Institutional environment and risk of a stock price crash: evidence from China

Li Xiaorong, Dong Hongye*

Stock price crashes damage China's macro-financial stability, restrict economic growth, and can lead to huge losses in wealth for investors. Therefore, how to reduce the risk for stock price crashes is an important theoretical and practical issue. This paper mainly studies the effects of the institutional environment that creates risks for stock price crashes. Using China's non-financial A-share listed companies from 1997 to 2012 as an example, this paper finds that the lower the level of government intervention is, the better the legal environment is, the faster the market process in business area is, then the lower the risks for stock price crashes will be. To solve the endogenous problem between the institutional environment and the risk of a stock price crash, this paper uses the number of seaports and whether the commercial ports or leased territories are opened after the first Opium War in Qing Dynasty as instrumental variables of the institutional environment. We find that the above conclusion is still valid with the method of 2SLS regression. Furthermore, this paper also finds that the government intervention index, the legal environment index, and the market index are negatively related to stock price synchronicity to a significant degree. These conclusions illustrate that the institutional environment is an important factor in the healthy and stable development of the capital market, which has important implications for policy markers or regulators to develop policies to promote the stable development of the stock market, to control market risk of listed companies, and to make investment decisions.

Keywords: institutional environment, capital market, stock price crash risk, stock price synchronicity

1. Introduction

The phenomenon of China's capital market ups and downs with sharp fluctuation in China's capital market is very serious. Four market slumps have taken place in China's stock market since 1997. From the perspective of time, the average time cycle is about 22.5 months, while from the perspective of space, the average amplitude is 51.56% with a maximum amplitude of 80.31% and a minimum amplitude of 33.48% (Teng, Wang & Liu, 2008). Tumbling stocks seriously

* Li Xiaorong(Corresponding Author, email: lixiaorongchina@163.com), Lecturer, School of Public Finance, Central University of Finance and Economics, Beijing, China; Dong Hongye(email: donghongye1@163.com), PH.D. Candidate, Renmin University of China, Beijing, China.

affect the healthy development of the capital market, restrict the growth of the economy, and bring about great damage to investor wealth. In recent years, scholars have begun to study which factors can affect the crash risks from the perspective of macroscopic system environments, which provides good suggestions for how to reduce the risk of a crash. However, there is limited literature regarding crash risks from the perspective of the macroscopic system environment. This paper aims to analyze and test whether the institutional environment can affect the risk of a crash. This understanding can enrich theoretical research in the field of crash risks and provide policy implications to promote the steady and healthy development of Chinese capital market.

Existing literatures mainly study the stock price crash risk from the perspective of information transparency (Jin & Myers, 2006; Hutton, Marcus & Tehranian, 2009), tax avoidance (Kim, Li & Zhang, 2011a), executive equity incentive (Kim, Li & Zhang, 2011b), analyst (N. X. Xu, Jiang, Yin & X. Z. Xu, 2012), the gender of executives (Li & Liu, 2012), institutional investors (Xu, Yu & Yin, 2013), and accounting conservatism (Kim & Zhang, 2014). It is not hard to see these studies have started from the perspective of corporate governance and information quality. However, a company is always in a specific system environment and tends to draw on advantages and avoid disadvantages in order to adapt to the institutional environment, which means the corporate governance structure arrangement is born within the institutional environment (Xia & Chen, 2007). Piotrosik & Wong(2011) point out that China's information environment is poor and stock price crash risks are higher than international level, which are rooted in China's specific systems. Therefore, the phenomenon of tumbling stock prices can be explained from the perspective of the institutional environment.

The decentralization included administrative decentralization and fiscal decentralization since China's reform and opening up. Administrative decentralization means the local government has higher independent decision-making power on the development of regional social and economic affairs, management, system formulation and implementation. Fiscal decentralization means local governments have the right to income instead of turning it over to higher authorities. Decentralization and the gap in regional resource endowment result in a big gap in the institutional environment, which provides excellent test conditions for the institutional environment's influence on the risk of stock price crashes. In fact, domestic scholars have studied the effect of regional institutional environment differences on corporate governance, accounting information, and corporate finance. For example, Zhou, Xu & Li (2011) study the relationship between marketization processes and perquisite consumption; Tang, Luo & Wang (2012) find that the higher the degree of marketization is, the better the efficiency of audit results or execution will be. Sun, Liu & Li (2005) find that the higher the degree of marketization is, the lower the enterprise long-term debt ratio will be. Lei & Liu (2007) find that the higher the degree of marketization is, the more cash dividends enterprises pay out. Jiang & Huang (2011) find that marketization affects the capital structure's dynamic adjustment abilities. Xia & Fang (2005) find that the faster the marketization process in the areas of a listed company is, the less the government intervention is, the higher the level of legal power is, and the higher the value of the

company will be.

The institutional environment has three dimensions: a government interference environment, legal environment, and market environment. This paper analyzes and tests the effects of the institutional environment on stock price crash risks respectively from three dimensions. In addition to the aforementioned slumps, the phenomenon of fluctuation synchronism is also common. Therefore, this paper will further study the relationship between institutional environment and stock price fluctuation synchronism. These two aspects do help to deeply understand influence mechanisms of China's macro institutional environment on the healthy and stable development of capital markets, which has important theoretical and practical significance.

The main contributions of this paper are as follows. First, studying the stock price crash risk from the perspective of macro-institutional environment expands the research scope. The stock price crash risk describes the three dimensional characteristics of stock price distribution. Current literatures mainly study the characteristics of the first two dimensions, while the third dimension is rare. The related literature typically takes on a perspective from inside companies or through information mediation. Therefore, the study of macro-institutional environment broadens the field and scope of research. Second, it enriches related research in the field of "system and enterprise behavior." Existing researches mainly study the influence of institutional environment on the enterprises, accounting for information qualities, financial decision-making, and company value. This paper, on the other hand, studies the economic consequences of the institutional environment from the perspective of extreme consequences of company stock prices, which further offers empirical evidence for "institutional influences on corporate behaviors" and also serves as a supplement to existing literatures in this field.

2. Theoretical analysis and research hypothesis

Institution is a series of rules that regulate the behaviors of individuals and/or organizations. Enterprises or business stakeholders need to rely on a system of rules to sign and execute contracts, and engage in trade activities. Therefore, substantial explanations of economic phenomena, economic behaviors, and economic relationships can be given from the perspective of institutional environment (Williamson, 1975). The institutional environment affects enterprise behaviors through two mechanisms of incentives and restraint (Fang, 2007). Good institutional environment can reduce transaction costs of contract execution and fair rules can ensure a reasonable return, which incentivizes enthusiasm of individual behaviors and improves efficiency of resource allocation. Good institutional environments can also effectively constrain people's opportunistic behaviors. Conversely, enterprises have no credible rules for specifications in poor institutional environments. The transaction cost is high and the defects of an institution can be maken use of for rent-seeking activities. Li & Liu (2012) find that the worse the institutional environment is, the more active rent-seeking activities are. The institutional environment affects the company's governance structure. La Porta, Lopez-de-Silanes, Shleifer & Vishny (1998,

1999) find that the country's legal system influences the degree of investor protection and ownership concentration. In areas with poor institutional environment, enterprises have more incentives to establish political relations (Faccio, 2006; Luo & Tang, 2009). Xia & Chen (2007) put forward a marketization process in the region that affects a company's controlled level by the government and its stake. Fan, Wong & Zhang (2013) find that the institutional environment affects the control level between the company's actual controllers and the company itself. Fang (2006) demonstrates the impact of institutional environments on enterprise behaviors from the perspective of enterprise behaviors' comprehensive effects (capital allocation efficiency).

Does the institutional environment affect a company's stock price crash risk? We analyze how the institutional environment affects crash risks from three dimensions of the government interference environment, legal environment, and market environment.

2.1. Government intervention

China has transformed from the planned economy into a market economy with Chinese characteristics through reforms. The most notable 'Chinese characteristics' is the still-tight relationship between the government and enterprises. The government leads economic growth in China. China's enterprises, even the private enterprises, also seek to improve ties with the government and to establish political connections. There are two theories about the governments' influence on enterprises: the hand of "support" and the hand of "plunder." The former theory states that the government will support enterprises, because political benefits and private benefits can be obtained from enterprises, while the latter theory believes government will plunder due to the policy burdens and political pressure (Pan & Yu, 2011). With the government's asylum benefits, enterprises have no incentive to set up a good corporate governance and information disclosure mechanism. For state-owned enterprises, they do not have to disclose the transparent information to get required financing due to the the relationship with the government and soft budget constraints (Kornai, Maskin & Roland, 2003; Lin & Li, 2004). For private enterprises, due to credit discrimination, it is more difficult to obtain required financing, even with the disclosure of transparent information. Therefore, they lobby the government, which contributes to listed companies' low governance levels in a given area with serious government intervention (Jiang & Yan, 2012), as well as agency problems (Xia & Fang, 2005), and low information transparency level. Some enterprises have poor performance because of government plunder, and local government of ficials tend to conceal the loss of enterprises in order to get promotion. Piotroski, Wong & Zhang (2011) find that when local government officials face promotion, the enterprises in the area would hide bad news and obtain short-term gains. Some literatures also provide empirical information about government intervention leading to the poor quality of information. Bushman, Piotroski & Smith (2004) find that the more severe government interference is, the more opaque the company's financial reports are. A study by Bushman & Piotroski (2006) shows that the more severe government interference is, the worse the accounting conservatism is.

When the agency problem is serious, company executives tend to hide bad news. However, there is a threshold to such behavior. There is a point beyond which hiding bad news is no longer possible, and is becoming known publicly, then there will be a sharp fall in stock prices, thereby increasing the risk of a crash (Jin & Myers, 2006; Hutton, Marcus & Tehranian, 2009). Using the multinational data and company data, Jin & Myers (2006) and Hutton, Marcus & Tehranian (2009) find that the more opaque businesses' reports are, the higher the crash risks will be. Therefore, the increasing agency problem, information opacity, and accounting conservatism brought on by government intervention will lead to the increasing risks of stock price crashes. On the other hand, the less severe government intervention is, the lower the risks will be.

2.2. Legal environment

The school of "law and finance" believes that the legal environment is essential to corporate governance and financial market development. La Porta, Lopez-de-Silanes, Shleifer & Vishny(1997) find that countries with poor rules and lower implementation levels have smaller capital markets. La Porta, Lopez-de-Silanes, Shleifer & Vishny(1998) study the different degrees of investor protection in different countries and further study the relationship between the degree and ownership concentration. La Porta, Lopez-de-Silanes, Shleifer & Vishny(2000) argue that the law is an important tool of corporate governance and its reform. Although scholars have studied the influence of legal environments on capital market development, we know very little about the two problems of why and how the legal environment affects capital market stability. Thus, we analyze the effect of legal environments on the risk of stock price crashes from the perspectives of agency problems and information transparency.

First of all, the better the legal environment and degree of investor protection are, the less serious the agency problems of controlling shareholders and managers are. In the areas with good legal environments, regulatory departments formulate a series of laws to protect investors' rights and interests. These laws get good execution. Companies that deprive the interests of small shareholders will be severely punished by regulators. The punishment includes not only economic sanctions, but also a loss of reputation. On one hand, reputation loss leads to stock price crash risks. On the other hand, it is a serious threat to the controlling shareholders' career. The high cost of punishment reduces the motivation and degree of controlling shareholders depriving the interests of minority shareholders. Dyck & Zingales (2004) suggest that how much the controlling shareholders deprive private benefits depends on the possibility of legal action. The stronger the action's ability is, the less the controlling shareholders deprive other shareholders of private benefits. The better the law environment is, the less control private benefits will have. Xia & Fang(2005) suggest that in the areas with higher levels of rule, there will be a possibility to constrain big shareholders violating interests of small shareholders. In a good legal environment, managers may stop obtaining private benifit for fear of getting dismissed or losing offers from other companies. Defond & Hung (2004) find that in the countries where investors get more

legal protection, the managers are more likely to be replaced when the company's performance declines. Based on the motivation of compensation contract, career building for managers and the purpose of expropriating small shareholders' benefit for major shareholders, they tend to hide the company losses and bad news, which will lead to the stock price being overvalued (Ball, 2009; Kothari, Shu & Wysocki, 2009; Kim, Li & Zhang, 2011a). Once the company's bad news accumulates to a certain degree that can't be hidden, the bad news may be suddenly released into the market, which contributes to the price declining (Jin & Myers, 2006; Hutton, Marcus & Tehranian, 2009). Therefore, the better the legal environment is, the less of a possibility there is that big shareholders will deprive minority shareholders, the less serious the managers' agency problem will be, and the less there will be of a risk of a crash.

Second, the better the legal environment is, the more transparent the company information will be. Signing and executing contracts depends on financial information, especially the financial contract. No matter whether it is the investors, creditors, or managers, interest realization and demands rely on high quality information. When the legal environment is good, a company's stakeholders will invest or partake in interest games with the information provided by the company, which promotes companies providing high quality information to meet the needs of shareholders. Conversely, when the legal environment is poor, signing and executing contracts depend on private mechanisms, which leads to low demand for company information and low corporate transparency. Bushman, Piotroski & Smith(2004) find that the better the legal environment is, the higher the information transparency will be. Bushman & Piotroski (2006) point out that a fare legal system raises the benefits of safeguarding rights as well as litigation costs, which motivates companies to provide more robust financial statements in order to reduce potential litigation costs. Filip, Labelle & Rousseau(2013) find that the better the legal system is, the higher the quality of financial reporting will be. Using the data of China, Yan, Xu, Shi & Wang(2012) find that property rights legal protection could reduce the degree of information asymmetry. Opaque information leads to increased crash risks (Jin & Myers, 2006; Hutton, Marcus & Tehranian, 2009). The implementation of prudent accounting policy can lower the stock price crash risks (Kim & Zhang, 2014). Therefore, a good legal environment can also reduce the risk of a crash from the perspective of information transparency.

2.3. Market environment

China's marketization reform means not only reducing government intervention and an improvement in the legal environment, but also the development of product and factor markets. With the speeding up of the marketization process, the product and factor markets gradually develop and the competition and price mechanisms work more effectively. In a region with a high degree of marketization, trading bodies rely more on market information and less on private channels of information. Therefore, enterprises need to give more information to the market in order to get more attention from interest subjects. Competition also encourages enterprises to

improve corporate governance structures and improve corporate information transparency in order to gain a competitive advantage. Cheng, Tan & Xu (2011) find that in an area with a higher marketization process, a company's voluntary disclosure level is higher. Zhou, Xu & Li (2011) find that the construction of market systems inhibit the rent-seeking motivations of establishing enterprise networks, and ultimately reduces the consumption level of on-the-job executives. Zheng (2011) study the economic consequences of a market-oriented reform from the perspective of shareholders' agency problems and find the increasing degree of marketization obviously alleviates the "hollowed out" consequences of controlling shareholders transfer of profits through connection transactions. It can be seen that the improvement of the market environment enhances information transparency and reduces managerial agency problems and big shareholders' encroachment problems, which is a help to controlling the risk of a crash caused by hiddening bad news.

Based on this analysis, we put forward our research hypothesis: the better the institutional environment is, such as a lower level of government intervention, better legal environment, and higher degree of marketization, the lower the risks of stock price crashes will be.

3. The research design

3.1. Sample selection and data sources

Measurements of the institutional environment using three distinct indices—one for government intervention, one for the legal environment and one for marketization (Fan, Wang & Zhu, 2011)—began in 1997. This paper uses samples from 1997 to 2011. Since studying the risks of stock price crashes requires a prolonged period of data, stock yield data of 2012 is used in calculating crash risks. We use in this paper the data for all A-share listed corporations in China as the initial samples. Data processing in this paper is as follows: (1) weeding out the samples of the financial industry, (2) facilitating the calculation of crash risks and eliminating the samples of stocks that have less than 30 observation of weekly return, (3) eliminating the samples with missing data, and (4) making all continuous variables accurate to 1% in order to avoid the influence of abnormal values on empirical results. We get 18,537 observation records as the sample. The institutional environment data is derived from Fan, Wang & Zhu(2011), while other data is derived from CSMAR.

3.2. Research variables

3.2.1. Stock price crash risk

According to Hutton, Marcus & Tehranian (2009), Kim, Li & Zhang (2011a, 2011b), Xu, Jiang, Yin & Xu (2012), Li & Liu (2012), and other existing literatures, this paper adopts the two

indexes of NCSKEW and DUVOL to measure the crash risk. The specific calculation steps are as follows.

First of all, we calculate the firm-specific weekly return of individual stocks by the week t: $W_{i,t}$. $W_{i,t}=Ln\ (1+\varepsilon_{i,t})$, $\varepsilon_{i,t}$ is the estimated residual in model (1).

$$r_{i,t} = \alpha_i + \beta_1 r_{m,t-1} + \beta_2 r_{I,t-1} + \beta_3 r_{m,t} + \beta_4 r_{I,t} + \beta_5 r_{m,t+1} + \beta_6 r_{I,t+1} + \varepsilon_{i,t} \tag{1}$$

Among them, $r_{i,t}$ is the return rate of individual stock i at week t. $r_{m,t}$ is the weighted average return of circulation values at week t. $r_{I,t}$ is the return rate of companies in the industry at week t. Adding the leading term and lagging term of market returns and industry returns is to reduce the deviation caused by asynchronous transactions (Dimson, 1979).

The industry return rate is calculated with the model (2):

$$r_{I,t} = \frac{\sum_{i \in I} w_{i,t} r_{i,t}}{\sum_{i \in I} w_{i,t}} \tag{2}$$

Among them, $w_{i,t}$ is the weight of stock i in the industry, which is measured by the A-share circulation value. The industry classification refers to China's securities industry classification. Secondly, calculating the crash risk NCSKEW and DUVOL.

The index of NCSKEW is calculated with the Formula (3), and a higher value of DUVOL means the higher crash risk.

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

n is transaction time of stock i in one year. The index of DUVOL is calculated with Formula (4). The higher value of DUVOL means the higher crash risk.

$$DUVOL_{i,t} = \log \left\{ \left[(n_u - 1) \sum_{DOWN} W_{i,t}^2 \right] \Big/ \left[(n_d - 1) \sum_{UP} W_{i,t}^2 \right] \right\} \tag{4}$$

Among them, n_u (n_d) is the number of weeks that the firm-specific weekly return ($W_{i,t}$) is larger (less) than the average return (W_i). Concretely, the company's number of weeks in one year is divided into two categories according to whether the firm-specific weekly return $W_{i,t}$ in each week is higher than the average $W_{i,t}$: one is the number of weeks that are lower than the firm-specific weekly return $W_{i,t}$ ("down" weeks); the other is the number of weeks that are higher than the firm-specific weekly return $W_{i,t}$ ("up" weeks). Next, we calculate the specific standard deviation of firm-specific weekly returns of these two kinds of samples respectively. Finally, DUVOL is equal to the logarithm of the ratio with standard deviation of "down" weeks and "up" weeks.

3.2.2. System environment

This paper selects an index of "the relationship between government and market," "intermediary organization development and the law," and "marketization" to represent the degree of government intervention, system environment, and marketization degrees, respectively (Fan, Wang & Zhu, 2011). However, the data of Fan, Wang & Zhu (2011) is only up to 2009, thus, the data from 2010 and 2011 is replaced with data from 2009.

3.2.3. Control variables

In reference to Hutton, Marcus & Tehran (2009), Kim, Li & Zhang (2011a, b), Xu, Jiang, Yin & Xu(2012), as well as Li & Liu (2012) and other literatures, the following variables are controlled in the regression model: the monthly average excess turnover rate DTURN, the difference between average turnover rate in the current period and previous period, the standard deviation of firm-specific weekly returns SIGMA, the standard deviation of firm-specific annual return, the average firm-specific weekly return RET, the natural logarithm of total assets SIZE, MB, MB= (the stock price at the end of the year * the number of circulated stock + net asset per share * the number of non-circulated stock)/book equity value, the asset-liability ratio LEV at the end of the year, LEV= liabilities book value/ total assets of company, the total assets return ROA, the interest before tax divided by final total assets, the handling absolute value ABACC, and the *DiscAcc* calculated by the modified Jones value. In addition, we also add the virtual variables of industry and year (See Table 1 below for variable explanation).

The calculation of *DiscAcc* is: first, figures are estimated by year and by industry, respectively, with the modified Jones value (as shown in the Formula (5)), and then the *DiscAcc* is calculated with the regression coefficient estimated by Formula (5).

$$\frac{TA_{i,t}}{Asset_{i,t-1}} = \alpha_0 \times \frac{1}{Asset_{i,t-1}} + \beta_1 \times \frac{\Delta Sales_{i,t}}{Asset_{i,t-1}} + \beta_2 \times \frac{PPE_{i,t}}{Asset_{i,t-1}} + \varepsilon_{i,t} \tag{5}$$

$$DiscAcc_{i.t} = \frac{TA_{i,t}}{Asset_{i,t-1}} - (\hat{\alpha}_0 \times \frac{1}{Asset_{i,t-1}} + \hat{\beta}_1 \times \frac{\Delta Sales_{i,t} - \Delta \mathrm{Re}c_{i,t}}{Asset_{i,t-1}} + \hat{\beta}_2 \times \frac{PPE_{i,t}}{Asset_{i,t-1}} \tag{6}$$

Among them, *TA* is the total accrued items, which is equal to the value of net operating profits minus operating activities; $Asset_{i,t-1}$ is the total assets of the company in the last year. $\Delta Sales_{i,t}$ is the difference between operating income in the current year and last year; ΔRec is the increased value of accounts; *PPE* is the original value of fixed assets.

3.3. Model design

We study the effect of government intervention, legal environment, and marketization degrees on crash risks with the models (7), (8), (9):

$$CrashRisk_{i,t+1} = \beta_0 + \beta_1 \times Govindex_{i,t} + \gamma \times ControlVariables_{i,t} + \varepsilon_{i,t} \quad (7)$$

$$CrashRisk_{i,t+1} = \beta_0 + \beta_1 \times Lawindex_{i,t} + \gamma \times ControlVariables_{i,t} + \varepsilon_{i,t} \quad (8)$$

$$CrashRisk_{i,t+1} = \beta_0 + \beta_1 \times Mktindex_{i,t} + \gamma \times ControlVariables_{i,t} + \varepsilon_{i,t} \quad (9)$$

Among them, $Crash\ Risk_{i,t+1}$ is the stock price crash risk in the forward period, and we measure the risk with the two indices of NCSKEW and DUVOL. $Govindex_{i,,t}$, $Lawvindex_{i,,t}$, and $Mktindex_{i,t}$ represent the index of government intervention, market environment, and marketization. $Control\ Variables_{i,t}$ is a series of controlled variables which are measured by the value in year t. The specific variables refer to Table 1.

Table 1
Variable introduction

Variables	Variable introduction
NCSKEW	The index 1 of stock price crash risk, the calculation formula refers to (3).The higher the value is, the higher the crash risk will be
DUVOL	The index 2 of stock price crash risk, the calculation formula refers to (4).The higher the value is, the higher the crash risk will be
Govindex	The index of government intervention, the higher the value is, the less government intervention will be
Lawindex	The index of legal environment, the higher the legal environment is, the better legal environment will be
Mktindex	The index of marketization, the higher the value is, the higher degree of marketization will be
DTURN	The monthly average excessing turnover rate, the difference between average turnover rate in current period and previous period
SIGMA	The standard deviation of firm-specific weekly return
RET	The average firm-specific weekly return, the formula of firm-specific weekly return is $W_{i,t}=Ln(1+\varepsilon_{i,t})$, $\varepsilon_{i,t}$ is The residual term of the model (1)
SIZE	The natural logarithm of total assets
MB	MB= (the stock price at the end of the year * the number of circulated stock + net asset per share * the number of non-circulated stock)/book equity value
LEV	The total assets return
ROA	The interest before tax/final total assets
ABACC	The handling absolute value ABACC and the DisAcc calculated by the modified Jones

4. Analysis of empirical results

4.1. Descriptive statistics

Table 2 provides the descriptive statistic results of the variables in this paper. (1) The mean

and the median of the first metric index of the risk of a crash, NCSKEW, are 0.262 and 0.273, respectively. The mean and the median of the second metric index of crash risk DUVOL are 0.213 and 0.217, respectively. The minimum values of these two indexes have bigger difference and standard deviation, which means the difference of listed companies' risk-factor for a stock price crash is obvious. (2) The standard deviation of the government intervention index is 8.53, while the legal environment index is 6.42 and marketization index is 7.65, which suggests that the degree of government intervention, legal environment, and marketization have big differences in the areas where companies locate. All these provide a good sample for testing the relationship between institutional environments and stock price crash risks. From Table 2, the distribution of other variables is within a reasonable range without outliers, which illustrates that the sample data is reliable.

Table 2
Descriptive statistics

Variables	N	Mean	Median	Std.	Min	Max
$NCSKEW_{t+1}$	18537	0.262	0.273	1.614	-4.166	4.496
$DUVOL_{t+1}$	18537	0.213	0.217	0.846	-1.818	2.301
$Govindex_t$	18537	8.245	8.530	1.662	-4.660	10.650
$Lawindex_t$	18537	8.150	6.420	5.034	0.000	19.890
$Mktindex_t$	18537	7.733	7.650	2.389	0.000	11.800
$DTURN_t$	18537	-0.002	-0.003	0.173	-0.488	0.517
$NCSKEW_t$	18537	0.252	0.268	1.558	-4.070	4.421
$SIGMA_t$	18537	0.015	0.010	0.013	0.001	0.068
RET_t	18537	0.000	0.000	0.000	-0.002	0.000
$SIZE_t$	18537	21.376	21.236	1.121	19.008	24.871
MB_t	18537	1.637	1.326	0.934	0.809	6.493
LEV_t	18537	0.492	0.491	0.216	0.064	1.346
ROA_t	18537	0.049	0.052	0.074	-0.304	0.237
$ABACC_t$	18537	0.070	0.049	0.069	0.001	0.347

4.2. Single variable test

We divide the index of government intervention, legal environment, and marketization into different groups according to whether the values of these indexes are smaller than the median or not, and then test each respectively. The results are shown in Table 3. A higher government intervention index illustrates less intervention. We can see from the Column A that in the group with severe government intervention, the mean and the median of the $NSCKEW_{t+1}$ are 0.371 and 0.323, respectively, while the mean and the median of $DUVOL_{t+1}$ are 0.245 and 0.267, respectively. The mean and the median of these two stocks price crash risks are greater than that of the group with less government intervention at a 1% significant level, which means the

more serious the government intervention is, the higher the price crash risk will be. We can see from the Column B that in the group with a poor legal environment, the mean and the median of $NSCKEW_{t+1}$ are 0.316 and 0.318, respectively, while the mean and the median of $DUVOL_{t+1}$ are 0.246 and 0.265, respectively. The mean and the median of these two stock price crash risks are greater than that of the group with a better legal environment at the 1% significant level, which means the worse the legal environment is, the higher the price crash risk will be. We can see from Column C that in the group with less marketization, the mean and the median of $NSCKEW_{t+1}$ are 0.325 and 0.328, respectively, while the mean and the median of $DUVOL_{t+1}$ are 0.252 and 0.273, respectively. The mean and the median of these two stock price crash risk factors are greater than that of the group with higher marketization at a 1% significant level, which means the less marketization is, the higher the price crash risk will be. In conclusion, the assumption that the better institutional environment is (the lower level of government intervention, the better legal environment, the higher marketization), the lower the stock price crash risk will be, gets preliminary validation.

Table 3
Single variable test

	Lower		Higher		Lower-higher	
	Mean	Median	Mean	Median	Difference of mean (the value of T)	Difference of median (the value of Z)
Column A: group by government intervention index	N=8836		N=9701			
$NCSKEW_{t+1}$	0.317	0.323	0.212	0.226	0.105^{***}(4.428)	0.097^{***}(4.825)
$DUVOL_{t+1}$	0.245	0.267	0.183	0.181	0.063^{***}(5.056)	0.086^{***}(5.380)
Column B: group by legal environment index	N=8840		N=9697			
$NCSKEW_{t+1}$	0.316	0.318	0.212	0.228	0.104^{***}(4.373)	0.090^{***}(4.491)
$DUVOL_{t+1}$	0.246	0.265	0.182	0.181	0.063^{***}(5.098)	0.084^{***}(5.129)
Column C: group by marketization index	N=8820		N=9717			
$NCSKEW_{t+1}$	0.325	0.328	0.204	0.223	0.121^{***}(5.116)	0.105^{***}(5.516)
$DUVOL_{t+1}$	0.252	0.273	0.177	0.174	0.075^{***}(6.030)	0.099^{***}(6.247)

Note: ***, **, * represent 1%, 5%, 10% significant level respectively.

4.3. Legal environment and stock price crash risk

Table 4 shows the regression results of effect of legal environment (government intervention, legal environment and marketization) on stock price crash risk.

4.3.1. Reduced government intervention can promote the healthy development of a capital market

Column (1) and Column (2) in Table 4 show that the regression coefficients of the Govindex

are -0.03 and -0.016, respectively, which indicates the reduction of government intervention can decrease the risk of a crash. In China, the governance mechanism's efficacy in dealing with China's listed companies is difficult to gage due to large scale government intervention (Yu, 2006), which leads to difficulty in guaranteeing high quality information. Government intervention, such as administrative examination approval, listing qualifications, credit discrimination, appointments, and promotion of corporate executives, leads to corporate rent-seeking, skimming from the government, and no incentive to improve corporate information transparency. In addition, corruption is easy to exist in the process of government intervention. Local government officials hide corrupt practices in order to avoid corruption exposure, which leads to more hidden information. Opaque information caused by government intervention hinders the timely release of bad news and increases the risk of crashes, which contributes to an unstable capital market. It can be seen that reducing government intervention is an important measure to promoting the stable development of capital markets.

Table 4
Legal environment and stock price crash risk: the regression results of OLS

	(1) $NCSKEW_{t+1}$	(2) $DUVOL_{t+1}$	(3) $NCSKEW_{t+1}$	(4) $DUVOL_{t+1}$	(5) $NCSKEW_{t+1}$	(6) $DUVOL_{t+1}$
$Govindex_t$	-0.030**	-0.016**				
	(-2.53)	(-2.47)				
$Lawindex_t$			-0.007*	-0.005**		
			(-1.65)	(-2.02)		
$Mktindex_t$					-0.020**	-0.012**
					(-2.05)	(-2.25)
$DTURN_t$	0.205**	0.139**	0.189**	0.140**	0.206**	0.139**
	(2.17)	(2.30)	(2.32)	(2.31)	(2.16)	(2.30)
$NCSKEW_t$	0.008	0.007	0.009	0.007	0.008	0.007
	(0.49)	(0.79)	(0.54)	(0.80)	(0.49)	(0.79)
$SIGMA_t$	-16.978***	-15.205***	-8.290***	-15.270***	-16.965***	-15.190***
	(-4.42)	(-7.34)	(-4.13)	(-7.40)	(-4.43)	(-7.38)
RET_t	-232.227*	-246.500***	13.085	-248.165***	-232.170*	-246.859***
	(-1.86)	(-3.95)	(0.29)	(-3.97)	(-1.87)	(-3.97)
$SIZE_t$	-0.064***	-0.035***	-0.063***	-0.035***	-0.064***	-0.035***
	(-4.83)	(-4.37)	(-4.80)	(-4.48)	(-4.84)	(-4.35)
MB_t	0.004	0.011	0.001	0.011	0.004	0.011
	(0.16)	(0.94)	(0.05)	(0.96)	(0.17)	(0.95)
LEV_t	0.015	0.016	-0.008	0.012	0.012	0.014
	(0.16)	(0.34)	(-0.08)	(0.27)	(0.13)	(0.30)
ROA_t	-0.651***	-0.358***	-0.590***	-0.366***	-0.654***	-0.358***
	(-2.97)	(-2.99)	(-2.82)	(-3.06)	(-2.97)	(-2.98)
$ABACC_t$	0.226	0.138*	0.251	0.138*	0.230	0.141*
	(1.32)	(1.74)	(1.51)	(1.77)	(1.37)	(1.79)
$CONSTANT$	2.085***	1.233***	1.831***	1.142***	1.976***	1.174***
	(6.10)	(6.26)	(5.97)	(6.21)	(6.07)	(6.14)

	(1) $NCSKEW_{t+1}$	(2) $DUVOL_{t+1}$	(3) $NCSKEW_{t+1}$	(4) $DUVOL_{t+1}$	(5) $NCSKEW_{t+1}$	(6) $DUVOL_{t+1}$
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
N	18537	18537	18537	18537	18537	18537
R^2	0.020	0.041	0.019	0.040	0.020	0.041

Note: It is the value of T in the bracket. The standard error is adjusted through the Cluster by company and by years. ***, **, * represent the level of 1%, 5% and 10% respectively.

4.3.2. The improvement of legal environments help to the stabilize development of capital markets

The regression coefficient in the third and fourth column in Table 4 are -0.007 and -0.005, respectively, which illustrates that the better the legal environment is, the lower the crash risk will be. The legal environment has a good relationship with investor protection, which is a key factor for the survival and development of the capital market. Although the laws in various parts of China are the same, regional law enforcement efficiency is different. Moreover, the litigation jurisdiction adopts the principle of "plaintiff accommodated to defendant" (Xia & Fang, 2005), which leads to the legal environment in the area having important influence on the controlling shareholder or executives. The higher the degree of the rule of law is, the lower the motivation and degree of controlling shareholder and executives abating self-interest will be, and the less likely enterprises will be to conceal bad news, which improves information transparency and reduces the risk of individual stock price crashes. It can be seen that law affects not only the size of capital markets (La Porta, Lopez-de-Silanes, Shleifer &Vishny, 1997), but also the stability of the capital market.

4.3.3. The advancement of market-based reforms is another important measure to guarantee the stable development of capital market

Column 5 and 6 in Table 4 show that the regression coefficients of Mktindex are -0.02 and -0.012, respectively, which illustrates marketization reform can reduce crash risks. Market-oriented reform is within the whole process of China's reform and opening up, and greatly improve the efficiency of resource allocation. In a fully market-oriented society, the market is the main part, relying on the "invisible hand" to guide local configuration and to weaken the function of power and relationships. This requires enterprises to fully comply with market rules to regulate their own behaviors, improve information transparency, corporate governance, and competitiveness. On the contrary, those enterprises that are not transparent or rely on a "relationship" to survive will eventually be eliminated by the market. Therefore, market-oriented reform improves the practice of information transparency and contains the controlling shareholders or executives from too much self-interested behavior, which will not lead to the accumulation and sudden release of bad news. Thus, the crash risk is reduced and stable development of capital market is guaranteed.

In conclusion, the hypothesis in this paper is further supported with the data analyzed. From the perspective of control variables, the monthly average of *DTURN* is significantly positive and *ROA* is significantly negative. The results of these two variables are similar to Kim, Li & Zhang (2011a, 2011b). The results of *SIGMA* and *SIZE* are similar with Xu, Yu & Yin (2013).

In the model of OLS regression, although one advanced period of value is adopted in the stock price crash risk, and the current period of value is adopted in the legal environment, which reduces endogenous problems to a certain extent. The possible causal relationship between legal environment and crash risks, or the possible common influence by a third variable, may contribute to a spurious correlation. Thus, the conclusion may be a deviation. To this end, we draw lessons from Fan, Wong & Zhang (2013) and empirically test with the 2SLS regression method, as well as the tool variables of "port number," "terminal," and "concession." "Port number" refers to the number of ports in the province, region, or municipality where the listed company is located. "Terminal" is the virtual variable. This value is 1 if the listed company opened the treaty ports to foreigners in the Qing dynasty after the first Opium War. Otherwise, the value is 0. "Concession" is also the virtual variable. This value is 1 if the listed company opened the concession area to foreigners after the first Opium War in the Qing dynasty after the first Opium War. Otherwise, the value is 0.[1] The number of the sea port depends on the distance of the area where the listed company is located from the sea. The terminal and concessions are determined by factors of more or less than 100 years. These three variables cannot be affected by the stock price crash risk. However, these three variables may affect the legal environment for foreign countries and their businesses (Fan, Wong & Zhang, 2013), which is in line with the conditions of the instrumental variable.

Table 5 shows the regression results of 2SLS. We can see that the three tool variables in the first stage are associated with the legal environment. The F-statistic and Hansen J-statistic illustrate that tool variables conform to the requirements of the relevant variables. In the second stage, the Govindex, Lawindex, and Mktindex have significantly negative correlations with stock price crash risks, which indicate a better legal environment, and thus a lower risk of a stock price crash. This further supports the research hypothesis and also suggests the robust conclusion.

4.4. Robust test

In order to further improve the robustness of the conclusion, this paper carried on the following several robustness tests:

[1] According to Fan, Wong & Zhang (2013), regions that have treaty ports are: Fu Jian, Guang Dong, Shang Hai and Zhe Jiang (*Treaty of Nanjing*, 1842); JuJian, Hu Nan, Hu Bei, Guang Dong, Jiang Su, Liao Ning and Shan Dong (*Treaty of Tian Jin*, 1858); Tian Jin and Xin Jiang (*Treaty of Beijing*, 1860); An Hui, Hu Bei, Guang Xi and Zhe Jiang (*Treaty of Yan Tai*, 1876); Chong Qing, Hu Bei and Zhe Jiang (*Treaty of Shimonoseki*, 1895). Regions that have concessions are Tian Jin (1860), Shang Hai (1845), Jiang Su (1863), Zhe Jiang (1896), An Hui (1877), Jiang Xi (1861), Fu Jian (1861), Shan Dong (1889), Guang Dong (1857), Chong Qing (1901) and Hu Bei (1861).

Table 3

Legal environment and stock price crash risk: the regression results of 2SLS

	Government intervention			Property rights			Marketization		
	1st Stage	2nd Stage		1st Stage	2nd Stage		1st Stage	2nd Stage	
	Govindex$_{i,t}$	*NCSKEW*$_{i,t+1}$	*DUVOL*$_{i,t+1}$	*Lawindex*$_{i,t}$	*NCSKEW*$_{i,t+1}$	*DUVOL*$_{i,t+1}$	*Mktindex*$_{i,t}$	*NCSKEW*$_{i,t+1}$	*DUVOL*$_{i,t+1}$
Post number	0.836***			0.834***			0.070***		
	(39.88)			(8.83)			(33.77)		
Dual	0.085***			-0.190***			0.200***		
	(9.32)			(-2.97)			(9.06)		
Concentr	1.153***			3.634***			1.629***		
	(61.78)			(16.92)			(60.03)		
Govindex$_{i,t}$		-0.002***	-0.004***						
		(-3.59)	(-3.88)						
Lawindex$_{i,t}$					-0.021***	-0.014***			
					(-3.57)	(-3.78)			
Mktindex$_{i,t}$								-0.019***	-0.022***
								(-3.58)	(-3.79)
DTURN$_{i,t}$	-0.191***	0.150*	0.134**	-0.419*	0.158*	0.125**	-0.218***	0.172*	0.125**
	(-2.68)	(1.69)	(2.42)	(-1.77)	(1.77)	(2.33)	(-2.66)	(1.70)	(2.44)
NCSKEW$_{i,t}$	-0.006	0.017	0.010	-0.018	0.013	0.009	-0.006	0.018	0.010*
	(-1.27)	(1.36)	(1.60)	(-0.61)	(1.18)	(1.39)	(-0.85)	(1.41)	(1.65)
SIGMA$_{i,t}$	-0.731	-13.945***	-13.986***	-11.839	-13.033***	-14.618***	-0.922	-13.792***	-13.886***
	(-0.46)	(-3.77)	(-7.38)	(-2.84)	(-4.18)	(-7.85)	(-0.44)	(-3.71)	(-7.31)
ME$_{i,t}$	-128.243**	-139.883	-211.167***	-865.380***	-181.143	-234.819***	-176.695**	-133.932	-207.362***
	(-2.50)	(-1.15)	(-3.33)	(-4.31)	(-1.54)	(-3.84)	(-2.44)	(-1.10)	(-3.27)
SIZE$_{i,t}$	0.876***	-0.008***	-0.016***	0.312***	-0.061***	-0.033***	0.140***	-0.008***	-0.016***
	(8.86)	(-4.74)	(-4.88)	(10.01)	(-4.39)	(-4.45)	(12.28)	(-4.74)	(-4.80)

	Government intervention			Property rights			Marketization		
	1st Stage	2nd Stage		1st Stage	2nd Stage		1st Stage	2nd Stage	
MB_i	0.006	0.007	0.012	0.010	0.007	0.012	0.031**	0.006	0.013
	(0.42)	(0.40)	(1.32)	(0.95)	(0.39)	(1.30)	(2.11)	(0.40)	(1.36)
LEV_i	-0.145***	-0.114	0.011	-1.284***	-0.152	-0.106	-0.325***	-0.115	0.008
	(-3.12)	(-0.28)	(0.06)	(-9.47)	(-0.45)	(-0.17)	(-6.35)	(-0.27)	(0.08)
ROA_i	0.236*	-0.766***	-0.399***	-0.321	-0.733***	-0.390***	0.170	-0.781***	-0.407***
	(1.73)	(-3.53)	(-3.56)	(-0.85)	(-3.48)	(-3.58)	(1.17)	(-3.58)	(-3.61)
$ANACC_i$	0.040	0.341*	0.184*	0.392	0.316	0.170*	0.777**	0.315*	0.192*
	(0.33)	(1.72)	(1.78)	(1.01)	(1.61)	(1.69)	(1.96)	(1.78)	(1.85)
CONSTANT	3.548***	2.882***	1.567***	-6.773***	2.285***	1.239***	-0.381	2.681***	1.462***
	(17.83)	(4.12)	(4.35)	(-8.94)	(3.65)	(3.80)	(-1.21)	(3.96)	(4.21)
Year	Control	Control	Control	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control	Control	Control	Control
N	18337	18337	18337	18337	18337	18337	18337	18337	18337
R^2	0.627	-	-	0.348	-	-	0.728	-	-
Predictive power of excluded instruments									
Partial-R^2		0.369	0.369		0.233	0.233		0.493	0.495
Robust F-statistic (Instruments)		4181.64	4181.64		3013.99	3013.99		8240.86	8240.86
F-statistic p-value		0.000	0.000		0.000	0.000		0.000	0.000
Test of overidentifying restrictions									
Hansen J-statistic		0.037	0.010		0.189	0.363		0.246	0.136
p-value		0.912	0.993		0.910	0.833		0.884	0.934

Notes: *, **, *** represent the significant level of 10%, 5% and 1% respectively; it is the value of T or Z in the bracket. In the second stage regression, the phenomenon of lacking R^2 may be appeared.

1. Legal environment is a continuous variable in this paper and we adopt a virtual variable to measure it. Specifically, we define these three variables: Highgov, Highlaw, and Highmkt according to the median of a government intervention index, legal environment index and marketization index. The value is 1 when the reading on the index is higher than the median while the value is 0 when the reading is lower than the median. Table 6 shows the regression results for the legal environment that was measured by using virtual variables. We find these three variables of the legal environment are significantly negative, which is in line with the conclusion.

Table 6
The regression results of legal environment measured by the virtual variable

	(1) $NCSKEW_{t+1}$	(2) $DUVOL_{t+1}$	(3) $NCSKEW_{t+1}$	(4) $DUVOL_{t+1}$	(5) $NCSKEW_{t+1}$	(6) $DUVOL_{t+1}$
$Highgov_t$	-0.063**	-0.033**				
	(-2.23)	(-1.97)				
$Highlaw_t$			-0.056*	-0.032*		
			(-1.64)	(-1.73)		
$Highmkt_t$					-0.081***	-0.051***
					(-2.57)	(-3.13)
$DTURN_t$	0.208**	0.141**	0.208**	0.141**	0.208**	0.140**
	(2.15)	(2.31)	(2.15)	(2.30)	(2.16)	(2.29)
$NCSKEW_t$	0.008	0.007	0.009	0.007	0.008	0.007
	(0.50)	(0.80)	(0.51)	(0.81)	(0.49)	(0.79)
$SIGMA_t$	-16.975***	-15.204***	-17.034***	-15.232***	-17.045***	-15.236***
	(-4.44)	(-7.33)	(-4.47)	(-7.38)	(-4.47)	(-7.37)
RET_t	-230.515*	-245.558***	-232.233*	-246.752***	-235.732*	-249.287***
	(-1.86)	(-3.93)	(-1.87)	(-3.93)	(-1.90)	(-3.96)
$SIZE_t$	-0.067***	-0.037***	-0.065***	-0.035***	-0.063***	-0.034***
	(-4.93)	(-4.47)	(-4.98)	(-4.49)	(-4.84)	(-4.27)
MB_t	0.004	0.011	0.005	0.011	0.004	0.011
	(0.16)	(0.94)	(0.20)	(0.99)	(0.19)	(0.98)
LEV_t	0.017	0.017	0.015	0.015	0.012	0.013
	(0.18)	(0.37)	(0.15)	(0.33)	(0.12)	(0.28)
ROA_t	-0.653***	-0.359***	-0.672***	-0.369***	-0.664***	-0.364***
	(-2.96)	(-2.98)	(-3.09)	(-3.09)	(-3.06)	(-3.06)
$ABACC_t$	0.225	0.138*	0.227	0.139*	0.230	0.141*
	(1.33)	(1.74)	(1.36)	(1.78)	(1.38)	(1.81)
CONSTANT	1.969***	1.171***	1.928***	1.147***	1.914***	1.136***
	(6.09)	(6.13)	(6.23)	(6.23)	(6.09)	(6.02)
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
N	18537	18537	18537	18537	18537	18537
R^2	0.020	0.040	0.020	0.040	0.020	0.041

Note: It is the value of T in the bracket. The standard error is adjusted through the Cluster by company and by years. ***, **, * represent the level of 1%, 5% and 10% respectively.

2. The value of legal environment in 2010 and 2011 are replaced by 2009 due to the availability of the data, which will lead to inaccurate conclusions. To this end, we reduce the

sample duration to 2009. Table 7 shows the regression results during the sample of 1997 to 2009. We can find that these legal environment indices still have a significantly negative correlation, which means the conclusion is highly reliable.

Table 7
The regression results during the changed sample

	(1) $NCSKEW_{t+1}$	(2) $DUVOL_{t+1}$	(3) $NCSKEW_{t+1}$	(4) $DUVOL_{t+1}$	(5) $NCSKEW_{t+1}$	(6) $DUVOL_{t+1}$
$Govindex_t$	-0.040***	-0.021***				
	(-3.36)	(-2.93)				
$Lawindex_t$			-0.014***	-0.007**		
			(-2.67)	(-2.41)		
$Mktindex_t$					-0.029***	-0.016**
					(-2.79)	(-2.45)
$DTURN_t$	0.359***	0.236***	0.358***	0.235***	0.358***	0.236***
	(4.14)	(3.99)	(4.14)	(3.97)	(4.10)	(3.95)
$NCSKEW_t$	0.025	0.016**	0.025	0.016**	0.025	0.016**
	(1.55)	(2.02)	(1.56)	(2.03)	(1.54)	(2.01)
$SIGMA_t$	-17.086***	-15.216***	-17.167***	-15.256***	-16.992***	-15.160***
	(-4.07)	(-6.38)	(-4.17)	(-6.52)	(-4.10)	(-6.45)
RET_t	-245.996**	-253.330***	-249.083**	-254.961***	-244.761**	-252.766***
	(-2.00)	(-3.89)	(-2.05)	(-3.98)	(-2.01)	(-3.93)
$SIZE_t$	-0.058***	-0.029***	-0.058***	-0.029***	-0.057***	-0.029***
	(-3.56)	(-3.16)	(-3.70)	(-3.28)	(-3.60)	(-3.16)
MB_t	0.001	0.018	0.003	0.018	0.002	0.018
	(0.05)	(1.37)	(0.11)	(1.42)	(0.10)	(1.42)
LEV_t	0.089	0.050	0.082	0.047	0.087	0.049
	(1.01)	(1.11)	(0.94)	(1.05)	(0.99)	(1.09)
ROA_t	-0.614**	-0.340**	-0.633***	-0.350**	-0.614**	-0.340**
	(-2.49)	(-2.48)	(-2.58)	(-2.56)	(-2.49)	(-2.47)
$ABACC_t$	0.079	0.062	0.085	0.065	0.087	0.066
	(0.43)	(0.71)	(0.47)	(0.76)	(0.48)	(0.76)
CONSTANT	2.250***	1.229***	1.914***	1.019***	2.104***	1.156***
	(4.55)	(4.70)	(4.25)	(4.25)	(4.41)	(4.58)
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
N	14800	14800	14800	14800	14800	14800
R^2	0.024	0.046	0.024	0.046	0.024	0.046

Note: It is the value of T in the bracket. The standard error is adjusted through the Cluster by company and by years. ***, **, * represent the level of 1%, 5% and 10% respectively.

3. More control variables. Kim, Li & Zhang (2011a, 2011b) find that tax avoidance and executive equity incentives increase the crash risk. Kim & Zhang (2014) find that accounting robustness could reduce the crash risk. To this end, we further add three control variables: tax avoidance, executive shareholding, and accounting robustness. The conclusion is the same as the former. The report is not in this paper due to limited space.

5. Expanding test

Instability of China's capital market is also represented in stock price's synchronous fall and rise. Morck, Yeung & Yu (2000) and Jin & Myers (2006) show that the degree of synchronicity in China's stock prices ranks high in the world, with the second and first rankings in the 40 countries in the sample. The synchronicity has a negative impact on corporate finances, capital markets, and economic policies (Xu, Hong, Wu & Xu, 2011). The question is whether the institutional environment affects the degree of synchronicity. When the specific information of companies is not reflected in the stock prices, this tends to lead to the synchronous fall and rise of stock prices. This means, therefore, that information transparency is an important factor in synchronicity. As is shown above, information transparency can improve with either declining government intervention, or improved rule of law, or the advancement of market-based reform, or any combination thereof. Therefore, improving the institutional environment can reduce the stock price synchronicity. To test this, we conduct a multiple regression analysis on the model in accordance with Hutton, Marcus & Tehranian(2009) and Gul, Kim & Qiu(2010). Table 8 shows the empirical results. The stock price's synchronicity is measured with Model 10:

$$SYN = Ln(\frac{R^2}{1-R^2}) \tag{10}$$

R^2 comes from Model 1. The *VAR* (*Industry Ret*) is the variance of yield. *Indnum* shows the number of the listed companies in the industry. *Indisize* shows the logarithm of the sum of listed company's assets. Other variables are defined the same as the above.

Table 8 shows that these three variables of the institutional environment are significantly negative at the level of 5% or 1%, which means the better the institutional environment is, the lower the synchronous degree of stock prices will be. It can be seen that the construction of the legal environment can not only reduce the crash risk, but also reduce the synchronous degree, which can promote the healthy and stable development of capital markets and improve the efficiency of capital market allocation of resources.

Table 8
Institutional environment and synchronous fall and rise of stock price

	(1) *SYN*	(2) *SYN*	(3) *SYN*
$Govindex_t$	-0.107***		
	(-4.13)		
$Lawindex_t$		-0.031**	
		(-2.34)	
$Mktindex_t$			-0.085***
			(-3.50)
Var(Industry Ret)	-9.161	-9.906	-11.281
	(-0.33)	(-0.33)	(-0.39)

	(1) *SYN*	(2) *SYN*	(3) *SYN*
SIZE	0.129***	0.130***	0.133***
	(3.45)	(3.44)	(3.56)
MB	-0.094***	-0.092***	-0.093***
	(-2.79)	(-2.71)	(-2.72)
LEV	-1.186***	-1.209***	-1.198***
	(-9.78)	(-9.82)	(-9.88)
ROA	2.026***	1.973***	2.027***
	(6.04)	(5.78)	(5.98)
Indnum	0.003	0.001	0.002
	(0.02)	(0.01)	(0.01)
Indsize	0.088	0.094	0.086
	(1.14)	(1.21)	(1.11)
CONSTANT	-0.334	-1.101	-0.679
	(-0.22)	(-0.73)	(-0.45)
Year	Control	Control	Control
Industry	Control	Control	Control
N	18537	18537	18537
R^2	0.105	0.103	0.106

Note: It is the value of T in the bracket. The standard error is adjusted through the Cluster by company and by years. ***, **, * represent the level of 1%, 5% and 10% respectively.

6. Conclusions

The steady development of capital markets has been the focus for China. Especially during the financial crisis, capital market volatility brought about great impacts on economic growth, market value, and investor wealth. It is a responsibility for a researcher to make a reasonable explanation of social economic phenomenon and make recommendations for the development of capital markets. Fortunately, academic research has found an index to measure the stock price crash risk and synchronicity of the fall or rise, which lays a solid foundation for research. It is unfortunate that the institutional environment, as addressed in the past literature, has no connection with the stability of capital markets, which provides a space for this paper. In fact, the environment is the most fundamental factor that affects the operation of enterprises. Enterprises always make their own decisions in their best interests under certain rules or institutional arrangements. Therefore, an institutional environment should be the logical starting point of studying enterprise behavior. A large body of literature has confirmed the influence of enterprise behavior on stock performance. This paper explains the instability of capital market with relevant theories of institutional influence. In comparison with the synchronicity of the stock price, the economic consequences of a crash risk are more serious. We first study the effect of institutional environment on the stock price crash risk. We further analyze and test the effect of government intervention, legal environment, and marketization on crash risks from the perspectives of government, law, and market. We find that the less the government intervention is, the better the legal environment is,

the faster the marketization process is, then the smaller the crash risk will be. Since endogenous factors may exist between the institutional environment and stock price crash risks, we choose three variables as the key variables of institutional environment: number of sea ports, whether the wharf was open, and whether the port was conceded to foreign countries in the Qing Dynasty after the first Opium War. We find the relationship between institutional environment and crash risk is still valid with the regression of 2SLS. The conclusion is still robust after changing the measurement of institutional environment and changing the sample period, which indicates that the conclusion is reliable. For the integrity of the study, we further study the effect of institutional environment on the synchronous fall and rise of the stock price and find that the government intervention index, legal environment index, and marketization index have significantly negative correlation with the synchronous fall and rise of the stock price. The above results indicate that the improvement of the institutional environment plays an important role in healthy and stable development of capital markets.

These conclusions allow for an important perspective shift for the department of policy's regulators and supervisors in regards to controlling market risk and investment policies. In particular, the perspective shifts are as follows.

6.1. The policy or regulatory department should further reduce government intervention, strengthen rule of law construction, and promote market reform

First of all, the government should be authorizing the reduction of intervention on capital markets and enterprises. The government does have the power in regards to decision-making for an enterprise's listing, refinancing, and delisting. Government's restrictions on capital markets lead companies to spend more time establishing networks without improving information transparency. Enterprises acquire debt financing through China's four state-owned banks, and government controls the credit policies. Existing researches indicate that state-owned bank loans pay less attention to the financial information and cannot distinguish the behaviors of earning management, which seriously damages information transparency improvement. The feasible measure is to further promote marketization of interest rates and to gradually loosen folk finance and develop Internet Finance. The development of financing channels is beneficial to reducing the effects of government on debt financing. Multi-competitive financing channels promote companies to regulate information disclosure and improve information transparency. The degree of disclosure for enterprise information is largely influenced by the promotion of local officials. For a long time, local government officials' appraisal mechanism require local governments to hide the bad news. Fortunately, the government has been aware of the dangers of this kind examination system. The "Notice On Improving Achievement Appraisal Work of Local Officials and Leading Cadres" which was issued in December, 2013, stipulated future examination of local party organs and leading cadres. "GDP" and its growth rate cannot be regarded as the main indicators of performance evaluation. It may be necessary to regard the information transparency

as the evaluation index, which will be conductive to reducing government corruption and rent-seeking behaviors. In addition, the government should gradually increase the appointment of marketization. Government appointing executives will hinder enterprises from providing information according to market rules.

Second, the government should strengthen the legal protective rights of investors. In addition to further perfecting the legal provisions, new policy needs to improve the efficiency of law enforcement. Previous literature has described the essential importance of legal protection on capital market development. These channels include curbing the control of shareholders to obtain self-interested goals and improving general information quality. From the perspective of the current situation, the amount of legislation has been comparable with that of developed countries, but the law enforcement efficiency is lower than the global average. Local governments will make use of their powers on controlling the personnel, finance, and welfare of courts at the sane level to protect subordinate enterprises, which interferes with the effective implementation of investor protection laws (Chen, Li, Rui & Xia, 2009). Therefore, reforming the judicial administration system, exploring the establishment of jurisdiction under the appropriate separation and unification of national laws can reduce local government's administrative intervention to a certain extent. To sum up, seeking to improve the independence of securities supervision and law enforcement agencies should be taken into consideration in policy making.

Finally, the government needs to adhere to the direction of market-oriented reform and further improve the degree of marketization. Current Chinese reform has entered into a "deep bottleneck" period (Li, Zhang, Liu & Chen, 2012). Faced with some problems in the market mechanisms, some people have become skeptical of the market-oriented reform. However, from this paper's conclusions, market-oriented reform has a significant effect on promoting capital market stability. Therefore, government should unswervingly adhere to the market-oriented reform direction and promote the process of marketization. As the Third Plenary Session of the 18th CPC Congress mentioned that "to build fair, open, and transparent market rules is to perfect the mechanisms which are mainly decided by the market, to perfect financial market systems," market rules can urge enterprises to perfect corporate governance, to reduce dependence on relationship contracts and appeal, and to provide the motives and degrees of information.

6.2. Listed companies are the macrocosmic body of the capital market

The risk of stock market fluctuations affects the stability of capital markets. This paper suggests the institutional environment is the main factor that increases market risks. Therefore, listed companies need to take the institutional environment into account when considering how to prevent and control market risks. In the areas where government intervention is serious, companies need to hinder government corruption and reduce the intervention of local official's personal legal careers regarding information disclosure, which will avoid the crash risk brought on by hiding bad news. In the areas with worse legal environment, the government should perfect

the corporate governance structure, regulate corruption, strengthen legal awareness of internal related personnel, and restrain unethical behavior of shareholders or executives. In areas with lower marketization, crash risks brought upon by opaque information in relationship contracts or rent-seeking should be given more attention. The huge loss of prices brought on by crash risks may do more harm than good if relying on relationships or rent-seeking.

6.3. The conclusions in this paper are also important for investors

Previously, investors who chose listed companies to invest were based more on the company's financial positions and corporate governance mechanisms than on the legal environment. We have tried to show in this paper that the institutional environment can affect share price distribution. Therefore, institutional environment should be an important factor to consider when deliberating about investing. In areas where government intervention is serious, that "visible hand" can be a double-edged sword: helping sometimes but not other times. Wealth shrinkage brought about by stock price crash risks due to government intervention should be avoided. Legislation and law enforcement efficiency in the areas where enterprises are located affect whether a business has been in accordance with the rules or not. For the enterprises that are located in areas with lower levels of legal environments, enterprises may hide in grey areas of the law. Therefore, investing in companies that have better legal environments may be the best policy. In addition, enterprises that are located in the areas with higher marketization, the crash risk is lower. Therefore, choosing stocks of those companies will avoid huge losses of wealth brought on by crash risk.

References

Ball, R. (2009). Market and political/regulatory perspectives on the recent accounting scandals. *Journal of Accounting Research*, *47*(2), 277-323.

Bushman, R., & J. Piotroski. (2006). Financial reporting incentives for conservative accounting: the influence of legal and political institutions. *Journal of Accounting and Economics, 42* (1/2), 107-148.

Bushman, R. M., J. D. Piotroski, & A. J. Smith. (2004). What determines corporate transparency? *Journal of Accounting Research, 42*(2), 207-252.

Chen, X. Y., Li, M. C., Rui, M., & Xia, L. J. (2009). Judicial independence and enforcement of investor protection law—the market reaction on the "Notice of 1/15" of Supreme People's Court. *China Economic Quarterly(Jingjixue Jikan)*, *9* (1), 1-28.

Cheng, X. S., Tan, Y. C., & Xu, L. (2011). Company value, volunteer disclosure and marketization process. *Financial Research(Jinrong Yanjiu)*, 8, 111-127.

Dechow, P., Sloan, R. & A. Sweeney. (1995). Detecting earnings management. *Accounting Review, 70*(2), 193-225.

DeFond, M., & M. Hung. (2004). Investor protection and corporate governance: evidence from worldwide CEO turnover. *Journal of Accounting Research, 42*(2), 269-312.

Dimson, E. (1979). Risk measurement when shares are subject to infrequent trading. *Journal of Financial Economics, 7*(2), 197-226.

Dyck, A., L. Zingales. (2004). Private benefits of control: an international comparison. *Journal of Finance, 59*(2), 537-600.

Faccio , M. (2006). Politically connected firms. *American Economic Review, 96*(1), 369-386.

Fan, G., Wang, X. L., & Zhu, H. P. (2011). *China's marketization index---relative progress of the regional marketization in 2011*. Beijing: Economic Science Press.

Fan, J. P. H., T. J. Wong, & T. Zhang. (2013). Institutions and organizational structure: the case of state-owned corporate pyramids. *Journal of Law, Economics, and Organization, 29*(6), 1217-1252.

Fang, J. X. (2006). The process of marketization and improvement of capital allocation efficiency. *Economic Research Journal(Jingji Yanjiu)*, 5, 50-61.

Fang, J. X. (2007). Ownership, institutional environment and credit capital allocation. *Economic Research Journal(Jingji Yanjiu),*12, 82-92.

Filip, A., R. Labelle, & S. Rousseau. (2015). Legal regime and financial reporting quality. *Contemporary Accounting Research, 32*(1), 280-307.

Gul, F.A., J-B. Kim, & A. A. Qiu. (2010). Ownership concentration, foreign shareholding, audit quality, and stock price synchronicity: evidence from China. *Journal of Financial Economics, 95*(3), 425-442.

Hutton, A.P., A.J. Marcus, & H. Tehranian. (2009). Opaque financial reports, R2, and crash risk. *Journal of Financial Economics, 94*(1), 67-86.

Jiang, F. X., & Huang, J. C. (2011). Marketization process and dynamic adjustment of capital structure. *Management World(Guanli Shijie)*, 3, 124-134.

Jiang, Y. B., & Yang, T. (2012). The impact of institutional environment on the implementation of accounting standards. *Accounting Research (Kuaiji Yanjiu)*, 4, 69-78.

Jin, L., & C.S. Myers. (2006). R2 around the world: new theory and new tests. *Journal of Financial Economics*, *79*(2), 257-292.

Kim J.-B., Y. Li, & L. Zhang. (2011a). Corporate tax avoidance and stock price crash risk: firm-level analysis. *Journal of Financial Economics, 100*(3), 639-662.

Kim J.-B., Y. Li, & L. Zhang. (2011b). CFOs versus CEOs: equity incentives and crashes. *Journal of Financial Economics*, *101*(3), 713-730.

Kim, J.B., & L. Zhang. (2015). Accounting conservatism and stock price crash risk: firm-level evidence. *Contemporary Accounting Research*, doi: 10.1111/1911-3846.12112.

Kornail, J., E. Maskin, & Roland, G. (2003). Understanding the soft budget constraint. *Journal of Economic Literature, 41*(4), 1095-1136.

Kothari, S.P., Shu, S. & Wysocki, P. D. (2009). Do managers withhold bad news? *Journal of Accounting Research*, *47*(1), 241–276.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, & R. Vishny. (2000). Investor protection and corporate governance. *Journal of Financial Economics*, *58*(1), 3-27.

LaPorta, R., F. Lopez-de-Silanes, A. Shleifer, & R.Vishny. (1998). Law and finance. *Journal of Political Economy*, 106, 1113-1155.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, & R. Vishny. (1997). Legal determinants of external finance. *Journal of Finance*, *52*(3), 1131-1150.

La Porta, R., F. Lopez-de-Silanes, & A. Shleifer. (1999). Corporate ownership around the world. *Journal of Finance*, 54, 471-517.

Lei, G. Y., & Liu, H. L., Marketization process, the nature of ultimate controller and cash dividend behavior. Management World(Guanli Shijie), 7, 120-128.

Li, X. R., & Liu, H. (2012). CEO vs CFO: sex and stock price crash risk. *World Economy*(*Shijie Jingji*), 12, 102-129.

Li, X. L., Zhang, X., Liu, Z., & Chen, D. (2012). Institutional environment and rent-seeking activities: research with the data from World Bank. *China Industrial Economics(Zhongguo Gongye Jingji)*, 11, 84-96.

Lin, Y. F., & Li, Z. Y. (2004). Policy burden, moral hazard and soft budget constraint. *Economic Research Journal*(*Jingji Yanjiu*), 2, 17-27.

Luo, D. L., & Tang, Q. Q. (2009). Research on institutional environment and performance of private listed corporations in China. *Economic Research Journal(Jingji Yanjiu)*, 2, 106-118.

Morck, R., B. Yeung, & W. Yu. (2000). The information content of stock markets: why do emerging markets have synchronous stock price movements? *Journal of Financial Economics, 58*(1-2), 215-260.

Pan, H. B., & Yu, M. G. (2011). Support hand, grabbing hand and remote acquisition. *Economic Research Journal(Jingji Yanjiu)*, 9, 108-120.

Piotroski, J. D., & T.J. Wong. (2011). Institutions and information environment of Chinese listed firms. Working Paper, The Chinese University of Hong Kong.

Piotroski, J.D., T.J. Wong, & T. Zhang. (2011). Political incentives to suppress negative financial information: evidence from state-controlled Chinese firms. Working Paper, The Chinese University of Hong Kong.

Sun, Z., Liu , F. W., & Li, Z. Q. (2005). Marketization degree, government intervention and corporate debt maturity structure—empirical evidence from China's listed companies. *Economic Research Journal(Jingji Yanjiu)*, 5, 52-63.

Tang, X. S., Luo, S., & Wang, H. Y. Marketization process and the role of government audit. *Audit Research(Shenji Yanjiu)*, 3, 25-31.

Teng, T., Wang, G. P., & Liu, Z. (2008). Spike model vs correct investment philosophy. Topic research report from the Galaxy Securities Institution.

Xia, L. J., & Chen, X. Y. (2007). Marketization process, reform strategy of state-owned

enterprises and endogenous decision of corporate governance structure. *Economic Research Journal(Jingji Yanjiu)*, 7, 82-95.

Xia, L. J., Fang, Y. Q. (2005). Government controlling, governance environment and company value—empirical evidence from security market of China. *Economic Research Journal(Jingji Yanjiu)*, 5, 40-51.

Xu, N. X., Jiang, X. Y, Yi, Z. H., & Xu, X. Z. (2012). Interests conflict of analyst, optimistic bias and stock price crash. *Economic Research Journal(Jingji Yanjiu)*, 7, 127-140.

Xu, N. X., Hong, T., Wu, S. N., & Xu, X. Z. (2011). Information transfer model, investors' psychological bias and stock price's synchronous fall and rise. *Economic Research Journal(Jingji Yanjiu)*, 4, 135-146.

Xu, N. X., Yu, S. Y., Yi, Z. Z. (2013). The herding behavior of institutional investors and stock price crash risk. *Management World(Guanli Shijie)*, 7, 31-43.

Williamson,O.E. (1975). *Markets and hierarchies, analysis and antitrust implications*. London: Collier Macmillan Publishing.

Yan, W., Xu, R., Shi, Q. H., & Wang, Y. X. (2012). Property rights protection and market information asymmetry: evidence from China A-B share. *Economic Research Journal(Jingji Yanjiu)*, 12, 128-141.

Yu, H. L. (2006). Government controlling and efficiency of governance mechanism----based on the empirical evidence from China's A-share market. *Nankai Business Review(Nankai Guanli Pinglun)*, *9* (1), 98-102.

Zheng, G. J. (2011). The micro mechanism of market reform: from the perspective of related party transaction. *China Accounting Review(Zhongguo Kuaiji Pinglun)*, *9* (3), 337-352.

Zhou, W., Xu, Y. D., & Li, H. Y. (2011). Network of relationship between government and enterprise, perquisite consumption and market system construction. *Statistical Research(Tongji Yanjiu)*, 2, 53-58.