Corporate Financing Constraints and Stock Price Crash Risk based on Overinvestment Perspective

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Abstract. As an anomaly in the capital market, the frequent occurrence of domestic and foreign stock price crashes can bring great impact on the stability of the market and economic development. The causes have also become an important topic of research for scholars, and this paper uses data of A-share listed companies of China in 2018 to study the impact of financing constraints on the risk of stock price crashes. The results show that the degree of financing constraints is significantly and negatively related to the risk of stock price collapse, i.e., the higher the degree of financing constraints, the lower the risk of stock price collapse. The findings can not only enrich the literature on stock price crash risk, financing constraints and other related fields, but also have important reference value for reducing stock price crash risk and promoting the healthy and stable development of China's capital market.

Keywords: Financing Constraint; Internal Funds; Stock Price Crash Risk.

1. Introduction

Stock price volatility is a constant topic in capital markets, and there has been a long-standing concern about stock price volatility, both in theoretical research and in practice. For the most part, such volatility of the stock price has been viewed as a risk and as a direct cause of losses for participants in the market (Adrian and Rosenberg, 2008) [1]. Stock market risk mainly comes from the volatility of stock prices, from the macro level, where huge stock price volatility arises from changes in macroeconomic conditions, and from the micro perspective, where stock price volatility arises from the release of corporate risk, especially operational risk (Wang and Yang et al., 2014) [2]. Theoretically, stock price fluctuations reflect changes in the intrinsic value of the firm, which is determined to some extent by its investment and operation behavior. If a firm adopts risky investment and operation behaviors, it will certainly affect the value of the firm, which will lead to share price volatility. (Wang Yang et al., 2014) [2].

As China is currently in the economic transition period, the phenomenon of difficult financing for enterprises has been an important issue facing China, and whether enterprises can obtain sufficient funds determines the survival and healthy development of enterprises, and how to solve the external financing dilemma of enterprises is a common topic of concern for academics and related engaged personnel. Facing the impact of the epidemic, the financing difficulties of enterprises have become more prominent, and the central bank's liquidity release by lowering quotas is partly to alleviate the difficulties of enterprise financing.

In a market economy, financing constraints increase the business risk faced by companies, which is called "financing constraint risk". Ball and Browns (1968) [3] also argue that the information on financing constraints disclosed by listed companies will be transmitted to investors, and due to information asymmetry, external investors will take the announcement of financing constraints made by business operators as an indication of the firm's risk. Wangetal demonstrates that financing constraints positively affect firms' idiosyncratic risk, and accordingly the higher the idiosyncratic risk premium. When a firm faces a financing constraint, the volatility of the firm's share price increases due to the information conveyed to the outside world and the increase in the risk premium, which exacerbates the market volatility.

2. Review of Literature

Financing constraints have been a popular topic in the field of corporate finance, and many scholars have conducted some degree of research. The phenomenon of financing constraints exists in firms due to the incompleteness of capital markets, such as: information asymmetry, agency problems, transaction costs, and other factors. Some scholars believe that the financing constraints of firms originate from factors external to the firm. The study represented by Fazzari & Athey (1987) [4] found that market incompleteness due to information asymmetry makes firms have financing constraints. (Myers and Majluf, 1984) found that due to imperfect capital markets and the presence of agency costs in the firm, the cost of external financing for the firm will be greater than the cost of internal financing, which is an important reason for the emergence of financing constraints. Wei et al. (2014) [5] showed that external factors such as a good financial ecological environment and a higher level of financial development alleviate the financing constraints faced by firms.Hadlock &Pierce (2010) [6] proposed using internal characteristics indicators such as firm age and firm size to portray the degree of financing constraints of firms. In addition, Kangtao Ye et al. (2010) [7] argue that firms with good reputation tend to be more widely recognized in the market, and their mitigate the financing constraints faced by firms by alleviating the degree of information asymmetry between firms and banks. Leilei Gu et al. (2018) [8] conducted an empirical analysis based on structural equation modeling, and the results showed that firms' own conditions have a stronger impact on financing constraints relative to the external environment. Dhawan (2001) [9] conducted an empirical study with a sample of listed firms in the U.S. and found that smaller firms face stronger financing constraints and subsequently bear higher risk, which leads to stronger incentives to innovate. Li (2011) [10] explains this further. He finds that financing constraints increase firms' innovation risk, so investors demand higher returns on firms' stocks, and there is a significant positive relationship between financing constraints and expected stock returns. whited et al. (1992) [11] also find a positive relationship between financing constraints and firms' stock returns through an empirical study. Wu Jia et al. (2014) [12] established a dynamic corporate investment decision model to construct financing constraint indicators and based on this, found that high financing constraint firms correspond to higher stock risk and return. Wang Jining et al. (2010) [13] used the Basalli model to analyze and concluded that financing-constrained firms have higher financial risk compared to financing-unconstrained firms.

From the collation of literature related to financing constraints, it can be seen that the existing literature mainly studies the causes of the formation of financing constraints and their effects on listed companies, such as on corporate innovation (Dhawan, 2001) [9], stock returns (Li, 2011; Whited, 1992) [10] [11], corporate risk (Wu, 2014; Wang, Jining, 2010) [12], has not yet entered into a direct study of its impact on corporate investment behavior and thus on corporate value and corporate risk ultimately affecting corporate share price volatility.

Compared with the above literature, the marginal contributions of this paper are: first, this paper explores the impact of financing constraints on corporate investment and thus on the risk of corporate share price collapse from the perspective of financing constraints. Second, the heterogeneity analysis of ownership and firm size reveals that the impact of financing constraints on firm stock price crash risk is more significant among SOEs and large-scale firms.

3. Theory and Hypothesis

Fazzarietal's study shows that the existence of financing constraints makes internal financing and external financing jointly influence corporate investment, and firms with a greater degree of financing constraints rely more on internal funding, while firms with relatively weaker financing constraints do not have to rely on internal funding for their investment behavior. For firms subject to financing constraints, internal funding influences firms' investment behavior, and financing constraints have a certain inhibitory effect on firms' investment behavior. Lien, Yujun et al. (2010) [14] found that financing-constrained firms retain more cash flow in cash or cash equivalents internally for

precautionary or speculative motives, and financing-constrained firms are more active and cautious in cash liquidity management behavior.

Brown's research suggests that accounting surplus or other accounting information has explanatory power and predictive value for stock prices or other economic variables. If accounting information can cause the possible distribution of random variables of interest to the receiver and cause it to act, then it can be assumed that the publication of the information sends a new signal to the market that the stock price will change, so the movement of the stock price can be observed to verify whether the published accounting information is useful. Due to the existence of financing constraints, companies will tend to weigh profit and loss and invest rationally, which can, to a certain extent, avoid the operational risks associated with over-investment and stabilize the corporate value, thus reducing the risk of share price collapse. Based on this, the hypothesis is proposed.

Hypothesis: Financing constraint has a negative effect on the risk of corporate share price collapse, and the higher the degree of corporate financing constraint, the smaller the risk of share price collapse.

4. Model, Variables and Data

4.1 Sample and Data

The 2018 Chinese listed companies in Shanghai and Shenzhen A-shares were selected from the CSMAR database as the research sample, and the following treatments were made to the data: first, the data of non-financial, PT, and ST companies were excluded; second, the samples with missing data among them were excluded; third, the continuous variables were scaled down at the 1% and 99% quartiles, and the final annual observations of 1197 companies for 2018 were obtained . The financial data used were mainly obtained from the Cathay Capital (CSMAR) database, etc., and the data were analyzed mainly using STATA se15.1 software.

4.2 Test Model

To test the hypothesis, the following OLS model is developed in this paper.

$$NCSKEW_i = \beta_1 WW_i + \beta_2 DAR_i + \beta_3 FAR_i + \beta_4 ROA_i + \beta_5 Lnsize_i + \beta_6 Lnage_i + \mu_i \quad (1)$$

$$DUVOL_i = \beta_1 WW_i + \beta_2 DAR_i + \beta_3 FAR_i + \beta_4 ROA_i + \beta_5 Lnsize_i + \beta_6 Lnage_i + \mu_i \quad (2)$$

The dependent variable is the stock crash risk of firm *i* in 2018. WW_i denotes the degree of financing constraint of firm *i* in 2018, DAR_i denotes the gearing ratio of firm *i* in 2018, FAR_i denotes the fixed assets ratio of firm *i* in 2018, FAR_i denotes the return on assets of firm *i* in 2018, $Lnsize_i$ denotes the firm size of the *i*th firm, and $Lnage_i$ denotes the firm age (in years) of the *i*th firm.

4.3 Definition of Variables

4.3.1 Explained Variable: Individual Stock Crash Risk

Drawing on the research of Hwa-Cheng Wang et al, this paper adopts the negative return bias coefficient (*NSCKEW*) and the upward and downward earnings volatility ratio (*DUVOL*) as a measure of stock price crash risk of listed companies. The specific calculation methods are as follows.

First, in order to strip the impact of market returns on the benefit of individual stocks, equation (3) is used to regress the weekly returns (*Ret*) of company *i* on an annual basis to obtain the weekly idiosyncratic returns of company.

$$Ret_{i,t} = \alpha_i + \beta_1 Ret_{m,t-2} + \beta_2 Ret_{m,t-1} + \beta_3 Ret_{m,t} + \beta_4 Ret_{m,t+1} + \beta_5 Ret_{m,t+2} + \varepsilon_{i,t} \quad (3)$$

$Ret_{i,t}$ is the return of firm *i* in week *t* and $Ret_{m,t}$ is the average market return in week *t*. To control the effect of non-synchronous stock trading, the market return overrun terms *t+1*, *t+2* and lag terms *t-1*, *t-2* are further added. $\varepsilon_{i,t}$ is the residual of the equation, which is the fraction of stock returns that cannot be explained by the market return, i.e., the idiosyncratic return. $W_{i,t} = \ln(1 + \varepsilon_{i,t})$ is defined as the idiosyncratic return of firm *i* at week *t*., using $W_{i,t}$ to calculate the proxy variables of stock price crash.

The first variable is the negative return skewness coefficient (*NCSKEW*), mainly by measuring the degree to which individual stocks are negatively skewed by returns. A greater degree of negative skew indicates a greater volatility of returns, and the greater the risk of a stock crash, where *n* represents the number of trading weeks in a year for company *i*'s stock and is calculated as in (4).

$$NCSKEW_{i,t} = \frac{n(n-1)^{\frac{3}{2}} \sum W_{i,t}^3}{(n-1)(n-2)\left(\sum W_{i,t}^2\right)^{\frac{3}{2}}} \tag{4}$$

The second variable is the ratio of upward and downward volatility of returns (*DUVOL*). If the shorter the duration of negative returns and the greater the degree of negative returns, then the greater the indicator, the greater the risk of stock crash. Where n_u denotes the number of weeks that $W_{i,t}$ is greater than the average market return, and n_d denotes the number of weeks that $W_{i,t}$ is less than the average market return.

$$DUVOL_{i,t} = \ln\left(\frac{\sum_{down} W_{i,t}^2}{n_d - 1}\right) - \ln\left(\frac{\sum_{up} W_{i,t}^2}{n_u - 1}\right) \tag{5}$$

4.3.2 Explanatory Variables

The explanatory variable in the model is the degree of financing constraints of the firm. The degree of financing constraints (Fincon) suffered by the firm, most of the established literature constructs various indicators based on the firm's financial statements, and then identifies whether the firm is subject to financing constraints and the degree of financing constraints. However, the relationship between firm behavior or financial characteristics variables and financing constraints is not stable or one-to-one, which makes the issue of financing constraints measurement a controversial area in the literature. The main financing constraint measures are: the investment-cash flow sensitivity index proposed by Fazzari et al. (1987); the KZ index designed by Kaplan et al. (1997), which is based on the combined weighting of financial indicators; the WW index of financing constraints obtained by Whited and Wu (2006) with a dynamic model structure; and the SA index (*SA*) obtained by weighting some firm characteristics SA index obtained by weighting indicators (Livdan et al., 2009; Hadlock & Pierce, 2010) [8]. Since, the use of the investment-cash flow sensitivity method is prone to error (Lien, Yujun, 2007) [15], and the KZ index tends to confuse financing constraints with financial distress, this paper draws on Whited and Wu, and Hadlock and Pierce's studies to adopt the WW index as a benchmark indicator for measuring the relative financing constraints of firms specifically, Whited and Wu measure the Euler equation through the generalized moments estimation method to obtain six explanatory factors of financing constraints, which are long-term debt level *TLTD* (long-term debt/total assets), cash flow ratio *CF* (net cash flow from operating activities/total assets*100%), the dummy variables *DIVPOS* (1 for listed companies paying cash dividends and 0 for the opposite), the natural logarithm of total assets *LnTA*, the growth rate of the firm's operating income (*SG*) and the growth rate of the firm's industry operating income (*ISG*) are calculated based on their given coefficients, and the larger the value, the higher the degree of financing constraint.

4.3.3 Controlled Variables

Based on previous scholars' studies, this paper further controls the enterprise characteristics variables as follows.

The controlled variable is the size of the firm (*Size*), which is expressed as the logarithm of the total assets of the firm. The larger the size of the firm, the stronger its ability to resist risk, and the expected stock price volatility is inversely related to it. The second variable is the size of the firm (*Age*), the earlier the firm is listed, the more experienced the firm is in dealing with risks, and the expected stock price volatility is inversely related to it; ratio of liabilities to assets(*DAR*), reflects the level of liabilities of the firm. The more debt a firm has, the more risk it faces, and the expected stock price volatility has a positive relationship with it; return on assets (*ROA*), monthly excess turnover (*Turnover*); book-to-market ratio (*BM*),; gearing ratio (*Lev*); information transparency (*Absacc*), expressed as the amount of manipulated accrued profits obtained by modifying the Jones model.

Table 1. Definition of Variables

Variable Type	*Variable Name*	*Variable Symbol*	*Variable Description*
Explanatory variables	Negative return bias coefficient	$NCSKEW_t$	The degree of negative bias of the company's weekly stock returns in year t
	Earnings fluctuation ratio	$DUVOL_t$	The volatility ratio of the weekly return of the company's stock in year t
	Earnings Volatility	*Sigma*	Standard deviation of weekly idiosyncratic returns
	Average Weekly Yield	*Ret*	Average of weekly idiosyncratic yields
	Monthly Excess Exchange Rate	*Turnover*	The difference between the average monthly turnover rate in year t and the average monthly turnover rate in year t - 1
	Gearing ratio	*Lev*	Total liabilities/total assets
	Company Size	*Size*	Logarithm of total assets at the end of the period
	Book-to-market ratio	*BM*	Net assets per share / Share price per share
	Total Return on Assets	*ROA*	Net profit/total assets
	Information Transparency	*Absacc*	Manipulated accrued profit from correction of Jones model
	State enterprise or not	*Soe*	Soe = 1 if ownership is state enterprise, otherwise 0
	Industry	*ind*	Industry dummy variables, 17 industry dummy variables

5. Empirical Analysis

5.1 Descriptive Statistics

The results in Table 2 show that the maximum value of *NCSKEW* is 3.452, the minimum value is -3.300, and the standard deviation is 0.734; the maximum value of *DUVOL* is 2.273, the minimum value is -1.662, and the standard deviation is 0.503, which indicates a large difference in the risk of stock price collapse of listed companies in China; the mean value of the degree of financing

constraints *ww* is 0.381, and the standard deviation is 1.325, the results are relatively close to the values reported in previous studies.

Table 2. Descriptive Statistics

VarName	Obs	Mean	SD	Min	Max
NCSKEW	1197	-0.193	0.734	-3.300	3.452
DUVOL	1197	-0.152	0.503	-1.662	2.273
WW	1197	0.381	1.325	-6.358	3.955

5.2 Regression Analysis

As in Table 3, the dependent variable in column (1) is *NCSKEW* with a coefficient of -0.0396, which is significant at the 95% level, indicating that the higher the degree of financing constraints, the lower the risk of future stock price collapse of the company. The dependent variable in column (2) is *DUVOL* with a coefficient of -0.0263, which is significant at the 95% level, indicating that the higher the degree of financing constraints, the lower the company's risk of future stock price collapse. In terms of control variables, the regression coefficients of current stock price crash risk variables *NCSKEW* and *DUVOL* are significantly positive, information transparency (*Absacc*), gearing (*Lev*), and book-to-market ratio (*BM*) are significantly and positively related to future stock price crash risk, and monthly excess turnover (*Turnover*), return on assets (*ROA*), and firm age (*Age*), are significantly and negatively related to future stock price, which are consistent with existing studies. Thus, the hypothesis is validated.

Table 3. Analysis of Regression Results

	(1)	(2)
VARIABLES	*NCSKEW*	*DUVOL*
WW	-0.0396** (0.0178)	-0.0263**(0.0123)
DAR	-5.4677*(2.9953)	-0.4829(2.0684)
Age_ln	-0.1783***(0.0464)	-0.1262***(0.0321)
Absacc	0.1204(0.3294)	0.0961(0.2275)
Lev	5.2148*(2.9972)	0.4572(2.0697)
BM	0.0793(0.1091)	0.0109(0.0753)
lnSize	2.3557***(0.6161)	1.0137**(0.4254)
ROA	-0.5646***(0.1355)	-0.1946**(0.0935)
Turnover	-0.1456***(0.0453)	-0.1043***(0.0313)
Constant	-6.9441***(1.8298)	-2.9364**(1.2636)
Observations	1,197	1,197
R-squared	0.043	0.027

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

6. Conclusions and Recommendations

6.1 Conclusion

This paper explores the relationship between the degree of financing constraint and the risk of corporate share price collapse using Chinese A-share listed companies in Shanghai and Shenzhen in 2018 as a research sample, and draws the following conclusions:

The degree of financing constraint has a significant negative relationship with the risk of corporate share price collapse, that is, the higher the degree of financing constraint, the lower the risk of share price collapse. This is mainly due to the fact that firms with higher financing constraints rely more on internal funds, and the limited internal funds make the financing constraints have a dampening effect on corporate investment, which can, to a certain extent, avoid the business risks associated with over-investment and thus reduce the risk of stock price collapse.

6.2 Suggestions

From the research findings, this paper provides some suggestions for different market players. From the government's perspective, financing constraint makes the share price of enterprises more volatile, thus intensifying the market volatility. The government should strengthen the construction of market economic development, try to avoid differentiated financing policies for listed companies, overcome the financing constraints of listed companies, and create favorable environmental conditions for listed companies to integrate the capital needed for investment; for investors, the financing constraints send the message of higher risk premium to the outside world. The degree of financing constraint affects the fluctuation of company value and share price to a certain extent, especially in the financial market with information asymmetry, investors should pay more attention to the degree of corporate financing constraint to improve investment efficiency. For listed companies, from the negative effect of financing constraint on the risk of stock price collapse, listed companies should pay attention to the agency problem and strengthen the supervision of management. For the enterprises with unconstrained financing, it is easier to get the support of external funds, and when there are a lot of cash assets inside the enterprises, the phenomenon of over-investment by management happens from time to time, which is easy to cause the arbitrariness of investment and increase the risk of enterprise investment eventually affects the volatility of enterprise share price. Therefore, listed companies should prevent and control management's over-investment to reduce the risk of stock price volatility.

References

[1] Adrian T, Rosenberg J, J Finance 63(6): p.2997-3030(2008).
[2] Wang, Yang, Zheng, Chunyan, Price theory and practice,03,57-58(2012).
[3] Ball R, Brown P, Journal of accounting research,159-178(1968).
[4] Fazzari S M, Athey M J, The Review of Economics and Stats, 69(3),481-487(1987).
[5] Wei, C. H., Zeng, A. M., Li, B., Accounting Research, 05, 73-80+95(2014).
[6] Hadlock C J, Pierce J R, Review of Financial Studies, 23(5),1909-1940(2010).
[7] Ye, Kangtao, Zhang, Ran, Xu, Haoping, Financial Research,08,171-183(2010).
[8] Gu Leilei, Li Jianjun, Peng Yuchao, Economic Theory and Economic Management, 07,88-99(2018).
[9] Dhawan R, Journal of Economic Behavior & Organization, 44(2001).
[10] Li, Dongmei, Review of Financial Studies, 12(34), 2974- 3007(2011).
[11] WHITED, TONI M. Debt, J Finance, 47(4),1425-1460.
[12] Wu, Jia, Xu, Shu, and Shen, Yu, Nankai Economic Research,05,54-71(2014).
[13] Wang Jining, Chen Zhichao, Seeking, 09,5-18+37(2010).
[14] Lian Yujun, Peng Fangping, Su Zhi. Financial Research,10,158-171(2010).
[15] Lian Yujun, Cheng Jian. Financial Research, 02,37-46(2007).