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Corporate social responsibility and stock price crash risk
Evidence from an Asian emerging market

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Abstract
Purpose – The purpose of this paper is to test opposing views of the relationship between corporate social responsibility (CSR) and stock price crash risk in a major Asian emerging stock market.
Design/methodology/approach – This paper suggests an endogenous relationship between CSR and stock price crash risk. Hence, this paper uses two-stage least squares regression analysis to address the bias and inconsistency associated with endogeneity issues. Moreover, previous studies argue that the level of effectiveness of corporate governance significantly affects firm-specific stock price crash risk. Thus, this paper further divides the overall sample into two sub-samples according to the median of the corporate governance index. Furthermore, this paper investigates the impact of CSR on stock price crash risk under corporate governance.
Findings – The empirical results show that CSR significantly mitigates Taiwanese stock price crash risk. This finding is consistent with the notion that socially responsible Taiwanese firms commit to a higher standard of transparency and engage in less bad news hoarding, thus reducing crash risk. The empirical results also show that CSR has a more pronounced effect in mitigating crash risk for Taiwanese firms with less effective corporate governance.
Originality/value – The study findings indicate that CSR plays a more important role in reducing crash risk for Taiwanese firms with weak governance mechanisms.
Keywords Corporate governance, Taiwan, Corporate social responsibility, Emerging market, Crash risk
Paper type Research paper

1. Introduction
In recent years, corporate social responsibility (CSR) has become an important topic in academic circles. However, studies show no consensus on the relationship between CSR and firm financial performance. Several studies have shown that socially responsible firms commit to higher ethical standards, higher standards of financial reporting transparency and less bad news hoarding. In particular, firms engage in CSR activities with the goal of enhancing their income (Tucker and Melewar, 2005; Dowling, 2006; Schuler and Cording, 2006) and improving their operating performance (Liang and Huang, 2013). Compared with other firms, socially responsible firms engage in less earnings management in financial reporting, disclose more financial information and suffer less from bad news (Gelb and Strawser, 2001; Tucker and Melewar, 2005; Dowling, 2006; Schuler and Cording, 2006; Kim *et al.*, 2012; McCarthy *et al.*, 2014). Based on these studies, CSR practices may be associated with lower stock price crash risk (Kim *et al.*, 2014).

By contrast, some studies show that CSR activities increase firms' operating costs and increase agency problems between shareholders and management, thus leading to a negative relationship between CSR and financial performance. In particular, McWilliams *et al.* (2006) note that it is difficult to determine whether management is

motivated to implement CSR for their own interest or for society. Petrovits (2006) and Prior *et al.* (2008) find a positive relationship between CSR and earnings management. Hence, management may adopt CSR to conceal firm misbehavior (Hemingway and Maclagan, 2004). Building on these studies, one would expect that CSR practices are associated with higher stock price crash risk (Kim *et al.*, 2014).

This paper aims to test the opposing views of the relationship between CSR and stock price crash risk in a major Asian emerging stock market. Existing studies focus on the impact of CSR on stock price crash risk in developed country markets in the USA and Japan, and these studies provide contradicting evidence. Specifically, the current study extends these works to an Asian emerging market, Taiwan.

This study makes several contributions to the literature. First, previous studies exploring the impact of CSR on stock price cash risk in developed markets (the USA and Japan) produce contradicting results. Kim *et al.* (2014) find that the mitigating effect of CSR on the stock price crash risk of USA firms is significant. However, Lu and Nakajima (2014) show that CSR has no effect on reducing the stock price crash risk of Japanese firms. Moreover, in contrast to practices in developed markets, CSR practices in emerging markets are limited to a minority of organizations and do not appear to be underpinned by structured CSR policies (Frynas, 2006). Therefore, the relationship between CSR and crash risk in developed markets may differ from that in emerging markets. Hence, research on this relationship in emerging markets is clearly necessary. The present paper fills this gap in the literature on CSR by examining the link between CSR and stock price crash risk in an Asian emerging market.

Second, the present study investigates the effect of CSR on stock price crash risk in a major Asian emerging market, Taiwan. In the second quarter of 2013, Taiwan's weights on the MSCI emerging markets index and the Asia index were respectively 10.81 percent and 14.22 percent, figures that were higher than those of South Korea and China. The total market capitalization of the Taiwan Stock Exchange (TWSE) amounted to US $903.43 billion on April 10, 2015, ranking in eighth position in Asia (Chung, 2012; Lee, 2013). The Taiwanese stock market is clearly an important market in both Asian and global stock markets. The results of this study could offer useful guidance to investors and firms that are seeking to reduce stock price crash risk in emerging markets.

Third, the present study is also of interest to policy-makers in emerging markets. Because CSR is, to some extent, regarded as a bridge connecting the arenas of business and economic and social developments, the question of what CSR does and could mean for emerging markets requires particular attention (Blowfield and Frynas, 2005). In fact, Taiwanese authorities and society have been promoting CSR practice. For instance, *Global Views* magazine and *CommonWealth* magazine established CSR awards for Taiwanese firms in 2005 and 2007, respectively. In 2010, the TWSE established the CSR Best Practice Principles for TWSE and GTSM (Gre Tai Securities Market) listed companies. The findings of this study could provide useful information for policy-makers to create an environment enabling CSR practices in Taiwan.

The remainder of this paper is structured as follows. Section 2 reviews the literature. Section 3 describes the sample, variable measurements, and research design. Section 4 presents the empirical results. Section 5 concludes the paper.

2. Literature review

Firms are highly interested in CSR because it can enhance consumers' perceptions of firms' ethical and integrity standards, promote social and economic development, and improve social or environmental conditions (Hsu *et al.*, 2013). More importantly,

Argenti and Druckenmiller (2004) propose the concept of reputation effect, which suggests that firms aiming to build and maintain good reputations must be enthusiastic about CSR activities. Their arguments are also supported by Fombrun (2005) and Hillenbrand and Money (2007). Based on their arguments, CSR firms tend to have higher financial performance (Tucker and Melewar, 2005; Dowling, 2006; Schuler and Cording, 2006; Lee *et al.*, 2011; Liang and Huang, 2013), better product quality (Milgrom and Roberts, 1986) and product profitability (Bagnoli and Watts, 2003; Bhattacharya and Sen, 2004; Brammer and Pavelin, 2004)[1]. Additionally, from the operating performance perspective, Liang and Huang (2013) and Chih *et al.* (2014) argue that firms can improve operating performance by increasing CSR activities because such activities do not erode firm profitability. Furthermore, CSR can also increase firm value (Harjoto and Jo, 2015).

Moreover, CSR is used by firms as an insurance mechanism (Klein and Dawar, 2004); although it does not directly increase firm profitability, CSR is likely to have value to firms because it can alleviate the impacts of bad news. Such findings are consistent with the insurance effect of CSR (Bhattacharya and Sen, 2004; Schnietz and Epstein, 2005; Tucker and Melewar, 2005). Thus, CSR firms have higher accounting information quality (Kim *et al.*, 2012), better financial disclosure and higher financial reporting transparency (Gelb and Strawser, 2001). Under the stakeholder theory of Freeman (1984), managers can enhance firm value by increasing CSR because of their duty to maximize shareholder value. Building on these studies, Kim *et al.* (2014) further investigate the relationship between the CSR and crash risk of US firms during the period 1995-2009, and they find that CSR practices reduce stock price crash risk by compensating for the lower levels of corporate governance of certain firms.

By contrast, according to stakeholder theory, the wealth of stockholders should suffer more damage from CSR practices because firms engaging in CSR must pay additional costs (Liang and Huang, 2013). Accordingly, based on the agency cost perspective of Jensen and Meckling (1976), which suggests that CSR activities increase operating costs, agency conflict arises between management and shareholders, thus leading to inferior financial performance (Hillman and Keim, 2001; Barnea and Rubin, 2005; McWilliams *et al.*, 2006). Furthermore, Hemingway and Maclagan (2004) and Kim *et al.* (2014) state that firms can use CSR activities as reputation insurance instruments to conceal misbehavior.

In particular, it is difficult to determine whether management motives for engaging in CSR are based on self-interest or the interests of society (McWilliams *et al.*, 2006). Chih *et al.* (2014) further indicate that management teams use CSR as a tool to improve their reputation and disguise their own self-interest. Hence, management may adopt CSR to conceal firm misbehavior (Hemingway and Maclagan, 2004). Supporting this view, empirical evidence suggests that CSR activities are positively associated with earnings management (Petrovits, 2006; Prior *et al.*, 2008). Lu and Nakajima (2014) also explore the relationship between the CSR and crash risk of Japanese firms over the period 2006-2013. They find, contrary to the results of Kim *et al.* (2014), that CSR and governance mechanisms in Japanese firms are not related to reductions in stock price crash risk. Table I presents an overview of the above empirical studies.

Existing papers focus on the influence of CSR on stock price crash risk in developed markets of the USA and Japan, and these works propose two opposing views of the relationship between CSR and stock price crash risk. The present paper extends these works to further investigate the relationship between CSR and crash risk in the Asian

Author(s)	Focus	CSR measures
Barnea and Rubin (2005)	1. Insider ownership 2. Institutional ownership	SR ratings from KLD
Chih et al. (2014)	Financial performance	Binary rating (CSR is equal to 1 for firms engaging in social responsibility activities and 0 otherwise)
Gelb and Strawser (2001)	1. Financial reporting transparency 2. Financial disclosure	CSR ratings from CEP
Hillman and Keim (2001)	Shareholder value	Social issue participation and stakeholder management rating from KLD
Harjoto and Jo (2015)	Financial performance	Based on KLD ratings, the CSR index is separated into a legal CSR index and a normative CSR index
Kim et al. (2012)	Earnings management	Score of CSR ratings from KLD
Kim et al. (2014)	Stock price crash risk	CSR score (score of CSR rating based on the MSCI ESG data) and CSR DSI400 (a value of 1 for firms included in the Domini 400 Social Index and 0 otherwise)
Lee et al. (2011)	Financial performance	Binary rating (CSR is equal to 1 for firms with CSR awards and 0 otherwise)
Liang and Huang (2013)	Operating performance	Number of CSR awards Fines of CSR
Lu and Nakajima (2014)	Stock price crash risk	CSR score (CSR ranking data provided by Toyo Keizai Inc.)
McCarthy et al. (2014)	CEO overconfidence	CSR ratings from KLD
Petrovits (2006)	Earnings management	Corporate philanthropy from Taft Group
Prior et al. (2008)	1. Earnings management 2. Financial performance	CSR score from the SiRi analysts ratings
Schnietz and Epstein (2005)	Cumulative abnormal returns	CSR ratings from KLD

Table I.
Overview of empirical studies on CSR

emerging market of Taiwanese firms. The results of this paper can offer useful guidance to investors and firms that are seeking to reduce stock price crash risk in emerging markets.

3. Empirical methodology and data description

3.1 Empirical methodology

Kim et al. (2014) argue that there may be an endogenous relationship between CSR and stock price crash risk. This paper uses two-stage least squares (2SLS)[2] regression analysis to address the bias and inconsistency associated with endogeneity problems. This paper uses a logit model in the first stage to estimate the predictive values of CSR. In the second stage, these predictive values, as dependent variables, are then entered into the stock price crash risk model regression. This paper uses the approach of Arellano (2003) to adjust the standard error of the parameter estimate of the panel robust standard error to examine the correlation between CSR and stock price crash risk. This paper employs the following two-stage equations.

The first-stage equation:

$$P\left(CSR_{i,t-1} = 1 \middle| z_{i,t-1}\right) = 1/(1+e^{-z_{i,t-1}}),$$

where:

$$z_{i,t-1} = a_0 + a_1 ROE_{i,t} + a_2 EPS_{i,t} + a_3 Tobin'sQ_{i,t} + a_4 CrashRisk_{i,t-1}$$
$$+ a_5 DTurn_{i,t-1} + a_6 RET_{i,t-1} + a_7 MB_{i,t-1} + a_8 SIZE_{i,t-1} + a_9 SIGMAR_{i,t-1}$$
$$+ a_{10} LEV_{i,t-1} + a_{11} ROA_{i,t-1} + a_{12} ABACC_{i,t-1} + a_{13} CGI_{i,t-1}$$
$$+ Industry\ Fixed\ Effect + Year\ Fixed\ Effect \qquad (1)$$

The second-stage equation:

$$CrashRisk_{i,t} = b_0 + b_1 \hat{CSR}_{i,t-1} + b_2 CrashRisk_{i,t-1} + b_3 DTurn_{i,t-1}$$
$$+ b_4 RET_{i,t-1} + b_5 MB_{i,t-1} + b_6 SIZE_{i,t-1} + b_7 SIGMAR_{i,t-1}$$
$$+ b_8 LEV_{i,t-1} + b_9 ROA_{i,t-1} + b_{10} ABACC_{i,t-1} + b_{11} CGI_{i,t-1}$$
$$+ Industry\ Fixed\ Effect + Year\ Fixed\ Effect + v_{i,t} \qquad (2)$$

In Equation (1), $CSR_{i,t-1}$ is equal to 1 if firm i in year $t-1$ is on three lists of CSR awards, including the ITBER (Investigation of Taiwanese Benchmark Enterprises' Reputation) and Excellence in Corporate Social Responsibility Award (ECSRA) of Taiwan *CommonWealth* magazine or the CSRA (CSR Award) issued by *Global Views magazine*, and is equal to 0 otherwise. In addition to the exogenous variables in Equation (2), this equation includes three firm characteristic variables for $ROE_{i,t}$, $EPS_{i,t}$, and *Tobin's* $Q_{i,t}$. $ROE_{i,t}$ is the return on equity of firm i in year t. $EPS_{i,t}$ is the earnings per share of firm i in year t. *Tobin's* $Q_{i,t}$ is the ratio of the total market value of the firm divided by the total asset value for firm i in year t[3]. These variables are included in Equation (1) because of their usefulness in constructing an instrumental variable for CSR such that, despite resembling CSR, it is uncorrelated with the error term of Equation (2) (Gujarati and Porter, 2009). Specifically, $ROE_{i,t}$ is included because firms with higher expected returns on stockholders' equity have greater opportunities to reach investments' required rates of return and are thus likely to have higher levels of CSR implementation[4]. $EPS_{i,t}$ is included because for firms with higher expected earnings per share, their shareholders may receive higher dividends and may thus be more likely to promote CSR. Higher *Tobin's* $Q_{i,t}$ values represent higher expected firm growth. Thus, firms engaging in CSR are more likely supported by stakeholders. The exogenous variables in Equation (2) are included because they are determinants of $CrashRisk_{i,t}$, which is correlated with $CSR_{i,t-1}$, and should thus be related to $CSR_{i,t-1}$. The choice of these variables is supported by the weak instrument test and the over-identification restriction test presented in the empirical results section. $\hat{CSR}_{i,t-1}$, which denotes the predictive values of $P(CSR_{i,t-1} = 1|z_{i,t-1})$ obtained from Equation (1), is inserted into Equation (2) to control for endogeneity problems.

In Equation (2), $CrashRisk_{i,t}$ is the stock price crash risk of firm i in year t. $CrashRisk_{i,t-1}$ is the stock price crash risk of firm i in year $t-1$. This paper employs two measures of firm-specific crash risk, negative conditional skewness (*NCSKEW*) and down-to-up volatility (*DUVOL*), following Chen *et al.* (2001). Kim *et al.* (2011a, b, 2014) and Kim and Zhang (2010) also use these two indicators as a proxy variable for stock price crash risk. This method ensures that the stock price crash risk is capable of reflecting firm-specific factors rather than broad market movements. Thus, this

paper estimates firm-specific weekly returns ($W_{i,\tau}$) using the following expanded market model:

$$r_{i,\tau} = c_0 + c_{1i}r_{m,\tau-2} + c_{2i}r_{m,\tau-1} + c_{3i}r_{m,\tau} + c_{4i}r_{m,\tau+1} + c_{5i}r_{m,\tau+2} + \varepsilon_{i,\tau} \tag{3}$$

where $r_{i,\tau}$ is the return on the stock of firm i in week τ, $_ir_{m,\tau-2}$ is the return on the Taiwan Capitalization Weighted Stock Index (TAIEX) of firm i in week $\tau-2$, $_ir_{m,\tau-1}$ is the return on the TAIEX of firm i in week $\tau-1$, $_ir_{m,\tau}$ is the return on the TAIEX of firm i in week τ, $_ir_{m,\tau+1}$ is the return on the TAIEX of firm i in week $\tau+1$, and $_ir_{m,\tau+2}$ is the return on the TAIEX of firm i in week $\tau+2$. Firm-specific weekly returns ($W_{i,\tau}$) are calculated as the natural logarithm of 1 plus the residual values from Equation (3).

The first measure of crash risk ($NCSKEW_{i,t}$) is the negative conditional skewness of firm-specific weekly returns over the fiscal year. $NCSKEW_{i,t}$ is the negative of the third moment of firm-specific weekly returns of firm i in year t divided by the standard deviation of firm-specific weekly returns raised to the third power. Specifically, for a given firm i in a fiscal year t, we calculate $NCSKEW_{i,t}$ as follows:

$$NCSKEW_{i,t} = -\left[n(n-1)^{3/2}\sum W_{i,\tau}^3\right] \Big/ \left[(n-1)(n-2)\left(\sum W_{i,\tau}^2\right)^{3/2}\right] \tag{4}$$

where $W_{i,\tau}$ is the firm-specific weekly returns of firm i in year t and n is the number of weekly returns during year t. Higher values of $NCSKEW$ indicate higher crash risk.

The second measure of crash risk ($DUVOL_{i,t}$) is the down-to-up volatility of firm-specific weekly returns over the fiscal year. $DUVOL_{i,t}$ is the natural logarithm of the ratio of the standard deviation of the firm-specific weekly returns of firm i in year t, which is calculated when the returns are above and below the annual mean:

$$DUVOL_{i,t} = \ln\left[(n_u-1)\sum_{Down} W_{i,\tau}^2 \Big/ (n_d-1)\sum_{Up} W_{i,\tau}^2\right] \tag{5}$$

where n_u is the number of observations for the firm-specific weekly returns of firm i in year t when the returns are above their annual mean and n_u is the number of observations for the firm-specific weekly returns of firm i in year t when the returns are below their annual mean. A greater crash risk implies a higher value of $DUVOL_{i,t}$[5].

$DTurn_{i,t-1}$ is the change in the monthly share turnover of firm i in year $t-1$, which is calculated as the average monthly share turnover of firm i in year t minus the average monthly share turnover of firm i in year $t-1$. As suggested by Chen *et al.* (2001), the change in trading volume, a proxy for the divergence of investor opinion among investor behaviors, predicts stock price crash risk, and an increase in trading volume indicates a greater crash risk. Thus, this paper predicts a positive effect of a change in share turnover on stock price crash risk.

$RET_{i,t-1}$ is the average firm-specific weekly return of firm i in year $t-1$ as a proxy for the levels of stock market bubbles. Chen *et al.* (2001) find that firm-specific weekly returns can assist in forecasting stock price crash risk. Therefore, a higher level of stock market bubbles implies a higher share return, leading to a higher crash risk. Thus, this study can forecast the positive influence of firm-specific weekly returns on stock price crash risk.

Firm growth ($MB_{i,t-1}$) is the market-to-book-value ratio of firm i in year $t-1$. Kim *et al.* (2014) show that a higher value for this ratio indicates a higher crash risk.

Thus, this study suggests that the market-to-book-value ratio has a positive effect on crash risk.

The variable $SIZE_{i,t-1}$, as a proxy for firm size, is the natural logarithm of the market value of equity of firm i in year $t-1$. Harvey and Siddique (2000) and Chen $et\ al.$ (2001) find that firm size has a positive effect on crash risk. Consequently, this study predicts a positive correlation between firm size and crash risk.

The variable $SIGMAR_{i,t-1}$, as a proxy for stock volatility, is calculated as the standard deviation of the firm-specific weekly returns of firm i in year $t-1$. Kim $et\ al.$ (2014) argue that higher stock volatility indicates a higher crash risk. Therefore, this study predicts a positive effect of stock volatility on crash risk.

$LEV_{i,t-1}$ is calculated as total long-term debts divided by total assets. This paper suggests that a higher leverage ratio indicates a higher financial risk, which results in a greater crash risk. However, high firm leverage can increase profitability and thus reduce the risk of crashes. Therefore, this paper claims that firm leverage does not have a significant effect on crash risk.

$ROA_{i,t-1}$ is the return on assets of firm i in year $t-1$ as a proxy for the firm's operating performance. More effective operating performance represents a lower crash risk (Hutton $et\ al.$, 2009; Kim $et\ al.$, 2011a, b). Hence, this paper suggests a negative correlation between firm operating performance and crash risk.

This paper uses the absolute value of the abnormal accruals ($ABACC_{i,t-1}$) of firm i in year $t-1$ as a proxy for earnings management. Consistent with the research of Dechow $et\ al.$ (1995), this paper uses the modified Jones model to estimate abnormal accruals by each year and each industry. Hutton $et\ al.$ (2009) suggest that the earnings management of firms has a positive effect on crash risk. Thus, this paper infers that higher levels of earnings management are associated with higher stock price crash risk.

The variable $CGI_{i,t-1}$ in this paper is the corporate governance index of firm i in year $t-1$ as a proxy for corporate governance. The CGI is calculated using the CGI equation of Chen $et\ al.$ (2007), as in the following equation:

$$Governance\ index\ P_{i,t-1} = CEO\ duality\ indicator_{i,t-1}$$
$$+Board\ size\ indicator_{i,t-1}$$
$$+Managerial\ ownership\ indicator_{i,t-1}$$
$$+Block\ shareholders'\ holding\ indicator_{i,t-1} \qquad (6)$$

where $CEO\ duality\ indicator_{i,t-1}$ is equal to 0 if the CEO and the chairman of the board of directors in a large firm i in year $t-1$ are the same person and is equal to 1 otherwise. By contrast, $CEO\ duality\ indicator_{i,t-1}$ is equal to 1 if the CEO and the chairman of the board of directors in a small firm i in year $t-1$ are the same person and is equal to 0 otherwise. Large firms are those whose firm value is above the average market value for all firms, and small firms are those whose firm value is below the average market value for all firms. $Board\ size\ indicator_{i,t-1}$ is equal to 1 if the board size of firm i in year $t-1$ is larger than the statutory maximum number of directors and smaller than two standard deviations of average board size and is equal to 0 otherwise. $Managerial\ ownership\ indicator_{i,t-1}$ is equal to 1 if the managerial ownership ratio of firm i in year $t-1$ is greater than 10 percent and is equal to 0 otherwise. $Block\ shareholders'\ holding\ indicator_{i,t-1}$ is the ratio of major shareholders (the top ten shareholders) of firm i in year $t-1$, which is equal to 1 if the ratio of major shareholders is larger than 25 percent and 0 otherwise.

Bae *et al.* (2006) finds that firms with more effective corporate governance have lower positive skewness of stock returns and better information disclosure than do firms with less effective corporate governance. Hence, corporate governance can affect stock price crash risk. Moreover, Andreou *et al.* (2013) also suggest that corporate governance can reduce stock price crash risk. Therefore, this paper posits that corporate governance has an adverse relationship with stock price crash risk.

The stock price crash risk can be affected by each year and each industry. Thus, this study adds two dummy variables of *Industry and Year Fixed Effects* to the regression model.

2SLS regression analysis yield inconsistent parameter estimates when instrumental variables are weak instrumental variables with very low correlations with the endogenous variables (Wooldridge, 2002; Lee, 2015). Hence, this paper tests appropriate instrumental variables using the method of weak instrumental variables of Stock and Yogo (2005) and Lee (2015). Meanwhile, according to Gujarati and Porter (2009) and Lee (2015), this study also examines the exogeneity of instrumental variables using the Hausman test for over-identification of restrictions.

3.2 Data description
This paper focusses on firms listed on the TWSE and the GTSM from 1997 to 2013. The CSR data are derived from three lists of CSR awards, including the ITBER and ECSRA of Taiwan *CommonWealth* magazine during the period 1997-2013 and the CSRA issued by *Global Views* magazine during the period 2005-2013. Financial data are collected from firms' annual reports and the *Taiwan Economic Journal* (*TEJ*) database. Similar to Hsu *et al.* (2013), this paper excludes financial firms and firms with insufficient financial or corporate governance data. For the 17-year sample period, the sample includes 14,683 firm-year observations and represents 1,341 firms.

The highest percentages of observations with CSR awards are 10.2 percent in 1997 and 9.9 percent in 1998, and the lowest percentages of observations with CSR awards are 2.4 percent in 2012 and 2.7 percent in 2013. In the other years, the percentage of CSR observations ranges from 2.9 to 9.5 percent, and the average percentage of CSR observations is 4.7 percent. Similar to Lee *et al.* (2011), the promotion of CSR remains in the early stage in Taiwan. Taiwanese authorities need to establish regulations and advocate CSR to assist in the sustainable operation of Taiwanese firms.

The mean (standard deviation) values of the crash risk measures, *NCSKEW* and *DUVOL,* are −0.0030 (0.0078) and −0.2529 (0.3462), respectively. The mean *NCSKEW* and *DUVOL* are much lower than those reported by Kim *et al.* (2014). CSR has an average value of 0.0420 and a standard deviation of 0.2006. Hence, few Taiwanese firms implemented CSR in the sample period, and there is still room for improvement in the sustainable development of Taiwanese firms.

4. Empirical results
4.1 Discussion of instrumental variables
Table II presents the results of testing whether the instrumental variables are weak instruments in the 2SLS regression. The *F*-test values of Model 1 (*NCSKEW*) and Model 2 (*DUVOL*) for the entire sample, the less effective corporate governance sample and the more effective corporate governance sample are positive and statistically significant at the 1 percent level. These results show that the instrumental variables are strong instruments and reject the null hypothesis in Table II. Thus, the regression coefficients are estimated consistently in this study.

The results of the over-identification restriction tests are presented in Table III. The Hausman test value for the entire sample, the less effective corporate governance sample and the more effective corporate governance sample are not significantly positive at the 10 percent level for Model 1 (*NCSKEW*) or Model 2 (*DUVOL*). Hence, these instrumental variables are consistent with the condition of exogenous variables in the study.

4.2 Effect of CSR on crash risk

Table IV reports the results of Equation (2) from the 2SLS second-stage regressions. The regression results for the two measures of stock price crash risk (*NCSKEW* and *DUVOL*) are exhibited in each respective model. The results show that the predicted CSR (*CSR*) is significantly and negatively associated with the stock price crash risk of Taiwanese firms. Model 1 (*NCSKEW*) indicates that *NCSKEW* is significantly and negatively associated with predicted CSR. The crash risk of CSR firms is 0.57 percent lower than that of non-CSR firms. Moreover, Model 2 (*DUVOL*) suggests that *DUVOL* is significantly and negatively associated with predicted CSR. The crash risk of CSR firms is 5.19 percent lower than that of non-CSR firms. Thus, the results in Table V show that CSR firms have a lower risk of stock price crash in the Asian emerging market of Taiwanese firms. Consistent with the results of Kim *et al.* (2014), this study argues that CSR firms may be less likely to hide negative news and may have a higher level of financial reporting transparency, leading to lower stock price crash risk in the Asian emerging stock market of Taiwanese firms.

The coefficients of the control variables indicate that a higher one-year-ahead crash risk (*NCSKEW1* and *DUVOL1*), a higher level of stock market bubble (*RET*), higher firm growth (*MB*), and larger firm size (*SIZE*) are significantly and positively associated with higher future crash risk in the Asian emerging stock market of Taiwanese firms. Consistent with the findings of Chen *et al.* (2001), this result implies

	Entire sample		Less effective corporate governance		More effective corporate governance	
	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)
F-test	9.457***	9.425***	4.374***	4.355***	3.561***	3.556***
p-value	3.08e-006	3.23e-006	0.0044	0.0045	0.0136	0.0137

Notes: The table presents the results of testing whether the instrumental variables are weak instruments in the 2SLS regression. ***Significant at the 1 percent level

Table II.
The first-stage weak instrumental variable tests

	Entire sample		Less effective corporate governance		More effective corporate governance	
	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)	Model 1 (*NCSKEW*)	Model 2 (*DUVOL*)
Hausman test	1.520	0.794	0.654	0.117	0.003	0.115
p-value	0.2177	0.3729	0.4186	0.7320	0.9537	0.7346

Notes: The table presents the results of the over-identification restriction tests

Table III.
The second-stage over-identifying restriction tests

Variables	Model 1 (NCSKEW)		Model 2 (DUVOL)	
	Coefficients	t-values	Coefficients	t-values
Constant	−0.0327	−18.52***	−1.2580	−15.63***
CŜR	−0.0057	−9.09***	−0.0519	−1.77*
NCSKEW1	0.0498	3.77***		
DUVOL1			0.0566	5.93***
DTurn	0.0001	0.15	−0.0021	−0.10
RET	0.1278	9.43***	4.1896	10.02***
MB	0.0007	5.67***	0.0282	5.34***
SIZE	0.0012	17.05***	0.0366	10.95***
SIGMAR	−0.0049	−1.07	0.3468	1.99**
LEV	0.0004	0.95	0.0204	1.00
ROA	−0.0053	−6.08***	−0.1193	−4.26***
ABACC	−0.0003	−0.94	−0.0084	−0.57
CGI	0.0000	−0.66	0.0013	0.42
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
Adj. R^2	0.1257		0.1251	

Notes: The table presents the regression results of a 2SLS analysis of the effect of CSR on stock price crash risk. This paper uses the approach of Arellano (2003) to adjust the standard error of the parameter estimate of the panel robust standard error. Dependent variables: NCSKEW and DUVOL are the crash risk measures of firm i in year t in Models 1 and 2, respectively. Independent variables: CŜR is the predicted CSR of Equation (1) of firm i in year $t-1$. NCSKEW1 is the crash risk measure of firm i in year $t-1$. DUVOL1 is the crash risk measure of firm i in year $t-1$. DTurn is the change in monthly share turnover of firm i in year $t-1$. RET is the average firm-specific weekly return of firm i in year $t-1$. MB is the market-to-book-value ratio of firm i in year $t-1$. SIZE is the natural logarithm of the market value of equity of firm i in year $t-1$. SIGMAR is calculated as the standard deviation of the firm-specific weekly returns of firm i in year $t-1$. LEV is calculated as the total long-term debt divided by the total assets of firm i in year $t-1$. ROA is the return on assets of firm i in year $t-1$. ABACC is the absolute value of the abnormal accruals of firm i in year $t-1$. CGI is the corporate governance index of the firm in year $t-1$. Year Fixed Effect is a set of year dummy variables. Industry Fixed Effect is a set of industrial dummy variables. *,**,***Significance at the 10, 5 and 1 percent levels, respectively

Table IV.
2SLS regression analysis of the effect of CSR on crash risk

that a high past return can be viewed as a high risk of a stock market bubble when stock prices return to fundamentals, and thus, a higher risk of stock market bubble implies a higher future stock price crash risk. Similar to the reasoning of Kim *et al.* (2014), this indicates that stocks with high *MB* can be regarded as glamour stocks that help to forecast crash risk; therefore, a higher *MB* can predict a higher future stock price crash risk. Supporting the arguments of Harvey and Siddique (2000) and Chen *et al.* (2001), larger firm size is implied by firms' overvalued stock price; hence, any changes in the prices of these firms will have a greater crash risk.

Another control variable is higher *ROA*, which is significantly and negatively associated with lower future crash risk. Similar to the results of Hutton *et al.* (2009) and Kim *et al.* (2011a, b), this finding shows that stocks with high *ROA* are regarded as stocks with high operating performance; hence, firms with a higher *ROA* will have a lower future stock price crash risk.

In particular, the *CGI* of Taiwanese firms has no effect on reducing future crash risk, as shown in Table IV. Contrary to the results of Andreou *et al.* (2013) and Lu and Nakajima (2014), corporate governance mechanisms do not appear to play an important monitoring role in Taiwanese firms. This empirical result indicates the need

Variables	Model 1 (NCSKEW)		Model 2 (DUVOL)	
	Coefficients	t-values	Coefficients	t-values
Constant	−0.0552	−13.67***	−1.4779	−8.61***
CSR	−0.0230	−9.93***	−0.3538	−3.88***
NCSKEW1	−0.0191	−1.09		
DUVOL1			0.0398	2.39***
DTurn	0.0005	0.71	0.0676	2.27***
RET	0.1134	7.25***	1.7937	2.81***
MB	0.0014	5.71***	0.0503	5.77***
SIZE	0.0022	13.03***	0.0509	6.93***
SIGMAR	−0.0237	−2.76***	−0.2887	−0.83
LEV	−0.0013	−1.46	−0.0634	−1.62
ROA	−0.0050	−2.79***	−0.0218	−0.33
ABACC	−0.0001	−0.17	−0.0018	−0.07
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
Adj. R^2	0.1530		0.1295	

Notes: The table presents the regression results of a 2SLS analysis of the effect of CSR on stock price crash risk for firms with weak corporate governance. This paper uses the approach of Arellano (2003) to adjust the standard error of the parameter estimate of the panel robust standard error. Dependent variables: NCSKEW and DUVOL are the crash risk measures of firm i in year t in Models 1 and 2, respectively. Independent variables: CSR is the predicted CSR of Equation (1) of firm i in year $t−1$. NCSKEW1 is the crash risk measure of firm i in year $t−1$. DUVOL1 is the crash risk measure of firm i in year $t−1$. DTurn is the change in monthly share turnover of firm i in year $t−1$. RET is the average firm-specific weekly return of firm i in year $t−1$. MB is the market-to-book-value ratio of firm i in year $t−1$. SIZE is the natural logarithm of the market value of equity of firm i in year $t−1$. SIGMAR is calculated as the standard deviation of the firm-specific weekly returns of firm i in year $t−1$. LEV is calculated as the total long-term debt divided by the total assets of firm i in year $t−1$. ROA is the return on assets of firm i in year $t−1$. ABACC is the absolute value of the abnormal accruals of firm i in year $t−1$. CGI is the corporate governance index of firm i in year $t−1$. Year Fixed Effect is a set of year dummy variables. Industry Fixed Effect is a set of industrial dummy variables. ***Significant at the 1 percent level

Table V.
2SLS regression
analysis of the effect
of CSR on crash risk
for firms with less
effective corporate
governance

for governmental authorities to improve corporate governance promotion and policy. However, it is also likely that the models in Table IV do not specify the relationship between CSR and crash risk properly.

Bae *et al.* (2006) and Kim *et al.* (2014) argue that the level of effectiveness of corporate governance has significant effects on firm-specific stock price crash risk. According to Kim *et al.* (2014), corporate governance can have two different effects on the link between CSR and crash risk. On the one hand, more effective corporate governance can ensure that management engages in CSR activities for genuine reasons rather than as a tool to disguise bad news. Under this scenario, the negative relationship between CSR and crash risk should be more pronounced for firms with more effective corporate governance. On the other hand, less effective corporate governance cannot effectively limit bad news hoarding behavior, and thus, committing to CSR to constrain earnings management becomes increasingly important. Under this scenario, the incremental effect of CSR on crash risk is expected to be stronger for firms with less effective corporate governance.

This paper further divides the overall sample into two sub-samples according to the median of the *CGI*. Thus, this paper further investigates the impact of CSR on stock

price crash risk based on corporate governance. The results of 2SLS second-stage regressions for two sub-samples are shown in Tables V and VI.

Table V presents the results of the 2SLS regression for the samples with less effective corporate governance. The coefficients of predicted CSR in Model 1 (*NCSKEW*) and Model 2 (*DUVOL*) in Table VI are −0.0230 and −0.3538, with *t*-values of −9.93 and −3.88, respectively. These coefficients are negative and statistically significant at the 1 percent level. The empirical results exhibit a significant and negative relationship between predicted CSR and crash risk for Taiwanese firms with less effective corporate governance. Moreover, among firms with less effective corporate governance, those that engage in CSR have a 2.30 percent lower crash risk than those that do not engage in CSR. This result is consistent with Kim *et al.* (2014), who find a significantly negative relationship between CSR and crash risk for firms with less effective corporate governance. This result indicates that the weak corporate governance factor may have no effect on reducing crash risk. Accordingly, consistent with the argument of Bhattacharya and Sen (2004), Schnietz and Epstein (2005), and Tucker and Melewar (2005) on the insurance effect of CSR, CSR may mitigate the impact of bad news on stock price crash risk. Consequently, this study suggests that

Variables	Model 1 (*NCSKEW*)		Model 2 (*DUVOL*)	
	Coefficients	*t*-values	Coefficients	*t*-values
Constant	−0.0320	−12.89***	−1.2590	−10.79***
CŜR	−0.0031	−3.55***	0.0736	1.23
NCSKEW1	0.0238	1.31		
DUVOL1			0.0361	2.65***
DTurn	0.0012	1.38	0.0198	0.55
RET	0.1129	5.44***	4.2210	6.60***
MB	0.0005	3.50***	0.0187	2.85***
SIZE	0.0012	11.97***	0.0365	7.49***
SIGMAR	−0.0033	−0.52	0.4070	1.60
LEV	0.0009	1.27	0.0480	1.63
ROA	−0.0059	−5.40***	−0.1551	−4.62***
ABACC	−0.0007	−0.29	−0.0094	−0.46
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
Adj. R^2	0.1151		0.1132	

Notes: The table presents the regression results of a 2SLS analysis of the effect of CSR on stock price crash risk for firms with strong corporate governance. This paper uses the approach of Arellano (2003) to adjust the standard error of the parameter estimate of the panel robust standard error. Dependent variables: *NCSKEW* and *DUVOL* are the crash risk measures of firm *i* in year t in Models 1and 2, respectively. Independent variables: *CŜR* is the predicted CSR of Equation (1) of firm *i* in year *t*−1. *NCSKEW1* is the crash risk measure of firm *i* in year *t*−1. *DUVOL1* is the crash risk measure of firm *i* in year *t*−1. *DTurn* is the change in monthly share turnover of firm *i* in year *t*−1. *RET* is the average firm-specific weekly return of firm *i* in year *t*−1. *MB* is the market-to-book-value ratio of firm *i* in year *t*−1. *SIZE* is the natural logarithm of the market value of equity of firm *i* in year *t*−1. *SIGMAR* is calculated as the standard deviation of the firm-specific weekly returns of firm *i* in year *t*−1. *LEV* is calculated as the total long-term debt divided by the total assets of firm *i* in year *t*−1. *ROA* is the return on assets of firm *i* in year *t*−1. *ABACC* is the absolute value of the abnormal accruals of firm *i* in year *t*−1. *CGI* is the corporate governance index of firm *i* in year *t*−1. *Year Fixed Effect* is a set of year dummy variables. *Industry Fixed Effect* is a set of industrial dummy variables. ***Significant at the 1 percent level

Table VI.
2SLS regression analysis of the effect of CSR on crash risk for firms with more effective corporate governance

Taiwanese firms with weak corporate governance engage in CSR for genuine reasons rather than using CSR as an instrument to conceal negative information.

In contrast to the results in Table IV, most of the control variables in Model 1 (NCSKEW) and Model 2 (DUVOL) of Table V are not statistically significant; however, a higher risk of a stock market bubble, higher firm growth, and larger firm size are significantly positively associated with higher future crash risk among Taiwanese firms with weak corporate governance. For similar reasons as in Table IV, the effects of these control variables on future crash risk are positive and significant.

The results of the 2SLS regression for the samples of firms with more effective corporate governance are presented in Table VI. The coefficient of predicted CSR in Model 1 (NCSKEW) is −0.0031, with a t-value of −3.55, and is negative and statistically significant at the 1 percent level. However, the coefficient of predicted CSR in Model 2 (DUVOL) is 0.0736, with a t-value of 1.23, and is not statistically significant at the 10 percent level. This result seems to indicate that the alleviating effect of CSR on crash risk is not pronounced for Taiwanese firms with strong corporate governance. Consistent with Andreou et al. (2013), this result implies that firms with strong corporate governance in Taiwan are less likely to hide misbehavior and thus have lower stock price crash risk. Hence, for Taiwanese firms with strong corporate governance, those engaging in CSR do not have a significantly lower crash risk than those not engaging in CSR.

Moreover, the coefficient of predicted CSR in Model 1 (NCSKEW) in Table VI is 1.99 percent smaller than that in Table V. This figure shows that CSR firms with weak corporate governance have a 1.99 percent lower crash risk than CSR firms with strong corporate governance. Overall, consistent with the results of Kim et al. (2014), these findings may suggest that the effect of CSR alleviates future stock price crash risk for Taiwanese firms with weak corporate governance, but the effect appears to have little influence on future crash risk for firms with strong corporate governance.

Similar to the results in Table V, the coefficients of the control variables strongly imply that a higher risk of a stock market bubble, higher firm growth, and larger firm size are significantly positively associated with higher future crash risk for Taiwanese firms with strong corporate governance mechanisms. Similar to the results in Table VI, the effects of these control variables on future crash risk are also positive and significant. However, these control variables in Table VI have a less positive impact on future crash risk than the variables in Table V.

Moreover, consistent with the results in Table IV, a higher ROA is significantly and negatively associated with lower future crash risk even for Taiwanese firms with strong corporate governance. Similar to the results for Table IV, the effect of ROA on future crash risk is negative and significant. Nevertheless, the ROA in Table VI has a more negative impact on future crash risk than that in Table V.

Overall, these results show that strong corporate governance mechanisms seem to play more effective roles in monitoring and managing crash risk than do weak corporate governance mechanisms in the Asian emerging market of Taiwanese firms.

5. Conclusion
This study investigates the relationship between CSR and crash risk in the Asian emerging market of Taiwanese firms. To the best of our knowledge, this study is the first to explore the impact of CSR and corporate governance on crash risk in the Asian emerging market of Taiwanese firms. This study reports the following findings: consistent with the finding of Kim et al. (2014), Taiwanese CSR firms commit

to higher standards of financial reporting transparency and thus exhibit less bad news hoarding behavior. More importantly, CSR has a more pronounced effect in mitigating crash risk for Taiwanese firms with weak corporate governance. CSR appears to have little influence on future crash risk when corporate governance is strong. Bubble levels of share prices, firm growth and firm size have significantly positive effects on crash risk in the Taiwanese stock market. *ROA* is significantly and negatively associated with lower future crash risk for Taiwanese firms with strong corporate governance.

The results of this study could provide useful information for investors and firms that are seeking to reduce stock price crash risk in emerging markets. The results may also be of interest to policy-makers concerned with CSR practices. More importantly, these results offer useful further guidance to investors building investment portfolios and managing risk management decisions in the emerging markets of Taiwanese firms. Finally, the authorities should be the first to promote CSR activities when corporate governance is weak in the emerging markets of Taiwanese firms.

Notes

1. Schuler and Cording (2006) state that customers prefer to buy the products and services of firms engaging in CSR activities.

2. Following an anonymous referee's suggestion, this study also conducts regressions using the Heckman (1979) two-stage estimation procedure. The results are very similar to those using the 2SLS method.

3. In this study, *Tobin's Q* = (market value of common stock+market value of perfect stock +long-term debt+short-term debt)/book value of total assets.

4. Following the perfect foresight approach of Lee *et al.* (2006) and Lin *et al.* (2010), this study uses the actual values as the expected values.

5. Chen *et al.* (2001) suggest that *DUVOL* is not likely to be influenced by extreme firm-specific weekly returns because of the involvement of third moments.

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