國立臺灣大學社會科學院經濟學系

博士論文

Department of Economics
College of Social Sciences
National Taiwan University

Doctoral Dissertation

公司股票流動性的暫時性變動、發債或發股的選擇與債務契約的研究

Essays on Transitory Liquidity, Debt-Equity Choices, and Debt Covenants

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中華民國105年1月

January, 2016

謝辭

在有限的時間與能力下，這本論文得以完成確實要感謝相當多人的幫忙。

最感謝的莫過於指導教授吳儀玲老師，在寫作過程中用心的指導，並細心地指出論文寫作所可能犯的錯誤。而在這本論文的研究方法與發展方向上，還邀請了林基財老師一同參與討論，讓我獲益良多，除了獲得很多寶貴的意見外，還從這些經驗中逐步去摸索並學習如何發展一個研究議題的能力。

同時，也要感謝口試委員們王泓仁老師、陳業寧老師、陳聖賢老師與胡星陽老師百忙之中前來擔任考試委員、抽空閱讀這本論文，指出文句與敘述上的錯誤，並針對每一篇文章都提出還可以再加以補強的地方，讓我了解到自己能力的不足以及在學術研究上還有待精進的空間。也要特別感謝前來參加個體研討會的黃景沂老師與王道一老師，針對那時還未成熟的債務契約這篇研究，提出相當多可以改善的寶貴意見，並指出口頭報告上可以加以注意的地方。也要感謝系辦楊禮禎助教給予我在處理行政事務上相當多的提醒與協助。

最後，要感謝我的家人與朋友們，在就讀期間所給予我的支持與陪伴。

Chinese Abstract (中文摘要)

本論文由三篇探討財務經濟學股票流動性、公司資本結構與債務契約的實證研究所組成。第一篇提出「股票流動性的暫時性變動」這個擇時指標，並討論其對於公司資金成本以及發債或發股選擇的影響；第二篇則是就訊息會隨著股票流動性從股票市場傳到債券市場的現象來討論這會對公司資本結構、公司發債或發股選擇造成的影響；第三篇以槓桿收購為目的的授信來討論公司債務契約的外部性。

第一章

Transitory Liquidity, Market Timing, and Debt-Equity Choices

我們的研究提出「股票流動性的暫時性變動」這個擇時指標，發現到暫時性的股票流動性增加會是公司發股的最佳時機。不同於 Bali, Peng, Shen, and Tang (2014)所定義的股票流動性衝擊，我們是以 Amihud (2002)所提出衡量股票不流動性的指標減去其長期平均、再取負值的方式，來定義「股票流動性的暫時性變動」。並且，即便與先前文獻所提出的各個進出市場指標作比較，我們認為「股票流動性的暫時性變動」是個能夠決定公司是否應適時進出市場的最佳指標。

第二章

Stock Liquidity, Debt Capacity, and Debt-Equity Choices

除了以股籌資的成本較低外，流動性較佳的公司也可能因為要保留將來以債來籌資的發債能力而發股。所以，在這篇文章裡，我們強調公司的發債能力進而發現到這個訊息是會隨著股票流動性從股票市場傳到債券市場。其他公司會因為標準普爾 500 指數其成分股 – 亦即各個產業領導者的股票流動性較佳而有較高的發債成本。這一方面指出領導者的股票流動性可以用來衡量各個公司的發債成本，也間接證實了股票流動性與公司發債能力的關係。我們更進一步指出，公司會以領導者的發債能力作為基準來決定發債或發股，這使得那些與領導者股票流動性相近的公司會因為保留發債能力而傾向於以股來籌資並有較好的表現。

第三章

The Externality of Debt Covenants: LBO loans

在進行槓桿收購交易公司發生債務契約違約與財務限制緩衝減少的情況下，我們的研究發現到同產業的其他公司反而能夠利用這些機會去增加舉債。這證實了債務契約的外部效果，確實會影響到其他公司以債籌資的行為。並且，特別是那些公司擁有與槓桿收購交易相同的貸款者，他們會因為來自於銀行的監督而增加發債與槓桿比。此外，我們還進一步發現到投機等級的信用評等、高收益價格比以及低市值帳面比等這些風險較高的公司會明顯地有增加舉債的行為。雖然這說明了銀行監督的需要，但是卻也因為貸款者與同產業其他公司間的道德風險問題，那些風險較低的公司反而會因為銀行監督有較低的市占率。

關鍵詞：股票流動性的暫時性變動、公司進出市場的時機、訊息外溢效果、發債或發股的選擇、槓桿收購、債務契約、外部性

Abstract

This dissertation includes three empirical researches on the issues of financial economics: stock liquidity, capital structure, and debt covenants. The first paper focuses on transitory liquidity and examines it as well-performing market-timing indicator on cost of capital and debt-equity choices. The second paper discusses the possible effects of the information spillover from equity market to debt market through stock liquidity on firms' debt-equity choices. The third paper analyzes external effect from debt covenant of leveraged buyout (LBO) borrowers on industry incumbents.

Chapter 1

Transitory Liquidity, Market Timing, and Debt-Equity Choices

We find strong evidence that firms can realize the time of lower cost of equity capital from temporary liquidity changes. Unlike Bali, Peng, Shen, and Tang's (2014) liquidity shock, a firm's transitory liquidity computed as the negative difference of log Amihud's (2002) illiquidity measure and its long-run mean is informative about its time-varying cost of equity capital and its debt-equity choice. Further, even in the presence of the previously identified firm-condition market-timing indicators, our findings show that transitory liquidity also is a well-performing market-timing indicator. Thus, a simple market-timing debt-equity choice depicted by transitory liquidity can have substantial explanatory power.

Chapter 2

Stock Liquidity, Debt Capacity, and Debt-Equity Choices

We emphasize that debt capacity concerns as the information spillover from equity market to debt market through stock liquidity. By showing that liquidity of S&P 500 firms, also called as leaders, in the same industry has a significant negative effect on net debt issuance, we find that leaders' liquidity can be used as a measure of the cost of issuing debt and that information spillover is the reason which makes stock liquidity also relevant to net debt issuance. Further, preserving debt capacity makes liquid firms prefer equity financing and get better performance by taking leaders' unused debt capacity as benchmark.

Chapter 3

The Externality of Debt Covenants: LBO loans

We discuss whether and how LBO borrowers' technical default and tight financial covenants can be the opportunities for industry incumbents to raise their debt capital. Incumbents, especially for those with more LBO bank loan lenders, are found to issue more debt and have higher book leverage either when LBO borrowers are in technical violation of financial covenants or when LBO borrowers have increasing covenant pressure in one year after the loan agreements. Further, because of moral hazard problem between creditors and incumbents, those incumbents with high risk can otherwise take the opportunity to issue debt and have greater market share.

Keywords: Transitory liquidity, market timing, information spillover, debt capacity concerns, leveraged buyout, debt covenants, externality

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Chapter 1

Transitory Liquidity, Market Timing, and Debt-Equity Choices

1.1. Introduction

Issuing firms have to spend higher issuance cost for compensating the higher risks that equity investors bear. Since buying and selling shares of liquid firms can have lower transaction cost, it is reasonable to expect liquid firms to have lower cost of equity capital. Though previous studies indicate the important role of liquidity in equity issuance (e.g., Baker and Stein (2004), Eckbo and Norli (2005), Lin and Wu (2013) and Stulz, Vagias, and van Dijk (2014)), whether and how the informativeness of time-varying lower cost of equity capital can be emanated from liquidity is yet examined.

According to O'Hara (2003), uninformed investors observe public information while informed investors observe public information and have an access to private information. Since more uninformed investors allow market makers to provide liquidity at lower costs, stock liquidity is largely determined by uninformed investors. As business conditions improve, uninformed investors could become less averse to investing in the equity market and demand a lower risk premium, particularly on firms that have been doing well. This influx of uninformed investors improves the firms' stock liquidity and lowers liquidity premium, and provides the firms a window of opportunity for equity issuance because at which time the costs of issuing new equity would be relatively low.[1] Conversely, liquidity deterioration may occur when uninformed investors find the firms unattractive. This could happen after a series of negative valuation shocks, which make uninformed investors to realize the heightened-level of risk. To the extent that the withdrawal of uninformed investors leads to undervaluation, some firms may conduct share buybacks to counter undervaluation.[2]

[1] This argument is in line with Korajczyk, Lucas, and McDonald (1991), and Korajczyk, Lucas, and McDonald (1992), who suggest that firms tend to issue equity following the disclosures of good news at which time the adverse selection cost could be temporarily reduced.

[2] Indeed, Brockman, Khurana, and Martin (2008) show that the frequency and magnitude of bad news announcements increase prior to repurchasing shares.

Thus, rather than liquidity itself, gradual changes in liquidity may better inform the timing of lower cost of equity capital.

In this study, we intend to investigate whether temporary liquidity improvement and temporary liquidity deterioration contain information related with cost of equity capital through which firms can take advantage of issuing new equity and buying shares back, respectively. The liquidity shock defined by Bali, Peng, Shen, and Tang (2014) seems to be a good candidate for measuring temporary changes in liquidity. In addition to liquidity shock, we also propose transitory liquidity defined as the tendency to overshoot in liquidity. By using three years as long-run period, we measure transitory changes in liquidity also called as transitory liquidity by subtracting each firm's log illiquidity measure from its three-year average of log illiquidity measures. We then use these two candidate variables to investigate whether temporary liquidity changes can be able to inform firms the time of lower cost of equity capital.

Our findings provide strong evidence that transitory liquidity is informative about a firm's time-varying cost of equity capital and its debt-equity choice. To test whether transitory liquidity is a useful and powerful market-timing indicator, we compare our transitory liquidity measure with the previously proposed market-timing indicators through which firms particularly consider high equity valuation important when timing the equity market. Nevertheless, our findings show that transitory liquidity indeed has useful market-timing information not contained in the previously proposed market-timing indicators and performs better than other market-timing indicators.

The remainder of the paper is organized as follows. Section 2 describes our data and variable constructions. Section 3 investigates whether temporary liquidity changes can be able to inform firms the timing of lower cost of equity capital. Section 4 employs debt-equity choices to discuss firms' behaviors of timing the equity market. Section 5 makes comparison with the previously identified market-timing variables. Section 6 examines whether transitory

liquidity's market-timing property is able to change firms' decisions to issue debt. Finally, Section 7 offers our concluding remarks.

1.2. Data and variable construction

Our sample construction is begun by including all common stocks listed on the NYSE/AMEX and NASDAQ exchange markets, covering the period from 1990 through 2010.

1.2.1. Measures of temporary liquidity changes

We measure a firm's liquidity of equity by using daily return data from CRSP. Following Bali, Peng, Shen, and Tang (2014), we mainly use Amihud's (2002) illiquidity ratio in analysis. Because Gopalan, Kadan, and Pevzner (2012) show that the Amihud (2002) measure is highly skewed, the square-root version of the Amihud (2002) measure ($\times 10^3$) for stock *i* during the period *t* is employed by computing as:[3]

$$Illiquidity_{i,t} = 10^3 \times \frac{1}{D}\sum_{d=1}^{D}\sqrt{\frac{abs(R_{i,d})}{VOL_{i,d}}}\ , \qquad (1.1)$$

$R_{i,d}$ and $VOL_{i,d}$ are the stock return of firm *i* on day *d* and its dollar trading volume on day *d*, respectively; and *D* is the number of positive-volume days for firm *i* during the period *t*.

Our first candidate variable for temporary changes in liquidity is Bali, Peng, Shen, and Tang's (2014) liquidity shock. The liquidity shock at *t* is the negative difference between the Amihud's (2002) illiquidity ratio at *t* and the past 12-month average of illiquidity. According to this definition, positive liquidity shock means firms experiencing liquidity increases.

In addition, we propose transitory liquidity as the second candidate variable. The log illiquidity measure in Eq. (1.1) is decomposed by the demeaned method. By defining three-year as long-run period, we then use each firm's long-run average of log illiquidity measures minus its log illiquidity measure as transitory liquidity. Positive value of transitory liquidity means that firms have temporary liquidity improvement.

[3] Our results are not sensitive to whether we adopt the raw version or the square-root version of the Amihud (2002) measure.

1.2.2. Sample construction for estimating cost of equity capital

When estimating cost of equity capital, we use monthly stock return data from CRSP and require that stocks with the beginning-of-month prices should be between $5 and $1,000 and that a stock should have more than 200 trading days in the previous year. Each month, I use the available 60 return observations to do rolling estimation and obtain the estimated coefficients for each firm. To mainly focus on firms' external finance behavior, we exclude firms in financial and utility industries. Since Fama and French (1993) three-factor model performs well empirically, we then use it to estimate the cost of equity capital. The monthly data of risk-free rate, market factor (MKT), size factor (SMB), and B/M factor (HML) are from Ken French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/).

1.2.3. Sample construction for investigating debt-equity choices

Accounting variables are from COMPUSTAT industrial quarterly files. Our main dependent variable is identified by using net debt issuance and net equity issuance. We follow Hovakimian, Opler, and Titman (2001), Hovakimian (2006), and Leary and Roberts (2005) to measure net debt issuance as the ratio of change in total debt from quarter *t-1* to quarter *t* divided by book value of assets at *t-1* and net equity issuance as the ratio of change in book equity minus change in retained earnings divided by book value of assets at *t-1*. And, we use 5% cutoff to identify significant debt or equity issuance. The dependent variable for firm *i*'s debt-equity choice in quarter *t* is set to one if its net debt issuance is greater than 5%; and zero if its net equity issuance exceeds 5%. Those firm-quarter observations with mixed debt and equity issuances are excluded.

Our control variables are similar as the ones used in Kayhan and Titman (2007), Roberts and Sufi (2009), and Leary and Roberts (2005), including: *Book D/A*, *Market-to-book*, *Tangibility*, *Profitability*, *Selling expense*, *R&D expense*, *R&D dummy*, *Size*, *Log(1+Age)*, *Peer illiquidity*, *Peer Book D/A*. The definitions of all the variables are listed in 1.Appendix A1. In addition, we require that firms should have at least 50 trading days per quarter with an

average minimum stock price of \$5,[4] book leverage less than one, market-to-book ratios less than ten, and non-missing data for transitory changes in liquidity and for all of the control variables used in our regression analysis. We trim all continuous variables at the 1st and 99th percentiles and separately analyze NYSE/AMEX firms and NASDAQ firms.[5]

1.3. Informativeness of lower equity capital cost

We suggest that temporary changes in liquidity should be able to inform firms the timing of equity issuance. To estimate time-varying cost of equity capital, we use three-factor model in Fama and French (1993) and specify it as the following:

$$E(r_{i,t})=r_{f,t}+(\beta_{MKT,i}+\beta_{MKT,TEMP,i}TEMPLIQ_{i,t-1})[E(r_{m,t})-r_{f,t}]+(\beta_{SMB,i}+\beta_{SMB,TEMP,i}TEMPLIQ_{i,t-1})SMB_t+$$
$$(\beta_{HML,i}+\beta_{HML,TEMP,i}TEMPLIQ_{i,t-1})HML_t. \quad (1.2)$$

The asset pricing model with the excess return on the market ($E(r_{m,t})-r_{f,t}$) included is the basic capital asset pricing model (CAPM) which indicates that an asset can be more or less related to the market. In addition to the market factor, Fama and French (1993) include the two additional risk factors: size (SMB) and B/M (HML) factors. The estimated betas: $\beta_{MKT,i}$, $\beta_{SMB,i}$, and $\beta_{HML,i}$ also represent an asset's risks that investors have to bear. As shown in Eq. (2), we expand the three-factor model and allow the estimated betas to vary with its temporary liquidity changes. $TEMPLIQ_{i,t-1}$ is the temporary liquidity changes in the previous period. Thus, through $\beta_{MKT,TEMP,i}$, $\beta_{SMB,TEMP,i}$, and $\beta_{HML,TEMP,i}$, we are able to realize whether temporary changes in liquidity can inform firms the timing of lower cost of equity capital.

[4] This requirement is set to follow Amihud's (2002) suggestion. He requires that the end-of-year price must exceed \$5 and at least 200 daily trading volumes in the prior 12 months when using firm-year observations in estimation.

[5] Similar to Leary and Roberts (2010), we would like to mitigate the impacts of outliers and data errors.

Table 1.1
Temporary liquidity changes and estimated betas

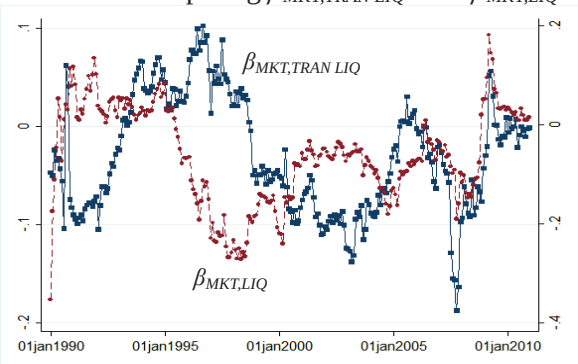
This table presents the mean value of estimated abnormal returns and betas using Fama-French three factor model. We require that stocks with the beginning-of-month prices should be between $5 and $1000 and that a stock should have more than 200 trading days in the previous year. Our sample periods cover from 1990 to 2010. For each month, each month should have at least 60 return observations for estimation. We then use the available 60 return observations to do rolling estimation and have the estimated coefficient for each firm each month. In Panel A, cross-sectional average of the estimated coefficients is reported. In Panel B, time-series average of the monthly estimated coefficients is reported. We first do monthly cross-sectional average of the estimated coefficients and then do the average of the monthly estimated coefficients over time. We multiply *MKT*, *SMB*, and *HML* with temporary changes in liquidity. There are two measurements for temporary liquidity changes: one is Bali, Peng, Shen, and Tang's (2014) liquidity shock and the other one is transitory liquidity. Following Bali, Peng, Shen, and Tang (2013), we measure liquidity shock in monthly frequency. It is the negative difference between the log illiquidity in month *t-1* and the mean of the log illiquidity from month *t-2* to month *t-13*. We also measure transitory liquidity in monthly frequency, which is the negative difference between the log illiquidity in month *t-1* and the mean of the log illiquidity in the previous 36 months. Those results are marked in gray shading. In addition, we also include liquidity as the negative value of the log illiquidity in month *t-1* and long-run liquidity as the negative value of the mean of the log illiquidity in the previous 36 months for comparison. Because quarterly frequency of accounting variables is available from COMPUSTAT, we also have quarterly transitory liquidity which is the negative difference between the log illiquidity in quarter *t-1* and the mean of the log illiquidity in the previous 12 quarters. We keep firms with positive adjusted R^2 and test the hypothesis that the mean value is zero. Because portfolios used to form *MKT* include all NYSE/AMEX and NASDAQ firms, we hence do not separate firms based on their listed markets and use all the sample firms to report results in this table. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Freq	α_0	$\beta_{MKT,0}$	$\beta_{MKT,\ LIQU}$	$\beta_{MKT,}$ *TRAN LIQ*	$\beta_{MKT,}$ *LIQ*	$\beta_{MKT,}$ *LR LIQ*	$\beta_{SMB,0}$	$\beta_{SMB,\ LIQU}$	$\beta_{SMB,}$ *TRAN LIQ*	$\beta_{SMB,}$ *LIQ*	$\beta_{SMB,}$ *LR LIQ*	$\beta_{HML,0}$	$\beta_{HML,\ LIQU}$	$\beta_{HML,}$ *TRAN LIQ*	$\beta_{HML,}$ *LIQ*	$\beta_{HML,}$ *LR LIQ*
Panel A: *FF3F* (cross-sectional average)	M	0.004***	1.141***	-0.020***				0.879***	-0.068***				0.092***	-0.019***			
		(90.238)	(619.327)	(-8.712)				(388.438)	(-21.604)				(30.926)	(-5.595)			
	M	0.005***	1.103***		-0.034***			0.862***		-0.077***			0.119***		-0.101***		
		(95.522)	(515.600)		(-16.221)			(312.634)		(-26.976)			(34.193)		(-32.893)		
	M	0.005***	1.624***			-0.075***		1.929***			-0.176***		0.965***			-0.177***	
		(91.279)	(141.929)			(-37.198)		(119.653)			(-64.453)		(57.035)			(-60.388)	
	M	0.005***	1.331***				-0.121***	1.280***				-0.118***	0.376***				-0.121***
		(91.613)	(57.431)				(-26.010)	(43.305)				(-19.666)	(10.242)				(-16.903)
	Q	0.005***	1.112***		-0.089***			0.867***		-0.157***			0.138***		-0.298***		
		(95.712)	(507.248)		(-18.008)			(313.527)		(-23.488)			(39.819)		(-39.846)		
Panel B: *FF3F* (time-series average)	M	0.004***	1.118***	-0.001				0.903***	-0.037***				0.010	0.006			
		(27.396)	(308.842)	(-0.368)				(132.051)	(-6.261)				(0.684)	(1.082)			
	M	0.004***	1.085***		-0.029***			0.817***		-0.035***			0.081***		-0.132***		
		(30.790)	(277.489)		(-7.714)			(67.205)		(-4.510)			(5.914)		(-12.741)		
	M	0.005***	1.562***			-0.061***		1.609***			-0.115***		0.693***			-0.141***	
		(26.011)	(52.195)			(-9.906)		(33.230)			(-12.650)		(15.177)			(-17.375)	
	M	0.004***	1.168***				-0.134***	1.194***				-0.077***	-0.063				0.046
		(23.705)	(16.536)				(-6.780)	(18.499)				(-3.719)	(-0.486)				(0.944)
	Q	0.005***	1.085***		-0.098***			0.834***		-0.075***			0.103***		-0.380***		
		(30.105)	(237.752)		(-8.199)			(75.950)		(-4.508)			(7.954)		(-13.161)		

The results of either using liquidity shock or using transitory liquidity as temporary liquidity changes are shown in Table 1.1. To make sure that a firm's excess returns across these periods can actually be explained by the included risk factors, we keep firms with positive adjusted R^2 after using the available 60 monthly return observations to do rolling estimation. Since we follow Bali, Peng, Shen, and Tang (2014) to have monthly frequency of liquidity shock measures, we first use liquidity shock in the previous month as temporary changes in liquidity. After that, transitory liquidity in month *t-1* is computed as the past 36-month average of log illiquidity measures minus log illiquidity at *t-1* and included as temporary liquidity changes. We also compute quarterly transitory liquidity because the quarterly frequency of accounting variables is available from COMPUSTAT. The transitory liquidity in quarter *t-1* is the past 12-quarter average of log illiquidity measures minus log illiquidity at *t-1*. In addition to transitory liquidity, we also include monthly frequency of liquidity as the negative value of the log illiquidity in month *t-1* and long-run liquidity as the negative value of the mean of the log illiquidity in the previous 36 months for comparison.

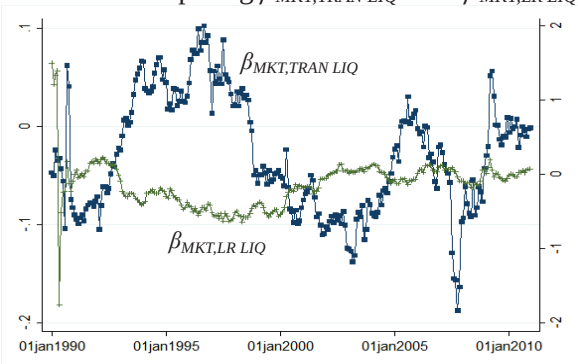
Panel A of Table 1.1 reports cross-sectional average of the estimated coefficients, showing that firms can recognize the timing of lower equity capital cost through temporary liquidity changes either measured by liquidity shocks or measured by transitory liquidity, liquidity or long-run liquidity in the previous periods. In Panel B of Table 1.1, we report the average of the monthly estimated coefficients over time. And, we can find that transitory liquidity, unlike liquidity shock, is more informative about the lower cost of equity capital. Comparing transitory liquidity with liquidity, we see that higher liquidity actually reduces the cost of equity capital. Comparing transitory liquidity with long-run liquidity, we do find that long-run liquidity, unlike transitory liquidity, may not be able to inform the timing of lower cost of equity capital.

Panel A-1: Comparing $\beta_{MKT,TRAN\ LIQ}$ with $\beta_{MKT,LIQ}$



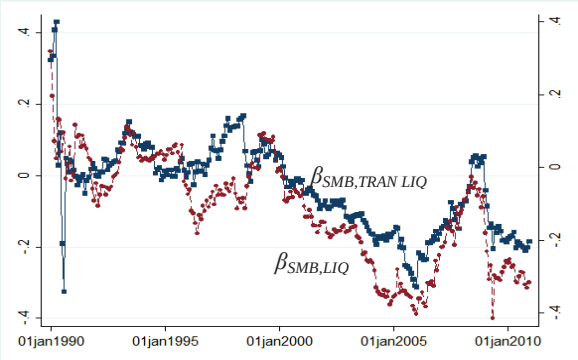
(The left axis: $\beta_{MKT,TRAN\ LIQ}$ and the right axis: $\beta_{MKT,LIQ}$)

Panel A-2: Comparing $\beta_{MKT,TRAN\ LIQ}$ with $\beta_{MKT,LR\ LIQ}$



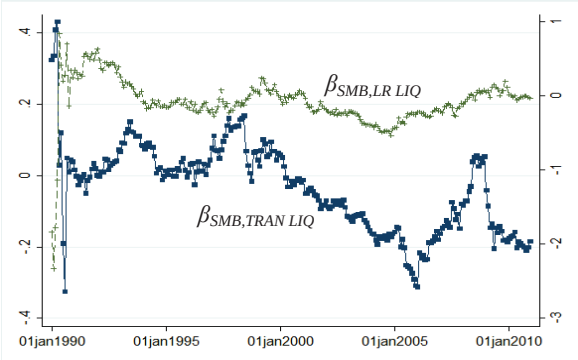
(The left axis: $\beta_{MKT,TRAN\ LIQ}$ and the right axis: $\beta_{MKT,LR\ LIQ}$)

Panel B-1: Comparing $\beta_{SMB,TRAN\ LIQ}$ with $\beta_{SMB,LIQ}$



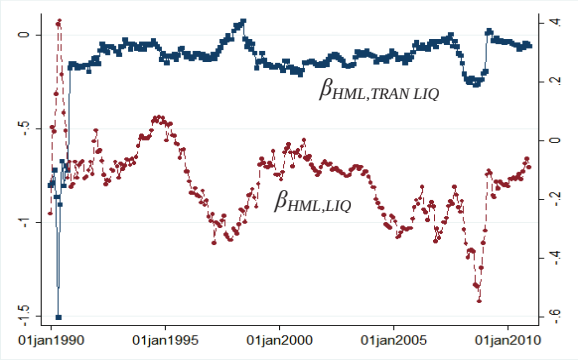
(The left axis: $\beta_{SMB,TRAN\ LIQ}$ and the right axis: $\beta_{SMB,LIQ}$)

Panel B-2: Comparing $\beta_{SMB,TRAN\ LIQ}$ with $\beta_{SMB,LR\ LIQ}$



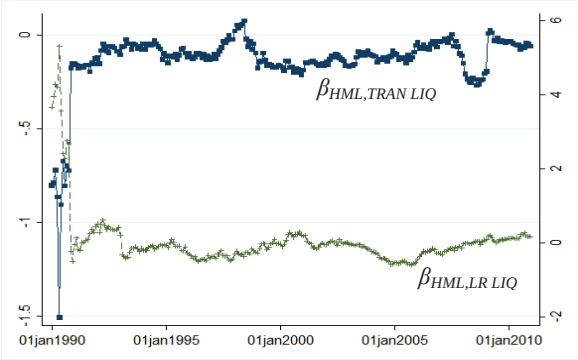
(The left axis: $\beta_{SMB,TRAN\ LIQ}$ and the right axis: $\beta_{SMB,LR\ LIQ}$)

Panel C-1: Comparing $\beta_{HML,TRAN\ LIQ}$ with $\beta_{HML,LIQ}$



(The left axis: $\beta_{HML,TRAN\ LIQ}$ and the right axis: $\beta_{HML,LIQ}$)

Panel C-2: Comparing $\beta_{HML,TRAN\ LIQ}$ with $\beta_{HML,LR\ LIQ}$



(The left axis: $\beta_{HML,TRAN\ LIQ}$ and the right axis: $\beta_{HML,LR\ LIQ}$)

Figure 1.1

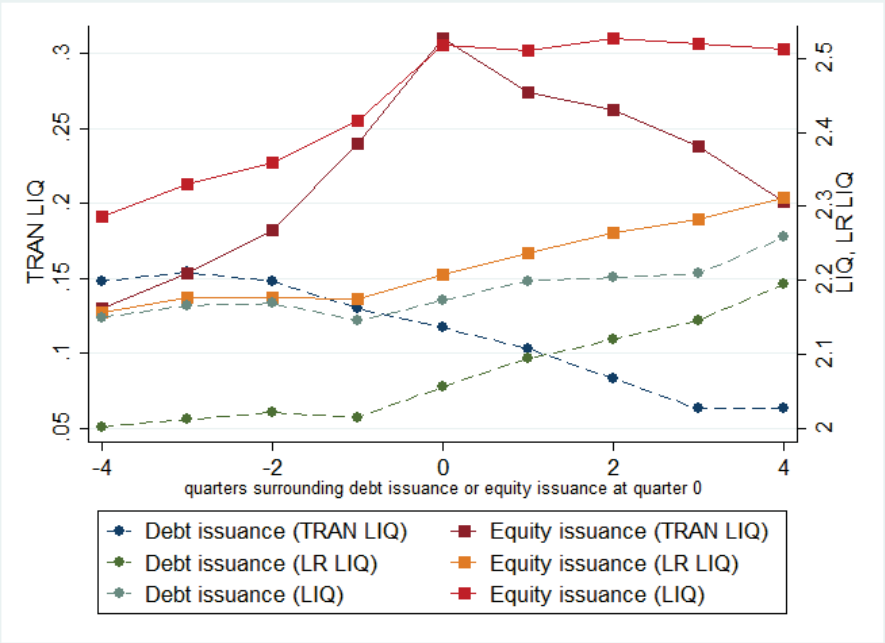
We depict time-series plot of the estimated betas through which a firm's transitory liquidity, liquidity, and long-run liquidity affect the cost of equity capital and make paired comparisons. In Panel A, we compare $\beta_{MKT,TRAN\ LIQ}$ with $\beta_{MKT,LIQ}$ and $\beta_{MKT,LR\ LIQ}$. In Panel B, we compare $\beta_{SMB,TRAN\ LIQ}$ with $\beta_{SMB,LIQ}$ and $\beta_{SMB,LR\ LIQ}$. In Panel C, we compare $\beta_{HML,TRAN\ LIQ}$ with $\beta_{HML,LIQ}$ and $\beta_{HML,LR\ LIQ}$.

In Figure 1.1, we specifically depict time-series plot of estimated betas through which a firm's transitory liquidity, liquidity, and long-run liquidity affect the cost of equity capital. Panel A of Figure 1.1 compares $\beta_{MKT,TRAN\ LIQ,i}$ with $\beta_{MKT,LIQ,i}$ and $\beta_{MKT,LR\ LIQ,i}$. The pattern of $\beta_{MKT,TRAN\ LIQ,i}$ is similar as the one of $\beta_{MKT,LIQ,i}$, consistent with the result that both transitory liquidity and liquidity can better inform the lower cost of equity capital. In contrast, the pattern of $\beta_{MKT,LR\ LIQ,i}$ is quite flat. This further provides evidence that the timing of lower cost of equity capital may not be clearly informed by long-run liquidity. Ben-Rephael, Kadan, and Wohl (2015) find that characteristic liquidity premium has significantly declined and been insignificant from zero especially after the year 2000. Slightly different from theirs, our estimation results show that average $\beta_{MKT,TRAN\ LIQ,i}$ decreases from 0.001 insignificant different from zero in the period 1990-1999 to -0.056 significant different from zero in 2000-2010. And, average $\beta_{MKT,LIQ,i}$ is about -0.061 significant different from zero whether in the period before 2000 or in the period after 2000. Accordingly, we can see that a firm's transitory liquidity, unlike its liquidity, can effectively lower its individual risk premium especially after the year 2000. Comparing $\beta_{SMB,TRAN\ LIQ,i}$ with $\beta_{SMB,LIQ,i}$ and $\beta_{SMB,LR\ LIQ,i}$ in Panel B of Figure 1.1 and comparing $\beta_{HML,TRAN\ LIQ,i}$ with $\beta_{HML,LIQ,i}$ and $\beta_{HML,LR\ LIQ,i}$ in Panel C of Figure 1.1 produce similar results. Our findings suggest that transitory liquidity should perform better on informing firms the favorable timing of issuing equity rather than issuing debt.

1.4. The debt-equity choices

In this section, we further investigate whether transitory liquidity can govern a firm's external finance behavior and function as a market-timing indicator in debt-equity choices.

Panel A: NYSE/AMEX



Panel B: NASDAQ

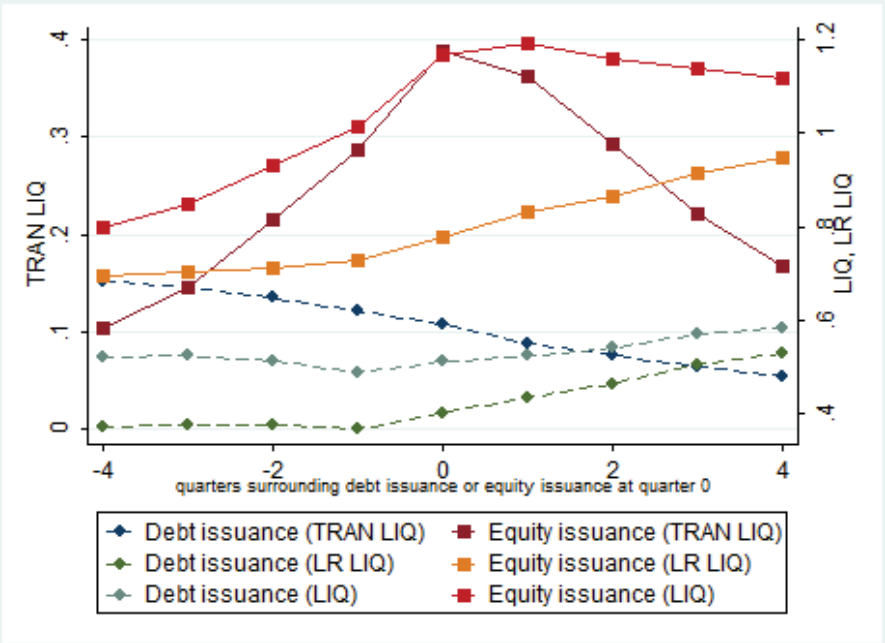


Figure 1.2

We define quarter 0 as the debt issuance quarter (equity issuance quarter) in which debt issuance (equity issuance) exceeds 5% of the pre-issue value of total assets. The observations with mixed debt and equity issuances are excluded. We plot the average quarterly transitory liquidity, long-run liquidity, and liquidity from quarter -4 to quarter +4 for the NYSE/AMEX (NASDAQ) sample in Panel A (B).

1.4.1 Time series property

In Table 1.2, we use firm-quarter observations and only use the models which can be converged successfully to examine time series property of transitory liquidity. For the NYSE/AMEX (NASDAQ) sample, the average AR(1) coefficient of transitory liquidity is 0.613 (0.583), suggesting that transitory liquidity is time-varying and has a gradually changing property. This pattern can allow managers to anticipate future changes and act on financing decisions when the conditions are right for issuing equity or debt. Further, by time-series property of liquidity, we can find that transitory liquidity almost captures the variation in liquidity. For the NYSE/AMEX (NASDAQ) sample, the average AR(1) coefficient of liquidity is 0.685 (0.595). We also see that temporary liquidity changes measured by transitory liquidity can largely alter the pattern of the expected long-run liquidity. In addition, we also use our sample to have market liquidity measure for each quarter and for two different stock markets. The estimated AR(1) coefficients can be close to one, showing that market liquidity is a non-stationary process. And, using Næs, Skjeltorp, and Ødegaard's (2011) market illiquidity series to estimate AR(1) coefficients also produces similar results.

1.4.2. Transitory liquidity surrounding issuance

To illustrate how well transitory liquidity determines firms' tendency toward debt issuance or equity issuance, we first draw the pattern of transitory liquidity surrounding issuance quarter. In the following figures, we show quarter-by-quarter average transitory liquidity from four quarters prior to through four quarters after significant debt issuance or equity issuance. We also depict quarter-by-quarter average long-run liquidity and liquidity surrounding debt issuance or equity issuance and make comparisons.

Table 1.2
Time series property

This table reports the cross-sectional averages of AR(1) coefficients. '% positive' reports the percentage of positive slope coefficients, while '% significant' gives the percentage with t-statistics greater than 1.645 (the 5% critical level in a one-tailed test). We use firm-quarter observations with available non-missing accounting variables and also include the observations in the previous three years from 1987 in estimation. We have 84,676 firm-quarter observations for 2,335 NYSE/AMEX firms and 128,806 firm-quarter observations for 5,300 NASDAQ firms.

	AR(1) coefficients					
	$TRAN\ LIQ_{t-1}$		LIQ_{t-1}		$LR\ LIQ_{t-1}$	
	NYSE/AMEX	NASDAQ	NYSE/AMEX	NASDAQ	NYSE/AMEX	NASDAQ
Lag of quarter 1						
Coefficient	0.613	0.583	0.685	0.595	0.902	0.884
% positive	96.005	93.474	94.410	91.962	98.670	97.860
% significant (t>1.645)	81.930	74.427	80.716	70.790	91.755	92.175
Converged	1,627	2,835	1,592	3,533	376	888

	Using market liquidity or marker illiquidity as reference: AR(1) coefficients			
	MKTLIQ 1987:1~2010:4	*MKTLIQ* 1987:1~2010:4	*ILR_NYSE* 1987:1~2008:4	*ILR_NYSE* 1946:1~2008:4
	NYSE/AMEX	NASDAQ	Næs, Skjeltorp, and Ødegaard (2011)	Næs, Skjeltorp, and Ødegaard (2011)
Lag of quarter 1				
Coefficient	0.999	0.999	0.924	0.976

In Panel A and Panel B of Figure 1.2, we show patterns of transitory liquidity, liquidity, and long-run liquidity around debt issuance or equity issuance for NYSE/AMEX firms and NASDAQ firms, respectively. It is obvious that transitory liquidity gradually increases before equity issuance and significantly deteriorates after equity issuance at quarter 0. Compared with transitory liquidity, liquidity is quite indifferent after equity issuance. The long-run liquidity can even persistently increase after equity issuance. On the contrary, it is difficult for us to observe that firms issue debt at quarter 0 through transitory liquidity surrounding debt issuance. These results further suggest that the timing of lower cost of equity capital can be better informed by transitory liquidity.

1.4.3. Probit analysis of the choice between debt and equity

We then use the following Probit specification to investigate whether transitory liquidity can affect firms' debt-equity choices:

$$P(y_{it}=1)=\Phi(\alpha+\beta TRAN\ LIQ_{i,t-1}+\gamma' X_{i,t-1}+\xi_{IND}+v_t+\varepsilon_{i,t}), \quad (1.3)$$

where $TRAN\,LIQ_{i,t\text{-}1}$ is firm *i*'s transitory liquidity in quarter *t-1*; $X_{i,t-1}$ is a set of control variables in quarter *t-1*. We control for industry fixed effects (ξ_{IND}) based on the Fama-French (1997) 48-industry classification and time fixed effects (ν_t) in this specification.[6] Specifically, following Leary and Roberts (2005, 2010) and Lemmon and Zender (2010), we use 5% cutoff for identifying firm-quarter observations with significant issuance of debt or equity and use them to estimate Eq. (1.3). Accordingly, the dependent variable in Eq. (1.3), $y_{i,t}$, is equal to one if firm *i*'s net debt issuance in quarter *t* exceeds 5% of its pre-issue value of total assets, (i.e., $\frac{\Delta D_t}{A_{t-1}} > 5\%$); and zero if firm *i*'s net equity issuance in quarter *t* exceeds 5% of its pre-issue value of total assets (i.e., $\frac{\Delta E_t}{A_{t-1}} > 5\%$). The firm-quarter observations with mixed debt and equity issuances are excluded. In Panel A of Table 1.3, we present summary statistics and find that 75.6% of NYSE/AMEX firms in our sample issuing debt when raising external capital and that 62% of NASDAQ firms issuing debt when making external financing choices. Compared to NYSE/AMEX firms, NASDAQ firms who issue debt or issue equity are on average temporarily more liquid. And, they are smaller and younger firms with lower book leverage, lower profitability, more R&D spending, and higher growth opportunities.

In Panel B of Table 1.3, we show the results of Probit analysis. Transitory liquidity can significantly affect a firm's debt-equity choices. For the NYSE/AMEX sample, it is significantly negative with a coefficient of -0.432. And, for the NASDAQ sample, the coefficient of transitory liquidity is -0.210 significantly negative. Further, marginal effect of transitory liquidity on the probability of issuing debt indicates that transitory liquidity can largely dictate a firm's debt-equity choices. Among all the explanatory variables, the marginal effect of transitory liquidity is highest with a value of 13% for NYSE/AMEX firms and is 8%

[6] According to Hovakimian (2006), we also do not report meaningless constant term when using Probit specification in estimation.

slightly smaller than *Market-to-book* for NASDAQ firms. Thus, we find empirical evidence that transitory liquidity can function as a market-timing indicator.

1.4.4. Exogenous liquidity shocks: the crises and decimalization events

In reality, we can only observe shocks to liquidity. This then raises the following question: How and which kinds of liquidity shocks can better lead to temporary liquidity changes as an important role in a firm's debt-equity choices?

We follow Bharath, Jayaraman, and Nagar (2013) to employ exogenous liquidity shocks: Asian financial crisis (1997Q3 and 1997Q4), Russian default crisis (1998Q3 and 1998Q4), and the decimalization of 2001 (2001Q1). And, because Bharath, Sudarshan, and Nagar (2013) indicate that liquidity shocks occurred in the crises event are unanticipated and that liquidity shocks occurred in the decimalization event are anticipated, we treat these two events separately in analysis and discuss the possible differences in the effect of transitory liquidity on a firm's debt-equity choices. For the crises event, we keep firms with significant debt issuance or significant equity issuance in the third quarter of 2000 and examine the effect of transitory liquidity which is from the third quarter of 1997 through the second quarter of 2000. For the decimalization event, we keep firms with significant debt issuance or significant equity issuance in the first quarter of 2004 and examine the effect of transitory liquidity which is from the first quarter of 2001 through the fourth quarter of 2003.

In Table 1.4, the estimation results of Probit analysis are reported. For firms issuing debt or equity in the third quarter of 2000, their transitory liquidity covering from Asian financial crisis, Russian default crisis through the second quarter of 2000 can have a significantly negative effect on firms' debt-equity choices with a coefficient of -1.111. On the contrary, for firms issuing debt or equity in the first quarter of 2004, their transitory liquidity covering from the decimalization of 2001 seems to have an insignificant effect. If we consider transitory liquidity as the evolvement of liquidity shocks, whether the shocks to liquidity are expected or unexpected should produce similar results. However, the effect of measuring

transitory liquidity from the decimalization of 2001 is weak. Accordingly, we may say that transitory liquidity which essentially captures unexpected liquidity shocks can largely dictate a firm's debt-equity choices.

Table 1.3
Transitory liquidity and debt-equity choices

Panel A reports the summary statistics of all the variables used in Probit analysis from 1990 to 2010. See 1.Appendix A1 for variable definitions. Panel B presents the results of the Probit model for debt-equity choices with the dependent variable equals one for debt issuance and zero for equity issuance. We estimate the model with significant debt issuance (=net debt issuance in a quarter exceeding 5% of the pre-issue value of total assets) or significant equity issuance (=net equity issuance in a quarter exceeding 5% of the pre-issue value of total assets). The estimated coefficients from the maximum likelihood Probit model is reported. We control for year-quarter fixed effects and Fama-French (1997) 48-industry indicator variables in each regression. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. And, we report the marginal effects at mean in the square brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary statistics

	NYSE/AMEX			NASDAQ		
	Mean	Median	SD	Mean	Median	SD
Net debt issuance (%)	8.121	6.974	12.485	6.899	6.078	14.462
Net equity issuance (%)	2.981	0.208	10.816	8.400	0.737	25.940
Debt-equity choice {0,1}	0.756	1.000	0.429	0.620	1.000	0.485
$TRAN\ LIQ_{t-1}$	0.157	0.138	0.400	0.183	0.141	0.616
$Log(Peer\ illiquidity)_{t-1}$	-0.164	-0.033	0.669	-0.136	-0.023	0.633
$Peer\ Book\ D_{t-1}/A_{t-1}$ (%)	24.913	25.526	6.366	22.044	22.063	6.600
$Book\ D_{t-1}/A_{t-1}$ (%)	25.744	25.044	15.503	20.463	17.936	17.091
$Market\text{-}to\text{-}book_{t-1}$	1.434	1.167	0.903	1.754	1.307	1.330
$Tangibility_{t-1}$	0.325	0.265	0.223	0.265	0.199	0.217
$Profitability_{t-1}$	0.035	0.035	0.031	0.019	0.030	0.058
$Selling\ expense_{t-1}$	0.231	0.195	0.373	0.457	0.278	2.184
$R\&D\ expense_{t-1}$	0.019	0.000	0.058	0.073	0.000	0.266
$R\&D\ dummy_{t-1}$	0.732	1.000	0.443	0.575	1.000	0.494
$Size_{t-1}$	1.902	2.046	1.684	-0.127	-0.176	1.389
Age_{t-1}	27.616	25.000	16.325	13.811	12.000	7.111

Panel B: Probit Analysis

	5% cutoff	
	Debt issuance vs. Equity issuance (1,0)	
	(1)	(2)
	NYSE/AMEX	NASDAQ
TRAN LIQ$_{t-1}$	-0.432***	-0.210***
	(-6.797)	(-5.298)
	[-0.128]	[-0.079]
Log(Peer illiquidity)$_{t-1}$	0.004	-0.004
	(0.052)	(-0.050)
	[0.001]	[-0.002]
Peer Book D_{t-1}/A_{t-1}	-0.002	0.025**
	(-0.215)	(2.162)
	[-0.001]	[0.010]
Book D_{t-1}/A_{t-1}	-0.010***	-0.002
	(-4.893)	(-1.114)
	[-0.003]	[-0.001]
Market-to-book$_{t-1}$	-0.132***	-0.246***
	(-3.335)	(-10.139)
	[-0.039]	[-0.093]
Tangibility$_{t-1}$	-0.076	0.549***
	(-0.402)	(3.298)
	[-0.022]	[0.207]
Profitability$_{t-1}$	0.301	1.386**
	(0.272)	(2.391)
	[0.089]	[0.522]
Selling expense$_{t-1}$	-0.045	-0.079
	(-0.877)	(-1.447)
	[-0.013]	[-0.030]
R&D expense$_{t-1}$	-0.417	-0.236
	(-0.742)	(-1.013)
	[-0.124]	[-0.089]
R&D dummy$_{t-1}$	0.027	0.381***
	(0.309)	(5.625)
	[0.008]	[0.143]
Size$_{t-1}$	-0.027	0.029
	(-1.294)	(1.485)
	[-0.008]	[0.011]
Log(1+Age)$_{t-1}$	-0.028	0.142**
	(-0.492)	(2.193)
	[-0.008]	[0.053]
Industry fixed effects	Yes	Yes
Year-quarter fixed effect	Yes	Yes
Pseudo R^2	0.101	0.192
Obs.	4,383	5,331

Table 1.4
Exogenous liquidity shocks: the crises and the decimalization events

In this table, we employ exogenous liquidity shocks: Asian financial crisis (1997Q3 and 1997Q4), Russian default crisis (1998Q3 and 1998Q4), and the decimalization of 2001 (2001Q1) and report the results of the Probit model for debt-equity choices. For the crises event, we keep firms with significant debt issuance or significant equity issuance in the third quarter of 2000 and examine the effect of transitory liquidity which is from the third quarter of 1997 through the second quarter of 2000. For the decimalization event, we keep firms with significant debt issuance or significant equity issuance in the first quarter of 2004 and examine the effect of transitory liquidity which is from the first quarter of 2001 through the fourth quarter of 2003. Accordingly, we do not control for year-quarter fixed effects and Fama-French (1997) 48-industry indicator variables. To save space, this table omits the coefficients (and the corresponding t-statistics) on the rest of the independent variables. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. And, we report the marginal effects at mean in the square brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	5% cutoff	
	Debt issuance vs. Equity issuance (1,0)	
	(1)	(2)
	Crises event	Decimalization event
	2000Q3	2004Q1
$TRAN\ LIQ_{t-1}$ *(1997Q3~2000Q2)*	-1.111***	
	(-3.267)	
	[-0.365]	
$TRAN\ LIQ_{t-1}$ *(2001Q1~2003Q4)*		-0.367
		(-1.372)
		[-0.127]
Pseudo R^2	0.287	0.201
Obs.	121	135

1.5. Robustness on transitory liquidity's market-timing property

Numerous studies have proposed various market-timing variables to show that firms tend to issue equity instead of debt especially when their equity value is high. In this section, we address the issue related with transitory liquidity's market-timing property that firms prefer equity over debt at the time when their transitory liquidity is high and test whether our finding can be highly robust in the presence of the previously identified market-timing variables.

First, we realize that the market-timing variables proposed in the literature can be classified into two groups: firm conditions and market conditions. Firm-condition market-timing

variables can be considered as firm-specific signal of issuing the equity while market-condition market-timing variables indicate the appropriate times for all the firms to issue equity. Since transitory liquidity's market-timing property is more closely related to firm-condition market-timing variables, we then focus on the comparison between transitory liquidity and firm-condition market-timing variables. 1.Appendix A2 details the nine firm-condition market-timing variables, including external financing weighted-average M/B (EFWAMB) proposed by Baker and Wurgler (2002), equally weighted-average of the firm's past market-to-book ratios (EWMB) proposed by Leary and Roberts (2005), quarterly timing (QT) and long-term timing (LT) proposed by Kayhan and Titman (2007), standardized market-to-book ratio, prior stock returns, and future stock returns proposed by DeAngelo, DeAngelo, and Stulz (2010), market-to-book value of equity (ME/BE) proposed by Dong, Loncarski, Horst, and Veld (2012), and prior 250-day cumulative abnormal stock returns proposed by Gomes and Phillips (2012).

Table 1.5 reports the pairwise correlations of transitory liquidity with each of the nine firm-condition market-timing variables. Transitory liquidity tends to be closely related to the market-timing variables based on stock performance. For example, for the NYSE/AMEX sample, the correlations of transitory liquidity with DeAngelo, DeAngelo, and Stulz's (2010) last 12-month and 36-month stock returns are 0.575 and 0.640, respectively; and its correlations with Gomes and Phillips's (2012) prior 250-day cumulative equal-weighted and value-weighted abnormal stock returns are 0.434 and 0.401, respectively. For the NASDAQ sample, transitory liquidity is also highly correlated with these stock-performance-based market-timing variables.

And, when we compare transitory liquidity with those market-timing indicators which are constructed by using market-to-book ratio as the basic component, we can find that firms whose liquidity temporarily goes up also have higher market-to-book ratio. However, our transitory liquidity is found to be less correlated with the four different historical market

valuations: EFWAMB, EWMB, QT, and LT. In Panel A and Panel B of Figure 1.3, we depict EFWAMB and natural logarithm of ME/BE around debt issuance or equity issuance for NYSE/AMEX firms and NASDAQ firms, respectively. A firm's ME/BE can reach to the highest value in the previous quarter before equity issuance at quarter 0. This pattern is similar as the increases in transitory liquidity before equity issuance. On the contrary, we do see that transitory liquidity is little related with EFWAMB. Even though a firm can have higher EFWAMB surrounding equity issuance, its EFWAMB will continuously increase whether after equity issuance or after debt issuance. This pattern is quite opposite to the decreases in transitory liquidity after equity issuance. Accordingly, unlike transitory liquidity or market-to-book ratio, a firm's historical market valuations have nothing to do with the timing of equity issuance.

In Table 1.6, we further add the market-timing variables one at a time as an independent variable to examine whether transitory liquidity can also be a well-performing market-timing indicator. Among all the nine firm-condition market-timing variables, Gomes and Phillips's (2012) prior 250-day cumulative abnormal stock returns is significant for both the NYSE/AMEX and NASDAQ samples, suggesting that it is a robust and effective market-timing variable. However, transitory liquidity remains highly significant in both NYSE/AMEX firms' and NASDAQ firms' debt-equity choices. In most of the comparison to each of the firm-condition market-timing variables, transitory liquidity is more significant than its counterpart, in terms of *t*-value. We then provide evidence that transitory liquidity is also a well-performing market-timing indicator for predicting firms' debt-equity choices.

1.6. Predicted probability, credit rating changes, and timing the market

We next further use the predicted probability of debt-equity choices from Panel B of Table 1.3 to discuss whether transitory liquidity's market-timing property can change firms' decisions to issue debt. Based on Graham and Harvey's (2001) survey, financial flexibility and credit ratings are two factors which can affect firms' decisions to issue debt. If firms have

their credit ratings downgraded in quarter *t-1* from quarter *t-2*, they should issue less amount of debt or not issue debt in quarter *t*. Thus, conditional on firms having their ratings either upgraded or downgraded, we discuss whether transitory liquidity is able to change firms' decisions.

S&P issuer credit ratings are monthly frequency data from COMPUSTAT. We assign 22 to firms with highest rating (AAA), 21 to AA+, …, and 0 to missing value. By the average value of credit ratings for each quarter, we can divide firms into two groups: firms with credit ratings downgraded or unchanged and firms with credit ratings upgraded. Panel A (B) of Figure 1.4 depicts how the probability of issuing debt, instead of equity, varies with transitory liquidity for the NYSE/AMEX (NASDAQ) sample. We can see that NYSE/AMEX firms with credit ratings upgraded otherwise have lower probability of issuing debt (vs. issuing equity) when their liquidity temporarily improves and that NASDAQ firms with credit ratings downgraded or unchanged otherwise have higher probability of issuing debt (vs. issuing equity) when their liquidity temporarily deteriorates. Thus, these two figures clearly illustrate that transitory liquidity's market-timing property can change firms' decisions to issue debt.

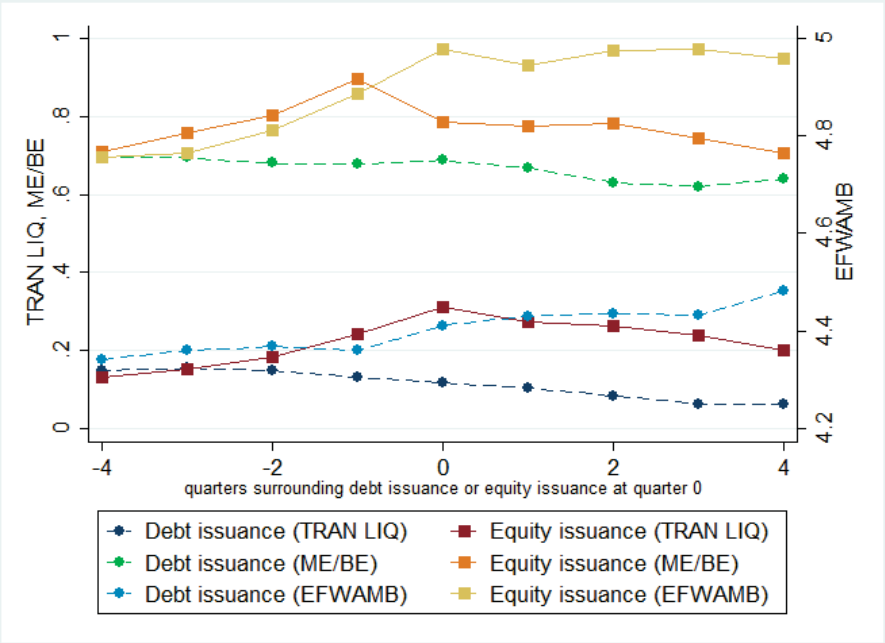
1.7. Conclusion

According to a survey conducted by Graham and Harvey (2001), nearly 63% of CFOs agree that "if our stock price has recently risen, the price at which we can sell is high". Though their findings show that equity prices can be an important factor determining a firm's equity issuance, whether such recent and temporary changes in the equity market may contain useful information other than equity valuation is yet examined. Since Baker and Stein (2004), Eckbo and Norli (2005), Lin and Wu (2013) and Stulz, Vagias, and van Dijk (2014) have emphasized the important role of liquidity in equity issuance, our study is thus motivated by investigating the possible market-timing informativeness emanated from temporary changes in liquidity.

In order to measure temporary liquidity changes, we consider two candidate variables:

liquidity shock defined by Bali, Peng, Shen, and Tang (2014) and our transitory liquidity defined by subtracting each firm's log Amihud's illiquidity measure from its three-year average of log Amihud's illiquidity measures. We provide strong evidence that transitory liquidity is informative about a firm's time-varying cost of equity capital and its debt-equity choice. Further, we do robustness checks on transitory liquidity's market-timing property by comparing it with the previously proposed firm-condition market-timing indicators. Our findings suggest that, through the informativeness of time-varying lower cost of equity capital, a simple market-timing debt-equity choice depicted by transitory liquidity appears to have substantial explanatory power.

Panel A: NYSE/AMEX



Panel B: NASDAQ

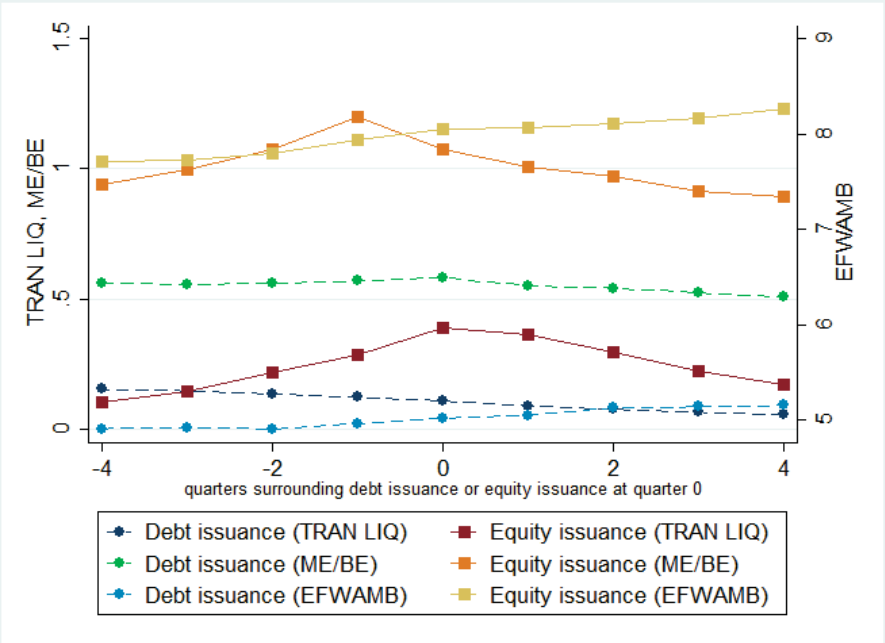
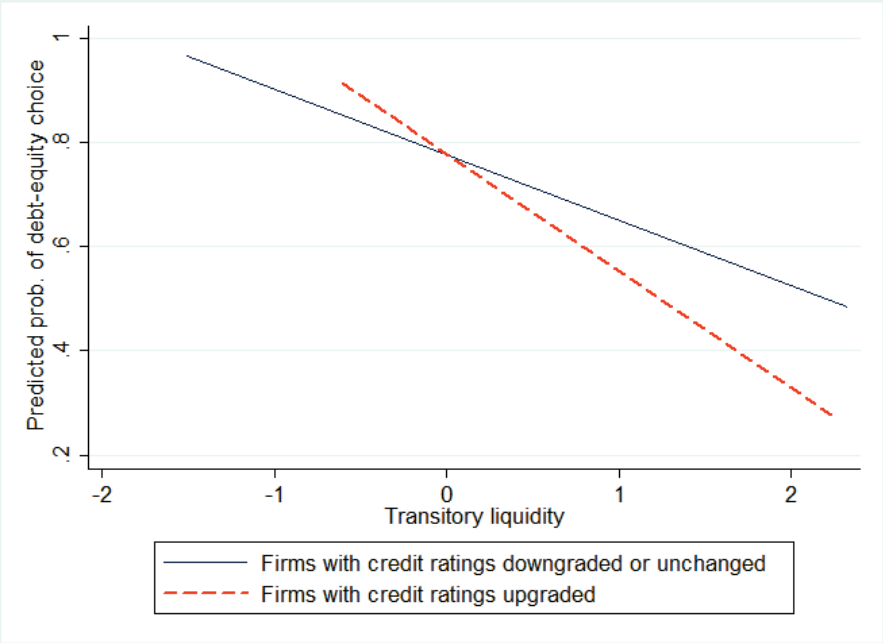


Figure 1.3

We define quarter 0 as the debt issuance quarter (equity issuance quarter) in which debt issuance (equity issuance) exceeds 5% of the pre-issue value of total assets. The observations with mixed debt and equity issuances are excluded. We plot the average quarterly transitory liquidity, natural logarithm of ME/BE, and EFWAMB from quarter -4 to quarter +4 for the NYSE/AMEX (NASDAQ) sample in Panel A (B).

Panel A: NYSE/AMEX



Panel B: NASDAQ

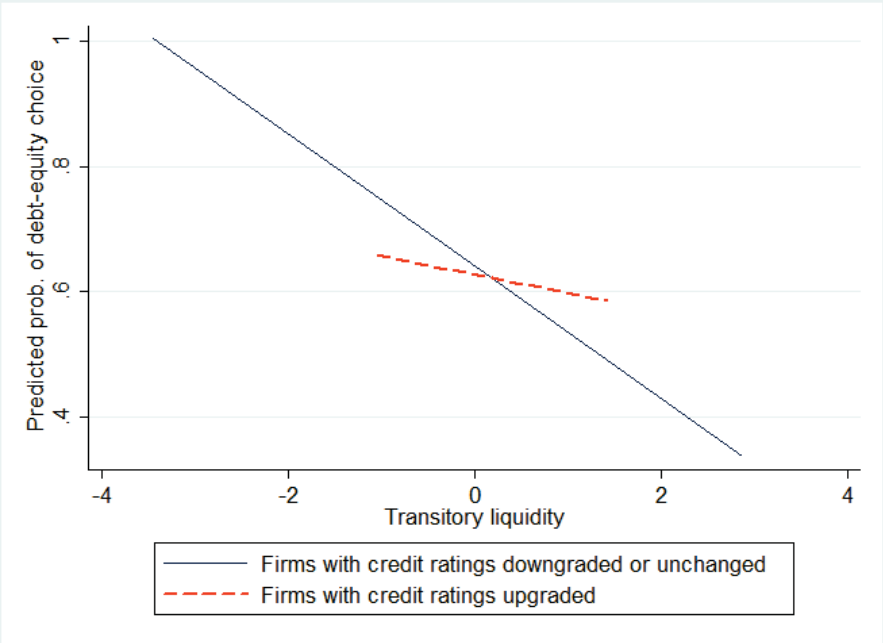


Figure 1.4

S&P issuer credit ratings are monthly frequency data from COMPUSTAT. We assign 22 to firms with highest rating (AAA), 21 to AA+, …, and 0 to missing value. By the average value of credit ratings for each quarter, we can divide firms into two groups: firms with credit ratings downgraded or unchanged and firms with credit ratings upgraded. Based on the Probit results in Panel B of Table 1.3, we plot the predicted probability of debt-equity choices with transitory liquidity for each group. NYSE/AMEX (NASDAQ) sample is shown in Panel A (B).

Table 1.5
Correlations of transitory liquidity and firm-condition market timing indicators

This table presents Pearson correlations between transitory liquidity and firm-condition market timing indicators. See 1.Appendix A2 for a detailed definition of the market timing indicators. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Market timing indicator$_{t-1}$											
	Baker and Wurgler (2002): EFWAMB	Leary and Roberts (2005): EWMB	Kayhan and Titman (2007): QT	Kayhan and Titman (2007): LT	DeAngelo, DeAngelo, and Stulz (2010): standardized M/B (Natural logarithm)	DeAngelo, DeAngelo, and Stulz (2010): Prior stock returns		DeAngelo, DeAngelo, and Stulz (2010): Future stock returns		Dong, Loncarski, Horst, and Veld (2012): ME/BE (Natural logarithm)	Gomes and Phillips (2012): Cumulative abnormal stock return	
						36-month	12-month	36-month	12-month		VW	EW
NYSE/AMEX												
TRAN LIQ$_{t-1}$	-0.005	-0.014	0.002	0.027*	0.227***	0.640***	0.575***	-0.157***	-0.092***	0.301***	0.401***	0.434***
NASDAQ												
TRAN LIQ$_{t-1}$	-0.027*	-0.017	0.012	-0.029**	0.254***	0.541***	0.580***	-0.150***	-0.150***	0.308***	0.334***	0.330***

Table 1.6

Robustness on transitory liquidity's market-timing property: the comparison of transitory liquidity with market-timing variables

This table reports the results of adding the market-timing variables one at a time to the Probit specification of debt-equity choices in Panel B of Table 1.3. To save space, this table omits the coefficients (and the corresponding t-statistics) on the rest of the independent variables. See 1.Appendix A2 for a detailed definition of the market timing indicators. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. And, we report the marginal effects at mean in the square brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Debt issuance vs. Equity issuance (1,0)											
	Baker and Wurgler (2002): EFWAMB	Leary and Roberts (2005): EWMB	Kayhan and Titman (2007): QT	Kayhan and Titman (2007): LT	DeAngelo, DeAngelo, and Stulz (2010): standardized M/B (Natural logarithm)	DeAngelo, DeAngelo, and Stulz (2010): Prior stock returns		DeAngelo, DeAngelo, and Stulz (2010): Future stock returns		Dong, Loncarski, Horst, and Veld (2012): ME/BE (Natural logarithm)	Gomes and Phillips (2012): Cumulative abnormal stock return	
						36-month	12-month	36-month	12-month		VW	EW
	NYSE/AMEX											
TRAN LIQ$_{t-1}$	-0.469***	-0.491***	-0.453***	-0.468***	-0.412***	-0.512***	-0.230**	-0.483***	-0.485***	-0.411***	-0.292***	-0.278***
	(-7.109)	(-7.320)	(-6.925)	(-7.059)	(-6.428)	(-6.116)	(-2.447)	(-6.459)	(-6.558)	(-6.379)	(-4.089)	(-3.793)
	[-0.140]	[-0.146]	[-0.135]	[-0.140]	[-0.122]	[-0.155]	[-0.069]	[-0.146]	[-0.147]	[-0.122]	[-0.086]	[-0.082]
Market timing indicator$_{t-1}$	-0.021**	-0.104*	-1.872*	-1.511***	-0.100*	0.033	-0.381***	-0.025	-0.063	-0.096	-0.316***	-0.316***
	(-2.002)	(-1.872)	(-1.662)	(-2.747)	(-1.717)	(0.642)	(-4.063)	(-0.609)	(-1.076)	(-1.628)	(-4.173)	(-4.072)
	[-0.006]	[-0.031]	[-0.559]	[-0.451]	[-0.030]	[0.010]	[-0.115]	[-0.008]	[-0.019]	[-0.029]	[-0.094]	[-0.094]
	NASDAQ											
TRAN LIQ$_{t-1}$	-0.289***	-0.289***	-0.273***	-0.279***	-0.179***	-0.325***	-0.217***	-0.264***	-0.261***	-0.176***	-0.180***	-0.179***
	(-6.693)	(-6.614)	(-6.421)	(-6.530)	(-4.513)	(-6.187)	(-4.166)	(-5.820)	(-5.764)	(-4.427)	(-4.377)	(-4.313)
	[-0.108]	[-0.108]	[-0.102]	[-0.104]	[-0.067]	[-0.122]	[-0.081]	[-0.099]	[-0.098]	[-0.066]	[-0.068]	[-0.067]
Market timing indicator$_{t-1}$	-0.013*	-0.035	-0.152	-0.157	-0.349***	0.072**	-0.091*	0.052*	0.074*	-0.354***	-0.091**	-0.083**
	(-1.811)	(-1.138)	(-0.631)	(-1.099)	(-7.053)	(2.132)	(-1.869)	(1.816)	(1.920)	(-7.096)	(-2.429)	(-2.275)
	[-0.005]	[-0.013]	[-0.057]	[-0.059]	[-0.131]	[0.027]	[-0.034]	[0.020]	[0.028]	[-0.133]	[-0.034]	[-0.031]

1.Appendix A1: Variable Definitions

Liquidity shock (*LIQU*) = the negative difference between the Amihud's (2002) illiquidity ratio at *t* and the past 12-month average of illiquidity.

Transitory liquidity (*TRAN LIQ*) = the negative difference of log illiquidity at *t* and its three-year average of log illiquidity measures

TEMPLIQ = the two candidate variables for temporary changes in liquidity: *LIQU* and *TRAN LIQ*

LIQ = the negative value of log illiquidity at *t*

LR LIQ = the negative value of three-year average of log illiquidity measures

MKT = the excess return on the market ($E(r_{m,t})$-$r_{f,t}$)

SMB = size factor computed as the difference between the average returns on small- and big-size portfolios

HML = B/M factor measured as the difference between the average returns on high- and low-B/M stocks

Net debt issuance = the ratio of change in total debt from quarter *t-1* to quarter *t* divided by book value of assets at *t-1*

Net equity issuance = the ratio of change in book equity minus change in retained earnings divided by book value of assets at *t-1*

Book D/A = the ratio of total debt (long-term debt plus the debt in current liabilities) to the book value of assets

Market-to-book = the ratio of book assets minus book equity plus market equity to book assets

Tangibility = the ratio of net property, plant, and equipment to book assets

Profitability = the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by assets

Selling expense = the selling expense scaled by the net sales

R&D expense = the research and development expense scaled by the net sales

R&D dummy = an indicator that takes the value of one when the firm reports zero or when R&D expense is not reported

Size = log book assets, where assets are deflated by the GDP deflator

Log (1+Age) = the logarithm of the number of years (plus one) elapsed since the first CRSP listing date of the company

Peer illiquidity = the average of peer firms' illiquidity, where peer firms are all the firms in the same industry based on the Fama-French (1997) 48-industry classifications, excluding the firm in question

Peer Book D/A = the average book leverage ratio of peer firms

1.Appendix A2: Equity market timing indicators measured based on an individual firm's share valuation history and its stock performance

Baker and Wurgler (2002)	EFWAMB: external finance weighted-average market-to-book ratios. For a given firm quarter, it is defined as: $EFWAMB_{t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{\sum_{r=0}^{t} e_r + d_r} * (\frac{M}{B})_s$, where the summation are taken starting at the IPO quarter (or the first quarter where stock price data are not missing), and *e* and *d* denote net equity and net debt issues, respectively.
Leary and Roberts (2005)	EWMB: equally weighted-average of the firm's past market-to-book ratios. For a given firm quarter, it is defined as: $EWMB_{t-1} = \sum_{s=0}^{t-1} (\frac{M}{B})_s$, where the summation are taken starting at the IPO year (or the first quarter where stock price data are not missing).
Kayhan and Titman (2007)	Quarterly timing (QT): $QT_{t-1} = \frac{\sum_{s=0}^{t-1} FD_s \left(\frac{M}{B}\right)_s}{t} - \left(\overline{FD} * \frac{\overline{M}}{B}\right)$. Long-term timing (LT): $LT_{t-1} = \left(\sum_{s=0}^{t-1} \frac{\left(\frac{M}{B}\right)_s}{t}\right) * \left(\sum_{s=0}^{t-1} \frac{FD_s}{t}\right)$, where the summations are taken for each firm-quarter observation over a five-year period and FD denotes financial deficit (i.e., the amount of external capital raised).
DeAngelo, DeAngelo, and Stulz (2010)	Natural log of standardized M/B: firm's M/B divided by the median M/B for all industrial firms. Prior stock returns: market-adjusted returns over the 36-month or 12-month ending immediately before the quarter in question. Future stock returns: market-adjusted returns over the 36-month or 12-month starting immediately after the quarter in question.
Dong, Loncarski, Horst, and Veld (2012)	Natural log of ME/BE: market value of equity divided by book value of equity.
Gomes and Phillips (2012)	Cumulative abnormal stock returns (250 prior days): a firm's cumulative abnormal return 250 days prior to the quarter in question minus the excess return relative to a portfolio of firms in the same size decile at the end of the year prior to the quarter.

Chapter 2

Stock Liquidity, Debt Capacity, and Debt-Equity Choices

2.1. Introduction

Many studies have examined the effects of stock liquidity on the cost of equity capital (e.g., Amihud and Mendelson (1986), Amihud (2002), and Acharya and Pedersen (2005)), on firm value (e.g., Fang, Noe, and Tice (2009)), and on capital structure (e.g., Lipson and Mortal (2009) and Chang and Yu (2010)). Since firms with higher stock liquidity tend to have a lower cost of equity capital, it is reasonable to expect liquid firms to prefer equity financing when raising capital. Indeed, Baker and Stein (2004), Eckbo and Norli (2005), Lin and Wu (2013) and Stulz, Vagias, and van Dijk (2014) show that stock liquidity plays an important role in equity financing decisions and in their post-offering expected stock returns.

Intriguingly, Butler and Wan (2010) show that debt issuers generally have better stock liquidity than comparable non-issuing firms, and argue that liquidity premium is a crucial factor for debt issuers having relatively low long-run stock returns. Furthermore, Odders-White and Ready (2006) argue that firms with higher stock liquidity tend to have higher credit ratings, which imply that they tend to have larger capacity to issue new debt. Also, Sunder (2006) notes that liquid firms may find debt financing desirable because high stock liquidity normally leads to high price informativeness, which could reduce lenders' monitoring costs.

While these studies suggest that stock liquidity contains rich information for corporate financing, both equity and debt, it is not clear when and how stock liquidity is more relevant to debt financing vis-à-vis equity financing. Thus, there is a need to better understand the role of stock liquidity in debt-equity choices.

The two seemingly conflicting findings—(i) debt-issuers tend to have high stock liquidity and (ii) firms time equity financing when stock liquidity is high—could co-exist if information spills over from equity market to debt market through stock liquidity. Liquidity

as price impact is the information outcome conveyed and produced in the equity market. And, whether preserving debt capacity for future investment can be the other side of the fact that liquid firms prefer equity financing is the focus of our study. More specifically, if the information that liquid firms issue equity for preserving debt capacity is spread in the debt market, those less liquid firms or illiquid firms who issue debt because of more debt capacity can otherwise have higher cost of issuing debt. Because leader firms are generally more liquid in each industry, we follow Fang, Noe, and Tice (2009) to define S&P 500 firms as leaders in each industry and discuss the effects of equity liquidity of S&P 500 firms in the same industry on a firm's net debt issuance and net equity issuance. To restrict our sample as firms other than S&P 500 companies in the same industry, we exclude S&P 500 constituent firms and have a final sample of 92,804 firm-quarter observations for 3,634 firms from 1986 through 2011.

Our finding that leaders' liquidity has a significant negative effect on net debt issuance provides evidence of the existence of information spillover and suggests that the liquidity of leader firms' equities can be used as a measure of the cost of issuing debt. By projecting debt-equity choices onto a firm's own liquidity and leaders' liquidity, we show that leaders' liquidity as the cost of issuing debt plays an important role in a firm's debt-equity choices. Firms tend to issue equity as leader firms' equities become more liquid. Further, we investigate whether liquid firms can prefer equity over debt when their liquidity is close to leaders' liquidity and whether illiquid firms can prefer debt over equity when their liquidity is far from leaders' liquidity. By measuring the closeness between a firm's own liquidity and leaders' liquidity, we find that liquid firms tend to issue equity especially when their liquidity is more close to leaders' liquidity.

We provide empirical evidence that the two seemingly conflicting findings in the literature co-exist because of debt capacity concerns. It is the information that spills over from equity market to debt market through stock liquidity and makes stock liquidity also relevant to net

debt issuance. And, preserving debt capacity can also be one of the reasons for liquid firms to issue equity especially when they take leaders' unused debt capacity as benchmark. Further, by following Fang, Noe, Tice (2009) to use market-to-book ratio and its three components: price-operating earnings, financial leverage, and operating profitability as firms' performance variables, we find that higher cost of issuing debt can make those less liquid firms who issue debt because of less debt capacity concerns have poor performance, lower financial leverage, lower operating profitability, and higher riskiness in the next quarter. In sum, these results suggest an alternative explanation for liquid firms with better performance that they benefit from taking leaders' unused debt capacity as benchmark to issue equity for preserving debt capacity.

The remainder of the paper is organized as follows. Section 2 describes our data and variable constructions. Section 3 investigates the effects of a firm's own liquidity and leaders' liquidity on net debt issuance and net equity issuance. In Section 4, we use Probit analysis to discuss debt-equity choices and examine whether leaders' liquidity is able to drive firms' debt-equity choices by liquidity closeness measurement. Section 5 examines whether debt capacity concerns can be the possible underlying channels. Finally, Section 6 offers our concluding remarks.

2.2. Data and variable construction

Graham and Leary (2011) review recent empirical capital structure research and note that, "In our view, the real question is which economic forces are most important to capital structure choices." In this section, we first discuss the important determinants identified in the extant literature, which will serve as the control variables in our analysis. Then, we present the data and summary statistics of the variables used in our analysis.

2.2.1. Capital structure variables and stock liquidity measures

Our study aims to further understand the role of stock liquidity in corporate financing decisions. Hence, following Hovakimian, Opler, and Titman (2001), Hovakimian (2006), and

Leary and Roberts (2005), our two dependent variables are *net debt issuance* (the ratio of change in total debt from quarter *t-1* to quarter *t* divided by book value of assets at *t-1*) and *net equity issuance* (the ratio of change in book equity minus change in retained earnings divided by book value of assets at *t-1*).[1]

Following Kayhan and Titman (2007), Roberts and Sufi (2009), and Leary and Roberts (2005), we include the following control variables: (1) *Book D/A*, defined as the ratio of total debt (long-term debt plus the debt in current liabilities) to the book value of assets; (2) *Market-to-book*, defined as the ratio of book assets minus book equity plus market equity to book assets; (3) *Tangibility*, computed as the ratio of net property, plant, and equipment to book assets; (4) *Profitability*, measured as the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by assets; (5) *Selling expense*, computed as the selling expense scaled by the net sales; (6) *R&D expense*, measured as the research and development expense scaled by the net sales;[2] (7) *R&D dummy*, an indicator that takes the value of one when the firm reports zero or when R&D expense is not reported; (8) *Size*, measured as log book assets, where assets are deflated by the GDP deflator; (9) *Log(1+Age)*, measured as the logarithm of the number of years (plus one) elapsed since the first CRSP listing date of the company.

Several stock liquidity measures exist, such as the share turnover, the bid-ask spread, and the price-impact measures. Hasbrouck (2009) and Goyenko, Holden, and Trzcinka (2009) find that Amihud's (2002) illiquidity ratio performs well in measuring the price impact of trades among the 12 low-frequency price impact proxies. Næs, Skjeltorp, and Ødegaard (2011) find that aggregated Amihud (2002) illiquidity ratio is a robust predictor of GDP

[1] The results are qualitatively similar if we use the statement of cash flows definition of the net debt issuance ((long-term debt issuance - long-term debt reduction)/lagged assets), the statement of cash flows definition of the net equity issuance (sale of common and preferred stock net of purchase of common and preferred stock/lagged assets), and the CRSP definition of the net equity issuance (the natural log of the ratio of the split-adjusted shares outstanding at the fiscal end of the time period in *t* divided by the split adjusted shares outstanding at the fiscal end of the time period in *t-1*).

[2] According to Kayhan and Titman (2007) and Flannery and Rangan (2006), selling expenses and R&D expenses could proxy for the uniqueness of a firm's products or the uniqueness of a firm's collateral.

growth, suggesting that the Amihud (2002) illiquidity measure is informative about economic conditions. We use the square-root version of the Amihud (2002) measure in analysis because Gopalan, Kadan, and Pevzner (2012) show that the Amihud (2002) measure is highly skewed. Accordingly, our main measure of stock illiquidity, the Amihud illiquidity ratio ($\times 10^3$) for stock *i* in quarter *t*, is computed as:[3]

$$Illiquidity_{i,t} = 10^3 \times \frac{1}{D} \sum_{d=1}^{D} \sqrt{\frac{abs(R_{i,d})}{VOL_{i,d}}} \quad , \tag{2.1}$$

where $R_{i,d}$ is the stock return of firm *i* on day *d*; $VOL_{i,d}$ is its dollar trading volume on day *d*; and *D* is the number of positive-volume days for firm *i* in quarter *t*. By definition, a high-liquidity stock is expected to have a low price impact per volume unit traded. Hence, Amihud (2002) measures stock illiquidity and a higher value of Amihud (2002) illiquidity ratio reflects greater illiquidity. Although the NYSE/AMEX and the NASDAQ have some differences in the market microstructure and in the ways trading volume is recorded (see Huang and Stoll (1996), Bessembinder and Kaufman (1997), Liu (2006), and Anderson and Dyl (2007)), it is known that volume on NASDAQ can be overstated and that we can follow Lipson and Mortal (2009) to divide NASDAQ firms' trading volume by two.

2.2.2. Sample construction and summary statistics

Our sample construction starts with all NYSE, AMEX, and NASDAQ non-financial and non-utility firms (i.e., excluding firms with four-digit SIC codes between 6000 and 6999 or between 4900 and 4999) on the CRSP daily stock return and the COMPUSTAT industrial quarterly files. The following are our sampling criteria: (1) we require more than 50 trading days per quarter with an average stock price greater than \$5;[4] (2) we exclude firm-quarter

[3] Our results are not sensitive to whether we adopt the raw version or the square-root version of the Amihud (2002) measure.

[4] To avoid unduly influences of non-synchronous trading and low-priced stocks on stock illiquidity measure, Amihud (2002) requires that the end-of-year price must exceed \$5 and that stock should have more than 200 trading days in the prior 12 months. Accordingly, we follow his suggestion to require that, to be included in our sample, a stock must have more than 50 trading days per quarter with an average stock price greater than \$5.

observations with book leverage greater than one or market-to-book ratios greater than ten;[5] (3) we trim all continuous variables at the 1st and 99th percentiles.[6]

We obtain S&P 500 historical constituent data from CRSP and delete stocks which are included in and excluded from S&P 500 in the same quarter. After using Fama-French 48 industry classification to identify each firm's industry, we are able to compute the mean value of Amihud (2002) illiquidity ratio for the S&P 500 firms in the same industry in the same quarter. To restrict our sample as firms other than S&P 500 companies in the same industry, we further exclude S&P 500 constituent firms. And, we also exclude any firms with fewer than four consecutive quarters of data because within-firm variation is one of our primary analyses. These criteria yield a final sample of 92,804 firm-quarter observations for 3,634 firms from 1986 through 2011.

Table 2.1 reports the summary statistics and the correlation matrix. The average net debt issuance is 1.039% and the average net equity issuance is 1.295%. And, we can find that firms on average are more illiquid than the S&P 500 firms in the same industry. In Panel B of Table 2.1, we can see that a firm's net debt issuance is significantly and positively correlated with the mean value of Amihud (2002) illiquidity ratio for the S&P 500 firms in the same industry at quarter *t-1* and that a firm's net equity issuance is significantly and negatively correlated with its own illiquidity of equity. In general, the correlations between illiquidity and firm characteristics are quite similar with the ones between the mean value of illiquidity for the S&P 500 firms in the same industry and firm characteristics. Larger firms, older firms, and firms with higher M/B, higher selling expense, and more R&D spending are more liquid and the S&P 500 firms in the same industry are also observed to be more liquid. The only difference is in the profitability. Although firms with higher profitability are more liquid, the S&P 500 firms in the same industry are otherwise found to be less liquid.

[5] This sample inclusion criterion is the same as Baker and Wurgler (2002), Leary and Roberts (2005), and Hovakimian (2006).

[6] Similarly, Leary and Roberts (2010) trim the upper and lower 1% of each variable used in their analysis of capital structure to mitigate the impact of data errors and outliers.

Table 2.1
Summary Statistics and Pearson Correlation Matrix

Panel A reports the summary statistics of the variables from 1986 to 2011. Panel B reports the Pearson correlation matrix. All continuous variables are trimmed at the 1st and 99th percentiles. *Net debt issuance*$_t$ is the ratio of change in total debt to the lagged book value of assets at quarter *t*. *Net equity issuance*$_t$ is the ratio of change in book equity minus change in retained earnings to the lagged book value of assets at quarter *t*. *Illiquidity*$_{t-1}$ is Amihud (2002) illiquidity ratio at quarter *t-1*. *Illiquidity*$^{S\&P500}_{t-1}$ is the mean value of Amihud (2002) illiquidity ratio for S&P 500 firms in the same industry based on the Fama-French (1997) 48-industry classifications in the same quarter *t-1*. *Book* D_{t-1}/A_{t-1} is the ratio of total debt (long-term debt plus debt in current liabilities) to the book value of assets at quarter *t-1*. *Market-to-book*$_{t-1}$ is book assets minus book equity plus market equity divided by book assets at quarter *t-1*. *Tangibility*$_{t-1}$ is the ratio of net property, plant, and equipment to assets at quarter *t-1*. *Profitability*$_{t-1}$ is EBITDA divided by assets at quarter *t-1*. *Selling expense*$_{t-1}$ is the selling expense scaled by net sales at quarter *t-1*. *R&D expense*$_{t-1}$ is the research and development expense scaled by net sales at quarter *t-1*. *R&D dummy*$_{t-1}$ is an indicator that takes the value of one when the firm reports zero or when R&D expense is not reported at quarter *t-1*. *Size*$_{t-1}$ is the logarithm of book assets, where assets are deflated by the GDP deflator at quarter *t-1*. *Age*$_{t-1}$ is the number of years elapsed since the first CRSP listing date of the company at quarter *t-1*. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary statistics

	Mean	Median	SD	N
Net debt issuance$_t$ *(%)*	1.039	0.000	8.922	92,804
Net equity issuance$_t$ *(%)*	1.295	0.170	8.955	89,412
Illiquidity$_{t-1}$	0.313	0.191	0.338	92,804
Illiquidity$^{S\&P500}_{t-1}$	0.035	0.028	0.026	92,804
Book D_{t-1}/A_{t-1}	0.194	0.167	0.176	92,804
Market-to-book$_{t-1}$	1.615	1.298	1.019	92,804
Tangibility$_{t-1}$	0.270	0.218	0.201	92,804
Profitability$_{t-1}$	0.037	0.037	0.027	92,804
Selling expense$_{t-1}$	0.260	0.221	0.175	92,804
R&D expense$_{t-1}$	0.036	0.000	0.084	92,804
R&D dummy$_{t-1}$	0.663	1.000	0.473	92,804
Size $_{t-1}$	1.079	1.064	1.223	92,804
Age $_{t-1}$	33.093	24.000	27.973	92,804

Panel B: Pearson correlation matrix

Variable	*Net debt issuance$_t$ (%)*	*Net equity issuance$_t$ (%)*	*Illiquidity$_{t-1}$*	*Illiquidity$^{S\&P500}_{t-1}$*	*Book D_{t-1}/A_{t-1}*	*Market-to-book$_{t-1}$*	*Tangibility$_{t-1}$*	*Profitability$_{t-1}$*	*Selling expense$_{t-1}$*	*R&D expense$_{t-1}$*	*R&D dummy$_{t-1}$*	*Size $_{t-1}$*	*Age$_{t-1}$*
Net debt issuance$_t$ (%)	1.000												
Net equity issuance$_t$ (%)	0.099***	1.000											
Illiquidity$_{t-1}$	0.006*	-0.018***	1.000										
Illiquidity$^{S\&P500}_{t-1}$	0.021***	-0.007*	0.286***	1.000									
Book D_{t-1}/A_{t-1}	-0.024***	-0.007**	0.012***	0.097***	1.000								
Market-to-book$_{t-1}$	0.031***	0.164***	-0.179***	-0.106***	-0.322***	1.000							
Tangibility$_{t-1}$	0.026***	-0.022***	0.033***	0.090***	0.291***	-0.158***	1.000						
Profitability$_{t-1}$	0.005	-0.000	-0.015***	0.072***	-0.104***	0.274***	0.125***	1.000					
Selling expense$_{t-1}$	-0.015***	0.047***	-0.015***	-0.097***	-0.255***	0.285***	-0.363***	-0.307***	1.000				
R&D expense$_{t-1}$	-0.026***	0.053***	-0.081***	-0.116***	-0.227***	0.227***	-0.249***	-0.225***	0.554***	1.000			
R&D dummy$_{t-1}$	0.030***	-0.035***	0.090***	0.161***	0.270***	-0.243***	0.272***	0.091***	-0.412***	-0.595***	1.000		
Size $_{t-1}$	-0.030***	-0.086***	-0.559***	-0.196***	0.358***	-0.277***	0.178***	-0.084***	-0.231***	-0.115***	0.129***	1.000	
Age$_{t-1}$	-0.027***	-0.062***	-0.073***	-0.025***	0.088***	-0.205***	0.092***	0.007**	-0.185***	-0.151***	0.122***	0.245***	1.000

2.3. The effects of a firm's own liquidity and leaders' liquidity on corporate financing

We begin our multivariate analysis on the associations of corporate financing with a firm's own liquidity and the mean value of liquidity of S&P 500 firms in the same industry by estimating the following panel regression:

$$y_{i,t}=\alpha+\beta_1 Liquidity_{t-1}+\beta_2 Liquidity_{t-1}^{S\&P500}+\gamma' X_{i,t-1}+\eta_i+\nu_t+\varepsilon_{i,t}, \quad (2.2)$$

where $y_{i,t}$ is net debt issuance or net equity issuance of firm *i* in quarter *t*. $Liquidity_{t-1}$ is the negative value of log *Illiquidity* at quarter t-1; *Illiquidity* is each firm's Amihud (2002) illiquidity ratio. And, $Liquidity_{t-1}^{S\&P500}$ is the negative value of log $Illiquidity^{S\&P500}$ at quarter *t-1*; $Illiquidity^{S\&P500}$ is the mean value of Amihud (2002) illiquidity ratio for S&P 500 firms in the same industry based on the Fama-French (1997) 48-industry classifications in the same quarter. Because Fang, Noe, and Tice (2009) indicate that S&P 500 firms are selected as leaders in each industry, we can also call $Liquidity^{S\&P500}$ as leaders' liquidity. $X_{i,t-1}$ is a set of one-quarter lagged control variables, including *Book D*/A, *market-to-book*, *tangibility*, *profitability*, *selling expense*, *R&D expense*, *R&D dummy*, *size*, and *log(1+Age)*. η_i controls for the firm-specific unobserved fixed effects; ν_t controls for the year-quarter fixed effects. And, $\varepsilon_{i,t}$ is the error term assumed to be heteroskedastic and within-firm correlated. We therefore run the panel regressions with the standard errors adjusted for heteroskedasticity and clustered at the firm-level.

Column (1) of Table 2.2 shows the panel regression results of net debt issuance for all firms. We can find that both a firm's own liquidity and leaders' liquidity can significantly determine net debt issuance. Firms issue more debt as their equities become more liquid. A one standard deviation increase in liquidity leads to a 0.637% increase in the net debt issuance for all firms in the next quarter, all else being equal. In contrast, as the equities of S&P 500 firms in the same industry become more liquid, firms will have higher cost of issuing debt. A one standard deviation increase in leaders' liquidity leads to a 0.545%

decrease in the net debt issuance for all firms in the next quarter, all else being equal. In columns (2) and (3) of Table 2.2, we treat NYSE/AMEX firms and NASDAQ firms separately and have similar results.

Column (4) of Table 2.2 shows the panel regression results of net equity issuance for all firms. As suggested by the previous studies, a firm's own liquidity is an important determinant of net equity issuance. A one standard deviation increase in liquidity leads to a 0.528% increase in the net equity issuance for all firms in the next quarter, all else being equal. However, unlike the significant effect on net debt issuance, leaders' liquidity is found to have almost no effect on a firm's net equity issuance. In columns (5) and (6) of Table 2.2, treating NYSE/AMEX firms and NASDAQ firms separately in analysis can also produce similar results.

The estimation results for the set of the control variables show that book leverage, profitability, R&D dummy, and firm size are significantly negative, whereas tangibility is significantly positive, in the net debt issuance regressions. These results are consistent with prior studies and suggest that more profitable firms need less debt, and firms with higher leverage and less transparent firms (i.e., those do not report their R&D expenses) tend to have lower debt capacity and issue less debt, while firms with more tangible assets (for collateral) tend to have higher debt capacity and issue more debt. As for the net equity issuance regressions, book leverage and market-to-book are significantly positive, but firm size is significantly negative. These results suggest that higher-growth firms, smaller firms, and higher-leverage firms tend to issue more equity.

Overall, the most interesting implication from our panel regressions is that, after controlling for firm-level characteristics and year-quarter and firm-fixed effects, the significant effect of leaders' liquidity on net debt issuance presents empirical evidence of the existence of information spillover from equity market to debt market and suggests that leaders' liquidity can be used as a measure of the cost of issuing debt.

Table 2.2
The Effects of a Firm's Own Liquidity and Leaders' Liquidity on Net Debt Issuance and on Net Equity Issuance

Columns (1) to (3) present $\frac{\Delta D}{A_{t-1}}$ regression. Columns (4) to (6) present $\frac{\Delta E}{A_{t-1}}$ regression. For each regression model, the estimation results for all firms, the NYSE/AMEX firms, and the NASDAQ firms are shown respectively. See Table 2.1 for the definitions of the explanatory variables. We control for firm fixed effects and year-quarter fixed effects in each regression. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	$\frac{\Delta D}{A_{t-1}}$(%)			$\frac{\Delta E}{A_{t-1}}$(%)		
	(1)	(2)	(3)	(4)	(5)	(6)
	All firms	NYSE/AMEX	NASDAQ	All firms	NYSE/AMEX	NASDAQ
Constant	6.659***	7.834***	5.537***	-5.944***	-1.766	-9.360***
	(5.627)	(3.942)	(3.574)	(-5.345)	(-1.571)	(-4.994)
$Liquidity_{t-1}$	0.603***	0.794***	0.494***	0.500***	0.513***	0.632***
	(5.436)	(4.137)	(3.424)	(4.725)	(3.537)	(4.229)
$Liquidity^{S\&P500}_{t-1}$	-0.828***	-0.762**	-0.847***	0.289	0.161	0.398
	(-4.332)	(-2.497)	(-3.458)	(1.593)	(0.907)	(1.392)
$Book\ D_{t-1}/A_{t-1}$	-16.134***	-15.062***	-18.989***	9.188***	6.681***	11.618***
	(-26.063)	(-16.294)	(-21.411)	(16.950)	(7.742)	(14.975)
$Market\text{-}to\text{-}book_{t-1}$	0.204***	0.415**	0.151*	1.861***	0.977***	2.081***
	(2.784)	(2.449)	(1.802)	(14.724)	(5.823)	(13.084)
$Tangibility_{t-1}$	7.144***	5.270***	9.319***	2.049***	0.201	3.816***
	(8.738)	(4.576)	(8.039)	(3.054)	(0.276)	(3.489)
$Profitability_{t-1}$	-14.538***	-20.483***	-11.938***	4.010*	3.860	5.889*
	(-5.246)	(-4.625)	(-3.386)	(1.703)	(1.484)	(1.745)
$Selling\ expense_{t-1}$	0.242	0.525	0.236	0.588	-0.186	0.982
	(0.331)	(0.310)	(0.275)	(0.585)	(-0.162)	(0.729)
$R\&D\ expense_{t-1}$	-1.120*	2.574	-1.454**	1.231	-0.973	1.314
	(-1.854)	(1.272)	(-2.345)	(0.707)	(-0.956)	(0.642)
$R\&D\ dummy_{t-1}$	-0.710***	-0.716***	-0.362	0.105	0.146	0.121
	(-4.172)	(-3.025)	(-1.351)	(0.513)	(1.013)	(0.319)
$Size_{t-1}$	-1.390***	-1.894***	-1.211***	-3.024***	-2.220***	-4.027***
	(-7.351)	(-6.775)	(-4.351)	(-16.504)	(-9.903)	(-13.604)
$Log(1+Age)_{t-1}$	-0.150	0.065	-0.284	0.410	0.150	0.497
	(-0.418)	(0.123)	(-0.513)	(1.231)	(0.534)	(0.763)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.066	0.061	0.078	0.096	0.076	0.096
Obs.	92,804	37,935	54,869	89,412	36,265	53,147

2.4. Leaders' liquidity, liquidity closeness, and debt-equity choices

So far, we have discussed the determinants of net debt issuance and the determinants of net equity issuance as if they are somewhat two separate corporate decisions. After realizing that leaders' liquidity plays an important role in a firm's net debt issuance, we further examine the possibility that it can also affect a firm's decisions to raise capital in the debt market or in the equity market.

In order to elaborate the role of leaders' liquidity in debt-equity choices, we first use the following Probit specification:

$$P\left(y_{i,t}=1\right)=\Phi(\alpha+\beta_1 Liquidity_{t-1}+\beta_2 Liquidity_{t-1}^{S\&P500}+\gamma' X_{i,t-1}+\eta_{IND}+\nu_t+\varepsilon_{i,t}). \quad (2.3)$$

The above specification controls for industry fixed effects (ξ_{IND}) based on the Fama-French (1997) 48-industry classification and time fixed effects (ν_t).[7] We estimate equation (2.3) by using only firm-quarter observations with significant amount of debt or equity being raised. Specifically, following Leary and Roberts (2005, 2010) and Lemmon and Zender (2010), we use 5% cutoff for identifying firm-quarter observations with significant issuance of debt or equity. Accordingly, $y_{i,t}$ is equal to one if firm *i*'s net debt issuance in quarter *t* exceeds 5% of its pre-issue value of total assets, (i.e., $\frac{\Delta D_t}{A_{t-1}} > 5\%$); and zero if firm *i*'s net equity issuance in quarter *t* exceeds 5% of its pre-issue value of total assets (i.e., $\frac{\Delta E_t}{A_{t-1}} > 5\%$). We exclude firm-quarter observations with mixed debt and equity issuances. In our sample, when raising external capital, the majority of firms rely on debt (67.61%=8,091/11,968).

[7] Similar to the Probit regressions in Tables 7 and 8 of Hovakimian (2006), we do not report constant term in the debt-equity choice in Table 2.3.

Table 2.3
Probit Analysis of the Choice between Debt and Equity:
Leaders' Liquidity and Liquidity Closeness

This table presents the results of the Probit model for debt-equity choices with the dependent variable equals one for debt issuance and zero for equity issuance. We estimate the model with net debt issuance in a quarter exceeding 5% of the pre-issue value of total assets or net equity issuance in a quarter exceeding 5% of the pre-issue value of total assets. We report the estimated coefficients from the maximum likelihood Probit model. In columns (1) to (3), we examine the role of leaders' liquidity in debt-equity choices. And, we also define liquidity closeness as the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity^{S\&P500}_{t-1}$ and examine its effects on debt-equity choices from columns (4) to (6). We control for year-quarter fixed effects and Fama-French (1997) 48-industry indicator variables in each regression. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	5% cutoff					
	Debt issuance vs. Equity issuance (1,0)					
	(1)	(2)	(3)	(4)	(5)	(6)
	All firms	NYSE/AMEX	NASDAQ	All firms	NYSE/AMEX	NASDAQ
$Liquidity_{t-1}$	-0.159***	-0.163**	-0.188***			
	(-4.790)	(-2.567)	(-4.721)			
$Liquidity^{S\&P500}_{t-1}$	-0.194***	-0.238*	-0.183**			
	(-2.634)	(-1.865)	(-2.041)			
$abs(Liquidity_{t-1}-Liquidity^{S\&P500}_{t-1})$				0.109***	0.081	0.140***
				(3.515)	(1.411)	(3.742)
$Book\ D_{t-1}/A_{t-1}$	-0.554***	-0.919***	-0.460***	-0.516***	-0.867***	-0.420***
	(-4.988)	(-4.757)	(-3.348)	(-4.673)	(-4.547)	(-3.064)
$Market\text{-}to\text{-}book_{t-1}$	-0.242***	-0.181***	-0.247***	-0.262***	-0.212***	-0.266***
	(-11.513)	(-4.164)	(-10.847)	(-12.743)	(-5.066)	(-11.940)
$Tangibility_{t-1}$	0.659***	0.614***	0.747***	0.661***	0.622***	0.745***
	(6.141)	(3.331)	(5.692)	(6.197)	(3.386)	(5.706)
$Profitability_{t-1}$	-0.646	-1.265	-1.092	-0.707	-1.489	-1.127
	(-0.977)	(-1.042)	(-1.433)	(-1.070)	(-1.233)	(-1.479)
$Selling\ expense_{t-1}$	-0.216*	0.181	-0.334**	-0.229*	0.163	-0.345**
	(-1.675)	(0.665)	(-2.324)	(-1.779)	(0.595)	(-2.407)
$R\&D\ expense_{t-1}$	-2.010***	-1.505*	-1.671***	-1.970***	-1.396*	-1.650***
	(-5.432)	(-1.939)	(-4.413)	(-5.357)	(-1.849)	(-4.362)
$R\&D\ dummy_{t-1}$	0.104*	-0.071	0.204***	0.101*	-0.063	0.197***
	(1.926)	(-0.792)	(3.075)	(1.873)	(-0.711)	(2.974)
$Size_{t-1}$	0.143***	0.095*	0.171***	0.107***	0.043	0.139***
	(5.005)	(1.944)	(4.852)	(3.990)	(0.964)	(4.109)
$Log(1+Age)_{t-1}$	-0.013	-0.089***	0.012	-0.011	-0.089***	0.018
	(-0.581)	(-2.700)	(0.403)	(-0.492)	(-2.702)	(0.614)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.154	0.103	0.187	0.152	0.101	0.185
Obs.	11,968	4,461	7,505	11,968	4,461	7,505

Columns (1) to (3) of Table 2.3 report the Probit analysis results of equation (2.3). It shows that both a firm's own liquidity and leaders' liquidity largely command a firm's debt-equity choices. $Liquidity_{t-1}$ is significantly negative with a coefficient of -0.159 (*t*-value=-4.790), and $Liquidity_{t-1}^{S\&P500}$ is significantly negative with a coefficient of -0.194 (*t*-value=-2.634). In columns (2) and (3), we can have similar results when treating NYSE/AMEX firms and NASDAQ firms separately. All these results show that firms tend to issue equity when their stock liquidity is high and their leader firms' liquidity is high.

Our finding that liquid firms prefer equity over debt is consistent with the previous studies. Further, we also find that firms rely more on equity financing when the stocks of S&P 500 firms in the same industry are more liquid. And, the statistically significant and negative relationship between leaders' liquidity and net debt issuance indicates that leaders' liquidity can play an important role in a firm's debt-equity choices because of measuring the cost of issuing debt. Accordingly, we then question whether and how leaders' liquidity can drive liquid firms' debt-equity choices.

Given that leader firms have higher liquidity of equity than other firms in the same industry and that firms tend to issue equity as leaders' liquidity improves, we discuss whether liquid firms can prefer equity over debt when their liquidity is close to leaders' liquidity and whether illiquid firms can prefer debt over equity when their liquidity is far from leaders' liquidity. And, we modify the Probit specification of equation (2.3) by measuring the closeness between a firm's own liquidity and leaders' liquidity:

$$P\left(y_{i,t}=1\right)=\Phi(\alpha+\beta_1 abs(Liquidity_{t-1}-Liquidity_{t-1}^{S\&P500})+\gamma' X_{i,t-1}+\eta_{IND}+\nu_t+\varepsilon_{i,t}), \qquad (2.4)$$

where $abs(Liquidity_{t-1}-Liquidity_{t-1}^{S\&P500})$ is the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity_{t-1}^{S\&P500}$, measuring the closeness between a firm's own liquidity and leaders' liquidity.

Columns (4) to (6) of Table 2.3 report the estimation results of equation (2.4). We find that

firms tend to issue equity when their liquidity of equity is more close to leaders' liquidity. $abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$ is significantly positive with a coefficient is 0.109 (*t*-value=3.515). In columns (5) and (6), although we can all have positive coefficients by treating NYSE/AMEX firms and NASDAQ firms separately, it is shown that the closeness between a firm's own liquidity and leaders' liquidity can better affect NASDAQ firms' debt-equity choices.

Moreover, we also round $abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$ to the integer and have 5,557 observations whose nearest integer of $abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$ is zero. This is the group in which a firm's own liquidity is almost equal to leaders' liquidity. In Table 2.4, we report the average liquidity, average leaders' liquidity, and average net debt issuance, average net equity issuance and average debt-equity choice for each group. We can see that the difference between $Liquidity_{t-1}$ and $Liquidity_{t-1}^{S\&P500}$ can be enlarged as a firm's equities become less liquid and leader firms' equities become more liquid. And, the increases in the average debt-equity choices as the value of $abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$ also show that illiquid firms can prefer debt over equity at the time when leaders' liquidity improves. For each group, we further define two subgroups as leader firms with higher liquidity and leader firms with lower liquidity by using the median value of leaders' liquidity in that group. And, we can find significant difference in the average debt-equity choices for the two subgroups except for the firms whose liquidity is more close to leaders' liquidity. Firms on average tend to issue equity when their leaders' liquidity is more liquid and that firms on average tend to issue debt when their leaders' liquidity is less liquid. Accordingly, our findings show that leaders' liquidity can be used by a firm to evaluate whether it has higher cost of issuing debt or higher cost of issuing equity.

Table 2.4
Group Analysis

In this table, firms are grouped based on the nearest integer of the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity^{S\&P500}_{t-1}$. We have five groups: the nearest integer=0, the nearest integer=1, the nearest integer=2, the nearest integer=3, the nearest integer>=4. For each group, the average liquidity, average leaders' liquidity, average net debt issuance, average net equity issuance, and average debt-equity choice are reported. And, we also use the median value of leaders' liquidity in that group to further define two subgroups as leader firms with higher liquidity and leader firms with lower liquidity. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, for the *t*-test on the difference of means between two subgroups and on the difference of means between the group of the nearest integer=0 and other four groups.

Nearest integer of $abs(Liquidity_{t-1}-Liquidity^{S\&P500}_{t-1})$		$Liquidity_{t-1}$	$Liquidity^{S\&P500}_{t-1}$	*Net debt issuance*$_t$	*Net equity issuance*$_t$	*Debt-Equity choice*
0		3.063	3.302	1.186	1.104	0.662
	$Liquidity^{S\&P500}_{t-1}$>= 3.258	3.611***	3.882***	1.214	0.979	0.671
	$Liquidity^{S\&P500}_{t-1}$< 3.258	2.515	2.722	1.158	1.231	0.655
1		2.470***	3.520***	1.092	1.161	0.665
	$Liquidity^{S\&P500}_{t-1}$>= 3.509	3.049***	4.105***	0.879***	1.027***	0.608***
	$Liquidity^{S\&P500}_{t-1}$< 3.509	1.892	2.936	1.305	1.296	0.707
2		1.554***	3.533***	0.996	1.548***	0.653
	$Liquidity^{S\&P500}_{t-1}$>= 3.499	2.097***	4.074***	0.798***	1.591	0.582***
	$Liquidity^{S\&P500}_{t-1}$< 3.499	1.014	2.994	1.195	1.505	0.704
3		0.715***	3.636***	1.071	1.223	0.721***
	$Liquidity^{S\&P500}_{t-1}$>= 3.631	1.175***	4.120***	0.725***	1.570***	0.634***
	$Liquidity^{S\&P500}_{t-1}$< 3.631	0.260	3.156	1.414	0.876	0.788
>=4		0.119***	4.028***	0.741***	0.864	0.730***
	$Liquidity^{S\&P500}_{t-1}$>= 4.043	0.493***	4.400***	0.553**	0.956	0.685*
	$Liquidity^{S\&P500}_{t-1}$< 4.043	-0.178	3.593	1.035	0.837	0.759

2.5. Possible channels

2.5.1 Debt capacity

Although we find that leaders' liquidity as a measure of the cost of issuing debt can play an important role, we have not examined the underlying channels that liquid firms can preserve debt capacity for future investment and that it is the information that spills over from equity market to debt market through stock liquidity. As suggested by Lemmon and Zender (2010), debt capacity concerns strongly affect a firm's financing behaviors. To preserve debt capacity for future investments, a firm should prefer equity over debt. And, those firms with less debt capacity concerns should be able to issue debt. In order to first examine whether liquid firms have to preserve debt capacity, we use Hahn and Lee's (2009) unused debt capacity measured

by modifying Almeida and Campello's (2007) tangibility measures to subtract book value of total debt from the expected asset liquidation value:

$$\textit{Unused debt capacity} = \frac{\textit{cash holdings(CHEQ)} + 0.715*\textit{receivables(RECTQ)} + 0.547*\textit{inventories(INVTQ)} + 0.535*\textit{property, plant and equipment(PPENTQ)}}{\textit{total assets(ATQ)}} - \frac{\textit{total debt (DLTTQ+DLC)}}{\textit{total assets(ATQ)}}. \quad (2.5)$$

The Pearson correlation coefficient between $Liquidity_{t-1}$ and $Unused\ debt\ capacity_{t-1}$ is -0.108 (p-value=0.000). This suggests the possibility that liquid firms have less unused debt capacity.

Based on the results of closeness between a firm's own liquidity and leaders' liquidity, we next discuss whether less debt capacity concerns can be the reason for a firm whose liquidity is far from leaders' liquidity to prefer debt financing. By comparing a firm's own unused debt capacity with leader firms' unused debt capacity, we are able to examine whether difference in unused debt capacity can be the channel through which a firm whose liquidity is more close to leaders' liquidity can decide whether to issue equity for preserving debt capacity if it takes leader firms' unused debt capacity as benchmark. In addition, we also compare book leverage, firm size, market-to-book ratio, and firm age. In Panel A of Table 2.5, we first report the correlation matrix. Similar to the definition of $Liquidity^{S\&P500}_{t-1}$, the five variables: $Unused\ debt\ capacity_{t-1}^{S\&P500}$, $Book\ D_{t-1}/A_{t-1}^{S\&P500}$, $Market\text{-}to\text{-}book_{t-1}^{S\&P500}$, $Size_{t-1}^{S\&P500}$, and $Age_{t-}^{S\&P500}$ are respectively the mean value of $Unused\ debt\ capacity_{t-1}$, $Book\ D_{t-1}/A_{t-1}$, $Market\text{-}to\text{-}book_{t-1}$, $Size_{t-1}$, and Age_{t-1} for S&P 500 firms in the same industry. As a firm's own liquidity is more close to leaders' liquidity, its unused debt capacity is also near the leaders' unused debt capacity. And, we also find that the other firm characteristics, such as book leverage, market-to-book ratio, firm size, and firm age are also close to the ones of leader firms. By grouping firms based on the nearest integer of $abs(Liquidity_{t-1} - Liquidity_{t-1}^{S\&P500})$, we can see that firms whose liquidity is far from leaders' liquidity on average are smaller and

younger with higher unused debt capacity, lower book leverage and lower market-to-book ratio from Panel B of Table 2.5.

Taken together, our findings show that liquid firms can have less unused debt capacity and that less liquid firms tend to issue debt because of less debt capacity concerns.

2.5.2 Firms' performance

After realizing that debt capacity concerns can be the underlying channel, we suggest that higher cost of issuing debt can make those less liquid firms who tend to issue debt because of more unused debt capacity have poor performance. In order to measure firms' performance, we follow Fang, Noe, Tice (2009) to use market-to-book ratio and its three components: price-operating earnings, financial leverage, and operating profitability. Because we cannot have the data of operating income after depreciation from quarterly COMPUSTAT, our operating earnings-to-price ratio, $OIBP_t$, is measured as the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by market value of equity at quarter *t*. LEV_t is market value of equity divided by market value of assets at quarter *t*. And, $OIBOA_t$ is also our profitability, measured as the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by book assets at quarter *t*. MB_t is our market-to-book ratio at quarter *t*. For each performance variable, we also have one-year average of the four quarters from quarter *t* to quarter *t+3* for analysis. We keep all the control variables and estimate the following regression model:

$$y_{i,t}=\alpha+\beta_1 abs(Liquidity_{t-1}-Liquidity_{t-1}^{S\&P500})+\gamma' X_{i,t-1}+\eta_i+\nu_t+\varepsilon_{i,t}, \qquad (2.6)$$

where $y_{i,t}$ is performance variable of firm *i* in quarter *t*.

Table 2.6 reports the estimation results.[8] We find that firms whose liquidity is near leaders' liquidity have better performance (higher *MB*), higher financial leverage (higher *LEV*), higher operating profitability (higher *OIBOA*), and lower riskiness (lower *OIBP*) in the next quarter.

[8] Overall, we have 92,804 firm-quarter observations. However, there is one NYSE/AMEX-listed firm, Katz Media Group Inc., with zero common shares outstanding recorded in COMPUSTAT in the second quarter of 1997. This can generate zero market value of equity and make *OIBP* missing value. We then have 92,803 firm-quarter observations when using *OIBP* as performance variable in estimation.

The lower operating earnings-to-price ratio for firms whose liquidity is more close to leaders' liquidity excludes the possibility of managerial myopia. And, firms whose liquidity is far from leaders' liquidity are found to have worse performance (lower *MB*), lower financial leverage (lower *LEV*), lower operating profitability (lower *OIBOA*), and higher riskiness (higher *OIBP*) in the next quarter. Using one-year average performance variables or treating NYSE/AMEX firms and NASDAQ firms separately in analysis can produce similar results. These results provide empirical evidence that more liquid firms can benefit from taking leaders' unused debt capacity as benchmark by issuing equity to preserve debt capacity.

Table 2.5
Unused Debt Capacity

In this table, we examine whether debt capacity concerns can be the channel through which a firm whose liquidity is more close to leaders' liquidity can decide whether to issue equity for preserving debt capacity if it takes leader firms' unused debt capacity as benchmark. Panel A reports the Pearson correlation matrix between the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity^{S\&P500}_{t-1}$, the difference between *Unused debt capacity*$_{t-1}$ and *Unused debt capacity*$_{t-1}^{S\&P500}$, the difference between *Book* D_{t-1}/A_{t-1} and *Book* $D_{t-1}/A_{t-1}^{S\&P500}$, the difference between *Market-to-book*$_{t-1}$ and *Market-to-book*$_{t-1}^{S\&P500}$, the difference between $Size_{t-1}$ and $Size_{t-1}^{S\&P500}$, the difference between Age_{t-1} and $Age_{t-1}^{S\&P500}$. Similar to the definition of $Liquidity^{S\&P500}_{t-1}$, the five variables: *Unused debt capacity*$_{t-1}^{S\&P500}$, *Book* $D_{t-1}/A_{t-1}^{S\&P500}$, *Market-to-book*$_{t-1}^{S\&P500}$, $Size_{t-1}^{S\&P500}$, and $Age_{t-1}^{S\&P500}$ are respectively the mean value of *Unused debt capacity*$_{t-1}$, *Book* D_{t-1}/A_{t-1}, *Market-to-book*$_{t-1}$, $Size_{t-1}$, and Age_{t-1} for S&P 500 firms in the same industry. In Panel B, we group firms based on the nearest integer of the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity^{S\&P500}_{t-1}$. There are five groups: the nearest integer=0, the nearest integer=1, the nearest integer=2, the nearest integer=3, the nearest integer>=4. For each group, we report the average of the absolute value of the difference between $Liquidity_{t-1}$ and $Liquidity^{S\&P500}_{t-1}$, the average of the difference between *Unused debt capacity*$_{t-1}$ and *Unused debt capacity*$_{t-1}^{S\&P500}$, the average of the difference between *Book* D_{t-1}/A_{t-1} and *Book* $D_{t-1}/A_{t-1}^{S\&P500}$, the average of the difference between *Market-to-book*$_{t-1}$ and *Market-to-book*$_{t-1}^{S\&P500}$, the average of the difference between $Size_{t-1}$ and $Size_{t-1}^{S\&P500}$, the average of the difference between Age_{t-1} and $Age_{t-1}^{S\&P500}$. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, for the *t*-test on the difference of means between the group of the nearest integer=0 and other four groups.

Panel A: Pearson correlation matrix

Variable	*abs(Liquidity*$_{t-1}$*-Liquidity*$^{S\&P500}_{t-1}$*)*	*Unused debt capacity*$_{t-1}$*-Unused debt capacity*$_{t-1}^{S\&P500}$	*Book* D_{t-1}/A_{t-1}*-Book* $D_{t-1}/A_{t-1}^{S\&P500}$	*Market-to-book*$_{t-1}$*-Market-to-book*$_{t-1}^{S\&P500}$	$Size_{t-1}$*-*$Size_{t-1}^{S\&P500}$	Age_{t-1}*-*$Age_{t-1}^{S\&P500}$
abs(Liquidity$_{t-1}$*-Liquidity*$^{S\&P500}_{t-1}$*)*	1.000					
Unused debt capacity$_{t-1}$*-Unused debt capacity*$_{t-1}^{S\&P500}$	0.104***	1.000				
Book D_{t-1}/A_{t-1}*-Book* $D_{t-1}/A_{t-1}^{S\&P500}$	-0.065***	-0.876***	1.000			
Market-to-book$_{t-1}$*-Market-to-book*$_{t-1}^{S\&P500}$	-0.229***	0.289***	-0.257***	1.000		
$Size_{t-1}$*-*$Size_{t-1}^{S\&P500}$	-0.703***	-0.380***	0.332***	-0.224***	1.000	
Age_{t-1}*-*$Age_{t-1}^{S\&P500}$	-0.063***	-0.069***	0.050***	-0.140***	0.199***	1.000

Panel B: Group analysis

Nearest integer of $abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$	$abs(Liquidity_{t-1}\text{-}Liquidity_{t-1}^{S\&P500})$	$Unused\ debt\ capacity_{t-1}\text{-}Unused\ debt\ capacity_{t-1}^{S\&P500}$	$Book\ D_{t-1}/A_{t-1}\text{-}Book\ D_{t-1}/A_{t-1}^{S\&P500}$	$Market\text{-}to\text{-}book_{t-1}\text{-}Market\text{-}to\text{-}book_{t-1}^{S\&P500}$	$Size_{t-1}\text{-}Size_{t-1}^{S\&P500}$	$Age_{t-1}\text{-}Age_{t-1}^{S\&P500}$
0	0.284	0.037	-0.015	0.190	-0.815	-16.683
1	1.055***	0.060***	-0.022***	-0.007***	-1.642***	-17.223
2	1.979***	0.092***	-0.036***	-0.268***	-2.538***	-19.416***
3	2.921***	0.106***	-0.041***	-0.512***	-3.259***	-21.725***
>=4	3.909***	0.143***	-0.062***	-0.656***	-4.002***	-21.951***

Table 2.6
Firms' Performance

We follow Fang, Noe, Tice (2009) to use market-to-book ratio as performance measurement and also employ the three components: price-operating earnings, financial leverage, and operating profitability of a firm's market-to-book ratio in analysis. $OIBP_t$ is our operating earnings-to-price ratio measured as the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by market value of equity at quarter *t*. LEV_t is computed as market value of equity divided by market value of assets at quarter *t*. And, $OIBOA_t$ is also our profitability, measured as the earnings before interest, taxes, depreciation and amortization (EBITDA) divided by book assets at quarter *t*. MB_t is our market-to-book ratio at quarter *t*. For each performance variable, one-year average of the four quarters from quarter *t* to quarter *t+3* is also used in analysis. Panel A shows the estimation results for all firms. Panel B and Panel C respectively show the results for the NYSE/AMEX firms and the NASDAQ firms. See Table 2.1 for the definitions of the explanatory variables. We control for firm fixed effects and year-quarter fixed effects in each regression. The standard errors adjust for heteroskedasticity and are clustered at the firm-level, and *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All firms

	$OIBP_t$	$\overline{OIBP_{t,t+3}}$	LEV_t	$\overline{LEV_{t,t+3}}$	$OIBOA_t$	$\overline{OIBOA_{t,t+3}}$	MB_t	$\overline{MB_{t,t+3}}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.002	0.009*	1.008***	0.964***	0.012***	0.020***	0.647***	1.056***
	(0.317)	(1.714)	(56.543)	(43.108)	(4.229)	(6.046)	(11.239)	(10.571)
abs(Liquidity$_{t-1}$-Liquidity$^{S\&P500}_{t-1}$)	0.007***	0.005***	-0.036***	-0.025***	-0.002***	-0.001***	-0.037***	-0.035***
	(13.780)	(11.505)	(-24.363)	(-15.076)	(-7.879)	(-4.337)	(-7.489)	(-4.522)
Book D_{t-1}/A_{t-1}	0.053***	0.044***	-0.687***	-0.565***	0.005***	0.005***	-0.021	0.002
	(20.023)	(16.750)	(-76.136)	(-54.104)	(4.010)	(3.583)	(-0.877)	(0.049)
Market-to-book$_{t-1}$	-0.004***	-0.004***	0.010***	0.009***	0.004***	0.003***	0.687***	0.477***
	(-13.170)	(-15.451)	(10.859)	(9.389)	(19.095)	(12.391)	(104.176)	(47.326)
Tangibility$_{t-1}$	0.002	0.013***	-0.041***	-0.056***	0.004**	0.009***	-0.236***	-0.344***
	(0.532)	(3.576)	(-3.515)	(-3.872)	(2.118)	(4.234)	(-6.531)	(-5.514)
Profitability$_{t-1}$	0.218***	0.167***	0.494***	0.405***	0.392***	0.313***	3.443***	3.436***
	(14.623)	(16.436)	(17.094)	(12.398)	(29.713)	(31.881)	(24.515)	(17.009)
Selling expense$_{t-1}$	-0.009***	-0.008***	0.050***	0.041***	-0.011***	-0.007**	0.188***	0.306***
	(-2.750)	(-2.587)	(5.812)	(3.883)	(-3.632)	(-2.533)	(3.698)	(4.143)
R&D expense$_{t-1}$	-0.009***	-0.006***	0.028***	0.026***	-0.014***	-0.008***	0.000	0.072
	(-3.951)	(-3.204)	(4.561)	(3.588)	(-5.124)	(-3.368)	(0.006)	(0.834)
R&D dummy$_{t-1}$	0.002*	-0.001*	0.005**	0.004*	0.000	-0.001**	-0.012	-0.003
	(1.952)	(-1.870)	(2.402)	(1.802)	(0.802)	(-2.460)	(-1.312)	(-0.256)
Size$_{t-1}$	0.005***	0.004***	-0.047***	-0.048***	-0.004***	-0.006***	-0.133***	-0.218***
	(7.413)	(5.615)	(-21.222)	(-17.806)	(-13.067)	(-14.568)	(-16.504)	(-16.359)
Log(1+Age)$_{t-1}$	0.003*	0.003	-0.004	0.002	0.004***	0.003**	-0.046***	-0.060*
	(1.810)	(1.545)	(-0.690)	(0.246)	(4.204)	(2.531)	(-2.688)	(-1.923)
Adjusted R^2	0.450	0.689	0.875	0.871	0.546	0.698	0.816	0.808
Obs.	92,803	74,590	92,804	74,591	92,804	74,591	92,804	74,591

Panel B: NYSE/AMEX firms

	$OIBP_t$	$\overline{OIBP_{t,t+3}}$	LEV_t	$\overline{LEV_{t,t+3}}$	$OIBOA_t$	$\overline{OIBOA_{t,t+3}}$	MB_t	$\overline{MB_{t,t+3}}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.001	0.015	1.033***	0.998***	0.011**	0.021***	0.383***	0.762***
	(-0.062)	(1.570)	(32.841)	(26.583)	(2.176)	(4.145)	(5.828)	(6.686)
abs(Liquidity$_{t-1}$-Liquidity$^{S\&P500}_{t-1}$)	0.010***	0.007***	-0.050***	-0.038***	-0.002***	-0.001***	-0.022***	-0.028***
	(11.291)	(9.098)	(-18.225)	(-12.674)	(-4.341)	(-3.247)	(-3.620)	(-2.735)
Book D_{t-1}/A_{t-1}	0.054***	0.044***	-0.708***	-0.577***	0.003	0.003	-0.024	0.020
	(13.064)	(10.604)	(-52.838)	(-37.959)	(1.495)	(1.539)	(-0.981)	(0.460)
Market-to-book$_{t-1}$	-0.006***	-0.006***	0.028***	0.024***	0.007***	0.005***	0.754***	0.564***
	(-9.306)	(-10.889)	(9.604)	(8.736)	(12.026)	(8.825)	(73.918)	(35.216)
Tangibility$_{t-1}$	0.005	0.011*	-0.061***	-0.069***	0.006*	0.008**	-0.135***	-0.218***
	(0.803)	(1.835)	(-2.979)	(-2.659)	(1.839)	(2.335)	(-3.393)	(-3.010)
Profitability$_{t-1}$	0.238***	0.199***	0.609***	0.486***	0.351***	0.310***	2.589***	2.688***
	(9.408)	(10.449)	(11.683)	(8.297)	(16.595)	(19.457)	(14.223)	(11.111)
Selling expense$_{t-1}$	0.003	0.002	0.040**	0.035	0.006	0.002	0.031	0.002
	(0.300)	(0.260)	(2.094)	(1.531)	(0.818)	(0.487)	(0.499)	(0.017)
R&D expense$_{t-1}$	-0.015**	-0.002	0.017	0.005	-0.022***	-0.003	0.125	-0.012
	(-2.459)	(-0.544)	(0.820)	(0.218)	(-4.063)	(-0.846)	(1.058)	(-0.102)
R&D dummy$_{t-1}$	0.002	-0.001	0.007**	0.006*	0.001	-0.000	0.005	-0.001
	(1.236)	(-0.999)	(2.339)	(1.711)	(0.967)	(-0.307)	(0.510)	(-0.073)
Size$_{t-1}$	0.009***	0.007***	-0.060***	-0.064***	-0.003***	-0.005***	-0.071***	-0.144***
	(6.363)	(5.011)	(-15.416)	(-12.985)	(-5.151)	(-7.055)	(-9.074)	(-10.339)
Log(1+Age)$_{t-1}$	0.001	-0.000	-0.008	-0.004	0.002	0.001	-0.001	0.005
	(0.514)	(-0.013)	(-0.882)	(-0.410)	(1.285)	(0.722)	(-0.049)	(0.145)
Adjusted R^2	0.434	0.671	0.874	0.867	0.522	0.705	0.874	0.854
Obs.	37,934	31,519	37,935	31,520	37,935	31,520	37,935	31,520

Panel C: NASDAQ firms

	$OIBP_t$	$\overline{OIBP_{t,t+3}}$	LEV_t	$\overline{LEV_{t,t+3}}$	$OIBOA_t$	$\overline{OIBOA_{t,t+3}}$	MB_t	$\overline{MB_{t,t+3}}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.001	0.002	1.025***	0.979***	0.008**	0.017***	0.839***	1.358***
	(-0.192)	(0.307)	(49.280)	(35.633)	(2.171)	(3.397)	(9.340)	(8.519)
$abs(Liquidity_{t-1}\text{-}Liquidity^{S\&P500}_{t-1})$	0.005***	0.003***	-0.028***	-0.017***	-0.002***	-0.001***	-0.044***	-0.039***
	(8.616)	(7.232)	(-16.999)	(-9.222)	(-6.504)	(-3.189)	(-6.280)	(-3.573)
$Book\ D_{t-1}/A_{t-1}$	0.048***	0.040***	-0.645***	-0.515***	0.006***	0.007***	0.004	0.019
	(14.704)	(13.083)	(-54.793)	(-37.423)	(4.316)	(3.738)	(0.091)	(0.279)
$Market\text{-}to\text{-}book_{t-1}$	-0.003***	-0.003***	0.006***	0.005***	0.004***	0.002***	0.656***	0.435***
	(-9.852)	(-11.780)	(7.143)	(5.785)	(15.139)	(9.118)	(79.000)	(34.513)
$Tangibility_{t-1}$	0.000	0.015***	-0.037***	-0.061***	0.001	0.009***	-0.329***	-0.473***
	(0.044)	(3.356)	(-3.006)	(-4.037)	(0.546)	(2.883)	(-5.764)	(-4.874)
$Profitability_{t-1}$	0.195***	0.139***	0.366***	0.293***	0.389***	0.288***	3.808***	3.593***
	(11.082)	(12.765)	(11.902)	(8.386)	(23.656)	(23.993)	(19.186)	(12.242)
$Selling\ expense_{t-1}$	-0.014***	-0.012***	0.033***	0.023**	-0.017***	-0.014***	0.244***	0.381***
	(-4.442)	(-4.052)	(3.596)	(1.979)	(-5.472)	(-3.815)	(3.636)	(3.903)
$R\&D\ expense_{t-1}$	-0.007***	-0.006***	0.021***	0.019***	-0.011***	-0.009***	-0.033	0.041
	(-3.144)	(-3.096)	(3.900)	(2.989)	(-3.980)	(-3.486)	(-0.394)	(0.418)
$R\&D\ dummy_{t-1}$	0.001	-0.001	0.002	-0.001	0.000	-0.002***	-0.026*	-0.015
	(1.062)	(-1.588)	(0.695)	(-0.226)	(0.199)	(-2.676)	(-1.699)	(-0.734)
$Size_{t-1}$	0.002***	0.001	-0.038***	-0.039***	-0.006***	-0.007***	-0.182***	-0.289***
	(2.858)	(1.518)	(-15.446)	(-12.514)	(-11.804)	(-12.114)	(-13.542)	(-12.866)
$Log(1+Age)_{t-1}$	0.007***	0.006**	-0.012	-0.003	0.006***	0.005***	-0.111***	-0.164***
	(2.661)	(2.472)	(-1.419)	(-0.309)	(4.620)	(2.665)	(-3.565)	(-2.892)
Adjusted R^2	0.455	0.710	0.874	0.875	0.563	0.707	0.786	0.784
Obs.	54,869	43,071	54,869	43,071	54,869	43,071	54,869	43,071

2.6. Conclusion

This study is motivated by two seemingly conflicting findings in the literature: (i) debt-issuers tend to have high stock liquidity, and (ii) firms time equity financing when stock liquidity is high. We find that these two findings can co-exist because of debt capacity concerns as the information spillover from equity market to debt market through stock liquidity. By examining the effects of equity liquidity of S&P 500 firms, also called as leaders, in the same industry on a firm's net debt issuance and net equity issuance, we present the evidence that leaders' liquidity can be used as a measure of the cost of issuing debt in support of the existence of the information spillover. It is the reason which makes stock liquidity also relevant to net debt issuance.

On the other hand, we measure the liquidity closeness as the absolute value of the difference between a firm's own liquidity and leaders' liquidity and find that firms whose liquidity is far from leaders' liquidity can tend to issue debt because of less debt capacity concerns. Further, higher cost of issuing debt can make those firms have poor performance. Thus, we empirically show that firms take leaders' unused debt capacity as benchmark to make their debt-equity choices and that to issue equity for preserving debt capacity makes liquid firms get better performance.

Chapter 3

The Externality of Debt Covenants: LBO Loans

3.1. Introduction

Staggering debt loan is one of the reasons that Energy Future Holdings Corp., the largest leveraged buyout in 2007, was filed for chapter 11 in 2014. And, Sbarro who agreed to a leveraged buyout deal in 2007 was filed for chapter 11 for the first time in 2011 because of debt load and fewer customers and filed for the second time in 2014.[1] Before bankruptcy, a firm can have higher debt burden and face increasing covenant pressure after agreeing to the leverage buyout (LBO) deal. Because significant amounts of debt are used in the acquisition, LBO borrowers' management has to perform with caution and have little room for error.

In an article posted on New York Times, Fabrikant (2009) describes that there is an increasing possibility that Clear Channel, the biggest leveraged buyout ever in the media business, can be in technical default and that other radio companies can be the surviving firms if they have the opportunity and capital structure to take market share from their peers, as pointed out by an equity analyst, Marci Ryvicker. This suggests the externality of debt covenants which is yet examined in the literature. We thus focus on the externality on cost of issuing debt to discuss whether and how LBO borrowers' technical default and tight financial covenants can be the opportunities for industry incumbents to raise their debt capital.

The role of debt covenant through which creditors will actively participate in firms' operating policies is emphasized by Chava and Roberts (2008), Gârleanu and Zwiebel (2009), Roberts and Sufi (2009), Nini, Smith, and Sufi (2009), Nini, Smith, and Sufi (2012), and Denis and Wang (2014). Chava and Roberts (2008) and Roberts and Sufi (2009) find that covenant violations lead to significant declines in capital expenditures and decreases in both net debt issuance and leverage ratio. Nini, Smith, and Sufi (2012) show that operating and stock price performances improve through an increase in CEO turnover after covenant violation. When directly studying the capital

[1] Top 10 bankruptcies of 2014 is available at http://www.lexology.com/library/detail.aspx?g=05c22dfb-8bdc-4cab-a1d0-2f7c9bc82eea

expenditure restrictions contained in the private loan agreement, Nini, Smith, and Sufi (2009) find that capital expenditure restrictions have a significant and negative impact on firms' investment but lead to subsequent increases in firms' valuation and operating performance. In the model of Gârleanu and Zwiebel (2009), creditors can get stronger control rights through tighter debt covenants. And, in the empirical work conducted by Denis and Wang (2014), creditors are found to be able to exercise control rights just through covenant renegotiations. Slightly different from the previous studies, Demiroglu and James (2010b) emphasize the signaling role of bank loan covenant and propose that borrowers use tight covenants when they expect improvements in future performance. While the literature has primarily focused on the relationship between debt covenants and borrowers' operations, we focus on financial covenant information in the LBO deals and intend to introduce a new dimension by analyzing whether and how industry incumbents' financing and operating policies can be changed in response to LBO borrowers' technical default and tight financial covenants. We provide evidence on these two primary questions: (1) Can LBO borrowers' technical default and covenant cushion affect industry incumbents' cost of debt financing? (2) Why their cost of issuing debt can be affected?

We obtain LBO loan data from DealScan database. However, as shown by Nini, Smith, and Sufi (2009), the Dealscan record of credit agreement can be incomplete. Through our text-search program based on individual Central Index Keys (CIKs), we have 202 actual loan contracts to 180 non-financial firms from EDGAR. Of all the financial covenants, performance covenants are written in the most loan agreements. And, Max. Debt to EBITDA covenant as the maximum value of the ratio of debt to EBITDA is the most commonly used and quarterly maintenance-based. We use the ratio of debt to EBITDA defined by the ratio of total debt on such fiscal quarter to EBITDA computed for the period of four consecutive quarters ended on such date in analysis and hand-collect post 1-quarter covenant threshold and post 1-year covenant threshold for each loan agreement. According to Chava and Roberts (2008), Demiroglu and James (2010b), and Denis and Wang (2014), covenant cushion as [1-(actual covenant accounting variable/covenant threshold)]

can be employed to characterize LBO borrowers and identify whether they are or are not in technical default of financial covenants. And, we can have the mean value of LBO borrowers' covenant cushion measures for each industry. We use Fama-French 48 industry classification to define industry incumbents. Further, based on lenders information, we are able to group borrowers having deals recorded in Dealscan into "same loan lenders group" and "different loan lenders group". We thus require that firms in our sample should have non-missing identification of loan lenders group and non-missing variables used in analysis. There are 10,786 observations for 1,963 incumbent firms in same loan lenders group and 6,428 observations for 1,301 incumbent firms in different loan lenders group.

We provide evidence on the externality of debt covenants by showing that incumbents can increase net debt issuance and have higher book leverage either when LBO borrowers are in technical default or when LBO borrowers' covenant pressure increases. And, compared with the situation that LBO borrowers are expected to have either the breach of covenant limits or uncomfortable closeness to covenant limits, the events of LBO borrowers' technical default and tight financial covenants can have real effect on incumbents' cost of issuing debt. We see that industry incumbents, especially for those with more LBO bank loan lenders, can issue more debt and have higher book leverage either when LBO borrowers are in technical violation of financial covenants or when LBO borrowers have increasing covenant pressure in one year after the loan agreements. And, consistent with the needs of monitoring, our findings also show that it is incumbents with high risk that can better take the opportunity to raise their debt capital. And, because of information asymmetry between the creditors and the industry incumbents, being monitored by banks can make high risk incumbent firms otherwise have greater market share.

To the best of our knowledge, we are the first to introduce a new dimension in the literature by presenting the evidence on the externality of debt covenants. Our findings can be important for incumbents to realize that being monitored by banks can facilitate their net debt issuing activities because high risk firms can better take the opportunity to issue debt. And, it can also be important

for those incumbents with low risk that they should understand the disadvantage of being monitored by banks because they can otherwise have market share grabbed by high risk incumbent firms.

The remainder of this study proceeds as follows. In Section 2, we develop the hypotheses for empirical tests. Section 3 discusses LBO loan data and covenant cushion. Section 4 presents sample construction and the primary empirical results. In Section 5, we examine incumbent firms' subsequent market share. Section 6 concludes.

3.2. Hypothesis Development

The key question in this study is whether debt covenants of LBO borrowers can have impacts on the other firms in the same industry. Previous studies have addressed the effects of covenants written in the loan agreements on borrowers' financing and operating policies. Chava and Roberts (2008) suggest that technical default can increase the subsequent cost of capital which leads to significant investment declines. More specifically, Roberts and Sufi (2009) indicate that covenant violation can be costly especially for debt financing. Differently, by emphasizing on the transfer of control rights and creditor intervention, Nini, Smith, and Sufi (2012) find improvement in both operating and stock price after a covenant violation. Even in the absence of technical default, creditor intervention can impact borrower's operation either through capital expenditure restrictions investigated by Nini, Smith, and Sufi (2009) or through debt renegotiations studied by Denis and Wang (2014).

Our first main hypothesis relates to the externality from LBO borrowers' debt covenants on the cost of debt financing. By using financial covenants which are accounting-based debt covenants, we are able to know whether LBO borrowers are more restricted to or can be more capable in compliance with debt covenants after the initiation of loan agreement. When the distance between borrowers' financial covenant and covenant threshold permitted by the loan contract is positive with greater amount, these borrowers are described as having more covenant slack, meaning that they are less restricted to and can be able to comply with the financial covenant. And, when the

distance is negative value, it means covenant violation and borrowers' being non-compliance with the financial covenant. We already know that covenant violation can increase borrower's cost of debt capital. Accordingly, if all the borrowers have to share the increasing cost of debt capital, we should expect that incumbent firms' cost of issuing debt is increased. More specifically, they are expected to decrease their net debt issuance and have lower book leverage when LBO borrowers in the same industry are in technical violation of financial covenants. Alternatively, if the increasing cost of debt capital and the renegotiation cost associated with technical default are specific to the borrower, other firms in the same industry can otherwise tend to issue more debt because they now have the opportunity and debt capacity. In other words, we may expect that incumbent firms can have lower cost of debt financing. When the events of borrowers' breach of financial covenant limits occurred in the same industry, industry incumbents are expected to increase net debt issuance and have higher book leverage.

Hypothesis 1 (Cost of debt financing): Existing firms' cost of issuing debt can be affected by LBO borrowers' being or not being in violation of financial covenants.

If all the borrowers' cost of debt financing is increased when LBO borrowers in the same industry are in technical default:

Hypothesis 1a (Increases in cost of debt financing): Existing firms' net debt issuance and book leverage is negatively affected by LBO borrowers' breach of financial covenant limits.

If only LBO borrowers' cost of debt financing is increased and other existing firms' cost of debt financing can be decreased when LBO borrowers in the same industry are incapable to comply with financial covenants:

Hypothesis 1b (Decreases in cost of debt financing): Existing firms' net debt issuance and book leverage is positively affected by LBO borrowers' being in technical default of financial covenants.

Our second hypothesis relates to the reason why externality on the cost of debt issuance exists.

LBO borrowers' breach of financial covenant limits can have substantial uncertainty about the outcome of renegotiation and whether technical default can be triggered. If the uncertainty caused by covenant violation can prevent creditors from lending more money to the existing firms in the same industry, we should expect that industry incumbents whose loan lenders also participate in LBO loans are expected to have higher cost of debt issuance. And, creditors can also lend less money to the existing firms whose loan lenders are different as the ones participating in LBO loans. On the other hand, if industry incumbents are observed to have the opportunity to issue debt, creditors can be more willing to lend their money to the existing firms with loan lenders also participating in LBO loans existing firms because of monitoring from LBO bank loan lenders. And, the needs of monitoring should also suggest that industry incumbents with high risk can issue more debt and have higher book leverage when LBO borrowers have breach of financial covenant limits.

Hypothesis 2a (Industry uncertainty): All industry incumbents, especially for those existing firms with loan lenders also participating in LBO loans, are expected to have higher cost of debt issuance when LBO borrowers are in technical violation of financial covenants.

Hypothesis 2b (Monitoring from LBO bank loan lenders): The existing firms whose loan lenders also participate in LBO loans, especially for those with more LBO bank loan lenders, are expected to have lower cost of debt issuance when LBO borrowers have breach of financial covenant limits.

Based on our first two hypotheses, we next develop the third hypothesis by further investigating whether and how industry incumbents' cost of debt financing can be affected by LBO borrowers' covenant cushion. Demiroglu and James (2010b) emphasize the signaling role of bank loan covenant that borrowers use tight covenants when they expect improvements in future performance. However, tighter debt covenants can make borrowers uncomfortable and bring the increasing pressure that leaves little room for error. If incumbent firms can also take the

opportunity to issue debt, they are expected to increase net debt issuance and have higher book leverage as LBO borrowers' covenant pressure increases.

Hypothesis 3 (Externality of covenant cushion on cost of debt financing): Existing firms' cost of issuing debt can be negatively affected by LBO borrowers' covenant cushion. As LBO borrowers have uncomfortable closeness to covenant limits, they can issue more debt and have higher book leverage ratio.

3.3. LBO Loan Data and Covenant Cushion

3.3.1 LBO loan data

We obtain loan data from Reuters Loan Pricing Corporation's DealScan database. Loans or facilities, as the basic unit of the observation in DealScan, are often grouped into one deal or one package. And, one deal or one package represents one loan contract in which the borrower is restricted to debt covenants. Even though DealScan provides information on basic loan characteristics, one of our major concerns is the incompleteness of the information on financial covenants. In order to obtain the original credit agreement, we, thus, use Perl programming language to download and read relevant electronic filings from EDGAR.

Since May 6, 1996, all firms, especially public firms, are required to have electronic filings on EDGAR. Among all the material contracts, bank loan agreements are also required for disclosure. The loan contracts can be the attachments to the SEC's EDGAR electronic filings. For the period 1996 through 2012, there are 475,791 individual CIKs in the EDGAR database. We use Perl program and follow Nini, Smith, and Sufi (2009) to scan every 10-Q, 10-K, and 8-K filings. 10-Q is the quarterly report and 10-K is the annual report. 8-K is the current report filing. However, our procedures are slightly different as the ones employed by Nini, Smith, and Sufi (2009). We also scan every S-1 and S-4 filings in EDGAR. S-1 is the form relating to firms' initial public offering (IPO) and S-4 is the form relating to mergers or exchange offers. The filing frequency of 8-K is more than one million times (1,097,996). 10-Q is the second most common filings with more than four hundred thousand times (425,796). The filing frequency of 10-K is 132,824. There are 37,222

firms having 10-K filing, 27,754 firms having 10-Q filing, and 36,095 firms having 8-K filing. S-1 and S-4 filings are much less with 16,507 and 61,139 filing frequencies, respectively. 13,437 firms have S-1 filing and 36,794 firms have S-4 filing.

According to SEC exhibit list of regulation S-K, most loan contracts can fall within EX-4 and EX-10. In addition, we also find that some loan contracts can be included in EX-1, EX-3, EX-11, and EX-99. These exhibit numbers are specified as the beginning of text that we are looking for. To search and download the loan agreements, we follow Nini, Smith, and Sufi (2009) and use the following ten terms for the keywords of loan contracts: "CREDIT AGREEMENT," "LOAN AGREEMENT," "CREDIT FACILITY," "LOAN AND SECURITY AGREEMENT," "LOAN & SECURITY AGREEMENT," "REVOLVING CREDIT," "FINANCING AND SECURITY AGREEMENT," "FINANCING & SECURITY AGREEMENT," "CREDIT AND GUARANTEE AGREEMENT," "CREDIT & GUARANTEE AGREEMENT." And, the end string is "In witness whereof". All the above words are used as a set of text strings for us to search all the non-missing CIKs' filings. We then extract the texts which contain the specified keywords and possibly are the loan contracts from the filings.

Our first step for obtaining each firm's CIK is to include all the package data from Dealscan initiated during the period from January 1996 to December 2012 and keep the dollar-denominated private loans.[2] After using Compustat-Dealscan linking file provided by Chava and Roberts (2008) to match companies, we have 45,888 packages with Compustat gvkey identified. Because the file date is only up to August 2012, we then use non-missing ticker symbol in Dealscan and the company information in Compustat industrial quarterly files to match companies. We have 1,942 packages with Compustat gvkey identified. In order to extend the sample, we match company name in Dealscan and company legal name in Compustat. We extract and compare these two variables with length specified as 6, 9, 12, 15, 18, 21, 24, 27, 30, 35, 40, 45, 50, 55, 60, 65, and 70. Through this process, we have 6,962 packages with Compustat gvkey identified. We can use the

[2] Here, since other currencies-denominated loan agreement can also have financial covenants measured by other currencies, we only analyze dollar-denominated private loans for consistency.

total of 54,792 packages to identify the borrower's CIK for reading filings on EDGAR. There are 9,181 non-missing CIKs in the end.

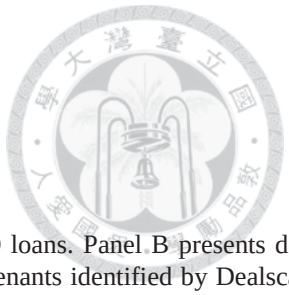


Table 3.1
LBO Loan Data

Panel A presents the time profile of total deal amount and loan contracts for our LBO loans. Panel B presents deal characteristics, including deal amount and details of financial covenants. Financial covenants identified by Dealscan, Financial covenants identified by contracts, performance covenant, capital covenant, coverage ratio covenant, debt to cash flow covenant, net worth covenant, debt to balance sheet covenant, liquidity covenant, minimum cash flow covenant, Max. Debt to EBITDA, Min. Fixed Charge Coverage, Min. Interest Coverage, Min. EBITDA, Max. Senior Debt to EBITDA, and capital expenditure restriction are all indicator variables. The number of financial covenants is the sum of all the financial covenants written in the loan contract. And, the structure of LBOs is also reported. Revolvers to LBO deal amount is the ratio of the amount of revolvers to LBO deal amount. Term A loans to LBO deal amount is the ratio of the amount of term A loans to LBO deal amount. Traditional bank debt includes revolvers and term A loans. Term B and other loans to LBO deal amount is the ratio of the amount of term B and other loans to LBO deal amount. Secured is equal to one if a loan is secured. Senior is equal to one if a loan is labeled as senior. All-in-drawn spread (bps) is the basis point spread over LIBOR. Panel C presents borrower characteristics. Total assets, book leverage ratio, market-to-book ratio, cash flow (operating income)/assets are measured as the average over four quarters prior to the loan agreement. Debt to EBITDA is the ratio of total debt on such fiscal quarter to EBITDA computed for the period of four consecutive quarters ended on such date prior to the loan agreement. Capital expenditure is the amount for the fiscal year prior to the loan contracts. Negative EBITDA is an indicator variable equal to one when EBITDA for the four consecutive quarters prior to the loan agreement is less than zero. Max (0, Debt to EBITDA) is the nonnegative value of Debt to EBITDA. Corporate credit rating is a dummy variable used to identify whether LBO borrower have a non-missing credit rating in the quarter prior to the loan contract. The value of credit rating is reported: firms with the highest rating (AAA) are valued 22 and firms with missing value are valued 0. Investment grade is an indicator which takes one if the S&P long-term issuer credit rating is BBB- or higher.

Panel A: Time profile of the total deal amount and loan contracts for our LBO loans

Year	Deal amount ($ in millions)	Number	Percentage
1996	2,986	9	5
1997	5,470	17	9
1998	5,453	25	13
1999	9,350	17	9
2000	3,145	7	3
2001	1,258	5	2
2002	3,010	7	3
2003	7,275	16	8
2004	11,937	28	15
2005	31,767	19	9
2006	41,555	15	7
2007	73,413	22	11
2008	25,032	6	3
2009	938	3	1
2010	2,175	3	1
2011	1,405	3	1
Total	226,173	202	100

Panel B: Deal characteristics and the structure of LBOs

Variable	Mean	Median	Standard deviation	N
Deal characteristics				
Deal amount ($ in millions)	1,120	302	2,525	202
Financial covenants identified by Dealscan{0,1}	0.366	0.000	0.483	202
Financial covenants identified by contracts{0,1}	0.911	1.000	0.286	202
Performance covenant{0,1}	0.911	1.000	0.286	202
Capital covenant{0,1}	0.079	0.000	0.271	202
Coverage ratio covenant{0,1}	0.817	1.000	0.388	202
Debt to cash flow covenant{0,1}	0.842	1.000	0.366	202
Net worth covenant{0,1}	0.050	0.000	0.217	202
Debt to balance sheet covenant{0,1}	0.020	0.000	0.140	202
Liquidity covenant{0,1}	0.015	0.000	0.121	202
Minimum cash flow covenant{0,1}	0.163	0.000	0.371	202
Max. Debt to EBITDA{0,1}	0.752	1.000	0.433	202
Min. Fixed Charge Coverage{0,1}	0.406	0.000	0.492	202
Min. Interest Coverage{0,1}	0.629	1.000	0.484	202
Min. EBITDA	0.163	0.000	0.371	202
Max. Senior Debt to EBITDA{0,1}	0.139	0.000	0.346	202
No. of financial covenants	2.351	2.000	1.222	202
Capital expenditure restriction{0,1}	0.728	1.000	0.446	202
Structure of LBOs				
Revolvers to LBO deal amount	0.348	0.233	0.289	186
Secured revolvers	0.946	1.000	0.214	186
Senior revolvers	1.000	1.000	0.000	186
Ratio of bank member in revolvers	0.500	0.500	0.237	186
Ratio of insurance member in revolvers	0.000	0.000	0.005	186
Ratio of other type member in revolvers	0.499	0.500	0.236	186
All-in-drawn spread (bps) of revolvers	264.785	250.000	72.023	186
Term A loans to LBO deal amount	0.296	0.274	0.125	55
Secured Term A loans	0.945	1.000	0.229	55
Senior Term A loans	1.000	1.000	0.000	55
Ratio of bank member in Term A loans	0.643	0.667	0.174	55
Ratio of insurance member in Term A loans	0.000	0.000	0.000	55
Ratio of other type member in Term A loans	0.357	0.333	0.174	55
All-in-drawn spread (bps) of Term A loans	266.364	250.000	50.910	55
Traditional bank debt to LBO deal amount	0.436	0.366	0.292	186
Secured Traditional bank debt	0.947	1.000	0.212	186
Senior Traditional bank debt	1.000	1.000	0.000	186
Ratio of bank member in Traditional bank debt	0.500	0.500	0.237	186
Ratio of insurance member in Traditional bank debt	0.000	0.000	0.005	186
Ratio of other type member in Traditional bank debt	0.499	0.500	0.237	186
All-in-drawn spread (bps) of Traditional bank debt	264.964	250.000	71.620	186
Term B and other loans to LBO deal amount	0.675	0.710	0.221	176
Secured Term B and other loans	0.871	1.000	0.303	176
Senior Term B and other loans	0.996	1.000	0.035	176
Ratio of bank member in Term B and other loans	0.388	0.333	0.257	176
Ratio of insurance member in Term B and other loans	0.018	0.000	0.056	176
Ratio of other type member in Term B and other loans	0.594	0.638	0.244	176
All-in-drawn spread (bps) of Term B and other loans	318.923	300.000	108.822	176

Panel C: Borrower characteristics

Variable	Mean	Median	Standard deviation	N
Total assets ($ in millions)	3,000	519	6,350	122
Book leverage ratio	0.423	0.406	0.304	113
Market-to-book ratio	1.411	1.180	0.680	65
Cash flow (operating income)/assets	0.050	0.043	0.036	111
Debt to EBITDA	-3.685	2.931	69.362	103
Capital expenditures ($ in millions)	182	30	455	115
Negative EBITDA {0,1}	0.027	0.000	0.163	111
Max (0, Debt to EBITDA)	3.167	2.931	3.164	103
Corporate credit rating {0,1}	0.704	1.000	0.444	117
Conditional on having credit rating:				
Credit rating (AAA=22; AA+=21; …)	10.063	9.833	2.057	80
Investment grade {0,1}	0.138	0.000	0.326	80

Of all the 54,792 packages, we can have 1,333 packages whose deal purposes are made for LBO. Because our search program is based on the firm's CIK, we then are able to use 811 packages with 468 non-missing CIKs and locate the credit agreement in EDGAR according to the date, the amount, the company name and all the other available background information provided by Dealscan. Our process yields 210 actual loan contracts. In the appendix, we discuss the possible unmatched reasons for only 26% match rate. After randomly selecting 30 unmatched package data and doing detailed search by hand, we find that most credit agreements which are written for LBO purposes have been already extracted. In our sample, we also require that both loan amount and interest spread of all the facilities in each deal should be nonmissing and are left with 632 packages made to 525 non-financial firms. Of these 632 packages, we have 202 contracts to 180 borrowers.[3]

Table 3.1 reports the summary statistics for the sample of 202 private loan agreements signed by 180 borrowers. Panel A of Table 3.1 presents the time profile of the year of the contracts. The

[3] When we require that both loan amount and interest spread of all the facilities in each deal made to non-financial firms are non-missing, match rate can be equal to 32%. Although it is still lower than Nini, Smith, and Sufi's (2009) 40% match rate, we only omit full contracts for 7% of the unmatched deals. In Nini, Smith, and Sufi's (2009) study, their text-search program can miss 41% of the unmatched deals with an actual loan agreement in EDGAR. One reason for low match rate is described by Nini, Smith, and Sufi (2009) that Reuters LPC may not have a copy of credit agreement when it records a bank loan in Dealscan data set. Here, we also provide the other reason for low match rate that LBOs usually occur in private firm. If private firms have initial public offering plans, they will have their financial information disclosed through S-1 filing in SEC EDGAR database. Of all 180 borrowers, Skype is this kind of private firm that we can have its LBO made in 2009. In contrast, if private firms do not intend to go public, we are unable to find full contract for the deal in EDGAR.

total deal amount dramatically increases during the LBO boom of 2004 to 2007 and reaches its highest value of $734 billion in 2007. And, the number of the credit agreements written during the LBO boom can be about 42% of our sample. This pattern is similar to time trends recorded by Demiroglu and James (2010a) and Shivdasani and Wang (2011).

Panel B of Table 3.1 presents summary statistics on deal characteristics. The average deal amount of $1,120 million is more than two times as large as the average deal amount of Nini, Smith, and Sufi's (2009) sample. When directly using the "Key Financial Ratios" information provided by Dealscan, we can have only 37% of our sample written with financial condition covenants. However, we use actual credit agreement to identify whether financial covenants are applied and find that 91% of the borrowers are required to maintain certain financial standards in their credit agreements. In other words, our findings question the accuracy and the reliability of directly using the reporting on financial covenants from Dealscan in analysis. Based on Christensen and Nikolaev's (2012) classification, over 90% of the deals contain performance covenants and only 8% of the borrowers are restricted with capital covenants. Coverage covenant and Debt to cash flow covenant are the two groups of financial covenants used mostly in the private loan contracts. And, we also list the five commonly used financial covenants as follows: Max. Debt to EBITDA (75%), Min. Fixed Charge Coverage (41%), Min. Interest Coverage (63%), Min. EBITDA (16%), and Max. Senior Debt to EBITDA (14%). On average, our sample of 202 credit agreements contains two financial covenants. Compared with Nini, Smith, and Sufi's (2009) sample, our sample of LBO deals is more restrictive on the borrowers. In addition to the financial covenants, about 73% of the agreements have a capital expenditure restriction. We further use 527 loans grouped into these 202 deals to understand the structure of LBOs. We find that term B and other loans are about 68 % of LBO deal amount. And, lenders of term B and other loans are mainly composed of other type member (59%), such as financing companies, mutual funds, hedge funds, and private equity funds. They also have higher spreads (318.923) than traditional bank debt (264.964). In addition, the ratio of secured term B and other loans is 0.871 smaller than the

ratio of secured traditional bank debt; the ratio of senior term B and other loans is 0.996 slightly smaller than the ratio of senior traditional bank debt.

From Compustat, we follow Nini, Smith, and Sufi (2009) and Denis and Wang (2014) to measure borrower characteristics by computing the average of four quarters prior to the credit agreements. Book value of assets is ATQ. Book leverage ratio is the ratio of total debt (DLTTQ + DLCQ) to the book assets. The market-to-book ratio is the ratio of total debt plus market equity (PRCCQ*CSHHQ) to book assets. Cash flow is the operating income (OIBDPQ), scaled by book value of assets. Because Max. Debt to EBITDA is the most commonly used financial covenant, debt to EBITDA is measured by the ratio of total debt on such fiscal quarter to EBITDA computed for the period of four consecutive quarters ended on such date. Because capital expenditure is also a commonly used restriction, we then include capital expenditure (CAPX) for the fiscal year prior to the loan contracts from annual COMPUSTAT. S&P issuer credit ratings are monthly frequency data from COMPUSTAT. A dummy variable is used to identify whether LBO borrower has a non-missing credit rating in the quarter prior to the loan contract.

Panel C of Table 3.1 describes borrower characteristics. The average value of total book assets for our sample is $3,000 million. We can find that the average deal amount is about 37% of average book assets. This ratio is quite close to the book leverage ratio (42%). The average market-to-book ratio is 1.411 and the average of cash flow scaled by book assets is 0.050. Compared with the one of Nini, Smith, and Sufi's (2009) sample, firm size of our sample may appear larger. The average capital expenditure in the previous fiscal year is $182 million which is 6% of the average of total assets. Because 3% of the borrowers with available non-missing data can have negative EBITDA for the previous four quarters, we then use maximum function to have nonnegative value of debt to EBITDA and obtain its average value equal to 3.167. Nearly 40% of the firms in our sample have Standard & Poor's issuer credit rating. Conditional on borrowers having corporate credit rating, we have 13.8% investment-grade firms. And, there are only two firms whose rating is CCC+ or below. The average value of credit ratings for our sample is 10

(BB-).

3.3.2 Max. Debt to EBITDA and covenant cushion

According to summary statistics in Table 3.1, Max. Debt to EBITDA and capital expenditure restriction are documented in over 70% of the loan contracts. Under the former one covenant (Max. Debt to EBITDA), borrowers are required not to have their ratio of debt to EBITDA higher than the threshold set quarterly in the credit agreements. In contrast, as mentioned by Nini, Smith, and Sufi (2009), capital expenditure restriction is the maximum amount for one specific fiscal year. Before borrowers breaching capital expenditure restriction, they are likely to have debt renegotiations triggered by failing to maintain quarterly ratio of debt to EBITDA. We then mainly focus on Max. Debt to EBITDA covenant. Based on the agreements, this covenant has three variations: the ratio of debt to EBITDA, the ratio of debt minus cash to EBITDA, and the ratio of debt to adjusted EBITDA. And, the ratio of debt to EBITDA is generally accepted definition which is employed by about 60% of the deals written with Max. Debt to EBITDA covenant. After hand-collecting covenant threshold information in one quarter and one year after the initiation of loan contract, we find that changes between the post 1-quarter covenant threshold and the post 1-year covenant threshold are quite little. The average of post 1-quarter Max. Debt to EBITDA covenant threshold is 5.55, only 0.01 higher than the average of the post 1-year covenant threshold.

We follow Chava and Roberts (2008), Demiroglu and James (2010b), and Denis and Wang (2014) to define covenant cushion as [1-(actual covenant accounting variable/covenant threshold)]. When actual covenant accounting variable is measured at the initiation of LBO loan contract, Demiroglu and James (2010b) indicate that the positive value of covenant cushion which is also called as covenant slack can be the measure of covenant tightness. We define the covenant cushion at the initiation of LBO loan contract as expected covenant cushion. When actual covenant account variable is measured in the fiscal quarter required by loan contract, Denis and Wang (2014) indicate that positive value of covenant cushion means that borrowers have some covenant slack

and are less restricted to the covenant; negative value of covenant cushion means that covenant violation which should not be taken as an immediate technical default but will allow creditors to exert their influence through renegotiation. We therefore have actual covenant cushion which is computed by using actual covenant accounting variable.

In Panel A of Table 3.2, covenant threshold of Max. Debt to EBITDA is reported. In Panel B of Table 3.2, we report non-missing actual covenant accounting variables for LBO borrowers. It is shown that all Debt to EBITDA accounting variables are on average higher than the covenant threshold. In Panel C of Table 3.2, covenant cushion measures are reported. We use non-missing Max(0,Debt to EBITDA), post 1-quarter covenant threshold, and post 1-year covenant threshold to measure post 1-quarter expected covenant cushion and post 1-year expected covenant cushion. And, post 1-quarter Debt to EBITDA, post 1-year Debt to EBITDA, post 1-quarter covenant threshold, and post 1-year covenant threshold are used to compute post 1-quarter actual covenant cushion and post 1-year actual covenant cushion. We have about 25% of LBO borrowers with non-missing covenant cushion measures which can be used in analysis. The mean value of both post 1-quarter expected covenant cushion and post 1-year expected covenant cushion is negative, showing that LBO borrowers on average are found not to be able to comply with Max. Debt to EBITDA at the initiation of LBO loans. The negative value of post 1-quarter actual covenant cushion indicates that LBO borrowers on average have breach of Max. Debt to EBITDA covenant limits in one quarter after the LBO loans. In contrast, positive value of post 1-year actual covenant cushion shows that LBO borrowers on average comply with Max. Debt to EBITDA covenant thresholds in one year after the LBO loans. We further separate firms into two groups: positive value of covenant cushion measures and negative value of covenant cushion measures. Because LBO borrowers can also be in technical violation of Max. Debt to EBITDA covenant during expansions, we thus find that whether firms are in compliance or non-compliance with Max. Debt to EBITDA covenant is little related to macroeconomic conditions.

Table 3.2
Max. Debt to EBITDA and Covenant Cushion

Panel A presents Max. Debt to EBITDA covenant thresholds. Panel B presents actual accounting variables of Debt to EBITDA. Max (0, Debt to EBITDA) is the nonnegative value of Debt to EBITDA. Panel C presents covenant cushion measures. Post 1-quarter expected covenant cushion = 1 – {Max (0, Debt to EBITDA) $_{\text{at the initiation of LBO loan}}$ /covenant threshold in one quarter after the initiation}. Post 1-year expected covenant cushion = 1 – {Max (0, Debt to EBITDA) $_{\text{at the initiation of LBO loan}}$ /covenant threshold in one year after the initiation}. Post 1-quarter actual covenant cushion = 1 – {Post 1-quarter Debt to EBITDA/covenant threshold }. Post 1-year actual covenant cushion = 1 – {Post 1-year Debt to EBITDA /covenant threshold}.

	Mean	Median	Standard deviation	N
Panel A: Max. Debt to EBITDA				
Post 1-quarter covenant threshold	5.552	5.7	1.449	93
Post 1-year covenant threshold	5.536	5.75	1.493	107
Panel B: Actual Debt to EBITDA variables				
Debt to EBITDA $_{\text{at the initiation of LBO loan}}$	6.983	6.450	7.908	111
Max (0, Debt to EBITDA) $_{\text{at the initiation of LBO loan}}$	7.549	6.450	5.457	111
Post 1-quarter Debt to EBITDA	10.680	6.467	38.075	103
Post 1-year Debt to EBITDA	5.967	5.890	2.813	110
Panel C: Covenant cushion measures				
Post 1-quarter expected covenant cushion	-0.358	-0.017	1.084	50 ($N_{Expansion}$: 47; $N_{Recession}$: 3)
Positive value	0.292	0.205	0.284	23 ($N_{Expansion}$: 21; $N_{Recession}$: 2)
Negative value	-0.911	-0.307	1.206	27 ($N_{Expansion}$: 26; $N_{Recession}$: 1)
Post 1-year expected covenant cushion	-0.380	-0.082	1.081	58 ($N_{Expansion}$: 55; $N_{Recession}$: 3)
Positive value	0.294	0.200	0.274	24 ($N_{Expansion}$: 22; $N_{Recession}$: 2)
Negative value	-0.856	-0.276	1.183	34 ($N_{Expansion}$: 33; $N_{Recession}$: 1)
Post 1-quarter actual covenant cushion	-2.602	-0.013	16.722	44 ($N_{Expansion}$: 42; $N_{Recession}$: 2)
Positive value	0.203	0.200	0.110	20 ($N_{Expansion}$: 18; $N_{Recession}$: 2)
Negative value	-4.940	-0.127	22.588	24 ($N_{Expansion}$: 24; $N_{Recession}$: 0)
Post 1-year actual covenant cushion	0.071	0.134	0.407	56 ($N_{Expansion}$: 46; $N_{Recession}$: 10)
Positive value	0.295	0.274	0.207	37 ($N_{Expansion}$: 32; $N_{Recession}$: 5)
Negative value	-0.364	-0.206	0.343	19 ($N_{Expansion}$: 14; $N_{Recession}$: 5)

Table 3.3
Descriptive Statistics and Pearson correlation matrix

Panel A presents descriptive statistics of our incumbent firms. We further separate firms into same loan lenders group and different loan lenders group. Same loan lenders group includes incumbent firms having the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan greater than 80%; different loan lenders group includes the rest of incumbent firms. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, for the t-test on the means between these two groups. In Panel B, we report the Pearson correlation matrix between net debt issuance at *t* and technical default identified by the industry mean of LBO borrowers' post 1-quarter expected covenant cushion, post 1-year expected covenant cushion, post 1-quarter actual covenant cushion, and post 1-year actual covenant cushion at *t-1*. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Descriptive statistics

Variable	Mean	Median	Standard deviation	N
All incumbent firms				
Net debt issuance$_t$ (%)	1.400	0.000	14.399	17,214
Book D_{t-1}/A_{t-1}	0.227	0.197	0.204	17,214
Market-to-book$_{t-1}$	1.602	1.220	1.230	17,214
Tangibility$_{t-1}$	0.248	0.182	0.214	17,214
Profitability$_{t-1}$	0.029	0.031	0.042	17,214
Size$_{t-1}$	5.955	5.889	1.803	17,214
Same loan lenders group				
Net debt issuance$_t$ (%)	1.443	0.000	13.830	10,786
Book D_{t-1}/A_{t-1}	0.218***	0.183	0.201	10,786
Market-to-book$_{t-1}$	1.672***	1.294	1.251	10,786
Tangibility$_{t-1}$	0.230***	0.163	0.204	10,786
Profitability$_{t-1}$	0.031***	0.032	0.042	10,786
Size$_{t-1}$	6.037***	6.001	1.776	10,786
Different loan lenders group				
Net debt issuance$_t$ (%)	1.328	0.000	15.306	6,428
Book D_{t-1}/A_{t-1}	0.242	0.219	0.207	6,428
Market-to-book$_{t-1}$	1.486	1.122	1.183	6,428
Tangibility$_{t-1}$	0.278	0.219	0.226	6,428
Profitability$_{t-1}$	0.027	0.030	0.043	6,428
Size$_{t-1}$	5.816	5.711	1.840	6,428

Panel B: Pearson correlation matrix

	D(Post 1-quarter expected covenant cushion$_{t-1}$<0)=1	*D(Post 1-year expected covenant cushion$_{t-1}$<0)=1*	*D(Post 1-quarter actual covenant cushion$_{t-1}$<0)=1*	*D(Post 1-year actual covenant cushion$_{t-1}$<0)=1*
All incumbent firms				
Net debt issuance$_t$ (%)	0.066*** N=5,818	0.029** N=6,877	0.017 N=5,507	0.045*** N=6,405
Same loan lenders group				
Net debt issuance$_t$ (%)	0.068*** N=3,642	0.017 N=4,323	0.050*** N=3,481	0.035** N=4,047
Different loan lenders group				
Net debt issuance$_t$ (%)	0.064*** N=2,176	0.061*** N=2,554	-0.012 N=2,026	0.058*** N=2,358

Table 3.4
The Externality on Incumbent Firms' Net Debt Issuing Activity

In this table, we report the estimation results of the external effect on incumbent firms' net debt issuance. In Panel A, we use all incumbent firms to do empirical analysis. In Panel B, we only include incumbents in the industry with only one LBO borrower in analysis. *Net debt issuance$_t$ (%)* is the ratio of change in total debt to lagged book assets at quarter *t*. There are four different covenant cushion measures at quarter *t-1*: *Post 1-quarter expected covenant cushion$_{t-1}$*, *Post 1-year expected covenant cushion$_{t-1}$*, *Post 1-quarter actual covenant cushion$_{t-1}$*, and *Post 1-year actual covenant cushion$_{t-1}$*. We use each of the four measures to identify technical default one at a time. The quarter *t-1* for post 1-quarter expected covenant cushion and post 1-year expected covenant cushion is the quarter of initiation of LBO loan. As for post 1-quarter actual covenant cushion, the quarter *t-1* is one quarter after the initiation of LBO loan. And, quarter *t-1* for post 1-year actual covenant cushion is one year after the initiation of LBO loan. *Book D_{t-1}/A_{t-1}* is the ratio of total debt to book assets at *t-1*. *Market-to-book$_{t-1}$* is the ratio of market assets to book assets at *t-1*. *Tangibility$_{t-1}$* is the ratio of net property, plant, and equipment to book assets at *t-1*. *Profitability$_{t-1}$* is EBITDA divided by assets at *t-1*. *Size$_{t-1}$* is log book assets at *t-1*. *Recession Dummy* is an indicator that takes the value of one when quarter *t* is during the recession period classified by NBER: 2001Q2, 2001Q3, 2001Q4, 2008Q1, 2008Q2, 2008Q3, 2008Q4, 2009Q1, and 2009Q2. When we estimate industry fixed effects model, standard errors are clustered by industry. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All incumbent firms

	Net debt issuance$_t$ (%)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.294***	1.545**						
expected covenant cushion$_{t-1}$<0)=1	(4.028)	(2.191)						
D(Post 1-year			0.425	-0.121				
expected covenant cushion$_{t-1}$<0)=1			(1.098)	(-0.125)				
D(Post 1-quarter					0.220	0.039		
actual covenant cushion$_{t-1}$<0)=1					(0.508)	(0.152)		
D(Post 1-year							1.044***	1.248*
actual covenant cushion$_{t-1}$<0)=1							(3.353)	(1.974)
Book D_{t-1}/A_{t-1}	-0.466	-0.952	1.747*	1.496	-3.410***	-4.204*	-1.930**	-2.438**
	(-0.591)	(-0.710)	(1.802)	(0.535)	(-3.100)	(-2.074)	(-2.511)	(-2.108)
Market-to-book$_{t-1}$	0.747***	0.690**	1.486***	1.454**	0.198	0.097	0.538***	0.562***
	(6.188)	(2.386)	(9.997)	(2.723)	(1.112)	(0.758)	(4.103)	(3.138)
Tangibility$_{t-1}$	3.646***	4.003***	3.205***	3.753***	3.551***	0.314	1.785**	0.781
	(4.917)	(4.566)	(3.460)	(6.905)	(3.432)	(0.207)	(2.420)	(1.226)
Profitability$_{t-1}$	-10.698***	-10.019*	-37.478***	-37.435**	3.148	6.836	0.185	0.583
	(-2.728)	(-1.737)	(-7.946)	(-2.267)	(0.636)	(1.693)	(0.049)	(0.075)
Size$_{t-1}$	-0.188**	-0.201***	-0.309***	-0.311**	-0.594***	-0.667*	-0.095	-0.100
	(-2.180)	(-3.308)	(-2.897)	(-2.628)	(-4.876)	(-1.886)	(-1.113)	(-1.333)
Recession Dummy	-0.257	-0.311***	-0.376	-0.232	0.199	0.796***	-1.368***	-0.848**
	(-0.437)	(-3.772)	(-0.482)	(-1.438)	(0.312)	(3.223)	(-3.712)	(-2.233)
Intercept	-0.090	-0.077	0.567	0.907	4.192***	5.685**	1.068*	1.228**
	(-0.144)	(-0.089)	(0.735)	(1.707)	(4.816)	(2.089)	(1.801)	(2.130)
Industry Fixed Effects		Yes		Yes		Yes		Yes
Adjusted R^2	0.014	0.017	0.023	0.023	0.007	0.017	0.009	0.010
Obs.	5,818	5,818	6,877	6,877	5,507	5,507	6,405	6,405

Panel B: Incumbents in the industry with only one LBO borrower

D(Post 1-quarter	1.368***	1.921***						
expected covenant cushion$_{t-1}$<0)=1	(4.180)	(3.064)						
D(Post 1-year			0.349	-0.095				
expected covenant cushion$_{t-1}$<0)=1			(0.885)	(-0.086)				
D(Post 1-quarter					0.220	0.039		
actual covenant cushion$_{t-1}$<0)=1					(0.508)	(0.152)		
D(Post 1-year							1.114***	1.454**
actual covenant cushion$_{t-1}$<0)=1							(3.540)	(2.337)
Industry Fixed Effects		Yes		Yes		Yes		Yes
Adjusted R^2	0.016	0.018	0.026	0.026	0.007	0.017	0.010	0.012
Obs.	5,694	5,694	6,427	6,427	5,507	5,507	6,102	6,102

3.4. Sample Construction and Empirical Results

3.4.1 Identification of loan lenders and incumbent firms

Given that we have complete financial covenant information for 202 actual loan contracts made to non-financial firms, we are able to use their lenders information for identifying whether other deals with non-missing loan amount and interest spread in Dealscan are made by the same lenders. Based on the lenders information for each facility, we have 764 lenders for 202 LBO loans. After that, we are able to compute the ratio of lenders also participating in LBO loans for each facility in a deal and have the mean value of it for all the loan facilities in a deal. We then classify a borrower into "same loan lenders group" if the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan is greater than 80%. In addition, "same loan lenders group" is also identified by either whether a borrower has the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan higher than 50% or whether a borrower has one facility made by one of 764 lenders for robustness checks. Further, an incumbent in same loan lenders group can be identified as having more same bank loan lenders if its average ratio of same bank loan lenders for all the deals recorded in Dealscan is greater than 50%. And, we can also identify whether an incumbent in same loan lenders have more same other type loan lenders by its average ratio of same other type loan lenders for all the deals recorded in Dealscan greater than 50%. By using Fama-French 48 industry classification, we are able to identify incumbent firms as

other firms in the same industry with available non-missing debt to EBITDA covenant cushion.[4]

3.4.2 On cost of issuing debt

To examine whether LBO borrowers' technical default of Max. Debt to EBITDA covenant can affect incumbent firms' net debt issuing activity, we run the following regression model:

$$Net\ debt\ issuance_{i,t}=\frac{\Delta D_i}{A_{i,t-1}}=\alpha+\beta*[D(covenant\ cushion_{i,t-1}<0)=1]+\gamma*controls_{i,t-1}+\varepsilon_{i,t}. \quad (3.1)$$

$Net\ debt\ issuance_{i,t}$ is the ratio of change in firm *i*'s total debt from quarter *t-1* to quarter *t* divided by firm *i*'s book assets at *t-1*. $D(Covenant\ cushion_{i,t-1}<0)=1$ is the variable that equals to one when mean value of LBO borrowers' covenant cushion measures in the incumbent firm *i*'s industry at *t-1* is negative. We have the following four different measures: post 1-quarter expected covenant cushion, post 1-year expected covenant cushion, post 1-quarter actual covenant cushion, and post 1-year actual covenant cushion and use each of the four measures to identify technical default one at a time. The quarter *t-1* for post 1-quarter expected covenant cushion and post 1-year expected covenant cushion is the quarter of initiation of LBO loan. As for post 1-quarter actual covenant cushion, the quarter *t-1* is one quarter after the initiation of LBO loan. And, quarter *t-1* for post 1-year actual covenant cushion is one year after the initiation of LBO loan. Firm *i*'s book leverage ratio (the ratio of total debt to book assets), market-to-book ratio (the ratio of market assets to book assets), tangibility (the ratio of net property, plant, and equipment to book assets), profitability (EBITDA divided by assets), and size (log book assets) are $controls_{i,t-1}$ as other factors which can determine a firm's net debt issuance. In order to control macroeconomic condition, we also include a recession dummy that takes the value of one when quarter *t* is during the recession period classified by National Bureau of Economic Research (NBER): 2001Q2,

[4] According to Fama-French 48 industry classification, we have 28 industries in analysis: Agriculture, Food Products, Printing and publishing, Consumer goods, Healthcare, Medical equipment, Chemicals, Textiles, Construction materials, Fabricated products, Machinery, Automobiles and trucks, Aircraft, Oil, Utilities, Communication, Personal services, Business services, Computers, Electronic equipment, Measuring and control equipment, Business supplies, Shipping containers, Transportation, Wholesale, Retail, Other.

2001Q3, 2001Q4, 2008Q1, 2008Q2, 2008Q3, 2008Q4, 2009Q1, and 2009Q2.

Before empirical analysis, we exclude observations with book leverage greater than one or market-to-book ratios greater than ten. In addition, we require that incumbent firms used in analysis should have non-missing data for dependent and control variables listed in model (1). Panel A of Table 3.3 presents descriptive statistics of our incumbent firms. The average net debt issuance is 1.400%. And, we find no significant difference in net debt issuance between same loan lenders and different loan lenders groups. As for firm characteristics, we see that incumbent firms classified in same loan lenders group have significantly higher book leverage, significantly higher market-to-book ratio, significantly higher tangible assets, significantly higher profitability, and significantly greater firm size than those classified in different loan lenders group. In Panel B of Table 3.3, we show the correlations between net debt issuance at *t* and technical violation identified by the industry mean of LBO borrowers' covenant cushion measures at *t-1*. We can find that all incumbent firms can issue more debt when LBO borrowers are expected to have technical default in one quarter or one year after the loan contract. And, different loan lenders group is better observed to have their net debt issuance be affected by LBO borrowers' expected technical violation. In contrast, same loan lenders group is observed to have their net debt issuing activity be easily affected by LBO borrowers' post 1-quarter technical default and post 1-year technical default. All these suggest that industry incumbents can otherwise have lower cost of issuing debt when LBO borrowers are expected to or are actually in technical violation of Max. Debt to EBITDA covenant after the initiation of loan agreements.

Table 3.4 reports the estimation results. We first can find positive effect from LBO borrowers' post 1-quarter expected technical default on incumbent firms' net debt issuing activities. After controlling for industry fixed effects, we have significant positive coefficient of 1.545 (*t*-value=2.191). In contrast, even controlling for industry fixed effects, post 1-year expected technical violation is found to have insignificant effect. Next, we find positive effect

from LBO borrowers' post 1-year technical default on incumbent firms' net debt issuing activity. Although we have marginally significant and positive coefficient of 1.248 (*t*-value=1.974) when controlling for industry fixed effects, we can have significantly positive coefficients on *D(Post 1-year actual covenant cushion*$_{t-1}$*<0)=1* in both regression models when only including incumbents in the industry with only one LBO borrower in analysis. In Table 3.5, we replace net debt issuance with book leverage and obtain similar results that either LBO borrowers' post 1-quarter expected technical default or LBO borrowers' post 1-year technical default can generate a corresponding increase in incumbent firms' book leverage ratios.

3.4.3 Why externality on cost of issuing debt exists

For investigating the reason why externality on cost of issuing debt exists, we treat same loan lenders group and different loan lenders group separately in analysis. In Table 3.6, we mainly discuss technical default identified by two covenant cushion measures: *Post 1-quarter expected covenant cushion*$_{t-1}$ and *Post 1-year actual covenant cushion*$_{t-1}$. We see that positive effect on net debt issuance exists especially for same loan lenders group. And, we can have similar results when only including incumbents in the industry with only one LBO borrower and when using two different ways to group the incumbent firms. Although different loan lenders group can also be observed to have higher book leverage when LBO borrowers are in technical default in one year after the loan agreements, result that positive effect exists especially for same loan lenders group is more robust.

Table 3.5
The Externality on Incumbent Firms' Book Leverage

In this table, we report the estimation results of the external effect on incumbent firms' book leverage. In Panel A, we use all incumbent firms to do empirical analysis. In Panel B, we only include incumbents in the industry with only one LBO borrower in analysis. *Book* D_t/A_t is total debt divided by book assets at quarter *t*. See Table 3.4 for the definitions of the explanatory variables. When we estimate industry fixed effects model, standard errors are clustered by industry. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All incumbent firms

	Book D_t/A_t							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter expected covenant cushion$_{t-1}$*<0)=1*	0.004**	0.004						
	(2.422)	(1.277)						
D(Post 1-year expected covenant cushion$_{t-1}$*<0)=1*			0.004***	0.003				
			(2.660)	(1.038)				
D(Post 1-quarter actual covenant cushion$_{t-1}$*<0)=1*					0.001	0.000		
					(0.723)	(0.124)		
D(Post 1-year actual covenant cushion$_{t-1}$*<0)=1*							0.006***	0.007***
							(3.877)	(3.721)
Book D_{t-1}/A_{t-1}	0.953***	0.951***	0.953***	0.951***	0.961***	0.958***	0.960***	0.956***
	(221.438)	(99.962)	(238.630)	(89.264)	(219.583)	(107.455)	(246.772)	(308.356)
Market-to-book$_{t-1}$	-0.000	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.083)	(-0.110)	(-0.949)	(-0.476)	(-1.341)	(-1.588)	(-1.147)	(-1.144)
Tangibility$_{t-1}$	0.018***	0.021***	0.017***	0.022***	0.018***	0.012*	0.016***	0.011**
	(4.466)	(4.965)	(4.549)	(4.802)	(4.405)	(1.994)	(4.293)	(2.780)
Profitability$_{t-1}$	-0.088***	-0.097***	-0.041**	-0.048	-0.001	0.006	0.001	0.010
	(-4.098)	(-2.874)	(-2.106)	(-1.388)	(-0.053)	(0.238)	(0.033)	(0.335)
Size$_{t-1}$	-0.000	-0.000	-0.000	-0.000	-0.001***	-0.002***	-0.000	-0.000
	(-0.948)	(-0.571)	(-0.686)	(-0.252)	(-2.892)	(-3.378)	(-0.079)	(-0.442)
Recession Dummy	0.002	0.002***	0.002	0.003**	0.004	0.006***	-0.000	0.003**
	(0.689)	(3.996)	(0.592)	(2.198)	(1.619)	(12.263)	(-0.030)	(2.325)
Intercept	0.011***	0.009**	0.010***	0.009***	0.015***	0.019***	0.009***	0.011***
	(3.246)	(2.340)	(3.208)	(2.856)	(4.436)	(4.322)	(3.111)	(3.204)
Industry Fixed Effects		Yes		Yes		Yes		Yes
Adjusted R^2	0.909	0.910	0.907	0.908	0.911	0.911	0.918	0.919
Obs.	5,818	5,818	6,877	6,877	5,507	5,507	6,405	6,405

Panel B: Incumbents in the industry with only one LBO borrower

D(Post 1-quarter expected covenant cushion$_{t-1}$*<0)=1*	0.005***	0.008***						
	(2.951)	(4.299)						
D(Post 1-year expected covenant cushion$_{t-1}$*<0)=1*			0.005***	0.005				
			(3.052)	(1.691)				
D(Post 1-quarter actual covenant cushion$_{t-1}$*<0)=1*					0.001	0.000		
					(0.723)	(0.124)		
D(Post 1-year actual covenant cushion$_{t-1}$*<0)=1*							0.006***	0.008***
							(4.022)	(4.259)
Industry Fixed Effects		Yes		Yes		Yes		Yes
Adjusted R^2	0.910	0.911	0.908	0.908	0.911	0.911	0.918	0.918
Obs.	5,694	5,694	6,427	6,427	5,507	5,507	6,102	6,102

Table 3.6
The Externality on Cost of Issuing Debt:
Same Loan Lenders Group and Different Loan Lenders Group

This table further examines the existence of the external effect on cost of issuing debt from technical default identified by two covenant cushion measures: *Post 1-quarter expected covenant cushion*$_{t-1}$ and *Post 1-year actual covenant cushion*$_{t-1}$. We treat same loan lenders group and different loan lenders group separately in analysis. Same loan lenders group includes incumbent firms having the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan greater than 80%; different loan lenders group includes the rest of incumbent firms. In Panel A, we use all incumbent firms to do empirical analysis. In Panel B, we only include incumbents in the industry with only one LBO borrower in analysis. In Panel C, we use two different ways to classify same loan lenders group and different loan lenders group and report the estimated coefficients for robustness checks. *Net debt issuance*$_t$ *(%)* is the ratio of change in total debt to lagged book assets at quarter *t*. *Book* D_t/A_t is total debt divided by book assets at quarter *t*. See Table 3.4 for the definitions of the explanatory variables. We estimate industry fixed effects model. And, standard errors are clustered by industry. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All incumbent firms

	Net debt issuance$_t$ *(%)*				*Book* D_t/A_t			
	Same loan lenders	Different loan lenders	Same loan lenders	Different loan lenders	Same loan lenders	Different loan lenders	Same loan lenders	Different loan lenders
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.454**	1.670			0.005	0.004		
expected covenant cushion$_{t-1}$*<0)=1*	(2.359)	(1.673)			(1.450)	(0.585)		
D(Post 1-year			0.965**	1.768			0.007**	0.008**
actual covenant cushion$_{t-1}$*<0)=1*			(2.498)	(1.504)			(2.601)	(2.323)
Book D_{t-1}/A_{t-1}	-0.512	-1.541	-0.991	-5.044***	0.953***	0.949***	0.960***	0.948***
	(-0.213)	(-1.043)	(-0.486)	(-4.452)	(66.143)	(113.340)	(115.341)	(91.246)
Market-to-book$_{t-1}$	0.649	0.740	0.334***	0.968*	-0.000	0.000	-0.000	-0.001
	(1.398)	(1.566)	(3.685)	(1.839)	(-0.143)	(0.270)	(-0.567)	(-0.501)
Tangibility$_{t-1}$	3.589**	4.735***	0.436	2.224	0.021***	0.024***	0.009	0.013**
	(2.124)	(8.037)	(0.312)	(1.552)	(2.857)	(3.925)	(1.701)	(2.346)
Profitability$_{t-1}$	-11.205	-8.778	5.483	-8.417	-0.106*	-0.085*	-0.013	0.050
	(-1.660)	(-0.664)	(1.427)	(-0.392)	(-1.771)	(-1.906)	(-0.382)	(0.475)
Size$_{t-1}$	-0.302***	-0.056	-0.084	-0.091	-0.001*	0.001	-0.000	0.000
	(-3.490)	(-0.473)	(-0.824)	(-1.124)	(-1.727)	(0.830)	(-0.601)	(0.254)
Recession Dummy	-0.340**	-0.249***	-1.133**	-0.458	0.006***	-0.006***	0.006**	-0.001
	(-2.109)	(-5.895)	(-2.132)	(-0.740)	(5.728)	(-21.242)	(2.241)	(-0.792)
Intercept	0.723	-1.216	1.238	0.858	0.012	0.005	0.011**	0.011***
	(0.466)	(-0.925)	(1.531)	(1.676)	(1.631)	(1.216)	(2.283)	(3.228)
Adjusted R^2	0.015	0.022	0.008	0.013	0.906	0.915	0.921	0.915
Obs.	3,642	2,176	4,047	2,358	3,642	2,176	4,047	2,358

Panel B: Incumbents in the industry with only one LBO borrower

D(Post 1-quarter	1.877***	1.988*			0.008***	0.007		
expected covenant cushion$_{t-1}$*<0)=1*	(4.202)	(1.929)			(4.568)	(1.389)		
D(Post 1-year			1.264***	1.811			0.008***	0.008**
actual covenant cushion$_{t-1}$*<0)=1*			(3.697)	(1.475)			(4.194)	(2.187)
Adjusted R^2	0.017	0.022	0.011	0.013	0.907	0.915	0.921	0.913
Obs.	3,571	2,123	3,835	2,267	3,571	2,123	3,835	2,267

Panel C: Robustness checks

Same loan lenders group includes incumbent firms having the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan greater than 50%; different loan lenders group includes the rest of incumbent firms.								
D(Post 1-quarter	1.650**	0.198			0.005	-0.002		
expected covenant cushion$_{t-1}$<0)=1	(2.511)	(0.151)			(1.622)	(-0.208)		
D(Post 1-year			1.373*	-0.102			0.008***	-0.001
actual covenant cushion$_{t-1}$<0)=1			(2.044)	(-0.175)			(3.476)	(-0.223)
Same loan lenders group includes incumbent firms having the loan lenders who also participate in our 202 LBO loan contracts; different loan lenders group includes incumbent firms having totally different lenders.								
D(Post 1-quarter	1.686**	-1.417			0.005	-0.007		
expected covenant cushion$_{t-1}$<0)=1	(2.476)	(-1.069)			(1.410)	(-0.711)		
D(Post 1-year			1.267*	0.731			0.008***	0.000
actual covenant cushion$_{t-1}$<0)=1			(1.905)	(0.929)			(3.558)	(0.048)

In Table 3.7, we further investigate the reason why externality on cost of issuing debt exists by using the average ratio of same bank loan lenders and the average ratio of same other type member lenders to identify the incumbents in same loan lenders group. When LBO borrowers are expected to have breach of covenant limits in one quarter after the loan agreements, all incumbent firms whether having more same bank loan lenders or having more same other type loan lenders can be observed to issue more debt. This indicates that they can also issue more debt even when they are not monitored by more LBO bank loan lenders. In contrast, it is quite clear that LBO borrowers' post 1-year actual technical default can make incumbent firms with more same bank loan lenders and less same other type loan lenders increase debt issuance and have higher book leverage. And, in Panel B of Table 3.7, we also find that incumbents whose lenders also participate in LBO loans and are mostly banks can issue more debt and have higher book leverage. Accordingly, our findings further indicate that being monitored either by LBO bank loan lenders or by bank loan lenders can bring the opportunity for incumbents to raise their debt capital when LBO borrowers are in technical default in one year after the loan agreements.

In Table 3.8, we further discuss whether incumbents with low risk or high risk can better take the opportunity to issue debt. Consistent with the needs of monitoring, incumbents with high risk are found to issue more debt and have higher book leverage especially when LBO borrowers are in technical default in one year after the loan agreements. From Panel A to

Panel C, our findings show that incumbents with speculative-grade, manager myopia (higher earnings-to-price ratio), and poor performance (low market-to-book ratio) can better be observed to take the opportunity to issue debt.

3.4.4 The externality of covenant cushion on cost of issuing debt

We next examine the externality from covenant cushion on cost of issuing debt. For negative value of covenant cushion measures, we replace it with zero to indicate that those firms are in technical violation and have no covenant cushion. In Panel A of Table 3.9, results indicate that incumbent firms' net debt issuance and book leverage can be negatively affected by LBO borrowers' post 1-year actual covenant cushion. And, similar to the results in Table 3.7 and Table 3.8, our findings listed in Panel B and Panel C of Table 3.9 are also consistent with the needs of being monitored by banks that industry incumbents with high risk can otherwise be observed to issue more debt and have higher book leverage when LBO borrowers have uncomfortable closeness to covenant limits in one year after the loan contracts.

Overall, therefore, we have results in support for the externality from LBO borrowers' technical default and their covenant cushion on industry incumbents' cost of issuing debt. And, it is LBO borrowers' post 1-year technical default and covenant cushion that can better have real effect on incumbents' cost of issuing debt. When LBO borrowers have breach of covenant limits and uncomfortable closeness to covenant limits in one year after the loan contracts, existing firms in the same industry, especially for those with more LBO bank loan lenders, can be observed to issue more debt and have higher book leverage. Consistent with the needs of monitoring, we also find that incumbents with high risk can better take the opportunity to issue debt.

Table 3.7
The Externality on Cost of Issuing Debt: Monitoring from LBO Bank Loan Lenders

In this table and the following tables, we only include same loan lenders group in analysis. The incumbent firm is identified as "More same bank loan lenders" if its average ratio of same bank member lenders for all the deals recorded in Dealscan is greater than 50%. And, the incumbent firm is identified as "More same other type loan lenders" if its average ratio of same other type member lenders for all the deals recorded in Dealscan is greater than 50%. The estimation results of monitoring from LBO bank loan lenders are reported in Panel A. And, the estimation results of monitoring from bank loan lenders are also reported in Panel B. We use the models specified in Table 3.4 and Table 3.5 to do the estimations. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Monitoring from LBO bank loan lenders

Panel A-1: More same bank loan lenders and less same bank loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More	Less	More	Less	More	Less	More	Less
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.455**	1.409**			0.006*	0.001		
expected covenant cushion$_{t-1}$<0)=1	(2.094)	(2.386)			(1.991)	(0.101)		
D(Post 1-year			0.927***	1.198			0.007***	0.006
actual covenant cushion$_{t-1}$<0)=1			(4.563)	(1.004)			(3.079)	(1.291)

Panel A-2: More same other type loan lenders and less same other type loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More	Less	More	Less	More	Less	More	Less
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.528*	1.517**			0.002	0.006*		
expected covenant cushion$_{t-1}$<0)=1	(1.782)	(2.636)			(0.251)	(1.926)		
D(Post 1-year			0.349	1.126***			0.004	0.007**
actual covenant cushion$_{t-1}$<0)=1			(0.309)	(3.925)			(0.830)	(2.610)

Panel B: Monitoring from bank loan lenders

Panel B-1: More bank loan lenders and less bank loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More	Less	More	Less	More	Less	More	Less
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.447**	1.820**			0.006*	0.003		
expected covenant cushion$_{t-1}$<0)=1	(2.496)	(2.552)			(1.886)	(0.354)		
D(Post 1-year			0.914***	1.473			0.007**	0.005
actual covenant cushion$_{t-1}$<0)=1			(2.985)	(1.098)			(2.680)	(0.862)

Panel B-2: More other type loan lenders and less other type loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More	Less	More	Less	More	Less	More	Less
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	2.072**	1.318**			0.006	0.005*		
expected covenant cushion$_{t-1}$<0)=1	(2.430)	(2.474)			(0.852)	(1.746)		
D(Post 1-year			0.136	1.168***			0.003	0.007***
actual covenant cushion$_{t-1}$<0)=1			(0.104)	(5.263)			(0.599)	(2.828)

Table 3.8
The Externality on Cost of Issuing Debt: Low Risk and High Risk

In this table, we identify an incumbent as low risk firm if it is an investment-grade firm, a firm with low operating earnings-to-price ratio, and a firm with high market-to-book ratio. In contrast, the incumbent firm is identified as high risk firm if it is an speculative-grade firm, a firm with high operating earnings-to-price ratio, and a firm with low market-to-book ratio. More specifically, we use credit rating in the previous quarter to identify whether a firm is investment-grade. And, we use operating earnings-to-price ratio in the previous quarter to classify an incumbent as high risk firm (low risk firm) if its operating earnings-to-price ratio is in the bottom third (top third) of all the firms with non-missing opearing earnings-to-price ratio within each industry-quarter. Similarly, we use market-to-book ratio in the previous quarter to classify an incumbent as high risk firm (low risk firm) if its market-to-book ratio is in the top third (bottom third) of all the firms with non-missing market-to-book ratio within each industry-quarter. The estimation results of investment-grade and speculative-grade, operating earnings-to-price ratio, and market-to-book ratio are respectively shown from Panel A to Panel C. We use the models specified in Table 3.4 and Table 3.5 to do the estimations. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Investment-grade and Speculative-grade

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk
	Investment	Speculative	Investment	Speculative	Investment	Speculative	Investment	Speculative
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	0.972	3.497***			0.003	0.005		
expected covenant cushion$_{t-1}$<0)=1	(1.325)	(3.024)			(0.428)	(1.342)		
D(Post 1-year			1.329***	3.987***			0.014***	0.014***
actual covenant cushion$_{t-1}$<0)=1			(3.226)	(3.003)			(3.613)	(3.505)

Panel B: Operating earnings-to-price ratio (OIBP)

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk
	Low OIBP	High OIBP	Low OIBP	High OIBP	Low OIBP	High OIBP	Low OIBP	High OIBP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	1.813*	2.222**			0.002	0.008***		
expected covenant cushion$_{t-1}$<0)=1	(2.002)	(2.805)			(0.314)	(3.426)		
D(Post 1-year			0.877	1.299***			0.007	0.010***
actual covenant cushion$_{t-1}$<0)=1			(1.170)	(2.908)			(1.078)	(2.934)

Panel C: Market-to-book ratio (MB)

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk
	High MB	Low MB	High MB	Low MB	High MB	Low MB	High MB	Low MB
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D(Post 1-quarter	0.890	2.333**			0.006	0.008*		
expected covenant cushion$_{t-1}$<0)=1	(1.224)	(2.286)			(1.039)	(1.730)		
D(Post 1-year			1.146*	0.672***			0.005	0.012***
actual covenant cushion$_{t-1}$<0)=1			(1.976)	(3.140)			(1.217)	(3.143)

Table 3.9
The Externality from Covenant Cushion on Cost of Issuing Debt

For negative value of covenant cushion measures, we replace it with zero to indicate that those firms are in technical violation and have no covenant cushions. Same loan lenders group includes incumbent firms having the average ratio of lenders also participating in LBO loans for all the deals recorded in Dealscan greater than 80%. Estimation results are shown in Panel A. Based on the findings listed in Panel A, we examine the externality from *Post 1-year actual covenant cushion*$_{t-1}$ in Panel B and discuss whether industry incumbents can also be observed to issue more debt because of being monitored by banks. In Panel C, we discuss whether incumbents with low risk or high risk can better take the opportunity to raise their debt capital. *Net debt issuance*$_t$ *(%)* is the ratio of change in total debt to lagged book assets at quarter *t*. *Book* D_t/A_t is total debt divided by book assets at quarter *t*. See Table 3.4 for the definitions of the explanatory variables. We estimate industry fixed effects model. And, standard errors are clustered by industry. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Same loan lenders group

	Net debt issuance$_t$ *(%)*				*Book* D_t/A_t			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post 1-quarter	-3.585				-0.012			
expected covenant cushion$_{t-1}$	(-1.500)				(-1.010)			
Post 1-year		0.784				-0.009		
expected covenant cushion$_{t-1}$		(0.231)				(-0.696)		
Post 1-quarter			-1.702**				-0.002	
actual covenant cushion$_{t-1}$			(-2.354)				(-0.367)	
Post 1-year				-4.377***				-0.026***
actual covenant cushion$_{t-1}$				(-4.517)				(-3.875)
Book D_{t-1}/A_{t-1}	-0.499	3.730	-2.155	-1.024	0.953***	0.957***	0.967***	0.960***
	(-0.208)	(0.867)	(-1.295)	(-0.510)	(66.191)	(67.537)	(113.299)	(117.912)
Market-to-book$_{t-1}$	0.651	1.977**	0.114	0.290***	-0.000	-0.000	-0.001	-0.001
	(1.409)	(2.186)	(0.627)	(3.108)	(-0.140)	(-0.161)	(-1.070)	(-0.992)
Tangibility$_{t-1}$	3.643**	3.517***	1.655	0.501	0.021***	0.021***	0.013	0.010*
	(2.205)	(4.119)	(0.874)	(0.361)	(2.947)	(3.728)	(1.403)	(1.767)
Profitability$_{t-1}$	-11.451*	-67.537**	6.756	5.971	-0.107*	-0.082*	0.006	-0.010
	(-1.747)	(-2.322)	(1.622)	(1.539)	(-1.807)	(-1.901)	(0.252)	(-0.292)
Size$_{t-1}$	-0.312***	-0.488***	-0.289**	-0.096	-0.001*	-0.001**	-0.001**	-0.000
	(-3.707)	(-4.303)	(-2.518)	(-1.003)	(-1.801)	(-2.303)	(-2.087)	(-0.783)
Recession Dummy	-0.329**	-0.648	0.615***	-1.002*	0.006***	0.003	0.007***	0.006**
	(-2.141)	(-1.211)	(5.114)	(-1.741)	(5.903)	(1.085)	(10.144)	(2.159)
Intercept	2.029	1.671	2.816***	2.442***	0.017**	0.016**	0.014***	0.019***
	(1.281)	(1.151)	(3.380)	(3.600)	(2.218)	(2.440)	(2.925)	(4.431)
Adjusted R^2	0.014	0.036	0.019	0.010	0.906	0.909	0.923	0.921
Obs.	3,642	4,323	3,481	4,047	3,642	4,323	3,481	4,047

Panel B: Monitoring from bank loan lenders

Panel B-1: More same bank loan lenders or more same other type loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More same bank loan lenders	Less same bank loan lenders	More same other type loan lenders	Less same other type loan lenders	More same bank loan lenders	Less same bank loan lenders	More same other type loan lenders	Less same other type loan lenders
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post 1-year	-4.396***	-4.267	-3.456	-4.666***	-0.028***	-0.017	-0.016	-0.028***
actual covenant cushion$_{t-1}$	(-8.172)	(-1.102)	(-0.922)	(-6.627)	(-5.281)	(-1.011)	(-1.078)	(-4.507)

Panel B-2: More bank loan lenders or more other type loan lenders

	Net debt issuance$_t$ (%)				*Book D_t/A_t*			
	More bank loan lenders	Less bank loan lenders	More other type loan lenders	Less other type loan lenders	More bank loan lenders	Less bank loan lenders	More other type loan lenders	Less other type loan lenders
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post 1-year	-4.309***	-5.105	-2.766	-4.789***	-0.028***	-0.017	-0.012	-0.029***
actual covenant cushion$_{t-1}$	(-7.331)	(-1.236)	(-0.678)	(-7.227)	(-4.673)	(-1.006)	(-0.713)	(-5.194)

Panel C: Low risk and high risk

Panel C-1: Investment-grade and Speculative-grade

	Net debt issuance$_t$ (%)		*Book D_t/A_t*	
	Low Risk	High Risk	Low Risk	High Risk
	Investment	Speculative	Investment	Speculative
	(1)	(2)	(3)	(4)
Post 1-year	-3.418**	-12.338***	-0.032**	-0.048***
actual covenant cushion$_{t-1}$	(-2.275)	(-2.934)	(-2.256)	(-7.069)

Panel C-2: Operating earnings-to-price ratio (OIBP)

	Net debt issuance$_t$ (%)		*Book D_t/A_t*	
	Low Risk	High Risk	Low Risk	High Risk
	Low OIBP	High OIBP	Low OIBP	High OIBP
	(1)	(2)	(3)	(4)
Post 1-year	-2.813	-6.535***	-0.019	-0.039***
actual covenant cushion$_{t-1}$	(-1.161)	(-6.413)	(-1.102)	(-4.835)

Panel C-3: Market-to-book ratio (MB)

	Net debt issuance$_t$ (%)		*Book D_t/A_t*	
	Low Risk	High Risk	Low Risk	High Risk
	High MB	Low MB	High MB	Low MB
	(1)	(2)	(3)	(4)
Post 1-year	-3.830*	-4.222***	-0.018*	-0.042**
actual covenant cushion$_{t-1}$	(-1.849)	(-3.742)	(-1.846)	(-2.318)

3.5. Incumbents' Subsequent Market Share

After realizing that monitoring from bank loan lenders can facilitate incumbents' net debt issuing activities and that those incumbents with high risk can better take the opportunity to issue debt, we next discuss whether those incumbents with low risk can benefit from being monitored by banks.

Following Leary and Roberts (2014), we measure a firm's market share at quarter *t* by its sales at quarter *t* divided by industry sales at quarter *t* and also have one-year average of the four quarters from quarter *t* to quarter *t+3*. We keep all the control variables and estimate the following regression model:

$$Market\ share_{i,t} = \alpha + \beta_1 * Low\ risk + \beta_2 * More\ bank\ loan\ lenders +$$
$$\beta_3 * (Low\ risk * More\ bank\ loan\ lenders) + \gamma * controls_{i,t-1} + \varepsilon_{i,t}. \quad (3.2)$$

Low risk is identified by using either one of the three measures: investment-grade, low OIBP, and high MB. *More bank loan lenders* is identified by either more same bank loan lenders or more bank loan lenders. By the interaction term, we are able to discuss whether low risk incumbent firms can have greater market share because of being monitored by banks. We estimate the industry fixed effects model and keep all the control variables, such as book leverage ratio, tangibility, profitability, size, and a recession dummy. Because LBO borrowers' post 1-year technical default and covenant cushion can better affect incumbents' cost of issuing debt, we use 4,047 incumbents with non-missing post 1-year actual covenant cushion in analysis. And, only those incumbents which can be identified by either one of the three low risk measures: investment-grade, low OIBP, and high MB are used to do the estimation.

Table 3.10 reports the estimation results. Although some of the positive estimated coefficients on low risk variables are insignificant, we can find that incumbents with high MB can on average have marginally significant greater market share in the next one quarter or in the next one year. However, having more bank loan lenders can otherwise make their market share smaller, a 0.2% decrease in market share. Accordingly, our findings indicate that

those incumbents with better performance cannot benefit from being monitored by banks and that those incumbents who have poor performance and more bank loan lenders can otherwise have greater market share. Accordingly, this further suggests that the externality of debt covenants is made by information asymmetry between the creditors and the industry incumbents and that mitigating moral hazard problem can be the opportunity for those incumbents with high risk to grab more market share.

Table 3.10
Incumbents' Subsequent Market Share

In this table, we examine incumbents' subsequent market share and use 4,047 incumbents with non-missing post 1-year actual covenant cushion in analysis. Only those incumbents which can be identified by either one of the three low risk measures: investment-grade, low OIBP, and high MB are used to do the estimation. Results of monitoring from LBO bank loan lenders are reported in Panel A. And, Results of monitoring from bank loan lenders are reported in Panel B. We estimate industry fixed effects model. And, standard errors are clustered by industry. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Monitoring from LBO bank loan lenders

	Market share$_t$			$\overline{\textit{Market share}_{t,t+3}}$		
	Investment	Low OIBP	High MB	Investment	Low OIBP	High MB
	(1)	(2)	(3)	(4)	(5)	(6)
Low risk	0.008	0.003	0.006*	0.006	0.004	0.007*
(Investment, Low OIBP, or High MB)	(1.177)	(0.887)	(1.773)	(0.911)	(1.076)	(1.923)
More same bank loan lenders	0.001	-0.001	0.001	0.001	-0.001	0.001
	(0.510)	(-0.951)	(0.841)	(0.487)	(-0.737)	(1.019)
Low risk*More same bank loan lenders	-0.013*	-0.002	-0.008**	-0.013*	-0.002	-0.009**
	(-2.033)	(-0.444)	(-2.133)	(-1.835)	(-0.650)	(-2.309)
Book D_{t-1}/A_{t-1}	-0.003	-0.003**	-0.002	-0.005	-0.003**	-0.002
	(-0.797)	(-2.353)	(-1.340)	(-1.136)	(-2.083)	(-1.196)
Market-to-book$_{t-1}$	0.003**	0.000	0.000	0.003***	0.000	0.000
	(2.711)	(0.600)	(0.978)	(3.010)	(0.476)	(1.005)
Tangibility$_{t-1}$	-0.003	0.003	0.004	-0.003	0.002	0.004
	(-0.622)	(0.997)	(1.112)	(-0.616)	(0.853)	(1.144)
Profitability$_{t-1}$	0.006	-0.013	-0.027***	0.035	-0.014*	-0.027***
	(0.220)	(-1.691)	(-3.595)	(1.000)	(-1.846)	(-3.412)
Size$_{t-1}$	0.012***	0.004***	0.005***	0.012***	0.004***	0.005***
	(4.029)	(3.563)	(3.352)	(4.142)	(3.574)	(3.414)
Recession Dummy	-0.002**	-0.002***	-0.001*	-0.003**	-0.002***	-0.001**
	(-2.245)	(-3.766)	(-1.922)	(-2.207)	(-3.550)	(-2.312)
Intercept	-0.081***	-0.020**	-0.022**	-0.084***	-0.020**	-0.023**
	(-3.467)	(-2.483)	(-2.652)	(-3.620)	(-2.529)	(-2.765)
Adjusted R^2	0.526	0.328	0.341	0.527	0.343	0.344
Obs.	1,193	2,400	2,609	1,126	2,211	2,417

Panel B: Monitoring from bank loan lenders

	$Market\ share_t$			$\overline{Market\ share_{t,t+3}}$		
	Investment	Low OIBP	High MB	Investment	Low OIBP	High MB
	(1)	(2)	(3)	(4)	(5)	(6)
Low risk	0.012	0.004	0.006	0.011	0.005	0.007*
	(1.551)	(0.984)	(1.610)	(1.277)	(1.158)	(1.759)
More bank loan lenders	-0.001	0.000	0.001	-0.001	0.001	0.001
	(-0.547)	(0.200)	(0.727)	(-0.367)	(0.544)	(0.876)
Low risk*More bank loan lenders	-0.017*	-0.003	-0.008*	-0.017*	-0.003	-0.009**
	(-2.011)	(-0.628)	(-1.939)	(-1.841)	(-0.799)	(-2.101)

3.6. Conclusion

In this study, we provide evidence on the externality of debt covenants by analyzing whether and how LBO borrowers' technical default and tight financial covenants can have impacts on industry incumbents' cost of issuing debt. Based on actual loan contract from EDGAR, we can have 202 contracts to 180 non-financial firms and hand-collect all the financial covenant information for each loan agreement. Among all the financial covenants, we mainly focus on Max. Debt to EBITDA covenant which is the most commonly used and quarterly maintenance-based one and use the ratio of debt to EBITDA which is the generally accepted definition in analysis. By using post 1-quarter covenant threshold and post 1-year covenant threshold to compute expected and actual covenant cushion, we are able to characterize LBO borrowers and identify whether they are in technical default and whether they have tight financial covenants.

To define incumbent firm, we use Fama-French 48 industry classification and compute the mean value of LBO borrowers' covenant cushion measures for each industry. We also can use each loan's lenders information provided by Dealscan and all the other deals recorded in Dealscan to identify whether firms' loan lenders also participate in LBO loans and whether they have more bank loan lenders. After requiring that incumbents in our sample should have non-missing identification of loan lenders group and non-missing variables used in analysis, we have 10,786 observations for 1,963 incumbent firms in same loan lenders group and 6,428 observations for 1,301 incumbent firms in different loan lenders group.

Our findings show that LBO borrowers' post 1-year technical default and covenant cushion can better have real effect on incumbents' cost of issuing debt. When LBO borrowers have breach of covenant limits and uncomfortable closeness to covenant limits in one year after the loan contracts, industry incumbents, especially for those with more LBO bank loan lenders, are found to issue more debt and have higher book leverage. And, consistent with the needs of monitoring, we also find that incumbents with high risk can better take the opportunity to raise their debt capital. Further, by examining incumbents' subsequent market share, we also provide evidence that the externality of debt covenants is made by information asymmetry between the creditors and the industry incumbents and that mitigating moral hazard problem can be the opportunity for those incumbents with high risk to have greater market share.

This study sheds new light on the role of debt covenant by presenting its externality on incumbent firms' cost of issuing debt. However, because of the properties of LBO loans, one question concerns the external effect from capital covenant is not able to be discussed in this study. Another question concerns the externality on the performance in the stock market because initial public offering is one exit strategy for private-equity LBO sponsors. Perhaps these and other related questions can be the issues for future research.

3.Appendix A: Debt covenants in the loan agreements

In the loan document, covenants are often broadly classified as affirmative covenants and negative covenants. According to Tirole (2006) and Nini, Smith, and Sufi (2012), affirmative covenants are the lists of events or actions that borrowers are required to take, such as maintaining sound accounting practices, notifying lenders the occurrence of any business related modification, and complying with the laws; negative covenants are the actions or events that borrowers must prevent from taking, such as paying dividends, making any acquisition which can change the jurisdiction of the borrowers, and issuing more debt until payment and satisfaction in full of all liabilities and termination of the loan agreement.

In addition to these two kinds of covenants, restrictions written based on accounting information are called as financial covenants. A firm's net worth, interest coverage, current ratio, capital expenditure, research & development expenditure, and Debt/EBITDA can be limited. Generally, financial covenants in the public bond contracts are incurrence-based, while financial covenants in the private loan agreement are maintenance-based. The incurrence-based covenants restrict firms on a case-by-case basis. Borrowers are only required to comply with the limits if they intend to take specified actions, such as borrowing more debt or paying dividends. For example, the loan agreement between Biomet, Inc. and Bank of America, N. A., dated September 25th, 2007 contains the following clauses:

> SECTION 7.03. Indebtedness. Create, incur, assume or suffer to exist any Indebtedness, provided that the Borrower may incur Indebtedness and any Restricted Subsidiary may incur Indebtedness if (x) immediately before and after such incurrence, no Default shall have occurred and be continuing and (y) the Total Leverage Ratio for the Test Period immediately preceding such incurrence would be less than or equal to 7.5 to 1.0 (calculated on a Pro Forma Basis (including a pro forma application of the net proceeds therefrom) as if such Indebtedness had been incurred and the application of the proceeds therefrom had occurred on the first day of such Test Period); provided that Restricted Subsidiaries that are Non-Loan Parties may not incur Indebtedness pursuant to the foregoing exception in an aggregate principal amount at any time outstanding in excess of the greater of $300,000,000 and 2.75% of Total Assets, in each case determined at the time of incurrence.

In the above example, Biomet, Inc. has an incurrence test that total leverage ratio defined as the ratio of consolidated total debt to consolidated EBITDA must be smaller than 7.5 to 1.0 when intending to take on more debt.

The maintenance-based covenants, on the other hand, restrict firms on a regular basis. Borrowers typically have to meet certain specified financial tests every fiscal quarter. The negative covenants in credit agreement for Hanger Orthopedic Group, Inc. dated as of May 26th, 2006 contain financial condition covenants, of which one is also related to leverage ratio.

7.1 Financial Condition Covenants.

(a) Consolidated Leverage Ratio. Permit the Consolidated Leverage Ratio as at the last day of any period of four consecutive fiscal quarters of the Borrower (or, if less, the number of full fiscal quarters subsequent to the Closing Date) ending with the last day of any fiscal quarter set forth below to exceed the ratio set forth below opposite the last day of such fiscal quarter:

Fiscal Quarter Ended:	Consolidated Leverage Ratio:
FQ3 2006, FQ4 2006, FQ1 2007	6.25 to 1.00
FQ2 2007, FQ3 2007	6.00 to 1.00
FQ4 2007, FQ1 2008, FQ2 2008	5.50 to 1.00
FQ3 2008	5.25 to 1.00
FQ4 2008, FQ1 2009, FQ2 2009	5.00 to 1.00
FQ3 2009	4.75 to 1.00
FQ4 2009, FQ1 2010, FQ2 2010	4.50 to 1.00
FQ3 2010	4.25 to 1.00
FQ4 2010, FQ1 2011, FQ2 2011 FQ3 2011, FQ4 2011, FQ1 2012 FQ2 2012, FQ3 2012, FQ4 2012 FQ1 2013, FQ2 2013	4.00 to 1.00

Chava and Roberts (2008) use data from Dealscan and show that there are at least 15 kinds of financial covenants: Max. Debt to EBITDA, Min. (Tangible) Net Worth, Min. Fixed Charge Coverage, Min. Interest Coverage, Max. Leverage Ratio, Max. Debt to Tangible Net Worth, Min. Current Ratio, Min. Debt Service Coverage, Max. Senior Debt to EBITDA, Min. EBITDA, Min. Quick Ratio, Min. Cash Interest Coverage, Max. Debt to Equity, Max. Senior Leverage, and Max. Loan to Value. Although Debt/EBITDA is defined as leverage ratio in

most loan contracts, leverage ratio reported in Dealscan is the one commonly defined in the literature which is the ratio of total debt to total capital.

However, information on covenants provided by Dealscan has some omissions. For example, the loan agreement for ADC Telecommunications, Inc. dated as of April 3rd, 2008 which is recorded as no financial covenants in Dealscan actually has one capital expenditure restriction and four financial covenants (Max. Debt to EBITDA, Max. Senior Debt to EBITDA, Min. Interest Coverage, and Min. Cash). As the other illustrative example, the loan contract for AM Communications, Inc. and its direct and indirect subsidiaries dated August 14th, 2002 is only recorded with two financial covenants in Dealscan.

Key Financial Ratios: Max. consolidated funded debt to consolidated EBITDA ratio of 3.5:1 thru 3/29/03, 3:1 thereafter; min. fixed charge coverage ratio increasing from 0.75:1 to 1.25:1.

Instead, according to the official loan document, this loan agreement has all three financial covenants, capital expenditure restriction, and research & development expenditure restriction. The missing financial covenant in Dealscan is shown below:

14. FINANCIAL COVENANTS. Borrowers shall maintain and keep in full force and effect each of the financial covenants set forth below: (a) Net Worth. Borrowers shall maintain at all times a minimum Net Worth in an amount not less than the amounts set forth below opposite the corresponding measurement periods:

Measurement Period:	Minimun Net Worth:
Closing Date through September 28, 2002	$6,700,000
September 29, 2002 through December 28, 2002	$7,500,000
December 29, 2002 through March 28, 2003	$8,700,000
March 29, 2003	$8,790,000
March 30, 2003 through April 1, 2004	(a) $8,790,000, plus (b) 80% of actual Consolidated Net Income of Borrowers for the Fiscal Year ended March 29, 2003.
April 2, 2004 through March 26, 2005	(a) Minimum Net Worth required for March 30, 2003 through April 1, 2004, plus (b) 80% of actual Consolidated Net Income of Borrowers for Fiscal Year ended April 1, 2004.
March 27, 2005, and at all times thereafter	(a) Minimum Net Worth required for April 2, 2004 through March 26, 2005, plus (b) 80% of actual

Consolidated Net Income of Borrowers for Fiscal Year ended March 26, 2005.

Nini, Smith, and Sufi (2009) collect the covenant information in the credit agreement and use six mutually exclusive categories to identify the financial covenants: coverage ratio covenants, debt to cash flow covenants, net worth covenants, debt to balance sheet covenants, liquidity covenants, and minimum cash flow covenants. Among all, coverage ratio covenants, debt to balance sheet covenants, and liquidity covenants have several components. Coverage ratio covenants include interest coverage, fixed charge coverage, and debt service covenants. The debt to total capitalization and debt to net worth covenants are included in debt to balance sheet covenants. Liquidity covenants include current ratio, quick ratio, and working capital covenants.

Based on the accounting information used in the covenants, Christensen and Nikolaev (2012) broadly classify the financial covenants into two groups: performance covenants and capital covenants. In the study conducted by Demerjian (2011), capital covenants are financial covenants with balance sheet variables and performance covenants are written on income statement values. The capital covenants, also called as balance sheet covenants, are the restrictions on balance sheet information, such as leverage, net worth, and current ratio. The performance covenants, also called as income statement covenants, are mainly formulated by operating performance, including coverage ratio, debt to cash flow, and minimum cash flow covenants. This classification method can show that financial covenants function differently. Capital covenants align the shareholders' incentives with the lenders ex ante, ensure the minimum value of a firm's asset maintained by the shareholders, and provide a lower bound of liquidation value. Performance covenants allow the lenders to monitor and examine whether the borrower has significant operating income to service the debt.

3.Appendix B: Unmatched package data in Dealscan

As described in Section 3.1, we can only have 26% match rate which is lower than Nini, Smith, and Sufi's (2009) 40%.[5] In order to understand the reasons, we randomly select 30 unmatched deals (= 5% * 601 unmatched package data) and examine the effectiveness of our text-search program.[6] After conducting a detailed search by hand, we list the unmatched reasons in the Appendix Table.

Among all the 30 unmatched observations, we can find full contract in EDGAR for two observations. One unmatched reason indicates that we should also consider locating the loan contract based on the amount of all the facilities in this deal and the other unmatched reason is because that we mismatch the company names. This shows that we may miss the contracts for 7% of the unmatched package data. For 47% of the unmatched observations, we directly search the company names in EDGAR and find that we are unable to have either the borrowers' information or the corresponding files in EDGAR. For the 33% of the unmatched observations, we cannot have the information related to the deal active date in EDGAR. And, for the remaining 10% of unmatched observations, we are unable to obtain loan contract in EDGAR.

[5] When requiring nonmissing loan amount and nonmissing interest spread of all the facilities in each deal made to non-financial firms, we can have match rate equal to 32% which is still a lower value.

[6] Nini, Smith, and Sufi (2009) randomly select 200 observations which are roughly 3% of 5,861 unmatched deals to address the possible misses in their program.

Appendix Table

Unmatched Reasons for Package Data in Dealscan

Deal Active Date	Company Name in Dealscan	Identified CIK	Company Name in EDGAR	Unmatched Reasons
20050131	Central Security Group Inc	0018748	CENTRAL SECURITIES CORP	Unable to have the information related to the deal active date in EDGAR
19971111	Premcor Refining Group Inc (fka Clark Refining & Marketing Inc)	0020762	PREMCOR REFINING GROUP INC	① Unable to have the information related to the deal active date in EDGAR ② The information on the interest rate of all the facilities in this deal is missing
20040503	Communications Supply Corp	0022701	COMMUNICATIONS SYSTEMS INC	① Unmatched company name ② No matching companies in EDGAR
19980514	Acterna [Ex-Dynatech Corp]	0030841	ACTERNA CORP	① Unable to have the information related to the deal active date in EDGAR ② The information on the interest rate of all the facilities in this deal is missing
20061211	Plantation Timber Products Group Ltd	0051434	INTERNATIONAL PAPER CO /NEW/	① Unmatched company name ② No corresponding files in EDGAR (Plantation Timber CIK: 1296805)
20060828	Orange Broadband	0074778	ORANGE & ROCKLAND UTILITIES INC	① Unmatched company name ② No corresponding files in EDGAR (Orange Broadband CIK: 1359372)
20031027	Hunter Fan Co	0312069	BARCLAYS PLC	Unable to have the information related to the deal active date in EDGAR
20070416	Hunter Fan Co	0312069	BARCLAYS PLC	Unable to have loan contract in EDGAR
20050930	Veritext LLC	0773318	VERITEC INC	① Unmatched company name ② No matching companies in EDGAR
20040524	Daily Racing Form LLC	0783412	DAILY JOURNAL CORP	① Unmatched company name ② No corresponding files in EDGAR (Daily Racing Form CIK: 884408)
20001001	Benchmark Medical	0863436	BENCHMARK ELECTRONICS	① Unmatched company name ② No matching companies in EDGAR

19980804	Celadon Group Inc	0865941	CELADON GROUP INC	Unable to have the information related to the deal active date in EDGAR
20060926	Petco Animal Supplies Inc	0888455	PETCO ANIMAL SUPPLIES INC	Unable to have the information related to the deal active date in EDGAR
20040802	Duane Reade Inc	0895364	DUANE READE INC	Unable to have the information related to the deal active date in EDGAR
20080718	USANA Health Sciences Inc	0896264	USANA HEALTH SCIENCES INC	Unable to have the information related to the deal active date in EDGAR
20040917	Culligan Water Technologies Inc	0914478	SAMSONITE CORP/FL	① Unmatched company name ② No corresponding files in EDGAR (Culligan Water Technologies CIK: 945382)
20040325	Saguaro Utility Group	0941138	UNS Energy Corp	Unmatched borrower name and unmatched loan facilities in the loan contract from EDGAR
20001122	Engle Homes	1049391	ENGLE HOMES ORLANDO INC	Unable to have loan contract in EDGAR
19980722	Anthony Crane Rental	1067606	ANTHONY & SYLVAN POOLS CORP	① Unmatched company name ② Full contract in EDGAR. ANTHONY CRANE RENTAL HOLDINGS LP CIK: 1070316 (The file of this credit agreement can be referred to Exhibit 10.3 and 10.4 of Registration Statement on Form S-4 filed on September 30, 1998, File No. 333-65003)
20080922	Centerplate Inc [ex-Volume Services America Inc]	1086774	Centerplate, Inc.	① Unable to have the information related to the deal active date in EDGAR ② The information on the interest rate of all the facilities in this deal is not provided
20020728	Network Communications Inc	1087879	NETWORK COMMERCE INC	① Unmatched company name ② No corresponding files in EDGAR (Network Communications CIK: 1364727)
20110915	Mutual Fund Store	1094810	MUTUAL FIRST FINANCIAL INC	① Unmatched company name ② No matching companies in EDGAR
20070507	Local TV LLC	1259550	LOCAL.COM Corp	① Unmatched company name ② No matching companies in EDGAR
20050824	Hit Entertainment	1309799	HARVEST ENERGY TRUST	① Unmatched company name

				② No corresponding files in EDGAR (Hit Entertainment CIK: 1038385)
20080912	Marshall Retail Group LLC	1399315	MARSHALL & ILSLEY CORP	① Unmatched company name ② No corresponding files in EDGAR (Marshall Retail Group CIK: 1216236)
19990723	ChipPAC International Co Ltd	1402159	ACROPOLIS PRECIOUS METALS INC.	① Unmatched company name ② No corresponding files in EDGAR (ChipPAC International Co CIK: 1097583)
20050331	Talecris Biotherapeutics Inc	1405197	Talecris Biotherapeutics Holdings Corp	Unable to have the information related to the deal active date in EDGAR
20080912	Weather Channel	1453090	Weatherford International Ltd./Switzerland	① Unmatched company name ② No matching companies in EDGAR
20060503	NPC International	1548621	NPC International, Inc., NPC Operating Company A, Inc. and NPC Operating Company B, Inc.	Unable to have loan contract in EDGAR
20100930	EVERTEC Inc	1559865	EVERTEC, Inc.	① Full contract in EDGAR ② We miss this contract because of the inconsistency between the deal amount and the amount requested by the borrower in the contract agreement. However, the amount of all the facilities in this deal is matched. Term B Loan: $350 million; Revolving Facility Loan: $50 million. (The file of this credit agreement can be referred to Exhibit 10.1 of Registration Statement on Form S-4 filed on April 14, 2011, File No. 333-173504)

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