

# Economic Policy Uncertainty and Stock Price Crash Risk: Evidence from China

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## ABSTRACT

This paper investigates the impact of economic policy uncertainty (EPU) on stock price crash risk. Adopting two firm-specific crash risk measures: negative conditional skewness (NCSKEW) and downward volatility (DUVOL), we find that China's EPU had a negative impact on stock price crash risk. This association is robust to a series of robustness checks, including adopting a firm fixed effects model, alternative EPU measure, and additional control variables. Further analyses suggest that the negative correlation of EPU and stock price crash risk is more pronounced for firms with higher analyst coverage. This research shows that EPU can help listed firms make more prudent decisions and reduce future stock price crash risk.

**Keywords:** Stochastic model checking, assume-guarantee reasoning, symmetric assume-guarantee rule, learning algorithm, probabilistic automata

## 1. INTRODUCTION

Stock price crash risk is an important economic characterization of the missing of corporate governance. Previous studies have explored determinants of the stock price crash risk, including mandatory adoption of IFRS [1], religion [2], tax avoidance [3], equity incentives [4], financial analysts [5], institutional investors [6], accounting conservatism [7], and management excess allowances [8]. Unlike previous studies, this paper aims to examine the relationship between EPU and stock price crash risk.

Compared with developed capital markets, China provides a different environment for studying the impact of EPU on stock price crash risk. Adopting the sample of A-share listed companies in China from 2008 to 2018, listed companies' stock price crash risk in China. It showed more obvious cyclical characteristics during the sample period: the proportion of individual stocks with stock price crash risk in 2008-2014 was below 10%, rising to more than 16% after 2015 and even reaching 47.2% in 2016 [9]. And the stock price crash risk is reflected in the sudden crash of one-way stock price,

causing heavy losses to investors, a sharp decline in wealth. That hits investors' enthusiasm for investment and seriously interferes with the role of capital markets in the allocation of resources, restricting the role of the stock market. China's capital market is not mature enough; investors' herd behavior is more obvious; internal trading, Rat Trading from time to time. The research on stock price crash risk in China has only begun in recent years and mainly focuses on explaining the formation mechanism and influencing factors of stock price crash risk. And from internal aspects, the elements mainly focus on the influence of relevant personnel within the company, such as the independent director system [10], the majority shareholder's shareholding ratio [11], and so on firms, etc. However, the analysis and guess of various factors still lack convincing data support, and the analysis of various factors is not complete.

No previous study has systematically studied the impact of EPU on China's stock price crash risk. At the same time, because China only formally carried out the reform of the equity system in 2008, the whole Chinese financial market system is weak. This background increases the influence of the EPU on listed companies,

increasing the link with the stock price crash risk of listed companies, so we study the impact of EPU on the stock price crash risk in the special Chinese financial market environment a different significance.

We fill this gap by using EPU data manually collected from China during 2007-2018 to examine the impact of the EPU on stock price crash risk. We find a negative correlation between the EPU and the stock price crash risk. This association is robust after a range of robustness checks, including adopting a firm fixed effects model, alternative EPU measure, and additional control variables. Moreover, further research suggests that the negative correlation of the EPU and stock price crash risk is more pronounced for firms with higher analyst coverage. Therefore, this article expects that a higher level of EPU index makes the firm more robust and the managers make fewer radical decisions so that the future stock price crash risk can be reduced.

This study contributes to the extant literature in three ways. First, we expand the research on the economic consequences of the EPU, and unlike most of the previous research on the macroeconomic impact of the EPU, we fill the study of the impact of the EPU on the firms' stock price crash risk, which is conducive to people from an individual and microeconomic point of view of the impact of the EPU. Second, we expand the research on the factors related to the stock price crash risk. Unlike previous research on the stock price crash risk, which mainly focuses on the influence of internal and external personnel, our research is based on China's particular financial market system, which fills the data in the macro policy impact on the firms' stock price crash risk. It is conducive to more EPU in corporate decision-making. Third, our further research conclusions also expand the relevant literature on the role of analysts in emerging capital markets.

## 2. DATA AND SAMPLE

### 2.1. Construction of sample

Our sample is comprised of all firms listed on the SHSE and SZSE from 2007 to 2018. We choose 2007 as the beginning year of our sample period because China's A-share listed companies have basically completed the share-trading reform. We exclude ST stocks and other stocks with abnormal trading conditions. We exclude samples that have been on the market for less than one year. Besides, we exclude the samples with less than 6 weeks of data when calculating the stock price crash risk variable. To avoid the influence of extreme values on the empirical results, all continuous variables are minorized at the 1% and 99% levels. Finally, we get a sample including 2007-2018 firm-year observations, representing 19291 firms.

### 2.2. Models

To test the impact of EPU on stock price crash risk, we construct the following regression model, which is shown as follow:

The hypotheses to be tested are that stock price crash risk is a function of EPU and other control variables. The basic empirical model employed is:

$$\begin{aligned}
 NCSKEW_{i,t+1} \text{ or } DUVOL_{i,t+1} &= \beta_0 + \beta_1 EPU_{i,t} \\
 &+ \sum_k \beta_k Controls_{k,i,t} \\
 &+ \epsilon_{i,t+1},
 \end{aligned} \tag{1}$$

where  $i$  indexes firms,  $t$  denotes years, and  $Controls_{k,i,t}$  is a set of control variables on an annual basis, including  $NCSKEW_{i,t}$ ,  $Sigma_{i,t}$ ,  $Ret_{i,t}$ ,  $Dturn_{i,t}$ ,  $Size_{i,t}$ ,  $BM_{i,t}$ ,  $LEV_{i,t}$ ,  $ROA_{i,t}$ , and  $AbsACC_{i,t}$ , considered crucial in related studies (Yuan et al., 2016). Appendix A provides the definitions of all control variables used in our analysis. Note that the one-year lagged measure of crash risk ( $NCSKEW_{i,t}$ ) is included as a control variable to avoid potential endogenous effects. In addition, to control for the sample's heterogeneity caused by year and industry, we adopt a two-way fixed effect model to estimate the regressions. All other continuous variables are winsorized at the 1% level in each tail.

### 2.3. Main Variables

#### 2.3.1. Dependent variable: stock price crash risk

Following Jin and Myers [12], and Kim et al. [13], we refer to a remote and negative anomaly in a company's residual earnings as a stock price collapse. We apply two firm-specific crash risk measures: negative conditional skewness ( $NCSKEW$ ) and downward volatility ( $DUVOL$ ). In detail, we estimate the following extended index model. We evaluate the following extended index model for calculating firm-specific weekly returns for each firm-year.

$$\begin{aligned}
 r_{i,\omega} &= \alpha_i + \beta_{1,i} r_{m,\omega-2} + \beta_{2,i} r_{m,\omega-1} + \beta_{3,i} r_{m,\omega} \\
 &+ \beta_{4,i} r_{m,\omega+1} + \beta_{5,i} r_{m,\omega+2} \\
 &+ \epsilon_{i,\omega},
 \end{aligned} \tag{2}$$

where  $r_{i,\omega}$  and  $\epsilon_{i,\omega}$  are the original earnings and firm-specific earnings of stock  $i$  in week  $\omega$  respectively, and  $r_{m,\omega}$  is the value-weighted market return. It includes both early and lagged market returns to allow for asynchronous trading. Then, we estimate firm  $i$  specific weekly earnings in week  $\omega$ .  $W_{i,\omega}$ , as the natural logarithm of 1 plus the firm-specific return in Eq. (1). The first measure of crash risk ( $NCSKEW$ ), which is calculated by taking the negative value of the third moment of firm-

specific weekly earnings for each year and normalizing it by raising it to the third power of the standard deviation of firm-specific weekly earnings. In details, for each firm  $i$  in year  $t$ , we compute crash risk as:

$$NCSKEW_{i,t} = - \left[ n(n-1)^{\frac{3}{2}} \sum_{\omega} W_{i,\omega}^3 \right] / \left[ (n-1)(n-2) \left( \sum_{\omega} W_{i,\omega}^2 \right) \right] \quad (3)$$

where  $n$  denotes the number of firm-specific weekly stock returns observed in year  $t$ . As  $NCSKEW_{i,t}$  increase, stock  $i$  is more likely to crash in year  $t$ . They are negatively correlated. Weeks with company-specific returns above (below) the annual average are assigned to the rising weeks (falling weeks) group.  $DUVOL_{i,t}$  is computed as the natural logarithm of the ratio of the standard deviation in the down weeks to that in the up weeks:

$$DUVOL_{i,t} = \log \left\{ \left( n_{up} - 1 \right) \left( \sum_{\omega \in DOWN\_weeks} W_{i,\omega}^2 \right) \right\} / \left\{ \left( n_{down} - 1 \right) \left( \sum_{\omega \in UP\_weeks} W_{i,\omega}^2 \right) \right\} \quad (4)$$

In this set of equations,  $n_{up}$  and  $n_{down}$  are the numbers of up and down weeks respectively. The higher the  $DUVOL_{i,t}$ , the greater the crash risk firm  $i$  faces in year  $t$ .

### 2.3.2. Test variable: EPU

Based on the frequency counts of articles on policy-related economic uncertainty, Baker, Bloom & Davis [14] constructs an EPU index in the South China Morning Post (SCMP). Therefore, we use the EPU index developed by Baker et al. [14] for China to proxy China's EPU.

**Table 1** Correlation analysis

|           | F_NCSKEW  | F_DUVOL   | EPU       | NCSKEW_it | Ret_t    | Sigmat   | Size     | Age      | Lev      | Frs      | Growth   |
|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|
| F_NCSKEW  | 1         | 0.884***  | -0.100*** | 0.052***  | -        | 0.030*** | -        | -        | -        | -        | 0.031*** |
| F_DUVOL   | 0.875***  | 1         | -0.100*** | 0.041***  | 0.029*** | 0.024*** | 0.117*** | 0.054*** | 0.057*** | 0.033*** | 0.030*** |
| EPU       | -0.085*** | -0.080*** | 1         | -0.011    | 0.024*** | -        | 0.126*** | 0.055*** | 0.064*** | 0.032*** | -        |
| NCSKEW_it | 0.053***  | 0.038***  | -0.001    | 1         | 0.182*** | 0.182*** | 0.195*** | 0.360*** | 0.101*** | 0.037*** | 0.059*** |
| Ret_t     | -0.011    | -0.003    | 0.180***  | 0.097***  | 1        | 0.051*** | 0.105*** | 0.021*** | 0.068*** | 0.047*** | 0.032*** |
| Sigma_t   | 0.025***  | 0.016**   | -0.214*** | -0.072*** | -        | 1        | 0.330*** | 0.149*** | 0.009    | 0.045*** | 0.035*** |
| Size      | -0.115*** | -0.125*** | 0.192***  | -0.111*** | 0.975*** | 0.312*** | 1        | -        | -0.010   | -        | 0.036*** |
| Age       | -0.054*** | -0.054*** | 0.354***  | -0.022*** | 0.269*** | -        | 0.168*** | 1        | 0.093*** | -        | -        |
| Lev       | -0.051*** | -0.061*** | -0.105*** | -0.063*** | 0.001    | 0.110*** | 0.399*** | 0.114*** | 1        | 0.156*** | 0.101*** |
| Frs       | -0.034*** | -0.034*** | -0.041*** | -0.053*** | 0.039*** | -0.005   | 0.234*** | -        | 0.039*** | 1        | 0.034*** |
| Growth    | 0.017**   | 0.013*    | -0.028*** | 0.014**   | -        | 0.049*** | -0.005   | 0.158*** | 0.056*** | 0.033*** | 1        |
|           |           |           |           |           | 0.059*** | 0.068*** |          | 0.026*** |          |          |          |

This table presents the relationship between the effects of different factors in the EPU, while controlling for industry and year fixed effects. Detailed descriptions of all variables are provided in the Appendix. The sample contains annual observations of all companies listed on the SHSE and SZSE from 2007 to 2018. All continuous variables are tabulated at the 1% level in each tail, with t-statistics in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels respectively.

## 3. EMPIRICAL RESULTS

### 3.1. Descriptive statistics

Table 1 provides descriptive statistics for the variables used in our analysis. The means of the crash risk measures,  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$ , are  $-0.274$  and  $-0.182$ , respectively. And the mean of the  $EPU_{baker}$  is 5.270. The mean of the standard deviation of firm-specific weekly returns is 0.048. The firms in our sample have an average size of 22.080, an average age of 2.772, an average leverage ( $Lev$ ) of 0.468, and an average of the first shareholding ( $Frs$ ) of 0.363. The average growth rate ( $Growth$ ) is 0.206.

**Table 2** Summary statistics

| variable | N     | mean   | sd    | min    | p50    | max   |
|----------|-------|--------|-------|--------|--------|-------|
| F NCSKEW | 19291 | -0.274 | 0.683 | -2.306 | -0.236 | 1.456 |
| F DUVOL  | 19291 | -0.182 | 0.469 | -1.306 | -0.181 | 0.963 |

|           |       |        |        |        |        |       |
|-----------|-------|--------|--------|--------|--------|-------|
| EPU_baker | 19291 | 5.270  | 0.560  | 4.410  | 5.188  | 6.132 |
| NCSKEW_it | 19291 | -0.244 | 0.652  | -2.199 | -0.211 | 1.393 |
| Ret_t     | 19291 | -0.001 | 0.001  | -0.005 | -0.001 | 0     |
| Sigma_t   | 19291 | 0.048  | 0.0180 | 0.0170 | 0.0460 | 0.104 |
| Size      | 19291 | 22.080 | 1.304  | 19.48  | 21.91  | 26    |
| Age       | 19291 | 2.772  | 0.364  | 1.609  | 2.833  | 3.434 |
| Lev       | 19291 | 0.468  | 0.205  | 0.0640 | 0.471  | 0.939 |
| Frs       | 19291 | 0.363  | 0.153  | 0.0880 | 0.346  | 0.759 |
| Growth    | 19291 | 0.206  | 0.518  | -0.574 | 0.118  | 3.701 |

### 3.2. Correlation analysis

The untabulated results suggest that *EPU\_baker* is significantly and negatively correlated with *NCSKEW<sub>t+1</sub>*

and *DUVOL<sub>t+1</sub>*. The results also indicate that all the correlations between the independent variables are relatively low. Also, the VIF values among different variables are less more than 10, which suggests that multicollinearity will not affect our empirical analysis.

**Table 3** Correlation analysis

|           | F_NCSKEW  | F_DUVOL   | EPU      | NCSKEW_it | Ret_t    | Sigma_t  | Size     | Age      | Lev      | Frs      | Growth   |
|-----------|-----------|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|
| F_NCSKEW  | 1         | 0.884***  | -        | 0.052***  | -        | 0.030*** | -        | -        | -        | -        | 0.031*** |
| F_DUVOL   | 0.875***  | 1         | -        | 0.041***  | -        | 0.024*** | -        | -        | -        | -        | 0.030*** |
| EPU       | -0.085*** | -0.080*** | 1        | -0.011    | 0.182*** | -        | 0.195*** | 0.360*** | 0.101*** | 0.037*** | 0.059*** |
| NCSKEW_it | 0.053***  | 0.038***  | -0.001   | 1         | 0.064*** | 0.051*** | 0.105*** | 0.021*** | 0.068*** | 0.047*** | 0.032*** |
| Ret_t     | -0.011    | -0.003    | 0.180*** | 0.097***  | 1        | 1.000*** | 0.330*** | 0.149*** | 0.009    | 0.045*** | 0.035*** |
| Sigma_t   | 0.025***  | 0.016**   | 0.214*** | -0.072*** | 0.975*** | 1        | 0.332*** | 0.149*** | -0.010   | 0.046*** | 0.036*** |
| Size      | -0.115*** | -0.125*** | 0.192*** | -0.111*** | 0.269*** | 0.312*** | 1        | 0.198*** | 0.408*** | 0.199*** | 0.009    |
| Age       | -0.054*** | -0.054*** | 0.354*** | -0.022*** | 0.088*** | 0.110*** | 0.168*** | 1        | 0.093*** | 0.156*** | 0.101*** |
| Lev       | -0.051*** | -0.061*** | 0.105*** | -0.063*** | 0.001    | -0.005   | 0.399*** | 0.114*** | 1        | 0.041*** | 0.034*** |
| Frs       | -0.034*** | -0.034*** | 0.041*** | -0.053*** | 0.039*** | 0.049*** | 0.234*** | 0.158*** | 0.039*** | 1        | 0.011    |
| Growth    | 0.017**   | 0.013*    | 0.028*** | 0.014**   | 0.059*** | 0.068*** | -0.005   | 0.026*** | 0.056*** | 0.033*** | 1        |

This table presents the relationship between the effects of different factors in the EPU while controlling for industry and year fixed effects. Detailed descriptions of all variables are provided in Appendix. The sample contains annual observations of all companies listed on the SHSE and SZSE from 2007 to 2018. All continuous

variables are tabulated at the 1% level in each tail, with t-statistics in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels respectively.

### 3.3. Baseline results

**Table 4** Baseline results

| VARIABLES | (1)                   | (2)                   | (3)                  | (4)                  |
|-----------|-----------------------|-----------------------|----------------------|----------------------|
|           | NCSKEW <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | DUVOL <sub>t+1</sub> |
| EPU       | -0.227***             | -0.151***             | -0.171***            | -0.112***            |
|           | (-17.79)              | (-17.63)              | (-11.74)             | (-11.52)             |
| NCSKEW_it |                       |                       | 0.062***             | 0.033***             |
|           |                       |                       | (7.40)               | (6.11)               |
| Ret_t     |                       |                       | 2.255                | -0.205               |
|           |                       |                       | (0.58)               | (-0.07)              |

|              |                     |                     |                      |                       |
|--------------|---------------------|---------------------|----------------------|-----------------------|
| Sigma_t      |                     |                     | 1.562***<br>(3.90)   | 0.686**<br>(2.36)     |
| Size         |                     |                     | -0.038***<br>(-7.89) | -0.032***<br>(-10.06) |
| Age          |                     |                     | -0.058***<br>(-3.56) | -0.044***<br>(-3.99)  |
| Lev          |                     |                     | -0.016**<br>(-2.42)  | -0.011***<br>(-3.41)  |
| Frs          |                     |                     | -0.046<br>(-1.16)    | -0.019<br>(-0.72)     |
| Growth       |                     |                     | 0.000***<br>(4.98)   | 0.000***<br>(4.12)    |
| Constant     | 0.963***<br>(13.13) | 0.631***<br>(12.04) | 1.575***<br>(12.58)  | 1.203***<br>(13.64)   |
| Observations | 19,672              | 19,672              | 19,294               | 19,294                |
| Industry FE  | Yes                 | Yes                 | Yes                  | Yes                   |
| Year FE      | Yes                 | Yes                 | Yes                  | Yes                   |
| r2           | 0.0504              | 0.0551              | 0.0621               | 0.0679                |

Table 3 reports the results of the role of EPU on the risk of a stock price crash. A detailed description of all variables is provided in Appendix A. The sample contains annual observations of all companies listed on the SSE and SZSE from 2007 to 2018. All continuous variables are tabulated at the 1% level in each tail, with t-statistics in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels respectively.

### 3.4. Robustness checks

In this section, we perform several robustness checks to examine the sensitivity of our results, including

adopting a firm fixed effects model, alternative EPU measure, and the inclusion of some omitted variables.

#### 3.4.1. Firm fixed effects model

In Table 4, we control for firm fixed effects and year fixed effects in our regression model to observe the significance of the *EPU* variable on stock price crash risk. As can be seen from Table 4, the coefficients of *EPU* on *NCSKEW<sub>t+1</sub>* and *DUVOL<sub>t+1</sub>* are -0.273 and -0.184; -0.213 and -0.137, respectively. This means that the *EPU* remains negatively correlated with the risk of a share price crash, and the results are significant.

**Table 5** Robustness check: firm fixed effects model

| VARIABLES | (1)<br>NCSKEW <sub>t+1</sub> | (2)<br>DUVOL <sub>t+1</sub> | (3)<br>NCSKEW <sub>t+1</sub> | (4)<br>DUVOL <sub>t+1</sub> |
|-----------|------------------------------|-----------------------------|------------------------------|-----------------------------|
| EPU       | -0.273***<br>(-20.11)        | -0.213***<br>(-6.17)        | -0.184***<br>(-20.24)        | -0.137***<br>(-5.89)        |
| NCSKEW_it |                              | -0.077***<br>(-9.29)        |                              | -0.051***<br>(-9.36)        |
| Ret_t     |                              | 2.050<br>(0.52)             |                              | -0.065<br>(-0.02)           |
| Sigma_t   |                              | 1.688***<br>(3.79)          |                              | 0.874***<br>(2.87)          |
| Size      |                              | -0.012<br>(-0.92)           |                              | -0.014<br>(-1.64)           |

|              |          |          |          |          |
|--------------|----------|----------|----------|----------|
| Age          |          | -0.080   |          | -0.063   |
|              |          | (-1.05)  |          | (-1.23)  |
| Lev          |          | -0.012   |          | -0.012*  |
|              |          | (-1.02)  |          | (-1.83)  |
| Frs          |          | -0.089   |          | -0.053   |
|              |          | (-0.92)  |          | (-0.83)  |
| Growth       |          | 0.000*** |          | 0.000*** |
|              |          | (4.33)   |          | (5.02)   |
| Constant     | 1.140*** | 1.238*** | 0.790*** | 0.985*** |
|              | (15.99)  | (5.06)   | (15.92)  | (6.07)   |
| Observations | 19,675   | 19,294   | 19,675   | 19,294   |
| Firm FE      | Yes      | Yes      | Yes      | Yes      |
| Year FE      | Yes      | Yes      | Yes      | Yes      |
| r2           | 0.0526   | 0.0601   | 0.0566   | 0.0633   |

3.4.2. Alternative measures

In table5, we adopt an alternative measure of the *EPU* index to explore the impact of *EPU* on stock price crash risk. Specifically, we measure the *EPU* index using the economic policy uncertainty index constructed based on

Guangming Daily. As is shown in Table 5, the coefficients on the *EPU* variable remain negative are -0.229 and -0.153; -0.173 and -0.113, respectively, and the results are still significant, which means that the measure of *EPU* index does not affect the negative correlation between *EPU* and the stock price crash risk.

Table 6 the *EPU* metric replacing results

|                      | (1)                   | (2)                  | (3)                   | (4)                  |
|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| VARIABLES            | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> |
| <i>EPU</i>           | -0.229***             | -0.173***            | -0.153***             | -0.113***            |
|                      | (-17.79)              | (-11.74)             | (-17.63)              | (-11.52)             |
| NCSKEW <sub>it</sub> |                       | 0.062***             |                       | 0.033***             |
|                      |                       | (7.40)               |                       | (6.11)               |
| Ret <sub>t</sub>     |                       | 2.255                |                       | -0.205               |
|                      |                       | (0.58)               |                       | (-0.07)              |
| Sigma <sub>t</sub>   |                       | 1.562***             |                       | 0.686**              |
|                      |                       | (3.90)               |                       | (2.36)               |
| Size                 |                       | -0.038***            |                       | -0.032***            |
|                      |                       | (-7.89)              |                       | (-10.06)             |

|              |          |           |          |           |
|--------------|----------|-----------|----------|-----------|
| Age          |          | -0.058*** |          | -0.044*** |
|              |          | (-3.56)   |          | (-3.99)   |
| Lev          |          | -0.016**  |          | -0.011*** |
|              |          | (-2.42)   |          | (-3.41)   |
| Frs          |          | -0.046    |          | -0.019    |
|              |          | (-1.16)   |          | (-0.72)   |
| Growth       |          | 0.000***  |          | 0.000***  |
|              |          | (4.98)    |          | (4.12)    |
| Constant     | 0.861*** | 1.498***  | 0.563*** | 1.153***  |
|              | (12.60)  | (12.19)   | (11.47)  | (13.33)   |
| Observations | 19,672   | 19,294    | 19,672   | 19,294    |
| Industry FE  | Yes      | Yes       | Yes      | Yes       |
| Year FE      | Yes      | Yes       | Yes      | Yes       |
| r2           | 0.050    | 0.062     | 0.055    | 0.068     |

### 3.4.3. The inclusion of some omitted variables

We include a new batch of data, including *SOE* (a dummy variable that equals one if the ultimate controlling shareholder of a listed firm is the state in year *t* and zero otherwise); we also include the *BIG4* (Big 4 auditors), *gender*; and we consider that the *isduality* (a dummy variable that equals one if the CEO and board chairman are the same person and zero otherwise) may have a significant impact on listed firms' future stock price crash risk, which may result in bias on our empirical results. To address the above concern, we are trying to

prove by adding these four variables to show that in addition to the variables that exist in the firm itself. The new external variables do not affect the significantly negative correlation results of *EPU*. And the results of Table 6 show that after adding these variables, the new *NCSKEW<sub>t+1</sub>* and *DUVOL<sub>t+1</sub>* of *EPU*, are -0.227 and -0.151; -0.189 and -0.122, respectively, the results are still significant, and the *EPU* and the stock price crash risk is still negatively correlated. So, the final data show that changes in these variables will not affect the analysis results of *EPU*. That is, the increase of *EPU* will reduce the risk of the firm's stock price crash risk.

**Table 7** The inclusion of some omitted variables

|                      | (1)                   | (2)                  | (3)                   | (4)                  |
|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| VARIABLES            | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> |
| EPU                  | -0.227***             | -0.189***            | -0.151***             | -0.122***            |
|                      | (-17.79)              | (-12.60)             | (-17.63)              | (-12.31)             |
| NCSKEW <sub>it</sub> |                       | 0.060***             |                       | 0.032***             |
|                      |                       | (7.17)               |                       | (5.92)               |
| Ret <sub>t</sub>     |                       | 2.081                |                       | -0.308               |
|                      |                       | (0.54)               |                       | (-0.11)              |
| Sigma <sub>t</sub>   |                       | 1.491***             |                       | 0.647**              |
|                      |                       | (3.71)               |                       | (2.21)               |

|              |          |           |          |           |
|--------------|----------|-----------|----------|-----------|
| Size         |          | -0.032*** |          | -0.029*** |
|              |          | (-6.11)   |          | (-8.35)   |
| Age          |          | -0.039**  |          | -0.033*** |
|              |          | (-2.33)   |          | (-2.90)   |
| Lev          |          | -0.014*   |          | -0.010*** |
|              |          | (-1.80)   |          | (-2.84)   |
| Frs          |          | -0.016    |          | -0.001    |
|              |          | (-0.39)   |          | (-0.02)   |
| Growth       |          | 0.000***  |          | 0.000***  |
|              |          | (4.99)    |          | (4.06)    |
| SOE          |          | -0.064*** |          | -0.038*** |
|              |          | (-5.13)   |          | (-4.58)   |
| Big4         |          | 0.015     |          | 0.007     |
|              |          | (0.62)    |          | (0.42)    |
| Gender       |          | 0.009     |          | 0.009     |
|              |          | (0.68)    |          | (0.93)    |
| ln_age       |          | -0.037    |          | -0.017    |
|              |          | (-1.20)   |          | (-0.83)   |
| Isduality    |          | 0.003     |          | -0.004    |
|              |          | (0.07)    |          | (-0.17)   |
| Constant     | 0.963*** | 1.664***  | 0.631*** | 1.237***  |
|              | (13.13)  | (9.67)    | (12.04)  | (10.63)   |
| Observations | 19,672   | 19,291    | 19,672   | 19,291    |
| Industry FE  | Yes      | Yes       | Yes      | Yes       |
| Year FE      | Yes      | Yes       | Yes      | Yes       |
| r2           | 0.0504   | 0.0638    | 0.0551   | 0.0692    |

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### 3.5. Additional statistics: analysis of the impact of analyst coverage

We first calculated the average annual industry analyst coverage and compared all the data with the mean, divided the data into two groups. In Table 7, the first two groups are the group with higher analyst coverage. The third four groups are the groups with lower analyst coverage. The regression calculation is based on

this, and the values are presented in Table 7. Therefore, we can see that in groups with lower analyst coverage,  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$ , are  $-0.172$  and  $-0.113$ , respectively; however, in groups with higher analyst coverage,  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$ , are  $-0.162$  and  $-0.105$ , respectively. From this, we can see that the regression coefficient of the EPU is more significant in the case of higher analyst coverage, indicating that in this case, the EPU has a higher inhibition effect on the stock price crash risk.

**Table 8** Additional analysis: the impact of analyst coverage

| VARIABLES            | (1)                   | (2)                  | (3)                   | (4)                   |
|----------------------|-----------------------|----------------------|-----------------------|-----------------------|
|                      | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub>  |
| EPU                  | -0.172***<br>(-8.40)  | -0.113***<br>(-7.88) | -0.162***<br>(-7.90)  | -0.105***<br>(-7.89)  |
| NCSKEW <sub>it</sub> | 0.046***<br>(3.89)    | 0.025***<br>(3.16)   | 0.059***<br>(5.07)    | 0.030***<br>(4.07)    |
| Ret <sub>t</sub>     | 84.662***<br>(3.74)   | 50.216***<br>(3.46)  | 0.751<br>(0.41)       | -1.019<br>(-0.67)     |
| Sigma <sub>t</sub>   | 5.956***<br>(4.15)    | 3.370***<br>(3.55)   | 1.701***<br>(3.92)    | 0.786***<br>(2.62)    |
| Size                 | -0.040***<br>(-5.58)  | -0.032***<br>(-6.26) | -0.073***<br>(-8.55)  | -0.056***<br>(-10.34) |
| Age                  | -0.025<br>(-1.24)     | -0.020<br>(-1.37)    | -0.046*<br>(-1.74)    | -0.040**<br>(-2.37)   |
| Lev                  | -0.123***<br>(-2.63)  | -0.089***<br>(-2.77) | -0.006<br>(-0.35)     | -0.004<br>(-0.45)     |
| Frs                  | -0.053<br>(-1.07)     | -0.042<br>(-1.16)    | -0.039<br>(-0.67)     | 0.007<br>(0.20)       |
| Growth               | 0.000***<br>(6.22)    | 0.000***<br>(5.41)   | 0.001<br>(1.52)       | 0.000<br>(1.29)       |
| Constant             | 1.526***<br>(8.24)    | 1.148***<br>(8.48)   | 2.201***<br>(10.86)   | 1.628***<br>(12.24)   |

|              |        |        |        |        |
|--------------|--------|--------|--------|--------|
| Observations | 9,804  | 9,804  | 9,490  | 9,490  |
| Industry FE  | Yes    | Yes    | Yes    | Yes    |
| Year FE      | Yes    | Yes    | Yes    | Yes    |
| r2           | 0.0741 | 0.0739 | 0.0725 | 0.0868 |

#### 4. CONCLUSION

We study the impact of economic policy uncertainty on stock price crash risk, using a unique dataset of all companies listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchange. We find that economic policy uncertainty is negatively related to the risk of stock price crash, which suggests that the higher the economy policy uncertainty, the lower the risk of stock price crash risk. We also extend prior research on crash risk by identifying new factors that impact analyst coverage, which has a mitigating effect on future stock price crash risk through EPU. Our research conclusions have a very important enlightenment on how to restrain the stock price fluctuations of listed companies in emerging capital markets.

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