markets worldwide (Wyss, 2004).

Literature Review: Kyle (1985) established that equilibrium in the game between informed traders and liquidity suppliers requires that informed demand, i.e., volume scales with uninformed demand, while illiquidity, i.e., Kyle's lambda is inversely proportional to the scale of uninformed demand because more noise makes total order flow less informative implying that more the volume is higher is the liquidity. Eleswarapu and Krishnamurti (1994) investigated the problem of illiquidity that afflicts the stocks listed on the Bombay Stock Exchange (B.S.E.) by empirically looking at the characteristics of firms leading to differential levels of trading frequency and also, the resultant effect on average returns. By conducting a pooled time series and cross-section regression on a random sample of 250 firms over the five year period from 1989 to 1993, they found evidence in favour of a liquidity premium for stocks on the B.S.E. Furthermore, it was put forth that trading frequency is positively related to number of shareholders and shares outstanding. Chordia et al. (2001) examined the relationship between liquidity and market returns for a sample of NYSE stocks from 1988 to 1992 and found that market liquidity is affected by market returns. Heflin et al. (2005) recommended that better spread-based measure of liquidity is effective spreads rather than relative or raw spreads. Johnson (2008) put forth that volume is not associated with liquidity over the period of time because of simple frictionless model. However, liquidity risk or the variance of liquidity is positively associated with volume. Izadinia and Ramsheh (2011) employed multivariable regressions for pooled data for the period from January 2003 to September 2009 to examine the relationship between liquidity and stock trading characteristics for companies listed in Tehran Stock Exchange. The study posits that trading characteristics, for instance, price of stock, trading volume etc. are essential determinants of liquidity. Ahn et al. (2012) empirically investigate whether the low-frequency liquidity measures that are popular among researches capture liquidity effectively and, if they do, which of the proxies measures liquidity best. They used benchmarks from high frequency data such as spread benchmarks (quoted spread, effective spread and the realized spread) and price impact

measures (Hasbraick's lambda, 5 minute price impact and adverse selection costs). Along with the high frequency they also utilized low frequency data such as spread proxies (Roll's spread, LOT measures, Zeros and Zeros 2) and price impact measures (Amihud, 2002; Amivest, 1985; Paster and Stambaugh, 2003). They concluded that there is not one universally accepted proxy for liquidity. Fong et al. (2014) analysed the liquidity proxies constructed from low-frequency (daily) stock data to liquidity benchmarks computed from high-frequency (intraday) data for 18,472 firms on 43 exchanges around the world from 1996- 2007. They found that a new proxy, FHT, strongly dominates prior percent cost proxies and it is highly correlated with percent effective spread, percent quoted spread, percent realized spread, and percent price impact. They posits that the best cost-per-volume proxies are FHT Impact, Zeros Impact, and Amihud and are highly correlated with lambda, but do not capture the level of lambda. Based on the literature, following alternative hypotheses has been formulated to analyse stock market liquidity:

$H1_1$: There is a significant variation in stock market liquidity across industry sectors.
$H1_2$: There is a significant variation in stock market liquidity in large companies vis-à-vis small companies.
$H1_3$: The stock market liquidity is high in large companies vis-à-vis small companies.
$H1_4$: The stock market liquidity is high in older companies vis-à-vis younger companies.
$H1_5$: The stock market liquidity is high in companies having high average closing price vis-à-vis companies having low average closing price.
$H1_6$: The stock market liquidity is high in companies having more stock return volatility vis-à-vis less stock return volatility.
$H1_7$: The stock market liquidity is high in highly leveraged companies vis-à-vis low leveraged companies.

Need and Significance of the Study: Liquidity has always been in at the focus of interest of financial market participants; however it has become the subject of academic research only in the past few years (Benic and Franic, 2009). Liquidity itself is not observable and therefore, has to be proxied by different liquidity measures (Wyss, 2004). A number of studies (Chordia et al., 2000; Benic and Franic, 2009), have documented that aggregate liquidity in the stock market varies over time. But there is dearth of studies on stock market liquidity in emerging countries such as India. Thus, an effort has been made to investigate the overall scope of stock market liquidity in a broader context through a comprehensive analysis of stock market liquidity across industry sectors, size and individual company specific characteristics.

Objectives of the Study:
Table 1 presents the objectives of the present study.

Table 1: Objectives of the Study

Objective	Fulfilment of Objective	Tools Utilized
Examination of the stock market liquidity in the selected companies	Industry-wise Analysis of Stock Market Liquidity Size-wise Analysis of Stock Market Liquidity Company-wise Analysis of Stock Market Liquidity	Descriptives *t*-Test Mann-Whitney U-test Logistic Regression

Source: Researcher's own compilation

Research Design:
Sample Selection and Data Sources: The present study has been confined to all the companies that are included in the S&P BSE-500 Index for five financial years from 2011-12 to 2015-16 amounting to 935 company-year observations. The study is fundamentally empirically-based constituting primarily of secondary data drawn from Prowess.

Variable Selection and Description: The present study aims to examine the degree of stock market liquidity as captured by Amihud illiquidity ratio, share turnover ratio and modified Amihud ratio in India. Amihud illiquidity ratio and modified Amihud ratio are measures of illiquidity, that is, higher ratio indicates lower liquidity and vice-versa. However, share turnover ratio is a measure of liquidity,

that is higher the ratio higher is the liquidity. The variables used in the present study have been discussed in the following Table 2:

Table 2: Variables Used in the Present Study

Variable	Symbol Used	Definition
Panel A: Dependent Variables (Stock Market Liquidity Variables)		
Amihud Illiquidity Ratio	AIR	It measures the average absolute change in share price per dollar of volume traded and computed as follows: $ILLIQ_{iy} = 1/D_{iy} \sum_{t=1}^{D_{iy}} \lvert R_{iyd} \rvert / VOLD_{iyd}$
Share Turnover Ratio	STR	It is calculated as shares traded divided by shares outstanding $Turnover_{i,t} = \frac{1}{12} \sum_{m=1}^{12} \frac{Vol_{i,t,m}}{Shrout_{i,t,m}}$,
Modified Amihud Ratio	MAR	Illiquidity is computed as the ratio of the absolute daily return to daily turnover ratio. $ILLIQ = D^{-1} \sum_d \{\frac{\lvert R_{dt} \rvert}{TURNOVER_{dt}}\}$
Panel B: Independent Variables (Company Characteristics)		
Age of Company	AGE	Natural logarithm of the number of years for which the company has been in existence since incorporation
Company Size	SIZ	Natural logarithm of firm's total sales
Closing Price	CPR	Log scaled daily closing stock price averaged over an annual trading period
Return Volatility	RVOL	Annualized standard deviation of daily stock returns over an annual trading period for each stock
Leverage	LEV	Total debt divided by total debt plus equity

Source: Researcher's Own Compilation

Data Analyses: The software packages, EViews (version 9), SPSS (version 16.0) and STATA (version 12) were utilized for analyzing the data in the present study. Parametric tests viz., t-tests and logistic regression as well as non-parametric test, Mann-Whitey U-test have been employed.

Empirical Results and Discussion:

Descriptive Statistics: Table 3 provides the descriptive statistics for the variables used in the study. The examination of the results in Panel A shows that the mean (median) value of ***AIR*** is 8.234 (8.201) while that for ***STR*** and ***MAR*** are 10.949 (10.895) and 4.523 (4.412) respectively. On the basis of the median value of different proxies of stock market liquidity, the sample observations have been separated into low magnitude and high magnitude of stock market liquidity. Further investigations reveals that stock market liquidity as proxied by ***AIR***, ***STR*** and ***MAR*** covers a wide range suggesting that sample covers companies having low as well as high stock market liquidity. The minimum value for both ***AIR*** and ***MAR*** are very small that is 2.405 and 1.011 respectively.

As can be inferred from the Panel B of Table 3 the average company in the sample is nearly 3 years old, suggesting that the sample companies are relatively young. Average ***SIZ*** of sample companies as measured by the natural logarithm of firm's sales is 10.278 with maximum and minimum values of 14.974 and 6.623 respectively. This suggests that the sample for the present study covers small as well as large size companies. In terms of average ***CPR***, the average company has a mean value of 5.321, with

maximum and minimum values of 8.294 and 1.648 respectively, covering a wide range. ***RVOL*** covers a narrow range from 0.008 to 0.058 with a mean (median) of 0.020 (0.019). ***LEV*** ranges from 0 to 1 with mean (median) as 0.804 (0.91).

Table 3: Descriptive Statistics

Panel A: Stock Market Liquidity							
Continuous Variables	**Symbol Used**	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Median**	**Maximum**
Amihud Illiquidity Ratio	AIR	935	8.234	2.226	2.405	8.201	16.744
Share Turnover Ratio	STR	935	10.949	1.283	6.296	10.895	14.621
Modified Amihud Ratio	MAR	935	4.523	1.427	1.011	4.412	9.778
Panel B:Company Characteristics							
Continuous Variables	**Symbol Used**	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Median**	**Maximum**
Age of the company	AGE	935	3.451	0.819	1.099	3.332	7.607
Company Size	SIZ	935	10.278	1.338	6.623	10.120	14.974
Closing Price	CPR	935	5.321	1.078	1.648	5.353	8.294
Standard Deviation	RVOL	935	0.020	0.007	0.008	0.019	0.058
Leverage	LEV	935	0.804	0.256	0	0.91	1

Note: Results are obtained using SPSS 16.0

Industry-wise Analysis of Stock Market Liquidity: The sample of the present study comprises of 187 companies bifurcated into broadly two industry sectors, i.e., manufacturing and service sector as per classification done in the PROWESS. The majority of sample companies belong to manufacturing sector. To look into the fact that whether the changes in stock market liquidity are industry specific or not, an analysis has been made to compare changes in stock market liquidity across different industry sectors. The parametric test, independent sample t-test; and non-parametric test, Mann Whitney U-test has been applied for the comparison of stock market liquidity of two industry sectors, i.e., manufacturing and services sector. *t*-tests are often used to compare the means from two different groups of data that are not related in any way, i.e., independent from one another.

The results of t-test from Table 4 clearly highlight that variations in stock market liquidity across industry sector are not significant as *t*-statistic is insignificant. Similar results are demonstrated by employing Mann Whitney U-test. Thus, the alternate hypothesis ***$H1_1$***, i.e., ***there is significant variation in stock market liquidity across industry sectors*** stands rejected.

Table 4: Results of *t*-Test and Mann-Whitney U-test for Stock Market Liquidity across Industries

Variables	**Mean**		**t-test**		**Mann-Whitney U-test**	
	Manufacturing	**Services**	**t-statistic**	**Sig.**	**z-test**	**Sig.**
AIR	8.24	8.22	0.075	0.940	-0.092	0.926
STR	1.09	1.09	0.042	0.967	-0.069	0.945
MAR	4.51	4.58	-0.524	0.600	-0.816	0.415

Note: The results are obtained using SPSS 16.0

*** indicates level of significance at 1 percent. The test of significance is two-tailed.
** indicates level of significance at 5 percent. The test of significance is two-tailed.
* indicates level of significance at 10 percent. The test of significance is two-tailed.

Size-wise Analysis of Stock Market Liquidity: The t-test results show that significant differences exist between the mean of small companies vis-à-vis large companies for ***AIR*** (t= 23.831, p< 0.01), ***STR*** (t= -2.871, p< 0.01), and ***MAR*** (t= 8.806, p< 0.01). Furthermore, an examination of the means between the two reveals that stock market liquidity is high in large companies for all the three parameters of stock market liquidity (***AIR*** and ***MAR*** are measure of stock market liquidity whereas ***STR*** represents liquidity). Similar results are confirmed by employing Mann Whitney U-test. The results lead to the acceptance of hypothesis ***H_{1_2}*, i.e., *there is significant variation in stock market liquidity in large companies vis-à-vis small companies.***

Table 5: Results of t-Test and Mann-Whitney U-test for Stock Market Liquidity Size-wise

Variables	Mean		t-test		Mann-Whitney U-test	
	Small Companies	Large Companies	t-statistic	Sig.	z-statistic	Sig.
AIR	9.60	6.87	**23.831*****	0.000	**-19.612*****	0.000
STR	1.08	1.10	**-2.871*****	0.004	**-2.252****	0.024
MAR	4.92	4.13	**8.806*****	0.000	**-7.782*****	0.000

Note: The results are obtained using SPSS 16.0
*** indicates level of significance at 1 percent. The test of significance is two-tailed.
** indicates level of significance at 5 percent. The test of significance is two-tailed.
* indicates level of significance at 10 percent. The test of significance is two-tailed.

Company-wise Analysis of Stock Market Liquidity: Logistic regression analysis has been invoked to investigate the impact of company specific characteristics on the stock market liquidity. Logistic regression predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more independent variables that can be either continuous or categorical.

The results of the logistic regression analysis are exhibited in Table 6, 7 and 8. The dependent variable is a dummy variable which takes the value of 1 if the observation is above or equals the median value when ranked by absolute values of stock market liquidity and zero otherwise. The likelihood ratio is significant at less than 1 percent level of significance implying that the introduction of the independent variables in the regression improves the ability of the model than with the null model only. The Cox & Snell R square and Nagelkerke R-square, taking ***AIR, STR*** and ***MAR*** as measure of dependent variable stock market liquidity, are reported to be 0.382 and 0.509; 0.196 and 0.262; and 0.125 and 0.166 respectively. The Hosmer and Lemeshow test in Table 6 shows that the model is fit to the data with chi square statistic of 6.142 with an insignificant p-value of 0.631 when stock market liquidity is proxied by ***MAR***. The prediction accuracy of the model as proxied by Amihud illiquidity ratio, share turnover ratio and modified Amihud ratio of stock market liquidity is 80.20, 69.80 and 64.60 percent respectively.

It can be inferred from the results presented in Table 7 that the probability of high magnitude of stock market liquidity, as proxied by ***STR***, is more in bigger size companies (positive coefficient of 0.130 significant at 5 percent level of significance); companies with low average closing price (negative coefficient of -0.196 with p-values less than 1 percent); and higher stock market return volatility (positive and significant coefficient of 150.976). Although ***AGE*** and ***LEV*** both has positive association with the magnitude of stock market liquidity but Wald chi-square for these coefficients is 0.004 and 0.035 respectively with insignificant p-values.

The results are similar as exhibited in Table 6 and 8 when stock market liquidity is proxied by ***AIR*** and ***MAR*** except ***LEV*** which is significant at less than 1 percent level in case of Amihud illiquidity ratio with a positive coefficient of 1.362 (Table 6) implying that higher the leverage, lower would be the stock market liquidity. Further, ***CPR*** is also significant at less than 1 percent in case when stock market liquidity is proxied by Amihud iliiquidity ratio but exhibits a contrary result of positive association between the stock market liquidity and average closing price (negative coefficient of -0.265). Negative coefficient of ***SIZ*** in case of ***AIR*** means that the probability of high magnitude of stock market liquidity is more in bigger size companies (negative coefficient of -1.648 significant at 1 percent level of significance).

Table 6: Logistic Regression Results of Company Characteristics on the Magnitude of Stock Market Liquidity (Amihud Illiquidity Ratio)

Variables	Coefficient	Standard Error	Wald chi-square	p-value
Constant	18.090	1.353	178.633	**0.000*****
AGE	-0.045	0.109	0.168	0.682
SIZ	-1.648	0.115	205.392	**0.000*****
CPR	-0.265	0.087	9.223	**0.002*****
RVOL	-39.580	13.400	8.724	**0.003*****
LEV	1.362	0.351	15.062	**0.000*****
Cox & Snell R square		0.382		
Nagelkerke R square		0.509		
Likelihood Ratio p(prob)		0.000		
Hosmer & Lemeshow Test		40.189 (0.000)		
Prediction Accuracy		80.20%		

Note: The results are obtained using SPSS 16.0
*** indicates level of significance at 1 percent. The test of significance is two-tailed.
** indicates level of significance at 5 percent. The test of significance is two-tailed.
* indicates level of significance at 10 percent. The test of significance is two-tailed.

Table 7: Logistic Regression Results of Company Characteristics on the Magnitude of Stock Market Liquidity (Share Turnover Ratio)

Variables	Coefficient	Standard Error	Wald chi-square	p-value
Constant	-3.337	0.793	17.688	**0.000*****
AGE	0.006	0.091	0.004	0.951
SIZ	0.130	0.060	4.743	**0.029****
CPR	-0.196	0.074	7.099	**0.008*****
RVOL	150.976	13.355	127.801	**0.000*****
LEV	0.058	0.310	0.035	0.853
Cox & Snell R square		0.196		
Nagelkerke R square		0.262		
Likelihood Ratio p(prob)		0.000		
Hosmer & Lemeshow Test		15.864 (0.044)		
Prediction Accuracy		69.80%		

Note: The results are obtained using SPSS 16.0
*** indicates level of significance at 1 percent. The test of significance is two-tailed.
** indicates level of significance at 5 percent. The test of significance is two-tailed.
* indicates level of significance at 10 percent. The test of significance is two-tailed.

Table 8: Logistic Regression Results of Company Characteristics on the Magnitude of Stock Market Liquidity (Modified Amihud Ratio)

Variables	Coefficient	Standard Error	Wald chi-square	p-value
Constant	4.300	0.763	31.788	**0.000*****
AGE	-0.090	0.088	1.051	0.305
SIZ	-0.365	0.059	38.189	**0.000*****
CPR	0.278	0.071	15.273	**0.000*****
RVOL	-91.737	11.734	61.121	**0.000*****
LEV	0.120	0.292	0.170	0.680
Cox & Snell R square	0.125			
Nagelkerke R square	0.166			
Likelihood Ratio p(prob)	0.000			
Hosmer & Lemeshow Test	6.142 (0.631)			
Prediction Accuracy	64.60%			

Note: The results are obtained using SPSS 16.0
*** indicates level of significance at 1 percent. The test of significance is two-tailed.
** indicates level of significance at 5 percent. The test of significance is two-tailed.
* indicates level of significance at 10 percent. The test of significance is two-tailed.

Overall, the results of the logistic regression to ascertain the effects of age, size, closing price, stock return volatility and leverage on the magnitude of stock market liquidity reveals that size of the company and stock market return volatility are dominant features of company having high stock market liquidity. Stock market liquidity is more in bigger size companies lending support to hypothesis $H1_3$, i.e., ***the stock market liquidity is high in large companies vis-à-vis small companies***; and higher stock market return volatility leading to the acceptance of hypothesis $H1_6$, i.e., ***the stock market liquidity is high in companies having more stock return volatility vis-à-vis less stock return volatility. AGE*** has insignificant p-values. Thus, the hypothesis $H1_4$, i.e., ***the stock market liquidity is high in older companies vis-à-vis younger companies*** stands rejected. The results further document that higher the leverage, lower would be the stock market liquidity (when stock market liquidity is proxied by ***AIR*** and ***MAR)***, thus, partially supporting hypothesis $H1_7$, i.e., ***the stock market liquidity is high in highly leveraged companies vis-à-vis low leveraged companies.*** Furthermore, closing price generates mixed effects on the magnitude of stock market liquidity leading to partial acceptance of hypothesis $H1_5$, i.e., ***the stock market liquidity is high in companies having high average closing price vis-à-vis companies having low average closing price.***

Conclusion: The present paper puts forth the analyses of stock market liquidity in the sample Indian companies carried out industry-wise, size-wise and company-wise. The results clearly document that variations in stock market liquidity across industry sector are not significant. However, there is significant variation in stock market liquidity in large companies vis-à-vis small companies. The result of the logistic regression highlights that size of the company and stock market return volatility are dominant features of company having high stock market liquidity. Stock market liquidity is more in bigger size companies lending support to hypothesis $H1_3$, and companies having higher stock market return volatility leading to the acceptance of hypothesis $H1_6$.

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