International Review of Economics and Finance 48 (2017) 235–254

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

# Overvaluation and the cost of bank debt

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ARTICLE INFO

*JEL classification:*
G32
G21

*Keywords:*
Overvaluation
Bank loan

ABSTRACT

Jensen (2005) suggests that overvalued equity increases agency costs, which are difficult to control through existing market mechanisms. In the present study, we document that banks can detect overvaluation and increase the price of bank loans to compensate for the engendered agency costs. On the basis of 17,309 firm–year observations of Taiwan-listed firms for the 2002–2012 period, we find that firm-specific overvaluation (the first component of the decomposition model proposed by Rhodes-Kropf, Robinson and Viswanathan (2005)) is positively correlated with the bank loan spread. In addition, the positive overvaluation–spread relationship is more conspicuous for firms associated with severe information asymmetry but attenuated for firms that had seasoned equity offerings prior to the loan initiation. Finally, we document that high bank loan costs reduce overvaluation and overvaluation-induced agency costs.

## 1. Introduction

According to Jensen and Meckling (1976), an efficient capital market might eliminate the traditional agency costs arising from conflicts of interest between managers and external equity and debt holders. However, real cases have demonstrated that the equity market might bias its estimation. Overvaluation not only motivates investors to excessively overprice services, but also allures managers to engage in inappropriate actions. Such inappropriate actions aimed at maintaining the anticipated price level are value-detrimental. The biased equity market does not eliminate destruction, but rather enables it. Jensen (2004, 2005) have confessed that most people are trapped in this vicious cycle. Extant empirical evidence supporting this overvaluation-triggered behavior includes research on earnings management (Chi & Gupta, 2009), mergers (Rhodes-Kropf, Robinson, & Viswanathan, 2005), and overinvestment (Polk & Sapienza, 2009).

The main reason why biased markets cannot solve this new type of agency problem is because overvalued equity aligns the interests of managers and shareholders; it enhances both managers' market-connected compensation and shareholders' wealth.[1] Such unethical practices, once triggered, cascade forward. Determining whether there are feasible mechanisms for addressing this problem when the arms-length market fails is critical. In this study, we focus on debtholders because overvalued equity is definitely not in their favor.[2]

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[1] This does not imply that overvaluation does not produce agency costs. Rather, we indicate that under certain conditions, the agency cost of overvaluation cannot be effectively addressed by shareholders because overvaluation could help shareholders engage in wealth transfer through seasoned equity issuance (Dong, Hirshleifer, & Teoh, 2012) and also help boards materialize their equity-based incentives (Jensen, 2004). Of course, long-run shareholders would be hurt if managers engage in value-destroying activities.

[2] First, overvalued equity jeopardizes the core value of a firm and therefore results in a higher default probability. Moreover, overvalued equity enhances information asymmetry between borrowing firms and debtholders.

http://dx.doi.org/10.1016/j.iref.2016.12.008
Received 30 April 2015; Received in revised form 14 November 2016; Accepted 17 December 2016
Available online 18 December 2016
1059-0560/ 

We consider public debtholders as well as private debt holders such as banks. Because banks are relatively more effective than public debtholders in monitoring and screening borrowing firms (Campbel & Kracaw, 1980; Diamond, 1984; Ramakrishnan & Thakor, 1984; Fama, 1985), we propose that banks could detect the existence of overvaluation and increase the loan spread for overvalued firms.

Following Rhodes-Kropf et al. (2005), we decompose firm market-to-book ratio into three components: firm-specific error (OV_firm), time-series sector error (OV_sector), and growth potentials (OV_growth).[3] Overvaluation can be gauged using either firm-specific or time-series sector error. Our empirical results reveal that firm-specific overvaluation (OV_firm) is positively associated with bank loan spread (Spread), implying that banks could be a promising resource for solving the overvaluation-triggered agency problem.

We further explore the moderating variables affecting the positive overvaluation–spread relationship for bank loans. The first is information asymmetry between the underlying firm and outsiders. When overvaluation is attributable to the agency conflicts outlined by Jensen (2005), inappropriate decisions by managers (e.g., earnings management and overinvestment) in prolonging market expectations further jeopardize the information quality of a firm's financial reports and therefore the firm's value.[4] In such cases, banks should place greater emphasis on collecting and identifying the borrowing firm's information, and therefore charge a higher loan spread to cover their additional costs associated with researching and supervising. We therefore postulate that information asymmetry would accentuate the positive overvaluation–spread relationship.

In this study, we use six variables covering two aspects to capture the information asymmetry between borrowing firms and banks. The first two variables are the dispersion of analysts' forecasts, Analyst_DISP, and analyst coverage, Num_analyst (Lang & Lundholm, 1993; Francis, Hanna, & Philbrick, 1997; Healy, Hutton, & Palepu, 1999; Barron, Kim, Lim, & Stevens, 1998). This stream of literature demonstrates that high Analyst_DISP and low Num_analyst imply a high degree of information asymmetry. Next, we use four proxies from studies on market microstructure, namely liquidity ratio (LR), illiquidity ratio (LLR), bid–ask spreads (BA_spread), and turnover rate (turnover; Bharath, Pasquariello, & Wu, 2009; Maskara & Mullineaux, 2011). This stream of literature suggests that the intensity of the information asymmetry of an asset correlates negatively with its liquidity. These variables are readily available sources that banks can employ to assess the degree of information asymmetry associated with borrowing firms. We postulate that information asymmetry positively moderates the overvaluation–spread relationship.

Furthermore, if banks' charging of a higher spread for overvalued equity is due to a concern of default risk, we postulate that this concern would be alleviated if the borrowing firm takes the window of opportunity presented by overvaluation to issue seasoned equity. Since a firm's leverage reduces after seasoned equity offerings (SEOs), debtholders benefit from the equity issue by lowering the likelihood of financial distress (Elliott, Prevost, & Rao, 2009). We therefore also postulate that issuing seasoned equity would attenuate the positive overvaluation–spread relationship.

Our empirical results from firm–year observations of 17,309 Taiwan-listed firms during the 2002–2012 period are consistent with the aforementioned hypotheses. First, we find an association between firms with firm–specific overvaluation and a higher yield spread of bank loans. Second, the positive overvaluation–spread relationship is more pronounced when information asymmetry is severe, as evidenced by high Analyst_DISP, low Num_analyst, decreased liquidity, high BA_spread, and low turnover. Furthermore, SEOs attenuate the positive overvaluation–spread relationship, but only for overvalued firms. Finally, we observe that higher bank loan costs reduce overvaluation and overvaluation-induced agency costs such as overinvestment and earnings management.

The sample of Taiwan is associated with the following characteristics that fit our investigated issue. First, although the financial markets in Taiwan have been substantially developed, which has significantly increased the level of direct finance, banks remain the major fund providers for firms seeking external financial sources.[5] Second, the financial system in Taiwan has been transformed from a controlled system into a liberalized one. Because the market of bank loans has become more competitive since liberalization (Kao & Liu, 2004), determining whether banks can discern a borrowing firm's overvaluation and factor it into the pricing of bank loans is intuitively crucial. Finally, since the enactment of the Financial Asset Securitization Act in 2002, banks have been able to securitize their assets to enhance liquidity and risk management. However, whether banks can maintain their impartial role as to discern a borrowing firm's overvaluation necessitates additional research. In summary, Taiwan provides a suitable environment for examining the relation between overvaluation and the yield spread of bank loans.

Our contributions to the literature are fourfold. First, we illustrate that banks could serve as an alternative mechanism to address overvaluation-induced agency costs (Jensen, 2004, 2005), particularly when the equity market is ineffective in curbing managers' value-detrimental activities (Chi & Gupta, 2009; Marciukaityte & Varma, 2008; Polk & Sapienza, 2009). In addition, we find that banks can detect borrowing firm's overvaluation. This might explain why equity issuance is more sensitive than debt issuance to overvaluation, as observed by Dong, Hirshleifer, & Teoh (2012). Second, our findings are consistent with those reported in previous studies, which have documented banks' unique roles of monitoring borrowing firms (Diamond, 1984), enhancing borrowing firms' governance quality (Byers, Fields, & Fraser, 2008), and adding value to borrowing firms (James, 1987; Lummer & McConnell, 1989). Third, we propose possible moderators of the positive relationship between overvaluation and the yield spread of bank loans. Specifically, we propose that information asymmetry augments the positive overvaluation–spread relationship, whereas seasoned

[3] The decomposition is associated with the merit of identifying the possible sources of overvaluation and the merit of separating overvaluation from growth potentials (Penman, 1996; Dong et al., 2012).

[4] Graham, Harvey, and Rajgopal (2006) show that the aggregate shareholder value destroyed by earnings management far exceeds that destroyed by high-profile fraud cases. Chi and Gupta (2009) indicate that overvaluation is statistically and economically related to subsequent income-increasing earnings management.

[5] During our sampling period, bank loans represent firms' main external financial sources (approximately 60–62%). By contrast, equity issuance and bond issues (including corporate bonds, euro convertible bonds, and global deposit receipts) comprise merely 17–20% and 5–8%, respectively.

equity issuance attenuates it. Finally, our results suggest that increased bank loan prices reduce overvaluation and overvaluation-induced agency costs.

The remainder of this paper is organized as follows. In Section 2, we review the related literature and develop our hypotheses. The data sources, variables, and empirical models are described in Section 3, and the empirical findings are reported in Section 4. Finally, our conclusions are presented in Section 5.

## 2. Literature review and hypothesis development

### 2.1. Overvalued equity and corporate policies

Financial scandals, such as those associated with Enron, WorldCom, and Xerox, engender a discussion on why current corporate governance practices could not prevent the happenings. According to Jensen (2004, 2005) the problem probably lies in the kinked and nonlinear compensation structure of CEOs and CFOs who are rewarded when stock prices increase but punished when stock prices miss the target level. Gradually over time, managers are triggered to act dishonestly to sustain the shares at a high price level.

Because both investors and managers pursue overvaluation, problems accompany overvalued equity. Polk and Sapienza (2009) indicate that firms with ample cash or debt capacity may engage in negative net present value (NPV) projects when their stock price is overpriced and forgo positive investment opportunities when their stock price is undervalued. They argue that managers of overvalued firms tend to overinvest to cater to market expectations. A misallocation of investment capital is more likely to occur when the expected duration of mispricing is relatively long and shareholders have relatively short investment horizons. Furthermore, firms with higher abnormal investments experience lower stock returns in the following period. Their findings illustrate that bias in investment policy is a manifestation of deeper agency problems that are attributable to market overvaluation.

The manager of an overvalued firm cannot simply inform the market that their equity is overvalued; therefore, they may inflate their reported performance to justify inflated stock prices. Managers can be tempted to engage in earnings management to protect their equity-linked compensation (Bergstresser & Philippon, 2006; Burns & Kedia, 2006), job security (Weisbach, 1988), and value in the executive labor market. Chi and Gupta (2009) determine that overvaluation is significantly related to subsequent income-increasing earnings management. Moreover, firms employing higher earnings management are associated with lower future abnormal stock returns. Marciukaityte and Varma (2008) demonstrate that firms engaging in earnings management induced by overvalued equity are penalized with a lower price level once this information becomes public knowledge.

In addition to earnings management, numerous inefficient market theories imply that firms raise more capital in response to overvaluation (Stein, 1996; Baker, Stein, & Wurgler, 2003; Gilchrist, Himmelberg, & Huberman, 2005). Overissuance has two effects. First, it generates profits for existing shareholders, ceteris paribus. Second, it confirms the market expectation of overoptimistic investment opportunities (Polk & Sapienza 2009). Moreover, equity is more sensitive than debt is to the overvaluation effect; thus, net equity issuance should be more positively sensitive to overvaluation than net debt issuance is. Dong et al. (2012) empirically verify this postulation. Hertzel and Li (2010) also investigate the effect of overvaluation on seasoned equity issuance and subsequent stock price underperformance. The third manifestation associated with overvaluation is overissuance.

### 2.2. Overvalued equity and bank loans

The findings of studies on overvaluation appear parallel with those of studies on bank loans. The relation between these two subjects is possibly informative but has not been explicitly explored. One reason why overvaluation-triggered agency problems are difficult to eliminate is that overvaluation benefits both managers and shareholders. Jensen (2004) indicates that manager payoff structure is kinked and nonlinear; that is, they are rewarded for increases in stock prices yet disproportionately punished for small decreases in stock prices. Moreover, the alignment in manager and shareholder interests is more salient in short-term corporate policies than in long-term ones. When the interests of managers and shareholders are well-aligned, existing markets enable rather than eliminate overvaluation-triggered misconduct. Although prior studies on equity have documented that overvalued equity results in earnings management, overinvestment, and equity issuance, few studies have explored overvaluation-triggered problems from a debt holder's perspective.

Second, because banks are considered crucial information sources (Leland & Pyle 1977; Campbel & Kracaw 1980) and delegated supervisors (Diamond 1984), they can avoid duplicated effort and the free-rider problem more effectively than debtholders can. Moreover, banks may increase loan prices to reflect their suspicion of manager's value-destructive activities. Additionally, monitoring costs, which increase with efforts in supervising overvalued firms, could also be factored into loan prices. The bank-monitoring mechanism is apparent in Japan, where a bank-dominated corporate governance system dominates the market-oriented system. Sakawa, Ubukata, and Watanabel (2014) find that compared with stake relationships, bank lending relationships increase borrower market liquidity and reduce information asymmetry in financial markets. Banks are therefore a promising candidate for addressing overvaluation-triggered agency problems. Accordingly, we hypothesize that the overvaluation of a borrowing firm's equity correlates positively with the yield spread of its bank loans, reflecting the lending bank's ability to discern overvaluation as well as its increased monitoring costs in supervising the borrowing firm's value-destructive activities.

**Hypothesis 1.** Overvaluation correlates positively with the yield spread of bank loans.

### 2.3. Moderating effect of information asymmetry

As indicated by Jensen (2005), overvaluation could be attributed to agency conflicts that induce managers to engage in earnings management, which further jeopardizes the information quality of a firm's financial reports and, consequently, its value. Moreover, lending banks would incur higher costs in collecting and verifying the information provided by the borrowing firm if high information asymmetry is concluded.

In the present study, we use several readily accessible sources to gauge the degree of information asymmetry between banks and borrowing firms. The first source is analysts, who are alternative information intermediaries. Banks could examine the private benefit of Num_analyst and Analyst_DISP to gauge the degree of information asymmetry associated with the borrowing firm. Lang and Lundholm (1993) indicate that firms with high frequency informative disclosures have larger Num_analyst, less Analyst_DISP, and less volatility in forecast revisions than firms with low frequency informative disclosures do. Francis et al. (1997) observe an increase in Num_analyst for firms holding conference calls. They also report an increase in analyst followings and a decrease in mispricing following voluntary firm-provided disclosures in the form of corporate analyst presentations. Healy et al. (1999) reveal changes in information intermediation after sustained increases in firm-provided disclosures. Moreover, Barron et al. (1998) indicate that analyst uncertainty could be measured more precisely by considering forecast errors and the number of forecasts. In the present study we consider Analyst_DISP and Num_analyst as two proxies of information asymmetry that banks obtain from analysts.

The trading behavior of informed and uninformed traders is partially based on information asymmetry. Our second measure of information asymmetry is derived from market microstructure studies focusing on how insiders benefit from financial markets as a result of information asymmetry. On the basis of Bharath et al. (2009) and Maskara and Mullineaux (2011), we consider liquidity and illiquidity as two measures of information asymmetry. BA_spread and turnover are selected as two additional proxies of information asymmetry.

We postulate that with two measures of the degree of information asymmetry associated with the borrowing firm, the lending bank would increase the price of bank loans to cover the cost of information collection. Specifically, we postulate that the information asymmetry gauged by different sources would accentuate the positive overvaluation–spread relationship.

**Hypothesis 2.** Information asymmetry associated with the borrowing firm accentuates the positive relationship between overvaluation and the yield spread of bank loans.

### 2.4. Effect of equity offerings

Prior studies on inefficient market theories imply that firms tend to issue equity rather than debt when their equity is overvalued (Asquith & Mullins, 1986; Mikkelson & Partch, 1986; Ritter, 1991; Stein, 2003).[6] Moreover, Dong et al. (2012) indicate that total financing increases with equity overvaluation. Therefore, lending banks might charge a higher loan spread for firms issuing equity than they would for firms that are not, because equity issuance increases the probability of the firm's equity being overvalued.

Nevertheless, Kalay and Shimrat (1987) reveal a nonsignificantly negative bond reaction for a sample of SEO announcements. However, Elliott et al. (2009) observe that bondholders experience a significant positive return on the announcement of an SEO, and this effect is more pronounced for lower-rating bonds. This positive impact could be attributable to alternative explanations such as leverage risk reduction, wealth transfer,[7] and information-signaling hypotheses. Their empirical results are most consistent with the leverage risk reduction hypothesis, implying that from the perspective of bondholders, the positive impacts of leverage reduction outweighs the negative impacts of information asymmetry caused by overvaluation. Using tradable private loans, Billett, Elkamhi, Mauer, & Pungaliya (2015) also determine that loan holders gain significantly positive returns in SEOs. By contrast, they argue that loan holders benefit from SEOs because of the wealth transfer effect. Regarding the long-run reaction of debtholders, an earlier study by Eberhart and Siddique (2002) indicates that positve long-run returns are associated with bondholders and negative long-run returns are associated with equityholders. If banks believe that their monitoring could effectively curb the agency costs of overvalued equity, SEOs can be expected to have an overall positive impact.

After a firm issues seasoned equity, its leverage decreases, thus also decreasing the threat of financial distress. With the equity issuance of the borrowing firm, the lending banks would be exonerated from the firm's default risk. Moreover, equity issuance implies that the issuing firm has been verified by the existing market, partially mitigating information asymmetry. Either from the perspective of reducing default risk or mitigating information asymmetry, the lending bank would be partially exonerated from the side effects of overvalued equity. We therefore propose the following hypothesis:

**Hypothesis 3.** Issuing seasoned equity attenuates the positive overvaluation–spread relationship.

[6] The issuance of overvalued securities generates significant profits for the existing shareholders and enhances the job security of managers (Jensen & Meckling, 1976). By contrast, this issuance coincides with market overoptimistic expectations of the firm's growth potentials. Therefore, current or potential projects are funded with the money obtained through equity issuance.

[7] Galai and Masulis (1976) and Eberhart and Siddique (2002) have indicated that SEOs are associated with wealth transfer from shareholders to bondholders because of a decrease in default risk.

## 3. Methodology

### 3.1. Sample

Our investigation is divided into three parts. First, we examine whether overvalued firms bear a higher cost of bank borrowing. Second, we investigate whether borrower's information asymmetry accentuates the positive overvaluation–spread relationship. Third, we explore whether the case of issuing seasoned equity attenuates the positive overvaluation–spread relationship. Data on loan contracts, financial measures, stock prices, and bank properties for the 2002–2012 period[8] were collected from the *Taiwan Economic Journal* (*TEJ*), a data company in Taiwan. We confine our sample to ≥2-year[9] loan contracts because we mainly investigate the long-term effects of overvaluation-triggered agency costs on financing. A loan contract comprises relevant loan characteristics such as the contract rate, amount of credit, and maturity. We exclude loans without a fixed rate, bank loans of financial and utility firms, and loans with missing information regarding the loan spread or market valuation. All variables are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. To attenuate the endogeneity issue, we require that all borrower-related variables and the proxies of overvaluation are measured 1 year before the initiation of the loan. The final sample comprises 17,309 loans from 1486 public firms in Taiwan.

Measuring bank loan price as the basis point spread between the bank loan rate and the interbank call loan rate is consistent with the standard of using the benchmark of London interbank offering rate. The effects of overvaluation on the loan spread are explored after the loan-specific and firm-specific variables are controlled for. Shen, Lin, and Wang (2015) also investigate Taiwanese bank loan contracts. The variable definitions, including firm-specific and loan-specific variables, provided in the present study are based on their setting.

### 3.2. Measurement of overvaluation

Following Rhodes-Kropf et al. (2005), we decompose the logarithm of firm market-to-book ratio, ln(*M/B*), into three components: firm-specific error, time-series sector error, and long-run value-to-book ratio. The merit of this approach relies on the fact that it can separate overvaluation from growth potential (Chi & Gupta, 2009; Hertzel & Li, 2010). The decomposition is as follows.

$$m_{it} - b_{it} = \underbrace{m_{it} - \nu(\theta_{it};\ \alpha_{jt})}_{\text{firm}} + \underbrace{\nu(\theta_{it};\ \alpha_{jt}) - \nu(\theta_{it};\ \alpha_{j})}_{\text{sector}} + \underbrace{\nu(\theta_{it};\ \alpha_{j}) - b_{it}}_{\text{long-run}}, \tag{1}$$

where $m_{it}$ is the natural logarithm of the market value of assets; $b_{it}$ is the natural logarithm of book assets; $\nu(\theta_{it};\ .)$ is a linear function of firm-specific accounting information at a point in time, $\theta_{it}$, and a vector of conditional accounting multiples, $\alpha$. The key difference in the $\nu(\theta_{it};\ .)$ expressions is that $\alpha_{jt}$ represents the multiples at time $t$ and $\alpha_j$ represents the long-run multiples. Accordingly, the first term, $m_{it} - \nu(\theta_{it};\ \alpha_{jt})$, which is called the firm-specific valuation error (OV_firm), is the difference between the market value and fundamental value conditional on time $t$ and the sector $j$ valuation effects. At time $t$, the overheating of the overall market or of industry $j$ relative to other industries will manifest in $\alpha_{jt}$. Consequently, $m_{it} - \nu(\theta_{it};\ \alpha_{jt})$ can effectively measure the independent firm-specific deviations from the fundamental value. The second term, $\nu(\theta_{it};\ \alpha_{jt}) - \nu(\theta_{it};\ \alpha_{j})$, is the difference between the fundamental value at time $t$ and the long-run value, and is called the time-series sector valuation error (OV_sector). When the sector-wide valuation wave approaches its peak, the time-series sector error is high. The third term, $\nu(\theta_{it};\ \alpha_{j}) - b_{it}$, is the difference between the long-run value and the current book value, and is used to measure a firm's growth opportunity (OV_growth).[10]

Rhodes-Kropf et al. (2005) provide three models for the different sets of accounting items in the estimation of $\nu(\theta_{it};\ \alpha_{jt})$. We adopt the third specification, which considers book value, net income, and market leverage. Accordingly, the market value of a firm can be expressed as

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(\mathrm{NI})^{+}_{it} + \alpha_{3jt} I_{(<0)} \ln(\mathrm{NI})^{+}_{it} + \alpha_{4jt} \mathrm{LEV}_{it} + \varepsilon_{it}, \tag{2}$$

where NI is net income and $\mathrm{NI}^{+}$ is its absolute value. Additionally, LEV is the market leverage ratio. Because net income can be negative, we use $\mathrm{NI}^{+}$ to make the log transformation reasonable. Moreover, we introduce the indicator variable $I_{(<0)}$ to assess the impact of negative net income.

This decomposition method allows us to separate misvaluation from OV_growth and thereby improve the accuracy overvaluation assessment methods. Alternative measures such as Tobin's q and market-to-book equity are associated with growth potentials and investment opportunities (Dong et al., 2012) and are therefore inappropriate for clearly determining a proxy for overvaluatuon. The measurement validity of Rhodes-Kropf et al. (2005) is further verified by Chi and Gupta (2009) and Hertzel and Li (2010).

[8] The sampling period considers that the Financial Holding Company Act was enacted on July 9, 2001 but not enforced until November 1, 2001.

[9] As shown in Table 5, the results of tests that use alternative thresholds to define long-term financing, such as 1- and 3-year periods, are qualitatively similar.

[10] If lending banks can examine the composition of overvaluation, they can differentiate overvaluation from growth potential and charge a high loan spread for overvalued firms, and a lower loan spread for firms with growth potential. However, the extant literature relating on the relationship between growth potential and prices of bank loans is conflicted. Dennis, Nandy, and Sharpe (2000), in studying the interrelationships between contract terms, indicate that firms with substantial growth opportunities are associated with higher information asymmetry and higher likelihood of being trapped in financial distress, compared with firms lacking substantial growth opportunities. From this perspective, growth potential is positively correlated with the bank loan costs. By contrast, Santos and Winton (2008) indicate that high growth potentials would allow debtholders to obtain additional asset value when firms are distressed. From this perspective, growth potentials help to reduce the cost of bank loans. Our Univariate analyses revealed that high growth potentials are inversely associated with bank loan spread (Table 4). However, the relationship is insignificant after including other variables and considering heterogeneity (Table 5).

**Table 1**
Firm-specific Misevaluation and Subsequent Abnormal Stock Returns. This table reports monthly portfolio risk-adjusted abnormal returns (alphas) from the three-factor model of Fama and French (1993) for the sample period 2002–2012. Each year observations are sorted and formed into quintiles based on the firm-specific valuation error of Rhodes-Kropf et al. (2005). Rank 1 (5) represents for lowest (highest) firm-specific valuation error. For each quintile portfolio we calculate the three-factor adjusted abnormal return (alphas) for the 1–12-, 13–24-, and 25–36-month holding periods. The data of risk-free rate and the excess returns of factors mimicking portfolio were collated from Taiwan Economic Journal (TEJ). $^{***}$, $^{**}$, and $^{*}$ denote the significance level of 1%, 5%, and 10%, respectively. The *p*-values for testing the difference in abnormal returns between the lowest and highest quintile portfolio are shown in parentheses. $^{***}$, $^{**}$, and $^{*}$ denote the significant level of 1%, 5%, and 10%, respectively.

| | Holding period | | |
|---|---|---|---|
| Firm-specific valuation error | 1–12 month | 13–24 month | 25–36 month |
| 1(Lowest) | 0.69%$^{***}$ | 0.51%$^{***}$ | 0.41%$^{***}$ |
| 2 | 0.47%$^{***}$ | 0.25%$^{***}$ | 0.29%$^{***}$ |
| 3 | 0.07% | 0.05% | 0.10% |
| 4 | −0.01% | −0.06% | −0.02% |
| 5(Highest) | −0.78%$^{***}$ | −0.86%$^{***}$ | −0.60%$^{***}$ |
| 1st–5th | 1.47%$^{***}$ | 1.37%$^{***}$ | 1.01%$^{***}$ |
| (p-value) | (0.00) | (0.00) | (0.00) |

According to Jensen (2005), a firm with high valuation is not necessarily a firm with overvalued equity. The agency costs related to overvalued equity imply that managers of firms with overvalued equity usually implement value-destroying activities to meet market expectations. In other words, value-destroying behavior—not high market valuation—is the key indicator of overvaluation. A firm with overvalued equity should experience a pronounced price decline in the long run because overvaluation cannot be sustained for long periods. Referring to Chi and Gupta (2009), if valuation errors effectively reveal misvaluation, an investment strategy of buying undervalued stocks and selling overvalued stocks would generate significant profit. To test whether valuation errors capture misvaluation, we follow a similar detection approach to that adopted by Chi and Gupta (2009), and trace the ex post returns of portfolios that sorted by valuation errors. Specifically, for each year, we sort the firms into quintiles on the basis of OV_firm and form a zero-investment portfolio by buying the least overvalued stocks in Quintile 1 and selling the most overvalued stock in Quintile 5. Next, equally weighted monthly calendar-time returns are calculated. Because fiscal year-end data are not immediately available to the market, we exclude the returns of the first 3 months after portfolio formation. For each portfolio, we perform a time-series regression on the monthly excess return on the Fama and French (1993) three-factor returns and estimate the factor-adjusted alpha with 1–12-, 13–24-, and 25–36-month holding periods.

The results summarized in Table 1 indicate that the factor-adjusted ex post returns are significantly positive for Quintile 1 but significantly negative for Quintile 5 under the different holding periods. Moreover, the factor-adjusted returns are nearly monotonic, but decrease from the least overvalued firms in Quintile 1 to the most overvalued firms in Quintile 5. The differences in the ex post factor-adjusted returns between the Quintiles 1 and 5 are 1.47%, 1.37%, and 1.01% under the 1–12-, 13–24-, and 25–36-month holding periods, respectively, and are significant at the 1% level. This implies that the value-destroying activities of the most overvalued firms are more detrimental than those of the least overvalued firms. Therefore, our measure of OV_firm appears to be capable of detecting a significant portion of mispricing.

### 3.3. Proxy for information asymmetry

We use six variables from readily accessible sources to define information asymmetry: Analyst_DISP, Num_analyst (Lang & Lundholm, 1993), LR, LLR, BA_spread, and turnover (Bharath et al., 2009; Maskara & Mullineaux, 2011). Analyst_DISP is defined as the standard error of analysts' earnings forecast divided by the absolute value of the mean forecast, a positive indicator of information asymmetry. Num_analyst is defined as the number of analysts issuing earnings forecasts on the underlying firm and is a negative indicator of information asymmetry. The LLR is defined as the mean of the square root of the ratio of the *i*th firm's daily absolute stock return to the reported daily dollar volume (in thousands) over all business days in the fiscal year with a nonzero volume. The LR is computed as minus the mean of the square root of the ratio of the *i*th stock's reported daily dollar volume (in thousands) to its absolute stock return over all business days in the fiscal year with a nonzero return. A high LLR or LR indicate low liquidity and high information asymmetry. BA_spread is defined as the average ratio of the daily bid–ask difference to the midpoint of the ask–bid prices over the fiscal year. Turnover is defined as the average ratio of daily trading volume to outstanding shares. A high BA_spread or low turnover indicates low information transparency.

### 3.4. Other control variables

The remaining control variables consist of firm- and loan-specific variables presented in previous studies (Bharath, Dahiya, Saunders, & Srinivasan, 2011; Dennis, Nandy, & Sharpe, 2000; Graham, Li, & Qiu, 2008; Hale & Santos, 2009; Lin, Ma, Malatesta, & Xuan, 2011; Santos & Winton, 2008; Strahan, 1999; Shen, Lin, & Wang, 2015). These variables are directly or indirectly related to risk and therefore dictate the yield spread of bank loans. Firm-specific variables are residual credit rating (lnrating_res),[11] market

[11] Freixas and Rochet (1997) indicate that credit risk is a core determinant of debt financing, because firms with higher performance are rated higher and have

value of firm assets (lnMV_A), leverage (leverage), profitability (profit), tangibility (tangibility), return volatility (ret_sd), cash flow volatility (ocf_sd), and the number of months since listing in the major market index (age_mkt).[12]

The loan-specific variables controlled in the models are loan size (lnamount), maturity (maturity), and a collateral dummy (d_security), which is assigned a value of 1 when a bank loan is secured by collaterals and 0 otherwise. Loan size can connote both economies of scale and credit risk. Therefore, the relation between loan size and yield spread is puzzling. Intuitively, long-maturity loans are associated with an increased risk of agency and liquidity problems and therefore higher yield spreads. However, Strahan (1999) and Bharath et al. (2011) have asserted that the price and nonprice terms of bank loans are complementary devices rather than trade-off devices. Risky firms are likely to shorten loan maturity when pursuing bank loans. Short-term loans are consequently associated with high loan spreads (Berger & Udell, 1990; Diamond, 1991). As mentioned, the impact of loan maturity on yield spread is yet to be empirically identified. The collateral dummy assumes that loans secured by collaterals are associated with low risks of agency and liquidity problems and are thus associated with low yield spreads. However, when being granted bank loans, risky firms are usually charged a high spread and require collaterals or a short loan maturity (Strahan, 1999; Bharath et al., 2011). Consequently, loans secured by collaterals can also be associated with high loan spreads (Berger & Udell, 1990; Diamond, 1991). In brief, the impact of collaterals on bank loan spread also necessitates additional investigation.

We also control for the bank relationships that affect loan spreads. The variables of bank relation consist of the number of relation banks, rel_num (Houston & James, 1996; Hale & Santos, 2009; Santos & Winton, 2008), and the number of years associated with the lending bank, yr_corp (Petersen & Rajan, 1994; Berger & Udell, 1995). A strong relationship is one in which a borrower relies on a single bank and has a long-run relationship with that bank. Long-run relationships are beneficial; banks can easily acquire private information on long-run borrowers, monitor long-run borrowers with high efficiency, and assume less risk in lending money to long-associated borrowers. However, the lock-in problems arising from close bank relationships may force borrowers to accept unfavorable terms in loan agreements (Sharpe, 1990; Rajan, 1992). Finally, year and industry dummies are controlled in the empirical models to mitigate endogeneity concern. Detailed definitions of all variables are provided in Appendix.

### 3.5. Summary statistics

Table 2 reports the summary statistics of the main variables. The loan spread is widely distributed with a mean of 153.95 basis points and a standard deviation of 92.01 basis points. The mean loan amount is NT$430 million (equivalent to US$14.32 million) and the average maturity is 62.81 months. Approximately 67% of bank loans are secured by collaterals. The mean firm-specific error, sector error, and long-term growth opportunity from the decomposition of a firm's logarithm of market-to-book ratio are 0.02, 0.02, and −0.04, respectively.

The mean credit rating is 5.86. Notably, credit ratings from the Taiwan Corporate Credit Risk Index module of the *TEJ* (an inverse indicator of credit risk) range from 1 to 9, demonstrating that the firms with the lowest default risk are assigned a score of 1 and those with the highest default risk of 9. The mean profit ratio is approximately 9% and the mean leverage is 16%. The mean standard deviation of market-adjusted returns 1 year prior to loan initiation is 2.38%. For the sampled firms, the mean tangibility is 39% and age_mkt is 112 months.[13] The mean rel_num and yr_corp are 8.18 and 5.38, separately.

The summary statistics for the six proxies of information asymmetry are as follows. Analyst_DISP is 0.67 on average, and the mean Num_analyst is 7.14. In addition, the mean LLR and LR are 0.59 and −5.70, separately. Moreover, the average BA_spread is 0.71 and the average turnover is 0.96%.

Table 3 displays the coefficients of partial correlation among the variables. The results reveal that yield spread correlates positively with OV_firm. This implies that banks can detect firm-specific overvaluation and when they do, they might require a higher yield spread. We use residual rating score (lnrating_res) that has been screened out firm specific properties to represent credit risk (Freixas & Rochet, 1997) and find that the yield spread correlates positively with lnrating_res. Moreover, the results suggest that banks charge a low spread for large and profitable borrowing firms, but charge a high spread for volatile firms. Moreover, banks charge a low spread for old firms and those with weak bank relations (as manifested in the rel_num and the age_mkt). Finally, we observe that lending banks charge a high spread for loans with long maturity and collateral and a low spread for large loans.

## 4. Empirical findings

### 4.1. Effect of overvaluation on the bank loan spread

Table 4 shows the differences in the loan yield spread for firms with a high and low level of overvaluation. The results reveal that firms with high OV_firm on average are associated with higher yield spread (164.59 basis points) compared with firms with low OV_firm (143.12 basis points). The difference is significant at the 1% level. The difference in the median basis points is also significant for firms with high and low OV_firm. Moreover, firms with high OV_growth are associated with a lower yield spread

(*footnote continued*)
lower-cost bank loans (compared with low-performance firms).

[12] Chi and Su (2015) document that small and young firms have higher cash-flow volatility than large and older firms do. Accordingly, size and age could be risk factors for the borrowing company.

[13] We define age (age_mkt) as the number of months since listing. Because some of the sampled firms received bank loans before listing, the ages of firms are negative.

**Table 2**
Summary Statistics. This table reports statistical description for the major variables. Variable definitions are shown in Appendix A.

| Variable | Mean | Median | S.D. | Min. | Max. |
|---|---|---|---|---|---|
| Spread (bp) | 153.95 | 140.60 | 92.01 | 4.60 | 477.60 |
| amount (thousand) | 430,618 | 81,667 | 1,193,465 | 2,166 | 9,130,000 |
| maturity (month) | 62.81 | 60.00 | 35.40 | 25.00 | 240.00 |
| d_security | 0.67 | 1.00 | 0.47 | 0.00 | 1.00 |
| OV_firm | 0.02 | 0.02 | 0.23 | −0.56 | 0.67 |
| OV_sector | 0.02 | 0.03 | 0.11 | −0.32 | 0.32 |
| OV_growth | −0.04 | −0.06 | 0.23 | −0.45 | 0.48 |
| rating | 5.86 | 6.00 | 1.52 | 1.00 | 9.00 |
| lnMV_A | 15.60 | 15.33 | 1.44 | 13.14 | 19.94 |
| profit (%) | 9.08 | 8.96 | 7.55 | −11.44 | 32.36 |
| leverage (%) | 16.42 | 14.95 | 11.55 | 0.00 | 60.02 |
| ret_sd (%) | 2.38 | 2.32 | 0.70 | 1.05 | 4.21 |
| ocf_sd (%) | 6.65 | 5.77 | 3.83 | 1.15 | 19.51 |
| tangibility (%) | 38.86 | 37.43 | 17.28 | 3.39 | 81.88 |
| age_mkt (months) | 112.49 | 85.50 | 106.75 | −84.00 | 609.00 |
| rel_num3y | 8.18 | 7.00 | 6.51 | 0.00 | 45.00 |
| yr_corp | 5.38 | 4.00 | 5.54 | 0.00 | 21.00 |
| Analyst_DISP | 0.67 | 0.28 | 1.36 | 0.02 | 8.89 |
| Num_analyst | 7.14 | 5.00 | 6.00 | 1.00 | 34.00 |
| LLR | 0.59 | 0.36 | 0.62 | 0.04 | 2.82 |
| LR | −5.70 | −3.68 | 6.05 | −31.31 | −0.31 |
| BA_spread | 0.71 | 0.57 | 0.47 | 0.00 | 2.38 |
| turnover (%) | 0.96 | 0.71 | 0.82 | 0.04 | 4.04 |

(145.28 basis points) than firms with low growth opportunities (162.64 basis points). Univariate analysis of these differences indicates that firms with high OV_firm are associated with a higher yield spread from lending banks than those with low OV_firm, implying that banks can determine a firm's overvalued equity and charge a higher yield spread.

The following regression model is used to examine the relation between overvaluation and loan spread in a stepwise manner (Table 5).

$$\text{Loan spread} = f(\text{overvaluation, firm characteristics, loan characteristics, industry, and year effects}).$$

In Models 1–4 of Table 5 *t*-statistics are calculated based on robust standard errors, whereas from Models 5–8 *t*-statistics are calculated based on standard errors adjusted for both robust standard errors and the firm-clustering effect. Model 1 displays the regression analysis of the three components of ln(*M/B*) and demonstrates that OV_firm correlates positively with bank loan spreads; this association is significant at the 1% level. By contrast, OV_growth correlates negatively with yield spread at the 1% significance level. Using Model 2, we examine the impact of firm characteristics on loan yield spread. As anticipated, the coefficients of lnrating_res,[14] lnMV_A, leverage, profit, tangibility, and ret_sd correlate significantly with loan yield spread. However, ocf_sd correlates negatively with yield spread.[15] Under Model 3, we analyze variables of age_mkt and bank relation, namely rel_num and yr_corp. Our results reveal that older firms are charged with a lower yield spread, but firms with strong bank relations, as manifested in small rel_num and high yr_corp, are charged with a higher yield spread. Through Model 4, we explore the impact of nonprice loan terms on yield spread. The results demonstrate that long-term loans and loans with collaterals are charged a higher yield spread than short-term loans or those without collaterals. Moreover, large loans are charged a lower yield spread than smaller loans are. As mentioned, *t*-statistics of all variables reported in Model 5 are adjusted for the firm-clustering effect. We find that OV_firm remains positively significant, although the regression coefficient decreases from 105.73 (Model 1) to 60.41 (Model 5). In Model 6, we include industry dummies and yearly dummies to mitigate the clustering effect. The qualitative results are similar[16] to those of other models, and OV_firm remains significant at the 1% level. The results of the different models support our first hypothesis that banks can determine the composition of a borrowing firm's overvaluation, specifically their OV_firm, and compensate for their overvaluation-related credit risk by increasing the price of the bank loans.

Our results regarding the other control variables are as follows. Yield spread correlates positively with lnrating_res. Moreover,

[14] Freixas and Rochet (1997) indicate that credit risk is a core determinant of debt financing in the sense that firms with higher performance are rated higher and have lower-cost bank loans.

[15] The negative relationship is counterintuitive. We explore possible explanations through the following methods. First, we use yearly data to calculate cash flow volatility because quarterly cash flow data became available in 2008. Using low frequency data to calculate cash flow volatility might capture growth potential rather than risk. Second, we further find that cash flow volatility correlates positively with profitability but negatively with size and age. This result is consistent with the findings of Chi and Su (2015), which reveal that small and young firms have higher cash-flow volatility than larger or older firms do. This higher cash flow volatility is definitely a manifestation of growth potential. Third, in an unreported result of segregating the sample into two subsamples: profit $>$ 0 and profit $<$ 0, we observe that the relation between cash flow volatility and bank loan spread is negative when the firm's profit is positive, and insignificant when the firm's profit is negative. For firms with positive profit, we further segregate the sample into two additional subsamples according to leverage. The results show that the negative volatility–spread relationship sustains only for firms with low leverage.

[16] After considering the industry-fixed effect and the clustering effect in adjusting for heteroscedasticity, we observe that some variables, including firm size and leverage, become insignificant.

**Table 3**
Correlation Matrix. This table reports the coefficients of partial correlation among variables. Variable definitions are shown in Appendix A. ***, **, and * denote the significant level of 1%, 5%, and 10%, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spread (1) | 1.00 | | | | | | | | | | | | | | | | |
| OV_firm (2) | 0.24*** | 1.00 | | | | | | | | | | | | | | | |
| OV_sector (3) | −0.006 | −0.02*** | 1.00 | | | | | | | | | | | | | | |
| OV_growth (4) | −0.08*** | 0.01 | 0.17*** | 1.00 | | | | | | | | | | | | | |
| lnrating_res (5) | 0.25*** | 0.25*** | 0.33*** | 0.08*** | 1.00 | | | | | | | | | | | | |
| lnMV_A (6) | −0.16*** | 0.05*** | 0.03*** | 0.05*** | 0.01 | 1.00 | | | | | | | | | | | |
| profit (7) | −0.38*** | −0.15*** | −0.02** | 0.22*** | 0.002 | 0.13*** | 1.00 | | | | | | | | | | |
| leverage (8) | −0.01 | 0.10*** | −0.08*** | −0.05*** | −0.003 | 0.40*** | 0.04*** | 1.00 | | | | | | | | | |
| ret_sd (9) | 0.22*** | 0.17*** | −0.04*** | 0.04*** | 0.004 | −0.36*** | −0.28*** | −0.10*** | 1.00 | | | | | | | | |
| ocf_sd (10) | −0.08*** | 0.03*** | −0.009 | 0.21*** | 0.04*** | −0.18*** | 0.07*** | −0.15*** | 0.12*** | 1.00 | | | | | | | |
| tangibility (11) | 0.007 | −0.13*** | −0.06*** | 0.23*** | −0.004 | 0.06*** | 0.19*** | 0.51*** | 0.09*** | −0.21*** | 1.00 | | | | | | |
| age_mkt (12) | −0.05*** | −0.03*** | −0.01* | −0.27*** | −0.006 | 0.57*** | −0.09*** | 0.14*** | −0.29*** | −0.36*** | −0.10*** | 1.00 | | | | | |
| rel_num3y (13) | −0.09*** | 0.08*** | 0.02*** | −0.23*** | 0.03*** | 0.46*** | 0.02*** | 0.29*** | −0.19*** | −0.12*** | 0.01 | 0.42*** | 1.00 | | | | |
| yr_corp (14) | 0.05*** | 0.02** | 0.01 | −0.20*** | 0.04*** | 0.20*** | −0.03*** | 0.04*** | −0.06*** | −0.25*** | −0.04*** | 0.42*** | 0.22*** | 1.00 | | | |
| lnmaturity (15) | 0.03*** | 0.03*** | −0.06*** | 0.06*** | −0.02** | −0.07*** | −0.09*** | 0.03*** | 0.06*** | 0.03*** | 0.02** | −0.15*** | −0.18*** | −0.04*** | 1.00 | | |
| lnamount (16) | −0.11*** | −0.07*** | −0.11*** | −0.01* | −0.03*** | 0.67*** | 0.10*** | 0.38*** | −0.29*** | −0.14*** | 0.11*** | 0.38*** | 0.25*** | 0.22*** | 0.07*** | 1.00 | |
| d_security(17) | 0.09*** | −0.006 | −0.04*** | 0.15*** | 0.03*** | −0.14*** | −0.005 | 0.10*** | 0.16*** | −0.02*** | 0.23*** | −0.09*** | −0.18*** | 0.09*** | 0.33*** | 0.007 | 1.00 |

**Table 4**
Test in Differences. This table reports the test in difference in bank loan yield spread, shown in basis point, for firms with high and low firm-specific errors (OV_firm), sector-specific error (OV_sector), and the difference in long-run value to current book value (OV_growth). Definitions of variables are reported in Appendix A. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | High ( > =median) | | Low ( < median) | | Test in Difference High - Low | |
|---|---|---|---|---|---|---|
| | mean | median | mean | median | Mean<br>t | Median<br>z |
| OV_firm | 164.59 | 147.50 | 143.12 | 136.30 | 21.47***<br>(15.45) | 11.20***<br>(10.38) |
| OV_sector | 148.36 | 135.00 | 159.56 | 147.60 | −11.20***<br>(−8.02) | −12.60***<br>(−12.46) |
| OV_growth | 145.28 | 133.50 | 162.64 | 147.20 | −17.36***<br>(−12.46) | −13.70***<br>(−13.44) |

profitable borrowing firms are charged a lower yield spread than are unprofitable firms. By contrast, firms with volatile stock returns are charged a higher yield spread than those without are. In addition, loans with long maturity are charged a lower spread. All of these results are consistent with those reported in prior studies (Bharath et al., 2011; Graham et al., 2008; Lin et al., 2011; Santos & Winton, 2008). Finally, in Models 7 and 8, we use alternative thresholds to define long-term debts and reexamined the first hypothesis. The evidence suggests that OV_firm remains significantly and positively associated with loan yield spread, as anticipated.

**Table 5**
Regression of Bank Loan Spread on Overvaluation. This table reports the regression of bank loan spread on overvaluation and other control variables. All variables are defined in Appendix A. Models 7 and 8 cover the sample with loan maturity longer than 12 and 36 months, respectively. In each cell, the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. In Model 1–4 *t*-statistics are calculated based on robust standard errors. In Model 5–8 *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| OV_firm | 105.73*** | | | | 60.41** | 62.96*** | 47.29*** | 68.85*** |
| | (26.53) | | | | (2.05) | (3.82) | (2.83) | (4.11) |
| OV_sector | 12.44** (2.09) | | | | −68.11** | 58.02** | 78.07** | 70.54** |
| | | | | | (−2.30) | (2.15) | (2.71) | (2.28) |
| OV_growth | −34.36*** (−12.19) | | | | −12.29 | 24.39 | 16.49 | 26.24 |
| | | | | | (−0.64) | (1.38) | (0.88) | (1.31) |
| lnrating_res | | 127.60*** (32.43) | | | 123.18*** | 122.94*** | 131.99*** | 105.04*** |
| | | | | | (3.46) | (5.70) | (5.97) | (4.63) |
| lnMV_A | | −6.25*** | | | −3.74 | −4.74 | −6.74* | −2.32 |
| | | (−16.76) | | | (−0.86) | (−1.21) | (−1.82) | (−0.50) |
| profit | | −4.15*** | | | −4.17*** | −3.19*** | −2.97*** | −2.97*** |
| | | (−43.65) | | | (−5.45) | (−5.87) | (−5.76) | (−4.60) |
| leverage | | 0.22*** | | | −0.09 | 0.08 | 0.22 | 0.21 |
| | | (3.49) | | | (−0.19) | (0.29) | (0.77) | (0.61) |
| ret_sd | | 12.09*** | | | 6.20 | 10.96*** | 18.60*** | 10.00** |
| | | (11.80) | | | (1.16) | (2.77) | (4.30) | (2.17) |
| ocf_sd | | −2.01*** | | | −1.88 | −1.20* | −2.05** | −0.77 |
| | | (−13.31) | | | (−1.62) | (−1.65) | (−2.37) | (−1.04) |
| tangibility | | 0.20*** | | | 0.37 | 0.25 | 0.06 | 0.19 |
| | | (4.67) | | | (1.56) | (1.37) | (0.32) | (0.86) |
| age_mkt | | | −0.04*** | | −0.04 | −0.03 | −0.03 | 0.03 |
| | | | (−5.75) | | (−0.87) | (−0.61) | (−0.54) | (0.44) |
| rel_num | | | −1.07*** | | −0.75 | −0.70 | −0.48 | −0.31 |
| | | | (−10.87) | | (−1.35) | (−1.22) | (−0.88) | (−0.45) |
| yr_corp | | | 1.54*** | | 0.87 | 0.98* | 0.30 | 1.42** |
| | | | (10.22) | | (0.95) | (1.85) | (0.57) | (2.23) |
| lnmaturity | | | | 3.02** | −7.25 | −12.54** | −1.27 | −15.85** |
| | | | | (2.01) | (−0.94) | (−2.47) | (−0.24) | (−2.15) |
| lnamount | | | | −5.92*** | 0.09 | −0.67 | 0.14 | −2.38 |
| | | | | (−15.35) | (0.03) | (−0.34) | (0.08) | (−1.06) |
| d_security | | | | 16.77*** | 7.68 | 5.65 | −2.02 | 6.68 |
| | | | | (12.15) | (1.15) | (1.25) | (−0.42) | (1.07) |
| Cons | 149.94*** | 266.23*** | 159.33*** | 198.06*** | 267.39*** | 304.57*** | 200.61*** | 284.08*** |
| | (221.25) | (38.54) | (137.28) | (28.25) | (3.89) | (5.77) | (3.88) | (4.52) |
| Industry dummy | N | N | N | N | N | Y | Y | Y |
| Year dummy | N | N | N | N | N | Y | Y | Y |
| $R^2$ | 0.06 | 0.24 | 0.02 | 0.02 | 0.27 | 0.46 | 0.43 | 0.50 |
| N | 17,309 | 17,309 | 17,309 | 17,309 | 17,309 | 17,309 | 21,801 | 12,285 |

**Table 6**
Regression Analysis Including the Moderating Effect of Information Asymmetry. This table reports the regression of bank loan spread on overvaluation with an additional inclusion of the moderating effect of information asymmetry. Information asymmetry is alternatively defined as (1) dispersion in analysts forecast of EPS (Analyst_DISP , Model 1), (2) the number of analyst following the company (Num_analyst, Model 2), (3) the illiquidity ratio (Model 3), (4) the liquidity ratio (Model 4), (5) bid-ask spreads (Model 5), and (6) turnover (Model 6). Variable definitions are shown in Appendix A. In each cell, the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) Var = Analyst_DISP | (2) Var = Num_analyst | (3) Var = LLR | (4) Var = LR | (5) Var = BA_spread | (6) Var = turnover |
|---|---|---|---|---|---|---|
| OV_firm | 50.50*** | 87.62*** | 5.65 | 105.96*** | −7.69 | 93.92*** |
| | (3.12) | (2.96) | (0.37) | (4.43) | (−0.39) | (3.26) |
| OV_firm * Var | 23.78** | −4.69* | 81.60*** | 8.06*** | 82.02*** | −33.17* |
| | (2.41) | (−1.90) | (4.19) | (3.37) | (3.20) | (−1.73) |
| Var | 9.29*** | −1.54*** | 12.16* | −1.00 | 7.00 | −7.00** |
| | (3.90) | (−2.58) | (1.92) | (−1.39) | (0.90) | (−2.24) |
| OV_sector | 106.11*** | 106.08*** | 39.92* | 55.65** | 44.42* | 63.84** |
| | (2.87) | (2.75) | (1.83) | (2.26) | (1.66) | (2.42) |
| OV_growth | 26.33 | 19.56 | 17.91 | 19.92 | 28.50 | 28.01 |
| | (1.55) | (1.02) | (1.09) | (1.17) | (1.59) | (1.62) |
| lnrating_res | 72.03*** | 89.64*** | 107.50*** | 118.83*** | 122.33*** | 120.78*** |
| | (4.09) | (4.83) | (5.98) | (6.15) | (5.73) | (6.18) |
| lnMV_A | −5.89 | −1.89 | −2.46 | −8.99** | −0.60 | −4.93 |
| | (−1.54) | (−0.38) | (−0.62) | (−2.11) | (−0.15) | (−1.28) |
| profit | −2.78*** | −2.28*** | −2.81*** | −3.33*** | −3.10*** | −3.08*** |
| | (−5.94) | (−3.68) | (−6.06) | (−6.01) | (−5.89) | (−5.97) |
| leverage | −0.23 | 0.09 | −0.12 | 0.001 | −0.01 | 0.04 |
| | (−0.73) | (0.26) | (−0.45) | (0.00) | (−0.05) | (0.12) |
| ret_sd | 2.91 | 6.35 | 10.17*** | 11.06*** | 9.18** | 12.18*** |
| | (0.57) | (1.17) | (2.70) | (2.95) | (2.32) | (3.14) |
| ocf_sd | −0.46 | −0.05 | −1.15* | −1.28* | −1.66** | −1.13 |
| | (−0.55) | (−0.07) | (−1.74) | (−1.81) | (−2.19) | (−1.64) |
| tangibility | 0.01 | −0.02 | 0.28* | 0.28 | 0.20 | 0.20 |
| | (0.05) | (−0.07) | (1.67) | (1.58) | (1.10) | (1.06) |
| age_mkt | −0.03 | −0.02 | −0.03 | −0.03 | −0.07 | −0.03 |
| | (−0.81) | (−0.51) | (−0.63) | (−0.53) | (−1.26) | (−0.59) |
| rel_num | −0.20 | −0.42 | −0.41 | −0.65 | −0.66 | −0.56 |
| | (−0.44) | (−0.85) | (−0.78) | (−1.16) | (−1.22) | (−1.04) |
| yr_corp | 0.65 | 0.82* | 0.81* | 0.83 | 0.91* | 1.01** |
| | (1.32) | (1.72) | (1.72) | (1.59) | (1.77) | (2.02) |
| lnmaturity | −11.02** | −11.29** | −12.20** | −11.74** | −11.24** | −13.04*** |
| | (−2.06) | (−2.26) | (−2.54) | (−2.36) | (−2.22) | (−2.62) |
| lnamount | 1.39 | 0.65 | −0.33 | −0.68 | −2.36 | −0.24 |
| | (0.59) | (0.29) | (−0.18) | (−0.36) | (−1.45) | (−0.13) |
| d_security | 6.74 | 5.90 | 6.07 | 5.45 | 8.01* | 5.96 |
| | (1.45) | (1.23) | (1.38) | (1.23) | (1.78) | (1.32) |
| Cons | 320.28*** | 204.35*** | 246.96*** | 363.75*** | 264.05*** | 301.54*** |
| | (6.47) | (2.98) | (4.49) | (6.33) | (4.65) | (5.78) |
| Industry dummy | Y | Y | Y | Y | Y | Y |
| Year dummy | Y | Y | Y | Y | Y | Y |
| $R^2$ | 0.42 | 0.41 | 0.48 | 0.47 | 0.47 | 0.47 |
| N | 11,861 | 13,178 | 17,309 | 17,309 | 15,608 | 17,309 |

### *4.2. Moderating effect of information asymmetry*

Borrowers' level of information asymmetry may influence the extent to which lending banks are suspicious of overvaluation-related agency costs. Nontransparent information lowers borrowers' costs of engaging in wealth expropriation and therefore heightens the associated overvaluation agency costs. Moreover, nontransparent information also increases the time and energy lending banks' spend collecting information. We therefore hypothesize that information asymmetry would accentuate the positive relation between overvaluation and bank loan spread. To examine how information asymmetry affects this relationship, we use various proxies for information asymmetry and observe how their interactions with OV_firm affect the bank loan spread. As mentioned, we consider the following proxies: Analyst_DISP, Num_analyst, LLR, LR, BA_spread, and turnover.

The six proxies of information asymmetry and their interactions with OV_firm are included in the models. The results are summarized in Table 6. For Model 1, Analyst_DISP correlates positively with bank loan spread. Moreover, the interaction between Analyst_DISP and OV_firm is positive (coefficient = 23.78) and significant at the 5% level. This implies that banks charge an even higher loan spread to overvalued firms when they are associated with high levels of information asymmetry. In Model 2, Num_analyst, an inverse indicator of information asymmetry, correlates negatively with bank loan spread and its interaction with

**Table 7**
Regression Analysis- the SEO Effect. This table reports the impact of seasoned equity offerings (SEOs) on the overvaluation-spread relationship. In Models 1 and 3 firm-specific errors (OV_firm), sector-specific error (OV_sector), and the difference in long-run value to current book value (OV_growth) are set one year prior to loan initiation. In Model 2 and 4 firm-specific errors (OV_firm), sector-specific error (OV_sector), and the difference in long-run value to current book value (OV_growth) are set two year prior to loan initiation. The analysis covers subsample for firms with non-positive firm-specific errors (OV_firm $\leq$ 0) in Models 1 and 2. Models 3 and 4 cover subsample for firms with positive firm-specific errors (OV_firm $>$ 0). Variable definitions are shown in Appendix A. In each cell, the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. $^{***}$, $^{**}$, and $^{*}$ denote the significance level of 1%, 5%, and 10%, respectively.

| | (1)<br>d_EO = $d\_EO_{t-1}$<br>OV_firm < =0 | (2)<br>d_EO = $d\_EO_{t-2}$<br>OV_firm < =0 | (3)<br>d_EO = $d\_EO_{t-1}$<br>OV_firm > 0 | (4)<br>d_EO = $d\_EO_{t-2}$<br>OV_firm > 0 |
|---|---|---|---|---|
| OV_firm | 51.85$^{**}$ | 10.83 | 59.48$^{*}$ | 95.69$^{***}$ |
| | (2.00) | (0.48) | (1.80) | (3.36) |
| OV_firm * d_EO | −152.01 | −60.07 | −103.29$^{**}$ | −71.51$^{*}$ |
| | (−1.39) | (−0.65) | (−2.17) | (−1.72) |
| d_EO | −32.62$^{**}$ | −15.13 | 14.00 | 12.57 |
| | (−2.28) | (−1.31) | (1.23) | (0.99) |
| OV_sector | 70.55$^{**}$ | −35.71 | 56.38$^{*}$ | 99.92$^{**}$ |
| | (2.16) | (−0.87) | (1.72) | (2.00) |
| OV_growth | 29.99 | 10.13 | 19.19 | 48.82$^{**}$ |
| | (1.24) | (0.42) | (0.98) | (2.54) |
| lnrating_res | 97.01$^{***}$ | 126.69$^{***}$ | 125.30$^{***}$ | 124.00$^{***}$ |
| | (4.97) | (5.49) | (5.17) | (4.88) |
| lnMV_A | −5.47 | 7.78 | −0.60 | −11.56$^{***}$ |
| | (−1.27) | (1.59) | (−0.12) | (−3.51) |
| profit | −3.16$^{***}$ | −3.08$^{***}$ | −3.01$^{***}$ | −2.50$^{***}$ |
| | (−7.33) | (−6.82) | (−3.93) | (−3.03) |
| leverage | −0.09 | −0.43 | 0.19 | 0.58 |
| | (−0.22) | (−1.08) | (0.55) | (1.58) |
| ret_sd | 7.46 | 12.72$^{***}$ | 15.57$^{***}$ | 23.89$^{***}$ |
| | (1.34) | (2.82) | (3.34) | (4.88) |
| ocf_sd | −1.09 | −1.22 | −1.62$^{*}$ | −2.61$^{***}$ |
| | (−1.32) | (−1.20) | (−1.73) | (−2.60) |
| tangibility | 0.48$^{*}$ | 0.37 | 0.10 | −0.15 |
| | (1.96) | (1.40) | (0.40) | (−0.54) |
| age_mkt | −0.02 | −0.04 | −0.05 | −0.03 |
| | (−0.31) | (−0.72) | (−0.79) | (−0.43) |
| rel_num | −0.14 | −0.34 | −0.72 | −0.86 |
| | (−0.32) | (−0.50) | (−0.89) | (−1.19) |
| yr_corp | 0.99$^{**}$ | 0.51 | 0.42 | 0.75 |
| | (2.05) | (0.97) | (0.69) | (1.04) |
| lnmaturity | −1.43 | −1.64 | −21.02$^{***}$ | −19.81$^{***}$ |
| | (−0.22) | (−0.27) | (−3.63) | (−3.31) |
| lnamount | 0.17 | −4.47$^{**}$ | −2.22 | 0.29 |
| | (0.09) | (−2.13) | (−0.82) | (0.13) |
| d_security | 1.99 | 8.87 | 12.68$^{*}$ | 8.30 |
| | (0.43) | (1.58) | (1.94) | (1.31) |
| Cons | 254.38$^{***}$ | 136.45$^{**}$ | 287.93$^{***}$ | 411.79$^{***}$ |
| | (4.41) | (2.09) | (4.78) | (7.56) |
| Industry dummy | Y | Y | Y | Y |
| Year dummy | Y | Y | Y | Y |
| $R^2$ | 0.33 | 0.35 | 0.55 | 0.56 |
| N | 7,720 | 6,795 | 9,589 | 8,085 |

OV_firm also correlates negatively with bank loan spread. In Model 3, the coefficient for the interaction between LLR and OV_firm is positively significant at the 1% level. The analysis of the interaction between LR and OV_firm (Model 4) also confirms that illiquidity magnifies the positive relation between overvaluation and yield spread. In Model 5, the interaction between BA_spread and OV_firm correlates significantly and positively with bank loan spread (*t*-value = 3.20). In Model 6, the coefficient for the interaction between turnover and OV_firm is significantly negative at the 10% level. The overall results of the six proxies for information asymmetry support the second hypothesis that the information asymmetry associated with a borrowing firm accentuates the positive relation between overvaluation and the yield spread of bank loans.

### *4.3. Effect of issuing seasoned equity*

The impact of issuing seasoned equity prior to applying for a bank loan on the cost of bank debt is detailed in Table 7. In Model 1, we include a dummy ($d\_EO_{t-1}$) that is assigned a value of 1 for borrowing firms issuing seasoned equity 1 year prior to applying for a bank loan and 0 otherwise. Additionally, the dummy included in Model 2 ($d\_EO_{t-2}$) is assigned the value 1 for borrowing firms issuing seasoned equity 2 years prior to applying for a bank loan and 0 otherwise. Furthermore, to determine the extent to which SEOs reduce

**Table 8**
Test in Difference of Earnings Management for Firms with High- and Low Firm-Specific Error. This table reports the test in difference in earnings management, gauged by the absolute value of discretionary accruals from the modified Dechow and Dichev (2002) model, for firms with high and low firm-specific valuation errors. $EM_0$ denotes the level of earnings management in loan initiation year. $EM_{-2}$ ($EM_{-1}$) stand for the level of earnings management two (one) year prior to loan initiation, while $EM_{+2}$ ($EM_{+1}$) stand for the level of earnings management two (one) year after loan initiation. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | Firm-specific Error | | | | Test in differences High - Low | |
|---|---|---|---|---|---|---|
| | High ( > =median) | | Low ( < median) | | | |
| | Mean | Median | Mean | Median | Mean<br>t | Median<br>z |
| $EM_{-2}$ | 0.06 | 0.04 | 0.05 | 0.03 | 0.01***<br>(7.62) | 0.01***<br>(7.49) |
| $EM_{-1}$ | 0.05 | 0.04 | 0.04 | 0.03 | 0.01***<br>(10.90) | 0.01***<br>(9.73) |
| $EM_0$ | 0.05 | 0.04 | 0.04 | 0.03 | 0.01***<br>(10.03) | 0.01***<br>(9.39) |
| $EM_1$ | 0.05 | 0.034 | 0.04 | 0.029 | 0.01***<br>(7.60) | 0.005***<br>(7.33) |
| $EM_2$ | 0.05 | 0.032 | 0.04 | 0.028 | 0.01***<br>(6.77) | 0.004***<br>(6.79) |

leverage, we divide the sample into two subsamples: overvalued firms (OV_firm > 0) and undervalued firms (OV_firm ≤ 0). This division is based on the premise that the reduction in leverage induced by SEOs is more significant for overvalued firms than it is for undervalued firms. Moreover, equity issuance is extremely costly for undervalued firms. Since overvalued rather than undervalued firms benefit from the leverage reduction effect and therefore have a lower likelihood of being trapped in financial distress, we anticipate that the interaction of OV_firm and the SEO dummy would be more significant among overvalued firms than among undervalued firms. The results support this assertion. We find that the interaction between OV_firm and the SEO dummy is significant only for the overvalued firms (regression coefficient = −103.29) issuing SEOs 1 year prior to loan initiation (Model 3), whereas the interaction is significant only for the overvalued firms (regression coefficient = −71.51) when issuing SEOs 2 years prior to loan initiation (Model 4). These results support the third hypothesis that the condition of issuing seasoned equity prior to loan initiation attenuates the positive overvaluation–spread relationship.

### *4.4. Robustness checks*

Prior studies have indicated that overvalued firms tend to engage in earnings management (e.g., Chi & Gupta, 2009). Therefore, our findings related to the positive overvaluation–spread relationship might rely on whether firms engage in earnings management. In other words, banks consider overvaluation-induced earnings management, which results in poorer information quality and aggravated default risk. The differences in earnings management between firms with high and low OV_firm are presented in Table 8. To analyze these differences, we adopt the modified Dechow and Dichev (2002) model, which measures earnings management as the absolute value of discretionary accruals. We evaluate the level of earnings management 2 years before to 2 years after loan initiation. The results indicate that firms with high OV_firm are associated with a higher level of earnings management compared with those with low OV_firm during the five consecutive years around loan initiation. This result implies that firms with higher OV_firm are inclined to engage in a higher level of earnings management than firms with lower OV_firm are, and this is presumably why banks consider the overvaluation of borrowing firms.

The results of the two-stage regression are presented in Table 9. At the first stage, firm earnings management is regressed on OV_firm and other control variables. The fitted earnings management from the first-stage of regression is then incorporated into the second stage of regression. As demonstrated in Table 9, we alternatively use the original Dechow and Dichev (2002) model (Model 1) and the modified Dechow and Dichev (2002) model (Model 2) to gauge firm earnings management levels. For brevity, we report only the results of the second-stage regression. Our results reveal that the fitted earnings management levels determined through Models 1 and 2 (i.e., overvaluation-triggered earnings management) correlate significantly and positively with bank loan spread. The results in Tables 8 and 9 further verify our postulation that banks do consider overvaluation-triggered earnings management, which worsens the information quality of borrowing firms and thereby increases the risk of financial distress. In addition, banks charge a higher bank loan spread for such firms.

We also examine whether the positive relationship between OV_firm and bank loan spread is spurious because both are affected by unidentified firm characteristics. As displayed in Table 10, we use two instrumental variables to identify possibly omitted risk-related factors: the short-sales dummy (d_short, assigned the value 1 when the firm has no previous history of short sales and 0 otherwise) and the difference between OV_firm and initial industry overvaluation (OV_ind). Selection of the two instrumental variables is based on the proposal of Boehme, Danielsen, and Sorescu (2006), who suggest that the following two factors might affect overvaluation: (1) security subject to short-sale constraints and (2) investors disagreeing on firm value.

We conduct instrumental variables approach through two-stage least squares model and report the results of the second-stage

**Table 9**
Two-Stage Regression. This table reports the two-stage least squares regression in conducting the impact of overvaluation triggered earnings management on loan yield spread. Earnings management is measured by the absolute of discretionary accrual based on Dechow and Dichev (2002) model (Model 1) and the modified Dechow and Dichev (2002) model (Model 2). In the first stage we regress earnings management on overvaluation (OV_firm), total asset (lnTA), inventory ratio (inventory_r), intangible asset ratio (intangible_r), and fixed asset ratio (tangibility). In the second stage we regress yield spread on the predicted value of earnings management from the first stage. Predicted |DA| represents the predicted value from first stage. Variable definitions are shown in Appendix A. In each cell, the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) | (2) |
|---|---|---|
| Predicted \|DA\| | 602.49* | 767.24* |
| | (1.81) | (1.93) |
| OV_sector | 49.46* | 52.47* |
| | (1.79) | (1.85) |
| OV_growth | 12.40 | 9.70 |
| | (0.63) | (0.50) |
| lnrating_res | 132.19*** | 130.67*** |
| | (5.36) | (5.44) |
| lnMV_A | −0.54 | −0.90 |
| | (−0.13) | (−0.22) |
| profit | −2.91*** | −2.86*** |
| | (−5.21) | (−5.23) |
| leverage | 0.29 | 0.27 |
| | (0.92) | (0.88) |
| ret_sd | 10.32*** | 10.02** |
| | (2.58) | (2.48) |
| ocf_sd | −1.42* | −1.42* |
| | (−1.82) | (−1.82) |
| tangibility | 0.28 | 0.31 |
| | (1.17) | (1.30) |
| age_mkt | −0.07 | −0.07 |
| | (−1.15) | (−1.12) |
| rel_num | −0.71 | −0.72 |
| | (−1.24) | (−1.26) |
| yr_corp | 0.69 | 0.70 |
| | (1.29) | (1.31) |
| lnmaturity | −13.62*** | −13.71*** |
| | (−2.72) | (−2.73) |
| lnamount | −1.73 | −1.67 |
| | (−0.87) | (−0.84) |
| d_security | 5.99 | 5.96 |
| | (1.35) | (1.34) |
| Cons | 282.62*** | 296.61*** |
| | (4.84) | (5.24) |
| Industry dummy | Y | Y |
| Year dummy | Y | Y |
| $R^2$ | 0.47 | 0.47 |
| N | 16,127 | 16,127 |

regression in Table 10. As shown in the table, OV_firm remains positively correlated with bank loan spread after including the instrumental variables d_short (Model 1) and OV_ind (Model 2). In Model 3, we substitute excess overvaluation (Excess_OV) for OV_firm. Excess_OV is the residual of the regression of the OV_firm on OV_sector, OV_growth, lnMV_A, profit, leverage, ret_sd, ocf_sd, tangibility, and age_mkt. This residual term is used to ameliorate the possibility that OV_firm is not exogenous. The results are consistent with the aforementioned results shown in Table 5.

A battery of robustness checks is also employed (Table 11). Prior studies have indicated that loan spread and maturity might be simultaneously determined. In the present study, two-stage least squares regression is employed using asset maturity as an instrument variable for loan maturity, following Graham et al. (2008) and Lin et al. (2011), to examine the potential endogeneity of spread and maturity. The results presented in Model 1 of Table 11 show that OV_firm remains statistically and economically significant. Model 2 considers firm-fixed effect regression with standard errors adjusted for heteroskedasticity and clustering within firms. With the firm-fixed effect controlled, the impact of OV_firm on loan spread decreases (from 62.96 in Model 6 to 37.71; see Table 5 for the Model 6 results). However, the regression coefficient remains economically and statistically significant. In Model 3, median regression is used because of its robustness to outliers. The result remains qualitatively similar to that of the various robustness checks. To address the potential endogeneity issue raised by Fields, Fraser, and Subrahmanyam (2012),[17] regression analysis is performed on the subsample of firms with no prior bank loans (Model 4). The sample of loans in the previous year is excluded to eliminate possible intertemporal

[17] When lending banks have some bargaining power in determining firm policies, the existing bank financing may alter the core or market value of the borrower. Therefore, the positive relationship between overvaluation and the latest bank loan may become spurious.

**Table 10**
Two-Stage Least Squares Regression Analysis of Overvaluation. This table displays the two-stage least squares regression analysis using instrument variables for firm-specific overvaluation error (OV_firm). In Model 1 the instrument is a short-sales dummy (d_short) that is assigned the value 1 for short sale and 0 otherwise. In Model 2 the instrument is industry overvaluation (OV_ind) which equals to the difference between firm-specific overvaluation and initial industry overvaluation. Model 3 reports the regression of yield spread on the excess overvaluation (Excess_OV) which is the residual term from the regression of overvaluation (OV_firm) on OV_sector, OV_growth, lnMV_A, profit, leverage, ret_sd, ocf_sd, tangibility, and age_mkt. Variable definitions are shown in Appendix A. In each cell in Models 1 and 2, the regression coefficient and the z-statistics in parentheses are reported in the upper and lower case, respectively. In Model 3 *t*-statistics are reported in parentheses. All standard deviations are calculated based on robust standard errors adjusted for firm-level clustering. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) IV = d_short | (2) IV = OV_ind | (3) OV_firm = Excess_OV |
|---|---|---|---|
| OV_firm | 541.11* | 89.83*** | 70.99*** |
| | (1.90) | (3.36) | (3.16) |
| OV_sector | 174.01 | 42.08 | 28.01 |
| | (1.60) | (1.62) | (1.14) |
| OV_growth | −22.26 | 37.55* | 43.25** |
| | (−0.49) | (1.90) | (2.06) |
| lnrating_res | −45.38 | 95.83*** | 102.99*** |
| | (−0.47) | (3.59) | (3.65) |
| lnMV_A | −18.91* | −6.07 | −3.78 |
| | (−1.86) | (−1.41) | (−0.87) |
| profit | −2.20** | −3.29*** | −3.12*** |
| | (−2.13) | (−6.16) | (−5.44) |
| leverage | −2.07 | −0.08 | 0.29 |
| | (−1.58) | (−0.23) | (0.76) |
| ret_sd | −19.27 | 8.49** | 16.66*** |
| | (−1.00) | (2.00) | (4.08) |
| ocf_sd | −0.99 | −1.36* | −1.51* |
| | (−0.61) | (−1.70) | (−1.85) |
| tangibility | 1.99* | 0.23 | −0.15 |
| | (1.77) | (1.09) | (−0.63) |
| age_mkt | 1.57 | −0.009 | −0.05 |
| | (1.23) | (−0.20) | (−0.95) |
| rel_num | −1.15 | −0.45 | −0.50 |
| | (−1.24) | (−0.76) | (−0.81) |
| yr_corp | 0.88 | 1.22 | 1.29* |
| | (0.96) | (1.61) | (1.65) |
| lnmaturity | −14.69 | −15.55* | −16.09** |
| | (−1.39) | (−2.20) | (−2.28) |
| lnamount | 9.88 | 0.55 | −0.03 |
| | (1.39) | (0.28) | (−0.01) |
| d_security | 7.65 | 11.09** | 10.84** |
| | (0.81) | (2.03) | (1.97) |
| Cons | 317.03*** | 301.25*** | 287.58*** |
| | (3.56) | (4.84) | (4.63) |
| Industry dummy | Y | Y | Y |
| Year dummy | Y | Y | Y |
| $R^2$ | . | 0.44 | 0.43 |
| N | 17,309 | 17,193 | 17,309 |

relationships between loan contracts and to eliminate the lead–lag effect. The results remain qualitatively similar to those of previous analyses. Model 5 considers the ex ante overvaluation measure, which is based on the estimations over the available years prior to loan initiation.[18] In Model 6, only the listed firms with longer than 7 years of history since being listed are included in order to control the possible contamination of initial public offering firms. These results are also consistent with those of previous analyses. The battery of robustness checks supports our hypothesis that firm overvaluation affect the pricing of bank loans.

All the aforementioned empirical results support that bank loan costs are directly related to overvalued equity. We also investigate whether bank loans can further reduce the agency problem of overvalued equity and anticipate that higher bank loan costs could reduce firm follow-on overvaluation or overvaluation-induced agency costs such as earnings management or overinvestment. To directly examine this relationship, we conduct an additional test by regressing firm follow-on overvaluation (gauged according to Rhodes-Kropf et al. (2005)), overinvestment (gauged according to Chen, Hope, Li, and Wang (2011)), and earnings management (measured using signed values of discretionary accruals, according to Ahn and Choi (2009)) on value-weighted bank loan spread (VW_spread) and other control variables. The results in Table 12 confirm that value-weighted bank loan spread correlates negatively with a firm's overvaluation (Model 1), investment level (Model 2), and earnings management (Model 3). Models 4 and 5 consider adjusted overvaluation (adjOV_firm) and adjusted excess investment (adjRes_inv) instead. Specifically, adjOV_firm is derived by

[18] In calculating the long-run sector multiples, $\alpha_j$, we average $\alpha_{jt}$ s from the annual regressions over the available year prior to the year of loan initiation. Hertzel and Li (2010) suggest that this method can prevent the forward-looking bias argued by Rhodes-Kropf et al. (2005).

**Table 11**
Robustness Checks. This table reports robustness check. Model 1 is the two-stage least squares regression with the first stage regression exploring loan maturity with the instrument variable of asset maturity. Model 2 conducts the firm fixed effect regression with standard errors adjusted for heteroskedasticity and clustering within firms. Model 3 applies median regression to mitigate the impact of outliers. Model 4 conducts the regression analysis for the subsample of firms that have no bank loan two year prior to this bank loan. Model 5 conducts the OV_firm-spread relation based on ex ante measure of overvaluation, in which the long-run sector multiple $\alpha_j$ is the mean of the annual multiple $\alpha_{jt}$over the available year prior to loan initiation. Model 6 documents regression analysis for the subsample of firms that have listed over 7 years. Variable definitions are shown in Appendix A. In each cell, except for Model 1, the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. In model 1 z- statistics are reported in parentheses. $^{***}$, $^{**}$, and $^{*}$ denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) Instrument for loan maturity | (2) Firm fixed effect | (3) Median regression | (4) Without loan in previous year | (5) Ex-ante measure of overvaluation | (6) Listed over 7 years |
|---|---|---|---|---|---|---|
| OV_firm | 63.02*** | 37.71* | 44.94*** | 76.88** | 57.92*** | 65.04*** |
| | (2.79) | (1.65) | (30.70) | (2.51) | (3.76) | (3.88) |
| OV_sector | 60.70 | 36.56 | 46.52*** | 29.32 | 13.14 | 65.19** |
| | (1.24) | (1.53) | (14.36) | (0.40) | (0.58) | (2.41) |
| OV_growth | −9.90 | −10.21 | 17.50*** | 7.46 | 31.42* | 28.16 |
| | (−0.30) | (−0.48) | (10.66) | (0.32) | (1.86) | (1.54) |
| lnrating_res | 119.53*** | 79.45*** | 115.47*** | 42.31 | 126.66*** | 120.38*** |
| | (4.39) | (3.88) | (65.25) | (0.96) | (5.56) | (5.41) |
| lnMV_A | −5.94 | −7.87 | −7.10*** | −0.72 | −4.92 | −4.22 |
| | (−1.14) | (−1.29) | (−22.29) | (−0.09) | (−1.31) | (−1.09) |
| profit | −2.56*** | −1.79*** | −3.08*** | −1.06 | −3.17*** | −3.08*** |
| | (−3.54) | (−2.99) | (−73.95) | (−1.46) | (−5.68) | (−5.48) |
| leverage | 0.002 | −0.39 | −0.09** | −0.39 | 0.15 | 0.14 |
| | (0.01) | (−1.24) | (−2.97) | (−0.70) | (0.51) | (0.49) |
| ret_sd | 12.56* | 4.61 | 9.61*** | 20.27*** | 11.16*** | 11.50*** |
| | (1.79) | (1.16) | (19.69) | (2.77) | (2.81) | (2.87) |
| ocf_sd | −1.63 | 0.29 | −0.07 | −2.29* | −1.35* | −1.37* |
| | (−1.35) | (0.33) | (−0.90) | (−1.71) | (−1.82) | (−1.78) |
| tangibility | 0.97 | 0.59* | 0.46*** | −0.58 | 0.19 | 0.23 |
| | (1.63) | (1.77) | (20.18) | (−1.06) | (0.96) | (1.17) |
| age_mkt | 0.15 | −0.63 | 0.001 | 0.26*** | −0.03 | −0.04 |
| | (1.31) | (−1.17) | (0.30) | (2.71) | (−0.62) | (−0.70) |
| rel_num | −0.04 | 0.67 | −0.55*** | −1.33 | −0.58 | −0.71 |
| | (−0.06) | (0.97) | (−11.83) | (−1.26) | (−1.03) | (−1.24) |
| yr_corp | 0.85 | 0.31 | 0.42*** | 0.74*** | 1.01* | 0.98* |
| | (1.12) | (0.84) | (7.25) | (0.71) | (1.88) | (1.82) |
| lnmaturity | 182.49 | −21.31*** | −6.81*** | −27.85*** | −12.49** | −11.43** |
| | (1.46) | (−3.76) | (−9.81) | (−2.62) | (−2.41) | (−2.22) |
| lnamount | −8.53 | 1.42 | 0.70*** | 0.19 | −1.05 | −1.50 |
| | (−1.40) | (0.75) | (3.15) | (0.05) | (−0.55) | (−0.85) |
| d_security | −52.44 | 3.25 | 2.02*** | 14.20 | 5.14 | 6.19 |
| | (−1.40) | (0.72) | (3.08) | (1.57) | (1.13) | (1.32) |
| Cons | −440.29 | 391.58*** | 296.12*** | 313.60*** | 314.95*** | 260.91*** |
| | (−0.93) | (3.86) | (52.22) | (3.03) | (6.03) | (5.13) |
| Industry dummy | Y | N | Y | Y | Y | Y |
| Year dummy | Y | Y | Y | Y | Y | Y |
| $R^2$ | . | 0.67 | 0.27 | 0.47 | 0.46 | 0.45 |
| N | 17,309 | 17,309 | 17,309 | 1,082 | 17,283 | 16,106 |

replacing negative overvaluation values with 0, whereas excess investment is obtained from the residual term of the following regression model (Chen et al., 2011):

$$\text{Invest}_{i,t+1} = \beta_0 + \beta_1 I\text{gr}_{i,t} + \beta_2 \text{growthsale}_{i,t} + \beta_3 I\text{gr} \times \text{growthsale}_{i,t} + \varepsilon_{i,t+1}, \quad (3)$$

where growth_sales is the sales growth rate and I_gr is a dummy value assigning the value 1 for negative sale growth. The term adjRes_inv is obtained by replacing the negative residual term with 0. The results demonstrate that VW_spread correlates negatively with adjOV_firm and adjRes_inv for the following period. Models 6–8 further include a loan securitization dummy (d_security_com) to address the possible impacts mentioned in Ahn and Choi (2009),[19] and the results are consistent with those of Models 1–3. In summary, all related results suggest that bank loan costs are higher when the borrower's equity is overvalued than that it would be if it is undervalued. Moreover, high bank loan costs reduce follow-on overvaluation and overvaluation-induced agency costs such as earnings management or overinvestment.

[19] Ahn and Choi (2009) indicate that a lender can liquidate collateral when the borrower defaults on the loan. Consequently, the lender's monitoring incentive might decrease. However, Rajan and Winton (1995) indicate that the borrower's future loans might not be secured, even if the current loan is fully secured. Therefore, having collateral does not totally eliminate the necessity for monitoring.

**Table 12**
Analysis of the Impact of Higher Cost of Bank Loan. This table reports the impact of bank loan spread (gauged by value-weighted spread, VW_spread) on overvaluation (OV_firm), investment (Invest), and discretionary accruals (DA). adjOV_firm is modified firm-specific overvaluation error (OV_firm) in which the value of OV_firm is replaced by 0 for negative value of OV_firm. adjRes_inv is modified excess investment, in which Res_inv is replaced by 0 for negative value of Res_inv. Except for Models 3 and 8 all independent variables are one-year lag behind the dependent variable. Variable definitions are shown in Appendix A. In each cell the regression coefficient and the *t*-statistics in parentheses are reported in the upper and lower case, respectively. *t*-statistics are calculated based on robust standard errors adjusted for firm-level clustering. All equations are conducted after the control of firm and yearly fixed effects. $^{***}$, $^{**}$, and $^{*}$ denote the significance level of 1%, 5%, and 10%, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | OV_firm | Invest | DA | adjOV_firm | adjRes_inv | OV_firm | Invest | DA |
| VW_spread | −0.02** | −0.01*** | −0.005** | −0.01* | −0.007*** | −0.02** | −0.01*** | −0.005** |
| | (−2.51) | (−3.99) | (−2.28) | (−1.94) | (−3.12) | (−2.50) | (−3.96) | (−2.28) |
| slack | −0.18 | 0.11** | −0.09* | −0.10 | 0.09** | −0.18 | 0.12** | −0.09* |
| | (−1.34) | (2.09) | (−1.66) | (−1.18) | (2.09) | (−1.33) | (2.16) | (−1.65) |
| intangible_r | −0.15 | 0.42 | 0.003 | 0.13 | 0.36* | −0.15 | 0.43 | 0.004 |
| | (−0.34) | (1.59) | (0.02) | (0.47) | (1.77) | (−0.34) | (1.64) | (0.02) |
| tangibility | −0.26** | −0.02 | −0.12*** | −0.14** | 0.01 | −0.26** | −0.01 | −0.12*** |
| | (−2.23) | (−0.49) | (−3.07) | (−2.01) | (0.34) | (−2.20) | (−0.39) | (−3.06) |
| growth_sale | −0.002 | 0.03*** | 0.01 | −0.01 | 0.007 | −0.002 | 0.03*** | 0.01 |
| | (−0.10) | (3.10) | (1.52) | (−1.10) | (0.97) | (−0.10) | (3.14) | (1.52) |
| ocf_sd | 0.91*** | 0.12 | −0.03 | 0.50** | 0.07 | 0.91*** | 0.12 | −0.03 |
| | (3.52) | (1.12) | (−0.33) | (2.56) | (0.93) | (3.52) | (1.12) | (−0.34) |
| lnTA | 0.10*** | −0.02*** | −0.01* | 0.07*** | −0.02*** | 0.10*** | −0.02*** | −0.01* |
| | (4.29) | (−3.03) | (−1.89) | (4.30) | (−2.74) | (4.27) | (−3.05) | (−1.87) |
| profit | 0.02 | 0.08* | 0.22*** | 0.01 | 0.03 | 0.02 | 0.08* | 0.22*** |
| | (0.15) | (1.79) | (3.12) | (0.13) | (0.74) | (0.15) | (1.85) | (3.11) |
| leverage | −0.02 | −0.07* | 0.04 | −0.10* | −0.03 | −0.02 | −0.06* | 0.04 |
| | (0.27) | (−1.76) | (1.08) | (−1.74) | (−0.94) | (−0.27) | (−1.72) | (1.08) |
| age_mkt | −0.12 | −0.06 | 0.008 | −0.04 | −0.05 | −0.12 | −0.06 | 0.009 |
| | (−1.01) | (−1.09) | (0.27) | (−0.50) | (−0.95) | (−1.00) | (−1.12) | (0.27) |
| d_security_com | | | | | | −0.00003 | −0.007 | 0.002 |
| | | | | | | (−0.00) | (−1.20) | (0.28) |
| Cons | −0.99** | 0.64*** | 0.22 | −0.77*** | 0.46** | −0.99** | 0.65*** | 0.21*** |
| | (−2.05) | (2.92) | (1.53) | (−2.68) | (2.32) | (−2.04) | (2.97) | (1.46) |
| Firm fixed effect | Y | Y | Y | Y | Y | Y | Y | Y |
| Year effect | Y | Y | Y | Y | Y | Y | Y | Y |
| Within $R^2$ | 0.12 | 0.16 | 0.28 | 0.12 | 0.09 | 0.12 | 0.16 | 0.28 |
| N | 1,296 | 1,296 | 956 | 1,296 | 1,296 | 1,296 | 1,296 | 956 |

## 5. Concluding remarks

In theory, conflicts of interest between creditors and shareholders may increase the cost of debt financing, particularly when managers are expected to engage in opportunistic behaviors (Jensen & Meckling, 1976; Myers, 1977). Considering that overvalued equity engenders additional agency costs (Jensen, 2004, 2005), we document that banks could possibly mitigate overvaluation-triggered agency costs. In this study, OV_firm is shown to be positively associated with bank loan spread, indicating that banks could carefully analyze borrowing firms' overvaluation and compensate for them by increasing the price of bank loans. The results echo an argument that has been presented in previous studies, which states that lending banks could obtain proprietary information when researching and supervising borrowing firms (Diamond, 1984; Ramakrishnan & Thakor, 1984). Moreover, banks could use readily accessible sources, such as analysts and market trading, to measure the information asymmetry associated with a borrowing firm. We find that inferred information asymmetry accentuates the positive relationship between overvaluation and bank loan spread. Furthermore, issuing seasoned equity attenuates this relationship. Finally, high bank loan costs reduce overvaluation and overvaluation-induced agency costs.

Prior studies on overvaluation have mainly focused on its effects on managers' behavior. However, our empirical findings provide complementary evidence that banks could be a promising candidate for reducing overvaluation-triggered agency costs. Moreover, our findings portray unique dimensions of banks (as compared with the dimensions explored in previous studies), such as effective monitoring (Diamond, 1984), enhancing borrowing firm's governance quality (Byers et al., 2008), and adding value to borrowing firms (James, 1987; Lummer & McConnell, 1989). Finally, we illustrate a potential research direction. Because insiders (e.g., banks) can measure overvaluation, future studies should consider focusing on whether other insiders (e.g., private equity funds) are also capable of dectecting a firm's overvaluation. If this capability is confirmed, whether overvalued firms prefer issuing equity and public debt over aquiring bank loans and private equity would be a suitable topic of further investigation.

## Appendix A. Variable definitions

| Variable | Definition |
|---|---|
| **Loan characteristics** | |
| Spread (bp) | The difference between the bank loan rate and the interbank call loan rate, measured in basis points. |
| lnamount | Natural log of the loan facility amount. Loan amount is measured in thousands of NT$. |
| lnmaturity | Natural log of loan maturity. Maturity is measured in months. |
| d_security | Dummy variable that is assigned the value 1 if the bank loan is secured by collaterals and 0 otherwise. |
| **Valuation measures** | |
| OV_firm | The difference between the market valuation and the valuation implied by contemporaneous industry-level valuation multiples. In Eq. (1) it is the $m_{it}-v(\theta_{it};\alpha_{jt})$component. |
| OV_sector | The difference between the valuation implied by contemporaneous industry-level valuation multiples and the valuation implied by long-run industry-level valuation multiples. In Eq. (1) it is the $v(\theta_{it};\alpha_{jt})-v(\theta_{it};\alpha_{j})$component. |
| OV_growth | The difference between the valuation implied by long-run industry-level valuation multiples and the book value. In Eq. (1) it is the $v(\theta_{it};\alpha_{j})-b_{it}$ component. |
| **Control Variables** | |
| lnrating_res | Natural log of the residual from regressing credit rating (rating) on firm-specific variables, including size, profitability, leverage, return volatility, tangibility, and number of months since listing. Credit rating score (rating) is from Taiwan Corporate Credit Risk Index (TCRI) of *TEJ* that the best firms are given the score of 1 and the worst firms are given the score of 9. |
| lnMV_A | Natural log of the market value of assets, in which market value of asset is (total asset - book equity + marker value of equity). |
| profit (%) | Ratio of earnings before interest, tax, depreciation, and amortization to total assets, reported in percentage. |
| leverage (%) | Sum of debt in current liability and long-term debt divided total asset, reported in percentage. |
| ret_sd (%) | Standard deviation of daily stock return net of valued-weighted market return over last 180 days before loan initiation. |
| ocf_sd (%) | Standard deviation of annual operating cash flow over total assets for the last 7 years, reported in percentage. |
| tangibility (%) | Ratio of net property, plant, and equipment to total asset, reported in percentage. |
| age_mkt | Number of months since listing. |
| **Bank relationship** | |
| rel_num3y | Number of relation banks over the previous 3 years. |
| yr_corp | Length of relationship with current lender in years. |
| **Moderators** | |
| Analyst_DISP | Standard deviation of analysts' earnings forecasts, scaled by the absolute value of the mean forecast. |
| Num_analyst | Number of analysts covers a company. |
| LLR | Mean of the square root of the ratio of firm's daily absolute stock return to the reported daily dollar volume (in thousands) over all days in the fiscal year with nonzero volume. |
| LR | *Minus* the mean of the square root of the ratio of stock's reported daily dollar volume (in thousands) to its absolute stock return over all days in the fiscal year with nonzero return. |
| BA_spread | Average ratio of the difference between the daily bid and ask closing prices to the midpoint of the bid and ask closing prices over the fiscal year. |
| turnover (%) | Average ratio of daily trading volume divided total outstanding shares over the fiscal year, reported in percentage. |
| $d\_EO_{t-1}$ | Dummy variable that is assigned the value 1 when the borrowing firm has issued seasoned equity one year prior to the borrowing and 0 otherwise. |
| $d\_EO_{t-2}$ | Dummy variable that is assigned the value 1 when the borrowing firm has issued seasoned equity two years prior to the borrowing and 0 otherwise. |
| **Instrument variables** | |
| asset maturity | the book value-weighted maturity of long-term assets and current assets, where the maturity of long-term assets is computed as gross property, plant, and equipment divided by depreciation expense, and the maturity of current assets is computed as current assets divided by the cost of goods sold, shown as [PPE/(CA + PPE)]*[PPE/Depreciation] + [CA/(CA + PPE)]*[CA/COGS] |
| OV_ind | Difference between firm-specific overvaluation and industry-average overvaluation |
| d_short | Dummy variable that equals to 1 when firms have no short sale transactions and the value of Analyst_DISP is missing and 0 otherwise. |
| **Variables in bank function test** | |
| EM | Earnings management, the absolute value of discretionary accruals (DA), extracted from the modified Dechow and Dichev (2002) model. The model is a regression of total current accruals on lagged, current, and future cash flows plus the change in revenue and PPE. Total current accruals is measured as the change in current assets |

| | |
|---|---|
| | minus the change in current liability and the change in cash, and plus the change in debt in current liability, scaled by lagged total asset. |
| Invest | Sum of capital expenditures and R & D expenditures minus the sale of fixed assets, scaled by the lagged total asset. |
| Res_inv | Excess investment defined as the residual of the investment model from Chen *et al.* (2011). Residual is from regressing investment in the next year on sale growth rate (growth_sale) and a dummy variable for negative sale growth (I_gr) in current year. $\text{Invest}_{i,t+1} = \beta_0 + \beta_1 I\text{gr}_{i,t} + \beta_2 \text{growthsale}_{i,t} + \beta_3 I\text{gr} \times \text{growthsale}_{i,t} + \epsilon_{i,t+1}$. |
| VW_spread | Value-weighted average of bank loan spreads in a fiscal year, using the amount of borrowing as weight. |
| d_security_com | Dummy variable equals to 1 when at least one of the bank loans granted in a fiscal year is secured and 0 otherwise. |
| slack | Ratio of cash holding to total asset |
| intangible_r | Ratio of intangible asset to total asset |
| growth_sale | Natural log of the net sale in current year divided by net sale in the previous year. |
| lnTA | Natural log of total asset |

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