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Corporate liquidity and firm value: evidence from China's listed firms

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ABSTRACT: The value of liquidity is a promising area for research. This paper analyzes the correlation between corporate liquidity and firm value by using evidence from China's listed firms. This paper also investigates the relation among corporate liquidity, R&D and firm size. The authors find that firm's sufficient liquidity can increase its market value. However, corporate liquidity has insignificant effect on firm's R&D. What's more, the authors further find that corporate liquidity also has diseconomies of scale. Excess corporate liquidity may adversely affect market value of large firms.

Keywords: liquidity; firm value; R&D; firm size

1 INTRODUCTION

Prior research suggests an association among firm size, firm value and liquidity risk premium (Banz, 1981; Amihud and Mendelson, 1986). This means that, not only market risk, but firm size, corporate liquidity and innovation ability can influence firm's market value (Jonathan, 2003).

Theoretically speaking, firm's liquidity can affect its decision making. For example, by holding financial flexibility, a firm can keep its normal operation and R&D input, and thus raises its market value. However, research focusing corporate liquidity and R&D has just been developed recently. In addition, the liquidity management classified by firm size needs to be further studied.

Thus, taking China's listed firms as sample, this paper analyzes the correlation between corporate liquidity and R&D. This paper also tests the liquidity management under different firm sizes.

2 HYPOTHESIS DEVELOPMENT

Holmstrom and Triole (2000) find that firms can reduce potential risk and increase firm value by holding appropriate level of liquidity. Guth (1990) suggests that firms can raise their competitiveness as well as firm value through R&D. Bosworth and Rogers (2001) further report that firm's intellectual property has significant influence on its firm value. This leads to our first and second hypothesis:

Hypothesis 1: *Sufficient liquidity helps firm operation and increase firm value.*

Hypothesis 2: R&D increases firm's competitiveness and firm value.

Brown and Peterson (2011) suggest that firms taking innovation usually suffer higher uncertainty and risk. But liquidity management provides financial flexibility to reduce this risk. Jonathan (2003) reports an association between corporate liquidity and innovation behavior. As a result, it is expected that sufficient corporate liquidity can provide R&D incentive and insurance. And the third hypothesis is as follows:

Hypothesis 3: With sufficient corporate liquidity, R&D can be better to increase firm value.

Firm size is an important determinant of firm value. The economy of scale predicts that larger firms have lower costs and higher competition position. In adverse, many literatures argue that larger firms have lower stock return (Banz, 1981; Reinganum, 1981; Donald B.keim, 1983). Thus, it leads to the final hypothesis:

Hypothesis 4: The correlation between firm size and firm value is negative.

However, it is unclear whether firms with different size will adopt different liquidity management. T Opler, L Pinkowitz, R Stulz and R Williamson (1999)

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Table 1. Variables definition

Denote	Variable	Definition
TQ	Tobin's q	(Equity Market Value + Liabilities Market Value) / Total Asset
R&D	R&D	Net Change of Intangible Assets / Total Assets
Liquidity	Cash Ratio	Cash / Total Asset
ROE	ROE	Net Income / Shareholder Equity
GROW	Growth	Current Period Shareholder Equity / Previous Period Shareholder Equity
LEV	Capital Structure	Total Liabilities / Shareholder Equity
SIZE	Firm Size	ln (Total Asset)
HHI	Industry Concentration	HHI=Σ $(Xi/X)^2$, Xi is revenue of Firm i

Table 2. Correlation coefficient

	TQ	R&D	Liquidity	ROE	GROW	LEV	SIZE	HHI
TQ	1	0.035	0.359**	0.153**	-0.017	0.040	-0.495**	-0.134**
R&D		1	-0.137**	-0.051*	-0.005	0.026	-0.093**	-0.002
Liquidity			1	0.119**	-0.040	-0.063*	-0.249**	-0.082**
ROE				1	0.051*	-0.425**	0.052*	0.024
GROW					1	0.005	0.028	0.069**
LEV						1	0.049	0.006
SIZE							1	0.085**
HHI								1

Notes: The values in parentheses are standard deviations. Two-tailed significance levels are denoted by *** 1%, ** 5%and* 10%.

predict that large firms keep lower level of liquidity because they can finance with lower cost. Rajan and Zingales (1995) and Kim and Sherman (1998) also report that small firms face less preferred finance costs and financial constraint. The final hypothesis is as follows:

Hypothesis 5: Large firms tend to hold lower level of liquidity.

3 EMPIRICAL DESIGN

We choose *Tobin's q* (TQ) as proxy variable of firm value, and *Cash Ratio* (Liquidity) as proxy variable of corporate liquidity. We choose *Profitability* (ROE), *Firm Size* (SIZE), *Growth* (GROW), *Capital Structure* (LEV) and *Industry Concentration* (HHI) as control variables (Bosworth and Rogers, 2001; A Dittmar and J Mahrt-Smith, 2005; Wolfgang Drobetz and Grüninger, 2007). Table 1 shows the definition of chosen variables.

In order to test HYPOTHESIS 1 and HYPOTHESIS 2, we estimate following model:

$$TQ_t = \beta_0 + \beta_1 \text{Liquidity}_t + \beta_2 R\&D_t + \beta_3 SIZE_t + + \beta_4 GROW_t + \beta_5 LEV_t + \beta_6 ROE_t + \beta_7 HHI_t + \varepsilon \quad (1)$$

In order to test HYPOTHESIS 3, we add *Liquidity*, *R&D* and their cross term into Model (2):

$$TQ_t = \beta_0 + \beta_1 \text{Liquidity}_t + \beta_2 R\&D_t + \beta_3 \text{Liquidity}_t \cdot R\&D_t + + \beta_4 GROW_t + \beta_5 LEV_t + \beta_6 ROE_t + \beta_7 HHI_t + \varepsilon \quad (2)$$

We include *SIZE* to test HYPOTHESIS 4. We also include the cross term of *SIZE* and *Liquidity* to test HYPOTHESIS 5:

$$TQ_t = \beta_0 + \beta_1 \text{Liquidity}_t + \beta_2 SIZE_t + \beta_3 \text{Liquidity}_t \cdot SIZE_t + + \beta_4 GROW_t + \beta_5 LEV_t + \beta_6 ROE_t + \beta_7 HHI_t + \varepsilon \quad (3)$$

We select China's listed firms as sample and use period of Year 2013. We exclude: (1) samples with incomplete data; (2) samples in financial sector (because these adopt a different accounting standard); (3) samples with B Share or H Share (because these face different regulations); (4) samples in Special Treatment or Particular Transfer (because these face different regulations). Finally we get 1517 valid observations. The data source is CSMAR. We use STATA 12.0 to run all the tests.

4 EMPIRICAL RESULTS

We first screen the problem of multicollinearity. And we adopt Pearson test because the sample is random and continuous. Table 2 reports the correlation coefficient between variables. *TQ* is significantly positive correlated with *Liquidity*, and it is significantly negative correlated with *SIZE*. This result verifies HYPOTHESIS 1 and HYPOTHESIS 4. Although TQ and R&D are positive correlated, the correlation is insignificant, which needs further studied. The correlation between other variables is reasonable. For example, TQ and ROE is significantly positive correlated, which shows that firm with higher ROE has higher market value. Although the correlation coefficients

Table 3. Regressions

	Dependent Variable: TQ					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	15.877***	0.892***	0.905***	16.101***	10.616***	10.170***
	(0.732)	(0.109)	(0.130)	(0.717)	(1.146)	(1.168)
Liquidity	0.030***	0.046***	0.045***	0.030***	0.331***	0.345***
	(0.003)	(0.003)	(0.005)	(0.003)	(0.050)	(0.051)
R&D	0.015	0.040***	0.037*			0.032*
	(0.010)	(0.011)	(0.020)			(0.018)
R&D* Liquidity			1.881E-4			-9.958E-4
			(0.001)			(0.001)
SIZE	-0.0672***			-0.679***	-0.427***	-0.413***
	(0.033)			(0.032)	(0.052)	(0.053)
Liquidity*SIZE					-0.014***	-0.014***
					(0.002)	(0.002)
GROW	9.463E-8	-5.008E-7	-5.027E-7	5.253E-8	-8.872E-7	-8.597E-7
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LEV	0.057***	0.044***	0.044***	0.057***	0.055***	0.055***
	(0.008)	(0.009)	(0.009)	(0.08)	(0.007)	(0.007)
ROE	0.023***	0.018***	0.018***	0.023***	0.024***	0.024***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
HHI	-2.013***	-2.654***	-2.651***	-2.016***	-1.739***	-1.746***
	(0.502)	(0.567)	(0.568)	(0.502)	(0.498)	(0.498)
R^2	0.358	0.176	0.176	0.357	0.372	0.374
Adj-R^2	0.355	0.173	0.172	0.354	0.369	0.370
F-Value	199.991***	53.731***	46.030***	139.480***	127.723***	99.892***
Obs	1517	1517	1517	1517	1517	1517

Notes: The values in parentheses are standard deviations. Two-tailed significance levels are denoted by *** 1%, ** 5%and* 10%.

between independent variables are significant, the variance inflation factor (VIF) stays close to 1. Therefore, there is no significant multicollinearity.

In Model 1, the coefficient of *Liquidity* is significantly positive. This suggests that higher level of liquidity increases firm value, which verifies HYPOTHESIS 1. And the coefficient of *R&D* is insignificantly positive, which suggests that R&D does not significantly increase firm value. The cause is complicated. The coefficient of *SIZE* is significantly negative, which means that firm does not benefit from expanding, verifying HYPOTHESIS 4. A possible explanation is that China's firms have expanded excessively and have reached the level of diseconomies of scale.

In Model 2, we particularly test the effect of R&D. The coefficient of *R&D* is significantly positive in absence of *SIZE*. This is indicated by HYPOTHESIS 2. A possible explanation is that R&D can increase firm value from a broader view.

In Model 3, the coefficient of cross term of *R&D* and *Liquidity* is insignificant. On one hand, this may be caused by the accounting treatment of R&D Capitalization or expensed. On the other hand, this may come from the time lagging effect of R&D. In particular, the Adj-R^2 lowers when taking out *SIZE*. It is indicated that the model may not be appropriate by missing some important factors. And it needs to be further studied.

In Model 4, the coefficient of SIZE is significantly negative. This means that there is negative correlation between firm size and firm value, which verifies HYPOTHESIS 4.

In Model 5, the *SIZE* and the *SIZE*Liquidity* are both significantly negative. This means that larger firms tend to hold lower level of liquidity, which verifies HYPOTHESIS 5.

5 CONCLUSIONS

By using evidence from China's listed firms, this paper tests the association among corporate liquidity, R&D, firm size and firm value. The empirical results suggest that R&D can increase firm value. However, empirical results do not indicate that corporate liquidity can help boost R&D. The possible explanation is that R&D has time lagging effect, and further research is needed. The empirical results also report the negative correlation between firm size and firm value, as well as the negative correlation between firm size and corporate liquidity. Large firms emphasize on opportunity cost of cash holding, while small firms hold more liquidity to smooth risk. Thus, different firms need different liquidity management strategy.

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