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Financial Derivatives, Firm Performance and Corporate Social Responsibility

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A B S T R A C T

Based on the data of 803 non-financial listed firms on the Taiwan Stock Exchange (TWSE) covering the period of 2010~2015, this study examines the relationship between firm's use of financial derivatives affects and performance and risk and how firm's performance on corporate social responsibility (CSR) strengthens or weakens the relationship. Through multiple regression estimation, empirical evidence generally shows that greater degree of financial derivatives usage is associated with better performance but higher risk, and interestingly, firm with better CSR performance tends to have more pronounced performance increase and less risk increase. CSR strengthens the positive effects of financial derivatives on performance and weakens the adverse effects of financial derivatives on risk, confirming the view that firm's engaging in CSR helps firm to shape a more cautious and sustainable investment decision in financial derivatives usage and obtain a more favorable consequence.

Keywords: Financial Derivatives, Corporate Social Responsibility

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1. Introduction

This study examines how financial derivatives affects firm performance and risk and whether firm's performance on corporate social responsibility (CSR) improves the consequences of financial derivatives usage in terms of larger performance increases and smaller risk increases. With the gradual deregulation of financial markets around the globe, the internationalization and liberalization of commodity and financial markets, firm's operation, investment and financing activities are involving more and more risk from various assets price fluctuation. At the same times, relaxed financial regulation caused enlarged fluctuation in interest rate, exchange rate and financial assets value, the characteristics of leverage usage and low transaction costs help firm to achieve various hedging, speculating and arbitrage needs, financial derivative products have gradually become one of the important tools of firm's financial management.

Financial derivative products have been highly developed since recent decades. During the period, in response to the market demand, the trading items have been continuously increased, and the trading hours have also been extended to the night. Derivatives financial products include forwards, futures, options, swaps and other exotic and more complex products. They were originally a safe haven for financial market participants, but they also provide opportunities to make a profit. Financial derivatives transaction involve high-risk leverage trading and off-balance-sheet activities. Improper operation may cause disastrous financial crisis for firms and overall financial markets.[1]

According to Blankley and Schroeder (2000), a typical firm's decision-making process is based on current expected value of exchange rates, interest rates, commodity prices and other assets prices. If changes in assets price do not match firm's expectations, cash flow will deviate from the expected level. Cash flows fluctuation not only increases firm's operating cost and earnings but also brings higher cost of capital (Minton and Schrand, 1999). As a typical firm has incentive to reduce the volatility of cash flow and earnings, the use of financial derivative products for risk control is a feasible method (Chen, Lin and Lu, 2014). Although the financial derivatives may help to increase the value, they may generate excessive leverage and cause firm's huge losses due to poor corporate governance mechanism, the low efficiency of the board of directors' supervising the management on use of financial derivatives, or the lack of internal risk control mechanism and risk management technique and implementation. If the operation of financial derivatives causes a huge loss, financial distress or even financial markets disturbance is emerged, and firm's shareholders as well as creditors and customers will be adversely affected. Therefore, the cost of financial derivatives is distributed among all stakeholders.

Existing studies have mentioned the benefit and cost of firm's use of financial derivatives. Tian (2004) found that firm with higher exchange rate risk and market risk tends to have higher probability of financial derivatives usage. Tsao, Chen, Chi and Lo (2009) pointed out that the possibility of financial derivatives usage is positively correlated with firm's value. Wu (2011) found that high-growth firms have higher excess returns from derivatives operation, and the use of derivatives for hedging purpose tends to increase firm's value. Bae, Kim and Kwon (2018) employed firm-level data for Korean firms and found that firms with more export, more foreign currency debt and higher exchange rate exposure are likely to use more currency derivatives for hedging. They also found that

[1] Since the 1990s, many well-known companies and financial institutions have reported incidents of huge losses caused by trading financial derivatives products, such as Gibson Greeting, Proctor and Gamble, the Orange County Government of California, Barings Bank in the UK, Japan's Daiwa Bank, Long-Term Capital Management Corporation, Union Bank of Ireland, Lehman Brothers, American Insurance Group (AIG), Merrill Lynch and the OCBC Bank in Taiwan. They all caused turbulent in financial markets.

sell transaction in currency derivatives bring higher firm value and currency derivatives usage by firms with high exposures is associated with lower firm risk but lower firm value as well. Bartram, Brown and Conrad (2011) employed cross-country nonfinancial firms to examine the effect of derivatives usage on firm risk and value. The authors found that the use of financial derivatives reduces both total risk and systematic risk, and the effect of derivatives usage on firm value is positive but weak. Belghitar, Clark and Mefteh (2013) investigated the effect of foreign currency derivatives usage on shareholder value and found that derivatives usage is effective in reducing overall foreign currency exposure but there is no evidence of shareholder value creation. Liu (2016) explored the impact of derivatives usage on bank risks in Taiwan's banking industry from 1998 to 2011 and found that higher degree of non-trading purpose interest rate and exchange rate derivatives usage tends to decrease interest rate and exchange rate risk, but bank with higher interest rate derivatives usage for trading purpose causes higher interest rate risk. Bank with higher trading purpose exchange rate derivatives usage is associated with lower exchange rate risk.

In recent years, more and more corporate scandals and business ethics violation cases are occurred. The public and the government have increasingly required firms to fulfill its social responsibilities instead of just stockholders' wealth maximization thinking. The international requirements on firm's fulfilling social responsibilities are also increasing. The Organization for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises, the World Business Council for Sustainable Development (WBCSD) and other well-known international CSR guidelines have consistently advocated the three-oriented responsibility of firm including the environment, the society and the corporate governance (ESG). At the same time, in practice, more and more pioneered firms that are actively adapting to this trend and have invested more and more resources to improve the performance on CSR and sustainability.

The research has also shown that taking CSR enhances various kinds of financial versus nonfinancial benefits. Most notably, some studies have mentioned that CSR can act as a risk management tool or functioning as an insurance for performance decline during bad events occur. Chen (2018) found that firm with better performance on CSR can mitigate stock price crash and supports the risk reduction hypothesis. Kao (2015) pointed out that the better CSR performance improves firm value and helps to stabilize the fluctuation risk of earnings. Liu (2014) found that because CSR requires firm pay attention to the interests of stakeholders and consider corporate sustainability, CSR performance has significant favorable impact on credit rating. Similar results could be found in Sen and Bhattacharya (2001), Godfrey (2005), Peloza (2006), Godfrey, Merrill and Hansen (2009), Minor and Morgan (2011), Koh, Qian and Wang (2014), Kao, Shiu and Lin (2016), Lins, Servaes and Tamayo (2017), Shiu and Yang (2017), Gupta and Krishnamurti (2018), Jia, Gao and Julian (2020) and Sun and Huang (2021).

This study aims to explore the impact of financial derivatives on firm value and risk, and considers the CSR performance in moderating the consequences of financial derivatives usage. This study employs the data of nonfinancial listed companies on the Taiwan Stock Exchange covering the period of 2010 to 2015. The main contribution of this study is to incorporate firm's CSR performance into the investigation of the effects of financial derivatives on firm performance and risk. Firm's CSR performance measures how firm's treating stakeholders and how distributes weights between short-term profitability versus long-term sustainability. The Difference of the degree of emphasizing on stakeholder's interest may form different investment strategy in the use of financial derivatives, thus the consequence on performance and risk is moderated by the degree of firm's engagement in CSR.

In quantifying CSR performance, in addition to construct discrete measurement from annual name-list of excellent performance on CSR by domestic yet famous magazines, the *Global Views Monthly* and the *Common Wealth*, the construction process and inclusion criterion of Shanghai Stock Exchange Social Responsibility Index is also considered. The basic empirical result shows that, greater degree of financial derivatives usage increases firm performance but also increases risk, and better firm's CSR performance enlarges the magnitude of performance increases and mitigates the magnitude of risk increases. The next section reviews the benefits and costs of financial derivatives and the role of CSR in corporate risk management mechanism in enhancing benefits versus alleviating costs of financial derivatives. Section 3 introduces the variables, data, and econometric model. Section 4 reports empirical result and discussion. The last section is conclusion and suggestion.

2. Literature Review and Hypothesis Development

2.1 The Benefit and Cost of Firm's Financial Derivatives Usage

Previous research shows that the motives for operating financial derivatives includes hedging and speculation (Guay, 1999; Guay and Kothari, 2003; Allayannis et al., 2009). Guay (1999) discovered that the motivation to transact financial derivatives is to hedge with an aim to reduce risk. A number of empirical studies supports that appropriate risk management increases corporate value (Carter, Rogers and Simkins, 2003; Graham and Rogers, 2002; Guay and Kothari, 2003). Similarly, Barton (2001) pointed out that derivative financial products help to stabilize cash flow and increase the value of the firm. In addition, firm may also engage in derivative financial products trading based on speculative motive. Bartram, Brown and Conrad (2011) found that the effect of financial derivatives usage on firm value is positive yet weaker. Belghitar, Clark and Mefteh (2013) found that foreign currency derivatives usage are effective in reducing overall foreign currency exposure but there is no evidence of shareholder value creation. Bae, Kim and Kwon (2018) found that transaction in currency derivatives bring higher firm value. This study proposes hypothesis 1a such that the degree of financial derivatives usage is positive correlated with firm performance.

Hypothesis 1a: The degree of firm's financial derivatives usage is positively correlated with firm performance. The larger the degree of financial derivatives usage, the better the performance.

It can be seen from endless cases in which many firms and financial institutions in financial markets history caused serious losses or even bankruptcy due to improper trading or investment on financial derivative products. Improper financial derivatives transaction may cause losses and increases the volatility of cash flow and earnings, adversely affecting the value of the company (Carter et al., 2003; Finnerty and Grant, 2002; Graham and Rogers, 2002; Guay and Kothari, 2003; Hodder et al., 2006). In Taiwan, Liu (2016) found evidence that banks with higher interest-rate derivatives for trading purposes have higher interest-rate risks. This study proposes hypothesis 1b such that financial derivatives usage is positive correlated with firm risk.

Hypothesis 1b: The degree of firm's financial derivatives usage is positively correlated with firm's risk. The larger the degree of financial derivatives usage, the greater the firm's risk.

2.2 CSR and Risk Management

Existing studies have pointed out that CSR helps to improve firm performance and value. The stakeholder theory of Freeman (1984) and the social impact viewpoint of Cornell and Shapiro (1987) show that companies can maximize the value of the company as they are satisfying the interests of stakeholders in operations. Cochran and Wood (1984) found that corporate social responsibility performance is positively correlated with financial performance. Brammer and Millington (2005),

Luce, Baber and Hillman (2001) and Hull and Rothenberg (2008) have similar findings. Wu and Shen (2013) used bank samples to prove that banks with higher social responsibility performance have better financial performance. Waddock and Graves (1997) found that the company's social responsibility performance has a positive relationship with the return on assets, returns on equity and return on sales.

Based on above findings, this study proposes that firm's well-perform on CSR will take into account the interests of all stakeholders in their financial derivatives investment decision-making, rather than simply considering the interests of shareholders or controlling shareholders, to enhance the benefit of firm's financial derivatives usage.

Hypothesis 2a: The firm's CSR performance strengthens the positive relationship between firm's financial derivatives usage and performance. The better the performance on CSR, the larger the firm performance increases by financial derivatives usage.

CSR has been mentioned in existing research as having the role and function of risk management and insurance for performance decline as negative events occur. Peloza (2006) mentioned that corporate managers engage in CSR to mitigate damage from corporate wrongdoing or negative shocks. The public tends to perceive firm's wrongdoing as "bad luck" instead of "poor management" when firm's CSR performance is better. Similar with Koh, Qian and Wang (2013), Godfrey, Merrill and Hansen (2009) pointed out that CSR is helpful to reduce the degree of damage as firm's negative events occurred. Lins, Servaes and Tamayo (2017) mentioned that during the 2008-2009 financial tsunami, firms with high CSR performance had higher profitability than low CSR companies. When firm is negatively influenced by negative events, the magnitude of damage is buffered by reputational capital, social trust and good image accumulating by engaging in CSR.

CSR engagement is also a risk preventive policy. Firm's following CSR criterion can effectively reduce loss incurred by managerial overconfidence and the value-decreasing overinvestment (McCarthy, Oliver and Song, 2017). Firm's investment and commitment in CSR helps to limit the occurrence of self-interested behaviors of the management. Choi, Lee and Park (2013) pointed out that socially responsible firms tend to maintain long-term and good relationships with stakeholders, rather than just short-sighted maximizing the interests of minority shareholders. The more the firm's engagement in CSR, the more resources and efforts are used to satisfy the interests of stakeholders. These commitments and investments limit the possibility of short-term opportunistic behaviors of the management. It helps to reduce the seriousness of agency problems between management (and controlling shareholders) and stakeholders and other agency costs (Jones, 1995; Andriof and Waddock, 2002). Chih, Shen and Kang (2008), Hong and Andersen (2011), and Choi, Lee and Park (2013) have also found that companies that invest more and commit to social responsibility are less likely to be speculative in earnings management. Firm with CSR limit the firm to form a less risky and more sustainable investment decision in financial derivatives usage, such that the magnitude of risk increase is smaller. Based on above argument, this study proposes hypothesis 2b such that firm CSR mitigates the adverse effect of financial derivatives on firm risk.

Hypothesis 2b: The firm's CSR performance weakens the positive relationship between the degree of financial derivatives usage and firm's risk. The better the performance of CSR, the smaller the firm's risk increase by financial derivatives usage.

3. Variable, Econometric Model, Sample and Data

3.1 Variable

3.1.1 Main Predictor－Financial Derivatives Usage

This study employs four proxies for firm's financial derivatives usage. First, total contracting amount of financial derivatives contracts (*DIRV_T*), refers to the principal of offset versus un-offset contracts. Limited by data acquisition, this study does not distinguish whether the amount is for trading purposes or not for trading purposes (further divided into "meet of hedging accounting" and "not meet of hedging accounting). Second, whether a firm has financial derivatives (*DIRV_TD*), if firm's principal of financial derivatives contracts is greater than zero, *DIRV_TD* is equal to 1, and 0 otherwise. Third, the ratio of firm's financial derivatives contracts principal to total sales (*DIRV_TSR*), defined as the principal of financial derivatives contracts divided by net sales. Fourth, the ratio of firm's financial derivatives contracts principal to total assets (*DIRV_TAR*), defined as the principal of financial derivatives divided by total assets. Greater value of *DIRV_T*, *DIRV_TD*, *DIRV_TSR* and *DIRV_TAR* represents greater degree of financial derivatives usage.

3.1.2 Moderator－Firm's CSR Performance

Following Hsu (2017), four proxies for firm's performance on CSR, which is based on annual name-lists of the "CSR Award" winners by the *Global Views Monthly* and the "Best Corporate Citizens" by the *Common Wealth*. First, current performance on CSR (*CSR_C*), if a firm has been chosen as either in one or both awards in a specific year, *CSR_C* is equal to 1 and 0 otherwise. Second, years of cumulative performance on CSR (*CSR_CUMU*), defined as the number of years that a firm has been chosen as either one of two annual lists of CSR awards winners. Third, continuous performance on CSR (*CSR_CONT*), defined as whether a firm has continuously been chosen as either one of two annual lists of CSR awards winners. If a firm has obtained one of the two awards every year during data period, *CSR_CONT* is equal to 1, and 0 otherwise. Fourth, overlapping performance on CSR (*CSR_OLP*), if a firm has won both awards in a particular year, *CSR_OLP* is equal to 1 and 0 otherwise. Greater value of *CSR_C*, *CSR_CUMU*, *CSR_CONT* and *CSR_OLP* represents better CSR performance.

According to Hsu (2007), alternative measure of CSR performance is introduced. The Shanghai Stock Exchange (SSE) in China constructed SSE Social Responsibility Index by the computation of social contribution value, including firm's annual cash payment toward main stakeholders, e.g., payment to employee (employee salary and benefits), creditors such as banks (loan interest), government (tax) and stockholders (cash dividends). Summarize above payments as a total value called social contribution value (*SCV*) to proxy for firm's value creation for society (main stakeholders). Divided *SCV* by firm's total asset to obtain social returns on asset (*SROA*). Divided *SCV* by firm's shares outstanding to obtain social contribution value per share (*SCVPS*). Greater value of *SCV*, *SROA* and *SCVPS* corresponds to better CSR performance.

3.1.3 Predicted Variables－Firm Performance and Risk

Firm's performance is proxied by three variables. First, returns on assets (*ROA*), defined as after-tax net income divided by total assets. Second, market value of common equity (*MKTVALUE*), defined as the average daily stock price multiplied by total shares outstanding. Third, Tobin's Q (*TQ*), defined as the sum of market value of common stock and book value of debt and then divided by asset. The first performance variable is accounting-based, and the latter two are market-based. While accounting-based performance variable measures the historical performance of firm, market-based

variable is forward-looking yet susceptible to the subjective evaluation from investors, investors' emotional and overall market volatility. Larger *ROA*, *MKTVALUE*, and *TQ* corresponds to better performance.

While the potential loss by financial derivatives transaction may adversely affects firm's financial condition and valuation from the investors, firm's stock returns volatility and stock price crash could be emerged. Firm's risk is proxied by three variables. The first is the volatility of firm's weekly stock returns (*WEKRET_VAT*), defined as the variance of weekly stock returns in a given year. Larger stock returns volatility implies higher risk of holding firm's stock and higher volatility of stockholders' wealth. The second is the skewness coefficient (*SKEW*) of weekly stock return, defined as the Pearson skewness coefficient of weekly stock return in a given year, and then multiply minus one. The reason of multiplying skewness coefficient by minus one is to make larger skewness coefficient is correspondent to greater degree of stock returns downside risk. The third risk proxy is the 5% percentile of weekly stock return in a given year and multiply minus one (*VaR95*), and higher *VaR95* implies greater degree of downside risk of holding the stock. The first risk proxy measures stock returns volatility, and the latter two measures downside risk of stock returns.

3.1.4 Controls

Based on existing studies, several variables are incorporated to control for performance and risk. First, Demsetz and Villalonga (2001) pointed out that firm size (*LNASSET*), proxied by total asset (taking natural logarithm), is a relevant factor influencing firm's performance. Larger firm is more able to withstand negative impacts of cash flow uncertainty and is likely to have better performance and lower risk. Second, Morck, Shleifer and Vishny (1988) indicated that higher debt ratio (total debt divided by total assets, *DEBT*) implies lower long-term solvency and higher firm's financial and bankruptcy risk. Higher debt ratio potentially has negative effects on firm's future profitability. Therefore, higher firm's debt ratio is associated with worse performance and larger risk. Third, Cheng, Wang and Weng (2000) and Ittner, Lanen and Larcker (2002) pointed out that aged (*AGE*) firms tend to have better reputation, specific expertise and industry knowledge by learning effects. Accumulated corporate reputation and business knowhow help firms to obtain better performance and lower risk.

Fourth, Pfeffer (1972) and Yermack (1996) argued that corporate board size (the number directors, *BOARD*) affects the efficiency of corporate board functioning on managerial monitoring and advising, which affects firm's performance and risk. Fifth, Fama and Jensen (1983) found that board independence helps corporate board to have better expertise and be able to monitor management independently which improves the quality of management decisions and thereby enhance the firm performance and reduce the risk. Higher independent director ratio (the number of independent directors divided by the number of directors, *INDR*) improves firm's performance and lowers risk. Sixth, Leland and Pyle (1977) believes that the higher the managerial shareholding ratio (the number of shares hold by the managers divided by the shares outstanding, *MSHARE*), the more convergent of private interests and corporate's interests, the better the quality of management decisions. Therefore, higher managerial shareholding ratio enhances firm's performance and reduces risk. Seventh, the higher the directors' shareholding ratio (the number of shares hold by the directors divided by the shares outstanding, *DSHARE*), the more the personal interests are convergent with firm's interests, and directors' efforts on managerial monitoring and advising increases, helping to increase performance and reduce risk. Eighth, institutional investors tend to have advantage on information collection and have expertise in enhancing internal and external corporate governance. The higher the institutional investor shareholding ratio (the number of shares hold by institutional investors divided by the shares outstanding, *INSTSHARE*), the more it improves firm performance and reduce risk. Table 1

summarizes mnemonics and brief definition of variables.

Table 1 Mnemonics and Definition of Variables

Variable	Mnemonics	Definition
Main Predictor		
Amount of Financial Derivatives	*DIRV_T*	The principal of financial derivatives contracts, refers to the amount of offset versus un-offset financial derivatives contracts
Dummy of Financial Derivatives	*DIRV_TD*	Whether a firm involves financial derivatives usage, if the principal of financial derivatives is greater than zero, *DIRV_TD* is equal to 1, and 0 otherwise
The Ratio of Financial Derivatives to Net Sales	*DIRV_TSR*	The principal of financial derivatives divided by net sales
The Ratio of Financial Derivatives to Total Assets	*DIRV_TAR*	The principal of financial derivatives divided by total assets
Moderator		
Current Performance on CSR	*CSR_C*	If a firm is either in annual name-list of the winners of "CSR Award" by the *Global Views Monthly* or the "Best Corporate Citizens" by the *Common Wealth* in a particular year, *CSR_C* is equal to 1, and 0 otherwise.
Cumulative Performance on CSR	*CSR_CUMU*	The cumulative years of a firm being either in annual name-list of the winners of "CSR Award" by the *Global Views Monthly* or the "Best Corporate Citizens" by the *Common Wealth*
Consistent Performance on CSR	*CSR_CONT*	If a firm is continuously being either in annual name-list of the winners of "CSR Award" by the *Global Views Monthly* or the "Best Corporate Citizens" by the *Common Wealth* in sample period, *CSR_CONT* is equal to 1, and 0 otherwise.
Overlap Effect of CSR	*CSR_OLP*	If a firm is in the annual name-list of the winners of "CSR Award" by the *Global Views Monthly* and the "Best Corporate Citizens" by the *Common Wealth* in a particular year, *CSR_OLP* is equal to 1, and 0 otherwise.
Social Contribution Value	*SCV*	Sum of cash dividend, employee salary, interest expense and tax, and then take natural logarithm.
Social Returns on Assets	*SROA*	social contribution value / total assets
Social Contribution Value per Share	*SCVPS*	social contribution value / shares outstanding
Predicted Variable		
Returns on Assets	*ROA*	After-tax net income divided by total assets.
Market Value of Common Equity	*MKTVALUE*	Average stock price multiply total shares outstanding.
Tobin's Q	*TQ*	Sum of market value of common stock and book value of debt and then divided by book value of asset.
Weekly Stock Return Volatility	*WEKRET_VAT*	The variance of weekly stock's stock return
Skewness of Weekly Stock Return	*SKEW*	The Pearson skewness coefficient of firm's weekly stock return and multiply minus one.
95%VaR of Weekly Stock Return	*VaR95*	The 5% percentile of weekly stock return and multiply minus one
Control Variable		
Firm size	*LNASSET*	Natural logarithm of total asset
Debt ratio	*DEBT*	Total Debt /Total assets
Firm age	*AGE*	Number of year since firm's established
Board size	*BOARD*	Number of board of director
Independent director ratio	*INDR*	Number of independent directors/ Number of directors
Managerial shareholding ratio	*MSHARE*	Number of shares hold by the management / shares outstanding
Directors' shareholding ratio	*DSHARE*	Number of shares hold by directors / shares outstanding
Institutional shareholding ratio	*INSTSHARE*	Number of shares hold by institutional investors / shares outstanding

Note: All definitions of variables are from the Taiwan Economic Journal (TEJ). Construction of CSR measurement is based on annual name lists of "CSR Award" by the *Global Views Monthly* (https://csr.gvm.com.tw/2021/award.html) and "Top Corporate Citizens" by the *Common Wealth* (https://topic.cw.com.tw/csr/report.aspx).

3.2 Econometric Model

This study applies multiple regression to examine how firm's CSR performance strengthens or weakens the impact of financial derivatives usage on performance and risk. The regression equations are:

$$\begin{aligned}\mathbf{PERF}_{i,t} &= \beta_0 + \beta_1 \mathbf{FD}_{i,t} + \beta_2 \mathbf{FD}_{i,t} * \mathbf{CSR}_{i,t} \\ &+\beta_3 LNASSET_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 AGE_{i,t} + \beta_6 BOARD_{i,t} \\ &+ \beta_7 INDR_{i,t} + \beta_8 MSHARE_{i,t} + \beta_9 DSHARE_{i,t} + \beta_{10} INSHARE_{i,t} + \varepsilon_{i,t} \qquad (1)\end{aligned}$$

$$\begin{aligned}\mathbf{RISK}_{i,t} &= \beta_0 + \beta_1 \mathbf{FD}_{i,t} + \beta_2 \mathbf{FD}_{i,t} * \mathbf{CSR}_{i,t} \\ &+\beta_3 LNASSET_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 AGE_{i,t} + \beta_6 BOARD_{i,t} \\ &+ \beta_7 INDR_{i,t} + \beta_8 MSHARE_{i,t} + \beta_9 DSHARE_{i,t} + \beta_{10} INSHARE_{i,t} + \varepsilon_{i,t} \qquad (2)\end{aligned}$$

where **PERF** and **RISK** are two vectors of performance and risk proxies, respectively, including returns on assets (*ROA*), market value of common equity (*MKTVALUE*), Tobin's Q (*TQ*), weekly stock returns volatility (*WEKRET_VAT*), skewness of weekly stock returns (*SKEW*) and 95% VaR of weekly stock returns (*VaR95*). **FD** is vector of proxy for firm's financial derivatives usage, including amount of financial derivatives (*DIRV_T*), dummy of firm's holding financial derivatives contracts (*DIRV_TD*), the ratio of financial derivatives principal amount to net sales *(DIRV_TSR*) and the ratio of financial derivatives principal amount to total assets (*DIRV_TAR*). **CSR** is vector of proxy for firm's performance on CSR, including current performance on CSR (*CSR_C*), cumulative performance on CSR (*CSR_CUMU*), consistent performance on CSR (*CSR_CONT*), overlap effect of CSR (*CSR_OLP*), social contribution value (*SCV*), social returns on assets (*SROA*) and social contribution value per share (*SCVPS*). *LNASSET* is firm's size, *DEBT* is debt ratio, *AGE* is firm age, *BOARD* is corporate board size, *INDR* is independent director ratio, *MSHARE* is managerial shareholding, *DSHARE* is directors' shareholding and *INSTSHARE* is institutional shareholding. Regression equations are OLS pooled estimated.

3.3 Samples and Data

The research sample consists of 803 non-financial listed firms on the Taiwan Stock Exchange (TWSE) ranging from 2010 to 2015.[2] The data of firm's financial derivatives contracts amount and the calculation of social contribution values, financial performance, risk, firm characteristic and corporate governance variables were collected from the Taiwan Economic Journal (TEJ) database. The construction of firm's performance on CSR is based on annual name-lists of "CSR Award" by the *Global Views Monthly* (https://www.gvm.com.tw/CSR/history.html) and "Top Corporate Citizens" by the *Common Wealth* (http://topic.cw.com.tw/csr/report.aspx).

4. Empirical Result

4.1 Descriptive Statistics and Correlation Analysis

Table 2 reports summarize statistics. In Panel A, mean of *CSR_C* is 0.0463, indicating that about 4.63% samples were selected as the "CSR Awards" winners by the *Global Views Monthly* and the

[2] With the development of the financial derivatives markets, the transaction amount of financial derivative products and types of products are increasing. A longer data period allow us to investigate long-term impact of financial derivatives on firm performance and risk.

"Top Corporate Citizens" winners by the *Common Wealth*. Mean of *CSR_CONT* is 0.0088, indicating that 0.88% of samples continuously received one of the former two awards during data period. Mean of *CSR_OLP* is 0.0086, indicating that 0.86% of samples received both awards.

Panel B shows the comparison results samples with financial derivatives usage (*DIRV_TD*=1) versus without financial derivatives usage (*DIRV_TD*=0) among all variables. The result shows that the mean return on assets (*ROA*) of the samples with financial derivatives is higher than the samples without financial derivatives (8.9186% and 7.4322%), but the difference in mean is not reaching at least 10% significance level. The mean of the samples with financial derivatives is higher than the samples without financial derivatives in market value (*MKTVALUE*) (15.9407 and 15.3754, respectively) and Tobin's Q (*TQ*) (1.3778 and 1.348, respectively), and the differences in mean both reach at least 10% significance level. Although firm with financial derivatives has significantly higher returns on asset, the result generally indicates that firm with financial derivatives tends to have larger market value and higher growth opportunity, confirming the hypothesis 1a such that financial derivatives usage helps firm to hedge risk and exploit potential profitable opportunity in financial market to contribute benefit to firm performance. The comparison results of risk variables reveal that mean weekly stock return volatility (*WEKRETVAT*) of the samples with financial derivatives is smaller than the samples without financial derivatives (23.5759% and 26.881%, respectively). Firm's weekly stock return rate skewness (*SKEW*) and weekly stock returns 95% VaR (*VaR95*) is both higher than the samples without financial derivatives, indicating that firm with financial derivatives tends to have lower stock return volatility but greater downside risk. However, mean differences in three risk variables are not statistically significant.

Panel B also shows that the current performance on CSR (*CSR_C*), cumulative performance on CSR (*CSR_CUMU*), consistent performance on CSR (*CSR_CONT*) and overlap effect of CSR (*CSR_OLP*) are significantly larger in means for samples with financial derivatives, indicating that the firm with financial derivatives tends to perform better on CSR. Moreover, firms with financial derivatives have significantly larger firm size, higher debt ratio, larger board size and higher independent director ratio.

Table 3 reports Pearson correlation coefficients among variables. First, correlation coefficients of financial derivatives amount (*DIRV_T*) and three performance variables are all positive and significant (0.0537, 0.2851 and 0.0465, respectively), indicating that higher amount of financial derivatives is associated with better performance in terms of higher returns on assets, larger market value of common equity and higher Tobin's Q. Correlation coefficient of financial derivatives amount (*DIRV_T*) and skewness of weekly stock returns (*SKEW*) is significantly positive (0.0555), means that higher amount of financial derivatives is associated with greater stock returns downside risk. Correlation of financial derivatives amount to net sales (*DIRV_TSR*) and returns on assets (*ROA*) and market value of common equity (*MKTVALUE*) are significantly positive, and the possible reasons for explanation is that while financial derivatives amount to net sales is negatively correlated with firm size (-0.1083) and returns on assets and market value of common equity are all positively correlated with firm size (0.1382 and 0.9055, respectively). More specifically, firm with higher financial derivatives amount to net sales tends to be a small firm with worse performance on returns on assets and market value of common equity. Similar explanation is applied on the negative correlation between financial derivatives amount to asset (*DIRV_TAR*) and returns on assets (*ROA*).

The correlation between the financial derivatives amount to net sales (*DIRV_TSR*) and stock return volatility and *VaR95%* stock returns is significantly positive, indicating a higher ratio of financial derivatives usage is correspond to higher stock return volatility and stock returns downside risks. Some of correlation coefficients between four proxies for financial derivatives usage and seven variables of

CSR performance are significantly positive and none of them are negative and significant, means that firm with better performance on CSR tends to have higher degree on financial derivatives usage. Almost all of correlation coefficients of firm's CSR performance and *ROA*, *MKTVALUE* and *TQ* are significantly positive, indicating that firm with better performance on CSR tends to have better performance on financial consequences. Most of the correlation coefficients of firm's CSR performance and *WEKRET_VAT* and *VaR95* are significantly negative, indicating that firm with better performance on CSR tends to have lower weekly stock return volatility and stock returns downside risk. Yet, most of the correlation coefficients of firm's CSR performance and *SKEW* are significantly positive, which represents that firm with better performance on CSR tends to have larger stock returns downside risk.

4.2 Regression Results

Table 4 reports pooled OLS regression estimation results of the effect of financial derivatives usage (measured by the total amount of financial derivatives contracts, *DIRV_T*) on firm performance and risk. In panel A, as firm performance is proxied by market value (*MKTVALUE*), estimated coefficients of *DIRV_T* is positive and reach 10% significance level, means that greater amount of financial derivatives is associated with higher market value of common equity. It is interesting that coefficients on cross product term (*DIRV_T *CSR_C*) are both positive and significant (0.101, 0.0187 and 0.0224), indicating that better performance on CSR strengthens the positive effect of financial derivatives usage on firm performance.

In panel B, three estimated coefficients on *DIRV_T* are positive for risk proxies. As firm's risk is proxied by weekly return volatility (*WEKRETVAT*) and 95%VaR stock returns (*VAR95*), positive coefficients both reach at least 5% significance level, indicating that greater amount of financial derivatives is associated with greater weekly return volatility and stock returns downside risk. It is also interesting that coefficients on cross product term (*DIRV_T *CSR_C*) are all negative (-0.0891, -0.0014 and -0.0263) and one of them reaches 5% significance level as firm's risk is proxied by the *VAR95*, indicating that better CSR performance weakens the effects of financial derivatives usage on firm's stock returns downside risk.

The estimated result in Table 4 generally shows while financial derivatives enhance firm's performance and increase firm's risk, firm's CSR performance strengthens the positive effect on performance and weakens the adverse effect on risk of financial derivatives, confirming the hypothesis 1a, 1b, 2a and 2b. Firm's performance on CSR helps firm to form a more sustainable and cautious investment decision on financial derivatives usage and then contributes to a more pronounced performance increase and lowered risk increase.

Estimated results of control variables generally show that firm with larger scale, higher debt ratio, lower age, small board size, higher managerial and institutional shareholdings tends to have better firm performance. Firm with larger scale tends to have lower stock return volatility and 95%VaR stock returns but higher stock returns skewness. Firm with higher debt ratio tends to have higher stock return volatility and 95%VaR returns but lower stock return skewness. Observe the goodness of the fit of overall regression estimation in Table 4, adjusted R-squares are between 3.87% and 88.11%. The *p*-value of Joint *F*-test on overall significance is very small, indicating the regression model specification is appropriate.

Table 2 Descriptive Statistics

Variable	Panel A. Full sample					Panel B. Samples with financial derivatives (*DIRV_TD*=1)					Samples without financial derivatives (*DIRV_TD*=0)					Mean Difference
	# of obs.	Mean	Std. Dev.	Min	Max	# of obs.	Mean	Std. Dev.	Min	Max	# of obs.	Mean	Std. Dev.	Min	Max	
ROA	2,119	8.8271	9.2410	-47.610	82.790	1,939	8.9186	9.0723	-47.610	43.290	180	7.8411	10.8751	-38.350	82.790	1.0775
MKTVALUE	2,079	15.894	1.5170	11.704	22.034	1,901	15.941	1.5267	11.704	22.034	178	15.398	1.3145	11.842	18.870	0.5425***
TQ	2,079	1.3697	0.7708	0.4474	8.0277	1,901	1.3778	0.7752	0.4474	8.0277	178	1.2828	0.7185	0.5667	4.9625	0.0950*
WEKRETVAT	2,078	23.604	25.745	0.4995	718.23	1,900	23.576	25.971	0.4995	718.23	178	23.902	23.258	1.8898	156.37	-0.3266
SKEW	2,077	-0.3602	0.8341	-4.9229	2.6269	1,899	-0.3537	0.8226	-4.9229	2.6269	178	-0.4296	0.9474	-4.4721	2.0386	0.0759
VaR95	2,079	6.4325	2.8200	-22.857	20.284	1,901	6.4408	2.8150	-22.857	20.284	178	6.3444	2.8801	1.8578	19.898	0.0963
CSR_C	2,126	0.0795	0.2706	0.0000	1.0000	1,946	0.0853	0.2794	0.0000	1.0000	180	0.0167	0.1284	0.0000	1.0000	0.0686***
CSR_CUMU	2,126	0.4915	1.4962	0.0000	9.0000	1,946	0.5319	1.5509	0.0000	9.0000	180	0.0556	0.4812	0.0000	5.0000	0.4763***
CSR_CONT	2,126	0.0165	0.1273	0.0000	1.0000	1,946	0.0180	0.1329	0.0000	1.0000	180	0.0000	0.0000	0.0000	0.0000	0.0180***
CSR_OLP	2,126	0.0155	0.1236	0.0000	1.0000	1,946	0.0170	0.1291	0.0000	1.0000	180	0.0000	0.0000	0.0000	0.0000	0.0170***
SCV	1,899	2.1965	0.6916	-0.5374	4.2021	1,744	2.2006	0.6900	-0.4649	4.2021	155	2.1505	0.7103	-0.5374	3.2991	0.0501
DIRV_T	2,126	12.690	4.4237	0.0000	21.199	1,946	13.864	2.2578	7.2056	21.199	180	0.0000	0.0000	0.0000	0.0000	13.864*
DIRV_TD	2,126	0.9153	0.2784	0.0000	1.0000	1,946	1.0000	0.0000	1.0000	1.0000	180	0.0000	0.0000	0.0000	0.0000	1.0000
DIRV_TSR	2,121	955.28	14990.3	0.0000	596048.4	1,941	1043.9	15667.4	0.0100	596048.4	180	0.0000	0.0000	0.0000	0.0000	1043.9***
DIRV_TAR	2,121	283.13	2576.0	0.0000	52875.5	1,941	309.38	2691.4	0.0080	52875.5	180	0.0000	0.0000	0.0000	0.0000	309.38***
LNASSET	2,121	16.089	1.4196	12.500	21.675	1,941	16.131	1.4414	12.500	21.675	180	15.636	1.0609	13.008	19.447	0.4948***
DEBT	2,121	35.690	15.933	0.0100	97.730	1,941	36.002	16.026	0.0100	97.730	180	32.329	14.515	0.5100	76.210	3.6732***
AGE	2,126	30.751	13.773	-3.0000	69.000	1,946	30.617	13.629	-3.0000	65.000	180	32.194	15.211	1.0000	69.000	-1.5773
BOARD	2,119	7.3648	2.3422	4.0000	21.000	1,939	7.4023	2.3759	4.0000	21.000	180	6.9611	1.9008	4.0000	13.000	0.4412***
INDR	2,119	16.407	17.108	0.0000	62.500	1,939	16.722	17.091	0.0000	62.500	180	13.017	16.971	0.0000	60.000	3.7042***
MSHARE	2,119	1.4590	2.6265	0.0000	28.090	1,939	1.4781	2.6119	0.0000	28.090	180	1.2531	2.7773	0.0000	19.370	0.2250
DSHARE	2,119	18.396	13.853	0.1200	88.960	1,939	18.357	13.939	0.1200	88.960	180	18.817	12.915	1.2900	61.000	-0.4603
INSTSHARE	2,118	41.958	22.619	0.0200	100.00	1,938	42.183	22.758	0.0200	100.00	180	39.540	20.977	3.8900	95.410	2.6429

Note: This table reports descriptive statistics (mean, standard deviation, minimum and maximum). See Table 1 for variable definitions. Yearly data is ranged from 2010 to 2015. Panel A is the result of full sample, and panel B shows the result of samples with financial derivatives usage (*DIRV_TD*=1) and samples without financial derivatives usage (*DIRV_TD*=0) and differences in means between two samples. *, ** and *** represent that the difference in mean reaches at least 10%, 5% and 1% significance level.

Table 3 Correlation Coefficients Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) *ROA*	1.0000																						
(2) *MKTVALUE*	0.3939*	1.0000																					
(3) *TQ*	0.5628*	0.3855*	1.0000																				
(4) *WEKRETVAT*	-0.1072*	-0.1655*	0.0960*	1.0000																			
(5) *SKEW*	0.0558*	0.1602*	0.0076	-0.1791*	1.0000																		
(6) *VaR95*	-0.1903*	-0.1772*	-0.0420	0.5305*	0.1438*	1.0000																	
(7) *CSR_C*	0.1266*	0.4057*	0.1580*	-0.0891*	0.0592*	-0.0941*	1.0000																
(8) *CSR_CUMU*	0.1206*	0.4877*	0.1766*	-0.1063*	0.0591*	-0.1162*	0.7869*	1.0000															
(9) *CSR_CONT*	0.1612*	0.3154*	0.1896*	-0.0530*	0.0534*	-0.0750*	0.4403*	0.5135*	1.0000														
(10) *CSR_OLP*	0.1457*	0.2843*	0.1798*	-0.0580*	0.0400	-0.0764*	0.4273*	0.4242*	0.6117*	1.0000													
(11) *SCV*	0.5990*	0.0670*	0.5081*	0.0021	0.0120	-0.0841*	0.1012*	0.0945*	0.0823*	0.0759*	1.0000												
(12) *DIRV_T*	0.0537*	0.2851*	0.0465*	-0.0053	0.0555*	0.0270	0.1514*	0.1829*	0.0844*	0.0821*	0.0093	1.0000											
(13) *DIRV_TD*	0.0325	0.1001*	0.0345	-0.0036	0.0255	0.0096	0.0706*	0.0886*	0.0393	0.0382	0.0199	0.8727*	1.0000										
(14) *DIRV_TSR*	-0.0586*	-0.1027*	-0.0048	0.1049*	-0.0142	0.0900*	-0.0180	-0.0203	-0.0081	-0.0078	0.0409	0.0824*	0.0194	1.0000									
(15) *DIRV_TAR*	-0.0109	-0.1224*	0.0405	0.0795*	-0.0041	0.0832*	-0.0291	-0.0337	-0.0136	-0.0129	0.1009*	0.1537*	0.0335	0.6613*	1.0000								
(16) *LNASSET*	0.1382*	0.9055*	0.0274	-0.2033*	0.1599*	-0.1544*	0.3653*	0.4521*	0.2579*	0.2351*	-0.2034*	0.2997*	0.0972*	-0.1083*	-0.1498*	1.0000							
(17) *DEBT*	-0.2193*	0.0285	-0.1466*	0.0524*	-0.0381	0.0530*	-0.0023	0.0185	0.0087	0.0056	-0.2042*	0.1078*	0.0643*	-0.0413	-0.0696*	0.2410*	1.0000						
(18) *AGE*	-0.1380*	0.0983*	-0.1444*	-0.2303*	0.0302	-0.2555*	0.0619*	0.0949*	-0.0709*	-0.0334	-0.2018*	-0.0118	-0.0319	-0.0006	-0.0313	0.1646*	-0.0197	1.0000					
(19) *BOARD*	0.0678*	0.4364*	0.1108*	-0.1094*	0.0593*	-0.1191*	0.2532*	0.3274*	0.1379*	0.1350*	-0.0021	0.1227*	0.0525*	-0.0285	-0.0353	0.4332*	0.0199	0.1770*	1.0000				
(20) *INDR*	0.1268*	0.1078*	0.1309*	0.1065*	-0.0185	0.0990*	0.0937*	0.1363*	0.1390*	0.1049*	0.1211*	0.0857*	0.0604*	-0.0369	0.0010	0.0642*	0.0265	-0.4078*	0.0890*	1.0000			
(21) *MSHARE*	0.0673*	-0.1361*	0.0982*	0.1184*	-0.0395	0.0719*	-0.0132	-0.0475*	-0.0319	-0.0114	0.1797*	-0.0132	0.0239	-0.0093	0.0478*	-0.1932*	-0.0511*	-0.2330*	-0.0761*	0.0742*	1.0000		
(22) *DSHARE*	0.1297*	-0.0082	0.1061*	0.0168	-0.0812*	-0.0599*	-0.0593*	-0.0482*	-0.0477*	-0.0713*	0.0936*	-0.0285	-0.0093	-0.0079	0.0068	-0.0448*	0.0176	-0.0985*	0.2049*	0.0016	-0.0120	1.0000	
(23) *INSTSHARE*	0.3214*	0.6458*	0.2711*	-0.1195*	0.0806*	-0.1415*	0.2491*	0.3123*	0.2004*	0.1883*	0.0689*	0.1410*	0.0326	-0.0804*	-0.0995*	0.5673*	0.0343	0.0442*	0.3552*	0.1207*	-0.1781*	0.3523*	1.0000

Note: This table reports pair-wise Pearson correlation coefficients among variables. See Table 1 for the definition of variables. Yearly data is ranged from 2010 to 2015. Correlation coefficients followed by an asterisk means that it reaches at least 5% significance level.

Table 4 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_T*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_C*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_T	0.0299	0.0056*	0.0056	0.2363**	0.0025	0.0386***
	(0.60)	(1.86)	(1.40)	(2.09)	(0.53)	(2.76)
*DIRV_T * CSR_C*	0.1010**	0.0187***	0.0224***	-0.0891	-0.0014	-0.0263*
	(2.36)	(5.74)	(4.53)	(-1.03)	(-0.33)	(-1.86)
INASSET	0.4199*	0.8919***	-0.1154***	-3.8385***	0.0979***	-0.2495***
	(1.92)	(62.61)	(-5.82)	(-6.88)	(5.14)	(-3.80)
DEBT	-0.1425***	-0.0167***	-0.0051***	0.1618***	-0.0042***	0.0136***
	(-10.77)	(-20.84)	(-5.18)	(3.98)	(-3.50)	(3.13)
AGE	-0.0815***	-0.0058***	-0.0069***	-0.3196***	-0.0015	-0.0481***
	(-5.23)	(-5.78)	(-6.05)	(9.32)	(-1.02)	(-9.65)
BOARD	-0.2341***	0.0143**	0.0238**	0.1019	0.0025	0.0089
	(-2.59)	(2.29)	(2.06)	(0.51)	(0.27)	(0.33)
INDR	0.0196	0.0005	0.0012	0.0626*	-0.0020*	0.002
	(1.59)	(0.60)	(1.17)	(1.88)	(-1.73)	(0.50)
MSHARE	0.3077***	0.0197***	0.0297***	0.4513	-0.0046	-0.0113
	(3.25)	(3.50)	(3.02)	(1.55)	(-0.47)	(-0.47)
DSHARE	0.0223	-0.0028**	-0.0023	-0.0183	-0.0051***	-0.0153***
	(0.15)	(-2.44)	(-1.42)	(-0.48)	(-3.07)	(-3.09)
INSTSHARE	0.1247***	0.0111***	0.0127***	0.014	0.0006	-0.0046
	(10.9)	(14.3)	(11.32)	(0.32)	(-0.50)	(-1.18)
Intercept	4.4827	1.6568***	2.8030***	84.0406***	-1.6806***	11.3850***
	(1.50)	(8.82)	(11.77)	(10.87)	(-6.37)	(12.07)
Adjusted R-square	0.1946	0.8811	0.1652	0.0952	0.0387	0.0972
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives usage (measured by the total amount of financial derivatives contracts, *DIRV_T*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 5 shows the regression result of the effect of financial derivatives usage (*DIRV_T*) on performance and risk and further considering the moderating effects of CSR performance (*CSR_CUMU*). In Panel A, it is found that coefficients on *DIRV_T* is all positive, and as performance is proxied by market value of common equity (*MKTVALE*), the coefficient reaches 10% significance level, which means that higher amount of financial derivatives contracts is correspond to greater market value. Interestingly, three coefficients on cross product term of (*DIRV_T*) and CSR performance are all positive. As performance variables are market value of equity and Tobin's Q, two positive coefficients both reach 1% significance level, indicating that firm's CSR performance positively moderates the effects of financial derivatives usage on firm's market value and market assessment of growth opportunity. The evidence again generally confirms the hypothesis 1a and 1b that firm participate in financial derivatives transaction to hedge risk and exploit potential profitable opportunity to obtain benefit on firm performance, and firm's performance on CSR helps to pay more attention to stakeholders' interests and sustainability and thus shape a more cautious and responsibility decision on financial derivatives transaction. The consequence of financial derivatives usage is thus better for firms with better CSR performance.

In panel B, coefficients on financial derivatives usage (*DIRV_T*) are significantly positive as firm's risk is proxied by weekly stock return volatility (*WEKRETVAT*) and 95% VaR stock returns (*VaR95*) (0.2349 and 0.0388, respectively), indicating that the higher amount of financial derivatives is correlated with larger stock return volatility and higher stock returns downside risk. Interestingly, coefficients on cross product terms of financial derivatives (*DIRV_T*) and CSR performance proxy (*CSR_CUMU*) are all negative, and coefficient reaches 5% significance level when risk is proxied by firm's 95% value at risk stock returns (*VaR95*), means that even if firm's financial derivatives amount increases firm's weekly returns volatility and stock returns downside risk, firm's better CSR

performance helps to mitigate the magnitude of risk increase. The result again confirms the hypothesis 2a and 2b such that while firm's financial derivatives usage increase firm's risk through high leverage with large potential loss during derivatives transaction, better performance on CSR limits firm's degree of risk-taking and puts more emphasis on risk control and management in investment decision, such that the magnitude of risk increase from financial derivatives is alleviated. While financial derivatives usage tends to increase firm's risk, the magnitude of risk increase can be mitigated through firm's engagement and commitment on stakeholder management. Finally, estimated results of control variables are similar to those in the Table 4, and the Joint F-test of estimated regression obtain very high statistical significance, indicating that regression equations specification is acceptable.

Table 5 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_T*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_CUMU*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_T	0.0321	0.0054*	0.0052	0.2349**	0.0027	0.0388***
	(0.65)	(1.81)	(1.31)	(2.07)	(0.58)	(2.77)
*DIRV_T * CSR_CUMU*	0.0126	0.0038***	0.0050***	-0.0124	-0.0008	-0.0053**
	(1.41)	(5.71)	(4.93)	(-0.77)	(-1.04)	(-1.96)
INASSET	0.4326*	0.8863***	-0.1250***	-3.8427***	0.1012***	-0.2417***
	(1.95)	(60.52)	(-6.00)	(-6.76)	(5.26)	(-3.62)
DEBT	-0.1432***	-0.0167***	-0.0051***	0.1623***	-0.0042***	0.0136***
	(-10.81)	(-20.77)	(-5.12)	(3.99)	(-3.55)	(3.13)
AGE	-0.0819***	-0.0060***	-0.0072***	-0.3190***	-0.0015	-0.0478***
	(-5.25)	(-5.97)	(-5.88)	(-9.29)	(-0.98)	(-9.58)
BOARD	-0.2319**	0.0124**	0.0208*	0.1019	0.0034	0.0115
	(-2.55)	(2.11)	(1.95)	(0.52)	(0.36)	(0.43)
INDR	0.0192	0.0002	0.0008	0.0632*	-0.0019	0.0024
	(1.56)	(0.25)	(0.78)	(1.89)	(-1.64)	(0.60)
MSHARE	0.3121***	0.0200**	0.0299***	0.4476	-0.0044	-0.0117
	(3.28)	(3.49)	(2.98)	(1.54)	(-0.44)	(-0.48)
DSHARE	0.0214	-0.0028**	-0.0021	-0.0177	-0.0052***	-0.0153***
	(1.40)	(-2.41)	(-1.37)	(-0.46)	(-3.12)	(-3.09)
INSTSHARE	0.1251***	0.0110***	0.0125***	0.0138	0.0006	-0.0045
	(10.93)	(14.33)	(11.39)	(0.31)	(0.55)	(-1.16)
Intercept	4.2989	1.7694***	2.9902***	84.0732***	-1.7417***	11.2276***
	(1.39)	(8.94)	(11.55)	(10.54)	(-6.38)	(11.61)
Adjusted R-square	0.9163	0.8814	0.1703	0.0952	0.039	0.0973
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2117	2079	2079	2078	2077	2079

Note: This table reports regression result of the effect of financial derivatives usage (measured by the total amount of financial derivatives contracts, *DIRV_T*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 6 and Table 7 report the regression result of the effect of financial derivatives amount (*DIRV_T*) on firm performance and risk and further considering the moderating effects of CSR performance, proxied by *CSR_CONT* and *CSR_OLP*. In Panel A of Table 6, coefficients on *DIRV_T* are significantly positive as firm performance is proxied by market value of common stock (*MKTVALE*) and firm's growth opportunities (*TQ*), indicating that greater amount of financial derivatives has positive effects on firm's market-based performance. Three coefficients on cross product terms of *DIRV_T* and *CSR_CONT* are all positive significant, means that firm's sustained and continuously perform well on CSR positively moderates the effects of financial derivatives on firm's market value and market assessment of firm's growth opportunity. The evidence again confirms the hypothesis 1a and 1b that greater degree of financial derivatives usage is correlated with better performance, and better CSR performance further increase the magnitude of benefit from financial derivatives transaction.

In Panel B of Table 6, similar as before, coefficients on *DIRV_T* are significantly positive in risk variable which is proxied by weekly stock return volatility (*WEKRETVAT*) and 95% VaR stock returns (*VaR95*), represents that greater financial derivatives amount is associated with greater stock market performance volatility and higher stock returns downside risk. Similarly, coefficients on the cross

product term of *DIRV_T* and CSR performance are significantly negative if firm risk is proxied by stock return volatility and 95% value at risk stock returns, means that even if firm's financial derivatives increases stock returns volatility and stock returns downside risk (marginal impacts of financial derivatives amount are 0.231 and 0.0371, respectively), firm's performance on CSR helps to mitigate the magnitude of risk increase (marginal impacts are changed to 0.231+(-0.2705)= -0.0395 and 0.0371+(-0.0872)=-0.0501, respectively). This again confirms the hypothesis 2a and 2b such that better CSR performance mitigates adverse effects of financial derivatives on firm risk.

The overall estimation result of Table 7 is similar with Table 6. Higher financial derivatives amount is associated with better performance (*MKTVALE* and *TQ*) and higher risk (*WEKRETVAT* and *VAR95*), and better CSR performance is associated with larger magnitude of performance increase and smaller magnitude of risk increase, confirming the Hypothesis 1a, 1b, 2a and 2b. Firm's engagement in CSR tends to emphasize on corporate sustainability so as to obtain better financial derivatives transaction consequences in terms of larger performance increase and lower risk increase. The estimation results of the controls and the goodness of fit of estimated regression in Table 6 and 7 is similar as before.

Table 6 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_T*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_CONT*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_T	0.0355	0.0067**	0.0070*	0.2310**	0.0024	0.0371***
	(0.72)	(2.27)	(1.76)	(2.06)	(0.51)	(2.66)
*DIRV_T * CSR_CONT*	0.4202***	0.0413***	0.0530***	-0.2705*	0.0032	-0.0872***
	(4.36)	(6.38)	(5.44)	(-1.77)	(0.40)	(-3.00)
INASSET	0.3705*	0.8941***	-0.1139***	-3.8257***	0.0958***	-0.2434***
	(1.74)	(63.42)	(-5.85)	(-6.95)	(5.15)	(-3.78)
DEBT	-0.1412***	-0.0167***	-0.0051***	0.1614***	-0.0041***	0.0135***
	(-10.79)	(-21.06)	(-5.26)	(3.98)	(-3.48)	(3.10)
AGE	-0.0750***	-0.0051***	-0.0060***	-0.3240***	-0.0015	-0.0495***
	(-4.81)	(-5.10)	(-4.99)	(-9.42)	(-1.00)	(-9.93)
BOARD	-0.2260**	0.0169***	0.0268**	0.0917	0.0021	0.0061
	(-2.47)	(2.72)	(2.35)	(0.46)	(0.22)	(0.23)
INDR	0.0171	0.0003	0.001	0.0639*	-0.0021*	0.0025
	(1.40)	(0.43)	(0.97)	(1.92)	(-1.77)	(0.62)
MSHARE	0.3179***	0.0216***	0.032***	0.4421	-0.0047	-0.014
	(3.33)	(3.76)	(3.22)	(1.51)	(-0.48)	(-0.58)
DSHARE	0.0246	-0.0028**	-0.0022	-0.0191	-0.0050***	-0.0156***
	(1.62)	(-2.47)	(-1.41)	(-0.50)	(-3.01)	(-3.17)
INSTSHARE	0.1230***	0.0111***	0.0126***	0.0147	0.0005	-0.0043
	(10.81)	(14.27)	(11.19)	(0.33)	(0.46)	(-1.12)
Intercept	4.9633*	1.5795***	2.7265***	84.0690***	-1.6460***	11.3596***
	(1.72)	(8.67)	(12.01)	(11.15)	(-6.45)	(12.43)
Adjusted R-square	8.2963	0.8817	0.1707	0.0955	0.0387	0.995
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives usage (measured by the total amount of financial derivatives contracts, *DIRV_T*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 7 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_T*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_OLP*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_T	0.0342	0.0066**	0.0068*	0.2322**	0.0024	0.0374***
	(0.69)	(2.23)	(1.71)	(2.07)	(0.51)	(2.68)
*DIRV_T * CSR_OLP*	0.3740***	0.0332***	0.0490***	-0.2879*	-0.0003	-0.0793***
	(3.77)	(5.10)	(4.27)	(-1.94)	(-0.03)	(-3.10)
INASSET	0.4106*	0.8989***	-0.1093***	-3.8403***	0.0969***	-0.2514***
	(1.93)	(64.26)	(-5.59)	(-7.01)	(5.13)	(-3.88)
DEBT	-0.1421***	-0.0168***	-0.0052***	0.1617***	-0.0042***	0.0136***
	(-10.85)	(-21.1)	(-5.37)	(3.99)	(-3.48)	(3.13)
AGE	-0.0780***	-0.0054***	-0.0064***	-0.3224***	-0.0016	-0.0489***
	(-5.01)	(-5.42)	(-5.26)	(-9.39)	(-1.03)	(-9.78)
BOARD	-0.2263**	0.0170***	0.0267**	0.0935	0.0022	0.0062
	(-2.48)	(-2.75)	(2.34)	(0.47)	(0.24)	(0.23)
INDR	0.0185	0.0005	0.0012	0.0633*	-0.0020*	0.0022
	(1.51)	(0.64)	(1.14)	(1.90)	(-1.74)	(0.55)
MSHARE	0.3112***	0.0210***	0.0311***	0.4473	-0.0047	-0.0125
	(3.32)	(3.78)	(3.22)	(1.53)	(-0.48)	(-0.53)
DSHARE	0.0255*	-0.0027**	-0.0021	-0.0206	-0.0051***	-0.0159***
	(1.68)	(-2.44)	(-1.31)	(-0.53)	(-3.05)	(-3.20)
INSTSHARE	0.1227***	0.0111***	0.0126***	0.0153	0.0005	-0.0043
	(10.74)	(14.3)	(11.27)	(0.35)	(0.48)	(-1.09)
Intercept	4.4602	1.5151***	2.6688***	84.2196***	-1.6617***	11.4601***
	(1.54)	(8.39)	(11.7)	(11.21)	(-6.47)	(12.46)
Adjusted R-square	0.1987	0.8807	0.1677	0.0955	0.0387	0.0988
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2117	2079	2079	2078	2077	2079

Note: This table reports regression result of the effect of financial derivatives usage (measured by the total amount of financial derivatives contracts, *DIRV_T*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Tables 8 reports the regression result of the effect of financial derivatives dummy (*DIRV_TD*) on firm performance and risk and further considering the moderating effects of CSR, where CSR is proxied by current performance on CSR (*CSR_C*). The result generally shows that the financial derivatives dummy is uncorrelated with all firm's performance and risk proxies, but the coefficients on cross product term of *DIRV_TD* and *CSR_C* are significantly positive for all performance proxies and the coefficient on cross product term of *DIRV_TD* and *CSR_C* is significantly negative as firm risk is proxied by VaR95% stock returns. While the effects of financial derivatives dummy on performance and risk is not statistically significant, even though the coefficients on cross-product term are significant, the estimation result fail to support Hypothesis 1a, 1b, 2a and 2b.

Tables 9 and Table 10 reports the regression result of the effect of financial derivatives usage (*DIRV_TD*) on firm performance and risk and further considering the moderating effects of CSR, where CSR is proxied by consistent performance on CSR (*CSR_CONT*) and overlap effect of CSR (*CSR_OLP*). The result generally shows that firm with financial derivatives tends to have significantly larger market value, and firm's consistently excellent performance on CSR and simultaneously obtain both CSR Award from two magazines improve the positive effect of financial derivatives usage on firm performance. Hypothesis 1a and 1b are supported.

Table 8 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_TD*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_C*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_TD	0.7732	0.0721	0.0664	0.0502	0.0439	0.1087
	(1.01)	(1.61)	(1.12)	(0.03)	(0.60)	(0.52)
*DIRV_TD * CSR_C*	1.5630**	0.2946***	0.3554***	-1.5832	-0.0247	-0.3997*
	(2.47)	(5.83)	(4.62)	(-1.19)	(-0.37)	(-1.80)
INASSET	0.4415**	0.8972***	-0.1099***	-3.5936***	0.0996***	-0.2149***
	(2.12)	(65.89)	(-5.99)	(-6.63)	(5.39)	(-3.36)
DEBT	-0.1429***	-0.0167***	-0.0051***	0.1638***	-0.0042***	0.0140***
	(-10.77)	(-20.84)	(-5.19)	(4.04)	(-3.51)	(3.20)
AGE	-0.0813***	-0.0058***	-0.0069***	-0.3228***	-0.0016	-0.0486***
	(-5.21)	(-5.78)	(-5.65)	(-9.36)	(-1.03)	(-9.71)
BOARD	-0.2371***	0.0138**	0.0232**	0.1099	0.0024	0.0095
	(-2.62)	(2.21)	(2.00)	(0.55)	(0.27)	(0.35)
INDR	0.0195	0.0005	0.0013	0.0658**	-0.0020*	0.0024
	(1.58)	(0.64)	(1.19)	(1.99)	(-1.73)	(0.61)
MSHARE	0.3066***	0.0197***	0.0297***	0.4675	-0.0046	-0.0094
	(3.25)	(3.53)	(3.04)	(1.61)	(-0.47)	(-0.39)
DSHARE	0.0224	-0.0027**	-0.0022	-0.0187	-0.0051***	-0.0153***
	(1.47)	(-2.40)	(-1.39)	(-0.49)	(-3.08)	(-3.09)
INSTSHARE	0.1247***	0.0111***	0.0126***	0.0122	0.0006	-0.0049
	(10.9)	(14.28)	(11.31)	(0.28)	(0.50)	(-1.25)
Intercept	3.8347	1.5803***	2.7280***	83.0493***	-1.7144***	11.2212***
	(1.27)	(8.55)	(12.09)	(10.72)	(-6.53)	(11.75)
Adjusted R-square	0.195	0.8812	0.1657	0.939	0.0388	0.0942
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives usage (*DIRV_TD*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 9 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_TD*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_CONT*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_TD	0.826	0.0842*	0.0808	-0.0096	0.04243	0.0944
	(1.08)	(1.89)	(1.37)	(-0.01)	(0.58)	(0.45)
*DIRV_TD * CSR_CONT*	6.2383***	0.6756***	0.8698***	-4.9860**	0.04486	-1.4700***
	(4.17)	(6.50)	(5.43)	(-1.97)	(0.36)	(-3.04)
INASSET	0.4096**	0.9000***	-0.1074***	-3.5847***	0.09750***	-0.2088***
	(2.03)	(67.24)	(-6.01)	(-6.70)	(5.43)	(-3.34)
DEBT	-0.1424***	-0.0168***	-0.0052***	0.1638***	-0.00414***	0.0139***
	(-10.87)	(-21.21)	(-5.38)	(4.05)	(-3.49)	(3.20)
AGE	-0.0749***	-0.0051***	-0.0060***	-0.3281***	-0.00152	-0.0501***
	(-4.79)	(-5.07)	(-4.96)	(-9.47)	(-1.00)	(-10.0)
BOARD	-0.2314**	0.0163**	0.0260**	0.1007	0.00196	0.0078
	(-2.52)	(2.60)	(2.26)	(0.50)	(0.21)	(0.29)
INDR	0.0175	0.0004	0.0011	0.0671**	-0.00206*	0.0029
	(1.43)	(0.50)	(1.04)	(2.03)	(-1.77)	(0.72)
MSHARE	0.3176***	0.0217***	0.0322***	0.4563	-0.00474	-0.0123
	(3.34)	(3.81)	(3.25)	(1.57)	(-0.48)	(-0.51)
DSHARE	0.0248	-0.0027**	-0.0021	-0.02	-0.00503***	-0.0158***
	(1.64)	(-2.41)	(-1.35)	(-0.52)	(-3.01)	(-3.22)
INSTSHARE	0.1228***	0.0110***	0.0125***	0.0134	0.00051	-0.0045
	(10.77)	(14.16)	(11.12)	(0.30)	(0.46)	(-1.15)
Intercept	4.112	1.4988***	2.6445***	83.1209***	-1.6801***	11.1818***
	(1.42)	(8.39)	(12.42)	(10.97)	(-6.60)	(12.08)
Adjusted R-square	0.2000	0.8818	0.1716	0.0942	0.0388	0.0970
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives usage (*DIRV_TD*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 10 Regression Result of the Effect of Financial Derivatives Usage (*DIRV_TD*) on Firm Performance and Risk－Moderating Effects of CSR (*CSR_OLP*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_TD	0.8214	0.0840*	0.0801	-0.001	0.0428	0.0957
	(1.08)	(1.88)	(1.36)	(-0.01)	(0.58)	(0.46)
*DIRV_TD * CSR_OLP*	5.8122***	0.5621***	0.8347***	-5.5773**	-0.0399	-1.3975***
	(3.91)	(5.48)	(4.49)	(-2.32)	(-0.25)	(-3.34)
INASSET	0.4444**	0.9047***	-0.1028***	-3.6007***	0.0988***	-0.2168***
	(2.20)	(68.08)	(-5.73)	(-6.77)	(5.41)	(-3.45)
DEBT	-0.1431***	-0.0169***	-0.0053***	0.1641***	-0.0042***	0.0140***
	(-10.91)	(-21.19)	(-5.46)	(4.06)	(-3.49)	(3.22)
AGE	-0.0774***	-0.0054***	-0.0063***	-0.3266***	-0.0016	-0.0495***
	(-4.96)	(-5.38)	(-5.21)	(-9.44)	(-1.05)	(-9.86)
BOARD	-0.2334**	0.0163***	0.0257**	0.1054	0.0022	0.0083
	(-2.56)	(2.61)	(2.24)	(0.52)	(0.24)	(0.31)
INDR	0.0188	0.0006	0.0013	0.0664**	-0.0020*	0.0026
	(1.53)	(0.70)	(1.20)	(2.01)	(-1.73)	(0.64)
MSHARE	0.3100***	0.0210***	0.0311***	0.4636	-0.0047	-0.0104
	(3.33)	(3.82)	(3.26)	(1.60)	(-0.48)	(-0.44)
DSHARE	0.0261*	-0.0026**	-0.0019	-0.0223	-0.0051***	-0.0162***
	(1.72)	(-2.34)	(-1.21)	(-0.58)	(-3.07)	(-3.26)
INSTSHARE	0.1222***	0.0110***	0.0124***	0.0145	0.0006	-0.0043
	(10.68)	(14.17)	(11.16)	(0.33)	(0.50)	(-1.10)
Intercept	3.6753	1.4359***	2.5873***	83.2800***	-1.7007***	11.2814***
	(1.27)	(8.11)	(12.1)	(11.04)	(-6.63)	(12.11)
Adjusted R-square	0.1988	0.8808	0.1694	0.0943	0.0388	0.0965
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives usage (*DIRV_TD*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Tables 11 reports the regression result of the effect of ratio of financial derivatives amount to sales (*DIRV_TSR*) on firm performance and risk and considering the moderating effects of CSR (*CSR_C*). In panel A, coefficient on *DIRV_TSR* is significantly negative as performance is proxied by *ROA*, means that higher ratio of financial derivatives amount to sales is corresponded to lower returns on asset (*ROA*). Similar with the explanation in Table 3, firm with larger ratio of financial derivatives to sales tends to have smaller assets, and firm with smaller assets tends to have lower returns on assets. That's why firm with larger ratio of financial derivatives amount to sales tends to have lower *ROA*. Coefficients on *DIRV_TSR*CSR_C* is significantly positive, represents that firm with better CSR performance helps to increase the marginal benefit from financial derivatives usage in terms of higher returns on assets. Hypothesis 1a and 1b are supported.

In Panel B, coefficients on *DIRV_TSR* are significantly negative as firm risk is proxied by *WEKRETVAT* and *VAR95*, means that larger ratio of financial derivatives amount to sales is corresponded to higher stock returns volatility and stock returns downside risk. However, coefficients on *DIRV_TSR*CSR_C* are not reaching statistically significance, firm's CSR performance has no moderating effect on the relationship between financial derivatives usage and firm risk. Hypothesis 2a is supported but hypothesis 2b is not. Estimation result in Table 12 is similar.[3]

[3] In the follow-up content without reporting, this study employs other financial derivatives usage measure (*DIRV_TAR*) to execute regression estimation as the above. Most of the evidence shows that although the coefficients on cross-product term are significant, the main effect of financial derivatives usage on firm performance and risk is not significant. Therefore, hypothesis 1a, 1b, 2a and 2b are not supported by the evidence.

Table 11 Regression Result of the Effect of Financial Derivatives Amount to Sales (*DIRV_TSR*) on Firm Performance and Risk—Moderating Effects of CSR (*CSR_C*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_TSR	-2.1E-05***	-1.19E-07	3.65E-07	0.0002***	1.59E-08	1.45E-05***
	(-4.05)	(-0.14)	(0.34)	(2.68)	(0.02)	(4.13)
*DIRV_TSR * CSR_C*	0.0074***	0.0006**	0.0008**	-0.0102	-0.0002*	-0.0017
	(3.29)	(2.25)	(1.97)	(-1.35)	(-1.91)	(-1.49)
INASSET	0.5220**	0.9146***	-0.0887***	-3.5078***	0.0991***	-0.2182***
	(2.56)	(69.78)	(-5.09)	(-6.80)	(5.52)	(-3.51)
DEBT	-0.1442***	-0.0169***	-0.0054***	0.1676***	-0.0041***	0.0146***
	(-10.92)	(-21.01)	(-5.50)	(4.19)	(-3.48)	(3.36)
AGE	-0.0820***	-0.0058***	-0.0070***	-0.3209***	-0.0016	-0.0485***
	(-5.25)	(-5.78)	(-5.67)	(-9.36)	(-1.04)	(-9.69)
BOARD	-0.2101**	0.0183***	0.0284**	0.0569	0.0022	0.0012
	(-2.29)	(2.94)	(2.49)	(0.29)	(0.24)	(0.05)
INDR	0.0201	0.0007	0.0015	0.0696**	-0.0020*	0.0027
	(1.61)	(0.92)	(1.43)	(2.11)	(-1.71)	(0.68)
MSHARE	0.3132***	0.0218***	0.0322***	0.4905*	-0.0045	-0.0081
	(3.31)	(3.86)	(3.27)	(1.70)	(-0.46)	(-0.34)
DSHARE	0.0204	-0.0032***	-0.0027*	-0.0154	-0.0051***	-0.0147***
	(1.35)	(-2.82)	(-1.72)	(-0.41)	(-3.06)	(-2.97)
INSTSHARE	0.1243***	0.0112***	0.0128***	0.0152	0.0005	-0.0048
	(10.9)	(14.35)	(11.42)	(0.35)	(0.49)	(-1.23)
Intercept	3.2704	1.3580***	2.4383***	81.3863***	1.6681***	11.3460***
	(1.12)	(7.67)	(11.03)	(11.37)	(-6.57)	(12.63)
Adjusted R-square	0.1949	0.8789	0.1535	0.102	0.0386	0.0994
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives amount to sales (*DIRV_TSR*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients (based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

Table 12 Regression Result of the Effect of Financial Derivatives Amount to Sales (*DIRV_TSR*) on Firm Performance and Risk -Moderating Effects of CSR (*CSR_CONT*)

Predictor	Panel A. Performance proxies			Panel B. Risk proxies		
	ROA	*MKTVALE*	*TQ*	*WEKRETVAT*	*SKEW*	*VAR95*
DIRV_TSR	-2.3E-05***	-2.13E-07	2.40E-07	0.0002***	-9.59E-10	1.45E-05***
	(-4.33)	(-0.26)	(0.23)	(2.68)	(-0.01)	(4.14)
*DIRV_TSR*CSR_CONT*	0.2245***	0.0151***	0.0201***	0.014	0.0024	-0.0099
	(9.04)	(6.15)	(6.33)	(0.27)	(1.12)	(-1.11)
INASSET	0.3533*	0.9028***	-0.1043***	-3.5075***	0.0975***	-0.2093***
	(1.78)	(68.3)	(-6.01)	(-6.70)	(5.35)	(-3.32)
DEBT	-0.1401***	-0.0167***	-0.0051***	0.1681***	-0.0041***	0.0145***
	(-10.73)	(-20.84)	(-5.19)	(4.18)	(-3.43)	(3.31)
AGE	-0.0804***	-0.0057***	-0.0068***	-0.3217***	-0.0016	-0.0486***
	(-5.18)	(-5.70)	(-5.57)	(-9.38)	(-1.04)	(-9.73)
BOARD	-0.1795**	0.0204***	0.0312***	0.0565	0.0025	-0.0004
	(-1.98)	(3.28)	(2.74)	(0.28)	(0.27)	(-0.02)
INDR	0.0142	0.0004	0.001	0.0681**	-0.0021*	0.0028
	(1.15)	(0.44)	(0.95)	(2.06)	(-1.78)	(0.71)
MSHARE	0.3098***	0.0216***	0.0320***	0.4872*	-0.0046	-0.0084
	(3.27)	(3.82)	(3.24)	(1.69)	(-0.47)	(-0.35)
DSHARE	0.0222	-0.0031***	-0.0026	-0.0138	-0.0050***	-0.0145***
	(1.46)	(-2.73)	(-1.64)	(-0.36)	(-3.03)	(2.95)
INSTSHARE	0.1241***	0.0112***	0.0128***	0.0134	0.0005	-0.005
	(10.87)	(14.35)	(11.41)	(0.31)	(0.45)	(-1.29)
Intercept	5.5791	1.5185***	2.6508***	81.4276***	-1.6459***	11.2288***
	(1.95)	(8.49)	(12.04)	(11.22)	(-6.38)	(12.33)
Adjusted R-square	0.2061	0.8807	0.1661	0.1018	0.0387	0.0991
F-stat. on overall .sig. (*p*-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Num. of obs.	2,117	2,079	2,079	2,078	2,077	2,079

Note: This table reports regression result of the effect of financial derivatives amount to sales (*DIRV_TSR*) on firm performance (Panel A) and risk (Panel B). Data is ranged from 2010 to 2015. The parentheses are *t*-values of coefficients

(based on White's consistent robust standard errors), and *, **, and *** mark that coefficient reaches at least 10%, 5%, and 1% significance level, respectively.

4.3 Additional Tests

The construction of CSR measurement so far are based on annual firm name list of well-perform on CSR by the *Common Wealth* and the *Global Views Monthly*. In addition, this study refers to the concept of the Shanghai Stock Exchange's development of the Shanghai Stock Exchange Social Responsibility Index to calculate social contribution value (*SCV*), social return on assets (*SROA*) and social contribution value per share (*SCVPS*) for all firm-year samples. While the correlation between four CSR measurement constructed from the *Global Views Monthly* and the *Common Wealth* and *SCV*, *SROA* and *SCVPS* from SSE Social Responsibility Index are significantly positive, two sets of CSR measurement are consistent. Based on these new developed CSR variables as proxies for CSR performance, this study re-estimates the relationship between firm's financial derivatives usage and firm performance and risk, and examines whether CSR performance has moderating effects on the above relationship.

The regression estimation result shows that some parts of coefficients on financial derivatives are positive and some are negative as explained variable is firm performance. As the measurement of financial derivatives usage is *DIRV_T* and *DIRV_TD*, financial derivatives positively affects firm performance, as the measurement of financial derivatives usage is *DIRV_TSR* and *DIRV_TAR*, financial derivatives negatively affects firm performance. The explanation is similar as before, firm with greater degree of *DIRV_TSR* and *DIRV_TAR* tends to be small firm with worse performance. In addition, estimated coefficients on cross product term of financial derivatives usage and CSR performance are almost all positive and most of them reach at least 10% significance level when explained variable is firm performance, indicating firm with greater social contribution value, social returns on assets and social contribution per share tends to have greater performance improvements in financial derivatives transaction. Empirical result generally supports hypothesis 1a and 1b.

Regression result shows that impact coefficients of financial derivatives usage on firm risk are positive, means that financial derivatives increases firm's risk. Similar as before, part of coefficients on cross product term of financial derivatives usage and CSR performance are significantly negative, indicating firms with greater social contribution value, social returns on assets and social contribution value per share tends to have smaller risk increase from financial derivatives transaction. Empirical result generally supports hypothesis 2a and 2b.

The original definition of financial derivatives contracts amount is sum of offset and un-offset amount of financial derivatives. This research considers separately the financial derivatives amount that has been offset versus financial derivatives amount without offset and then re-estimates the regression. Most of the empirical evidence is similar with previous result. Greater degree of financial derivatives usage is associated with better firm performance but higher risk, but firm's CSR performance strengthens firm's performance improvement and weakens firm's risk increase by financial derivatives transaction. Empirical evidence generally supports the hypothesis 1a, 1b, 2a and 2b.

5. Conclusion and Suggestion

This study employs the data of 803 listed non-financial firms on the Taiwan Stock Exchange (TWSE) in 2010-2015 to test whether firm's use of financial derivatives affects firm performance and risk and further considers whether firm's CSR performance helps to obtain additional benefits of financial derivatives operation. The main reason of CSR's positive moderating effect is that firm's engagement

in CSR limits managerial opportunistic behaviors and puts more emphasis on stakeholders' interests to form a more cautious investment decision such that the financial derivatives operation has better consequence in terms of larger performance improvement and smaller risk increase. The CSR performance measurement are constructed based on the annual firm name-lists of "CSR awards" and "Best Corporate Citizens" from Taiwanese well-known business magazines, the *Global Views Monthly* and the *Common Wealth*. At the same time, this research refers to the construction of SSE Social Responsibility Index to compute social contribution value, social returns on assets and social contribution value per share.

Through multiple regression estimation, it is found that higher degree of firm's financial derivatives usage corresponds to better performance but also corresponds to greater risk. Interestingly, firm with better CSR performance obtains even larger magnitude of performance increase and smaller magnitude of risk increase. The implication of empirical evidence is that while a firm's financial derivatives usage may increase firm risk, but if firm's CSR performance is strengthened, the financial consequences of financial derivatives transaction would be more favorable.

The implication of the evidence is that securities authorities should continue to promote public offering companies to undertake social responsibility actions, increase incentives to encourage companies to assume social responsibility, and increase their visibility and reputation in the financial market by their effort to promote sustainability. Investors should also carefully choose companies with good social responsibility performance to invest. CSR helps to protect investors' wealth and reduce investors' risk.

Regarding the research limitation, first of all, the types of financial derivative products that a typical company operate in fact include futures (indices or contracts of various commodities), index (single stock) options, combination of options, forward contracts, exchanges and other commodities. So far, this research does not collect the data according to various types of financial derivative products in detail, but uses the concept of an annual total transaction amount to quantify the degree to which a company operates. The degree of the influence of different types of financial derivative products on company performance and risk is highly distinguished. Operating futures versus options (long or short) have very significant differences in the profit and risk profile. Therefore, future research could employ more detailed information to further analyze different types of financial derivatives, and examine how different types of financial derivatives operation affect the company's performance and risk. Second, the impacts of for trading purpose and not for trading purpose in financial derivatives operation is different and could be separated investigated.

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