# External Guarantees and Stock Price Crash Risk

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## Abstract

We evaluate the financial risk and explore the potential motivation of pervasive external guarantee activities. Using a sample of Chinese A-share listed firms during the period from 2008 to 2017, we find a positive association between external guarantees intensity and stock price crash risk. High repayment obligations and weak guarantee relationship amplify the crash risk. The positive association is more pronounced in firms with low business trust, binding financial constraints, and severe information asymmetry. Nevertheless, external guarantees strengthen the bank-firm relationship with a higher probability of bank loan approval and reduce dependence on related-party transactions. Our findings are consistent with the notion that listed firms are motivated by promoting access to bank loans through external guarantees at the cost of shareholders with potential crash risk.

**JEL classifications**: H81, G21, G32

**Keywords**: information asymmetry, business trust, financial constraints

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# 1. Introduction

Financing support among firms has attracted wide academic attention over the past decades. Existing literature has focused on mutual guarantees institutions, which are formed by a large number of small firms to increase loan credit through a corporation as member firms share joint loan obligations. Mutual guarantees institutions are reported to reduce credit interest costs by satisfying collateral requirements (Columba et al., 2010; Busetta and Zazzaro, 2012; Gama and Duarte, 2017). Despite the recent findings on formal mutual guarantees institutions in Italy (Columba et al., 2010) and Portuguese (Gama and Duarte, 2017), the external guarantee activities of listed firms to their peers or affiliated parties have received relatively little attention. Existing studies have examined the causes of external guarantees (An et al., 2016; Song et al., 2019) and the effect on firm growth (Liu and Zheng, 2005; Leng et al., 2015) and incentives for tunneling behaviors (Zheng et al., 2007; Zhang et al., 2020). However, there is a lack of empirical evidence on the financial risk associated with external guarantees. Therefore, understanding the economic consequences of external guarantees for listed firms provides important policy implications for financial regulations and risk management.

In this study, we aim to study the relationship between external guarantees intensity and stock price crash risk for listed firms in China. Stock price crashes stand for the tremendous stock price drop in the short term due to the sudden release of negative information of the firms that are accumulated over time. External guarantees may result from mixed purposes, including business collaboration or resource tunneling (Berkman et al., 2009). The information of external guarantees may not be fully incorporated in stock prices because of misrepresentation of managers or limited information processing capacity of investors in the Chinese stock market (Morck et al., 2000; Sun et al., 2019). Therefore, instead of examining stock returns or volatility, we focus on the stock price crash risk that is more relevant to financial stability and investor

protection. By classifying the details of external guarantees, we investigate differential consequences concerning guarantee modes and business relationships and explore the moderating role of business trust, financial constraints, and information asymmetry.

There have been mixed findings concerning the consequences of guarantee activities. Some studies show that loan guarantees increase the bank loan approval rate for the guaranteed parties, reducing financial constraints, and improving operating efficiency (Columba et al., 2010; Busetta and Zazzaro, 2012). Due to substantial adverse selection problem in the credit market (Crawford et al., 2018), mutual guarantee arrangement facilitates debt financing when firms are unable to meet the collateral requirements (Busetta and Zazzaro, 2012), and they also reduce information asymmetry and financing costs (Columba et al., 2010). However, other studies document several negative consequences of guarantee activities, as guarantee contracts are regarded as contingent liabilities of the guarantors (Liu and Zheng, 2005). These findings suggest that guarantee activities may bring large financial risks to the guarantors because the guarantee contract will transfer repayment obligations to guarantors when the guaranteed party defaults. Studies have shown that guarantee activities constrain firm value and growth (Cook and Spellman, 1996; Liu and Zheng, 2005), amplify liquidity risks (Besley and Coate, 1995), and may lead to stock price crashes. Therefore, external guarantees are one of the important risk sources of listed firms.

Despite the existence of negative consequences brought by external guarantees, the rapid growth of guarantees activities is warranted by both supply and demand sides. On the demand side, listed firms may provide guarantees for related parties in funding shortage to strengthen business ties, maintain the viability of their business partners, or alleviate the credit rationing to maximize the collective interests. Besides, external guarantees are not counted as the debt of guarantors, and they can also receive 4% of the total deal size from the guaranteed parties as a commission (Liu and Zhang, 2017). Therefore, listed firms have strong incentives to provide external guarantees to support other firms in need. Meanwhile, the listed firms are also qualified guarantors according

to the Guarantee Law of the People's Republic of China.

On the supply side, when firms apply for bank loans, they will be mandated by banks to have a third-party guarantee to reduce the banks' risk exposure, which practically spurs the growth of the huge guarantee market. Guarantors have a good knowledge of the financial condition of the guaranteed parties, and the information and supervisory advantages of guarantors can effectively reduce the monitoring cost of banks and borrowing cost of guaranteed parties (Katz, 1999). Therefore, banks are willing to utilize the opportunity to reduce the default risk of their loans and partially transfer risks to listed firms.

The tremendous development of the external guarantee market coincides with the surge of non-bank financial institutions in recent years.[2] Moreover, state-owned enterprises usually gain more credit support from state-owned banks due to close political connections (Ge and Qiu, 2007), whereas small and medium-sized enterprises suffer from credit rationing (Cheng et al., 2020). The substantial credit rationing further pushes the loan allocated to the guaranteed parties, which would otherwise be turned down loan requests by the commercial banks in China. Therefore, backed by large listed firms, guaranteed firms are capable of raising necessary funding by establishing a guarantee partnership with listed firms, especially under the dominant position of commercial banks in the loan market.

The unique activities of external guarantees in China provide us with several advantages. First, a pervasive phenomenon in China is that financial institutions running loan businesses often require firms to obtain guarantees from third parties to reduce their loan recovery risks (Jimenez et al., 2006). Therefore, many listed firms

[2] According to *Securities Times*, the penetration rate of China's financial leasing market has increased from 0.073% in 2006 to about 5% in July 2019. As of the end of June 2019, there were 12,081 registered commercial factoring companies nationwide, an increase of 4,222 from the beginning of 2018. *China Securities Journal* also reported that more and more financial leasing, commercial factoring and other types of institutions are involved in the loan market of listed companies, which is usually dominated by banks and trust companies. To a certain extent, this has further boosted the expansion of the guarantee market for listed companies.

actively provide external guarantees for commission income (Liu and Zhang, 2017), the convenience of subsidiaries (La Porta et al., 2003), or resource tunneling (Zheng et al., 2007; Zhang et al., 2020). Over the past decade, listed firms in China have accumulated a large number of guarantee obligations. The diverse ownership structure also allows us to discuss different implications for private and state-owned enterprises. To the best of our knowledge, this study is the first to provide empirical evidence concerning the risk implications of the external guarantee activities that widely exist among Chinese listed firms[3]. Second, the mandatory provisions in the Company Law of P. R. China require detailed disclosure of external guarantee activities, including the information on the specific clauses as part of the deal arrangement. The mandatory disclosure not only provides access to rich contract information but also alleviates the concern of self-selection bias due to partial disclosure. Therefore, we believe that China is an opportune setting for examining the economic consequence of external guarantee activities.

Based on a sample comprising 14,666 firm-year observations from 2008 to 2017, we find that external guarantee intensity is positive associated with stock price crash risk. One standard deviation increase in external guarantee intensity corresponds to a 7.15% increase in stock price crash risk. The response in the stock market shows that the external guarantee activities, especially high-risk guarantees reduce the firm value, which is consistent with the evidence from certificates of deposit and Tobin's Q (Cook and Spellman, 1996; Zheng et al., 2007). The primary results remain intact when the endogeneity concerns are appropriately addressed using instrumental variable regression, propensity score matching, and the Heckman selection model. In addition, we examine the economic consequences of various modes of external guarantees and find that deals with more repayment obligations for guarantors, such as general

[3] By contrast, in developed banking markets, such background promotion of external guarantees, which is inertial only under Chinese credit tradition and validity, is trifling for competitive commercial banks, and thus these arrangement of guarantees transfer slight risk and deserve diminutive attention outside China.

guarantee, maximum guarantee, and joint responsibility guarantee, are associated with high stock price crash risk. We also find that deals involving the first-time guaranteed parties are the major driver of stock price crashes. However, when the guarantee relationship between two parties strengthens as the number of deals increases, guarantees activities are no longer significantly related to stock price crash risk. The results suggest that a solid guarantee relationship helps to alleviate the negative relationship between external guarantees and stock price crash risk.

Furthermore, the cross-sectional analyses demonstrate that business trust of the located region, financial constraints, and information asymmetry between investors and firms play a moderating role in the association between external guarantees and stock price crash risk. In particular, strong business trust reduces the crash risk of external guarantees as it encourages firms in the guarantee networks to strengthen business ties and promote long-term cooperation in guarantee activities. Financial constraints contribute to huge danger in firm value and future stock price crash risk resulting from external guarantees because financial constraints trigger a greater risk of bankruptcy and prevent the firm from continuing to operate to repay when default. Information transparency also leads to lessening of stock price crash risk of external guarantees, because it enables complete disclosure of information in external guarantees, and the risks will not be exposed until future loan default.

Moreover, we find that the positive association between external guarantees intensity and stock price crash risk is more pronounced in non-stated-owned enterprises, during the period of low loan costs, and in regions with a high level of financial development. State-owned enterprises (SOEs) are often considered to receive implicit guarantees from the government as the last resort when they are in financial distress, which offsets the contingent risks brought by the external guarantees. Therefore, non-SOEs need to tolerate a higher credit premium for loans of the guaranteed party with the same amount. The increase in the interest rate implies increasing financing costs and stricter loan requirements of financial institutions. Therefore, listed firms are more

likely to provide external guarantees that bear the huge risk of loan default. In regions with a high level of financial development, firms that choose external guarantees may have higher operating risks, and they have to seek third-party guarantees due to financial exclusion, resulting in higher future repayment risk. Listed firms' involvement in external guarantees results in an increase in approval probability and volume of bank loans and a reduction in dependence on related-party transactions which signals negative information to investors. Our findings are consistent with the notion that listed firms are motivated by promoting access to bank loans through external guarantees. Our findings are robust to alternative model specifications and measures of external guarantees intensity.

Our study contributes to three strands of literature. First, it contributes to the literature on the role of mutual guarantees in business financing (Columba et al., 2010; Busetta and Zazzaro, 2012) and the consequences of external guarantees on guarantors (Liu and Zheng, 2005; Berkman et al., 2009; Huang, 2016). Mutual guarantees institutions formed by participants of small firms are found to reduce credit interest cost by satisfying collateral requirements (Columba et al., 2010; Busetta and Zazzaro, 2012; Gama and Duarte, 2017) and the likelihood of experiencing financial tensions (Bartoli et al., 2013). Existing literature focuses on the consequences of external guarantees on guarantors from the perspective of business operation (Liu and Zheng, 2005) and resource tunneling (Berkman et al., 2009; Huang, 2016). We examine the value implications of the external guarantee activities by examining the response from the stock market and investigate the association between external guarantees and stock price crash risk. To the best of our knowledge, this study is the first to provide empirical evidence concerning the value implications of the external guarantee activities using China's unique large-amount and wide-scale external guarantees directly provided by listed firms.

Second, we contribute to the large volume of literature on information asymmetry in the credit market. Existing studies mainly focus on information asymmetry between

borrowers and lenders (Berger and Udell, 1990; Jimenez et al., 2006; Xu et al., 2020). For instance, collateral in loans is reported to help settle down problems of adverse selection (Jimenez et al., 2006). We investigate the information asymmetry between guarantors and guaranteed parties and show that a solid guarantee relationship helps alleviate the association between external guarantees and stock price crash risk. Moreover, we examine the consequences of the information asymmetry between listed firms and investors and our findings for the key role of information asymmetry in the relationship between external guarantees and stock price crash risk is consistent with the bad new hoarding theory (Jin and Myers, 2006; Hutton et al., 2009).

Finally, we contribute to the literature on the business trust in financial development and the credit market. External guarantee activities are pervasive in the region with an underdeveloped finance industry and are important in credit enhancement for indirect financing (Garmaise and Moskowitz, 2003; Allen et al., 2005). Firms located in regions with high social trust rely on informal finance (Wu et al., 2014). The strong business trust helps alleviate the information asymmetry in the external guarantee activities, making them sustainable with the screening and monitoring, reducing default risk of guarantees and stock price crash risk. By introducing business trust into the examination of the economic consequences of external guarantees, we bring a broad cultural and institutional perspective to the unique credit enhancement phenomenon.

The remainder of the paper is organized as follows: Section 2 reviews the literature and proposes testable hypotheses; Section 3 presents data source, empirical methodology, and summary statistics; Section 4 reports the results of the association between external guarantees and stock price crash risk; Section 5 further analyzes the moderating roles of business trust, financial constraints, and information asymmetry; Section 6 examines the economic incentives for listed firms to engage in external guarantees; Section 7 conducts a series of robustness checks, and Section 8 finally concludes.

## 2. Literature Review and Hypothesis Development

The existing literature mainly focuses on the determinants of external guarantee activities. Some studies examine the internal motivation of external guarantees from the corporate governance perspective. In detail, corporate governance factors, such as the board size of directors and the supervisors, and separation of the positions of CEO and chairman, affect the scale of external guarantees (An et al., 2016). Song et al. (2019) also document that firms conduct guarantee activities when the internal control quality is high. Moreover, in the sample of listed firms with external guarantees, the scale of external guarantees and the scale of high-risk guarantees decrease with the enhancement of internal control quality. As for ownership, SOEs provide more guarantees rather than receiving guarantees (Jian and Xu, 2012). The outside pressure from lenders also encourages external guarantees. Loan lenders try to avoid adverse selection problems (Jimenez et al., 2006) by transfer default risks to guarantors through guarantees from third-party guarantors.

Existing literature also studies the impact of external guarantees on listed firms' future growth. Although firms' business of guarantees will not increase firms' default risk of bonds with complete risk prevention, external guarantees of state-owned enterprises may increase the default risk of guarantors because of lack in risk management or benefit tunneling (Leng et al., 2015). A more negative view of the relationship between external guarantees and corporate performance and document is that external guarantees may inhibit corporate growth (Liu and Zheng, 2005). Premiums and spreads of credit risk increase the risk of external guarantees, which in turn affect firm value (Cook and Spellman, 1996).

At the same time, the tunnel effect is also considered as a potential channel through which external guarantees affect firm value. With the increase of related guarantees, firms' value is seriously infringed (Zheng et al., 2007). Therefore, the balance of related-party guarantees is also treated as a direct measure of tunneling (Huang, 2016).

Berkman et al. (2009) suggest that firms with related-party guarantees have significantly higher leverage ratios and lower dividend rates, indicating that listed firms exploit small and medium investors by related guarantees. Although related-party guarantees increase implicit tunneling, the positive relationship is reduced by marketization (Zhang et al., 2020).

Existing research on stock price crash risk has discovered many factors that influence stock price crash risk. Most of them are related to the characteristics of corporate operations, profitability, governance, and managers (Jin and Myers, 2006; Kim et al., 2011b; Kim and Zhang, 2016; Chen et al., 2017; Xiang et al., 2020). Literature about corporate governance has shown that managerial characteristics of listed firms, corporate governance, and external investors all affect stock price crash risk. Kim et al. (2011b) find that equity incentives for different executives have a heterogeneous impact on firms' stock price crash risk. Chen et al. (2017) document that profit smoothing exacerbates stock price crash risk and this relationship becomes stronger when managers block bad news. Francis et al. (2016) find that abnormal operations in business, such as real earnings management, increase future stock price crash risk. According to Xiang et al. (2020), if institutional investors are attracted by exogenous events, firms face a larger stock price crash risk in the future.

First, although external guarantees of listed firms and stock price crash risk have attracted wide attention of scholars in recent years and find predictive factors of information disclosure, financial indicators, and corporate governance, there is no literature to study the direct relationship between the two. External guarantees are contingent liabilities (Liu and Zheng, 2005), and thus have a negative value. When the guaranteed party does not perform well and fails to repay the debt, the guarantor needs to bear joint repayment liabilities. Therefore, the greater the intensity of external guarantees, the larger the operating risk the firm will bear. Therefore, once the guarantor suffers liquidity crises or performance declines, it is inevitable that the stock price will fall sharply. Hence, external guarantees are of negative value to listed firms. Given the

economic reasoning, we propose our first hypothesis as follows:

*H1: A large proportion of the newly-formed guarantee amount to total assets is positively associated with a great stock price crash risk in the future.*

Information asymmetry in the credit market (Crawford et al., 2018) creates the lemon problem that relatively safe firms cannot obtain loans (Ikeda, 2019). This effect will expand the adverse selection of firms. Firms that need financing, on the one hand, are forced to increase their loan prices; on the other hand, must seek strong guarantors for their guarantees to increase their competitiveness in the loan market. Therefore, whether guaranteed parties can smoothly repay their debts does not only depend on the fundamentals of themselves. If listed firms provide first-time guarantees for new counterparties, the new guarantees will increase their stock price crash risk. Correspondingly, if there is a stable guarantee relationship between listed firms and guaranteed parties, subsequent guarantees will not increase listed firms' stock price crash risk. Given the above economic reasoning, we propose the second hypothesis:

*H2: Firm's stock price crash risk is larger for firms conducting the first-time guarantee to guaranteed parties. A solid guarantee relationship will help alleviate the positive association between external guarantees intensity and stock price crash risk.*

Hypothesis *H2* considers the information asymmetry in the lending market and analyzes the role of information asymmetry between guarantors and guaranteed parties in the association between external guarantees and stock price crash risk. Note that information asymmetry does not only exist between the two parties in guarantee activities, but also between listed firms and investors. Previous literature has shown that information disclosure and financial transparency contribute to stock price crashes. Jin and Myers (2006) and Hutton et al. (2009) show that stock price crash risk is negatively associated with the information transparency of firms measured by stock price synchronicity. The improvement of accounting conservatism also reduces stock price crash risk (Kim and Zhang, 2016). Analyses about two U.S. accounting standards updates in 2010 and 2011 discovery that stricter accounting policies for fair value

disclosure improve the financial information transparency of firms, thereby reducing the stock price crash risk of firms (Hsu et al., 2018).

We conjecture that high information transparency of listed firms reduces the positive association between external guarantees and stock price crash risk. Because low information asymmetry enables investors to fully understand firms' operating and investment status, and thus they do not blindly and excessively panic about minor negative news through unprofessional speculation and result in firms' stock price crash risk. Full disclosure of the detailed content of guarantee contracts will also enable investors to have a better prediction of default probability. It prevents investors from self-estimating default probability based on incomplete information, exaggerates the guaranteed party's default probability, and even resorts to overreactions, such as panic selling. Therefore, the third hypothesis is formulated as follows:

*H3: The association between external guarantees intensity and stock price crash risk will be stronger for firms with higher information asymmetry.*

# 3. Data and Empirical Methodology

## 3.1 Sample and Data Sources

The data in this paper comes from the China Stock Market and Accounting Research (CSMAR), a leading data vendor for economic and financial studies in China. We obtain the detailed information of external guarantees from the External Guarantees Database, analyst coverage from the Analyst Forecasts Database, the Shanghai Interbank Offered Rate from the Bank Research Database, and accounting information from the Financial Statement Database.

Our initial sample starts with all listed firms in the Chinese stock market from 2008 to 2017. We exclude from our sample the firms only issuing B shares (only for foreign investors) and those operating in the finance industry. Following Jin and Myers (2006), we drop firm-year observations whose shares are traded for less than 26 weeks during a fiscal year to reduce the potential sample selection bias driven by delisting or

listing suspension. These screening procedures leave a sample of 14,666 firm-year observations. All the continuous variables in the regression models are winsorized at the 1st and 99th percentile to alleviate the impact of outliers in the data.

## 3.2 Variable Constructions

### 3.2.1 External Guarantees Intensity

We aim to construct a primary measure of external guarantees intensity that reflects the relative scale of external guarantees of a firm, such that a larger value indicates greater intensity of external guarantee activities. The main explanatory variable *GUATA* is the external guarantees intensity, calculated as the amount of newly-formed external guarantees scaled by the firm's total assets over a fiscal year. We rule out the events that the listed firms or guaranteed parties violate guarantee contracts or decide not to provide or receive guarantees. We also exclude events that guarantee contracts have been signed and announced but creditors finally decide to provide loans without guarantees. The screening criteria ensures that the primary measure of external guarantees intensity is not biased by illegal contracts that are invalid eventually or canceled guarantee deals that do not constitute actual impacts.

### 3.2.2 Stock Price Crash Risk

Following Kim et al. (2011a), we begin by estimating an extended market model to obtain firm-specific abnormal stock returns:

$$r_{i,\tau} = \alpha_i + \beta_{1i} r_{m,\tau-2} + \beta_{2i} r_{m,\tau-1} + \beta_{3i} r_{m,\tau} + \beta_{4i} r_{m,\tau+1} + \beta_{5i} r_{m,\tau+2} + \varepsilon_{i,\tau} \quad (1)$$

where $r_{i,\tau}$ is the stock return of firm *i* in week $\tau$; $r_{m,\tau}$ is the value-weighted market return in week $\tau$. The firm-specific abnormal return is then transformed from the residual $\varepsilon_{i,\tau}$ in Eq. (1) as follows:

$$R_{i,\tau} = ln\left(1 + \varepsilon_{i,\tau}\right). \quad (2)$$

Following the literature, we construct two measures of stock price crash risk. The first measure *NCSKEW* is the negative conditional skewness of the firm-specific weekly returns (Kim et al., 2011a):

$$NCSKEW_{i,t} = -\left[n(n-1)^{\frac{3}{2}}\sum R_{i,\tau}^{3}\right]\Big/\left[(n-1)(n-2)\left(\sum R_{i,\tau}^{2}\right)^{\frac{3}{2}}\right], \quad (3)$$

where *n* is the firm-specific number of weekly returns in a fiscal year. A large value of *NCSKEW* indicates great stock price crash risk.

Following Kim et al. (2011b), the second measure is the return volatility *DUVOL*. We first calculate an up-and-down ratio of the standard deviation of firm-specific weekly returns on down weeks to that on up weeks and modify it with logarithmic transformation.

$$DUVOL_{i,t} = ln\left\{\left[(n_u - 1)\sum_{DOWN} R_{i,\tau}^{2}\right]\Big/\left[(n_d - 1)\sum_{UP} R_{i,\tau}^{2}\right]\right\}, \quad (4)$$

where $n_u$ is the number of weeks when firm-specific weekly returns are lower than the mean of the respective annual firm-specific returns; $\sum_{DOWN} R_{i,\tau}^{2}$ is the standard deviations of firm-specific weekly returns on down weeks, which is calculated for each firm and fiscal year if the firm-specific weekly returns on the weeks are lower than the mean of the respective annual firm-specific returns, and vice versa. A high value of *DUVOL* indicates high stock price crash risk.

### 3.3 Econometric Model

We investigate the association between external guarantees intensity and the stock price crash risk by estimating the following panel fixed-effect model:

$$CRASH_{i,t+1} = \alpha + \beta GUATA_{i,t} + \gamma X_{i,t} + \theta_i + \eta_t + \mu_{i,t} \quad (5)$$

where *CRASH* denotes the measures of stock price crash risk *NCSKEW* and *DUVOL*. The main explanatory variable is the external guarantees intensity *GUATA*. The vector *X* contains several firm characteristics. We also include the firm and year fixed effects to control for time-invariant firm characteristics, the general business cycles, and macroeconomic conditions.

We include a series of control variables at the firm level. Following Kim et al. (2011a), we first control for general firm characteristics: *SIZE* is the natural logarithm of the firm's market value; *AGE* is the number of years since the firm was founded;

*ROA* is the return on total assets; *LEV* is the total liabilities divided by total assets; *MTB* is the market-to-book ratio. Following Chen et al. (2001), we include variables associated with turnover, idiosyncratic return, and volatility: *DTURN* is the change in an annual average of monthly turnover rate; *RET* is the average stock return within the year; *SIGMA* is the standard deviation of stock return within the year. Given the finding of Chen et al. (2017) on earnings management and Xiang et al. (2020) on institutional investors' monitoring, we add measures of earnings management and institutional holdings in the regressions: *ABACC* is the absolute value of manipulated accrual earning; *INSTHOLD* is the institutional shareholding ratio. Finally, considering the persistence of stock price crash risk, we follow the convention in the literature to control for lagged term of the stock price crash risk *NCSKEW* (Wu and Lai, 2020).

### 3.4 Summary Statistics

Figure 1 reports the aggregate amount of newly-formed external guarantees of Chinese non-financial listed firms from 2008 to 2017. It shows that the amount of external guarantees of Chinese listed firms rises gradually over the sample period, reaching a peak in 2016 with an aggregate amount of about 3 trillion Yuan. It remains at a high level in 2017, suggesting the pervasive existence of external guarantee behaviors.

(Insert Figure 1 about here)

Panel A of Table 1 reports the summary statistics. The average values of the stock price crash risk measures *NCSKEW* and *DUVOL* are -0.274 and -0.189, respectively. The average of the external guarantees intensity *GUATA* is 0.096, that is, the newly-formed external guarantees amounts to 9.6% of the total assets. However, *GUATA* has a large variance of 4.779, which shows a large variation in the external guarantees intensity. Besides, the average total assets of the listed firms in our sample are 9.57 billion Yuan and the average firm age is 15.27 years. The average institutional shareholding ratio is 5.1%, suggesting that institutional investors hold a substantial

proportion of shares.

Panel B of Table 1 presents the Pearson correlation matrix. The correlation coefficient between *NSCKEW* and *DUVOL* is 0.88, indicating that the two are highly correlated in measuring stock price crash risk. Therefore, we will use *NCSKEW* as the main explained variable in the subsequent specifications. Except for the two measures for stock price crash risk *NCSKEW* and *DUVOL*, the correlation coefficients between explanatory variables and control variables are all less than 0.40, and most of the correlation coefficients are less than 0.20. The result indicates that the regression model is not likely to suffer from multicollinearity problems.

(Insert Table 1 about here)

# 4. Empirical Results

## 4.1 External Guarantees and Stock Price Crash Risk

To begin with, we examine the association between the external guarantees intensity and stock price crash risk by estimating the baseline regression in Eq. (5).

Table 2 reports the baseline regression results. Column (1) shows that the external guarantees intensity *GUATA* is positively associated with stock price crash risk without adding firm and year fixed effects, and the coefficient is 0.0041 with a *t*-statistic of 6.70, which is significant at the 1% level. The result suggests that the scale of external guarantees is positively correlated with the future stock price crash risk. The result also implies that one standard deviation increase in *GUATA* is associated with a 7.15% increase in stock price crash risk. Column (2) shows a positive and significant estimated coefficient of *GUATA* when the industry fixed effect is included in the regression. The coefficient is positive with a *t*-statistic of 5.12, which is significant at the 1% level. The result suggests that external guarantee intensity is positively associated with an increase in stock price crash risk.

In Column (3), we further control for year fixed effect, and the estimated

coefficient of *GUATA* reduces slightly to 0.0030 with a *t*-statistic of 3.38, which is significant at the 1% level. The results demonstrate that an increase in the intensity of the firms' external guarantee activities is associated with higher stock price crash risk. The results are consistent with the notion that external guarantees might bring negative performance outcomes for the Chinese listed firms.

In terms of control variables, the coefficients of *SIZE* and *AGE* are significantly negative at the 1% level. Larger firms can withstand various types of external shocks, and earlier established firms are capable to identify various types of risks. Therefore, they have a lower stock price crash risk. The coefficients of *MTB* are all significantly positive at the 1% level, which suggests that the greater the deviation of the market value from the book value, the larger the bubble accumulated in the stock price, and the higher the future stock price crash risk. The coefficients of *SIGMA* are all positively significant, which is in line with the intuition that large variance in stock price means large crash risk. Institutional investors' shareholding ratio *INSTHOLD* are all significantly positive, indicating that the herd effect of institutional investors increases a firm's stock price crash risk in the future (Xu et al., 2013). All models include the lagged term of stock price crash risk *NCSKEW*, and the estimated coefficients are also all significantly positive, suggesting that the stock price crash risk is persistent with high autocorrelation across periods.

In summary, the findings in Table 2 provide support to the hypothesis *H1* that an increase in the external guarantees intensity is associated with higher stock price crash risk. The result remains quantitatively similar after controlling for firm and year fixed effects.

(Insert Table 2 about here)

## 4.2 Identification Issues

A major concern about our baseline result is endogeneity issues. For example, listed firms engaging in external guarantees may be associated with weak corporate

governance and complex related party network. Thus, they are motivated to tunnel resources out of listed firms to benefit subsidiaries or related parties, resulting in great stock price crash risk. Meanwhile, our results could also be driven by unobservable characteristics (e.g., regional credit atmosphere and cultural sensitivity) that are related to both external guarantee activities and future crash risk. In addition to controlling for firm and year fixed effects in all regressions and using lagged values of external guarantee intensity in baseline results, we adopt an instrumental variable (IV) estimation, propensity-score-matching (PSM), and Heckman selection model to alleviate endogeneity concerns.

### 4.2.1 Instrumental Variable Regression

We perform instrumental variable estimations to address the possibility that the baseline model might suffer from omitted variable bias. We construct two instrumental variables from the perspective of guarantors and guaranteed parties respectively. The first instrument *GUA-MEAN* is defined as the average external guarantees intensity of peer listed firms in the same industry and the life cycle. On the one hand, the formation of a guarantee relationship helps consolidate the business partnership. Listed firms tend to strategically maintain their guarantee network to stabilize their business relationship to gain a competitive edge in the product market competition. Therefore, there will be a high correlation between the guarantees of the listed firm and their peers in the same industry. Also, firms in the same life cycle have a similar pattern in cash flow and firm growth opportunities and they exhibit similar incentives for guarantee activities. This suggests that *GUA-MEAN* has a correlation with the main endogenous explanatory variable and meets the inclusion restriction of an instrumental variable. On the other hand, the external guarantee intensity of peer firms is not likely to have a direct effect on the firm's stock price crash risk because these firms do not share the same external guarantee network. Therefore, *GUA-MEAN* satisfies the exclusion restriction.

The second instrument *GUA-CENTER* is the mean value of the natural logarithm of the distance between the guaranteed party and its city center. The farther the

guaranteed party is from the city center where it is located, the more difficult it is to access financing from financial institutions such as commercial banks due to higher loan rates (Degryse and Ongena, 2005) and information costs (Knyazeva and Knyazeva, 2012). Therefore, the tendency of the guaranteed party to seek guarantees from listed firms increases with the distance from the city center. Therefore, this instrument satisfies the inclusion restriction. Besides, the geographic location of the guaranteed party is believed to have no direct effect on the stock price crash risk of the listed firms. Thus, it also satisfies the exclusion restriction of valid instrument variables.

Table 3 reports the results of instrumental variable regression. Column (1) reports the first-stage regression in which the external guarantees intensity *GUATA* is used as the dependent variable and two instrument variables are the main explanatory variables along with other control variables. We find that *GUATA-MEAN* and *GUA-CENTER* are positively and significantly correlated with *GUATA*. The result is consistent with our theoretical arguments that the intensity of external guarantees is positively associated with industry average *GUATA* and the distance between guaranteed parties and their city centers. The *F*-statistic in the first-stage regression is 67.74, which is greater than 10. Therefore, these two instrumental variables do not suffer from weak-IV issues. Columns (2)-(3) report the results of the second-stage regression where the fitted value of the external guarantee intensity is used as the main explanatory variable. Column (2) shows a positive coefficient of *GUATA,* which is significant at the 10% level. Column (3) shows similar results that the external guarantee intensity is positively associated with stock price crash risk measured by *DUVOL*, and the coefficient is significant at the 1% level.

Therefore, the results in Table 3 demonstrate that our primary findings remain quantitatively intact when the endogeneity concerns are addressed appropriately by instrumental variable regressions.

(Insert Table 3 about here)

### 4.2.2 Propensity Score Matching

Our primary results might be driven by the systematic difference between listed firms with or without the external guarantee activities. We construct a matched sample using the PSM procedure to address this concern. Specifically, listed firms with external guarantees are defined as the treatment group and the rest of the firms are defined as the control group.

We estimate the propensity score using a Logit model with the same set of control variables as matching covariates. The dependent variable is a dummy variable that equals one if a firm's external guarantees intensity is above the median in each industry in year *t* and zero otherwise. Then, the one-to-one nearest neighbor matching technique without replacement is applied with a common support requirement in the matching procedure. The PSM procedure leaves us with a matched sample consisting of 6,920 firm-year observations.

The test of covariate balance in Panel A of Table 4 shows that the matching covariates are not significantly different from each other between the treatment and control groups. The result suggests that the matching procedure has minimized the difference in the firm characteristics between the treatment and the control group.

Panel B reports the results based on the matched sample. When controlling other similar characteristics of firms, the coefficients of *GUATA* in Columns (1)-(3) are all significantly positive under different specifications of fixed effect. All *t*-statistics are larger than 4 and are significant at the 1% level. The coefficients of *GUATA* on *DUVOL* in Columns (4)-(6) have similarly significant and positive results. Therefore, we find that the results of baseline regression remain quantitatively similar when the propensity score matching technique is applied to construct the matched sample. The main results of this paper remain robust after controlling the differences in systemic characteristics of firms.

(Insert Table 4 about here)

### 4.2.3 Heckman Selection Model

Our previous results included a full sample of listed firms including firm-year observations conducting no external guarantees, so there may be a self-selection problem for external guarantees. Firms that have no external guarantees may introduce bias when estimating the coefficients of external guarantees amount. Moreover, due to the geographical environment and the distribution of financial institutions, and the influence of regional credit preferences, firms' choice of external guarantees may not be random, and it will also bring about self-selection bias. For this reason, we apply the Heckman selection model to correct the sample selection bias for robustness purposes.

In the first stage, we estimate a Probit model using the full sample with a set of control variables similar to our primary specification. The dependent variable *GUA* is a dummy that equals one if a firm has any newly-formed external guarantees in the firm-specific year and zero otherwise. Column (1) in Table 5 reports the result of the first-stage regression of the Heckman selection model. The inverse Mills ratio (*IMR*) is obtained from the Probit regression.

In the second stage, we include *IMR* in Columns (2)-(5) to address the sample selection bias. The coefficients of the main explanatory variable *GUATA* in Column (2) is positive and significant at the 1% level. Column (3) further controls for year fixed effect and the coefficient of *GUATA* remains positive and statistically significant. The result suggests that external guarantee intensity is positively associated with *NSCKEW*. Columns (4) and (5) show consistent findings when *DUVOL* is used as a measure of stock price crash risk. Note that the inverse Mills ratio is significant across all specifications. Thus, the sample selection issues have been appropriately addressed with the Heckman selection model.

In short, our main results remain intact that external guarantee intensity has a positive and significant association with stock price crash risk when the sample selection bias has been alleviated.

(Insert Table 5 about here)

### 4.3 Modes of External Guarantees

External guarantees activities can be classified into four modes based on the repayment responsibilities of the guarantors. First of all, mortgage, hypothecation, lien, and deposit belong to the guarantees that the guarantors bear the lowest default risk. This mode of external guarantees allows the guarantors to take procession of the pledged assets for compensation when the guaranteed party breaches the repayment obligation. Thus, the guarantors bear low risk in this case.

Secondly, general external guarantees refer to an agreement under which a guarantor and a creditor agree that the guarantors shall be obligated to take the liabilities according to the agreement if the guaranteed party fails to deliver the repayment obligation. Given the information asymmetry in the bank lending process, the guarantor will bear a substantial risk of bankruptcy.

Finally, maximum guarantees and joint responsibility guarantees are two modes of external guarantees with the highest risk. The maximum guarantees denote a series of guarantee contracts specifying the maximum amount of guarantees over time. During this period, the formation, type, and the number of creditors' rights are all uncertain.[4] Therefore, guarantors face a high degree of uncertainty in contingent liabilities. In addition, joint responsibility guarantees mean that if the debtors fail to perform the debt at the expiration of the performance period, guarantors may also be required to assume the repayment responsibility. Moreover, guarantors do not have the right to require the creditors to solve the problem by litigating the debtors in the first place, and the creditors have direct recourse, which may cause the potential moral hazard of the debtors. In these two modes of external guarantees, listed firms have no clues about the

[4] During this period, debtor can ask any times of loan with uncertain amount for each time as they want from creditors if the aggregate amount is not over the maximum of agreed guarantee contract between listed firm and guaranteed party. It is initially designed to shorten complex process for those firms need recurring guarantees, while these guarantees hide huge risks.

exact future contingent obligation. Therefore, guarantors bear the highest risk in this case.

In this section, we aim to examine whether different guarantee modes are associated with stock price crash risk due to the distinct amount of risk borne by the guarantors. We construct three explanatory variables to reflect different guarantee modes of listed firms. Specifically, *PROPERTY* is the actual amount of external guarantees associated with a mortgage, hypothecation, lien, and deposit over total assets; *PROMISE* is the actual amount of general guarantees over total assets, and *GUARANTEE* is the actual amount of maximum guarantees and joint responsibility guarantees over total assets. We conjecture that general external guarantees, maximum guarantees, and joint responsibility guarantees result in severe stock price risk with significantly positive coefficients, while mortgage, hypothecation, lien, and deposit guarantees have no similar results for lower risk.

Table 6 reports the relevant results for different modes of external guarantees. In Column (1) the primary explanatory variable *PROPERTY* negative and insignificant, suggesting that external guarantees backed by a mortgage, hypothecation, lien, and deposit do not have a significant and positive association with stock price crash risk. By contrast, the other two modes of external guarantees have a strong and significant association with stock price crash risk. Specifically, Column (2) shows a significantly positive estimated coefficient of *PROMISE* with a *t*-statistic of 9.05, which is significant at the 1% level. Similarly, the estimated coefficient of *GUARANTEE* in Column (3) is positive with a *t*-statistic of 2.03, which is significant at the 5% level. This shows that the maximum guarantees and joint responsibility guarantees are significantly and positively associated with stock price crash risk.

In summary, the results in Table 6 demonstrate that only guarantees with more repayment liabilities for guarantors, such as general external guarantee, maximum guarantee, and joint responsibility guarantee, contribute to severe stock price crash risk in the future. Therefore, as the repayment responsibilities of the guarantors increase,

guarantees with the same scale become riskier for guarantors and firms suffer from severer stock price crash risk.

(Insert Table 6 about here)

### 4.4 Clientele Relationship of External Guarantees

Research of bank-enterprises relationship provides evidence that switches of firms from different branches of banks suffer from larger loan costs if firms provide no information on previous loan and bank relationship (Xu et al., 2020). These costs reflect the default risk of building a new relationship. Similarly, in clientele relationships of guarantees, firms' guarantees for new partners will also have a greater default risk due to information opacity. As the guarantee relationship becomes stable, such opacity and information asymmetry will be gradually reduced. Hence, we conjecture that an increase in the guarantee relationship, namely, the number of repeated external guarantee deals with a particular counterparty, helps alleviate future stock price crash risk.

To test hypothesis *H2* and examine how the guarantee relationship between guarantors and the guaranteed party is associated with the stock price crash risk of listed firms, we construct three explanatory variables to reflect the historical frequency of external guarantees for the listed firms. Specifically, *NEWGUA* is the amount of first-time external guarantees of the listed firms in year *t* scaled by total assets; *MIDREPEAT* is the number of external guarantees with the same counterparty who has 1 to 3 times of historical deals in year *t* scaled by total assets, and *HIGHREPEAT* is the number of external guarantees with the same counterparty who has 4 or more times of historical deals in year *t* scaled by total assets.

Table 7 reports the results for the clientele relationship of external guarantees. Column (1) shows that *NEWGUA* has a positive coefficient with a *t*-statistic of 3.63, which is significant at the 1% level. The result demonstrates that the first-time external guarantee transactions are associated with high stock price crash risk. It suggests that a

fresh and unstable guarantees relationship may contribute to high stock price crash risk. In Column (2), the coefficient of *MIDREPEAT* is positive and significant at the 5% level, and the coefficient of *HIGHREPEAT* in Column (3) is insignificant at the conventional level. Meanwhile, the magnitude of the estimated coefficients reduces with the clientele relationship of external guarantees. The results suggest that when the relationship between the two parties strengthens with an increasing number of successful deals, the external guarantee activities no longer impose a significant association with stock price crash risk.

One possible explanation is that due to the information asymmetry in the external guarantee transactions similar to that in the bank lending market (Crawford et al., 2018). Guaranteed parties selectively disclose their material business information, making it impossible for guarantors to fully assess the risks associated with the external guarantee activities, which results in increased stock price crash risk subsequently. After the two parties gain mutual trust through continuous deals, the degree of information asymmetry between the two parties is gradually reduced as the cost of screening and post-deal supervision falls. Thus, the association between external guarantees and the stock price crash risk is no longer pronounced.

The findings in Table 7 demonstrate that a strong guarantee relationship helps alleviate the information asymmetry between the two parties in external guarantees and enables them to avoid the high risk associated with external guarantees. As a result, our empirical evidence lends support to hypothesis *H2* that a solid guarantee relationship helps to dampen the correlation between external guarantees and stock price crash risk.

(Insert Table 7 about here)

# 5. Cross-Sectional Analyses

## 5.1 The Role of Business Trust

The foundation for successful external guarantee deals is the business trust

between two parties. On one hand, listed firms may find it profitable to engage in the external guarantee deals for revenue if the risk associated with the deal is well under control. They may also provide guarantees for related parties in funding shortages to strengthen business ties and maintain the viability of their business partners. Therefore, the decision of external guarantees largely depends on the extent of business trust, which is originated from historical cooperation and repeated transactions. In the regions with low finance development levels, firms may turn to informal financing networks, which heavily rely on social trust to reduce credit risk (Garmaise and Moskowitz, 2003; Allen et al., 2005). Moreover, business trust forms a screening mechanism that firms with inferior credit records will be identified and eliminated from the guarantee network in the long run. The screening mechanism also mandates the guaranteed parties to repay loans in a timely fashion and avoid defaults which will bring damage to the business partnership with the guarantors. Given the above argument, we conjecture that creditworthy business trust helps alleviate the negative association between external guarantees intensity and stock price crash risk.

We estimate the following panel fixed-effect model to test this conjecture:

$$CRASH_{i,t+1} = \alpha + \beta_1 GUATA_{i,t} + \beta_2 GUATA_{i,t} * BT_{i,t} + \beta_3 BT_{i,t} + \gamma X_{i,t} + \theta_i + \eta_t + \mu_{i,t}, (6)$$

where *BT* denotes two measures of business trust, namely *TRUST* and *CEI*. Following Wu et al. (2014), *TRUST* denotes the social trust index of the province where the listed firms are headquartered based on the Chinese General Social Survey in 2013[5]. *CEI* denotes the environment of business trust in the listed firm's headquarter city[6]. We

[5] One question in this survey is "Generally speaking, how much do you trust strangers?". Respondents can answer "highly untrusted", "untrusted", "so-so", "trusted", or "highly trusted". We first convert these answers to 1, 2, 3, 4, and 5 respectively. Then we calculate the average value by province as a measure of province-level social trust level.

[6] CEI denotes the China Commercial Credit Environment Index, which is a well-known index that measures commercial credit in major cities in China. This index has been compiled in 2010, 2011, 2012, 2015, and 2017. This project is based on economic, financial, and social data, surveys, and interviews to evaluate the commercial trust environment for nearly 300 cities in China. The evaluation system includes release of credit market tools, function of corporate credit management, construction of credit information system, credit supervision of

transform these two measures into dummy variables that equal to one if the business trust level is above medium in each year and zero otherwise. The coefficient of the interaction term $\beta_2$ is expected to be significantly negative if our conjecture holds.

Table 8 reports the results for the role of business trust. The estimated coefficients of *GUATA* are all positively significant at the 1% level, indicating the positive association between external guarantees intensity and stock crash risk. The coefficient of the interaction *GUATA*TRUST* in Column (1) is -0.0023, which is significant at the 1% level. This suggests that social trust attenuates the positive association between external guarantee intensity and stock price crash risk. In Column (2), the interaction *GUATA*CEI* is also negative and significant at the 1% level, indicating that business trust alleviates the adverse correlation between external guarantees and stock price crash risk.

Columns (3) and (4) report similar results when the stock price crash risk is measured by *DUVOL*. The estimated coefficient of interaction *GUATA*TRUST* is positive and significant at the 1% level. The interaction of external guarantees intensity and *CEI* is also negative and significant at the 1% level, which suggests that business trust helps in reducing the positive association between external guarantees and stock price crash risk. Therefore, we get similar results when using different stock price crash risk measures.

Therefore, consistent with our conjecture, the findings in Table 8 demonstrate that high business trust helps alleviate the adverse consequence of external guarantees on stock price crash risk. Strong business trust encourages firms in the guarantee networks to focus on long-term cooperation, strengthening business ties, promoting sustainability of future guarantee activities, thereby reducing the risk of external guarantees.

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government, honesty and integrity in key areas, integrity education, and companies' perception to local market's credit environment.

(Insert Table 8 about here)

## 5.2 The Role of Financial Constraint

The financial constraint of listed firms is closely related to the decision to engage in external guarantee activities. Firms facing financial constraints often fail to obtain endogenous financing, and the funds obtained from daily operations cannot meet their funding needs. These firms exhibit instability in operating cash flow. The guarantee is essentially contingent liability. If such a firm carries out guarantee activities, then it may trigger a greater risk of bankruptcy and prevent the firm from continuing to operate to repay when default, which contributes to huge danger in firm value. Correspondingly, firms facing financial constraints will try to ease financial constraints in the lending market or stock markets through various methods, such as large-scale debt and financing activities, or risky but proffering investment. Such activities will make investors pay more attention to firms' financial activities.

Besides, investors may track the past guarantee information and continuously interpret historical information that may not be reflected in the current stock price. It makes listed firms less trustworthy and firms' operations tend to be viewed negatively. Therefore, we conjecture that the relationship between external guarantees and stock price crash risk is pronounced when the firms are subject to a high degree of financial constraint.

Therefore, we estimate the following panel fixed-effect model to test this conjecture:

$$CRASH_{i,t+1} = \alpha + \beta_1 GUATA_{i,t} + \beta_2 GUATA_{i,t} * FC_{i,t} + \beta_3 FC_{i,t} + \gamma X_{i,t} + \theta_i + \eta_t + \mu_{i,t}, (7)$$

where *FC* denotes two financial constraint measures, namely *CFVOL* and *FCTE*, which reflect the uncertainty in operating cash flow and investment efficiency, respectively.[7]

[7] We do not use HP index (Hadlock and Pierce, 2010) or WW index (Whited and Wu, 2006) as they are based on listed firms in the U.S. and are not suitable for listed firms in China. We suspect the correctness of simply using their estimated coefficients from the US market and applying them to listed firms in China. For example, for

Specifically, *CFVOL* is calculated as the absolute value of the standard deviation of operating cash flow per share scaled by its average value over the last three years. A larger *CFVOL* represents greater financial constraints. *FCTE* denotes the investment efficiency estimated from a stochastic frontier model following Wang (2003) and Greene (2005). A larger *FCTE* denotes greater financial constraints. We transform these two measures into dummy variables that equal to one if the business trust level is above medium in each year and zero otherwise. The coefficient of the interaction term $\beta_2$ is expected to be significantly negative if our conjecture holds.

Table 9 reports the results for the role of financial constraint. The *GUATA* remains positive and statistically significant in most of the specifications. Our variable of interest, the interaction term *GUATA*CFVOL* in Column (1) is positive and significant at the 1% level. The result suggests that uncertainty in firms' operating cash flow exacerbates the association of external guarantee intensity on stock price crash risk. In Column (2), the coefficients of interaction term *GUATA*FCTE* is positive and significant at the 1% level, suggesting that investment inefficiency under financial constraint alleviate the positive correlation between external guarantees intensity and stock price crash risk. The coefficients of *FCTE* is significantly negative, indicating that financial constraint is negatively associated with stock price crash risk.

In Columns (3) and (4), the interaction terms have significantly positive coefficients when using *DUVO*L as the measure for stock price crash risk. This shows that financial constraint strengthens the positive association between external guarantee intensity and stock price crash risk. In other words, listed firms will not be able to repay the debt for the guaranteed party when they face financial constraints once the guaranteed party defaults.

Therefore, the findings in Table 9 demonstrate that the positive association between external guarantee intensity and stock price crash risk is pronounced in firms

guaranteed parties, external guarantees as a financing method are popular in China but is not important in the United States at all.

facing high financial constraints. The findings provide support to the role of financial constraint in exaggerating the contingent payment risk associated with the external guarantee activities.

(Insert Table 9 about here)

### 5.3 The Role of Information Asymmetry

Our previous results have shown that an increase in the solidarity of guarantee relationship, namely, the number of repeated external guarantee deals with a particular counterparty, helps alleviate future stock price crash risk. This implies that a guarantee relationship may reflect the degree of information asymmetry and a stronger relationship can reduce information asymmetry. Evidence of a lack of transparency (Jin and Myers, 2006) and strict accounting disclosure (Hsu et al., 2018) also suggest that information asymmetry plays an important role in driving stock price crashes. Therefore, we conjecture the association between external guarantees intensity and stock price crash risk is pronounced when firms are subject to more information asymmetry.

We estimate the following panel fixed-effect model to test this conjecture:

$$CRASH_{i,t+1} = \alpha + \beta_1 GUATA_{i,t} + \beta_2 GUATA_{i,t} * ASYM_{it} + \beta_3 ASYM_{i,t} + \gamma X_{i,t} + \theta_i + \eta_t + \mu_{i,t}, \quad (8)$$

where *ASYM* denotes information asymmetry measures, namely, *SIZE*, *INSTHOLD*, and *ANA*. First, *SIZE* is defined as the natural logarithm of total assets. Large firms are more visible in the financial market and news media (Bhushan, 1989). Thus, the extent of information asymmetry for large firms tends to be small. Second, *INSTHOLD* denotes the percentage of shares held by institutional investors. The participation of institutional investors also improves the quality of the firm's internal control and operating management, play a monitoring role in investment and financing decisions (Callen and Fang, 2013), resulting in more management disclosure (Boone and White, 2015), and reduced information asymmetry. Finally, *ANA* is the number of analysts covering the firm. The research of the analysts and the release of research reports

produce information directly (Frankel and Li, 2004), helping investors gain access to corporate information with lower cost, and reduce the degree of information asymmetry. The coefficient of the interaction term $\beta_2$ is expected to be significantly negative if our conjecture holds.

Table 10 reports the results for the role of information asymmetry. The estimated coefficients of *GUATA* in all columns are positively significant, indicating the positive associations between external guarantees intensity and stock price crash risk. In Columns (1), the coefficient of the interaction *GUATA*SIZE* is negative and significant at the 5% level. Large firms have more complete corporate governance. Guarantee decision-making has a more complicated and rigorous process. Moreover, there will be more detailed and high-standard risk review and quota control for the guaranteed parties, which reveals more potential risk information hidden in guarantee contracts. Therefore, the size of firms can significantly reduce the negative association between external guarantee activities and stock price crash risk.

In Column (2), the coefficients of the interactions of *GUATA*INSTHOLD* is negatively significant at the 5% level. Similarly, institutional investors have professional financial analysis teams, and they have more detailed and continuous risk analyses on guarantee activities of the listed firms they invest in. Therefore, institutional investors may influence the guarantee decisions of listed firms based on their own more professional risk information, which also restrain stock price crash risk related to guarantee activities.

In Column (3), the coefficient of the interaction *GUATA*ANA* is significantly negative at the 10% level. The same goes for analysts' attention to reduce the negative effects of external guarantee intensity on stock price crash risk. It is just by disclosing risk information in the capital market, putting pressure on listed firms, and making them cautiously choose lower-risk guarantee parties.

The results in Table 10 demonstrate that the reduction of the information transparency helps mitigate the positive association between external guarantee

intensity and the stock price crash risk. Therefore, our empirical evidence provides support to the hypothesis *H3*. Information transparency enables complete disclosure of information in external guarantees, and the risks will not be exposed until loan default, which leads to the stock price crashes.

(Insert Table 10 about here)

### 5.4 Sub-Sample Analyses

In this section, we conduct sub-sample analyses to examine the heterogeneous association between external guarantee intensity and stock price crash risk. First, we divide the samples into two parts based on the ownership nature, i.e., whether they are SOEs or not. SOEs are often considered to receive implicit guarantees from the government as the last resort when they are in financial distress, which offsets the contingent risks brought by the external guarantees. Therefore, we conjecture that the positive relationship between external guarantees and stock price crash risk is pronounced in non-SOE firms.

Second, we divide the sample into two parts based on the median level of the Shanghai Interbank Offered Rate (Shibor) to see how the relationship is dependent on the cost of debt financing. Low cost of debt helps relieve firms' debt burden and reduces the risk associated with external guarantee activities. However, the increase in the interest rate implies increasing financing costs and stricter loan requirements of financial institutions. Therefore, listed firms are more likely to provide external guarantees while bearing the risk of loan default. Therefore, we conjecture that external guarantee intensity is positively associated with stock price crash risk during the period with a high cost of debt.

Finally, we explore the heterogeneous association between external guarantees and stock price crash risk corresponding to financial development level in the region where listed firms are headquartered. In particular, we divide the sample into two parts based on the median level of the financial development index in the region. In regions with a

low level of financial development, external guarantees play an important role in financing activities that comprehensive credit history and social ties help strengthen the guarantee relationship. Therefore, the quality of the guaranteed parties is certified through a long-term screening mechanism, thus the guarantee risk of guarantors is reduced. By contrast, in regions with a high level of financial development, firms have pervasive access to financing through banks or other financial institutions (Guiso et al., 2004). Therefore, firms that choose external guarantees may have higher operating risks, and they have to seek third-party guarantees due to financial exclusion, resulting in higher future repayment risk. Therefore, we conjecture that the positive association between external guarantee intensity and stock price crash risk is pronounced in regions with high financial development.

Table 11 reports the regression results. According to Columns (1) and (2), the estimated coefficient of *GUATA* for the non-SOE sample in Column (2) is positive with a coefficient of 0.0028, which is significant at the 1% level, whereas it is not significant for SOEs in Column (1). Therefore, newly-formed external guarantees of non-SOE are positively correlated with the firm's stock price crash risk, but the impact is absent in SOEs. This is because financial constraints faced by non-SOE is often more severe. Indirect financing represented by banks requires borrowers to seek external guarantees to increase their repayment probability to ensure the security of lenders' funds. Due to the requirements of lenders, listed firms of non-SOE will guarantee each other to form a guarantee network, while risks cannot be ruled out in external guarantees decisions from this contagious network.

Columns (3) and (4) report the sub-sample results of the cost of debt. The estimated coefficient for the high cost of debt sample in Column (4) is 0.0041, which is significant at the 1% level, while there is no similar result for the period of the low cost of debt in Column (3). The results show that when the Shibor is relatively high, the newly-formed external guarantees amount is positively associated with stock price crash risk at the 1% level, while the newly-formed external guarantees do not have a

significant impact when Shibor is low. This is because listed firms bear high pressure of capital supply when Shibor is high, and the probability of loss caused by the guarantee contract will increase accordingly. The same level of loss conduces to a greater risk of bankruptcy for the firms.

From the financial development level, the estimated coefficient of *GUATA* in Column (6) is positive of 0.0018 with a *t*-statistic of 2.29, which is significant at the 5% level, whereas no similar pattern exists in Column (5) with a low financial development level. The result suggests that in regions with a high level of financial development, new external guarantees are related to future stock price crash risk.

Therefore, we conclude that the positive association between external guarantees intensity and stock price crash risk only happens in non-SOE, during the period of low loan costs, and regions with low financial development level.

(Insert Table 11 about here)

## 6. Why Do Firms Engage in External Guarantees?

As the widely existed tradition in China, banks usually urge non-quality debtors to seek guarantors for their loans. Therefore, considering the baneful association of external guarantees with future stock price crash risk, the listed firm must secure benefits from the relationship of external guarantees when shouldering the default risk transferred by banks from guaranteed parties. One possible explanation is the increased access to external financing by consolidated bank-firm relationships. Guarantee contracts help listed firms maintain a sustainable business relationship with banks, which may help them gain access to future bank loan financing (Petersen and Rajan, 1994; Blackwell and Winters, 1997). Additionally, firms' demand for loans may also proliferate because of involvement in external guarantees. They have a high demand to apply for loans from banks when realizing how the bank-firm connection in external guarantees will facilitate the loan application process.

Another explanation is the potential tunneling behaviors of managers through external guarantees. Related parties will exploit external guarantees to tunneling (Berkman et al., 2009) and achieve personal interest at the cost of shareholders. However, with the concern that listed firms maintain sustainable relationships with banks, they will rely less on business relationships with related partners in financial need of interim funds (Jian and Wong, 2010), which is generally regarded as tunneling by investors and will impair firm value (Cheung et al., 2006). Therefore, we conjecture that the external guarantee activities tend to consolidate bank-firm relationships and reduce firms' dependence on related-party transactions, and thus our study may support the bank financing hypothesis rather than the tunneling hypothesis.

We construct two measures to quantify the bank financing channel. The first measure *LOAN* is a dummy variable that equals one if the firm obtains any loan from banks in the subsequent year and zero otherwise. The second measure *MAXLOAN* is the logarithm of one plus max loan amount authorized by the banks. We also construct two measures for tunneling behaviors. In particular, *RELATE* measures the dependence of listed firms on related-party transactions calculated as the ratio of related transactions excluding those for commodity trading. *TUNNEL* is defined as the other receivables scaled by total assets in the last year (Jiang et al., 2010).

Table 12 presents the economic incentives for Chinese listed firms to engage in external guarantees. The estimated coefficients of *GUATA* in Column (1) is positive with a *t*-statistic of 8.40, which is significant at the 1% level. The result suggests that large external guarantees intensity is associated with a great probability of obtaining bank loans in the subsequent period. The result of Column (2) also demonstrates that external guarantees intensity is positively correlated with the maximum amount of authorized bank loans, which is beneficial to the financing demand of listed firms in liquidity shortage. In Column (3), the coefficient of external guarantees intensity is negative and significant at the 5% level. The result shows that listed firms rely less on related-party transactions when they engage in external guarantee activities. It suggests

that external guarantees may alleviate potential tunneling behaviors of controlling shareholders and reduce agency issues due to enhanced firm-bank relationship. However, the coefficient of *GUATA* in Column (4) is insignificant, suggesting that the tunneling effect through external guarantees may not exit in our research.

In sum, we study the incentives of the listed firms to engage in external guarantees and find that the engagement in external guarantees improves the bank-firm relationship and alleviates their dependence on related-party transactions. The beneficial effects of future financing access propel Chinese listed firms to engage in external guarantee activities while bearing the repayment obligations in the default of the guaranteed party. Therefore, our findings support the bank financing hypothesis of external guarantees.

(Insert Table 12 about here)

# 7. Robustness Checks

## 7.1 Alternative Model Specifications

We examine the robustness of our primary findings with different model specifications. First, we exclude from our sample the financial crisis from 2015 to 2016 to reduce the impact of the stock market crashes in China. Under extreme market conditions, the stock price crashes may not be driven by external guarantees activities but rather the result of market panic or financial contagion. Second, we use an alternative industry classification according to the "Guidelines for the Classification of Listed Companies" released by the China Securities Regulatory Commission in 2001, which contains more detailed sub-industries. In addition, we consider the cumulative amount of external guarantees instead of newly-formed external guarantees as the main explanatory variable. The accumulation of external guarantees reflects the overall extent of contingent liabilities (Liu and Zheng, 2005). Therefore, we conjecture that the cumulative external guarantees are positively associated with stock price crash risk.

Table 13 reports the relevant regression results with alternative model

specifications. The association between external guarantees intensity and stock price crash risk remains quantitatively similar under alternative sample period and model specifications. Specifically, the results of Columns (1) and (2) show that even in the non-crisis period or with alternative industry fixed effects, the external guarantees intensity is still positively associated with stock price crash risk. Therefore, our results are not likely driven by financial crisis or industry classifications. Similarly, the coefficients of accumulative guarantees intensity *AGUA* in Columns (3) and (4) are also positive and significant at the 1% level. The results show that accumulative guarantee intensity is also positively associated with stock price crash risk. Accumulative guarantee intensity reflects the overall extent of contingent liabilities and risk of external guarantees, which may contribute to the future stock price crash risk. Therefore, our results are robust to an alternative measure of external guarantees intensity incorporating historical guarantee information.

(Insert Table 13 about here)

### 7.2 High-Risk Guarantees

We investigate the association between several high-risk external guarantees and stock price crash risk. As we have shown, external guarantees intensity is positively correlated with stock price crash risk. However, our measure of external guarantees includes those with superior risk management or internal control. In this section, we focus on high-risk guarantee contracts, and conjecture that guarantees that greatly exceed solvency, guarantees to high-risk firms, and guarantees to related parties will exacerbate firms' future stock price crash risk.

To test this hypothesis, we construct three measures of high-risk guarantees, including *GUAHDCO*, *GUASHLD,* and *GUA50T*. First, if the guaranteed parties have high financial leverage and rely on guarantees to obtain funds and maintain firm operation, such guarantees tend will bring excessive risk to the listed firms. Our second measure *GUAHDCO* is defined as the number of external guarantees provided directly

or indirectly to the guaranteed parties with a debt-to-asset ratio over 70% scaled by total assets.

Second, from the perspective of the relationship between guarantors and guaranteed parties, external guarantees with major shareholders or related parties bring potential conflict of interests and weaken internal control. Our last measure of high-risk guarantees *GUASHLD* is the number of external guarantees provided to ultimate controlling shareholders and their related parties scaled by total assets.

Finally, aggressive guarantee activities bring great contingent debt obligations to the listed firms, and the relative size of external guarantees reflects such repayment risk. Thus, our first measure *GUA50T* is defined as the number of external guarantees exceeding 50% of the net assets of the listed firms scaled by total assets.

Table 14 reports the relevant regression results. We find that different types of high-risk guarantees all have a significant and positive association with stock price crash risk. The result in Column (1) shows that providing guarantees to the counterparty in financial distress is positively associated with stock price crash risk. This is due to the insufficient solvency of the guaranteed party, which leads to an increase in the repayment risk borne by the listed firms. Column (2) focuses on the guarantees provided to the ultimate controlling shareholders and related parties. The estimated coefficient of *GUASHLD* is 0.0017 and significant at the 1% level. The result suggests that the screening and monitoring incentives of the listed firms might be weakened due to the conflict of interests, thus the default risk of the guaranteed party increases substantially. Therefore, the external guarantees to ultimate controlling shareholders and related parties are associated with high stock price crash risk.

Column (3) focuses on the situation of over-guarantee, that is, the guarantee amount exceeding 50% of its net assets. Because listed firms have carried out a large number of external guarantees, they have formed too many contingent liabilities, laying down hidden dangers for the future release of negative information and causing stock prices to collapse. Column (4) includes the three types of high-risk guarantees in the

regression model and the result shows that the positive association between various high-risk guarantees and stock price crash risk cannot be subsumed by each other. Thus, different types of high-risk guarantees play an independent role in affecting the stock price crash risk.

Therefore, we find that high-risk guarantees are also positively associated with stock price crash risk. The results are consistent with our conjecture that high-risk guarantees bring excess risk to the listed firms, resulting in increased stock price crash risk in the future.

(Insert Table 14 about here)

# 8. Conclusions

External guarantees have become increasingly popular among Chinese listed firms over the past decade. External guarantees provide financing support to the counterparty amid financing activities. However, compared to the tremendous size of the guarantee market, relatively little attention has been paid to the economic consequences of external guarantees, especially in terms of financial risk brought by these activities. Our study fills in the gap of the literature by shedding light on the association between external guarantees intensity and stock price crash risk for listed firms in China. To our best knowledge, this study is the first to provide empirical evidence concerning the unique financing phenomenon in China. We also apply multi-dimensional analyses on the risks of external guarantees from the perspective of guarantee modes and clientele relationships. Moreover, the examination of the role of business trust, financial constraints, and information asymmetry help understand the heterogeneous association between external guarantees and stock price crash risk.

We find that external guarantee intensity is significantly and positively associated with stock price crash risk. The potential endogeneity concerns are addressed using propensity score matching, instrumental variable regression, and the Heckman selection

model. Also, stock price crash risk increases with repayment responsibilities of the listed firms. By contrast, the solid guarantee relationship helps attenuate the positive association between external guarantees intensity and stock price crash risk. Further analysis shows that while the positive association is attenuated by business trust, it is pronounced in firms facing financial constraints and information asymmetry. Moreover, the positive association between external guarantees intensity and stock price crash risk is more pronounced in non-SOE, during the period of low loan costs, and regions with higher financial development. Listed firms engage in external guarantees to increase the probability and volume of bank loans and reduce dependence on related-party transactions. Our findings are robust to alternative measures of external guarantees and model specifications.

Our findings provide regulatory insights for preventing systematic risks in the financial market. First, our findings demonstrate that first-time guarantees, unsecured guarantee modes, and high-risk guarantees deserve intensive regulatory attention. Detailed information disclosure for external guarantees involving these types of deals should be mandated. Meanwhile, authorities can issue regulatory warnings to high-risk guarantees. Moreover, our empirical evidence calls on listed firms to strengthen screening and monitoring on guarantee contracts and reduce the information asymmetry between two parties. Future policies should propose to mandate detailed disclosure of external guarantees contracts to reduce systematic financial risk and protect the right of minority shareholders. Given the limited disclosure of financial information and corporate governance of the guaranteed parties, how the managerial incentives and characteristics of guaranteed parties contribute to the decision of external guarantees will be our future research topic.

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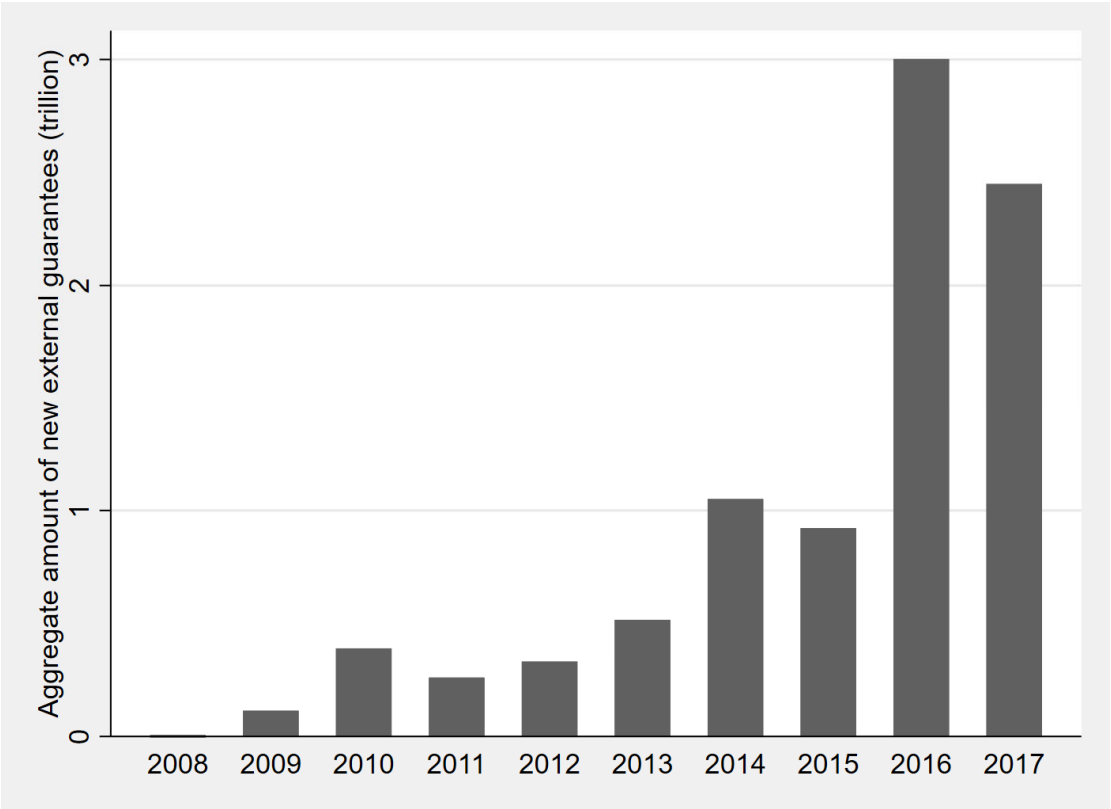


**Figure 1. Aggregate Amount of Newly-Formed External Guarantees**

Figure 1 presents the aggregate amount of newly-formed external guarantees of Chinese non-financial listed firms from 2008 to 2017.

## Table 1. Descriptive Statistics

This table presents the summary statistics and variable correlations between variables in the sample of A-share non-financial listed firms from 2008 to 2017. The measures for stock price crash risk include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly stock return. *DUVOL* is the upper and lower volatility, that is, the logarithm of the standard deviation of the firm's weekly stock return during the falling week and the rising week. The measure for external guarantees *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors).

Panel A：Summary statistics

| | Mean | S.D. | Q5 | Q25 | Median | Q75 | Q95 | N |
|---|---|---|---|---|---|---|---|---|
| NCSKEW | -0.274 | 0.699 | -1.545 | -0.662 | -0.223 | 0.168 | 0.811 | 21,887 |
| DUVOL | -0.189 | 0.497 | -1.039 | -0.515 | -0.182 | 0.152 | 0.623 | 21,887 |
| GUATA | 0.096 | 4.779 | 0.000 | 0.000 | 0.000 | 0.016 | 0.148 | 23,700 |
| SIZE | 95.658 | 230.333 | 5.646 | 13.140 | 28.527 | 70.589 | 387.768 | 23,699 |
| AGE | 15.265 | 5.506 | 6.000 | 11.000 | 15.000 | 19.000 | 24.000 | 23,700 |
| LEV | 0.439 | 0.222 | 0.098 | 0.261 | 0.431 | 0.607 | 0.808 | 23,696 |
| ROA | 0.038 | 0.057 | -0.053 | 0.014 | 0.037 | 0.066 | 0.124 | 23,698 |
| MTB | 2.385 | 2.217 | 0.375 | 0.949 | 1.726 | 3.029 | 6.702 | 22,976 |
| DTURN | -0.004 | 0.048 | -0.081 | -0.024 | -0.003 | 0.015 | 0.073 | 21,704 |
| RET | -0.001 | 0.001 | -0.004 | -0.002 | -0.001 | -0.001 | -0.000 | 21,887 |
| SIGMA | 0.051 | 0.021 | 0.024 | 0.036 | 0.047 | 0.060 | 0.091 | 21,887 |
| ABACC | 0.077 | 0.086 | 0.005 | 0.023 | 0.051 | 0.098 | 0.242 | 22,081 |
| INSTHOLD | 0.051 | 0.047 | 0.003 | 0.014 | 0.036 | 0.073 | 0.147 | 20,001 |

Panel B: Pearson correlation matrix

| | NCSKEW | DUVOL | GUATA | SIZE | AGE | ROA | LEV | MTB |
|---|---|---|---|---|---|---|---|---|
| NCSKEW | 1.00 | | | | | | | |
| DUVOL | 0.88*** | 1.00 | | | | | | |
| GUATA | 0.01 | 0.01 | 0.01 | 1.00 | | | | |
| SIZE | -0.14*** | -0.16*** | -0.09*** | -0.01** | 1.00 | | | |
| AGE | -0.06*** | -0.06*** | -0.03*** | 0.01 | 0.16*** | 1.00 | | |
| ROA | 0.01 | -0.01 | 0.02*** | 0.00 | 0.01** | -0.11*** | 1.00 | |
| LEV | -0.06*** | -0.07*** | -0.05*** | -0.01 | 0.41*** | 0.20*** | -0.41*** | 1.00 |
| MTB | 0.07*** | 0.05*** | 0.07*** | 0.01** | -0.52*** | -0.03*** | 0.20*** | -0.38*** |

## Table 2. External Guarantees and Stock Price Crash Risk

This table presents the association between newly-formed external guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. The dependent variables include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | NCSKEW | | | DUVOL | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| GUATA | 0.0041*** | 0.0039*** | 0.0030*** | 0.0036*** | 0.0035*** | 0.0029*** |
| | (6.70) | (5.12) | (3.38) | (4.46) | (3.94) | (2.64) |
| SIZE | -0.0615*** | -0.0474*** | -0.0478*** | -0.0532*** | -0.0454*** | -0.0444*** |
| | (-10.12) | (-7.54) | (-6.99) | (-12.32) | (-10.00) | (-9.15) |
| AGE | -0.0034*** | -0.0035*** | -0.0045*** | -0.0024*** | -0.0023*** | -0.0033*** |
| | (-2.90) | (-3.00) | (-3.62) | (-2.84) | (-2.65) | (-3.69) |
| LEV | 0.0376 | 0.0162 | 0.0076 | -0.0152 | -0.0267 | -0.0221 |
| | (1.07) | (0.45) | (0.21) | (-0.60) | (-1.04) | (-0.86) |
| ROA | 0.1886 | 0.1885 | 0.2599** | 0.0364 | 0.0398 | 0.0921 |
| | (1.54) | (1.55) | (2.15) | (0.42) | (0.46) | (1.07) |
| MTB | 0.0299*** | 0.0301*** | 0.0192*** | 0.0181*** | 0.0180*** | 0.0111*** |
| | (7.64) | (7.61) | (4.56) | (6.64) | (6.48) | (3.78) |
| DTURN | -0.3829*** | -0.3436** | -0.3224* | -0.3001*** | -0.2662*** | -0.1409 |
| | (-2.75) | (-2.47) | (-1.93) | (-3.11) | (-2.75) | (-1.19) |
| RET | 74.9474*** | 68.4038*** | 35.5418* | 59.5112*** | 55.9687*** | 43.4318*** |
| | (3.61) | (3.32) | (1.69) | (4.21) | (3.98) | (3.00) |
| SIGMA | 4.8557*** | 4.2413*** | 4.6595*** | 3.1151*** | 2.7210*** | 4.0246*** |
| | (3.79) | (3.36) | (3.54) | (3.57) | (3.14) | (4.39) |
| ABACC | 0.1091 | 0.1490** | 0.0938 | 0.0737 | 0.0985* | 0.0443 |
| | (1.58) | (2.09) | (1.30) | (1.50) | (1.94) | (0.87) |
| INSTHOLD | 1.5320*** | 1.3844*** | 1.3398*** | 0.9411*** | 0.8577*** | 0.8322*** |
| | (12.83) | (11.61) | (11.27) | (11.03) | (10.10) | (9.85) |
| NCSKEW | 0.0425*** | 0.0326*** | 0.0623*** | 0.0274*** | 0.0215*** | 0.0460*** |
| | (4.87) | (3.81) | (7.23) | (4.43) | (3.51) | (7.50) |
| Firm FE | N | Y | Y | N | Y | Y |
| Year FE | N | N | Y | N | N | Y |
| Observations | 14,666 | 14,666 | 14,666 | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.05 | 0.06 | 0.09 | 0.05 | 0.06 | 0.09 |

## Table 3. Instrumental Variable Regression

This table presents the results of instrumental variable regression on the association between newly-formed external guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. We use two instrumental variables from the perspective of the guaranteeing and the guaranteed party, respectively. The first one *GUA-MEAN* is the average value of the amount of the external guarantee of one listed firm in the same industry and the same life cycle except itself. The second instrumental variable *GUA-CENTER* is the mean value of the natural logarithm of the distance between the guaranteed party and its city center. The dependent variables include *GUATA*, *NCSKEW*, and *DUVOL* in Columns (1)-(3) respectively. *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. *NCSKEW* and *DUVOL* are measures of stock price crash risk. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | First stage | Second stage | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | GUATA | NCSKEW | DUVOL |
| GUA-MEAN | 1.6152*** | | |
| | (28.27) | | |
| GUA-CENTER | 0.0161** | | |
| | (2.50) | | |
| GUATA | | 0.0042* | 0.0047*** |
| | | (1.80) | (2.59) |
| SIZE | -0.0209** | -0.0478*** | -0.0444*** |
| | (-2.56) | (-6.98) | (-9.14) |
| AGE | -0.0005 | -0.0045*** | -0.0033*** |
| | (-0.19) | (-3.62) | (-3.69) |
| LEV | -0.0332 | 0.0076 | -0.0222 |
| | (-0.45) | (0.21) | (-0.86) |
| ROA | -0.1698 | 0.2601** | 0.0924 |
| | (-0.95) | (2.15) | (1.08) |
| MTB | -0.0108 | 0.0192*** | 0.0111*** |
| | (-1.55) | (4.56) | (3.78) |
| DTURN | 0.2416 | -0.3223* | -0.1408 |
| | (0.95) | (-1.93) | (-1.19) |
| RET | -45.6298** | 35.5210* | 43.4026*** |
| | (-2.10) | (1.69) | (3.00) |
| SIGMA | -3.1936** | 4.6581*** | 4.0228*** |
| | (-1.96) | (3.53) | (4.39) |
| ABACC | 0.0525 | 0.0939 | 0.0445 |
| | (0.53) | (1.30) | (0.87) |
| INSTHOLD | -0.1955 | 1.3399*** | 0.8323*** |
| | (-1.49) | (11.27) | (9.85) |
| NCSKEW | 0.0126 | 0.0623*** | 0.0460*** |
| | (1.21) | (7.23) | (7.51) |
| Firm FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 17,373 | 14,666 | 14,666 |
| Number of Firms | 2,836 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.94 | 0.04 | 0.04 |
| *F*-Statistics | 67.74 | 46.46 | 46.57 |

## Table 4. Propensity Score Matching

This table presents details of PSM. Panel A reports the *t*-test differences between treatment and control groups. Panel B reports the association between newly-formed external guarantee intensity and stock price crash risk for a matched sample of Chinese non-financial A-share listed firms from 2008 to 2017. The treatment group consists of firms having above-median external guarantee intensity within the industry each year, and the rest of the firms are defined as the control group. We perform a 1:1 nearest neighbor matching technique without replacement. The matching covariates are the same set of control variables. The dependent variables include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Balance of Matching Covariates

| | Sample | Control | Treatment | Diff | T-stats |
|---|---|---|---|---|---|
| SIZE | Full | 21.74 | 22.31 | -0.56 | -32.39 |
| | Matched | 22.37 | 22.36 | 0.01 | 0.48 |
| AGE | Full | 14.75 | 16.28 | -1.53 | -20.52 |
| | Matched | 16.10 | 16.12 | -0.02 | -0.25 |
| LEV | Full | 0.40 | 0.51 | -0.10 | -36.53 |
| | Matched | 0.50 | 0.49 | 0.01 | 2.52 |
| ROA | Full | 0.04 | 0.03 | 0.02 | 19.61 |
| | Matched | 0.03 | 0.04 | -0.00 | -1.93 |
| MTB | Full | 2.62 | 1.92 | 0.69 | 24.50 |
| | Matched | 1.91 | 1.94 | -0.04 | -1.13 |
| DTURN | Full | -0.00 | -0.00 | -0.00 | -2.43 |
| | Matched | -0.00 | -0.00 | 0.00 | 0.48 |
| RET | Full | -0.00 | -0.00 | -0.00 | -11.70 |
| | Matched | -0.00 | -0.00 | -0.00 | -1.50 |
| SIGMA | Full | 0.05 | 0.05 | 0.00 | 12.21 |
| | Matched | 0.05 | 0.05 | 0.00 | 1.59 |
| ABACC | Full | 0.08 | 0.07 | 0.01 | 4.82 |
| | Matched | 0.07 | 0.07 | -0.00 | -0.48 |
| INSTHOLD | Full | 0.05 | 0.05 | -0.00 | -1.75 |
| | Matched | 0.05 | 0.05 | 0.00 | 1.43 |

Panel B: Matched Sample

| | NCSKEW | | | DUVOL | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| GUATA | 0.0037*** | 0.0037*** | 0.0034*** | 0.0037*** | 0.0038*** | 0.0038*** |
| | (5.67) | (5.16) | (4.17) | (5.51) | (5.84) | (5.08) |
| SIZE | -0.0680*** | -0.0552*** | -0.0507*** | -0.0579*** | -0.0515*** | -0.0473*** |
| | (-7.64) | (-5.88) | (-5.06) | (-9.22) | (-7.67) | (-6.74) |
| AGE | -0.0068*** | -0.0062*** | -0.0059*** | -0.0042*** | -0.0036*** | -0.0037*** |
| | (-4.00) | (-3.48) | (-3.20) | (-3.43) | (-2.79) | (-2.77) |
| LEV | 0.1155** | 0.1112** | 0.0963 | 0.0369 | 0.0290 | 0.0247 |
| | (2.13) | (1.96) | (1.62) | (0.94) | (0.72) | (0.58) |
| ROA | 0.3797** | 0.3778** | 0.3879** | 0.1322 | 0.1274 | 0.1307 |
| | (2.10) | (2.07) | (2.12) | (1.02) | (0.96) | (0.99) |
| MTB | 0.0215*** | 0.0203*** | 0.0156** | 0.0090* | 0.0076 | 0.0045 |
| | (3.11) | (2.86) | (2.14) | (1.86) | (1.53) | (0.88) |
| DTURN | -1.0673*** | -1.0408*** | -0.6310*** | -0.7780*** | -0.7550*** | -0.2603 |
| | (-5.27) | (-5.11) | (-2.64) | (-5.40) | (-5.24) | (-1.53) |
| RET | 93.0427*** | 90.0588*** | 49.9500 | 78.2579*** | 75.8248*** | 54.7974** |
| | (3.00) | (2.91) | (1.58) | (3.72) | (3.58) | (2.54) |
| SIGMA | 7.5148*** | 7.2095*** | 6.3356*** | 5.5366*** | 5.3104*** | 5.4008*** |
| | (4.00) | (3.82) | (3.26) | (4.32) | (4.10) | (4.05) |
| ABACC | 0.1055 | 0.1570 | 0.1067 | 0.0972 | 0.1367* | 0.0836 |
| | (1.00) | (1.42) | (0.95) | (1.25) | (1.67) | (1.02) |
| INSTHOLD | 1.5113*** | 1.3884*** | 1.3140*** | 0.9084*** | 0.8353*** | 0.7799*** |
| | (8.69) | (7.89) | (7.47) | (7.39) | (6.72) | (6.28) |
| NCSKEW | 0.0414*** | 0.0306** | 0.0509*** | 0.0292*** | 0.0228** | 0.0401*** |
| | (3.25) | (2.44) | (4.06) | (3.26) | (2.57) | (4.50) |
| Firm FE | N | Y | Y | N | Y | Y |
| Year FE | N | N | Y | N | N | Y |
| Observations | 6,920 | 6,920 | 6,920 | 6,813 | 6,813 | 6,813 |
| Adjusted $R^2$ | 0.06 | 0.06 | 0.08 | 0.05 | 0.06 | 0.08 |

## Table 5. Heckman Selection Model

This table presents the results of the Heckman selection model on the association between newly-formed external guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. Column (1) reports the first-stage regression. *GUA* is a dummy variable that equals one if the firm conducts any external guarantee and zero otherwise. The dependent variables in Columns (2)-(5) include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). *IMR* is the inverse Mills ratio estimated from the first-stage Probit regression. All regressions include firm and year fixed effects. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | GUA | NCSKEW | NCSKEW | DUVOL | DUVOL |
| GUATA | | 0.0036*** | 0.0029*** | 0.0032*** | 0.0029*** |
| | | (5.12) | (3.35) | (3.82) | (2.62) |
| SIZE | 0.0245 | -0.0556*** | -0.0511*** | -0.0546*** | -0.0474*** |
| | (1.10) | (-8.15) | (-6.90) | (-11.16) | (-8.86) |
| AGE | -0.0057 | -0.0045*** | -0.0035** | -0.0033*** | -0.0024** |
| | (-1.38) | (-3.70) | (-2.28) | (-3.80) | (-2.17) |
| LEV | 1.2530*** | -0.0631 | -0.2053 | -0.1158*** | -0.2169 |
| | (11.47) | (-1.50) | (-1.05) | (-3.87) | (-1.52) |
| ROA | -0.2530 | 0.2741** | 0.3007** | 0.1361 | 0.1295 |
| | (-0.78) | (2.22) | (2.39) | (1.54) | (1.43) |
| MTB | -0.0741*** | 0.0338*** | 0.0327** | 0.0221*** | 0.0234** |
| | (-6.41) | (8.52) | (2.58) | (7.92) | (2.51) |
| DTURN | 0.1076 | -0.3633*** | -0.3428** | -0.2883*** | -0.1597 |
| | (0.40) | (-2.61) | (-2.04) | (-2.98) | (-1.34) |
| RET | 51.6799 | 69.6547*** | 27.6276 | 57.3749*** | 36.1933** |
| | (1.31) | (3.38) | (1.23) | (4.08) | (2.35) |
| SIGMA | 6.7872** | 3.9977*** | 3.5549** | 2.4472*** | 3.0144*** |
| | (2.53) | (3.16) | (2.13) | (2.83) | (2.58) |
| ABACC | -0.4401*** | 0.2002*** | 0.1657* | 0.1560*** | 0.1101 |
| | (-2.95) | (2.73) | (1.74) | (3.00) | (1.59) |
| INSTHOLD | 0.3720 | 1.3878*** | 1.2756*** | 0.8615*** | 0.7735*** |
| | (1.12) | (11.63) | (9.79) | (10.15) | (8.32) |
| NCSKEW | | 0.0330*** | 0.0620*** | 0.0220*** | 0.0457*** |
| | | (3.85) | (7.20) | (3.58) | (7.46) |
| IMR | | -0.1263*** | -0.2531** | -0.1419*** | -0.2315** |
| | | (-3.68) | (-2.12) | (-5.75) | (-2.19) |
| Firm FE | Y | Y | Y | Y | Y |
| Year FE | Y | N | Y | N | Y |
| Observations | 15,144 | 14,666 | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,680 | 2,657 | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | | 0.06 | 0.09 | 0.06 | 0.09 |

## Table 6. Consequences of Different Modes of External Guarantees

This table presents the association between different guarantee modes and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. The dependent variable *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *PROPERTY* is the actual guarantee amount of mortgage, hypothecation, lien, and deposit guarantee over total assets; *PROMISE* is the actual general guarantee amount over total assets. *GUARANTEE* is the actual amount of maximum guarantee and joint responsibility guarantee over total assets. Other control variables are as follows. *SIZE* is the natural logarithm of the firm's market value; *AGE* is the number of years since the firm was founded; *ROA* is the return on total assets; *LEV* is the total liabilities divided by total assets; *MTB* is the market-to-book ratio; *DTURN* is the change in annual average monthly turnover rate; *RET* is the average stock return within the year; *SIGMA* is the standard deviation of stock return within the year; *ABACC* is the absolute value of manipulated accrual earning, and *INSTHOLD* is the institutional shareholding ratio. All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust t statistics clustered by firm and year are reported in parentheses. ***, ** and * indicate significant at the levels of 1%, 5% and 10%, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| PROPERTY | -0.3197 | | |
| | (-0.99) | | |
| PROMISE | | 0.0044*** | |
| | | (9.05) | |
| GUARANTEE | | | 0.0014** |
| | | | (2.03) |
| SIZE | -0.0481*** | -0.0478*** | -0.0478*** |
| | (-7.02) | (-6.98) | (-6.99) |
| AGE | -0.0044*** | -0.0045*** | -0.0045*** |
| | (-3.58) | (-3.61) | (-3.63) |
| LEV | 0.0083 | 0.0076 | 0.0077 |
| | (0.23) | (0.21) | (0.21) |
| ROA | 0.2576** | 0.2596** | 0.2595** |
| | (2.13) | (2.15) | (2.15) |
| MTB | 0.0192*** | 0.0191*** | 0.0192*** |
| | (4.59) | (4.56) | (4.56) |
| DTURN | -0.3208* | -0.3218* | -0.3227* |
| | (-1.92) | (-1.93) | (-1.93) |
| RET | 35.3727* | 35.5205* | 35.5887* |
| | (1.68) | (1.69) | (1.69) |
| SIGMA | 4.6498*** | 4.6577*** | 4.6626*** |
| | (3.53) | (3.53) | (3.54) |
| ABACC | 0.0928 | 0.0937 | 0.0935 |
| | (1.29) | (1.30) | (1.30) |
| INSTHOLD | 1.3392*** | 1.3398*** | 1.3394*** |
| | (11.27) | (11.27) | (11.27) |
| NCSKEW | 0.0622*** | 0.0623*** | 0.0623*** |
| | (7.23) | (7.24) | (7.23) |
| Firm FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 |

## Table 7. Differential Consequences of Guarantee Relationship

This table presents the association between guarantee relationships and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. We construct three explanatory variables to measure the guarantee relationship between the listed firms and the guaranteed parties. Specifically, *NEWGUA* is the actual guarantee amount that has been guaranteed by the firm for the first time scaled by total assets; *MIDREPEAT* is the actual guarantee amount that has been guaranteed by the firm for 1 to 3 times during the year scaled by total assets, and *HIGHREPEAT* is the actual guarantee amount that is guaranteed by the firm for 4 or more times scaled by total assets. The dependent variable *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| NEWGUA | 0.0140*** | | |
| | (3.63) | | |
| MIDREPEAT | | 0.0031** | |
| | | (2.44) | |
| HIGHREPEAT | | | 0.0804 |
| | | | (0.40) |
| SIZE | -0.0478*** | -0.0478*** | -0.0477*** |
| | (-6.98) | (-6.99) | (-6.98) |
| AGE | -0.0045*** | -0.0045*** | -0.0045*** |
| | (-3.61) | (-3.62) | (-3.62) |
| LEV | 0.0075 | 0.0078 | 0.0062 |
| | (0.21) | (0.21) | (0.17) |
| ROA | 0.2598** | 0.2598** | 0.2602** |
| | (2.15) | (2.15) | (2.15) |
| MTB | 0.0191*** | 0.0191*** | 0.0192*** |
| | (4.56) | (4.56) | (4.57) |
| DTURN | -0.3219* | -0.3225* | -0.3231* |
| | (-1.93) | (-1.93) | (-1.94) |
| RET | 35.5319* | 35.5553* | 35.5142* |
| | (1.69) | (1.69) | (1.69) |
| SIGMA | 4.6580*** | 4.6605*** | 4.6581*** |
| | (3.53) | (3.54) | (3.54) |
| ABACC | 0.0937 | 0.0937 | 0.0941 |
| | (1.30) | (1.30) | (1.31) |
| INSTHOLD | 1.3397*** | 1.3397*** | 1.3391*** |
| | (11.27) | (11.27) | (11.26) |
| NCSKEW | 0.0623*** | 0.0623*** | 0.0623*** |
| | (7.23) | (7.23) | (7.23) |
| Firm FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 |

## Table 8. The Role of Business Trust

This table presents the association between newly-formed external guarantee intensity and stock price crash risk corresponding to business trust for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. We use *TRUST* and *CEI* to measure the firm's degree of business trust. *TRUST* is the social trust measure in the firm's located province based on a survey conducted by the Chinese General Social Survey in 2013. *CEI* measures the environment of commercial trust in the firm's located city. We transform these two measures into dummy variables that equal to one if the business trust level is above medium in each year and zero otherwise. The dependent variables include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | NCSKEW | | DUVOL | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| GUATA | 0.0040*** | 0.0043*** | 0.0042*** | 0.0045*** |
| | (8.24) | (8.21) | (9.97) | (13.03) |
| GUATA*TRUST | -0.0023*** | | -0.0029*** | |
| | (-3.07) | | (-4.56) | |
| GUATA*CEI | | -0.0030*** | | -0.0035*** |
| | | (-3.11) | | (-4.60) |
| TRUST | -0.0051 | | -0.0100 | |
| | (-0.46) | | (-1.28) | |
| CEI | | -0.0095 | | 0.0014 |
| | | (-0.83) | | (0.17) |
| SIZE | -0.0478*** | -0.0474*** | -0.0444*** | -0.0445*** |
| | (-6.98) | (-6.95) | (-9.13) | (-9.18) |
| AGE | -0.0044*** | -0.0044*** | -0.0032*** | -0.0033*** |
| | (-3.57) | (-3.60) | (-3.59) | (-3.68) |
| LEV | 0.0071 | 0.0068 | -0.0232 | -0.0221 |
| | (0.20) | (0.19) | (-0.90) | (-0.86) |
| ROA | 0.2561** | 0.2577** | 0.0848 | 0.0924 |
| | (2.11) | (2.13) | (0.98) | (1.08) |
| MTB | 0.0191*** | 0.0193*** | 0.0110*** | 0.0110*** |
| | (4.55) | (4.61) | (3.75) | (3.76) |
| DTURN | -0.3211* | -0.3223* | -0.1386 | -0.1405 |
| | (-1.92) | (-1.93) | (-1.17) | (-1.19) |
| RET | 35.6258* | 35.6509* | 43.6070*** | 43.3817*** |
| | (1.69) | (1.69) | (3.01) | (3.00) |
| SIGMA | 4.6634*** | 4.6696*** | 4.0332*** | 4.0206*** |
| | (3.54) | (3.54) | (4.40) | (4.39) |
| ABACC | 0.0939 | 0.0916 | 0.0445 | 0.0446 |
| | (1.30) | (1.27) | (0.87) | (0.87) |
| INSTHOLD | 1.3393*** | 1.3340*** | 0.8312*** | 0.8331*** |
| | (11.27) | (11.23) | (9.85) | (9.85) |
| NCSKEW | 0.0623*** | 0.0623*** | 0.0460*** | 0.0460*** |
| | (7.24) | (7.23) | (7.51) | (7.51) |
| Firm FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 | 0.09 |

## Table 9. The Role of Financial Constraints

This table presents the association between newly-formed external guarantee intensity on stock price crash risk corresponding to financial constraints for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. We use *CFVOL* and *FCTE* to measure the firm's financial constraints. *CFVOL* is the absolute value of the standard deviation scaled by the average value of the firm's operating cash flow per share in the past three years. *FCTE* is estimated from a stochastic frontier model based on Greene (2005) where the high value indicates great financial constraints. The dependent variables include *NCSKEW* and *DUVOL*. *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | NCSKEW | | DUVOL | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| GUATA | 0.0015*** | 0.0010 | 0.0011** | 0.0010** |
| | (2.67) | (1.31) | (2.21) | (2.02) |
| GUATA*CFVOL | 0.0026*** | | 0.0033*** | |
| | (3.17) | | (4.83) | |
| GUATA*FCTE | | 0.0035*** | | 0.0035*** |
| | | (3.62) | | (5.29) |
| CFVOL | -0.0127 | | -0.0134* | |
| | (-1.14) | | (-1.67) | |
| FCTE | | -0.0288** | | -0.0285*** |
| | | (-2.50) | | (-3.47) |
| SIZE | -0.0484*** | -0.0491*** | -0.0450*** | -0.0457*** |
| | (-7.05) | (-7.13) | (-9.24) | (-9.36) |
| AGE | -0.0045*** | -0.0041*** | -0.0033*** | -0.0029*** |
| | (-3.62) | (-3.31) | (-3.69) | (-3.27) |
| LEV | 0.0098 | 0.0143 | -0.0199 | -0.0155 |
| | (0.27) | (0.39) | (-0.77) | (-0.60) |
| ROA | 0.2478** | 0.2503** | 0.0795 | 0.0827 |
| | (2.04) | (2.07) | (0.92) | (0.96) |
| MTB | 0.0191*** | 0.0190*** | 0.0110*** | 0.0109*** |
| | (4.55) | (4.53) | (3.76) | (3.74) |
| DTURN | -0.3249* | -0.3133* | -0.1435 | -0.1320 |
| | (-1.95) | (-1.88) | (-1.22) | (-1.12) |
| RET | 36.1398* | 34.9305* | 44.0571*** | 42.8284*** |
| | (1.71) | (1.66) | (3.04) | (2.96) |
| SIGMA | 4.7153*** | 4.6005*** | 4.0831*** | 3.9664*** |
| | (3.58) | (3.49) | (4.46) | (4.33) |
| ABACC | 0.0975 | 0.0964 | 0.0482 | 0.0468 |
| | (1.35) | (1.34) | (0.94) | (0.92) |
| INSTHOLD | 1.3365*** | 1.3182*** | 0.8288*** | 0.8108*** |
| | (11.24) | (11.06) | (9.81) | (9.59) |
| NCSKEW | 0.0622*** | 0.0616*** | 0.0459*** | 0.0453*** |
| | (7.21) | (7.17) | (7.48) | (7.42) |
| Firm FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 | 0.09 |

## Table 10. The Role of Information Asymmetry

This table presents the association between newly-formed external guarantee intensity and stock price crash risk corresponding to information asymmetry for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. We use *SIZE*, *INSTHOLD*, and *ANA* to measure information asymmetry. *SIZE* is the natural logarithm of the firm's total assets. *INSTHOLD* is the percentage of shares held by institutional investors. *ANA* is the number of analysts covering the firm. The dependent variable *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), and *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| GUATA | 0.0668** | 0.0058*** | 0.0053*** |
| | (2.07) | (3.64) | (3.31) |
| GUATA*SIZE | -0.0030** | | |
| | (-1.97) | | |
| GUATA*INSTHOLD | | -0.1416** | |
| | | (-2.12) | |
| GUATA*ANA | | | -0.0014* |
| | | | (-1.91) |
| ANA | | | 0.0078*** |
| | | | (9.71) |
| SIZE | -0.0478*** | -0.0478*** | -0.0830*** |
| | (-6.97) | (-6.98) | (-10.71) |
| AGE | -0.0045*** | -0.0045*** | -0.0029** |
| | (-3.61) | (-3.61) | (-2.31) |
| LEV | 0.0075 | 0.0077 | 0.0327 |
| | (0.21) | (0.21) | (0.91) |
| ROA | 0.2603** | 0.2590** | -0.0889 |
| | (2.15) | (2.14) | (-0.71) |
| MTB | 0.0191*** | 0.0192*** | 0.0102** |
| | (4.55) | (4.57) | (2.37) |
| DTURN | -0.3220* | -0.3217* | -0.3503** |
| | (-1.93) | (-1.93) | (-2.11) |
| RET | 35.5093* | 35.5255* | 21.6922 |
| | (1.69) | (1.69) | (1.03) |
| SIGMA | 4.6580*** | 4.6573*** | 3.7353*** |
| | (3.53) | (3.53) | (2.85) |
| ABACC | 0.0937 | 0.0937 | 0.0944 |
| | (1.30) | (1.30) | (1.32) |
| INSTHOLD | 1.3400*** | 1.3432*** | 1.0310*** |
| | (11.27) | (11.30) | (8.44) |
| NCSKEW | 0.0623*** | 0.0623*** | 0.0523*** |
| | (7.23) | (7.24) | (6.15) |
| Firm FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 |

## Table 11. Sub-Sample Analysis

This table presents the association between newly-formed external guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. The sample is divided by ownership, Shanghai Interbank Offered Rate (Shibor), and financial development level (FDL). The dependent variable *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | SOE | | Shibor | | FDL | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | SOE | Non-SOE | Low | High | Low | High |
| GUATA | -0.0474 | 0.0028*** | 0.0016 | 0.0041*** | -0.0486 | 0.0030*** |
| | (-0.32) | (3.83) | (1.64) | (6.64) | (-0.75) | (3.82) |
| SIZE | -0.0386*** | -0.0439*** | -0.0437*** | -0.0525*** | -0.0434*** | -0.0557*** |
| | (-4.13) | (-4.11) | (-4.22) | (-6.22) | (-4.51) | (-5.57) |
| AGE | -0.0004 | -0.0053*** | -0.0030 | -0.0051*** | -0.0018 | -0.0071*** |
| | (-0.17) | (-3.44) | (-1.63) | (-3.26) | (-1.03) | (-4.00) |
| LEV | 0.0672 | 0.0209 | 0.0727 | -0.0318 | 0.0269 | -0.0060 |
| | (1.19) | (0.42) | (1.34) | (-0.68) | (0.55) | (-0.11) |
| ROA | 0.2218 | 0.2618 | 0.1962 | 0.3355** | 0.1933 | 0.3624* |
| | (1.24) | (1.57) | (1.02) | (2.20) | (1.21) | (1.89) |
| MTB | 0.0191** | 0.0219*** | 0.0306*** | 0.0017 | 0.0192*** | 0.0177*** |
| | (2.41) | (4.10) | (5.23) | (0.30) | (3.23) | (2.98) |
| DTURN | -0.7818*** | -0.0612 | -0.2260 | -0.2068 | -0.5808** | -0.1145 |
| | (-2.79) | (-0.30) | (-1.12) | (-0.71) | (-2.28) | (-0.51) |
| RET | 99.8049*** | 7.0222 | -43.1571 | 191.8089*** | 76.7777** | 5.1302 |
| | (2.74) | (0.26) | (-1.59) | (5.13) | (2.29) | (0.18) |
| SIGMA | 8.1646*** | 2.6039 | -1.8751 | 14.5892*** | 6.7984*** | 2.7560 |
| | (3.88) | (1.43) | (-1.01) | (6.90) | (3.43) | (1.47) |
| ABACC | 0.1948* | -0.0025 | 0.1315 | 0.0531 | 0.0526 | 0.1247 |
| | (1.77) | (-0.03) | (1.24) | (0.56) | (0.56) | (1.10) |
| INSTHOLD | 1.4375*** | 1.1987*** | 1.3704*** | 1.3056*** | 1.3432*** | 1.2810*** |
| | (8.33) | (7.38) | (7.34) | (8.91) | (8.64) | (6.65) |
| NCSKEW | 0.0737*** | 0.0416*** | 0.0163 | 0.0943*** | 0.0597*** | 0.0589*** |
| | (5.93) | (3.54) | (1.25) | (8.24) | (5.05) | (4.58) |
| Firm FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 7,007 | 7,659 | 6,506 | 8,160 | 7,948 | 6,605 |
| Number of Firms | 1,071 | 1,709 | 2,525 | 2,346 | 1,909 | 1,845 |
| Adjusted $R^2$ | 0.10 | 0.06 | 0.09 | 0.09 | 0.08 | 0.10 |

## Table 12. Incentives for Engaging in External Guarantees

This table presents the economic incentives of newly-formed external guarantee intensity for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. The dependent variables include *LOAN*, *MAXLOAN*, *RELATE,* and *TUNNEL*. *LOAN* is a dummy that equals one if the firm obtains any loan from the banks and zero otherwise. *MAXLOAN* is the logarithm of one plus the aggravate size of max loan amount authorized by the banks. *RELATE* is the ratio of related transactions excluding those for commodity trading. *TUNNEL* is the other receivables scaled by total assets in last year. The main explanatory variable *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | Bank Financing | | Tunneling | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | LOAN | MAXLOAN | RELATE | TUNNEL |
| GUATA | 0.0048*** | 0.0495*** | -0.0292** | 0.0038 |
| | (8.40) | (5.78) | (-1.97) | (0.84) |
| SIZE | -0.0346*** | -0.0149 | 0.2515 | -0.0057*** |
| | (-6.19) | (-0.17) | (0.89) | (-2.73) |
| AGE | -0.0074*** | -0.0684*** | 0.0352 | 0.0007* |
| | (-6.25) | (-4.38) | (0.66) | (1.81) |
| LEV | 0.1588*** | 3.8505*** | -1.7770 | 0.1413*** |
| | (5.13) | (9.71) | (-1.19) | (4.03) |
| ROA | -0.0920 | -0.1693 | -9.8850** | -0.3836** |
| | (-0.99) | (-0.14) | (-2.00) | (-2.25) |
| MTB | -0.0185*** | -0.3147*** | -0.0126 | 0.0260*** |
| | (-6.21) | (-8.69) | (-0.09) | (2.82) |
| DTURN | -0.0557 | -3.2557*** | 4.3865 | 0.0021 |
| | (-0.57) | (-3.08) | (1.32) | (0.08) |
| RET | 4.7543 | 103.8496 | -4.2e+02 | 17.4645** |
| | (0.35) | (0.66) | (-0.86) | (2.23) |
| SIGMA | 1.6231* | 31.5328*** | -32.0521 | 0.2002 |
| | (1.85) | (3.00) | (-0.86) | (0.84) |
| ABACC | -0.0224 | 0.4103 | 2.9642 | 0.1155 |
| | (-0.48) | (0.71) | (1.25) | (1.24) |
| INSTHOLD | 0.3658*** | 5.7303*** | -0.9664 | -0.0411 |
| | (3.88) | (4.61) | (-0.19) | (-1.34) |
| NCSKEW | 0.0240*** | 0.3170*** | -0.0555 | 0.0003 |
| | (4.12) | (4.53) | (-0.23) | (0.09) |
| Industry FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 15,144 | 15,144 | 15,144 | 15,131 |
| Number of Firms | 2,680 | 2,680 | 2,680 | 2,680 |
| Adjusted $R^2$ | 0.20 | 0.17 | 0.12 | 0.05 |

## Table 13. Alternative Model Specifications

This table presents the association between newly-formed external guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017 under alternative model specifications. Column (1) excludes the financial crisis period from 2015 to 2016. Column (2) uses alternative industry fixed effect following the "Guidelines for the Classification of Listed Companies" issued by the China Securities Regulatory Commission in 2001. The explanatory variables include *GUATA* in Columns (1) and (2) and *AGUA* in Columns (3) and (4). *GUATA* is the external guarantee intensity, calculated as the amount of newly-formed external guarantees scaled by total assets. *AGUA* is the accumulative amount of external guarantees scaled by total assets. The dependent variables include *NCSKEW* in Columns (1)-(3) and *DUVOL* in Column (4). *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. *DUVOL* is the up-and-down volatility, which is the logarithm of the standard deviation of the firm's weekly specific return in the down week and the up week. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1)<br>Exclude Crisis Period | (2)<br>Full Industry FE | (3)<br>NCSKEW | (4)<br>DUVOL |
|---|---|---|---|---|
| GUATA | 0.0042*** | 0.0030*** | | |
| | (7.61) | (3.77) | | |
| AGUA | | | 0.0017*** | 0.0013*** |
| | | | (13.20) | (13.70) |
| SIZE | -0.0487*** | -0.0430*** | -0.0478*** | -0.0444*** |
| | (-6.44) | (-6.10) | (-6.99) | (-9.15) |
| AGE | -0.0047*** | -0.0045*** | -0.0045*** | -0.0033*** |
| | (-3.32) | (-3.58) | (-3.61) | (-3.68) |
| LEV | -0.0101 | 0.0200 | 0.0074 | -0.0223 |
| | (-0.25) | (0.55) | (0.20) | (-0.86) |
| ROA | 0.2799** | 0.2337* | 0.2594** | 0.0917 |
| | (2.10) | (1.91) | (2.15) | (1.07) |
| MTB | 0.0098** | 0.0213*** | 0.0192*** | 0.0111*** |
| | (2.02) | (5.01) | (4.56) | (3.78) |
| DTURN | -0.3894 | -0.3230* | -0.3228* | -0.1413 |
| | (-1.60) | (-1.93) | (-1.93) | (-1.20) |
| RET | 190.5165*** | 37.0548* | 35.6002* | 43.4862*** |
| | (5.38) | (1.75) | (1.69) | (3.00) |
| SIGMA | 13.4627*** | 4.7161*** | 4.6644*** | 4.0290*** |
| | (6.81) | (3.55) | (3.54) | (4.40) |
| ABACC | 0.0758 | 0.0925 | 0.0939 | 0.0443 |
| | (0.93) | (1.29) | (1.30) | (0.87) |
| INSTHOLD | 1.3165*** | 1.3283*** | 1.3401*** | 0.8323*** |
| | (9.98) | (11.10) | (11.27) | (9.85) |
| NCSKEW | 0.0783*** | 0.0572*** | 0.0623*** | 0.0460*** |
| | (7.72) | (6.65) | (7.23) | (7.50) |
| Firm FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 10,657 | 14,664 | 14,666 | 14,666 |
| Number of Firms | 2,354 | 2,655 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 | 0.09 |

## Table 14. High-Risk Guarantees

This table presents the association between high-risk guarantee intensity and stock price crash risk for a sample of Chinese non-financial A-share listed firms from 2008 to 2017. The dependent variables *NCSKEW* is the negative conditional skewness of the firm's weekly specific return. The main explanatory variables include *GUAHDCO*, *GUASHLD,* and *GUA50T*. *GUAHDCO* is the ratio of the amount of debt guarantee provided directly or indirectly to the guaranteed parties with a debt-to-asset ratio of more than 70% scaled by total assets. *GUASHLD* is the ratio of the guarantee amount provided for shareholders, actual controllers, and their related parties scaled by total assets. *GUA50T* is the ratio of the total guarantee amount exceeding 50% of the net assets scaled by total assets. Other control variables include *SIZE* (the natural logarithm of the firm's total assets), *AGE* (number of years since the firm's establishment), *ROA* (return on assets), *LEV* (leverage ratio calculated as total liabilities over total assets), *MTB* (market-to-book ratio), *DTURN* (the change in annual average monthly turnover rate), *RET* (average stock return within the year), *SIGMA* (standard deviation of stock return within the year), *ABACC* (absolute value of nondiscretionary accruals estimated from modified Jones model), and *INSTHOLD* (percentage of shares held by institutional investors). All regressions include firm and year fixed effects and the lag term of *NCSKEW*. The robust *t*-statistics clustered by the firm are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| GUAHDCO | 0.0018*** | | | 0.0018*** |
| | (6.69) | | | (6.68) |
| GUASHLD | | 0.0017*** | | 0.0017*** |
| | | (15.62) | | (15.63) |
| GUA50T | | | 0.0018*** | 0.0018*** |
| | | | (11.63) | (11.63) |
| SIZE | -0.0479*** | -0.0478*** | -0.0478*** | -0.0478*** |
| | (-6.99) | (-6.99) | (-6.99) | (-6.98) |
| AGE | -0.0045*** | -0.0045*** | -0.0045*** | -0.0045*** |
| | (-3.62) | (-3.61) | (-3.61) | (-3.60) |
| LEV | 0.0076 | 0.0075 | 0.0076 | 0.0074 |
| | (0.21) | (0.21) | (0.21) | (0.20) |
| ROA | 0.2595** | 0.2595** | 0.2595** | 0.2598** |
| | (2.15) | (2.15) | (2.15) | (2.15) |
| MTB | 0.0192*** | 0.0192*** | 0.0192*** | 0.0192*** |
| | (4.57) | (4.56) | (4.57) | (4.57) |
| DTURN | -0.3234* | -0.3228* | -0.3226* | -0.3235* |
| | (-1.94) | (-1.93) | (-1.93) | (-1.94) |
| RET | 35.5744* | 35.6028* | 35.5028* | 35.4995* |
| | (1.69) | (1.69) | (1.68) | (1.68) |
| SIGMA | 4.6628*** | 4.6649*** | 4.6561*** | 4.6587*** |
| | (3.54) | (3.54) | (3.53) | (3.53) |
| ABACC | 0.0935 | 0.0939 | 0.0938 | 0.0943 |
| | (1.30) | (1.30) | (1.30) | (1.31) |
| INSTHOLD | 1.3392*** | 1.3402*** | 1.3400*** | 1.3406*** |
| | (11.27) | (11.27) | (11.27) | (11.27) |
| NCSKEW | 0.0623*** | 0.0623*** | 0.0622*** | 0.0622*** |
| | (7.23) | (7.23) | (7.22) | (7.22) |
| Firm FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 14,666 | 14,666 | 14,666 | 14,666 |
| Number of Firms | 2,657 | 2,657 | 2,657 | 2,657 |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 | 0.09 |