

# 銀行往來關係影響財務困窘溢出嗎？

## Does Banking Relationship Matter in Financial Distress Spillover?

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**摘要：**銀行與借款企業間具有直接且緊密的關聯性，而此一往來關係被認為是風險的重要機轉；企業的財務困窘極可能會藉由跨產業溢出效果傳導給往來銀行負面的影響。本研究結果顯示公司宣告破產重整確實使企業股價呈現顯著但幅度不大的短期負異常報酬。然而，出乎意料地，往來銀行卻未因借款企業的困窘而使其股價蒙受太大的負面損失。本研究進而指出借款利率、企業財務槓桿、企業獲利效率對於銀企往來負面事件宣告外溢模式最具解釋力。具體而言，實證研究發現當借款企業被索取的利率愈低時，其溢出效果愈高。此外，當借款企業受困於高企業財務槓桿時，宣告事件之負向溢出效果大於正向溢出效果。最後，借款公司之高企業獲利效率，能有效地預測財務困窘事件對銀企往來所產生之溢出效果。

**關鍵詞：**財務困窘；重整；往來銀行；溢出效果

**Abstract:** Given that the direct lender-borrower interconnectedness and propinquity are critical means of efficient risk transfer, the financial distress involves the negative propagation through inter-sector spillovers. This study documents a small but significant and non-transitory adverse valuation effect of reorganization filing on the value of the troubled sample data. However, it is striking to note that the lender is resilient to the propagation of borrower distress. There is not too much noteworthy impact on relationship banks upon the filing proclamation. This study also shows

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that the loan interest rate, borrower leverage, and borrower profit efficiency help enlighten the stock market differentiation to bad filer-based news on its lender. More specifically, this empirical study finds that the lower the interest rate imposed by top lenders, the greater the degree of inter-sector spillovers. In addition, this study reveals that the negative externality effect dominates the positive one when the sample data is confined to a high level of total liabilities by total assets. Finally, the greater the value of the net income by assets, the more capable it is in predicting results.

**Keywords:** Financial distress; Reorganization; Lender; Spillover effects

## 1. Introduction and Background

The lender-borrower appositeness is derived from the notion that the long-term interconnectedness and proximity between the lenders and their borrowing firms may generate value and amplify economic competence and efficiency (Petersen and Rajan, 1995; Berger and Udell, 1995; Fields *et al.*, 2006; Degryse and Ongena, 2007). However, the existing empirical literature on the underlying advantages of the lending appositeness has mainly put emphasis on documenting the avails to the borrowing firms. On the whole, continuing relationships leave substantial room for flexibility and discretion in developing implicit long-run contracting that permits the use of delicate and noncontractable information from which borrowers receive potential benefits; for example, they face lower credit costs, are more likely to have loan terms renegotiated in the very depths of the credit predicament, and are asked to provide somewhat less rigorous collateral (Boot, 2000).

Relationship banking is held to be most of assistance for borrowing firms during periods of serious financial distress, particularly in the contexts of some countries, e.g., Germany, Japan, and Taiwan, where it appears to be common practice for the better-informed debtee to become the last resort for a financially catastrophic borrower (Elsas and Krahenen, 1998; Tang, 2010; Chi, 2013). One promising rationale for such a bank considered a solution to support a borrowing

firm in financial hardship is that the bank knows more about the future prospects and the essential volatility of the firm as well as concerning the firm's true state (Sharpe, 1990; Berger and Udell, 1995; Von Thadden, Berglöf and Roland, 2010), thus believing the financially catastrophic borrower will maintain a presence in such a competitive landscape (Elsas and Krahnert, 1998; Isagawa, Yamashita and Yamashita, 2010). Therefore, the leading bank can lend more than other less-knowledgeable banks (e.g., Hoshi, Kashyap and Scharfstein, 1991).

A substantial empirical literature has examined the role of such appositeness in shielding borrowers from financial hardship. Much less is known about the advantages of such appositeness for lending banks, except for Sharpe (1990), Boot (2000) and Bharath *et al.* (2007). These studies document that for an incumbent relationship debtee, the comparative advantage resulting from the making use of proprietary information over very long periods of time bears the following benefits. First, a leading debtee would have a greater propensity of offering future information sensitive products and services to the relationship-dependent borrower compared to a less informed debtee. Meanwhile, it can impose higher prices on the services and appropriate most of the value ascribable to the exercise of the bank information monopoly. Yet, a fundamental question in costs to a bank of such appositeness is largely disregarded.

Empirical studies have found that lending banks most susceptible to borrower shocks are those struggling firms that are in financial distress. For example, Kracaw and Zenner (1996) and Chi (2013) state that there is an undeviating effect on the bank when the borrowing firm declares default, bankruptcy, or reorganization. This suggests that a high level of exposure to the financially catastrophic borrower causes debtees to have a portfolio that is possibly excessive risk-taking, that is less diversified, or that enhances the likelihood of regulatory interference. There may also be circumlocutory effects on the value of the debtee in the case of borrower failure or distress. Particularly, the financially catastrophic incident at one firm can produce a propagation spillover effect because the former conveys information about the competitive disadvantage in the marketplace within a sector (Schwarcz, 2008); that is to say a firm's distress may communicate greater negative expectations about industry asset values and future business prospects to which the debtee may be

exposed. Bharath *et al.* (2007) also assert that the incident of a borrowing firm's failure or catastrophe may be conjectured as a signal of poor credit management skills for issuing loans and may imply the potential loss of reputation, loss of income potential or psychological injuries of the debtee.

Nevertheless, there has been another strand of empirical research regarding the announcement of a borrowing firm's financial failure or catastrophe as a low cost or even a no news event for its debtee. The rationale underlying such a perspective is that banks may soon be able to fully collect their loans from a borrower falling in danger of insolvency because of their seniority or collateral (e.g., Chan and Thakor, 1987; Kracaw and Zenner, 1996). Additionally, a bank in general diversifies its offer of small loans to a large number of borrowers, as a result it is likely that the loan default of any single borrower will have a trivial effect on the lending bank (Isagawa, Yamashita and Yamashita, 2010). Since the indication from these literatures is non-conclusive, the present study attempts to add to the scant but promising literature by investigating the impacts of reorganization petition filings by borrowing firms on the bank shareholder wealth. Above all, albeit the explosion in reorganization request is a judicially identified warning sign of financial fragility of the greatest state, such a petition should rigorously affect the awareness of bank shareholders. This is most probably owing to the high likelihood that bank shareholders will be harmed, and the high visibility of such harm.

Following previous literature, this study examines whether the financial failure or catastrophe of one sample data, suggested by a public reorganization proclamation, propagates to its leading debtee, as well as the degree of the propagation spillover effect. This analysis ascertains that the investors quickly anticipate or impound to this filer-based negative news and fully assimilate its implication for borrower's value on a timely and unbiased basis. However, in a dissimilar vein, the negative stock price reaction to its leading lending bank to such proclamation news appears to be temporary and mostly immaterial. This paper implies that the market instantaneously but not entirely incorporates the impact of a borrower's reorganization request signal on the stock price of affected banks. Therefore, this study finds some evidence supporting the incomplete inter-sector information transfers.

Further investigation suggests two detailed and comprehensive dimensions, loan-based information and filer-based information, significantly help enlighten the stock market differentiation to bad filer-explicit news on its top lending bank. This analysis shows that the debtees are likely to provide the flexibility and customizability in renegotiating reduces the cost of financial distress for borrowers. The results follow that a decrease in lending rates increases the odds of negative spillover effects<sup>2</sup>. This study also finds that an overriding negative-propagation effect exists when the sample data is confined to a high level of total liabilities by total assets. Finally, the borrower's profit efficiency is the most important determinant of the investor's perception of the bank loan quality and subsequent loan defaults.

The rest of this paper is organized as follows: In Section 2, this paper describes sample and data; Section 3 outlines research design and empirical methodology; Section 4 presents empirical results; and Section 5 concludes.

## **2. Sample Selection and Data Collection**

This paper first examines the stock price behavior of both sample borrowers and leading banks subsequent to financially catastrophic borrowing firms' proclamations of reorganization filing. The multi-stage sampling scheme embarks on first with the recognition of identities. Following the same approach and procedure exercised by Chi (2013), this paper makes use of Market Observation Post System of the Taiwan Stock Exchange Corporation (TSEC) and the Key Number and Digest System of ROC Law to pinpoint research incidents. These two public access databases comprises the indispensable information for this study on the identity of the incident, date of filing and closing of the reorganization procedure, categories of reorganizations and reasons for filing of reorganization petition. This study undertakes the debtee-filer appositeness of private non-financial identities. Therefore, this study eliminates the filers of financial institutions and public sector

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<sup>2</sup> Der and Everitt (2002) point out that the parameters' estimates are best interpreted if they are converted into odds ratios by exponentiating them.

non-commercial filers. That is, these two sectors involve unquestionably different financing structure and financial development which have to exclude from the present study.

At the next stage of sampling, the identification of the specific debtee of a financially catastrophic identity is introduced. Following the same rationale used by Chi and Tang (2008) and Morck, Nakamura and Shivdasani (2000), a sample data's debtee of this study is defined as the financial institution (excluding foreign banks and insurance companies) with the largest debt claim of all the lending banks involved before or on the date of the sample data's filing a petition for reorganization. The databank provides both accounting data of individual and consolidated accounts and is made available through the Taiwan Economic Journal (TEJ) Co., Ltd. On the whole, this study exploits the individual accounts since the Long- and Short-Term Borrowings Details module of the TEJ databank also reports accounts at this level. This module contains information on the subject of every loan transaction, including the lending bank, the short- or long-term loan, the loan amount, the loan currency, the maturity, the loan period, the fixed or floating rate, the interest rate, the pledge or collateral, the type of collateral, and the loan limit. Finally, the daily stock closing price and the rate of return on the Taiwan stock exchange capitalization weighted stock index, TWSE index or TAIEX index, or the GTSM index are generated from the TEJ Equity databank.

### **3. Empirical Methodology**

#### **3.1 Measuring Abnormal Returns**

In the first stage of the analysis, this study starts with standard event study method to examine the stock price behavior of the sample borrowers following their filing proclamations. In this study, the spillover effect of a financial distress refers to the negative externality effects of stocks of one or more sample firms to others (Kaufman, 1994). Therefore, the present study further investigates the propagation effect of financial catastrophe by sample data on the stock returns of their leading

debtees. This study employs the day of filing for reorganization request as the conventional incident day (day 0). That is, if the market is efficient, stock prices should mirror all conceivable changes in the event outcomes and thus deteriorating poor and weak loan quality shows harmful repercussion on top debtee performance.

This study measures the stock price behavior by cumulating daily abnormal returns ( $AR$ ) during a specified time period. Explicitly, the current study presents empirical evidence for nine different event metrics centered on the incident: 2-day window  $[-1,0]$  and  $[0,+1]$ , 3-day window  $[-1,+1]$  and  $[0,+2]$ , 4-day window  $[0,+3]$ , 5-day window  $[-2,+2]$  and  $[0,+4]$ , 6-day window  $[0,+5]$  and 11-day window  $[-5,+5]$ . The daily  $AR$  for any leading debtee stock is gauged as follows:

$$AR_{jt} = R_{jt} - E(\tilde{R}_{jt}) \quad (1)$$

where  $t$  is the day measured relative to the 11-day event period from day -5 to day +5,  $AR_{jt}$  is the return on stock  $j$  on incident day  $t$ , and  $E(\tilde{R}_{jt})$  is the expected rate of return on stock  $j$  at incident day  $t$ . Accordingly to Brown and Warner (1985),  $E(\tilde{R}_{jt})$  is calculated from the time-series of the observed return for sample dataset  $j$  in the pre-estimation period. The  $AR$  for each sample dataset is then estimated as the difference between the observed return and the expected return during a pre-estimation period.

The cross-sectional average  $AR$  for each incident day is gauged as shown:

$$AR_t = \frac{1}{N} \sum_{j=1}^N AR_{jt} \quad (2)$$

where  $N$  is the number of sample firms and main debtees with  $AR$ s on day  $t$ . The cumulative abnormal return ( $CAR$ ) for any sample  $j$  (for a given interval of time for  $K$  to  $L$ ) is generated using equation (3).

$$CAR_j = \sum_{t=K}^L AR_{jt} \quad (3)$$

The cross-sectional average  $CAR_{jKL}$  over the incident window is gauged as shown:

$$CAR_{KL} = \frac{1}{N} \sum_{j=1}^N CAR_{jKL} \quad (4)$$

### 3.2 Abnormal Return Statistical Significance

Following the methodology employed by Mikkelsen and Partch (1988), the test statistics ( $Z$ ) for the  $AR$  and  $CAR$  are shown in equations (5) and (6).

$$Z = \frac{1}{\sqrt{N}} \sum_{j=1}^N \left[ \frac{\sum_{t=K}^L AR_{jt}}{\text{VAR}(\sum_{t=K}^L AR_{jt})} \right] \quad (5)$$

$$\text{Var}(\sum_{t=K}^L AR_{jt}) = V_j^2 \left[ T + \frac{T^2}{ED} + \frac{\sum_{t=K}^L \tilde{R}_{mt} - T(\bar{R}_m)^2}{\sum_{i=1}^{ED} (\tilde{R}_{mi} - \bar{R}_m)^2} \right] \quad (6)$$

where  $V_j^2$  = residual variance for sample dataset  $j$  from the market model over the research estimation period,  $ED$  = number of days in the research estimation period employed to take the gauge of the market model,  $T$  = number of days in the interval  $(L-K+1)$ ,  $\tilde{R}_{mi}$  = market portfolio return for the  $i$ th day of the research estimation period,  $\tilde{R}_{mt}$  = market portfolio return for day  $t$ ,  $\bar{R}_m$  = market portfolio average return over the research estimation period.



Price and quote specific data are often non-normality, fat tails, and volatility clustering (Pati, 2008). In data which exhibit skewness, extreme asymmetries, multimodality, or heavy tails, non-parametric tests offer a very satisfactory alternative to parametric tests, predominantly with small samples (Kitchen, 2009). For this reason, the non-parametric generalized sign (*GS*) test (Cowen and Sergeant, 1996) and the Wilcoxon rank-sum test (Kaplan and Roll, 1972) are used to test for statistical significance of *AR* and *CAR* for the two research datasets in this paper:

$$GS = \frac{|p^+ - p|}{\sqrt{p(1-p)/N}} \quad (7)$$

The above generalized sign (*GS*) gauge has an approximate unit normal distribution. Where  $p^+$  is the observed fraction of positive stock returns calculated across sample borrowers and debtees in one particular incident, or the average fraction of sample dataset with non-adverse excess returns for incidents over multiple days.

The Wilcoxon rank-sum test considers that both the sign and the magnitude of excess returns are indispensable. This analysis is carried on as follows:

$$W = \min(W^+, W^-) \quad (8)$$

where  $W^+$  = the aggregation of the ranks of the positive differences,  $W^-$  = the aggregation of the ranks of the adverse differences, and  $W$  = the smaller of positive or adverse rank aggregations.

The statistical significance analysis is executed employing the following asymptotic test statistic:

$$\frac{W - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}} \quad (9)$$

The exact test and Monte Carlo method are prevailing techniques for obtaining accurate results when the dataset is not large enough for standard

asymptotic approximations. For that reason, lastly, this paper takes the gauge of the asymptotic  $p$  value, exact  $p$  value, and the Monte Carlo estimate of the exact  $p$  value to enable making trustworthy inferences and implications.

### **3.3 Variables**

Davydenko and Franks (2008) document that 75.7% of bank loans in France and 88.5% in Germany are guaranteed, whereas Tang (2010) reports that 85.29% of loans are guaranteed for firm loans in Taiwan, which is similar to the order of magnitude presented by Chi (2009). Benmelech and Bergman (2009) reveal that collateral allows a diminution of the possible bad loan loss for the debtee in the incident of a loan default. Meanwhile, guarantee and collateral helps to overcome the adverse selection and moral hazard problems (Bakhtiar, Sugema and Irfany, 2014). In a similar vein, Besanko and Thakor (1987) and Benmelech and Bergman (2011) state that guarantee is more costly for low-quality borrowing firms since they have a greater likelihood of defaulting and consequently of losing the guarantee and collateral. Therefore, the guarantee serves a signaling mechanism, conveying significant proprietary information on the borrower to the debtee which facilitates to determine and regulate loan pricing. In this study, thereby, a negative regressor coefficient sign is predicted for guarantee.

Default risk has a decisive effect on the loan interest rate imposed on a debt instrument. Berger and Udell (1995), Elsas (2005) and Chi (2013) corroborate this argument that a higher loan interest rate highlights more non-performing loans, implying a positive risk-interest interconnection. It is possible that the high interest rate may impose and even induce an excessively risky investment project. That is to say, the need to produce greater returns to meet the high borrowing cost may lead the sample data to take risks which could result in likely default. It is therefore expected that the much more high-risk pool is associated with a comparatively high interest rate on its loans, and to that end a negative regressor coefficient sign is predicted.

The larger the loan size, the more concentrated the fortunes of the leading debtee in a smaller number of firms, and the riskier the main debtee's exposure to borrower-specific risks (Kracaw and Zenner, 1996). Jiménez and Saurina (2004) and

Chi and Tang (2008) also find that default rates ascend with loan volume, providing an underlying principle for debtees to compel and enforce loan caps as a consequence of moral hazard. Likewise, in Besley, Meads and Surico's (2013) study on how U.K. lenders price default risk on loans, a 1% increase in the loan size is associated with an interest rate spread which is 6 basis points higher irrespective of the borrower's position in the riskiness distribution. These interpretations highlight a negative interconnection between loan size and the effect on the wealth of the debtee.

In practice, the Tier-II capital is composed of loan loss reserves in the main. As economic conditions deteriorate and financial tensions continue, a distinct treatment of loan loss reserves as capital has recently drawn considerable attention. Increases in loan loss reserves by debtees usually dwindle net income and Tier-I capital (Grammatikos and Saunders, 1990). Bank regulations consent to the add-back of reserves as Tier-II capital under the regulatory beliefs that loan loss reserves symbolize capital that should be built up during times of economic prosperity, to absorb losses during times of economic recession (Wall and Koch, 2000). For that reason loan loss reserves could be viewed as the first line of insolvency defense against debtee deteriorations and systemic risk. Likewise, Grammatikos and Saunders (1990) reveal that additions to the loan loss reserve by main debtees are viewed approvingly by the market participants because the market may view main debtees with high ratio as debtees that are willing to shoulder more uncertainty and doubt. Along these lines, it is expected that any main debtee that has built up loan loss reserves earlier than a filing proclamation by its filers should be less negatively impacted by news of the catastrophic incident.

### **3.4 The Model and Empirical Proxies**

This study utilizes a distinctive loan-based data set to investigate the spillover effects on a leading debtee while its borrowing firms experience a financial catastrophic incident. A multiple regression model has been explored after controlling for the impact of other variables that are lined with borrower features. A multiple regression equation for predicting the spillover effects on a leading debtee can be conveyed as follows:

$$CAR = \alpha_0 + \alpha_1 GUARANT + \alpha_2 INTRATE + \alpha_3 LN(1 + LOANSIZE) + \alpha_4 TIER2 + \sum \alpha_k CNTRLVAR \quad (10)$$

where *CAR* is a proxy for the degree of propagation spillover effects. *GUARANT* is binary, taking a value of one if the loan is guaranteed, and zero otherwise. *INTRATE* is loan interest rate.  $LN(1 + LOANSIZE)$  signifies the natural log of one plus loan amount (in US\$ million). *TIER2* is the loan loss reserve of the debtee divided by the debtee's capital in the fiscal year preceding the proclamation year. *CNTRLVAR* denotes a set of control variables in the model for this research. These include natural log of assets (*BNLA*), cash flows from operations to current liabilities (*BCFOCL*), and total liabilities by total assets (*BTLTA*). In addition, net income by assets is included to control for sample data profit efficiency (*BNIA*). Lastly, *PYEAR* is a proclamation-time dummy variable.

## 4. Empirical Findings

### 4.1 Market Reaction to Filing Proclamations by the Borrowers

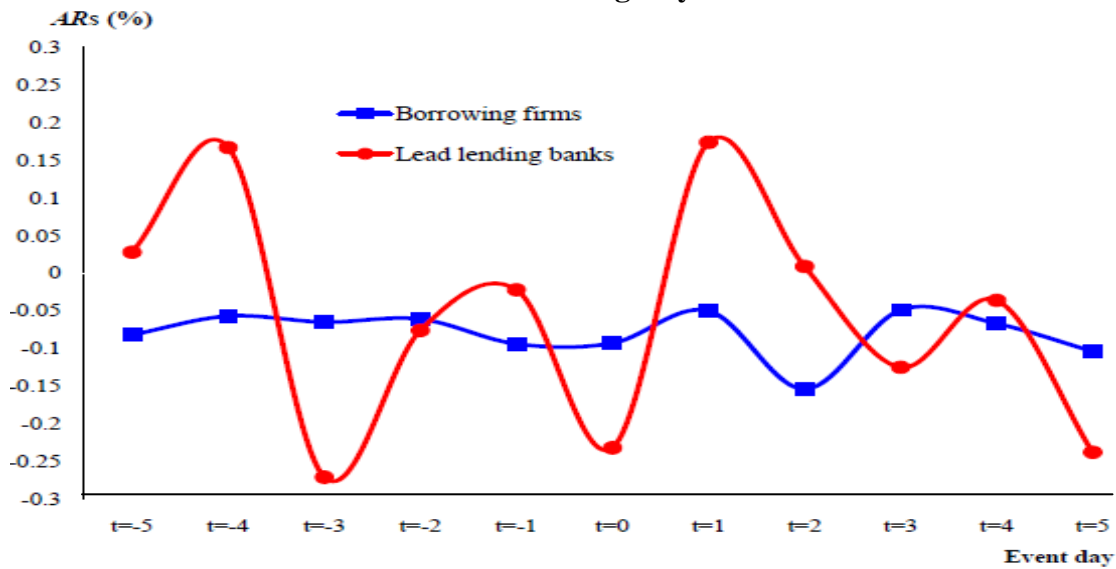
This study firstly looks into how efficient the market is in pricing the stocks of sample firms which experience the financial catastrophe and hardship. Figures 1-2 and Panel A of Table 1 indicates that nearly three-fourths of the portfolio undergo significant stock-valuation losses by virtue of the filings, with an average negative drift of -0.093 ( $z = -2.316$ ) on incident date. Another interested fact to be noticed is that the declines in value are evidently modest for the filers over the entire research period. This consequence is consistent with the findings in other studies (e.g., Davydenko, Strebulaev and Zhao, 2012). Besides, this empirical finding consists with the view that this bad news is known to the market well before the proclamation (Chi and Tang, 2005; Hertz et al., 2008).

### 4.2 Spillover Effects

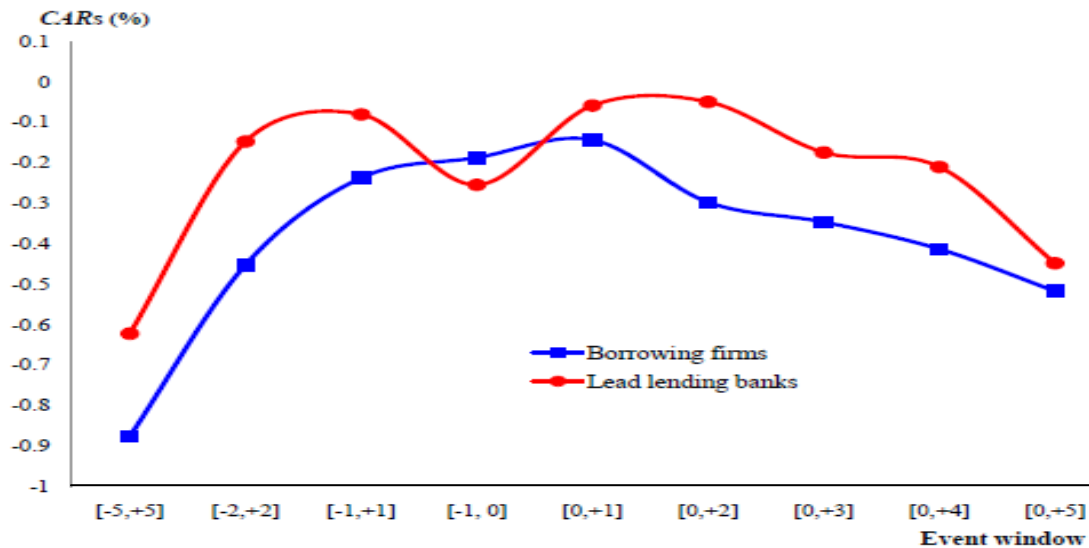
This subsection demonstrates the plausibility of the borrower's financial failure and catastrophe to impact the stock prices of other profiles that have direct

interconnectedness and proximity with the sample firm. The worst negative price reactions occur on the day 0 and the window [-5,+5], with the incident day *AR* of -0.232 ( $z = -1.717$ ) and the 11-day *CAR* of -0.622 ( $z = -2.353$ ) which are significantly more than would occur randomly with GS test statistics of -6.328 and -6.246. However the striking finding is that unlike the previous literature this study reveals that there is not too much significant impact on leading debtees upon the filing proclamation. The mostly statistically insignificant spillovers can be attributed to the fact that the debtee exposures are constrained on account of the diversification requirements imposed on the debtees. On the grounds, the exposure to a filing borrower is on average too trivial to seriously influence a leading backer's equity prices (Chi and Tang, 2008; Tang, 2010).

**Figure 1**  
**ARs Surrounding Day 0**



**Figure 2**  
**CARs Surrounding Day**



### 4.3 Tests on Multicollinearity

Table 2 displays the correlation coefficients for the regressors used in the regression model of this study. It can be seen that the loan interest rate is significantly correlated to the *TIER2* at the one percent significance level. There is also a significantly positive involvement between loan total and natural log of assets at the one percent significance level. Hence, there are significant correlations between two out of four of the regressors and also between one regressor and one control variable. However, none of the coefficients is in excess of 0.8, which is exercised as a threshold of serious multicollinearity (Gujarati, 1992). Thus, the low correspondences between regressors imply trivial multicollinearity problems in this paper.

**Table 1**  
**Market Reaction to Filing Proclamation**

<b>Panel A: Filing Incident and Its Spillovers</b>									
This table illustrates abnormal returns ( <i>AR</i> ) and cumulative abnormal returns ( <i>CAR</i> ) for the portfolio of financially catastrophic filers around the date of the incident. <i>AR</i> ( <i>CAR</i> ) is the market-adjusted cumulative excess return (in %) of the sample data portfolio, using the market model over the research period. The market return is proxied by the TWSE index or TAIEX index, or the GTSM index. The significance for <i>ARs</i> ( <i>CARs</i> ) is tested following Mikkelson and Partch (1988). The "% (>0)" entry shows the percentage of borrowing firms with positive values. The statistical significance for this fraction is according to a generalized sign test. The superscripts *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.									
Day	Full sample			Positive-return subsample		Negative-return subsample		<i>GS</i> statistic	Wilcoxon
	Mean %	<i>z</i> -stat.	% >0	Mean %	<i>z</i> -stat.	Mean %	<i>z</i> -stat.		rank-sum test
									<i>Z</i>
-5	-0.082	-1.842*	40.00	0.022	4.341***	-0.084	-2.295**	2.694**	-4.197
-4	-0.057	-1.688*	47.37	0.019	5.299***	-0.071	-2.388**	3.079***	-4.623
-3	-0.065	-1.943*	32.63	0.027	5.073***	-0.062	-2.575**	2.953***	-3.823
-2	-0.061	-1.838*	35.79	0.020	4.663***	-0.061	-2.345**	2.643**	-4.015
-1	-0.094	-2.335**	27.37	0.019	2.959**	-0.084	-2.639**	2.596**	-3.516
0	-0.093	-2.316**	26.32	0.026	5.196***	-0.083	-2.694***	2.641**	-3.408
+1	-0.050	-7.007***	15.79	0.019	2.568***	-0.040	-9.843***	3.618***	-2.521
+2	-0.154	-2.947***	24.21	0.019	4.363***	-0.135	-3.195***	3.265***	-3.296
+3	-0.049	-7.542***	15.79	0.014	2.912**	-0.040	-10.607***	3.261***	-2.666
+4	-0.067	-2.099**	32.63	0.023	4.920***	-0.063	-2.624**	2.852**	-3.724
+5	-0.104	-2.721***	26.32	0.017	3.637***	-0.093	-3.005***	2.779**	-3.408
-5,+5	-0.876	-2.720***	28.42	0.206	4.849***	-0.745	-3.236***	3.452***	-3.823
-2,+2	-0.452	-2.917***	27.37	0.103	4.106***	-0.403	-3.375***	3.488***	-3.823
-1,+1	-0.237	-2.812***	25.26	0.064	3.764***	-0.207	-3.255***	3.165***	-3.724
-1, 0	-0.187	-2.323***	27.37	0.045	4.341***	-0.167	-2.667**	2.685**	-3.823
0,+1	-0.143	-3.231***	24.21	0.045	3.356***	-0.123	-3.837***	3.678***	-3.724
0,+2	-0.297	-3.245***	24.21	0.064	3.511***	-0.258	-3.697***	3.733***	-3.724
0,+3	-0.346	-3.602***	22.11	0.078	3.648***	-0.298	-4.141***	4.138***	-3.621
0,+4	-0.413	-3.424***	24.21	0.101	3.840***	-0.361	-4.010***	4.122***	-3.724
0,+5	-0.517	-3.294***	24.21	0.118	3.781***	-0.454	-3.810***	3.864***	-3.724

**Panel B: Spillover Effect and Leading Debtees Stock Returns**

This table illustrates abnormal returns (*AR*) and cumulative abnormal returns (*CAR*) for the main bank portfolio the day 0, the date when a sample data filed for reorganization petition. *AR* (*CAR*) is the market-adjusted cumulative excess return (in %) of the debtee portfolio, using the market model over the research period. The market return is proxied by the TWSE index or TAIEX index, or the GTSM index. The significance for *ARs* (*CARs*) is tested following Mikkelsen and Partch (1988). The "% (>0)" entry shows the percentage of main debtees with positive values. The statistical significance for this fraction is according to a generalized sign test. The superscripts \*, \*\*, and \*\*\* represent significance at the 10%, 5%, and 1% levels, respectively.

Day	Positive-return subsample		Negative-return subsample		Full sample			GS statistic	Wilcoxon rank-sum test Z
	Mean %	z-stat.	Mean %	z-stat.	Mean %	z-stat.	% >0		
-5	1.004	3.496***	-0.709	-5.692***	0.028	0.178	43.16	-6.248***	-5.572
-4	1.052	3.492***	-0.598	-5.466***	0.167	0.894	43.16	-6.248***	-5.579
-3	0.540	4.580***	-0.836	-5.599***	-0.271	-2.178**	41.05	-6.086***	-5.445
-2	1.176	4.482***	-0.683	-5.340***	-0.076	-0.491	32.63	-5.387***	-4.863
-1	1.182	3.368***	-0.835	-4.701***	-0.022	-1.120	40.00	-6.003***	-5.376
0	0.908	3.616***	-1.131	-5.677***	-0.232	-1.717*	43.62	-6.328***	-5.644
+1	1.158	4.199***	-0.722	-4.952***	0.174	-0.956	47.37	-6.557***	-5.840
+2	1.313	4.615***	-0.758	-5.246***	0.009	-0.046	36.84	-5.746***	-5.159
+3	1.091	4.569***	-0.901	-6.220***	-0.125	-0.752	38.95	-5.916***	-5.305
+4	0.662	5.455***	-0.881	-4.953***	-0.036	-0.263	45.26	-6.402***	-5.711
+5	0.533	3.546***	-0.898	-5.597***	-0.238	-1.659*	42.55	-6.249***	-5.577
-5,+5	10.619	4.071***	-8.952	-5.479***	-0.622	-2.353***	43.16	-6.246***	-5.580
-2,+2	5.737	4.024***	-4.129	-5.261***	-0.147	-1.169	41.05	-6.081***	-5.445
-1,+1	3.248	3.776***	-2.688	-5.216***	-0.080	-1.148	44.21	-6.329***	-5.643
-1, 0	2.090	3.490***	-1.966	-5.249***	-0.254	-2.406***	43.16	-6.248***	-5.577
0,+1	2.066	3.965***	-1.853	-5.482***	-0.058	-1.162	46.32	-6.483***	-5.774
0,+2	3.379	4.156***	-2.611	-5.407***	-0.049	-2.289***	43.16	-6.247***	-5.579
0,+3	4.470	4.314***	-3.512	-5.591***	-0.174	-0.250	41.05	-6.085***	-5.442
0,+4	5.132	4.432***	-4.393	-5.530***	-0.210	-0.253	45.26	-6.405***	-5.711
0,+5	5.665	4.350***	-5.291	-5.531***	-0.448	-1.657*	44.21	-6.326***	-5.645



Belsley, Kuh and Welsch (1980) contend that the tests of multicollinearity based on correlation analysis can not indicate significant multicollinearity between groups of three or more regressors. To this end, the collinearity diagnosis is further performed with variance inflation factors, tolerance values, and condition number analysis. The largest variance inflation factor is 2.387 and the lowest tolerance value is 0.419, suggesting that the standard errors of regression coefficients are unbiased. As a result, this study is able to reliably contrast all variables on the degree of spillover effects simultaneously. The results of the condition number analysis also indicate a lack of any substantial collinear links between the regressors based, in part, on the condition numbers which are less than 8.181.

#### 4.4 Regression Analysis of the Inter-Sector Spillovers

The proclamation spillovers are examined in further detail in a multiple regression of the borrowing firms' *CARs*. Summary estimates for the regressors are reported in Table 3. The results show that the *F*-statistic is statistically significant at the one percent level. Hence, this study concludes that at least one of the regressors is linearly related to *CAR* over a three-day period  $[0, +2]$ <sup>3</sup>. The regression equation in this study does have some validity in fitting the data, in other words the regressors are not purely random with respect to the degree of spillover effect.

The coefficient for the *INTRATE* regressor is 0.437, significant at the ten percent significant level, indicating that an increase of one unit of loan interest rate increases the chance of a leading backer having a lesser degree of a proclamation spillover effect by 1.548, conditional on the remaining regressors<sup>2</sup>. It is noteworthy that the result is opposite to the previous postulate in this study and to the findings of previous studies on the existence of a positive appositeness between interest rates and the riskiness of borrowers. That is, it seems that the lower the interest rate imposed by leading backers, the greater the degree of proclamation spillovers. This finding is consistent with the contentions of Ioannidou, Ongena and Peydró (2015) and Jiménez and Saurina (2004) and indicates that reductions in loan interest rates

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<sup>3</sup> This study makes use of the cumulative abnormal stock market return measured over a three-day period  $[0, +2]$  as dependent variable because it is most significant incident window at incident and post incident.

are followed by a deterioration of lending standards and, with some additional lag, by increases in default rates.

The estimated coefficient on the *BTLTA* regressor is negative (with a value of -0.212) and statistically significant at the ten percent level. It follows that an increase of one unit of sample data total liabilities by total assets reduces the chance of a leading debtee having a less adverse price impact by 1.236, conditional on the remaining regressors. In common with the literature, this study reports that a high level of total liabilities by total assets makes the financially catastrophic sample data more fragile and increases the likelihood of failure or catastrophe (Tang, 2010). Grammatikos and Saunders (1990) and Jorion and Zhang (2007) find adherent evidence that the borrowing firm's total liabilities by total assets has also increased considerably prior to its hardship, and this may have been a significant contributing determinant to the prospects for future performance and remaining a going concern (Mian and Sufi, 2010).

The positive coefficient on the regressor *BNIA* (with a value of 0.844) is exceedingly significant at the one percent level, showing that a rise of one unit of borrower profit efficiency enhances the probability of a leading debtee having a lesser extent of a proclamation spillover by 2.326, conditional on the remaining regressors. The result is the mirror image of the findings of previous studies Chi (2009) shows that borrowing filers with low profit efficiency are less flexible and invasive than borrowers having high profit efficiency, and hence the low profitable borrowers are riskier and have negative expected returns. Chi (2013) also corroborates Jorion and Zhang's (2007) assertion that a profitable sample firm would have more financial resources available to provide a firm's growth options and flexibility to respond to new opportunity and conditions. In sum, the results strongly ascertain that the impact of proclamation incident on the stock price of affected debtees is mostly driven by aggregated filer-based information that tends to overwhelm the effect of leading-debtee- and loan-based features. Finally, the coefficients on the regressors of *GUARANT*,  $LN(1 + LOANSIZE)$ , *TIER2*, *BNLA*, and *BCFOCL* are insignificant at any conventional levels. This indicates that these

five regressors have no incremental discriminant power beyond that presented by the other regressors<sup>4</sup>.

#### **4.5 Results of Difference in Means Test and Friedman Rank Sum Test**

This subsection provides further estimates presenting the difference in the means of the regressors underlying this study to enlighten the magnitude of the proclamation spillovers. The result shows the only significant regressor, *INTRATE*, at *Y-1* of 6.756% for *CAR-* sub-datasets and of 6.180% for *CAR+* sub-datasets, respectively. The difference suggests that the mean of the absolute value of the loan interest rate for *CAR-* sub-datasets is higher than that for *CAR+* ones at the five percent significance level. The Friedman rank sum test further confirms significance at the five percent level with a  $\chi^2$  statistics of 4.667. When comparing the means of the control variables for *CAR+* sub-datasets with the absolute value of those for *CAR-* sub-datasets in the difference in means test, *BTLTA* is found to be the only significant control variable, with a t-statistics of 2.614. In consequence, at the five percent significance level, the mean of the absolute value of the total liabilities by total assets for *CAR-* sub-datasets is significantly higher than the means for *CAR* ones.

### **5. Conclusions**

This study contributes to the field of relationship banking by adding to the scant body of literature currently existing on the theme of spillover effects. Given that the direct debtee-borrower interconnectedness and proximity are critical means of efficient risk transfer, the financial hardship of a sample data involves the potential for negative propagation through proclamation spillovers. This study documents a

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<sup>4</sup> This analysis replicates the results of Section 4.4 by employing an alternative incident window to assess the robustness of results. Specifically, the window [0, 0] is tested over the whole of the debtees; results were similar and are, hence, not reported.

**Table 2**  
**Pearson Correlation Matrix**

This table displays the binary correlation coefficients for the regressors to check for the degree of multicollinearity among the regressors. *GUARANT* is binary, taking a value of one if the loan is guaranteed, and zero otherwise. *INTRATE* is loan interest rate.  $LN(1 + LOANSIZE)$  signifies the natural log of one plus loan amount (in US\$ million). *TIER2* is the loan loss reserve of the debtee divided by the debtee's capital in the fiscal year preceding the proclamation year. *CNTRLVAR* is a set of control variables in the model for this research. These include natural log of assets (*BNLA*), cash flows from operations to current liabilities (*BCFOCL*), and total liabilities by total assets (*BTLTA*). In addition, net income by assets is included to control for sample data profit efficiency (*BNIA*). Lastly, this study uses year dummy variables to control for any temporal fixed effects. \*\*\* indicates significance at the 1% level, when tested two-sided.

	<i>GUARANT</i>	<i>INTRATE</i>	$LN(1 + LOANSIZE)$	<i>TIER2</i>	<i>BNLA</i>	<i>BCFOCL</i>	<i>BTLTA</i>	<i>BNIA</i>	<i>PYEAR</i>
<i>GUARANT</i>	1								
<i>INTRATE</i>	-0.020	1							
$LN(1 + LOANSIZE)$	0.074	0.121	1						
<i>TIER2</i>	0.008	0.443***	0.085	1					
<i>BNLA</i>	-0.093	-0.022	0.504***	-0.032	1				
<i>BCFOCL</i>	0.171	-0.051	-0.014	0.068	0.036	1			
<i>BTLTA</i>	0.003	0.183	0.016	0.144	-0.173	-0.199	1		
<i>BNIA</i>	-0.044	0.039	-0.111	0.022	-0.050	0.021	0.069	1	
<i>PYEAR</i>	0.094	-0.076	-0.064	-0.063	0.009	0.093	-0.027	-0.061	1

**Table 3**  
**Regression Estimates of Spillovers**

The table reports the results for multiple regression of the form:  $CAR = \alpha_0 + \alpha_1 GUARANT + \alpha_2 INTRATE + \alpha_3 LN(1+LOANSIZE) + \alpha_4 TIER2 + \sum \alpha_k CNTRLVAR$ .  $CAR$  is the three-day [0, +2] cumulative abnormal return for the leading debtee, measured as a percentage.  $GUARANT$  is binary, taking a value of one if the loan is guaranteed, and zero otherwise.  $INTRATE$  is loan interest rate.  $LN(1 + LOANSIZE)$  signifies the natural log of one plus loan amount (in US\$ million).  $TIER2$  is the loan loss reserve of the debtee divided by the debtee's capital in the fiscal year preceding the proclamation year.  $CNTRLVAR$  is a set of control variables in the model for this research. These include natural log of assets ( $BNLA$ ), cash flows from operations to current liabilities ( $BCFOCL$ ), and total liabilities by total assets ( $BTLTA$ ). In addition, net income by assets is included to control for sample data profit efficiency ( $BNIA$ ). Lastly, this study uses year dummy variables to control for any temporal fixed effects. \* and \*\*\* indicate significance at the 10% and 1% levels, respectively.

Variable	Sign	Coefficient	T-statistic	F-statistic	R <sup>2</sup>	Adjusted R <sup>2</sup>
Intercept		5.738	1.701*			
<i>GUARANT</i>	+	0.044	0.390			
<i>INTRATE</i>	—	0.437	1.952*			
<i>LN(1 + LOANSIZE)</i>	—	0.117	0.625			
<i>TIER2</i>	+	0.534	1.020			
<i>CNTRLVAR</i>						
<i>BNLA</i>	+	-0.479	1.635			
<i>BCFOCL</i>	+	0.195	0.926			
<i>BTLTA</i>	—	-0.212	1.734*			
<i>BNIA</i>	+	0.844	7.375***			
<i>PYEAR</i>	?	-0.055	-0.237			
				8.250***	0.347	0.215

small but significant and non-transitory adverse effect of reorganization proclamation on the value of the troubled sample data itself. However, its debtee is resilient to the propagation of borrower failures and losses.

Additional results in this study indicate that two key dimensions are coupled with the market differentiation between the leading debtees with negative and positive proclamation propagation effects. More specifically, this study shows that the probability of being a positive-propagation-effect identity increases with the availability of loan-based information along with aggregated ex-ante filer-based information in profit efficiency and profitability, whereas decreases with sample data leverage. Previous literature appears to have a consensus towards the more pronounced the default risk, the higher the loan interest rate imposed by the lending institution. However, the paradox is that an interest rate rise to compensate for greater risk lead to an increase in bad loans, which makes the financial institutions to desist from raising the lending rate. Therefore, the debtees are likely to provide the flexibility and customizability in renegotiating reduces the cost of financial hardship for borrowers.

Borrower total liabilities by total assets is a noticeable measure of bank loan quality in the structural model of default risk for the reason that the highly leveraged sample data has less flexibility and scalability to make an instantaneous reaction in response to changes in market circumstance and demand. Thus, consistent with this view, this study finds that the negative proclamation spillover effect dominates the positive one when the sample data is confined to a high level of total liabilities by total assets. Finally, the sample firm's profit efficiency is the most essential determinant of the market participant's perception of the financial institution loan eminence and subsequent lend-default. Because the profit efficiency and profitability increase as more of a sample data's value is due to the possibility and prospect of its future growth.

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