

# **Bank Loan Covenants, Lending Relationships and Covenant Violations**

**By**  
**Yi Zheng**

Student ID: 45050406

Supervisors: Professor Jing Shi

Associate Professor Qing Zhou

A Thesis Submitted in Fulfillment of the Requirements of  
the Degree of  
Master of Research (Finance)

18 January 2019

The Department of Applied Finance  
The Faculty of Business and Economics  
Macquarie University

## Statement of Originality

*This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.*

(Signed)  \_\_\_\_\_ Date: 18/01/2019

## **Acknowledgments**

This thesis would have been impossible without the assistance and support of my supervisors. First, I am profoundly grateful to my principal supervisor, Professor Jing Shi, who has been very supportive throughout. His guidance and expertise were critical in all stages of this research and in the writing of this thesis.

I am also profoundly grateful to my associate supervisor, Associate Professor Qing Zhou, who has provided me with invaluable help both professionally and personally when I most needed it. She has been very caring and has provided great suggestions on how to make my research and thesis better.

Finally, I must express my gratitude to my parents for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of the research and writing of this thesis.

# CONTENTS

<b><i>CONTENTS</i></b> .....	<b><i>I</i></b>
<b><i>LIST OF TABLES</i></b> .....	<b><i>II</i></b>
<b><i>ABSTRACT</i></b> .....	<b><i>III</i></b>
<b><i>1. Introduction</i></b> .....	<b><i>1</i></b>
<b><i>2. Theories and hypothesis development</i></b> .....	<b><i>6</i></b>
<b><i>2.1. Lending relationships and financial covenant strictness</i></b> .....	<b><i>6</i></b>
<b><i>2.2. Lending relationships and covenant violations</i></b> .....	<b><i>9</i></b>
<b><i>3. Data and measurement</i></b> .....	<b><i>11</i></b>
<b><i>3.1. Data and sample selection</i></b> .....	<b><i>11</i></b>
<b><i>3.2. Variable definitions</i></b> .....	<b><i>13</i></b>
<b><i>3.2.1. Financial covenant strictness</i></b> .....	<b><i>13</i></b>
<b><i>3.2.2. Lending relationships</i></b> .....	<b><i>15</i></b>
<b><i>3.2.3. Other variables</i></b> .....	<b><i>18</i></b>
<b><i>3.3. Sample description</i></b> .....	<b><i>20</i></b>
<b><i>4. Analyses of lending relationships and financial covenant strictness</i></b> .....	<b><i>24</i></b>
<b><i>4.1. The impact of lending relationships on financial covenant tightness</i></b> .....	<b><i>24</i></b>
<b><i>4.2. The impact of lending relationships on financial covenant intensity</i></b> .....	<b><i>30</i></b>
<b><i>5. Analyses of lending relationships and covenant violations</i></b> .....	<b><i>38</i></b>
<b><i>5.1. Financial covenant strictness and lending relationships</i></b> .....	<b><i>39</i></b>
<b><i>5.2. Financing capacity of relationship borrowers</i></b> .....	<b><i>49</i></b>
<b><i>6. Additional tests</i></b> .....	<b><i>56</i></b>
<b><i>7. Conclusion</i></b> .....	<b><i>57</i></b>
<b><i>References</i></b> .....	<b><i>59</i></b>

## LIST OF TABLES

<i>Table 1 The standard definitions and frequencies of financial covenant types.....</i>	<i>15</i>
<i>Table 2 Comparison of each number of loan packages that borrowing companies have in the full sample and the relationship sample .....</i>	<i>18</i>
<i>Table 3 The descriptions of the main variables.....</i>	<i>19</i>
<i>Table 4 Summary statistics for the relationship and covenant strictness sample and the covenant violation sample .....</i>	<i>21</i>
<i>Table 5 The effect of lending relationship intensity and lending relationship duration on financial covenant tightness.....</i>	<i>25</i>
<i>Table 6 The nonlinear effect of lending relationship intensity and lending relationship duration on financial covenant intensity.....</i>	<i>31</i>
<i>Table 7 Covenant strictness predicts actual covenant violations.....</i>	<i>40</i>
<i>Table 8 The predictive ability of the lending relationship for actual covenant violations .....</i>	<i>44</i>
<i>Table 9 The interaction of the lending relationship with the distribution of financing capacity and firm size as a predictor of actual covenant violations .....</i>	<i>50</i>
<i>Table 10 The predictive ability of the lending relationship depends on the distribution of financing capacity and the firm size .....</i>	<i>53</i>

## **ABSTRACT**

Using a large sample of U.S. corporate bank loans, we investigate the influence of lending relationships on loan covenants and covenant violations. Consistent with the information asymmetry argument, we find that lending relationships substitute for financial covenants in loan contracts. In addition, the effect of lending relationship intensity on the total number of financial covenants included in a loan package is U-shaped.

It appears that lending relationship intensity acts as an indicator of covenant violations. Specifically, an increasing lending relationship intensity decreases the likelihood of covenant violations, but relationship borrowers who have access to the public debt market or are of a large size in their industry are subject to a high probability of covenant violations. Overall, relationship borrowers with different levels of relationship intensity and financing capacity are subject to a distinct probability of covenant violations.

Keywords:

lending relationships, financial covenants, covenant violations, lead arrangers, information asymmetries, creditor control rights

## 1. Introduction

Banks act as important delegated monitors of borrowing companies through lending relationships where bank loan covenants play a key role (Rajan and Winton, 1995; Boot, 2000; Park, 2000). The loan covenants provide shifts of control rights from borrowing companies to creditors when the firms' performance deteriorates or the firms violate loan covenants. While previous studies mainly focus on the loan price and availability of credit, research in nonprice loan terms (i.e., loan covenants) is relatively sparse.<sup>1</sup> How does bank relationship lending influence loan covenant strictness? How does the loan covenant strictness in relationship lending affect the ex post covenant violation? Answers to these questions remain unexplored and have implications for both information asymmetry theories and bank lending practice. In this paper, we seek to answer these questions by empirically examining a large sample of U.S. corporate bank loan covenants and covenant violation cases.

Due to the existence of information asymmetries between creditors and borrowers, creditors usually access limited information from their borrowers, which results in weak creditors' control rights and uncertain credit risk among their borrowers (Sufi, 2007). To solve the issues, loan covenants are widely used by creditors to intervene in borrowers' operating activities and monitor borrowers' performance. Among the different categories of loan covenants,<sup>2</sup> financial covenants act as an effective instrument to require borrowing companies to maintain their financial ratios within a certain level (Apilado and Millington, 1992). Financial covenants are not homogeneously restrictive in all loan agreements,

---

<sup>1</sup> There are two exceptions: Bharath, Dahiya, Saunders and Srinivasan (2009) explored the effects of lending relationships on loan maturity and security, and Prilmeier (2017) explored the effects of lending relationships on loan terms beyond price and the availability of borrowers' credit.

<sup>2</sup> Nini, Smith and Sufi (2012) divided covenants into three categories: affirmative covenants, negative covenants and financial covenants.

however, because the degree of borrowers' information transparency varies. For repeated lending activities between a borrower and a lender, the lender becomes a *relationship lender* and acquires more borrower information, which is generally difficult for nonrelationship lenders to obtain. As lending activities proceed further, the relationship lender becomes better informed relative to other nonrelationship lenders. Therefore, we argue that the lending relationships can mitigate the information asymmetry problem between creditors and borrowers, thereby affecting the financial covenant strictness of bank loans. Thus, the effect of lending relationship status on the financial covenants of a loan contract is an empirical question.

We examine the impacts of lending relationships on financial covenant strictness. Two proxies, financial covenant tightness and financial covenant intensity, are utilized to measure financial covenant strictness. While the financial covenant tightness is the ex-ante probability of financial covenant violation (Murfin, 2012), the financial covenant intensity is the total number of financial covenants in a loan package (Demerjian and Owens, 2016). Financial covenant intensity refers to the range of financial events over which the lender can intervene, while financial covenant tightness involves the timing of the lender's intervention.

Using a sample of 6,891 bank loan packages that involve 3,084 nonutility, nonfinancial and nonpublic administration U.S. borrowing companies in the period between 1995 and 2008, we document the following notable findings. First, we find that lending relationship intensity and lending relationship duration monotonically decrease financial covenant tightness in a loan package. This phenomenon is more apparent in relationship borrowing companies that have strong bargaining power for their lenders.<sup>3</sup> These results support the study of Garleanu

---

<sup>3</sup> Notably, to examine the effect of relationship borrowers' bargaining power, the lending relationships are measured by lending relationship duration rather than lending relationship intensity.



and Zwiebel (2008) where they observe that excessively restrictive covenants are usually applied at the beginning stage of a lending relationship to mitigate the information asymmetry risk.

Second, we analyze the impact of lending relationships on financial covenant intensity and find that in contrast with the intensity of financial covenant tightness, financial covenant intensity is primarily driven by lending relationship intensity rather than lending relationship duration. In addition, lending relationship intensity has a U-shaped effect on financial covenant intensity. While a larger number of financial covenants are used at the beginning stage and high level of a lending relationship, the minimum number of financial covenants is found at the medium level of lending relationships. We argue that the nonlinear effect is due to the confluent impact of information asymmetries and lock-in effects (Schenone, 2009; Rajan, 1992; Sharpe, 1990), as well as creditors' monitoring incentives (Rajan and Winton, 1995; Boot, 2000; Park, 2000).

We then explore the forecasting powers of financial covenant strictness and lending relationships on loan covenant violations. The relationship lender's expectation for covenant violations can be reflected by financial covenant strictness, and lending relationships have statistically significant impacts on financial covenant strictness, so financial covenant strictness and lending relationships should be correlated with covenant violations. We also consider the financing capacity of the relationship borrower to be an essential factor that affects covenant violations.

The results first reveal that when tighter financial covenants are assigned to a loan, the borrowers are more likely to report a covenant violation within the loan's tenure. However, for relationship lending, higher financial covenant intensity is more likely to predict a

covenant violation rather than financial covenant tightness, because these two variables separately refer to the range and the timing with which creditors can intervene.

Second, we find low and high lending relationship intensities are more likely to report a covenant violation in the loan's tenure compared to medium relationship intensity. We argue this because banks prefer to sign more restrictive financial covenants to a loan contract to mitigate the uncertain credit risk from the borrowing company in the inception of a lending relationship (Garleanu and Zwiebel, 2008). Additionally, high lending relationship intensity is subject to a lower violation cost than other levels of relationship intensity, and the exclusive lending relationship is an extreme case (Gertner and Scharfstein, 1991; Morris and Shin, 2004).

Third, we find that the financing capacity of relationship borrowers is a significant factor that affects relationship borrowing companies in violating loan covenants. Since relationship borrowers with high financing capacity can obtain capital from the public debt market, relationship lending is not the sole channel for them to acquire capital, so that these borrowers can easily trade off the loss of covenant violations. Due to the low or negligible loss of covenant violations, it is conceivable that borrowers with high financing capacity would be likely to violate covenants.

The contributions of this paper are at least twofold. While the prior literature focuses on the borrowing company's prior performance to determine the lender's contingent control rights and monitoring incentives (Rajan and Winton, 1995; Boot, 2000; Park, 2000), the effect of lending relationships on covenant strictness (Prilmeier, 2017) and thus covenant violations remain unexplored. Hence, this study fills the gap and reconciles the mixed evidence in the previous studies.

We also contribute to the scarce literature on the effect of lending relationships on financial covenant strictness. A large body of literature primarily focuses on lending activities by small and private borrowers, although a recent paper by Bharath, Dahiya, Saunders and Srinivasan (2009) suggests that lending relationships are valuable for relationship borrowers, as the lending relationship can reduce interest rates and collateral requirements associated with the acquisition of larger loans. However, to the best of our knowledge, the present paper is the first work on the effect of relationship intensity on financial covenant selection.

The remainder of this paper is organized as follows. Section 2 reviews the existing literature and theories on lending relationships, covenant strictness and covenant violations to develop testable hypotheses. Section 3 describes the data and the measure of variables and presents summary statistics for the sample. Sections 4 and 5 present our main results. Section 6 presents a series of robustness checks. Section 7 concludes by outlining the important implications of this study and presents our future research.

## **2. Theories and hypothesis development**

In this section, we review the existing literature and theories surrounding loan covenants, lending relationships and covenant violations. Then, we propose our primary hypotheses on this topic.

### **2.1. Lending relationships and financial covenant strictness**

Information asymmetry exists in the use of covenants for all types of debt agreements, including private loan contracts and bonds and note indentures, but typically, covenants are more numerous and detailed in private loan contracts (Taylor and Sansone, 2006; Gilson and Warner, 1998; Kahan and Tuckman, 1993). Loan covenants serve as an effective instrument to mitigate agency costs and flexibly monitor borrowers' performance (Billett, King and Mauer, 2007; Qi and Wald, 2008; Bharath, Pasquariello, and Wu, 2008; Qi, Roth and Wald, 2011; Chava, Kumar and Warga, 2009; Miller and Reisel, 2011; Prilmeier, 2017) because they allow for an increase in lender influence over the financial decisions of borrowing companies (Sufi, 2007; Roberts and Sufi, 2009; Nini, Smith, and Sufi, 2009, 2012; Chava and Roberts, 2008; Beneish and Press, 1993). Garleanu and Zwiebel (2008) developed a theoretical model to explain why creditors frequently choose covenants as an effective instrument to ensure their control rights. In their model, information asymmetry between a lender and a borrower is strongly correlated with the potential for future wealth transfer. In this situation, increasing the restrictiveness of covenants is an effective way to distribute more financial decision-making rights to the lender so as to protect the lender's interests (Chava and Robert, 2008; Nini, Smith and Sufi, 2009, 2012; Roberts and Sufi, 2009, 2009; Beneish and Press, 1993). In addition, more restrictive covenants used in the secondary loan market can substitute for the borrower's reputation (Drucker and Puri, 2008).

In practice, covenants can be divided into three categories: affirmative covenants, negative covenants and financial covenants (Nini, Smith, and Sufi, 2012). Among these types of covenants, financial covenants are commonly used by lenders to limit borrowers' accounting performance and risk. Financial covenants require borrowers to maintain financial ratios within certain ranges to mitigate information asymmetry risk and protect creditors' interests. Financial covenants also contribute to improving the borrower's financial performance and enhancing the borrower's firm value because this method can effectively provide protection against information asymmetries (Diamond 1984, 1991; Aghion and Bolton, 1992; Dewatripont and Tirole, 1994; Rajan and Winton, 1995). Therefore, riskier firms are usually subjected to loan contracts with more restrictive financial covenants (Berlin and Mester, 1992; Billett, King and Mauer, 2007; Rauh and Sufi, 2010; Demiroglu and James, 2010).

On the other hand, repeated lending activities can reduce information asymmetries between relationship lenders and relationship borrowers because relationship lending allows relationship lenders to acquire specific information about the relationship borrower by repeated interactions over time (Boot, 2000). This is one reason why excessively restrictive covenants are usually applied at the beginning of a lending relationship to resolve the problem of information asymmetries (Garleanu and Zwiebel, 2008).

In addition, there is a substantial body of literature focusing on the various factors that influence credit availability to borrowers (Bernanke and Gertler, 1995; Peek and Rosengren, 1997; Kang and Stulz, 2000; Paravisini, 2008, Lin and Paravisini, 2011). A number of papers represent a positive relationship between the lending relationship duration and the availability of credit to the relationship borrower (Petersen and Rajan, 1994; Berger and Udell, 1995; Cole, 1998; Degryse and Van Cayseele, 2000). Lending relationships can result in lower interest rate spreads, fewer collateral requirements, and a larger available loan

amount for the borrower (Bharath, Dahiya, Saunders and Srinivasan, 2007, 2009; Bester, 1985; Boot and Thakor, 1994, Murfin, 2012, Prilmeier, 2017; Bradley and Roberts, 2004; Chava and Roberts, 2008; Robert and Sufi, 2009; Nini, Smith and Sufi, 2009, 2012; Matvos, 2013; Reisel, 2014). Hoshi, Kashyap, and Scharfstein (1990) use the example of financial distress in Japanese firms to explain that borrowers with strong banking relationships are less likely to experience constrained credit than borrowers with weak banking relationships.

Furthermore, specific information about the relationship borrower can reduce the relationship lender's monitoring cost. Because they acquire specific information about relationship borrowers, relationship lenders can appropriately aim their monitoring efforts given the borrower's situation instead of monitoring every aspect of the relationship homogeneously, which dramatically reduces the relationship lenders' monitoring costs (Fama, 1985; Boot, 2000). Due to lock-in effects, relationship lenders have an information acquisition advantage over other outside lenders (Rajan, 1992; Sharpe, 1990).

The use of covenants in relationship lending should be different from that in nonrelationship lending. Due to the information asymmetries, the primary purpose of covenant use is to reduce information asymmetries between the lender and the borrower (Apilado and Millington, 1992), and lending relationships can also contribute to a decrease in information asymmetries (Prilmeier, 2017). Bharath, Dahiya, Saunders and Srinivasan (2009) initially research the effect of lending relationship intensity on loan contract terms. They indicate that relationship borrowers obtain better loan terms from relationship lenders, especially given the high borrower transparency in relationship lending. Considering the existing literature, therefore, we hypothesize that a lending relationship can contribute to less restrictive covenants assigned to a loan contract:

**Hypothesis 1 (H1):** Lending relationships can substitute for financial covenants assigned to loan contracts.

## **2.2. Lending relationships and covenant violations**

A covenant violation is a default event, meaning that it gives the creditor the right to accelerate the debt or increase the interest rate. In practice, creditors rarely accelerate the debt; instead, a covenant violation usually triggers a renegotiation of the credit agreement (Nini, Smith and Sufi, 2012). An increase in the creditor control right is usually associated with a covenant violation, which has an essential impact on borrowers' competitors and product-market competition (Billett, Esmer and Yu, 2018). There are several studies that investigate the cost of covenant violations through borrowing companies' annual financial reports (Beneish and Press, 1993; Chen and Wei, 1993; Nini, Smith and Sufi, 2012). The cost of a covenant violation is typically significant for borrowers, so borrowers usually only accept covenants with which they can easily comply (Demiroglu and James, 2010). Dichev and Skinner (2002) indicate that borrowers commonly accept covenants whose corresponding financial ratios are sufficiently manipulable.

On the other hand, a large number of papers indicate that a change in a lender's behavior is strongly related to that lender experiencing a default (e.g., Berger and Udell, 2004; Chava and Purnanandam, 2011). A default event by an individual borrowing company affects the lead arranger's ex post activities in the syndicated loan market (Gopalan, Nanda and Yerramilli, 2011).

According to the literature, covenant violations are an essential issue to research because they have confounding effects on both the lender and the borrower. Murfin (2012) develops a model to suggest that covenant strictness is strongly correlated with covenant violations.

According to the existing literature, we hypothesize that the cost of a violation is higher for relationship borrowers than for nonrelationship borrowers, so the probability of covenant violations is low for relationship borrowers. Therefore, we posit that:

**Hypothesis 2 (H2):** Lending relationships can reduce the probability of covenant violations.



### **3. Data and measurement**

#### **3.1. Data and sample selection**

Our data are sourced from Loan Pricing Corporation's DealScan database and Compustat database over the period 1995 - 2008. We obtain sole lender and syndicated loan information from Loan Pricing Corporation's DealScan database. This database reports a large number of loan characteristics, such as loan covenants, loan maturities, loan amounts, loan types, and loan purposes. According to the introduction to LPC DealScan by Strahan (1999), Carey and Hrycray (1999)<sup>4</sup> and Chava and Roberts<sup>5</sup> (2008), DealScan covers a large proportion of the outstanding commercial and industrial U.S. loan market. The accounting information of borrowing companies is obtained from the Compustat database. Data from Compustat and DealScan are then merged via a link file provided by Chava and Roberts (2008).

We eliminate borrowing companies from the utility, financial and public administration sectors from our two samples using the one-digit SIC code. This provides data for 6,891 loans involving 3,084 U.S. borrowing companies in the relationship and covenant strictness sample, while there are data for 6,249 loans incurred by 2,857 U.S. borrowing companies in the covenant violation sample.

Because the DealScan database reports covenant information at the package level (or the deal level), and a covenant in a package applies to all facilities in this package, we integrate all loan data to the package level. In addition, to ensure that the borrowing companies' accounting information we use is publicly available on the active date of the loans in our

---

<sup>4</sup> According to Carey and Hrycray (1999), the DealScan database covered between 50% and 75% of outstanding commercial and industrial loans in the U.S. in the early 1990s, and the coverage increased after that.

<sup>5</sup> Chava and Roberts (2008) estimate that approximately 60% of DealScan data are gathered from SEC filings.

sample, we employ the borrowing companies' latest issued accounting information to match the loans.

Furthermore, we take bank mergers and holding companies into consideration. Over our sample period, there were a large number of bank mergers and acquisitions activities in the U.S. banking sector. Since the successor entity has access to specific information on the original entities' relationship borrowers, we assume that the successor entity is the relationship lender for the existing relationship borrowers. We use the Federal Reserve's National Information Center and Bloomberg to track bank mergers and bank holding companies by hand matching the data. This process allows us to track the root of a lending relationship even if the original relationship lender does not exist due to a bank merger or acquisition.

A number of data selection criteria are implemented. Because we focus on U.S. corporate bank loans in this study, loans involving foreign currency or syndicated foreign countries or unknown countries are excluded from the sample. In addition, loans with missing required loan information in the DealScan database and loans with missing financial information for borrowing companies in the Compustat database are both excluded from the sample. Moreover, due to the limit of the link file for DealScan and Compustat provided by Chava and Roberts (2008), loans that do not match the borrowing companies' financial information in the Compustat database are omitted from the sample. Finally, if there is no record in the Compustat database for the fiscal year prior to the loan active date, the loan is omitted from the sample.

## 3.2. Variable definitions

### 3.2.1. Financial covenant strictness

In practice, covenants are divided into three categories: affirmative covenants, negative covenants and financial covenants (Nini, Smith, and Sufi, 2012). Affirmative covenants mainly require borrowers to take certain actions, such as purchasing insurance or meeting the creditor's demand for regular reporting. Negative covenants are mainly used by creditors to prevent borrowers from taking certain actions, such as paying dividends or disposing of assets. Financial covenants are based on accounting performance and risks, such as requiring borrowers to maintain financial ratios within certain levels. In this study, we focus only on financial covenants.

In this study, financial covenant strictness is measured by financial covenant intensity and financial covenant tightness. Financial covenant intensity is the total number of financial covenants included in a package. Financial covenant tightness is measured as in Murfin (2012). The financial covenant tightness can be measured as the ex ante probability of technical default by borrowers for individual financial covenants in a loan:

$$p = 1 - \Phi\left(\frac{r_t - \underline{r}}{\sigma_t}\right)$$

where  $\Phi$  is the standard normal cumulative distribution function,  $\underline{r}$  is the specified value of a covenant violation threshold in a loan contract,  $r_t$  is the borrowing company's realized financial ratio that corresponds to the loan covenant at the loan inception, and  $\sigma_t$  is the standard deviation of the borrowing company's realized financial ratio over the 12 quarters preceding the loan inception. If a covenant limits  $\underline{r}$  to a maximum value, the covenant tightness equation is multiplied by negative one to ensure that the covenant tightness value

falls between zero and one. The borrowing company's realized financial ratio is calculated from the quarterly Compustat North America database, which is measured as in Demerjian and Owens (2016). It is worth mentioning that due to the extensive missing information on intangible assets in the quarterly Compustat North America database, we solve this issue using the last annualized figures divided by the median standard deviation of the financial ratio for all borrowing companies, which involves tangible net worth covenants and debt with tangible net worth covenants. Finally, we calculate the financial covenant tightness of a loan package as the average tightness across all financial covenants in a loan package. We apply this method to measure the financial covenant tightness of each loan package.

Table 1 shows a variety of financial covenant types in the relationship and covenant strictness sample. Financial covenants are categorized in six groups as in Nini, Smith and Sufi (2009): coverage ratio covenants, debt to cash flow ratio covenants, debt to balance sheet covenants, liquidity covenants, earnings before interest, tax, depreciation and amortization (EBITDA) covenants, and net worth covenants. These covenants require borrowing companies to maintain a certain level of coverage ratio, liquidity, net worth and EBITDA, or they restrict borrowing companies' maximum debt proportion. Thus, these financial covenants effectively mitigate credit risks and ensure creditors' control rights. Among these financial covenants,<sup>6</sup> coverage covenants are the type most frequently assigned to loans. A total of 77.53% of the loan packages in the relationship and covenant strictness sample contain at least one of the coverage covenants, followed by debt to cash flow covenants (61.41%) and net worth covenants (39.17%), respectively.

---

<sup>6</sup> The DealScan database also includes Max. Capex, Max. Loan to Value, Max. Long-Term Investment to Net Worth, Max. Net Debt to Assets, Max. Total Debt (including Contingent Liabilities) to Tangible Net Worth, Min. Equity to Asset Ratio, Min. Net Worth to Total Asset and Other Ratio. However, each of these covenants appears in a negligible proportion (i.e., < 0.05%) of the DealScan full database. Therefore, we omit them from this study (Demerjian and Owens, 2016).

**Table 1 The standard definitions and frequencies of financial covenant types**

This table summarizes the standard definitions and frequencies of financial covenant types reported in the relationship and covenant strictness sample, based on data collected from the DealScan database. This sample of loans with available covenant information includes 6,891 loans packages that involve 3,084 nonutility, nonfinancial and nonpublic administration U.S. borrowers in the period between 1995 and 2008.

<b>Financial covenants</b>	<b>Standard definition of financial covenants</b>	<b>Frequency of the sample (%)</b>
Max. Debt to EBITDA	Debt/EBITDA	51.52
Max. Senior Debt to EBITDA	Senior Debt/EBITDA	9.89
<b><i>Any debt to cash flow ratio covenant</i></b>		<b>61.41</b>
Max. Debt to Equity	Debt/Net Worth	0.77
Max. Debt to Tangible Net Worth	Debt/Tangible Net Worth	10.61
Max. Leverage Ratio	Debt/Assets	10.18
Max. Senior Leverage	Senior Debt/Assets	0.10
<b><i>Any debt to balance sheet covenant</i></b>		<b>21.66</b>
Min. Cash Interest Coverage	EBITDA/Interest Paid	0.95
Min. Debt Service Coverage	EBITDA/(Interest Expense + Principal)	7.81
Min. Fixed Charge Coverage	EBITDA/(Interest Expense + Principal + Rent Expense)	36.79
Min. Interest Coverage	EBITDA/Interest Expense	31.98
<b><i>Any coverage ratio covenant</i></b>		<b>77.53</b>
Min. Current Ratio	Current Assets/Current Liabilities	11.83
Min. Quick Ratio	Account Receivable + Cash and Equivalents/Current Liabilities	3.48
<b><i>Any liquidity covenant</i></b>		<b>15.31</b>
<b><i>Min. EBITDA</i></b>	EBITDA	<b>11.40</b>
Min. Net Worth	Net Worth	19.67
Min. Tangible Net Worth	Tangible Net Worth	19.50
<b><i>Any net worth covenant</i></b>		<b>39.17</b>
<b>Total Number of Loans</b>		<b>6,891</b>

### 3.2.2. Lending relationships

To measure the lending relationship status, we focus on lead arrangers of loans, since lead arrangers serve as an intermediary between other participant lenders and the borrowing companies, and they are usually better informed than other participant lenders in a syndicated loan (Ivashina, 2009). To define the lead arranger in a loan, we classify all sole

lenders and those lenders who have a value of “Yes” in the field “Lead Arranger Credit”<sup>7</sup> as lead arrangers. We also categorize lenders that are labeled in the “Lender roles” field with “agent”, “administrative agent”, “arranger” and “lead bank” as lead arrangers (Prilmeier, 2017). Then, we mainly employ four alternative measures of lending relationship intensity.

The first variable *Relation(Maximum)* is defined as the percentage of the total loan package amount that a borrowing company raised from the current lead arranger over the five years prior to the current loan package to the total loan package amount that the borrowing company obtained from all lenders over the past five years (Prilmeier, 2017; Bharath, Dahiya, Saunders and Srinivasan, 2009; Schenone, 2009). If there are multiple lead arrangers within one package, we designate *Relation(Maximum)* as the maximum value of the package:

$$Relation(Maximum) = \max_k \frac{\sum Loan\ amount_{kj}}{\sum Loan\ amount}$$

where *k* is the lead arranger for the largest value of *Relation(Maximum)* in package *j*. This sample excludes cases where there has been no loan raised by the borrower in the last five years. In addition, if the current loan is the first time that the borrowing company is interacting with this lead arranger, the value of *Relation(Maximum)* for this package is zero.

The second alternative variable *Relation(Number)* is measured as the percentage of the number of loan packages that are raised from the current lead arranger in the five years prior to the current loan package to the total number of loan packages that the borrowing company contracted in the last five years (Bharath, Dahiya, Saunders and Srinivasan, 2009):

$$Relation(Number) = \frac{\sum Loan\ number_k}{\sum Loan\ number}$$

---

<sup>7</sup> Sufi (2007) focuses on the field “Lead Arranger Credit” as the sole criterion for lead arranger selection.

The third relationship variable is Relation(Duration), which is the time period in years from the active date of the borrower's first loan package with the current lead arranger to the active date of current loan package (Prilmeier, 2017).

The fourth variable is Relation, which is a binary measure for the lending relationship. It is designed to identify the existence of prior lending activities between the borrower and the current lead arranger.

The four variables capture lending relationship status from a variety of perspectives. The first and second measures of lending relationships are lending relationship intensity, which captures the current lead arranger's participation amount and the number of all loans with the borrowing company over the previous five years. Therefore, these two variables compare the current lender's participation with that of other lenders for the borrowing company. The third and fourth variables of lending relationships are absolute terms that capture the current lead arranger and the borrower's lending relationships. It is worth noting that our sample period is from 1995 to 2008, but the first and second measures require a five-year prior lag. Thus, loans that are raised between 1990 and 1995 are used to calculate these two variables, but they are not included in our final sample. For the third and fourth measures, they involve the first time that the borrower interacts with the current lead arranger, so the borrower's full set of loan packages in the DealScan is employed to determine the third and fourth variables.

Table 2 offers a comparison of each number of loan packages that borrowing companies have in the full sample and the relationship sample. In our full relationship and covenant strictness sample, there are a large number of loan packages that a borrowing company first contracted with its current lead bank. Relation(Maximum) and Relation(Number), however, are calculated using at least two loan packages per borrowing company because these two variables cannot be solely determined by the current loan package. Therefore, if the current

loan package is the sole package that the borrowing company contracted with the lead arranger, the loan package is omitted from the relationship sample.

**Table 2 Comparison of each number of loan packages that borrowing companies have in the full sample and the relationship sample**

This table reports the difference in the number of loan packages that borrowing companies have between the full sample and the relationship sample. In the final sample, if borrowing companies have only one loan with a specific lead arranger, the loan is included in the final sample, but is excluded in the relationship sample. Thus, there is no borrowing company with only one loan with a specific lead arranger in the relationship sample. All borrowing companies have at least two loans in the relationship sample because the lending relationship intensity is defined such that it cannot be determined by the first loan that a borrowing company contracts with a lead arranger. The final sample includes 3,084 U.S. borrowing companies from nonutility, nonfinancial and nonpublic administration sectors in the period between 1995 and 2008.

Number of loans number per firm	Final sample		Relationship sample	
	Number	Percent (%)	Number	Percent (%)
1	1392	45.14	0	0.00
2	733	23.77	530	17.19
3	401	13.00	496	16.08
4	261	8.46	359	11.64
5	142	4.60	295	9.57
6	76	2.46	260	8.43
7	49	1.59	197	6.39
8	14	0.45	171	5.54
9	6	0.19	125	4.05
10	6	0.19	120	3.89
11	1	0.03	104	3.37
12	1	0.03	90	2.92
13	1	0.03	74	2.40
14	0	0.00	56	1.82
15 or more	1	0.03	207	6.71
Total	3084	100.00	3084	100.00

### 3.2.3. Other variables

Table 3 defines a detailed description of the main dependent variables, explanatory variables and control variables used in this study. In summary, financial covenant tightness and financial covenant intensity are the variables used to measure the financial covenant strictness of a loan package. Relation(Maximum), Relation(Number), Relation(Duration)



and Relation are the variables that serve as the measures for a lending relationship. Among the four variables of lending relationships, Relation(Maximum) and Relation(Number) are used to measure lending relationship intensity, while Relation(Duration) is used to measure the time length of a lending relationship. Rated, Not Rated and Rating are determined by the S&P issuer credit ratings for the relationship borrowing companies. Rated and CP Access serve as two proxies for access to the public debt market. Ln(loan amount), Ln(maturity), Ln(lender) and Collateral are the variables determined by the loan characteristics. Ln(asset), Leverage, Tangibility, Current Ratio, Market-to-Book and Coverage Ratio are calculated using the accounting information of borrowing companies, so they can reflect borrowing companies' financial performance. Small Borrower and S&P 500 are the variables that reflect borrowing companies' size.

**Table 3 The descriptions of the main variables**

This table summarizes the descriptions of the main dependent variables, explanatory variables and control variables employed in this study.

Variable name	The description of the variable
Covenant Tightness	The ex ante probability of a covenant violation, which employs one minus the cumulative normal distribution function of the difference between borrowing companies' real financial ratios and the covenant limits divided by the previous twelve-quarter standard deviations of the financial ratios. Each loan's covenant tightness is calculated by averaging the tightness across all financial covenants in the loan.
Covenant Intensity	The total number of financial covenants included in a deal.
Violation	The actual covenant violation reported in 10-Q reports in SEC filings.
Ln(Covenant Intensity)	The natural logarithm of the total number of financial covenants in a loan.
Relation(Maximum)	The total loan amount to the borrower by the lead arranger over the previous five years divided by the total loan amount raised by the borrowing company over the five years prior to the current loan. For loans with multiple lead arrangers, Relation(Maximum) is the largest value for the lead arranger's relationship intensity.
Relation(Number)	The lead arranger's proportion of participation in the previous five years. For loans with multiple lead arrangers, the value is determined by the same lead arranger as Relation(Maximum).
Relation(Duration)	The time elapsed from the active date of the first loan that the borrowing company contracted with the same lead arranger to the active date of the current

---

	loan in years.
Ln[Relation(Duration)]	The natural logarithm of one plus Relation(Duration), which is the time elapsing from the active date of the first loan that the borrowing company contracted with the same lead arranger to the active date of the current loan in years.
Relation	A dummy variable that equals one if there was a loan contracted between the borrowing company and the lead bank prior to the current loan; otherwise, it equals zero.
Rated	A dummy variable that equals one if the firm has an S&P issuer credit rating; otherwise, it equals zero.
CP Access	A dummy variable that captures whether a borrower has access to commercial paper in the market and employs S&P short-term issuer credit ratings as a proxy. It equals one if the S&P short-term issuer credit rating reaches A-2 or above; otherwise, it equals zero.
Small Borrower	A dummy variable indicating whether the borrower's size is smaller than the median size of borrowers in the same industry in the sample at the one-digit SIC level.
Ln(loan amount)	The natural logarithm of the total amount that a loan commits from the contract.
Ln(maturity)	The natural logarithm of the weighted average loan maturity in months.
Ln(lender)	The natural logarithm of the total number of participating lenders within a loan, including syndicated loans and sole lender loans.
Collateral	A dummy variable that equals one if a loan is secured; otherwise, it equals zero.
Ln(asset)	The natural logarithm of the total assets of the borrowing company.
Leverage	The ratio of the book value of total debts to total assets.
Tangibility	The ratio of net property, plant, and equipment (PPE) to total assets.
Current Ratio	The ratio of the current assets to the current liabilities.
Market-to-Book	The ratio of the market value of outstanding shares plus the book value of total debt and preferred stock to the book value of total assets.
Coverage Ratio	The ratio of the earnings before interest, tax, depreciation and amortization (EBITDA) to the interest expense.
Rating	A categorical variable that equals one, two, three, or four if Standard & Poor's (S&P) long-term issuer credit rating is AAA, AA+, AA, or AA-, respectively, and so forth; it equals zero if there is no S&P long-term issuer credit rating.
Not Rated	A dummy variable that equals one if the borrowing company does not have any S&P issuer credit rating; otherwise, it equals zero.
S&P 500	A dummy variable that equals one if the borrowing company is a member of the S&P 500 index; otherwise, it equals zero.

---

### 3.3. Sample description

In this study, we mainly employ two samples to analyze the impact of lending relationships on financial covenant strictness and covenant violations. Table 4 reports the summary

statistics for these two samples. In Panel A, the borrowing companies' accounting information is taken from an annual Compustat database. However, the accounting information of borrowing companies is taken from the quarterly Compustat database in Panel B, due to the use of quarterly covenant violation data provided by Nini, Smith and Sufi (2012). Following Nini, Smith and Sufi (2012), covenant violations are considered as a new violation if the borrowing company did not report a covenant violation over the four quarters prior to the current violation.

**Table 4 Summary statistics for the relationship and covenant strictness sample and the covenant violation sample**

This table shows summary statistics for the dependent, main explanatory and control variables in the sample of 6,891 loans and 6,249 loans raised by nonutility, nonfinancial and nonpublic administration U.S. borrowing companies between 1995 and 2008. Panel A reports the descriptive statistics for the relationship and covenant strictness sample, and Panel B reports the descriptive statistics for the covenant violation sample. All financial ratios are winsorized at 1% to reduce the effect of outliers. Relation(Maximum) and Relation(Number) indicate the percentage of the loan amount and the loan number involved by the current lead arranger over the past five years, respectively. It is worth mentioning that all of the dollar amounts in the variables are converted to 2008 U.S. dollars using the Consumer Price Index for All Urban Consumers.

Panel A: Relationship and covenant strictness sample							
Variable	mean	std. dev.	min	p25	p50	p75	max
Relation(Maximum)	0.466	0.499	0	0	0	1	1
Relation(Number)	0.423	0.471	0	0	0	1	1
Relation(Duration)	1.639	2.581	0	0	0	2.493	16.04
Covenant Tightness	0.488	0.308	0	0.242	0.500	0.724	1
Covenant Intensity	1.672	1.497	0	0	2	3	7
Ln(loan amount)	18.59	1.633	12.31	17.55	18.67	19.71	24.09
Ln(maturity)	3.683	0.698	0	3.458	3.871	4.094	5.529
Ln(lender)	1.436	1.074	0	0.693	1.386	2.197	5.170
Ln(asset)	19.76	1.853	13.18	18.50	19.73	20.98	26.05
Leverage	0.332	0.253	0	0.157	0.283	0.455	1.345
Tangibility	0.309	0.225	0.0170	0.133	0.252	0.435	0.903
Current Ratio	1.898	1.152	0.307	1.162	1.630	2.305	7.262
Market-to-Book	0.707	0.152	0.0850	0.638	0.734	0.812	0.936
Coverage Ratio	19.19	50.62	-31.34	2.590	5.826	13.75	370.8
Rating	4.317	5.832	0	0	0	10	22
Not Rated	0.600	0.490	0	0	1	1	1
S&P 500	0.131	0.337	0	0	0	0	1

Panel B: Covenant violation sample							
Variable	mean	std. dev.	min	p25	p50	p75	max
Violation	0.0880	0.283	0	0	0	0	1
Relation(Maximum)	0.336	0.472	0	0	0	1	1
Relation(Number)	0.290	0.428	0	0	0	0.747	1
Relation(Duration)	0.822	1.551	0	0	0	1.203	10.84
Covenant Tightness	0.491	0.300	0	0.262	0.500	0.709	1
Covenant Intensity	2.527	1.078	0	2	2	3	7
Ln(loan amount)	18.54	1.707	12.80	17.41	18.70	19.76	23.55
Ln(maturity)	3.699	0.602	0	3.541	3.871	4.094	5.620
Ln(lender)	1.563	1.176	0	0	1.609	2.485	5.170
Collateral	0.347	0.476	0	0	0	1	1
Ln(asset)	19.86	1.812	14.01	18.61	19.92	21.14	25.31
Leverage	0.353	0.217	0	0.199	0.334	0.474	1.112
Tangibility	0.309	0.232	0.0180	0.127	0.245	0.437	0.908
Current Ratio	1.878	1.050	0.334	1.191	1.652	2.292	6.485
Market-to-Book	1.396	0.892	0.314	0.848	1.138	1.641	5.447
Coverage Ratio	15.55	45.81	-36.63	2.477	5.256	11.31	362.7
Rating	4.484	5.528	0	0	0	10	20
Not Rated	0.572	0.495	0	0	1	1	1
S&P 500	0.120	0.324	0	0	0	0	1

Panel A of Table 4 shows the descriptive statistics for the relationship and covenant strictness sample. In this sample, on average, the lending relationship intensity is approximately 0.47 for Relation(Maximum) and 0.42 for Relation(Number), respectively. The average lending relationship duration is 1.6 years in the sample. In addition, the average covenant tightness is 0.49, and 1.67 covenants on average are assigned to a loan package in the sample.

Panel B of Table 4 shows the summary statistics for the covenant violation sample. In this sample, the average lending relationship intensity is approximately 0.34 and 0.29 for Relation(Maximum) and Relation(Number) respectively, and relationship duration is approximately 0.8 years. In addition, the average financial covenant tightness and financial covenant intensity are approximately 0.491 and 2.5 per loan package, respectively.

There are some different characteristics in these two samples. The relationship intensity in the covenant violation sample is smaller than that in the relationship and covenant strictness sample; however, the average financial covenant intensity shows the opposite in the two sample. In addition, the average value of financial covenant tightness, approximately 0.49, is similar between these two samples. Moreover, the average market-to-book ratio in Panel A is significantly less than that in Panel B, which is almost half of Panel B. But the average coverage ratio in the relationship and covenant strictness sample is larger than that in the covenant violation sample. The other control variables are similar in these two samples.

## **4. Analyses of lending relationships and financial covenant strictness**

In this section, to explore the effect of lending relationships on the financial covenant strictness of the loan contract, we employ multiple regressions to analyze the impact of lending relationships on financial covenant tightness and financial covenant intensity.

### **4.1. The impact of lending relationships on financial covenant tightness**

To examine whether repeated lending activities between a borrower and a lender influence the financial covenant tightness of their loan contracts, we employ an ordinary least squares (OLS) regression to analyze whether the impact is significant. The results of the effect of lending relationship intensity and lending relationship duration on financial covenant tightness are reported in Table 5. The lending relationship intensity is measured by Relation(Maximum). The control variables include borrowing company and loan characteristics, as well as the one-digit SIC industry fixed effects, year fixed effects, loan purpose fixed effects and loan type fixed effects. Year fixed effects are based on the year of the active date of the deal. Loan purpose fixed effects and loan type fixed effects are classified into six and three categories, respectively (Durcker and Puri, 2009).

**Table 5 The effect of lending relationship intensity and lending relationship duration on financial covenant tightness**

This table reports ordinary least squares (OLS) regression results for financial covenant tightness on lending relationship intensity, lending relationship duration, Standard & Poor's (S&P) issuer credit ratings, access to commercial paper, small borrowers and control variables. This sample excludes U.S. borrowing companies from the utility, financial and public administration sectors between 1995 and 2008. **Low**

**Relation(Maximum)** and **High Relation(Maximum)** are categorized by Relation(Maximum) with values less than 30% and at least 70%, respectively. Control variables are defined in Table 4. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO and MBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through G). All other loan types are categorized as the other loan group. Numbers in parentheses are t-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Covenant Tightness	Covenant Tightness	Covenant Tightness	Covenant Tightness	Covenant Tightness	Covenant Tightness
Relation(Maximum)	-0.021*** (-2.801)		0.008 (0.653)			
Low Relation(Maximum)		0.955*** (12.591)				
High Relation(Maximum)		-0.021*** (-2.814)				
Ln[Relation(Duration)]			-0.023*** (-2.742)	-0.016*** (-2.597)	-0.014*** (-2.752)	-0.024*** (-3.662)
Ln[Relation(Duration)] × Rated				-0.006 (-0.683)		
Ln[Relation(Duration)] × CP Access					-0.051*** (-2.891)	
CP Access					-0.009 (-0.294)	
Ln[Relation(Duration)] × Small Borrower						0.011 (1.187)

Small Borrower						0.032** (2.417)
Ln(loan amount)	0.009 (1.589)	0.009 (1.591)	0.008 (1.397)	0.008 (1.406)	0.007 (1.277)	0.007 (1.303)
Ln(maturity)	0.044*** (5.920)	0.044*** (5.918)	0.045*** (5.957)	0.045*** (5.978)	0.045*** (6.078)	0.044*** (5.925)
Ln(lender)	-0.001 (-0.203)	-0.001 (-0.205)	-0.001 (-0.153)	-0.001 (-0.128)	-0.001 (-0.237)	0.001 (0.235)
Ln(asset)	-0.004 (-0.793)	-0.004 (-0.801)	-0.003 (-0.525)	-0.003 (-0.560)	-0.002 (-0.416)	0.006 (0.985)
Leverage	0.327*** (16.303)	0.327*** (16.298)	0.327*** (16.310)	0.327*** (16.275)	0.332*** (16.669)	0.326*** (16.307)
Tangibility	-0.052*** (-2.728)	-0.052*** (-2.725)	-0.052*** (-2.701)	-0.052*** (-2.705)	-0.053*** (-2.762)	-0.052*** (-2.700)
Current Ratio	-0.021*** (-5.275)	-0.021*** (-5.273)	-0.021*** (-5.306)	-0.021*** (-5.298)	-0.021*** (-5.301)	-0.021*** (-5.405)
Market-to-Book	-0.052 (-1.638)	-0.052 (-1.636)	-0.049 (-1.544)	-0.050 (-1.563)	-0.047 (-1.470)	-0.052 (-1.624)
Coverage Ratio	-0.001*** (-9.200)	-0.001*** (-9.199)	-0.001*** (-9.267)	-0.001*** (-9.253)	-0.001*** (-9.184)	-0.001*** (-9.262)
Rating	0.021*** (8.067)	0.021*** (8.064)	0.021*** (7.908)	0.020*** (7.809)	0.017*** (5.520)	0.021*** (7.975)
Not Rated	0.262*** (7.641)	0.262*** (7.635)	0.256*** (7.456)	0.250*** (6.988)	0.210*** (5.143)	0.253*** (7.330)
S&P 500	-0.077*** (-4.178)	-0.077*** (-4.179)	-0.077*** (-4.183)	-0.077*** (-4.188)	-0.065*** (-3.405)	-0.083*** (-4.522)
Constant	-0.145 (-1.463)	-0.145 (-1.455)	-0.153 (-1.537)	-0.144 (-1.449)	-0.113 (-1.107)	-0.316*** (-2.718)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5945	5945	5945	5945	5945	5945
adj. R-squared	0.237	0.237	0.238	0.238	0.241	0.240

The results presented in Table 5 indicate a statistically significant negative relationship between lending relationships and financial covenant tightness at the 1% significant level. We can estimate that increasing the lending relationship intensity by one standard deviation can reduce financial covenant tightness by 3.37% from its mean for loan packages. The lending relationship duration effect on financial covenant tightness is also economically



significant as increasing  $\text{Ln}[\text{Relation}(\text{Duration})]$  by one standard deviation implies a decrease in financial covenant tightness by 6.07% from its mean.

The results shown in column 1 indicate that the coefficient on the relationship variable  $\text{Relation}(\text{Maximum})$  is -0.021 and statistically significant at the 1% level. This finding suggests that financial covenant tightness for loan contracts decreases as the increasing lending relationship intensity, which is consistent with the theory developed by Garleanu and Zwiebel (2008). They argued that excessively restrictive covenants are usually applied at the beginning of a lending relationship to resolve the problem of information asymmetries. In addition, financial covenants are tighter for those loans with a longer maturity and for borrowing companies with higher leverage and lower tangibility, current ratios and coverage ratios. Borrowing companies with poor ratings or without an S&P rating are more likely to accept tighter financial covenants, while borrowing companies that are members of the S&P 500 usually receive slacker financial covenants from relationship lenders.

For column 2 of Table 5, we classify  $\text{Relation}(\text{Maximum})$  into three categorical variables: Low  $\text{Relation}(\text{Maximum})$ , Medium  $\text{Relation}(\text{Maximum})$  and High  $\text{Relation}(\text{Maximum})$ . Low  $\text{Relation}(\text{Maximum})$  equals  $\text{Relation}(\text{Maximum})$  if  $\text{Relation}(\text{Maximum})$  is less than 30%, and High  $\text{Relation}(\text{Maximum})$  equals  $\text{Relation}(\text{Maximum})$  if  $\text{Relation}(\text{Maximum})$  is at least 70%; the remaining loans fall into Medium  $\text{Relation}(\text{Maximum})$ . Therefore, the medium lending relationship loan serves as the baseline group. A Low  $\text{Relation}(\text{Maximum})$  indicates that the current lead arranger is not the borrowing company's main lender. Although the lead arranger is better informed than other nonrelationship lenders, it is still not well informed about the borrowing company. A Medium  $\text{Relation}(\text{Maximum})$  suggests that the current lead bank is one of the borrower's major creditors, but the lead bank is not

the borrower's sole major creditor. A High Relation(Maximum) implies that the borrower primarily obtains loans from this lead bank rather than from other lead banks.

The three levels of lending relationship intensity can act as a proxy for the degree of the lending relationship intensity. It also allows the comparison of exclusive and nonexclusive lending relationship effects. The results in column 2 show that low relationship intensity usually leads to significantly more restrictive financial covenants than medium relationship intensity. By contrast, high lending relationship intensity can lead to slacker financial covenants. This result is consistent with our first hypothesis that lending relationships can substitute for financial covenants assigned to loan contracts.

Column 3 adds  $\text{Ln}[\text{Relation}(\text{Duration})]$  as one explanatory variable in the regression. The coefficient for  $\text{Ln}[\text{Relation}(\text{Duration})]$  is -0.023, which is statistically significant at the 1% level. This result shows that the financial covenant tightness is significantly driven by lending relationship duration. In this regression, lending relationship intensity Relation(Maximum) is not significant, but relationship duration is strongly significant and negatively related to financial covenant tightness. In addition, for loans with tighter covenants, the loan and borrowing companies' characteristics are very similar to those in column 1.

Due to the strongly negative correlation between lending relationship duration and financial covenant tightness, we take borrowing companies' bargaining power for their relationship lenders into account to detect the interaction effect on financial covenant tightness. Borrowing companies that have access to the public debt market have strong financing capacity; we consider these borrowing companies with strong bargaining power for their relationship lenders.

We employ the variables Rated, CP Access and Small Borrower as the proxies for bargaining power of borrowing companies in column 4 through 6. Column 4 examines the relationship duration and the interactive effect of relationship duration based on the dummy variable Rated on covenant tightness. The result suggests that the interactive effect of relationship duration and credit ratings is not significant and that financial covenant tightness is mainly driven by relationship duration. The result shown in column 5 indicates that the coefficient of interaction with relationship duration and access to commercial paper is significantly and negatively related to financial covenant tightness (-0.051). Column 6 indicates that lending relationship duration and being a small borrower have a significant effect on financial covenant tightness, but their interactive effect is not statistically significant.

In summary, the results in column 1 through 3 of Table 5 indicate that financial covenant tightness declines with strong lending relationship intensity and long lending relationship duration. This result is consistent with our first hypothesis that lending relationships can substitute for financial covenants assigned to loan contracts. In addition, Columns 4 to 6 suggest that under a lending relationship, a decrease in covenant tightness is commonly observed in large borrowing companies or in borrowing companies that have access to commercial paper. The borrowing companies primarily have long relationship duration with their lead banks. Notably, the effect of lending relationships on financial covenant tightness seen in columns 4 through 6 is mainly based on lending relationship duration rather than lending relationship intensity. These results are consistent with the information asymmetry theory and the model in which excessively restrictive covenants are usually applied at the beginning of a lending relationship to resolve the problem of information asymmetries, as developed by Garleanu and Zwiebel (2008).

## 4.2. The impact of lending relationships on financial covenant intensity

In this sector, we test the effects of lending relationships on financial covenant intensity. Because the financial covenant intensity, which is calculated by counting the number of financial covenants in a loan, is a count variable, we estimate the impact of the lending relationship on financial covenant intensity by employing Poisson regressions. In Table 6, columns 1 and 3 of Panel A and column 1 of Panel B test the potential nonlinear effect of lending relationships on financial covenant intensity. The regressions can be expressed as follows:

$$\log(\text{Covenant Intensity}_i) = \alpha_1 + \beta_1 \text{Relation}(\text{Maximum}/\text{Duration}/\text{Number})_i + \gamma_1 \text{Relation}(\text{Maximum}/\text{Duration}/\text{Number})_i^2 + \delta_1 \text{Controls}_i + \epsilon_i$$

where Covenant Intensity is the total number of financial covenants in a loan. In addition, we classify Relation(Maximum) and Relation(Number) into three categories: low, medium and high. We employ dummy variables for the three categories. Low Relation(Maximum) and Low Relation(Number) equal one if the corresponding relationship intensity is lower than 30%, and High Relation(Maximum) and High Relation(Number) equal one if the corresponding relationship intensity is 70% or higher; otherwise, they equal zero. Then, we use the Poisson regression to detect the effect of low and high relationship intensity on financial covenant use. The regression equation can be represented as follows:

$$\log(\text{Covenant Intensity}_i) = \alpha_1 + \beta_1 \text{Low Relation}(\text{Maximum}/\text{Number})_i + \gamma_1 \text{High Relation}(\text{Maximum}/\text{Number})_i + \delta_1 \text{Controls}_i + \epsilon_i$$

In the regression, the relationship variables Relation(Maximum) and Relation(Number) are used to measure the lending relationship intensity.

**Table 6 The nonlinear effect of lending relationship intensity and lending relationship duration on financial covenant intensity**

This table shows Poisson regression results for financial covenant use on relationship intensity, relationship duration and control variables in the sample that excludes U.S. borrowing companies from the utility, financial and public administration sectors between 1995 and 2008. **Relation(Maximum)** is employed as the measure of lending relationship intensity in Panel A, whereas **Relation(Number)** is the measure of lending relationship intensity in Panel B. **Low Relation(Maximum)** and **Low Relation(Number)** are dummy variables capturing a lending relationship intensity under 30%, while **High Relation(Maximum)** and **High Relation(Number)** are dummy variables capturing a lending relationship intensity of at least 70%. The control variable is the same as that used in Table 5. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO and MBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through G). All other loan types are categorized as the other loan group. Numbers in parentheses are z-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

Panel A				
	(1)	(2)	(3)	(4)
	Covenant	Covenant	Covenant	Covenant
	Intensity	Intensity	Intensity	Intensity
Relation(Maximum)	-6.064*** (-3.148)			
Relation(Maximum) <sup>2</sup>	4.519*** (2.981)			
Low Relation(Maximum)		0.754** (2.513)		0.630** (2.127)
High Relation(Maximum)		0.331 (1.119)		0.325 (1.124)
Ln[Relation(Duration)]			0.120* (1.678)	0.124* (1.725)
{Ln[Relation(Duration)]} <sup>2</sup>			0.000 (0.011)	-0.001 (-0.046)
Ln(loan amount)	0.021 (1.233)	0.021 (1.238)	0.025 (1.449)	0.025 (1.474)

Ln(maturity)	0.098*** (4.159)	0.098*** (4.158)	0.104*** (4.408)	0.104*** (4.408)
Ln(lender)	0.237*** (14.673)	0.237*** (14.665)	0.235*** (14.504)	0.235*** (14.496)
Ln(asset)	-0.178*** (-10.165)	-0.178*** (-10.153)	-0.183*** (-10.422)	-0.183*** (-10.422)
Leverage	-0.350*** (-5.910)	-0.350*** (-5.906)	-0.333*** (-5.647)	-0.333*** (-5.650)
Tangibility	0.082 (1.458)	0.079 (1.408)	0.068 (1.194)	0.067 (1.183)
Current Ratio	-0.010 (-0.881)	-0.010 (-0.882)	-0.012 (-1.022)	-0.012 (-1.011)
Market-to-Book	0.158* (1.693)	0.160* (1.710)	0.162* (1.711)	0.161* (1.707)
Coverage Ratio	-0.000 (-0.872)	-0.000 (-0.860)	-0.000 (-0.762)	-0.000 (-0.742)
Rating	0.060*** (7.947)	0.060*** (7.950)	0.062*** (8.135)	0.062*** (8.144)
Not Rated	0.808*** (8.063)	0.808*** (8.063)	0.846*** (8.383)	0.846*** (8.381)
S&P 500	-0.157*** (-2.704)	-0.157*** (-2.707)	-0.158*** (-2.746)	-0.158*** (-2.728)
Constant	3.171*** (5.495)	1.292*** (2.939)	1.514*** (4.515)	1.186*** (2.694)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes
Observations	5050	5050	5050	5050
Panel B				
	(1)	(2)	(3)	
	Covenant intensity	Covenant intensity	Covenant intensity	
Relation(Number)	-7.950*** (-3.164)			
$Relation(Number)^2$	5.875*** (3.081)			
Low Relation(Number)		0.665*** (3.289)	0.524*** (2.595)	
High Relation(Number)		0.242 (1.232)	0.220 (1.141)	
Ln[Relation(Duration)]			0.122* (1.711)	
$\{Ln[Relation(Duration)]\}^2$			-0.001	

			(-0.036)
Ln(loan amount)	0.021 (1.244)	0.021 (1.226)	0.025 (1.461)
Ln(maturity)	0.098*** (4.161)	0.098*** (4.162)	0.104*** (4.410)
Ln(lender)	0.237*** (14.665)	0.237*** (14.676)	0.235*** (14.507)
Ln(asset)	-0.178*** (-10.173)	-0.177*** (-10.151)	-0.183*** (-10.419)
Leverage	-0.350*** (-5.908)	-0.350*** (-5.908)	-0.334*** (-5.653)
Tangibility	0.083 (1.467)	0.081 (1.430)	0.068 (1.204)
Current Ratio	-0.010 (-0.881)	-0.010 (-0.878)	-0.012 (-1.008)
Market-to-Book	0.158* (1.694)	0.159* (1.701)	0.160* (1.700)
Coverage Ratio	-0.000 (-0.868)	-0.000 (-0.870)	-0.000 (-0.753)
Rating	0.060*** (7.937)	0.060*** (7.948)	0.062*** (8.142)
Not Rated	0.807*** (8.048)	0.808*** (8.067)	0.846*** (8.384)
S&P 500	-0.156*** (-2.691)	-0.157*** (-2.715)	-0.158*** (-2.735)
Constant	3.704*** (5.081)	1.380*** (3.610)	1.292*** (3.352)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes
Observations	5050	5050	5050

To examine the potential nonlinear effect of lending relationships on financial covenant intensity, the results in column 1 in Panel A and column 1 in Panel B show that the linear term is significantly negative, and the quadratic term is significantly positive. The coefficients for Relation(Maximum) are -6.064 and -7.950 for linear terms compared to 4.519 and 5.875 for the quadratic terms in Panel A and Panel B, respectively, all of which are statistically significant at the 1% level. The results of these two regressions indicate that there is a nonlinear effect of lending relationship intensity on the number of financial

covenants assigned to a loan, which show a U-shaped effect of lending relationship intensity on financial covenant intensity. For column 3 of Panel A, however, the results from the regression suggest that there is no nonlinear relationship between lending relationship duration and financial covenant intensity.

A potential explanation for the U-shaped effect of lending relationship intensity on financial covenant intensity is due to a confluence of two separate impacts. The downward part of the U-shaped effect is related to the decrease in information asymmetries (Schenone, 2009), and the upward sloping part of the U-shaped effect could be related to lock-in effects (Rajan, 1992; Sharpe, 1990). Rajan (1992) follows the theory of lock-in effects to suggest that relationship lenders use information acquisition to gain an advantage over outside lenders.

In addition, the monitoring incentive theory provides another potential explanation for the U-shaped effects. According to monitoring incentive theory (Rajan and Winton, 1995; Park, 2000), loan covenants are an effective instrument to structure loan contracts and enhance banks' monitoring incentives. If the borrowing company contracts under the homogenous restrictive covenants with all banks, it can result in overlaps in monitoring effort and renegotiation by banks. To solve this problem, it is reasonable for a borrower to contract more restrictive covenants with one bank and slacker covenants with others. The additional covenants can detect the deterioration of the borrowing company's financial situation before it is too late, so that these covenants enhance banks' monitoring incentives.

Under the monitoring incentive theory, the decrease in financial covenant intensity in relationship lending is related to the cost and benefits of employing financial covenants. Loan covenants can result in ex post costs for a borrowing company via renegotiation or prepayment (Garleanu and Zwiebel, 2008). Thus, the borrowing company should trade off the cost against the benefits of covenants. If covenant costs are high and/or covenant benefits



are low for a loan contract, then trade-off theory provides an explanation for the decline in covenant intensity in a lending relationship. In addition, the upward sloping part of the U-shaped effect could be explained by relationship lenders' incentive to maintain the created value of their lending relationships (Boot, 2000). Thus, the relationship lenders' incentives enhance the lender's willingness to renegotiate and reduce the covenant use cost, so that financial covenant intensity increases in loans.

The results of the two regressions shown in column 2 of Panel A and column 2 of Panel B denote that low lending relationship intensity is significantly and positively related to financial covenant intensity. The coefficient of high relationship intensity is positive but not significant. The reason is that whether the benefits of a covenant are low in a lending relationship depends on the existence of a free-rider problem among senior lenders. If there is only one bank, there will be no free riders, and then the demand for restrictive covenants decreases. In other words, the demand for more restrictive covenants declines in an exclusive lending relationship if covenant benefits cannot balance covenant costs. Therefore, the number of financial covenants assigned to a loan does not dramatically increase from a medium to a high level of lending relationship intensity.

Column 4 of Panel A and column 3 of Panel B test the effect of the low and high lending relationship intensity and lending relationship duration on financial covenant intensity. These two results are highly similar: low lending relationship intensity and the linear term of lending relationship duration both have a statistically significant effect on the financial covenants intensity at the 5% and 10% level, respectively, but the high relationship intensity and the quadratic term of relationship duration are not significant. Therefore, financial covenant intensity is mainly driven by low relationship intensity and relationship duration.

This result is similar to the results in columns 2 and 3 in Panel A and those in column 2 in Panel B.

The results in Table 6 show that the total number of financial covenants in a loan increases in those loans that have longer maturities and more participating lenders. Rajan and Winton (1995) indicated that sometimes long-term loans are contracted with covenants, while short-term loans are contracted without covenants assigned by the borrower and the lender. The reason is that, in comparison with those loans with short maturities and fewer participating creditors, there is greater uncertainty time risk and management risk for loans with longer maturities and more participating lenders, so it is reasonable that creditors are more likely to choose high financial covenant intensity for loans with a long maturity and more creditors.

In addition, the results indicate that higher financial covenants intensity are primarily accepted by borrowing companies with fewer assets and lower leverage ratio. The coefficients of the current ratio and coverage ratio are significant but negative. Notably, current ratio covenant and coverage ratio covenant are the frequently used financial covenants in loan contracts to ensure the creditor's interests. Borrowing companies with poor ratings or without an S&P rating are usually subject to more financial covenants in their loan contracts. Most of those companies are not members of the S&P 500.

In summary, the results shown in Table 5 and Table 6 suggest that lending relationship intensity and lending relationship duration have a statistically significant effect on financial covenant tightness and financial covenant intensity. In addition, there is a U-shaped effect of lending relationship intensity on financial covenant intensity. Medium lending relationship borrowers are more likely to obtain loans with the fewest financial covenants, while the low and high lending relationships are subject to higher financial covenant intensity than medium lending relationships.

Since covenant intensity can act as an efficient instrument for monitoring incentives, more financial covenants cover more characteristics of the borrowing company, and more monitoring activities must be performed. If the additional financial covenants can effectively enhance the lender's monitoring incentives, then financial covenant intensity should be different from financial covenant tightness in ensuring creditor control rights. On the other hand, Demiroglu and James (2010) and Li, Vasvari, and Wittenberg-Moerman (2016) indicate that covenant tightness can act as the borrower's expectation of future performance. However, if financial covenants work only for the sole function of ensuring the ex post transfer of control rights, financial covenant tightness and financial covenant intensity should work similarly in ensuring creditors' control rights after a covenant violation. In this case, the two measures are interchangeable, and the empirical result should be the same (Prilmeier, 2017).

## **5. Analyses of lending relationships and covenant violations**

In this section, the covenant violation prediction is examined using financial covenant intensity, covenant tightness, lending relationship intensity and relationship duration. Section 4 illustrates that financial covenant strictness is related to creditors' expected covenant violations, and lending relationships have a significant impact on the financial covenant strictness of loan contracts. Thus, financial covenant strictness and lending relationships should predict covenant violations.

Since borrowing companies usually report a loan covenant violation in their 10-Q reports in SEC filings, we employ quarterly data from the Compustat database to capture accounting information from borrowing companies. We also use the quarterly covenant violation dataset that is provided by Nini, Smith and Sufi (2012). According to Nini, Smith and Sufi (2012), a covenant violation is viewed as a new event if the borrowing company did not report the violation in the past four quarters. The loan tenure is assumed to last until the loan reaches maturity as specified in the loan contract.

We employ probit regressions to examine whether a covenant violation occurred during a loan's tenure using the proposed measures of financial covenant strictness and lending relationships. In addition, we use control variables for loan characteristics, including loan amount, loan maturity in months, the total number of participating lenders in a loan, the presence of collateral, and borrowing companies' financial characteristics, including their total assets, leverage ratio, tangibility ratio, current ratio, market-to-book ratio, and coverage ratio. We also consider the fixed effects of the borrowing companies' industries, the year of loans contracted, loan purpose and loan type.

## **5.1. Financial covenant strictness and lending relationships**

In accordance with the measure of financial covenant tightness provided by Murfin (2012), financial covenant tightness is strongly correlated with the probability of covenant violations. The results shown in Table 7 prove that a significant correlation exists between financial covenant tightness and the probability of a covenant violation. Control variables include the borrowing company and loan characteristics, as well as the one-digit SIC industry fixed effects, year fixed effects, loan purpose fixed effects and loan type fixed effects. Year fixed effects are based on the year of the loan active dates. Loan purpose fixed effects and loan type fixed effects are classified into six and three categories, respectively (Durcker and Puri, 2009). All of the financial ratios are winsorized at 1% to reduce the effect of outliers.

**Table 7 Covenant strictness predicts actual covenant violations**

This table shows the probit regression results of actual covenant violations predicted by financial covenant tightness, covenant intensity and lending relationship in the sample that excludes U.S. borrowing companies from the utility, financial and public administration sectors between 1995 and 2008. Other control variables are the same as those used in Table 5. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through H). All other loan types are categorized as the other loan group. Numbers in parentheses are z-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

	(1) Violation	(2) Violation	(3) Violation	(4) Violation	(5) Violation
Covenant Tightness	0.246*** (3.174)		0.242*** (3.159)		
Ln(Covenant Intensity)		-0.071 (-1.486)	-0.067 (-1.406)		
Covenant Tightness × Relation				-0.174 (-0.683)	
Ln(Covenant Intensity) × Relation					0.864*** (3.876)
Relation				0.080 (0.507)	-0.847*** (-3.445)
Ln(loan amount)	0.055* (1.686)	0.058* (1.789)	0.055* (1.695)	0.058* (1.788)	0.062* (1.912)
Ln(maturity)	-0.186*** (-4.926)	-0.172*** (-4.603)	-0.183*** (-4.827)	-0.175*** (-4.691)	-0.190*** (-5.065)
Ln(lender)	-0.165*** (-5.157)	-0.159*** (-4.968)	-0.160*** (-5.000)	-0.164*** (-5.133)	-0.168*** (-5.227)
Collateral	0.153*** (2.943)	0.164*** (3.144)	0.154*** (2.955)	0.162*** (3.108)	0.161*** (3.103)
Ln(asset)	-0.069** (-2.294)	-0.072** (-2.417)	-0.069** (-2.309)	-0.072** (-2.411)	-0.075** (-2.484)
Leverage	0.591*** (5.180)	0.669*** (5.963)	0.594*** (5.212)	0.672*** (5.942)	0.652*** (5.778)

Tangibility	-0.433*** (-4.170)	-0.445*** (-4.295)	-0.429*** (-4.128)	-0.452*** (-4.366)	-0.456*** (-4.393)
Current Ratio	-0.125*** (-4.926)	-0.128*** (-5.022)	-0.124*** (-4.858)	-0.130*** (-5.110)	-0.128*** (-5.018)
Market-to-Book	-0.255*** (-6.333)	-0.261*** (-6.422)	-0.256*** (-6.345)	-0.261*** (-6.410)	-0.255*** (-6.310)
Coverage Ratio	-0.004** (-2.027)	-0.004** (-2.044)	-0.004** (-2.013)	-0.004** (-2.068)	-0.004** (-2.110)
Rating	0.133*** (8.348)	0.136*** (8.696)	0.132*** (8.334)	0.137*** (8.725)	0.137*** (8.689)
Not Rated	1.789*** (8.575)	1.832*** (8.963)	1.784*** (8.594)	1.844*** (8.958)	1.827*** (8.874)
S&P 500	0.175 (1.569)	0.163 (1.452)	0.163 (1.453)	0.177 (1.587)	0.176 (1.575)
Constant	-2.197*** (-4.141)	-2.117*** (-3.989)	-2.131*** (-3.994)	-2.190*** (-4.143)	-2.164*** (-4.102)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	9515	9515	9515	9515	9515

Columns 1 through 3 of Table 7 examine the prediction of covenant violations using financial covenant strictness. The results shown in column 1 in Table 7 suggest that tighter financial covenants are, in fact, predictive for covenant violations. It is economically significant that an increase in covenant tightness by one unit leads to an increase in the probability of covenant violation of 24.6%. In addition, covenant violations usually occur for loan contracts with a large amount and borrowing companies with higher leverage or lower tangibility, current ratio, market-to-book ratio or coverage ratio. These borrowing companies usually have poor S&P ratings or lack a rating.

For comparison, we repeat the analysis with an alternative measure of financial covenant strictness in column 2, the natural logarithm of financial covenant intensity. The results shown in column 2 indicate that natural logarithm of the financial covenant intensity is not statistically significant in predicting a new covenant violation. The results in column 3 show

that financial covenant intensity is not significant in predicting covenant violations, but financial covenant tightness is strongly significant and positively related to covenant violations. In addition, the loan and borrowing company characteristics are very similar to those in column 1. The coefficient for financial covenant tightness in the first regression is 0.246 compared to the 0.242 coefficient estimated in the third regression when we add  $\text{Ln}(\text{Covenant Intensity})$  to the regression. Financial covenant tightness in both regressions is positive and statistically significant at the 1% level.

To understand why the empirical result for financial covenant tightness is different from that for financial covenant intensity, the features of these two variables should be considered. Financial covenants intensity refers to the range of different financial aspects in which the lender can intervene, while financial covenant tightness involves the timing through which the lender can intervene. Covenant intensity is the total number of financial covenants in a loan, but this cannot reflect the distance between the actual financial condition and the corresponding covenant violation. Financial covenant tightness, however, does reflect this issue. Thus, the different results for financial covenant tightness and covenant intensity are consistent with their different roles in a loan contract. These differences also explain why financial covenant tightness can act as a predictor of covenant violations.

To examine the prediction of covenant violations by lending relationships, column 4 and column 5 take the relationship dummy variable *Relation* into account. Column 4 examines the interactive effect of financial covenant tightness and the relationship variable *Relation*, which is a binary measure for the lending relationship designed to capture the existence of prior lending activities between a borrower and a lead arranger. The results in column 4 indicate that tighter financial covenants in relationship lending are not significant in predicting covenant violations. The results in column 5, however, show that the prior lending



relationship and the interaction of financial covenant intensity with the prior lending relationship are both significantly correlated with covenant violation. Both coefficients are statistically significant at the 1% level. The results in column 5 indicate that the existence of a prior lending relationship between the borrowing company and the lead bank means that the borrowing company is less likely to experience a covenant violation. A greater number of financial covenants in a loan contract indicate that the relationship borrower is more likely to violate the loan covenants.

For relationship lending, financial covenant intensity is more likely to predict a covenant violation than financial covenant tightness. The potential explanation is that relationship lenders can take advantage of information acquisition for relationship borrowers, whereas nonrelationship lenders cannot. According to the theory of information asymmetry and monitoring cost (Rajan and Winton, 1995; Park, 2000; Garleanu and Zwiebel, 2008), since relationship lenders are better informed than outside lenders (Rajan, 1992), assigning more financial covenants to a loan is likely to indicate that the relationship lender is not well informed or the relationship lender discovered that the relationship borrower's financial performance deteriorated. Thus, the relationship lender set more financial covenants in loan contracts to ensure their control rights and interests. Under these conditions, it is reasonable that for the creditors, the relationship borrowers are subject to a high probability of loan covenant violations.

According to the results shown in Table 7, a prior lending relationship between the borrowing company and the lead bank is significantly and negatively correlated with covenant violations. We extend the analysis to explore how lending relationships predict covenant violations in Table 8.

**Table 8 The predictive ability of the lending relationship for actual covenant violations**

This table shows probit regression results of actual covenant violations on relationship intensity, relationship duration and control variables in the sample that excludes U.S. borrowing companies from the utility, financial and public administration sectors between 1995 and 2008. **Relation(Maximum)** is employed as the measure of lending relationship intensity in Panel A, whereas **Relation(Number)** is the measure of lending relationship intensity in Panel B. **Low Relation(Maximum)** and **Low Relation(Number)** are dummy variables that reflect a lending relationship intensity under 30%, while **High Relation(Maximum)** and **High Relation(Number)** are dummy variables that capture a lending relationship of at least 70% intensity. The control variable is the same as that used in Table 7. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through F). All other loan types are categorized as the other loan group. Numbers in parentheses are z-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

Panel A				
	(1)	(2)	(3)	(4)
	Violation	Violation	Violation	Violation
Relation(Maximum)	-0.181** (-2.139)		-0.292* (-1.780)	
Low Relation(Maximum)		3.596*** (13.767)		3.687*** (13.231)
High Relation(Maximum)		3.415*** (12.391)		3.391*** (12.146)
Ln[Relation(Duration)]			0.101 (0.805)	0.105 (0.837)
Ln(loan amount)	0.086 (1.563)	0.087 (1.587)	0.086 (1.564)	0.087 (1.589)
Ln(maturity)	-0.086 (-1.288)	-0.086 (-1.280)	-0.086 (-1.268)	-0.085 (-1.260)
Ln(lender)	-0.110** (-1.986)	-0.113** (-2.022)	-0.111** (-1.993)	-0.113** (-2.032)
Collateral	0.214** (2.482)	0.216** (2.504)	0.215** (2.485)	0.217** (2.509)

Ln(asset)	-0.125** (-2.438)	-0.124** (-2.408)	-0.123** (-2.403)	-0.121** (-2.370)
Leverage	0.725*** (3.518)	0.727*** (3.526)	0.733*** (3.554)	0.736*** (3.564)
Tangibility	-0.331* (-1.835)	-0.335* (-1.854)	-0.340* (-1.887)	-0.344* (-1.909)
Current Ratio	-0.118** (-2.384)	-0.118** (-2.392)	-0.119** (-2.394)	-0.119** (-2.402)
Market-to-Book	-0.425*** (-4.694)	-0.426*** (-4.691)	-0.423*** (-4.672)	-0.423*** (-4.668)
Coverage Ratio	-0.001 (-0.521)	-0.001 (-0.523)	-0.001 (-0.520)	-0.001 (-0.522)
Rating	0.128*** (4.006)	0.128*** (4.010)	0.128*** (3.997)	0.128*** (4.000)
Not Rated	1.802*** (4.382)	1.808*** (4.393)	1.806*** (4.376)	1.813*** (4.387)
S&P 500	0.382** (1.983)	0.385** (1.986)	0.383** (1.985)	0.385** (1.988)
Constant	-2.364** (-2.344)	-6.020*** (-5.335)	-2.445** (-2.376)	-6.198*** (-5.291)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes
Observations	2666	2666	2666	2666
Panel B				
	(1)	(2)	(3)	(4)
	Violation	Violation	Violation	Violation
Relation(Number)	-0.182** (-2.142)		-0.294* (-1.787)	
Low Relation(Number)		3.596*** (13.767)		3.687*** (13.231)
High Relation(Number)		3.415*** (12.391)		3.391*** (12.146)
Ln[Relation(Duration)]			0.102 (0.811)	0.105 (0.837)
Ln(loan amount)	0.086 (1.564)	0.087 (1.587)	0.086 (1.565)	0.087 (1.589)
Ln(maturity)	-0.087 (-1.288)	-0.086 (-1.280)	-0.086 (-1.268)	-0.085 (-1.260)
Ln(lender)	-0.110** (-1.986)	-0.113** (-2.022)	-0.111** (-1.994)	-0.113** (-2.032)
Collateral	0.214**	0.216**	0.215**	0.217**

	(2.482)	(2.504)	(2.486)	(2.509)
Ln(asset)	-0.125**	-0.124**	-0.123**	-0.121**
	(-2.437)	(-2.408)	(-2.402)	(-2.370)
Leverage	0.725***	0.727***	0.733***	0.736***
	(3.518)	(3.526)	(3.555)	(3.564)
Tangibility	-0.332*	-0.335*	-0.340*	-0.344*
	(-1.836)	(-1.854)	(-1.888)	(-1.909)
Current Ratio	-0.118**	-0.118**	-0.119**	-0.119**
	(-2.384)	(-2.392)	(-2.395)	(-2.402)
Market-to-Book	-0.425***	-0.426***	-0.423***	-0.423***
	(-4.694)	(-4.691)	(-4.672)	(-4.668)
Coverage Ratio	-0.001	-0.001	-0.001	-0.001
	(-0.521)	(-0.523)	(-0.520)	(-0.522)
Rating	0.128***	0.128***	0.128***	0.128***
	(4.006)	(4.010)	(3.996)	(4.000)
Not Rated	1.802***	1.808***	1.806***	1.813***
	(4.382)	(4.393)	(4.376)	(4.387)
S&P 500	0.382**	0.385**	0.383**	0.385**
	(1.983)	(1.986)	(1.984)	(1.988)
Constant	-2.365**	-6.020***	-2.448**	-6.198***
	(-2.345)	(-5.335)	(-2.378)	(-5.291)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes
Observations	2666	2666	2666	2666

Panel A of Table 8 begins by estimating the probit regression of covenant violations on the relationship measure Relation(Maximum) and appropriate controls, as in Table 7. Column 1 shows that Relation(Maximum) is negatively related to covenant violations. It is economically significant that an increase in Relation(Maximum) by one unit leads to a decrease in the probability of covenant violation by 18.1%. This result suggests that stronger lending relationship intensity between a borrowing company and a lead bank means that the loan covenants are less likely to be violated. Most of these relationship borrowing companies are highly leveraged, and they have fewer total assets and tangible assets and lower current ratios, potential growth opportunities and interest coverage ratios. In addition, they are usually poorly rated by S&P issuers or not rated at all.

The results shown in column 1 of Panel A in Table 8 indicate that relationship borrowers are less likely to violate covenants. One potential explanation for this result is that covenant violations result in terminating or deteriorating the lending relationship (Nini, Smith and Sufi, 2012). The violation cost is usually high or destructive for relationship borrowers. Because the lending relationship allows for lower interest rates and lower collateral requirements, it is valuable to relationship borrowers (Bharath, Dahiya, Saunders and Srinivasan, 2009). This could be one reason why relationship borrowers generally try to cultivate and maintain a good relationship with their lenders. Therefore, relationship borrowers are less likely to violate a covenant.

Another potential explanation is that relationship lenders can more easily mitigate the credit risks associated with their relationship borrowers than those of other nonrelationship borrowers due to information asymmetries. It is conceivable that a well-informed relationship lender can take advantage of information acquisition to gain knowledge about the relationship borrower. Thus, relationship lenders detect and prepare for changes in relationship borrowers' performance early in the process, which can reduce the relationship borrowers' probability of covenant violations.

Column 2 of Panel A in Table 8 replaces the relationship intensity measure with two dummy variables: Low Relation(Maximum) and High Relation(Maximum), which equal one if Relation(Maximum) is less than 30% or at least 70%, respectively. Therefore, loans with medium relationship intensity serve as the baseline group. The coefficients for Low Relation(Maximum) and High Relation(Maximum) in column 2 are 3.596 and 3.415, respectively, which are statistically significant at the 1% level. The results presented in column 2 indicate that loans with low or high lending relationship intensity are in fact predictive of covenant violations because they are usually subject to having more financial

covenants assigned to loans as the result of Table 6. The coefficients for Low Relation(Maximum) and High Relation(Maximum) in column 4 are 3.687 and 3.391, respectively, which are again statistically significant at the 1% level.

The results shown in column 2 and column 4 in Panel A of Table 8 indicate that borrowers with low and high lending relationship intensities are more likely to violate covenants. A potential explanation for this result of low lending relationship intensity is related to information asymmetries. In the inception of a lending relationship, a lead bank has limited specific information about a borrowing company; thus, the lead bank usually prefers to attach more restrictive financial covenants to a loan contract to mitigate the uncertain credit risk from the borrowing company (Garleanu and Zwiebel, 2008). More restrictive financial covenants are subject to less freedom in making decisions and more likely to result in technical defaults for the borrowing company. Therefore, more restrictive financial covenants in a low level of lending relationship result in high probability of covenant violations.

A potential explanation for the results of high level of lending relationship is renegotiation costs. Covenant violations result in renegotiation between the lender and the borrower. Garleanu and Zwiebel (2008) argue that covenant violations are related to the ex post cost for a borrowing company via renegotiation or prepayment. Renegotiation costs should be lower under relationship lending than under nonrelationship lending, and the lowest cost is for a loan with an exclusive lender (Gertner and Scharfstein, 1991; Morris and Shin, 2004). Thus, a high level of relationship intensity is subject to a lower violation cost than other levels of relationship intensity, and the exclusive lending relationship is an extreme case. It provides a reason that borrowers with high level of lending relationship are more often subject to covenant violations.

The results presented in columns 3 through 4 in Table 8 indicate that lending relationship duration cannot predict a covenant violation, while relationship intensity can act as a predictor of covenant violations. Because lending relationship duration is an absolute term representing the time period between the first loan contracted with the same lead bank and the current loan, it does not suggest the relative relationship of the lead bank compared to the other lenders.

For comparison, we repeat the analysis with an alternative measure of lending relationship, *Relation(Number)*, which measures the number of loans in which the lead arranger has participated divided by all loans raised by the borrowing company in the five years prior to the current loan in Panel B. The results in Panel B are consistent with those in Panel A. All lending relationship intensity terms are still statistically significant.

## **5.2. Financing capacity of relationship borrowers**

Because lending relationship intensity can predict covenant violations, we deeply explore the question with the interaction between lending relationship intensity and dummy variables indicating borrowing companies' financing capacity. A borrowing company with S&P issuer credit ratings or access to the commercial paper market can easily access the public debt market, so the company is reviewed as owning high financing capacity. We employ A-2 or better of the short-term S&P issuer credit ratings to act as the proxy for access to the commercial paper market (Murfin, 2012). In addition, we think firm sizes are an alternative factor that can affect the financing capacity of a firm because small-size borrowers usually have low financing capacity (Kahan and Tuckman, 1993). We define a small borrower as one with a firm size below the median size of borrowers in its industry.

**Table 9 The interaction of the lending relationship with the distribution of financing capacity and firm size as a predictor of actual covenant violations**

This table shows probit regression results for actual covenant violations predicted by the interaction of lending relationship intensity and the presence of a Standard & Poor (S&P) issuer credit rating, access to the commercial paper market and total assets below the industrial median in the sample that excludes U.S. borrowing companies from the utility, financial and public administration sectors between 1995 and 2008. The regressions in columns 1 through 3 employ **Relation(Maximum)** as the measure of relationship intensity, and the regressions in columns 4 through 6 employ **Relation(Number)**. The control variable is the same as that used in Table 7. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through F). All other loan types are categorized as the other loan group. Numbers in parentheses are z-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

	(1) Violation	(2) Violation	(3) Violation	(4) Violation	(5) Violation	(6) Violation
Relation(Maximum)	-0.291*** (-2.655)	-0.209** (-2.441)	0.015 (0.109)			
Relation(Maximum) × Rated	0.309* (1.739)					
Relation(Maximum) × CP Access		3.798*** (10.662)				
Relation(Maximum) × Small Borrower			-0.315* (-1.792)			
Relation(Number)				-0.292*** (-2.659)	-0.209** (-2.445)	0.014 (0.104)
Relation(Number) × Rated				0.309* (1.742)		



Relation(Number) ×					3.798***	
CP Access					(10.663)	
Relation(Number) ×						-0.314*
Small Borrower						(-1.788)
CP Access		-3.554***			-3.554***	
		(-15.066)			(-15.065)	
Small Borrower			0.334**			0.334**
			(2.172)			(2.170)
Ln(loan amount)	0.091*	0.084	0.085	0.091*	0.084	0.085
	(1.671)	(1.499)	(1.563)	(1.672)	(1.500)	(1.563)
Ln(maturity)	-0.085	-0.088	-0.094	-0.085	-0.088	-0.094
	(-1.281)	(-1.302)	(-1.399)	(-1.282)	(-1.302)	(-1.399)
Ln(lender)	-0.117**	-0.109*	-0.112**	-0.117**	-0.109*	-0.112**
	(-2.126)	(-1.927)	(-2.018)	(-2.127)	(-1.927)	(-2.017)
Collateral	0.219**	0.212**	0.227***	0.219**	0.212**	0.227***
	(2.527)	(2.456)	(2.620)	(2.528)	(2.456)	(2.619)
Ln(asset)	-0.124**	-0.124**	-0.075	-0.124**	-0.124**	-0.075
	(-2.428)	(-2.371)	(-1.271)	(-2.427)	(-2.370)	(-1.271)
Leverage	0.712***	0.727***	0.726***	0.712***	0.727***	0.726***
	(3.486)	(3.548)	(3.555)	(3.487)	(3.549)	(3.555)
Tangibility	-0.335*	-0.336*	-0.337*	-0.335*	-0.336*	-0.337*
	(-1.851)	(-1.855)	(-1.885)	(-1.851)	(-1.855)	(-1.885)
Current Ratio	-0.114**	-0.119**	-0.118**	-0.114**	-0.120**	-0.118**
	(-2.333)	(-2.409)	(-2.372)	(-2.333)	(-2.409)	(-2.372)
Market-to-Book	-0.425***	-0.425***	-0.415***	-0.425***	-0.425***	-0.415***
	(-4.681)	(-4.691)	(-4.606)	(-4.680)	(-4.691)	(-4.607)
Coverage Ratio	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.535)	(-0.519)	(-0.457)	(-0.535)	(-0.519)	(-0.457)
Rating	0.129***	0.123***	0.129***	0.129***	0.123***	0.129***
	(4.068)	(3.395)	(4.069)	(4.068)	(3.395)	(4.068)
Not Rated	1.915***	1.739***	1.778***	1.915***	1.740***	1.778***
	(4.483)	(3.703)	(4.308)	(4.484)	(3.703)	(4.308)
S&P 500	0.388**	0.412**	0.376*	0.388**	0.412**	0.376*
	(2.008)	(2.182)	(1.941)	(2.008)	(2.181)	(1.941)
Constant	-2.547**	-2.279**	-3.517***	-2.549**	-2.280**	-3.516***
	(-2.498)	(-2.197)	(-3.035)	(-2.500)	(-2.198)	(-3.035)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2666	2666	2666	2666	2666	2666

In Table 9, the coefficient for the interaction of Relation(Maximum) and Rated is 0.309, compared to 3.798, which is the coefficient for the interaction of Relation(Maximum) and CP Access. These coefficients are statistically significant at the 10% level and 1% level, respectively. The results in column 1 of Panel A and Panel B suggest that covenant violations in relationship lending are concentrated in rated borrowing companies. Column 2 of Panel A and Panel B indicates that a relationship borrowing company with access to the commercial paper market is subject to predictive covenant violations. Column 3 of Panel A and Panel B shows the interaction between lending relationship intensity and the firm size of borrowing companies. This result shows that covenant violations strongly depend on relationship borrowers' firm size. A relationship borrowing company being small for its industry is subject to a low probability of an actual covenant violation. These results are statistically significant.

Whether access to the public debt market for relationship borrowers is related to the financing capacity of the borrowers in the market can thus reflect how much the borrowers value a lending relationship. If relationship lending is not a sole financing source for the borrower, the cost of losing this lending relationship might be low or negligible, because the borrower can obtain capital from other channels. Thus, the borrower would be likely to violate covenants when they can easily trade off the loss of violation. In summary, a relationship borrower having strong financing capacity is subject to a high probability of covenant violations.

A borrowing company with strong financing capacity has various channels for obtaining capital; thus, its relationship intensity with a specific lead bank may be low. The results in Table 9 could be driven by a group of borrowing companies with similar values for relationship intensity. To address this concern, we divide relationship intensity into three

groups. Low Relationship Intensity and High Relationship Intensity are dummy variables that equal one if relationship intensity is less than 30% and at least 70%, respectively. Consequently, Medium Relationship Intensity acts as the baseline group.

**Table 10** *The predictive ability of the lending relationship depends on the distribution of financing capacity and the firm size*

This table shows probit regression results for actual covenant violations predicted by the interaction of the lending relationship intensity with the borrowing company's financing capacity and its firm size in the sample that excludes U.S. borrowing companies from utility, financial and public administration sectors in the period between 1995 and 2008. The dependent variable is the actual covenant violation, whose data are provided by Nini, Smith and Sufi (2012). **Relation(Maximum)** acts as the lending relationship variable. The control variable is the same as that used in Table 7. For all of the regressions in this table, **Industry Fixed Effects** are used at the one-digit SIC level, and **Year Fixed Effects** are based on the year of the active date of the loan. **Loan Purpose Fixed Effects** are classified into six groups: acquisition, other, general, recapitalization, LBO, and miscellaneous. The acquisition group includes acquisition line and takeover. The other category contains CP backup, credit enhancement, debtor-in-possession and ESOP. The general group covers capital expenditures, corporate purposes and working capital. The recapitalization group is debt repayment, dividend recapitalization and recapitalization. The LBO category contains LBO. All of the other loan purposes are classified as the miscellaneous group. **Loan Type Fixed Effects** are classified into three categories: credit line, term loan and other loan. The credit line group includes 364-day facility, limited line, revolver/line <1 year, and revolver/line ≥1 year. The term loan group contains delay draw term loans, revolver/term loans, and term loans (Regular; A through F). All other loan types are categorized as the other loan group. Numbers in parentheses are z-statistics corrected for heteroscedasticity. \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels, respectively.

	(1) Violation	(2) Violation	(3) Violation
Low Relation(Maximum)	3.867*** (12.449)	3.603*** (14.025)	3.500*** (13.903)
High Relation(Maximum)	3.576*** (10.961)	3.395*** (12.495)	3.516*** (13.099)
Low Relation(Maximum) × Rated	-0.597 (-1.483)		
High Relation(Maximum) × Rated	-0.287 (-0.674)		
Low Relation(Maximum) × CP Access		0.000 (.)	
High Relation(Maximum) × CP Access		0.242 (0.666)	

Low Relation(Maximum)× Small Borrower			0.334**
			(2.169)
High Relation(Maximum)× Small Borrower			0.018
			(0.102)
Ln(loan amount)	0.092*	0.085	0.086
	(1.697)	(1.522)	(1.587)
Ln(maturity)	-0.085	-0.087	-0.093
	(-1.273)	(-1.294)	(-1.391)
Ln(lender)	-0.120**	-0.111**	-0.115**
	(-2.164)	(-1.962)	(-2.053)
Collateral	0.221**	0.214**	0.229***
	(2.550)	(2.478)	(2.642)
Ln(asset)	-0.123**	-0.122**	-0.073
	(-2.397)	(-2.342)	(-1.250)
Leverage	0.714***	0.729***	0.728***
	(3.494)	(3.555)	(3.562)
Tangibility	-0.338*	-0.339*	-0.340*
	(-1.870)	(-1.874)	(-1.902)
Current Ratio	-0.115**	-0.120**	-0.119**
	(-2.340)	(-2.416)	(-2.380)
Market-to-Book	-0.426***	-0.425***	-0.416***
	(-4.677)	(-4.687)	(-4.603)
Coverage Ratio	-0.001	-0.001	-0.001
	(-0.537)	(-0.521)	(-0.459)
Rating	0.129***	0.123***	0.130***
	(4.073)	(3.398)	(4.075)
Not Rated	1.325**	1.744***	1.785***
	(2.205)	(3.712)	(4.321)
S&P 500	0.390**	0.415**	0.378*
	(2.012)	(2.188)	(1.947)
Constant	-5.880***	-5.940***	-7.073***
	(-5.449)	(-5.161)	(-5.671)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes
Observations	2666	2554	2666

In Table 10, we examine the interaction of the low relationship intensity and high relationship intensity groups with indicators of an S&P issuer credit rating, access to the commercial paper market and smaller firm size than median-sized borrowers in the same

industry in the sample. All of the coefficients for Low Relation(Maximum) and High Relation(Maximum) in the regressions are statistically significant at the 1% level.

Columns 1 and 2 of Table 10 show that the interaction of Low Relationship Intensity and High Relationship Intensity with the access to the public debt market is not significantly subject to predictive covenant violations. In column 3, the coefficient for the interaction of Low Relation(Maximum) and Small Borrower is 0.334, which is statistically significant at the 5% level. Column 3 of Table 10 suggests that the small borrower with low relationship intensity is significantly correlated with the prediction of covenant violations. This result is consistent with the results in Table 8, indicating that low relationship intensity is subject to a high probability of covenant violations. These results are statistically significant.

In summary, the results of Table 10 indicate that low and high relationship intensity are strongly related to covenant violations but not to whether the relationship borrowers have access to the public debt market. Therefore, the results suggest that relationship borrowers with low and high levels of relationship intensity are more likely to violate covenants regardless of whether the relationship borrower has high financing capacity.

## 6. Additional tests

To ensure the robustness of our results, we repeat the previous analysis using alternative measures of leverage, which are calculated by the book value of total debt to equity and the book value of total debt to the EBITDA. These results strongly support the results presented in previous sections.

In addition, some lenders may have certain preferences for covenant choices that are correlated with the lending relationship status. To address this concern, we add lead arranger fixed effects to the regression while retaining the same controls as those in the previous regressions, and the results still support our conclusion.

Furthermore, the sample period is from 1995 to 2008, which covers the credit boom period, so the results may be driven by the credit boom before the financial crisis. We divide the sample into two groups. The period of one group is between 2005 and the middle of 2007, and the period of the other group is from 1995 to 2004. This result suggests that the previous result is stable and not significantly driven by the special period.

Finally, the value of relationship intensity is zero or one for many loans in our sample because many borrowers contracted with only one lead bank in the previous five years prior to current loans. To check whether this result is mainly driven by these loans, we repeat the analysis in Table 5 with a sample that only includes loans with a value of `Relation(Maximum)` that is larger than zero and smaller than one. This result is statistically similar.

## 7. Conclusion

In this paper, we employ four distinct measures for lending relationship status to explore how lending relationships affect loan covenant strictness and thus predict covenant violations. In accordance with information asymmetry theory, we test the effect of lending relationships on covenant strictness. We find that financial covenant tightness monotonically decreases with the strength of lending relationship intensity and the length of the relationship duration; however, the effect of lending relationship intensity on the financial covenant intensity is U-shaped. This can be explained by a confluent impact of information asymmetries and lock-in effects and the creditors' monitoring incentive theory.

In addition, we discuss the prediction of covenant violations through financial covenant strictness and lending relationships. We find that tighter financial covenants are more often subject to covenant violations, and lending relationships are significantly related to covenant violations. As the lending relationship intensity increases, relationship borrowers are less likely to violate covenants, but this result also depends on the renegotiation cost and financing capacity of the borrowing companies. Small-size relationship borrowers or borrowers without access to public debt are less likely to violate loan covenants because of their low financing capacity.

Covenant violations with relationship lending give rise to interesting questions for future research. In this paper, we conjecture that relationship borrowers with high relationship intensity are subject to low renegotiation costs when they violate covenants. This conjecture relies on the theory that the renegotiation cost should be lower under relationship lending than under nonrelationship lending, especially when there is an exclusive lender (Gertner and Scharfstein, 1991; Morris and Shin, 2004). We will examine the actual renegotiation cost and violation cost for relationship borrowers and relationship lenders in future research.

In addition, due to the decrease in information asymmetries, relationship lenders and borrowers both experience benefits from relationship lending; however, there are many cases in which lending relationships are terminated. In comparison with Panel A and Panel B in Table 4, the average lending relationship duration in the violation sample is significantly shorter than that in the relationship and covenant strictness sample. We conjecture that covenant violations are likely one essential reason for the termination of lending relationships. We will examine the actual reasons for loan contract terminations in future research.



## References

- Aghion, P. and Bolton, P., 1992. An incomplete contracts approach to financial contracting. *The Review of Economic Studies*, 59(3), pp.473-494.
- Apilado, V.P. and Millington, J.K., 1992. Restrictive loan covenants and risk adjustment in small business lending. *Journal of Small Business Management*, 30(1), p.38.
- Beneish, M.D. and Press, E., 1993. Costs of technical violation of accounting-based debt covenants. *Accounting Review*, pp.233-257.
- Berger, A.N. and Udell, G.F., 1995. Relationship lending and lines of credit in small firm finance. *Journal of Business*, pp.351-381.
- Berger, A.N. and Udell, G.F., 2004. The institutional memory hypothesis and the procyclicality of bank lending behavior. *Journal of Financial Intermediation*, 13(4), pp.458-495.
- Berlin, M. and Mester, L.J., 1992. Debt covenants and renegotiation. *Journal of Financial Intermediation*, 2(2), pp.95-133.
- Bernanke, B.S. and Gertler, M., 1995. Inside the black box: the credit channel of monetary policy transmission. *Journal of Economic Perspectives*, 9(4), pp.27-48.
- Bester, H. (1985). Screening vs. Rationing in Credit Markets with Imperfect Information. *The American Economic Review*, 75(4), 850-855.
- Bharath, S., Dahiya, S., Saunders, A. and Srinivasan, A., 2007. So what do I get? The bank's view of lending relationships. *Journal of Financial Economics*, 85(2), pp.368-419.
- Bharath, S.T., Dahiya, S., Saunders, A. and Srinivasan, A., 2009. Lending relationships and loan contract terms. *The Review of Financial Studies*, 24(4), pp.1141-1203.
- Bharath, S.T., Pasquariello, P. and Wu, G., 2008. Does asymmetric information drive capital structure decisions?. *The Review of Financial Studies*, 22(8), pp.3211-3243.

- Billett, M.T., Esmer, B. and Yu, M., 2018. Creditor control and product-market competition. *Journal of Banking & Finance*, 86, pp.87-100.
- Billett, M.T., King, T.H.D. and Mauer, D.C., 2007. Growth opportunities and the choice of leverage, debt maturity, and covenants. *The Journal of Finance*, 62(2), pp.697-730.
- Boot, A.W., 2000. Relationship banking: What do we know?. *Journal of Financial Intermediation*, 9(1), pp.7-25.
- Boot, A.W. and Thakor, A.V., 1994. Moral hazard and secured lending in an infinitely repeated credit market game. *International Economic Review*, pp.899-920.
- Bradley, M. and Roberts, M.R., 2004. The structure and pricing of corporate debt covenants. Available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=585882](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=585882).
- Carey, M. and Hrycray, M., 1999. Credit flow, risk, and the role of private debt in capital structure. *Unpublished Working Paper, Federal Reserve Board*.
- Chava, S. and Purnanandam, A., 2011. The effect of banking crisis on bank-dependent borrowers. *Journal of Financial Economics*, 99(1), pp.116-135.
- Chava, S. and Roberts, M.R., 2008. How does financing impact investment? The role of debt covenants. *The Journal of Finance*, 63(5), pp.2085-2121.
- Chava, S., Kumar, P. and Warga, A., 2009. Managerial agency and bond covenants. *The Review of Financial Studies*, 23(3), pp.1120-1148.
- Chen, K.C. and Wei, K.J., 1993. Creditors' decisions to waive violations of accounting-based debt covenants. *Accounting Review*, pp.218-232.
- Cole, R.A., 1998. The importance of relationships to the availability of credit. *Journal of Banking & Finance*, 22(6-8), pp.959-977.
- Degryse, H. and Van Cayseele, P., 2000. Relationship lending within a bank-based system: Evidence from European small business data. *Journal of Financial Intermediation*, 9(1), pp.90-109.

- Demerjian, P.R. and Owens, E.L., 2016. Measuring the probability of financial covenant violation in private debt contracts. *Journal of Accounting and Economics*, 61(2-3), pp.433-447.
- Demiroglu, C. and James, C.M., 2010. The information content of bank loan covenants. *The Review of Financial Studies*, 23(10), pp.3700-3737.
- Dewatripont, M. and Tirole, J., 1994. A theory of debt and equity: Diversity of securities and manager-shareholder congruence. *The Quarterly Journal of Economics*, 109(4), pp.1027-1054.
- Diamond, D.W., 1984. Financial intermediation and delegated monitoring. *The Review of Economic Studies*, 51(3), pp.393-414.
- Diamond, D.W., 1991. Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy*, 99(4), pp.689-721.
- Dichev, I.D. and Skinner, D.J., 2002. Large-sample evidence on the debt covenant hypothesis. *Journal of Accounting Research*, 40(4), pp.1091-1123.
- Drucker, S. and Puri, M., 2008. On loan sales, loan contracting, and lending relationships. *The Review of Financial Studies*, 22(7), pp.2835-2872.
- Fama, E.F., 1985. What's different about banks?. *Journal of Monetary Economics*, 15(1), pp.29-39.
- Garleanu, N. and Zwiebel, J., 2008. Design and renegotiation of debt covenants. *The Review of Financial Studies*, 22(2), pp.749-781.
- Gertner, R. and Scharfstein, D., 1991. A theory of workouts and the effects of reorganization law. *The Journal of Finance*, 46(4), pp.1189-1222.
- Gilson, S. and Warner, J., 1998. Private versus public debt: Evidence from firms that replace bank loans with junk bonds. Available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=140093](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=140093).
- Gopalan, R., Nanda, V. and Yerramilli, V., 2011. Does poor performance damage the reputation of financial intermediaries? Evidence from the loan syndication market. *The Journal of Finance*, 66(6), pp.2083-2120.

Hoshi, T., Kashyap, A. and Scharfstein, D., 1990. The role of banks in reducing the costs of financial distress in Japan (No. w3435). *National Bureau of Economic Research*.

Ivashina, V., 2009. Asymmetric information effects on loan spreads. *Journal of Financial Economics*, 92(2), pp.300-319.

Kahan, M. and Tuckman, B., 1993. Private vs. public lending: Evidence from covenants. Available at <https://escholarship.org/uc/item/1xw4w7sk>.

Kang, J.K. and Stulz, R.M., 2000. Do banking shocks affect borrowing firm performance? An analysis of the Japanese experience. *Journal of Business*, 73(1), pp.1-23.

Lin, H. and Paravisini, D., 2011. What's bank reputation worth? The effect of fraud on financial contracts and investment. Available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1427330](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1427330).

Li, N., Vasvari, F.P. and Wittenberg-Moerman, R., 2016. Dynamic threshold values in earnings-based covenants. *Journal of Accounting and Economics*, 61(2-3), pp.605-629.

Matvos, G., 2013. Estimating the benefits of contractual completeness. *The Review of Financial Studies*, 26(11), pp.2798-2844.

Miller, D.P. and Reisel, N., 2011. Do country-level investor protections affect security-level contract design? Evidence from foreign bond covenants. *The Review of Financial Studies*, 25(2), pp.408-438.

Morris, S. and Shin, H.S., 2004. Coordination risk and the price of debt. *European Economic Review*, 48(1), pp.133-153.

Murfin, J., 2012. The supply-side determinants of loan contract strictness. *The Journal of Finance*, 67(5), pp.1565-1601.

Nini, G., Smith, D.C. and Sufi, A., 2009. Creditor control rights and firm investment policy. *Journal of Financial Economics*, 92(3), pp.400-420.

Nini, G., Smith, D.C. and Sufi, A., 2012. Creditor control rights, corporate governance, and firm value. *The Review of Financial Studies*, 25(6), pp.1713-1761.

- Paravisini D. Local bank financial constraints and firm access to external finance. *The Journal of Finance*. 2008 Oct;63(5):2161-93.
- Park, C., 2000. Monitoring and structure of debt contracts. *The Journal of Finance*, 55(5), pp.2157-2195.
- Peek, J. and Rosengren, E.S., 1997. The international transmission of financial shocks: The case of Japan. *The American Economic Review*, pp.495-505.
- Petersen, M.A. and Rajan, R.G., 1994. The benefits of lending relationships: Evidence from small business data. *The Journal of Finance*, 49(1), pp.3-37.
- Prilmeier, R., 2017. Why do loans contain covenants? Evidence from lending relationships. *Journal of Financial Economics*, 123(3), pp.558-579.
- Qi, Y. and Wald, J., 2008. State laws and debt covenants. *The Journal of Law and Economics*, 51(1), pp.179-207.
- Qi, Y., Roth, L. and Wald, J.K., 2011. How legal environments affect the use of bond covenants. *Journal of International Business Studies*, 42(2), pp.235-262.
- Rajan, R.G., 1992. Insiders and outsiders: The choice between informed and arm's-length debt. *The Journal of Finance*, 47(4), pp.1367-1400.
- Rajan, R. and Winton, A., 1995. Covenants and collateral as incentives to monitor. *The Journal of Finance*, 50(4), pp.1113-1146.
- Rauh, J.D. and Sufi, A., 2010. Capital structure and debt structure. *The Review of Financial Studies*, 23(12), pp.4242-4280.
- Reisel, N., 2014. On the value of restrictive covenants: Empirical investigation of public bond issues. *Journal of Corporate Finance*, 27, pp.251-268.
- Roberts, M.R. and Sufi, A., 2009. Control rights and capital structure: An empirical investigation. *The Journal of Finance*, 64(4), pp.1657-1695.

- Roberts, M.R. and Sufi, A., 2009. Renegotiation of financial contracts: Evidence from private credit agreements. *Journal of Financial Economics*, 93(2), pp.159-184.
- Schenone, C., 2009. Lending relationships and information rents: Do banks exploit their information advantages?. *The Review of Financial Studies*, 23(3), pp.1149-1199.
- Sharpe, S.A., 1990. Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships. *The Journal of Finance*, 45(4), pp.1069-1087.
- Strahan, P.E., 1999. Borrower risk and the price and nonprice terms of bank loans. *Federal Reserve Bank of New York*, Staff Paper No.90. Available at <http://ssrn.com/abstract=192769>.
- Sufi, A., 2007. Bank lines of credit in corporate finance: An empirical analysis. *The Review of Financial Studies*, 22(3), pp.1057-1088.
- Sufi, A., 2007. Information asymmetry and financing arrangements: Evidence from syndicated loans. *The Journal of Finance*, 62(2), pp.629-668.
- Taylor, A. and Sansone, A., 2006. The handbook of loan syndications and trading. *McGraw Hill Professional*.