

## **LIQUIDITY ASPECTS OF LARGE CORPORATE BUSINESS : A STUDY WITH REFERENCE TO LISTED COMPANIES IN INDIA**

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### ***ABSTRACT***

*The present study examines the determinants of liquidity of listed companies in India. The analysis is based on data collected from 219 large companies of Bombay Stock Exchange 500 index. The study evaluates the determinants of liquidity by taking current ratio as well as quick ratio as dependent variables for checking sensitivity. We found current assets to total assets, operating profit margin and receivable days positively determine the level of liquidity. Payable days, trade debtors to current assets, current liability to total assets and size of the firm negatively determine the liquidity.*

Keywords: liquidity, panel data, current ratio.

### **INTRODUCTION**

Liquidity is a prerequisite for the survival of any firm (Khan and Jain 2011). The major ratios which indicate liquidity are current ratio (current assets divided by current liability) and quick ratio or acid-test ratio (current assets minus inventories divided by current liability). There are

also some other ratios such as cash ratio and net working capital. Current ratio is a measure of short term solvency. Current ratio of 2:1 is considered as an ideal ratio (Pandey, 2011), (Khan and Jain, 2011), (Chandra, 2008). Current ratio of 2: 1 indicates that for meeting a one rupee of current liability the firm is having 2 rupees of current assets. However in the case of the quick ratio inventory is omitted from current assets for looking at the liquidity, because an asset is considered liquid only when if it can be converted in to cash immediately without a loss of value (Pandey, 2011). 1:1 is considered the ideal quick ratio.

The present economic conditions after the 2008 economic recession is that liquidity has become the major concern for all investors. Stiff competition in the market pushes the companies to keep the current ratio and quick ratio as low as possible (Krishnankutty and Chakraborty, 2011). Table 1 shows the average current ratios over the past 10 years from 2001-2010 on the basis of the Bombay Stock Exchange sectoral classification. From the table it is evident that except for agriculture and healthcare all the selected large corporate sectors as well as a sample taken as a whole, for most of the stated periods they are below the ideal ratio of 2:1. Even such sectors as FMCG , Metal & metal products & mining, Oil & gas and Transport equipment all have current ratios much lower than the sample taken as a whole.

<b>TABLE: 1 SECTORAL AVERAGE OF CURRENT RATIO</b>										
<b>Sectors</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>Total Sample as a whole</b>	1.50	1.44	1.37	1.26	1.29	1.34	1.39	1.45	1.38	1.39
Agriculture	2.27	2.19	2.00	2.14	1.83	1.96	2.26	1.90	1.53	1.98
Capital Goods	1.68	1.60	1.53	1.47	1.51	1.49	1.42	1.39	1.38	1.33
Chemical & petro chemical	1.65	1.54	1.54	1.43	1.49	1.46	1.62	1.45	1.30	1.24
FMCG	1.15	1.15	1.10	1.01	1.09	1.13	1.24	1.25	1.41	1.24
Healthcare	2.54	2.54	2.33	2.23	2.31	2.64	2.49	2.22	1.91	1.96
Housing related	1.60	1.55	1.36	1.49	1.32	1.52	1.75	2.15	2.14	2.18
Metal & metal products & mining	1.15	1.10	0.97	0.99	1.29	1.49	1.81	1.65	1.60	1.74
Miscellaneous	1.55	1.51	1.44	0.63	0.60	1.42	1.79	1.56	1.71	1.74
Oil & gas	1.51	1.37	1.24	1.29	1.21	1.20	1.18	1.38	1.20	1.23
Power	1.96	2.32	2.83	1.72	1.94	1.73	1.61	1.52	1.51	1.56
Transport equipment	1.63	1.44	1.30	1.09	1.18	1.22	1.21	1.08	1.14	0.96

*Source: authors' calculations*

## **RATIONALE OF THE STUDY**

Ratio analysis is a powerful tool of financial analysis (Pandey, 2011, Khan and Jain, 2011). Financial ratios are the major tool used for evaluating a firm's financial condition and performance (Van Horne et.al, 2008). According to the various users of financial ratios they are mainly classified into four categories namely liquidity ratios, leverage ratios, activity ratios and profitability ratios. Liquidity measures a firm's ability to meet the current obligations, leverage ratio shows the liquidity equity proportion in capital structure, activity ratios shows the efficiency in utilizing the assets and profitability measures the overall performance and effectiveness of a firm (Pandey, 2011).

Opler *et al.* (1999) examine the determinants and implication of cash and marketable securities of publically traded U.S firms. The study found that firms with strong growth opportunity and riskier cash flows hold relatively high cash to total non-cash assets. And firms that are having high credit ratings hold lower ratios of cash to total non-cash assets. Banerjee (2010) said that the liquidity position of a firm is largely affected by the composition of current assets inasmuch as any considerable shift from relatively more current assets to relatively less current assets or vice versa. Therefore it is desirable to study the distribution of current assets to determine the liquidity position exactly. Krishnankutty and Chakraborty (2011) examine the trend and determinants of current ratios of listed companies in India using panel data with fixed and random effect. The study found that current ratio is showing a negative trend in last decade. Receivable days, payable days, inventory days and size of the firm are the major determinant of current ratio. Chakraborty. (2003) says that liquidity consider two aspects namely the level of investment in current assets and the sources of financing current assets.

There are a quite number of studies on liquidity and profitability trade-off, liquidity in the aspect of investment etc. In this background the present study is designed. The objective of the study is to understand the determinants of liquidity and to study the level of liquidity in large corporate businesses of India.

## **DATA SOURCE AND METHODOLOGY**

### **Source of Data**

The study is dealing with the public limited companies listed in the Bombay Stock Exchange (BSE) 500 index. The period considered for the study is ten years i.e., 2001 – 2010. Banking, finance and IT companies are kept out of the scope of the study as the current assets and

liabilities structure of these companies are different from others. Moreover the non availability of data of companies continuously for the entire study period also kept them out of the scope of the study for meaningful interpretation and comparison. Thus the total numbers of companies considered in the present study is 219. The CMIE (Centre for Monitoring Indian Economy) data base is used for collecting the financial data.

### **Variables Used For the Study**

The study used two dependent variables as proxy for measuring liquidity in order to check the sensitivity of the result- Current ratio (CR) and Quick ratio (LQ).

Current ratio (CR) = Current assets/ Current liability

Liquidity ratio (LQ) = (current assets- inventories)/ current liability

Independent variables used for the study are as follows:

Receivable days (ARDAYS) = (Accounts receivable X 365)/ Sales.

Payable days (APDAYS) = (Accounts payable X 365)/ Sales

Inventory turnover (INVTURN) = Sales/ Inventory

Size of the firm (SIZE) = Natural logarithm of sales

Asset turnover (ASSTRN) = Sales/ Total assets

Current assets to total assets (CATA) = Current assets/ Total assets

Current liability to total assets (CLTA) = Current liability/ Total assets

Operating profit margin (OPEM) = PBIT/Sales

Trade debtors to current assets (SDCA) = Trade debtors/ Current assets

## Panel Least Square with Fixed and Random Effect

The study used balanced panel data for the analysis. A data set contains observations on different objects studied over a period of time and this is called panel data. It is a combination of cross-sectional data and time series data. In balanced panel data same time period must be available for all cross-sections.

To analyze the aspect liquidity the study proposes the panel least square with fixed and random effects. For assessing the relationship between liquidity and its determinants static panel data models are used. There are three types of panel data models: a pooled Ordinary Least Square (OLS) regression, panel model with random effects and the panel model with fixed effects. The evaluation of a pooled OLS regression can be presented in the following way:

$$CR_{it} = \beta_0 + \beta_1(AR\text{DAY}_{it}) + \beta_2(AP\text{DAYS}_{it}) + \beta_3(SI\text{ZE}_{it}) + \beta_4(IN\text{VTURN}_{it}) + \beta_5(SA\text{T}\text{A}_{it}) + \beta_6(CA\text{T}\text{A}_{it}) + \beta_7(OP\text{EM}_{it}) + \beta_8(SD\text{CA}_{it}) + \beta_9(CL\text{T}\text{A}_{it}) + \varepsilon_{it}, \dots \dots \dots (1)$$

$$LQ_{it} = \beta_0 + \beta_1(AR\text{DAY}_{it}) + \beta_2(AP\text{DAYS}_{it}) + \beta_3(SI\text{ZE}_{it}) + \beta_4(IN\text{VTURN}_{it}) + \beta_5(SA\text{T}\text{A}_{it}) + \beta_6(CA\text{T}\text{A}_{it}) + \beta_7(OP\text{EM}_{it}) + \beta_8(SD\text{CA}_{it}) + \beta_9(CL\text{T}\text{A}_{it}) + \varepsilon_{it}, \dots \dots \dots (2)$$

Where  $i$  indexes firms,  $t$  indexes time,  $\beta_1, \beta_2, \beta_3, \dots, \beta_9$  are the coefficients of independent variables.  $CR_{it}$  is the current ratio,  $LQ_{it}$  is quick ratio are the measure of liquidity,  $AR\text{DAYS}_{it}$  is receivable days,  $AP\text{DAYS}_{it}$  is payable days,  $IN\text{VTURN}_{it}$  is inventory turnover,  $SI\text{ZE}_{it}$  is size of the firm,  $SA\text{T}\text{A}_{it}$  is asset turnover,  $CA\text{T}\text{A}_{it}$  is the current assets to total assets,  $CL\text{T}\text{A}_{it}$  is current liability to total assets,  $OP\text{EM}_{it}$  is operating profit margin,  $SD\text{CA}_{it}$  is trade debtors to current assets and  $\varepsilon_{it}$  is the error term which is assumed to have a normal distribution and varies over both company and time. However, by using a pooled OLS regression, firms' unobservable individual effects are not controlled, and so, as Bevan and Danbolt (2004) conclude, heterogeneity, a consequence of not considering those effects, can influence measurements of the estimated parameters. While by using panel models of random or fixed effects, it is possible to control the implications of firms' non-observable individual effects on the estimated parameters. Therefore, by considering the existence of non-observable individual effects, we have:

$$CR_{it} = \beta_0 + \beta_1(AR\text{DAY}_{it}) + \beta_2(AP\text{DAYS}_{it}) + \beta_3(SI\text{ZE}_{it}) + \beta_4(IN\text{VTURN}_{it}) + \beta_5(SA\text{T}\text{A}_{it}) + \beta_6(CA\text{T}\text{A}_{it}) + \beta_7(OP\text{EM}_{it}) + \beta_8(SD\text{CA}_{it}) + \beta_9(CL\text{T}\text{A}_{it}) + u_{it}, \dots \dots \dots (3)$$

$$LQ_{it} = \beta_0 + \beta_1(AR\text{DAY}_{it}) + \beta_2(AP\text{DAYS}_{it}) + \beta_3(SI\text{ZE}_{it}) + \beta_4(IN\text{VTURN}_{it}) + \beta_5(SA\text{T}\text{A}_{it}) + \beta_6(CA\text{T}\text{A}_{it}) + \beta_7(OP\text{EM}_{it}) + \beta_8(SD\text{CA}_{it}) + \beta_9(CL\text{T}\text{A}_{it}) + u_{it}, \dots \dots \dots (4)$$

where  $u_{it} = \mu_i + \varepsilon_{it}$ , with  $\mu_i$  being firms' unobservable individual effects. The difference between a pooled OLS regression and a model considering unobservable individual effects lies precisely in  $\mu_i$ .

For testing the relevance of unobservable individual effects, the study used the LM (Lagrange Multiplier) test. This tests the null hypothesis of irrelevance of unobservable individual effects, against the alternative hypothesis of relevance of unobservable individual effects. Not rejecting the null hypothesis, we conclude that unobservable individual effects are not relevant, and so a pooled OLS regression would be an appropriate way of carrying out evaluation of liquidity determinants. On the contrary, if we reject the null hypothesis that unobservable individual effects are not relevant, we can conclude that a pooled OLS regression is not the most appropriate way of carrying out analysis of the relationship between liquidity and its determinants.

However, there may be correlation between firms' unobservable individual effects and liquidity determinants. If there is no correlation between firms' unobservable individual effects and liquidity determinants, the most appropriate way of carrying out evaluation is by using a panel model of random effects. If there is correlation between firms' individual effects and liquidity determinants, the most appropriate way of carrying out evaluation is using a panel model admitting the existence of fixed effects. For testing the possible existence of correlation, we use the Hausman test. This tests the null hypothesis of non-existence of correlation between unobservable individual effects and the explanatory variables, in this study, liquidity determinants, against the null hypothesis of existence of correlation. By not rejecting the null hypothesis, we can conclude that correlation is not relevant, and a panel model of random effects is the correct way of carrying out evaluation of the relationship between liquidity and its determinants. On the other hand, by rejecting the null hypothesis, we conclude that correlation is relevant, and so the most appropriate way to carry out evaluation of the relationship between liquidity and its determinants is by using a panel model of fixed effects. In this study, we also present the evaluation of the most appropriate panel model, according to the results of the LM and Hausman tests which is consistent with the existence of first order autocorrelation.

### **Quantile Regression Analysis**

Quantile regression (Koenker and Bassett 1978; Koenker and Hallock 2001) is a method for fitting a regression line through the conditional quantiles of a distribution. It allows the examination of the relationship between a set of independent variables and the different parts of the distribution of the dependent variable. Quantile regression overcomes some of the disadvantages of the conditional mean framework built upon central tendencies, which tend to lose information on phenomena whose tendencies are toward the tails of a given distribution

(Hao and Naiman 2007). The use of quantile regression approach is chosen also because of skewed distribution of CR, LQ, ARDAYS, APDAYS, SIZE, INVTURN, SATA, CATA, CLTA, OPEM, and SDCA (see the evidence in Table 2). Since in such case the usual assumption of normally distributed error terms is not warranted and could lead to unreliable estimates. Furthermore, companies analyzed are fundamentally heterogeneous and it may make little sense to use regression estimators that implicitly focus on the ‘average effect for the average company’ by giving summary point estimates for coefficients. Instead, quantile regression techniques are robust to outliers and are able to describe the influence of the regressors over the entire conditional distribution of CR, LQ, ARDAYS, APDAYS, SIZE, INVTURN, SATA, CATA, CLTA, OPEM, and SDCA.

Standard least squares regression techniques provide summary point estimates that calculate the average effect of the independent variables on the ‘average company’. However, this focus on the average company may hide important features of the underlying relationship. As Mosteller and Tukey (1977, pp.266) correctly argued, “What the regression curve does is give a grand summary for the averages of the distributions corresponding to the set of  $x$ ’s. We could go further and compute several regression curves corresponding to the various percentage points of the distributions and thus get a more complete picture of the set. Ordinarily this is not done, and so regression often gives a rather incomplete picture. Just as the mean gives an incomplete picture of a single distribution, so the regression curve gives a correspondingly incomplete picture for a set of distributions”. Quantile regression techniques can therefore help us obtain a more complete picture of the underlying relationship between liquidity (CR, LQ) and its determinants. In our case, estimation of linear models by quantile regression may be preferable to the usual regression methods for a number of reasons. While the optimal properties of standard regression estimators are not robust to modest departures from normality, quantile regression results are characteristically robust to outliers and heavy tailed distributions. In fact, the quantile regression solution  $\hat{\beta}_0$  is invariant to outliers of the dependent variable that tend to  $\pm\infty$  (Buchinsky, 1994). Another advantage is that, while conventional regressions focus on the mean, quantile regressions are able to describe the entire conditional distribution of the dependent variable. In the context of this study, all determinants of liquidity (CR, LQ) are of interest in their own right, we do not want to dismiss them as outliers, but on the contrary we believe it would be worthwhile to study them in detail. This can be done by calculating coefficient estimates at various quantiles of the conditional distribution. Finally, a quantile regression approach avoids the restrictive assumption that the error terms are identically distributed at all points of the conditional distribution. Relaxing this assumption allows us to acknowledge company heterogeneity and consider the possibility that estimated slope parameters vary at different quantiles of the conditional distribution of all determinants of liquidity.

The quantile regression model, first introduced by Koenker and Bassett (1978), can be written as:

$$y_{it} = x_{it}'\beta_0 + \varepsilon_{\theta it} \quad \text{with} \quad \text{Quant}_{\theta}(y_{it} | x_{it}) = x_{it}'\beta_0 \quad (5)$$

where  $i$  denotes company,  $t$  denotes time,  $y_{it}$  is the dependent variable,  $x_{it}$  is a vector of regressors,  $\beta$  is the vector of parameters to be estimated, and  $\varepsilon$  is a vector of residuals.  $Quant_{\theta}(y_{it} | x_{it})$  denotes the  $\theta^{th}$  conditional quantile of  $y_{it}$  given  $x_{it}$ . The  $\theta^{th}$  regression quantile  $0 < \theta < 1$ , solves the following problem:

$$\min_{\beta} \frac{1}{n} \left\{ \sum_{i,t: y_{it} \geq x_{it}'\beta} \theta |y_{it} - x_{it}'\beta| + \sum_{i,t: y_{it} < x_{it}'\beta} (1-\theta) |y_{it} - x_{it}'\beta| \right\} = \min_{\beta} \frac{1}{n} \sum_{i=1}^n \rho_{\theta} \varepsilon_{\theta it} \quad (6)$$

where  $\rho_{\theta}(\cdot)$ , which is known as the ‘check function’, is defined as”:

$$\rho_{\theta}(\varepsilon_{\theta it}) = \begin{cases} \theta \varepsilon_{\theta it} & \text{if } \theta \varepsilon_{\theta it} \geq 0 \\ (\theta - 1) \varepsilon_{\theta it} & \text{if } \theta \varepsilon_{\theta it} < 0 \end{cases} \quad (7)$$

Equation (6) is then solved by linear programming methods. As one increases  $\theta$  continuously from 0 to 1, one traces the entire conditional distribution of  $y_{it}$ , conditional on  $x_{it}$  (Buchinsky 1998).

Here we assume that CR and LQ is the function of ARDAYS, APDAYS, SIZE, INVTURN, SATA, CATA, CLTA, OPEM, and SDCA. Due to the advantages (as stated above) of quantile regression estimation technique over OLS, fixed and random effect models in the study, we examined at the 5<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup> and 95<sup>th</sup> quantiles as shown here for first and second specifications respectively:

$$\begin{aligned} Q_{.05}(CR_{it}) &= \alpha_{.05} + \beta_{.05,1} ARDAYS + \beta_{.05,2} APDAYS + \beta_{.05,3} SIZE + \beta_{.05,4} INVTURN \\ &+ \beta_{.05,5} SATA + \beta_{.05,5} CATA + \beta_{.05,5} OPEM + \beta_{.05,5} SDCA + \beta_{.05,5} CLTA + \varepsilon_{.05it} \end{aligned} \quad (8)$$

$$\begin{aligned} Q_{.25}(CR_{it}) &= \alpha_{.25} + \beta_{.25,1} ARDAYS + \beta_{.25,2} APDAYS + \beta_{.25,3} SIZE + \beta_{.25,4} INVTURN \\ &+ \beta_{.25,5} SATA + \beta_{.25,5} CATA + \beta_{.25,5} OPEM + \beta_{.25,5} SDCA + \beta_{.25,5} CLTA + \varepsilon_{.25it} \end{aligned} \quad (9)$$

$$\begin{aligned} Q_{.5}(CR_{it}) &= \alpha_{.5} + \beta_{.5,1} ARDAYS + \beta_{.5,2} APDAYS + \beta_{.5,3} SIZE + \beta_{.5,4} INVTURN \\ &+ \beta_{.5,5} SATA + \beta_{.5,5} CATA + \beta_{.5,5} OPEM + \beta_{.5,5} SDCA + \beta_{.5,5} CLTA + \varepsilon_{.5it} \end{aligned} \quad (10)$$

$$\begin{aligned} Q_{.75}(CR_{it}) &= \alpha_{.75} + \beta_{.75,1} ARDAYS + \beta_{.75,2} APDAYS + \beta_{.75,3} SIZE + \beta_{.75,4} INVTURN \\ &+ \beta_{.75,5} SATA + \beta_{.75,5} CATA + \beta_{.75,5} OPEM + \beta_{.75,5} SDCA + \beta_{.75,5} CLTA + \varepsilon_{.75it} \end{aligned} \quad (11)$$

$$Q_{.95}(CR_{it}) = \alpha_{.95} + \beta_{.95,1} ARDAYS + \beta_{.95,2} APDAYS + \beta_{.95,3} SIZE + \beta_{.95,4} INVTURN + \beta_{.95,5} SATA + \beta_{.95,5} CATA + \beta_{.95,5} OPEM + \beta_{.95,5} SDCA + \beta_{.95,5} CLTA + \varepsilon_{.95it} \quad (12)$$

$$Q_{.05}(LQ_{it}) = \alpha_{.05} + \beta_{.05,1} ARDAYS + \beta_{.05,2} APDAYS + \beta_{.05,3} SIZE + \beta_{.05,4} INVTURN + \beta_{.05,5} SATA + \beta_{.05,5} CATA + \beta_{.05,5} OPEM + \beta_{.05,5} SDCA + \beta_{.05,5} CLTA + \varepsilon_{.05it} \quad (13)$$

$$Q_{.25}(LQ_{it}) = \alpha_{.25} + \beta_{.25,1} ARDAYS + \beta_{.25,2} APDAYS + \beta_{.25,3} SIZE + \beta_{.25,4} INVTURN + \beta_{.25,5} SATA + \beta_{.25,5} CATA + \beta_{.25,5} OPEM + \beta_{.25,5} SDCA + \beta_{.25,5} CLTA + \varepsilon_{.25it} \quad (14)$$

$$Q_{.5}(LQ_{it}) = \alpha_{.5} + \beta_{.5,1} ARDAYS + \beta_{.5,2} APDAYS + \beta_{.5,3} SIZE + \beta_{.5,4} INVTURN + \beta_{.5,5} SATA + \beta_{.5,5} CATA + \beta_{.5,5} OPEM + \beta_{.5,5} SDCA + \beta_{.5,5} CLTA + \varepsilon_{.5it} \quad (15)$$

$$Q_{.75}(LQ_{it}) = \alpha_{.75} + \beta_{.75,1} ARDAYS + \beta_{.75,2} APDAYS + \beta_{.75,3} SIZE + \beta_{.75,4} INVTURN + \beta_{.75,5} SATA + \beta_{.75,5} CATA + \beta_{.75,5} OPEM + \beta_{.75,5} SDCA + \beta_{.75,5} CLTA + \varepsilon_{.75it}$$

$$Q_{.95}(LQ_{it}) = \alpha_{.95} + \beta_{.95,1} ARDAYS + \beta_{.95,2} APDAYS + \beta_{.95,3} SIZE + \beta_{.95,4} INVTURN + \beta_{.95,5} SATA + \beta_{.95,5} CATA + \beta_{.95,5} OPEM + \beta_{.95,5} SDCA + \beta_{.95,5} CLTA + \varepsilon_{.95it} \quad (16)$$

(17)

We used *sqreg* module of STATA 11 for simultaneous quantile regression estimation and obtain an estimate of the entire variance-covariance of the estimators by bootstrapping with 100 bootstrap replications. Simultaneous quantile regression is a robust regression technique that accounts for the non-normal distribution of error terms and heteroskedasticity (Koenker and Bassett 1978; Koenker and Hallock 2001). Unlike traditional linear models, such as OLS regression, that assume that estimates have a constant effect, simultaneous quantile regression can illustrate if independent variables have non-constant or variable effects across the full distribution of the dependent variable.

## RESULTS

### Panel Least Square with Fixed and Random Effect

Before conducting regression analysis, correlation analysis was carried out in order to find out whether there is any evidence of severe multicollinearity among the test variables. Since we do not find evidence of multicollinearity (see appendix 1), regression analysis has been carried out with incorporation of all variables simultaneously. First, we present the results of the static panel model analysis. Results of panel data models with random and fixed effects have been presented in table 3

**TABLE: 3 THE RESULT OF PANEL LEAST SQUARE WITH FIXED AND RANDOM EFFECTS**

Independent variable	Model 3		Model 4	
	FE	RE	FE	RE
ARDAYS	.001359*** (.0001807)	.001340*** (.0001701)	.0007274*** (.0001623)	.0007693*** (.0001509)
APDAYS	-.0025031*** (.0004036)	-.0028219*** (.0003958)	-.0008163** (.0003625)	-.0009949*** (.0003529)
SIZE	-.0275186 (.0232609)	-.0424685** (.0195117)	.0358867* (.0208895)	.0268993 (.0170912)
INVTURN	.0006654 (.0004277)	.0008435** (.0004218)	.0013438*** (.0003841)	.0014444*** (.0003763)
SATA	-.1002509** (.0463167)	-.1113813*** (.0403838)	-.1999969*** (.0415948)	-.1789142*** (.0355039)
CATA	2.483092*** (.1596137)	2.009579*** (.139276)	1.540021*** (.1433415)	1.161519*** (.1225136)
OPEM	.0746823 (.0582761)	.0713454 (.0536048)	.1482225*** (.052335)	.1451047*** (.0474001)
SDCA	-.8604573*** (.1493588)	-.8202655*** (.1396742)	-.5290588*** (.134132)	-.4320049*** (.1237661)
CLTA	-.2818231*** (.0729365)	-.3506192*** (.065621)	-.013249 (.0655008)	-.0932999 (.0578927)
constant	1.191029*** (.2016914)	1.556322*** (.1838392)	.2842534 (.1811294)	.4926345*** (.1612464)
<b>Model Summary</b>				
R2 with in	0.2178	0.2137	0.1420	0.1378
R2 between	0.0664	0.0975	0.0241	0.0470
R2 overall	0.1101	0.1342	0.0576	0.0776
F- test	60.70***		36.07***	
Fixed effect, F- test	11.97***		10.24***	
Wald test		527.91***		305.08***
Hausman test		79.49***		59.87***
No.of firms	219	219	219	219
Total panel observation	2190	2190	2190	2190
Dependent variable	Current ratio	Current ratio	Quick ratio	Quick ratio

Notes: 1. The Hausman test has  $\chi^2$  distribution and tests the null hypothesis that unobservable individual effects are not correlated with the explanatory variables, against the null hypothesis of correlation between unobservable individual effects and the explanatory variables. 2. The Wald test has  $\chi^2$  distribution and tests the null hypothesis of insignificance as a whole of the parameters of the explanatory variables, against the alternative hypothesis of significance as a whole of the parameters of the explanatory variables. 3. The F test has normal distribution  $N(0,1)$  and tests the

null hypothesis of insignificance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters. 4. \*\*\*, \*\*, and \*denote significance at 1, 5 and 10 % level of significance respectively. 5. FE, RE denotes fixed effect and random effect respectively.

From analysis of the results of the Wald and F tests, we can conclude that we cannot reject the null hypothesis that the explanatory variables do not explain, taken as a whole, the explained variable, and so the determinants selected in this study can be considered explanatory for both the model.

The results of the Hausman test show that we cannot reject the null hypothesis of absence of correlation between firms' unobservable individual effects and debt determinants. Therefore, we can conclude that the most appropriate way to carry out evaluation of the relationship between debt and its determinants is evaluation of a fixed effects panel model. So the study will interpret the result based on the fixed effect model in both the model.

Receivable days (ARDAYS) and current assets to total assets (CATA) are positively significant at 1 percent in both the model. However payable days (APDAYS), trade debtors to current assets (SDCA) and sales to total assets (SATA) are negatively significant at 1 percent, 5 percent and 1 percent respectively for model 3, and 5 percent 1 percent, 1 percent respectively in case of model 4. Size (SIZE), inventory turnover (INVTURN) and operating profit margin (OPEM) not showing any kind of significance for model 3. But in case of model 4 all these variables are positively determine the liquidity at 10 percent, 1 percent and 1 percent respectively. Current liability to total assets (CLTA) is negatively significant at 1 percent in case of model three and it is not showing any kind of significance for model 4.

### Quantile Regression

First, we present descriptive statistics of our all variables analyzed in Table 4

	<b>Mean</b>	<b>Median</b>	<b>Std. Dev.</b>	<b>Skewness</b>	<b>Kurtosis</b>	<b>Jarque-Bera</b>	<b>Probability</b>	<b>Observations</b>
CR	1.66	1.40	1.09	4.35	37.26	114016.50	0.00	2190
QR	0.91	0.71	0.89	5.28	53.86	246242.40	0.00	2190
ARDAYS	119.63	81.25	189.79	11.36	203.02	3697717.00	0.00	2190
APDAYS	54.06	44.55	50.36	11.86	311.11	8714126.00	0.00	2190
SIZE	6.95	6.88	1.55	0.26	4.24	164.33	0.00	2190
INVTURN	13.05	7.30	45.00	20.76	572.23	29724637.00	0.00	2190

SATA	1.01	0.87	0.72	2.41	14.97	15200.36	0.00	2190
CATA	0.49	0.48	0.22	0.18	2.17	75.12	0.00	2190
CLTA	0.28	0.24	0.17	0.92	3.44	326.97	0.00	2190
OPEM	0.24	0.15	0.62	14.20	255.57	5894525.00	0.00	2190
SDCA	0.46	0.46	0.19	0.10	2.63	16.83	0.00	2190

Source: author's calculation

Table 4 shows one measures of tails i.e., the kurtosis among other descriptive statistics. It is well known that whenever this quantity exceeds 3, we say that the data feature excess kurtosis, or that their distribution is leptokurtic, that is, it has heavy tails. It is evident from Table 1 that except for CATA, CLTA and SDCA distribution of all variables is leptokurtic. This shows that data is not normal which is also proved with the JB test statistic. JB test statistics shows, in particular, that no variables follow feature of normality. Therefore, estimation technique (like OLS) based linear Gaussian models will be biased hence, use of quantile regression estimation is more appropriate. Therefore, the study applied quantile regression estimation technique and report result of quantiles  $\theta \in \{0.05, 0.25, 0.50, 0.75, 0.95\}$  in Table 5 below

variable/Quantile	0.05	0.25	0.50	0.75	0.95
ARDAYS	-.0000148 (.0001336)	.0000458 (.000141)	.0006652* (.0004027)	.0024982*** (.0009622)	.0064441*** (.0009615)
APDAYS	-.0003102 (.0002405)	- .0008817*** (.000244)	-.0009839* (.000502)	-.0055724 *** (.0017402)	-.0106295** (.0042633)
SIZE	-.0116334* (.0065733)	-.0100971* (.0055473)	-.014754* (.0083752)	- .1070995*** (.0266563)	- .2496088*** (.0331077)
INVTURN	.0004743 (.0009316)	.0006844 (.0005639)	.0015268 ** (.0006534)	.0010218 (.0011177)	.0000451 (.0017497)
SATA	-.0200322 (.0227599)	-.0067823 (.0153479)	.0046304 (.0220382)	-.052079 (.0571485)	-.1080383 (.0694277)
CATA	1.284888*** (.0750841)	1.602161*** (.0804146)	1.709484*** (.137283)	1.104016*** (.4100967)	-.1620684 (.2606661)
OPEM	-.02974 (.0345951)	.0267738 (.059165 )	.0665217 (.1426374)	.7173953 (.4456597)	1.343607*** (.4033663)
SDCA	- .1734254*** (.0659588)	- .2134072*** (.0608423)	- .2768251*** (.0980112)	- .8202248*** (.2841327)	- 2.801899*** (.332155)
CLTA	- .7836924***	- 1.494018***	- 2.037849***	-1.064997 (.776718 )	-1.1649004** (.0709893)

	(.0911939)	(.1094826)	(.209865)		
constant	.7441981***	1.07581***	1.375898***	2.686525***	5.817202***
	(.0775229)	(.0776037)	(.0880631)	(.3909906)	(.4222078)
<b>Model summary</b>					
Pseudo R2	0.2463	0.1963	0.1605	0.1463	0.2447
Dependent variable : Current ratio(CR)					
Note: ***, **, and *denote significance at 1, 5 and 10 % level of significance respectively.					

Source: author's calculation

It is evident from Table 5 that receivable days(ARDBAYS) is not showing significance for 0.05<sup>th</sup> and 0.25<sup>th</sup> quantile but in case of 0.50<sup>th</sup>, 0.75<sup>th</sup> and 0.95<sup>th</sup> quantile it is positively significant at 10 percent, 1 percent and 1 percent respectively. Except the lowest quantile 0.05<sup>th</sup> payable days (APDBAYS) is showing a negative significant in all other quantiles as 1 percent, 10 percent, 1 percent and 5 percent respectively. Size of the firm (SIZE) is showing a negative significance irrespective of the quantile as 10 percent, 10 percent, 10 percent, 1 percent and 1 percent respectively. Inventory turnover (INVTURN) is showing a positive significance at 5 percent only in case of median quantile (0.50) all other case it is not showing any kind of significance. Sales to total assets (SATA) is not showing any kind of significance irrespective of the quantile. Except the highest quantile 0.95<sup>th</sup> in all other case current assets to total assets (CATA) is positively significant at 1 percent. Operating profit margin (OPEM) is positively significant at 1 percent only in the highest quantile 0.95<sup>th</sup> all other case it is not showing significance. Trade debtors to current assets (SDCA) are negatively significant at 1 percent irrespective of the quantiles. Constant is positively significant at 1 percent irrespective of the quantiles.

variable/Quantile	0.05	0.25	0.50	0.75	0.95
ARDBAYS	.0001704** (.000082)	.0000507 (.0001502)	.0002138 (.0001957)	.001535*** (.0005653)	.0050529*** (.0008062)
APDBAYS	-.0001728 (.0001936)	- .0006685*** (.0002424)	-.0009442** (.0004246)	-.003045*** (.0008896)	-.001586 (.0024815)
SIZE	-.0082464** (.0038967)	.0019985 (.0047509)	-.009198 (.0077416)	-.0125959 (.0155781)	.0506542 (.0575565)
INVTURN	-.0002293 (.0003509)	-.0000676 (.0007831)	.0019822 (.0014558)	.0032103** (.0015054)	.002015 (.0029973)
SATA	.0486478*** (.0108099)	.0227531* (.0124971)	-.0061727 (.0186605)	- .0776478*** (.029639)	- .2121861*** (.0576296)
CATA	.270684*** (.0517543)	.5389883*** (.0660343)	.5342399*** (.1249824)	.449313** (.1766196)	.2226931 (.2812334)

OPEM	.0649691* (.0366213)	.1630878*** (.0405958)	.2647922*** (.0667938)	.1387364*** (.1749885)	1.296822* (.6808432)
SDCA	.3295429*** (.0533951)	.6128637*** (.044715)	.4985588*** (.0661216)	-.2017263 (.1540333)	- 1.510364*** (.3855738)
CLTA	-.0894916 (.0565402)	- .2570917*** (.0872533)	-.3542804* (.1959924)	-.0890996 (238902)	- .2188621*** (.0735277)
constant	.0023406** (.0437993)	-.0165878 (.0475904)	.3377901*** (.0888365)	1.055545*** (.1523291)	1.925666*** (.5318802)
<b>Model summary</b>					
Pseudo R2	0.0564	0.0836	0.0622	0.0671	0.1707
Dependent variable : Quick ratio (LQ)					
Note: ***, **, and *denote significance at 1, 5 and 10 % level of significance respectively.					

Table 6 shows the result of quantile regression based on the Quick ratio taken as dependent variable. Receivable days (ARDAYS) are positively significant at 5 percent for the lowest quantile 0.05<sup>th</sup>, 0.25<sup>th</sup> and 0.50 it is not showing significance and in case of 0.75<sup>th</sup> and 0.95<sup>th</sup> it is positively significant at 1 percent. In case of payable days (APDAYS) the lowest quantile 0.05<sup>th</sup> and the highest quantile 0.95<sup>th</sup> are not significant. All other case i.e., 0.25<sup>th</sup>, 0.50<sup>th</sup> and 0.75<sup>th</sup> it is negatively significant at 1 percent, 5 percent and 10 percent respectively. However size of the firm (SIZE) is negatively significant at 5 percent only for the lowest quantile all other case it is not showing any kind of significance. Inventory turnover (INVTURN) is not showing significance except the 0.75<sup>th</sup> quantile, for this quantile it is positively significant at 5 percent. Sales to total assets (SATA) are positively significant at 1 percent and 10 percent 0.05<sup>th</sup> and 0.25<sup>th</sup> quantiles. 0.50<sup>th</sup> quantile is not showing significance and in case of 0.75<sup>th</sup> and 0.95<sup>th</sup> quantile is negatively is significant at 1 percent. Except for the highest quantile 0.95<sup>th</sup> current assets to total assets (CATA) is positively significant at 1 percent, 1 percent, 1 percent and 5 percent respectively. Operating profit margin (OPEM) is the only one variable showing positive significance irrespective of the quantiles as 10 percent, 1 percent, 1 percent, 1 percent and 10 percent. Trade debtors to current assets (SDCA) are positively significant at 1 percent for 0.05<sup>th</sup>, 0.25<sup>th</sup> and 0.50<sup>th</sup> quantile. 0.75<sup>th</sup> quantile is not showing significance. And for the highest quantile 0.95<sup>th</sup> it is negatively significant at 1 percent. Current assets to total assets (CLTA) is negatively significant for 0.25<sup>th</sup>, 0.50 and 0.95<sup>th</sup> quantile at 1 percent, 10 percent and 1 percent respectively. In case of constant except 0.25<sup>th</sup> quantile in all other case it is positively significant at 1 percent.

## CONCLUSION

The study was intended to identify the determinants of liquidity for Indian firms using a panel framework. The study has taken current ratio as well as quick ratio as dependent variable for checking the sensitivity of the ratios. For the analysis, we have taken 219 firms (from the BSE 500 firms based on the availability of data) during the period 2001-2010, comprising of a panel model with fixed and random effects. However, most of the variables show skewed

distribution and therefore, we relied upon quantile regression analysis as an appropriate tool and quantiles used for our case are  $\theta \in \{0.05, 0.25, 0.50, 0.75, 0.95\}$ .

We found that the Fixed and random effect model are not found to performing well. The overall study find that Receivable days are positively determine the liquidity in case of upper quantiles (0.75<sup>th</sup>, 0.95<sup>th</sup>). However the payable days are negatively determining the liquidity for the lower quarter to upper quarter quantiles (0.25<sup>th</sup>- 0.75<sup>th</sup>). Size of the firm is negatively determining the liquidity only for the lowest quantile (0.05<sup>th</sup>). Inventory turnover does not have any impact on determining the liquidity. In case of sales to total assets we are unable to draw any kind of conclusion because of un-common result in both the model. Current assets to total assets are positively determining the liquidity except the upper quantile (0.95<sup>th</sup>). Operating profit margin is positively determining the liquidity in upper quantile (0.95<sup>th</sup>). Trade debtors to current assets negatively determine the liquidity in upper quantiles (0.75<sup>th</sup>, 0.75<sup>th</sup>). And in case of lower quantile it is showing significance in opposite signs. Current liability to total assets negatively determines the liquidity in case of 0.25<sup>th</sup>, 0.50<sup>th</sup> and 0.95<sup>th</sup> quantile.

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