# Study on Investment Efficiency, Institutional Investor and Stock Price Crash Risk

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**Abstract:** Stock price crash risk has become a common phenomenon in the capital market and it has tremendous negative influence on economy. Majority of the researches regarding crash risk are the causes of it. However, this paper focus on the economic effect of it. I use OLS model to identify the relationship between crash risk and investment efficiency. I find that it has negative influence on investment efficiency, and this relationship is more significant in Non-SOEs. Also, this relationship will be alleviated with the presence of stable institutional investors.

## 1. Introduction

Stock price crash risk is premised on the notion that managers have a strong tendency to withhold bad news for an extended period, allowing bad news to stockpile. When the accumulation of bad news passes a threshold, it is revealed to the market at once, leading to a large negative drop in price for the stock (Jin and Myers,2006). Reasonable asset pricing is the prerequisite to ensure the healthy operation of the capital market, especially for stock market. However, stock price crash risk, a phenomenon of abnormal fluctuation of stock price, may exert negative influence on the resource allocation and development of the real economy. Also, the investment activity, one of the most important activities in companies, plays a vital role in the cash flow generation as well as the growth of the value of companies. But in China, since the development of capital market is immature and mechanisms to deal with those risks are not perfect, it is necessary to know the impact of crash risks on investments as well as solutions to those problems.

A large body of literature examines the underlying determinants of the stock price crash risk. They find that some internal factors, such as corporate taxation avoidance (Kim et al., 2011), corporate social responsibility (Kim et al., 2013), accounting conservation (Kim et al., 2016) and other external factors, such as investor protection (Wang et al., 2014), analyst coverage (Xu et al., 2013), media report(Luo et al., 2014) have great influences on stock price crash risk. However, majority of researchers focus on the reasons why the stock price crash risk will occur rather than the economic influences this phenomenon will have. So, this paper mainly bases on investment efficiency and exam the economic consequences and mechanisms of the stock price crash risk will have. By researching this topic, we can recognize the adverse effect of crash risk on investment efficiency, and it plays a very important role in improving investment efficiency as well as promoting the development of economy.

According to investment theory, managers should continue investing until marginal investment revenue equals to marginal costs by undertaking positive net present value projects based on the assumption that there is no friction in the capital markets (Abel,1983). However, agency problems may induce managers to make sub-optimal investment decisions resulting in both over-investment or under-investment, which lower investment efficiency. The existing research reveals that higher quality financial reporting helps to disclose more information about listed firms, which increase shareholders' and external investors' abilities to monitor managerial investment activities. And it can be associated with investment efficiency improvement (Biddle et al.,2009). Prior study of crash risk attributes stock price crashes to managers' incentives and abilities to hide bad news. When

accumulated bad news crosses a tipping point, managers give up to conceal the information and all the bad news will be released at once, which results a sudden huge decrease in stock price. Information asymmetry between management and external investors is the main cause of crash risk. The following hypothesis is developed based on these arguments:

H1: The stock price crash risk is negatively related with investment efficiency.

H1a: Firms with higher stock price crash risk will increase more over investments.

H1b: Firms with lower stock price crash risk will increase more under investments.

In China, governments have huge impact on the development of SOEs. Endorsed by governments, SOEs are more easily to get financing from securities markets. Also, information is not important in investment decisions of SOEs because those companies need to invest under the guidance of governments rather than growth opportunities (Sun et al., 2005). But for Non-SOEs, they face with more complicated financing constrains in the market (Brandt and Li, 2003). Without support from governments, those companies need to improve information disclosure quality in order to gain investors' recognition as well as acquire lower financing costs, which could alleviate financing constrains and decrease under-investment because of lack of capital. What is more, influenced by market mechanism, Non-SOEs are more careful to make investment decisions in order to avoid wastes of resources because of overinvestment. Non-SOEs must keep information transparency to alleviate information asymmetry and to gain more trusts from outside investors. Compared with SOEs, Non-SOEs have higher information sensitivity. The following hypothesis is developed based on above arguments:

H2: The relationship between stock price crash risk and investment efficiency varies in SOEs and Non-SOEs.

Institutional investors have become the dominant equity investors in the Chinese capital market than before. They tend to have substantial influences on the operation and decision making of listed companies, including investment decisions (Sias and Starks, 1997). According to previous research, the investment period is a very important factor which can affect corporate governance (Jiang et al.,2015). Based on this theory, there are two kinds of institutional investors: stable institutional investors and transactional institutional investors. The former one has a higher share-holding ratio as well as longer holding period and focuses more on the long-term operation of the company (Niu et al.,2013). This kind of investors are prone to spend more time analyzing and monitoring the invested companies, which could reduce the information asymmetry between the firm and investors. Also, stable institutional investors play an important role in limiting earnings management and guiding executives to pay more attention on the long-term profit by investing those high return projects (Li et al.,2014). Compared with transactional institutional investors which focus more on immediate interests, stable institutional investors are more familiar with firms and are more willing to supervise the management (Chen,2007). The following hypothesis is developed based on above arguments:

H3: The stable institutional investors will attenuate the impact of stock price crash risk on investment efficiency.

The remainder of this paper is organized as follows: section 2 comprises imperial model I used in this paper. Section 3 contains research design. Section 4 presents main numerical results. Section 5 depicts main conclusion.

## 2. Imperial Model

In this paper, I quantify investment efficiency by Richardson Model.

$$Inv\_new_t = \beta_0 + \beta_1 Grow_{t-1} + \beta_2 Lev_{t-1} + \beta_3 Cash_{t-1} + \beta_4 Age_{t-1} + \beta_5 Size_{t-1} + \beta_6 Yret_{t-1} + \beta_7 Inv\_new_{t-1} + \sum Year + \sum Industry + \varepsilon \quad (1)$$

I measure stock price crash risk by negative conditional skewness of firm-specific weekly returns over the fiscal year (Ncskew) and down-to-up volatility measure (Duvol). In model (2), $R_{i,t}$

represents return of stock i in the t week and $R_{m,t}$ symbols the corresponding market return. After regression I get residuals. In estimating residuals, samples with firm-specific weekly returns less than 30 are excluded.

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

The firm-specific weekly return for stock i in week t, $W_{i,t}$, is calculated by the natural logarithm of one plus residual in model (2). First proxy of crash risk is calculated by the following model (3):

$$Ncskew_{i,t}= - [n (n-1)^{3/2}\sum W^3_{i,t}] / [ (n-1) (n-2) (\sum W^2_{i,t})^{3/2}] \quad (3)$$

The second measurement of stock price crash risk is Duvol. Variable $n_{up}$ and $n_{down}$ represents the number of week when the firm-specific weekly return for stock i in week t, $W_{i,t}$, is higher or lower than the average return of that year. Based on the model (4), I get the Duvol value.

$$Duvol_{i,t}=\log\{[(n_{up}-1) \sum_{down} W^2_{i,t}] / [(n_{down}-1) \sum_{up} W^2_{i,t}]\} \quad (4)$$

A higher value of $Ncskew_{i,t}$ and $Duvol_{i,t}$ represents higher crash risk.

I introduce a dummy variable TYPE to measure the stable institutional investors. $IOS_{i,t}$ defines characteristics of stable institutional investors. $INSNUM_{i,t}$ is the percentage of shares hold by institutional investors in year t of firm i. $IOS_{i,t}$ is calculated by this divided to standard deviation of holding shares of last three years. Higher $IOS_{i,t}$, greater percentage of holding shares as well as stable of holding shares, which is consistent with definition of stable institutional investors.

$$IOS_{i,t} = \frac{INSNUM_{i,t}}{STD(INSNUM_{i,t-1};INSNUM_{i,t-2};INSNUM_{i,t-3})} \quad (5)$$

Because in different industries, it is difficult to compare the stability of investment of institutional investors. I introduce the median of $IOS_{i,t}$ as measurement. TYPE equals to 1 when $IOS_{i,t}$ is larger than its median in the certain industry in year t. By this way, I can distinguish between transactional institutional investors and stable institutional investors.

To test the effect of crash risk on investment efficiency, I regress investment efficiency and other control variable using the following model (6):

$$Eff\_inv_{i,t} =\alpha_0+\alpha_1 CRASHRISK_{i,t-1} + \alpha_2 ControlVariables_{i,t-1} +\varepsilon_{i,t-1} \quad (6)$$

$CRASHRISK_{i,t-1}$ is the proxy of stock price crash risk, which is measured by Ncskew and Duvol. If $\alpha_1$ is positive, H1 will be confirmed. In order to know crash risk is more related to over investment or under investment, I replace Eff_inv with OverInv or UnderInv and then do the regression.

As for hypothesis 2, I can divide my sample into two separate parts according to the ownership, then retest model (6) to examine the value of key coefficient.

In order to test stable institutional investors impact on the investment efficiency and crash risk, I add an intersection variable into model (6):

$$Eff\_inv_{i,t} = \beta_0+\beta_1 CRASHRISK_{i,t-1}+\beta_2 TYPE_{i,t-1} * CRASHRISK_{i,t-1}+\beta_3 TYPE_{i,t-1}+ \beta_4 Control Variables_{i,t-1} +\varepsilon_{i,t-1} \quad (7)$$

In model (7), $\beta_1+\beta_2$ reflects influence of stock price crash risk on the investments efficiency when the institutional investors hold shares in the company. $\beta_2$ is the most important coefficient to test hypothesis 3. If $\beta_2$ is negative, H3a will be confirmed.

## 3. OLS Model

In this paper, I use the most common method of fitting a straight line to a sample of data: ordinary least squares method (OLS). I perform OLS linear regression in Stata to generate predictions or to model a dependent variable in terms of its relationships to a set of explanatory variables. The most important point of this model is to minimize the sum of the squares of the deviations of the data from the line.

To test the effect of stock price crash risk on investment efficiency, I run model (6) in OLS regression. In order to examine the relationship between crash risk and investment under the existence of stable institutional investors, I include an intersection variable in model (6) and use OLS model to get regression results.

## 4. Numerical Results

### 4.1 Crash Risk and Investment Efficiency

In this section, I perform investment efficiency examination first in order to find the relationship between these two variables. Then I explore the relationship in two alternative scenarios, over-investment and under-investment, depicted by positive and negative residuals in the Richardson's investment efficiency model. Table 1 lists the regression results of these two variables and I define stock price crash risk as variable NCSKEW and DUVOL and make regression separately. In regard of model (6), the results show that the crash risk increases the investment inefficiency, since the investment efficiency measure coefficient is positive and significant and regression results do not vary in these two conditions. These results are in line with those reported by Biddle et al. (2009), and confirm our hypothesis 1.

Table 1. Regression of investment efficiency and stock price crash risk

| Variables | Eff_inv | Eff_inv |
|---|---|---|
| DUVOL | 0.00379*** | - |
| | (0.00111) | |
| NCSKEW | - | 0.00231*** |
| | | (0.000844) |
| Lev | -0.0124*** | -0.0124*** |
| | (0.00386) | (0.00386) |
| CashFlow | -0.0226*** | -0.0228*** |
| | (0.00799) | (0.00800) |
| Yret | 0.0227*** | 0.0213*** |
| | (0.00190) | (0.00178) |
| Age | -0.00295*** | -0.00297*** |
| | (0.000893) | (0.000893) |
| Constant | 0.0823*** | 0.0817*** |
| | (0.00526) | (0.00525) |
| R-squared | 0.079 | 0.078 |
| Year | Control | Control |

| | | |
|---|---|---|
| Industry | Control | Control |
| Observations | 6,988 | 6,988 |
| R-squared | 0.076 | 0.075 |
| F | 32.243*** | 32.517*** |

Furthermore, I regress crash risk with over-investment and under-investment and the regression results are shown in table 2. No matter how I define crash risk, the relationship between over-investment and crash risk is not significant. But the under-investment measure coefficient is positive and significant in this condition, which means that crash risk has a closer relationship with under-investment. In my sample, overinvestment observations only account for 34.67%, which means that the phenomenon of underinvestment is more prominent in China. This finding is consistent with research of Chen et al. (2011). However, in China, majority of Non-SOE firms suffer underinvestment because it is more difficult for them to get enough financing when compared with SOEs, which sponsored by government (Allen et al.,2005). However, information does not play an important role in investment decisions in SOEs because they tend to invest according to the preferences of the government. So, this maybe the reason why crash risk has a significantly positive relationship with underinvestment rather than overinvestment.

Table 2. Regression of over-investment or under-investment and stock price crash risk

| Variables | OverInv | UnderInv |
|---|---|---|
| NCSKEW | 0.00169 | 0.00170*** |
| | (0.00219) | (0.000483) |
| DUVOL | 0.00482* | 0.00207*** |
| | (0.00287) | (0.000637) |
| Lev | -0.0195* | -0.0108*** |
| | (0.0104) | (0.00217) |
| CashFlow | -0.0963* | -0.0141*** |
| | (0.0265) | (0.00419) |
| Yret | 0.0350*** | 0.0152*** |
| | (0.00466) | (0.00101) |
| Age | -0.00139 | -0.00274*** |
| | (0.00227) | (0.000518) |
| Constant | 0.109*** | 0.0666*** |
| | (0.0132) | (0.00305) |
| Year | Control | Control |
| Industry | Control | Control |
| R-squared | 0.085 | 0.190 |
| F | 10.774*** | 57.946*** |

### 4.2 Relationship between Crash Risk and Investment Efficiency in Different Actual Controller

Table 3 lists influence of crash risk on investment efficiency under different actual controller situations. I divide total sample into two separate parts: SOEs and Non-SOEs and retest model (6) in order to find effect of government on this relationship. In SOEs, the relationship between crash risk and investment efficiency is negative but this regression results do not pass the test of significance. It can be concluded that the crash risk is not remarkably negative influence the investment efficiency. Endorsed by government, SOEs are more like to invest according to preference of government rather than the market condition (Sun et al.,2005). However, in Non-SOEs, the relationship is extremely

significant, which means that phenomenon that higher crash risk with lower investment efficiency exists in Non-SOEs. Hypothesis 2 is confirmed.

Table 3. Regression of crash risk and investment efficiency under different actual controller situations

| | SOE | | Non-SOEs | |
|---|---|---|---|---|
| Variables | Eff_inv | Eff_inv | Eff_inv | Eff_inv |
| NCSKEW | 0.000527 | - | 0.00326*** | - |
| | (0.000978) | | (0.00122) | |
| DUVOL | - | 0.00104 | - | 0.00479*** |
| | | (0.00130) | | (0.00154) |
| Lev | -0.0145*** | -0.0145*** | -0.0196*** | -0.0196*** |
| | (0.00452) | (0.00452) | (0.00566) | (0.00566) |
| Cash Flow | -0.0135 | -0.0113 | -0.0119 | -0.0115 |
| | (0.0102) | (0.0102) | (0.0137) | (0.0137) |
| Yret | 0.0102*** | 0.0104*** | 0.0298*** | 0.0308*** |
| | (0.00254) | (0.00270) | (0.00206) | (0.00215) |
| Age | -0.000198 | -0.000195 | 0.000866 | 0.000832 |
| | (0.000205) | (0.000205) | (0.00128) | (0.00128) |
| Constant | 0.0474*** | 0.0472*** | 0.0527*** | 0.0525*** |
| | (0.00472) | (0.00472) | (0.00264) | (0.00263) |
| Year | Control | Control | Control | Control |
| Industry | Control | Control | Control | Control |
| R-squared | 0.016 | 0.016 | 0.052 | 0.053 |
| F | 5.94*** | 5.88*** | 47.66*** | 47.13*** |

### 4.3 Relationship between Crash Risk and Investment Efficiency with the Existence of Stable Institutional Investors

Concerning the interaction term of the crash risk and institutional investors, it has been designed to offer us evidence as to whether the presence of stable institutional investors has a moderating effect on the interrelation between crash risk and investment efficiency. I choose DUVOL as an example, the negative and significant coefficient of the interaction term indicates that the stable institutional investors attenuate the impact of stock price crash risk on investment efficiency, which because the stable institutional investors play a very important role in monitoring managements and this reduce information asymmetry between firms and investors significantly (Li et al.,2014).

Table 4. Regression of crash risk and investment efficiency under the existence of stable institutional investors

| Variables | Eff_inv |
|---|---|
| L.DULTYPE | -0.00267* |
| | (0.00146) |
| L.TYPE | -0.00827*** |
| | (0.00165) |
| L.DUVOL | 0.00302** |
| | (0.00120) |
| CashFlow | -0.0190** |
| | (0.00852) |
| Yret_lag | 0.0213*** |
| | (0.00206) |
| Lev | -0.0143*** |
| | (0.00440) |
| Age | -0.00209* |
| | (0.00115) |
| Constant | 0.0745*** |
| | (0.00332) |
| Year | Control |
| Industry | Control |
| R-squared | 0.0847 |
| F | 31.24*** |

## 5. Conclusion and Future Research

In this paper, I examine the relationship between the stock price crash risk and investment efficiency. I find that crash risk has a negative influence on the investment efficiency, and this relationship is more significant in Non-SOEs. In addition, compared with over-investment, crash risk is more likely to result in under-investment in China. What is more, the relationship between crash risk and investment efficiency is attenuated with the presence of stable institutional investors. I classify institutional investors in two categories in this paper, but this classification seems a bit rough. In the future, I think that more detailed classification could be carried out in the research based on deep understanding of behavioral characteristics of institutional investors. Also, in this paper, I only take institutional investors into account, some other factors, such as auditors, will also influence the information disclosure. I should consider those factors in the future research.

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