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The Effect of Corporate Internal Determinants on Stock Price Crash Risk

The Effect of Corporate Internal Determinants on Stock Price Crash Risk in Listed Egyptian Companies

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Abstract:

The main aim of this paper is to investigate the effect of corporate internal determinants including corporate social responsibility (CSR) and corporate governance (CG) on stock price crash risk (SPCR). Further, it considers the moderating effect of corporate governance on the relationship between corporate social responsibility and stock price crash risk in Egypt. This research covers seven years period spanning from 2015 to 2021, including a sample of 62 Egyptian listed firms. The ordinary Least Square (OLS) regression analysis is employed to test the research hypotheses. The results of this research reveal that there is a significant curvilinear relationship between stock price crash risk and corporate social responsibility disclosure level, which means the existence of an optimal level of the Environmental and Social (ES) disclosure to minimize stock price crash risk. Further, the results indicate that there is a positive significant direct effect of corporate governance on stock price crash risk. The interaction between corporate social responsibility and corporate governance was found to have a positive effect on stock price crash risk.

Keywords: Stock Price Crash Risk, Corporate Social Responsibility, Corporate Governance, and Egyptian stock Exchange.

1. Introduction:

The main aim of this paper is to investigate the effect of corporate internal determinants including corporate social responsibility (CSR) and corporate governance (CG) on stock price crash risk (SPCR). There is growing consent among governments and businesses around the world that companies should conduct their operations in an environmentally and socially responsible manner. Therefore, companies nowadays are shifting toward meeting the increasing demands for corporate social responsibility (CSR) practices. Globally, companies are adopting the idea of being socially responsible organizations and incorporate strategies and practices of CSR into their daily operations to increase their resource efficiency, lower costs, and improve their reputation. In addition, companies become more aware of the impact of corporate social responsibility practices and communication (Adel *et al.*, 2019).

Corporate social responsibility activities reduce the information asymmetry thus, enhancing the relationship between the company and its stakeholders. Corporate social responsibility has emerged as a powerful strategy that inspires the success of numerous companies both locally and internationally (Said *et al.*, 2017). For Egyptian companies, environmental awareness is a relatively recent concern. For the first time in 1997, Egypt had a full-time minister of state for environmental affairs who was in charge of implementing environmental national and international standards, policies, and projects. Despite this, many companies are still not taking environmental issues seriously. This recent awareness is anticipated to lead to sustainable growth and improve the ability of the Egyptian Environmental Affairs Agency to keep track on how business companies are performing when it comes to environmental issues (Aboud and Yang, 2022).

It is important to successfully respond to and manage stakeholder relationships effectively, because their investment decisions strongly affect companies' performance and the whole market. Hence, corporate governance mechanisms play an important role in managing this critical relationship since it focuses on defending stakeholders' rights. The success of CG can be assessed through examining the corporate disclosure and transparency decisions, the relationship with stakeholders, the attributes of the board of directors, the policies and regulations, and the structure of ownership and control (Shahwan, 2015; Majumder, Akter and Li, 2017). Information

asymmetry might also be reduced by strong corporate governance (CG) mechanisms and in turn this will have a significant effect on the overall level of risk that the company may face.

The current research studies one of the unfavorable phenomena that occurs in the market due to agency problems that arise from the separation of control and ownership, that is stock price crash risk (SPCR). According to the literature crash risk is defined as negative skewness in the distribution of returns for the company's specific stocks (Kim *et al.*, 2014). SPCR is conceptually based on the argument that managers have a tendency for an extended time to withhold bad news, resulting in accumulating bad news and when the accumulation of bad news reaches a critical point, it is revealed to the market at once, leading to a significant negative decrease in the stock price (Kothari *et al.*, 2009). SPCR may have significant negative effects on financial stability worldwide (Dyck *et al.*, 2019). Generally, financial instability has wiped away billions of investor wealth, and during crashes, many companies have experienced bankruptcy (Edwards, 1988).

Hence, a growing stream of financial and accounting literature seeks to relate company characteristics to the likelihood of price crashes. Corporate social responsibility and corporate governance can play a vital role in the market as they are effective tools in enhancing information transparency and controlling bad news hoarding. Since SPCR is considered to be unfavorable phenomena, studying factors that may affect its occurrence is important in order to find effective ways to mitigate it. Unlike developed countries, both consumer and financial markets and business dynamics are relatively immature in developing countries. The lack of credibility in the regulatory system, the existence of corruption and the lack of a general enabling environment in developing countries give CSR practices a different direction, although it has great importance (El-Bassiouny and El-Bassiouny, 2019).

The prior literature indicated that there is no general agreement concerning the relationship between CSR and SPCR. Several studies confirmed that there is negative relationship between CSR and SPCR , implying that when CSR disclosure increase, SPCR will decrease as a result of information asymmetry (Kim *et al.*, 2014; Zhang *et al.*, 2016; Wu & Hu, 2019; Huang & Liu, 2021 and Feng *et al.*, 2021). Other studies implies positive relationship between CSR and SPCR, suggesting that managers engage in CSR activities to hoard bad news for their personal interest and incentives and to protect company's image in the market (Wang *et al.*, 2021).

In contrast, other studies found no significant relationship between CSR and SPCR (Zhou *et al.*, 2021 and Dumitrescu & Zakriya, 2021).

CG mechanisms are divided into internal mechanisms and external mechanisms. Internal CG mechanisms include the board of directors, specialized committees and ownership structure. External CG mechanisms are factors that are beyond the company's ability to control. External CG mechanisms include outside monitoring of shareholders, legal protection of shareholders, external auditors, and regulators. The current research will focus on the internal corporate governance mechanisms as they are considered to be one of the most effective tools that can control manager's behavior and reduce information asymmetry that might have an effect on SPCR. Furthermore, there are contradictory results in the literature concerning the relationship between corporate governance (CG) and stock price crash risk (SPCR).

Some previous studies revealed that CG attributes directly affect SPCR, which means that CG increase likelihood of SPCR (Andreou *et al.*, 2016; Al Mamun *et al.*, 2020 and Wu *et al.*, 2020). Another stream of literature found that CG negatively affect SPCR, which means that when the company has effective CG structure, bad news hoarding decreased and in turn SPCR is reduced (Jeon, 2019; Qayyum *et al.*, 2020; Jebran *et al.*, 2020 and Krishnamurti *et al.*, 2021). Moreover, on the relationship between corporate social responsibility, corporate governance and stock price crash risk, there are limited studies that investigated the relationship among those variables. Furthermore, those studies were conducted in developed countries. Thus, the current research will replicate this investigation in emerging market (Egypt).

According to previous literature, the current research predict that there is significant relation between CSR and SPCR (Kim *et al.* 2014, Lee 2016 and Hunjra *et al.* 2020) as well as between CG and SPCR as these relations are not examined in Egypt. Hence, previous studies suggest studying these relations in order to determine whether CSR practices help reduce SPCR and whether CG matters in emerging markets.

2. Research Contribution

The current research contributes to the previous literature from different ways; this research might contribute to the understanding of the effect of two important internal corporate determinants that are corporate social responsibility and corporate governance on stock price crash risk by conducting the research in Egyptian context as one of the most important emerging markets. Additionally, it is important to particularly examine the effect of CSR and CG on SPCR in Egyptian stock market as ES, CG and SPCR may have a more significant correlation in emerging stock markets where regulations and market transparency are considered to be weak. Further, this research provides managers with great evidence regarding the effect of CSR disclosure level and CG on SPCR. It reveals the importance of establishing CG structure that can eliminate likelihood of crash risk and continuous improvement of CSR practices in order to be more responsible reduce principal-agent problem.

Finally, the results of the current research indicate that Egyptian market has weak regulation enforcement and low awareness for CSR and CG as forces to promote and develop investments. The empirical results of the research show that CSR and CG may be practiced serving the short-term interest of corporate managers not for the purpose of maintaining long-term growth and stability. Overall, the results highlight the importance of internal CG mechanisms and CSR practices of companies operating in Egypt. On practical grounds, this urges the need for a revised CG Code that aims at strengthening the role of decision makers inside the company to control managers' behavior and incorporating the necessity for having corporate performance measures that goes beyond profit-oriented ones to include CSR practices.

3. Literature Review and Hypotheses Development

Managers, on average, have more information than investors and other stakeholders about their companies' current and future operational success and financial health. As a result, agency costs and signaling motives influence their decision on whether to keep or share this information (opacity versus clarity) (Dumitrescu & Zakriya, 2021). Prior literature introduces different views on the implications of CSR activities on information transparency and opportunistic behavior of managers in concealing bad news which leads to

conflicting predictions about the relation between CSR activities and future SPCR in different countries (Wang *et al.*, 2021).

According to previous literature, agency problem and information asymmetry are considered to be the main reasons behind SPCR. CSR can be considered as an effective tool to mitigate the likelihood of crash risk, but managers can use CSR as a tool to hide bad news and to gain personal benefits and thus, CSR is going to be a concealing tool rather than transparency tool. The management balance theory claims that CSR serves the interests of management rather than shareholders. According to this view, businesses are unable to fully meet the interests of all stakeholders, hence the interests of each group must be evaluated (Hao *et al.*, 2018).

According to this theory when managers engage more in CSR in order to achieve personal goals, the likelihood of SPCR will increase. Hemingway and Maclagan (2004) found that managers adopt CSR practices in order to achieve personal goals and to hide unethical behavior and this means that CSR increase information asymmetry and in turn will result in SPCR. Moreover, Petrovits, (2006) stated that managers use CSR as a tool to hide real information about company's financial performance. Theoretically, when CSR practices are used as a self-interest tool by managers this will increase information asymmetry in the market which in turn will increase the likelihood of SPCR. Hence, these studies found and support the a positive relation between the two variables (Hemingway & Maclagan, 2004; Wang *et al.*, 2021).

However, there are many studies that found a negative association between CSR and SPCR (Wu & Hu, 2019; Feng *et al.*, 2021; Zhou *et al.*, 2021). Theoretically social trust can be gained through disclosing clear financial and non-financial information as CSR reports. This disclosure can reduce information asymmetry in the market and reduce likelihood of SPCR. Hence, it will result in a more stable market. CSR can reduce investor's risk and lower corporate financing costs through eliminating information asymmetry. Since stock price crash risk is caused by the existence of information asymmetry between managers and investors, thus the probability of SPCR will be reduced.

A study that was conducted in China by Kim *et al.* (2014) from 1995 to 2009 added that when managers are functioning in a strong CSR-oriented company, they will be less motivated to hide bad news and thus likelihood of SPCR is mitigated. Further, Cao, Xia and Chan (2016) found that social trust can eliminate SPCR in China stock market. Using listed firms in China during the period from 2009–2020, Feng *et al.* (2021) found a significant negative relationship between CSR and SPCR for Chinese firms which is consistent with stakeholder theory that suggests higher Environmental, Social and Governance (ESG) ratings reflect more transparent information environments, leading to less hoarding of bad news and, similarly, less stock price crash risk.

Based on previous studies it is believed that CSR practices can improve the Egyptian market through mitigating the likelihood of SPCR and this can be achieved by reducing information asymmetry between managers and investors. Bai, Qin & Zhang (2021) suggests that factors like information transparency and market integration may shape significant swings in emerging market stock prices. Thereby it is important to conduct more research in order to improve information environment in emerging markets like Egypt. The companies can send signals to investors through disclosing clear CSR reports and this in turn will increase transparency and trust and also can help investors take their decisions rationally and protect company from any aggressive reaction from the market that can result in SPCR. Thus, CSR disclosure level will have a significant effect on the probability of SPCR whether it is positive or negative effect. Therefore, the first hypothesis states that:

Hypothesis 1 (H1). There is a Significant Relationship between Corporate Social Responsibility Information Disclosure Level and Stock Price Crash Risk.

According to previous literature and the agency theory of Jin & Myers (2006) crash risk can result from unethical behavior of managers for the sake of greater incentives and bonuses but in the presence of effective control and monitoring inside the company the motives to hold back bad news can be eliminated, thus the presence of effective corporate governance mechanisms can help improving the information environment and protect company from any unfavorable events, and in turn crash risk will be reduced. Mainly corporate governance mechanisms are classified into internal

mechanisms which is represented in board of directors, ownership structure, CEO and their duality role, and external mechanisms which is reflected in overall laws and regulations, institutional investors and auditors' oversight. Each dimension has its own effect on stock price crash risk because some of them can contribute to SPCR and the others can mitigate its occurrence. Many studies focused on board of directors and CEO characteristics and gender to provide new ways to improve corporate governance system inside the company in order to have a more stable and successful environment.

Kothari *et al.* (2009) mentioned that managers have the motive to hold bad news to achieve personal goals, hence, managerial ownership might contribute to SPCR because managers act for their own interest, and they will hoard any bad news. However, the existence of independent directors on the board can act as a protection tool in order to protect investors right in the company as they will be motivated to disclose the important information whether it is bad or good and thus will negatively affect crash risk.

Academic study has recently confirmed that an effective corporate governance can solve agency problem and enhance company's operations (Sami *et al.*, 2011). Callen & Fang (2013) mentioned that the ability of CG to solve agency problems is a critical aspect in lowering the risk of SPCR. All stakeholders' rights (e.g., shareholders, managers, and creditors) are affected by CG. When there is a conflict of interest between principals and agents, such rights are usually neglected, resulting in agency problem (Sami *et al.*, 2011). Manager's ignorance of stakeholders' interests is more severe in countries with poor CG mechanisms than in countries with strong CG mechanisms. As a result, stock prices fall in nations with ineffective CG mechanisms (Johnson *et al.*, 2000).

Qayyum *et al.* (2020) examined the role of board gender diversity in influencing SPCR at the firm-level in twelve (12) Asia-Pacific Markets. Their research found a significant negative relation between board gender diversity and stock price crash risk. Hu *et al.* (2022) examined the effect of insider ownership on firms' SPCR. A large-scale international sample consisting of observations from 40 countries from the 1988 to 2018 period was used. The results reflect an inverted U-shaped relationship between insider ownership and SPCR. This means that insider ownerships in a company have strong incentives to hoard bad news, and this in turn will enhance the occurrence of SPCR. Zhang *et al.* (2023) mentioned that giving managers complete operational rights has the potential to be beneficial since, company managers

are frequently better at corporate governance than government. Giving authority to managers is likely to result in "insider control" spinning out of control due to a lack of efficient supervision and restricting mechanisms, thus the agency cost will take place.

Furthermore, companies that experienced fraud but have strong CG their stock price performance is restored quickly. This reflect how effective CG mechanisms will help companies restore its financial position in the market even it has experienced great loss (Farber, 2005). Generally, the companies that suffer from information asymmetry problem and high information opacity need to have a strong corporate governance system to close the information gap between managers and investors and thus SPCR will be decreased. The current research will focus on internal corporate governance dimensions and their effects on SPCR. Finally, it is believed that corporate governance will have a significant effect on stock price crash risk. Therefore, the second hypothesis states that:

Hypothesis 2 (H2). There is a Significant Relationship between Corporate Governance and Stock Price Crash Risk.

Generally, CSR, CG and SPCR are related in such a way that makes each concept affect the other. According to previous literature, CSR and CG are regarded as two important practices nowadays as they can improve the information environment in the market. However, they are considered to be double-edged weapons, they can be opportunistically used by companies and managers to achieve personal goals and to hoard bad news and thus will increase information asymmetry. Since there is huge literature on how CG affects the likelihood of SPCR and most of them found significant effect of CG on SPCR. Also, there are many studies that investigate how CSR practices are affected by CG mechanisms. Despite that there is a limited number of studies that investigated how CG moderates the relationship between CSR and SPCR in emerging markets. Accordingly, the current research will investigate this relationship in Egypt.

Kim *et al.* (2014) investigated the relationship between CSR, CG and SPCR. Using a sample from 1995 to 2009. The results show that CSR practices have a significant mitigating effect on SPCR. In addition, they found that the mitigating effect of CSR is more pronounced when company has less effective corporate governance because corporate governance mechanisms itself can ensure strong internal control over the board and thus hoarding bad news by managers will be reduced and the probability of crash

risk will be eliminated. In addition, Lee (2016) conducted a study in a major Asian emerging market (Taiwan) from 1997 to 2013 to test the opposing views of the relation between CSR, CG and SPCR. They found that CSR practices strongly mitigate SPCR, explaining the results with the notion that socially responsible companies will have high transparency and thus SPCR will be reduced. In addition, the results reveal that CSR has more mitigating effect on SPC when the company is experiencing ineffective CG structure. This reflects the slight influence of CSR practices on SPCR when company has strong corporate governance structure.

Moreover, El Gammal *et al.* (2018) conducted a study to test whether ethics can affect corporate governance and corporate social responsibility practices. Data were collected through questionnaires from small to medium-sized enterprises (SMEs) in MENA region countries. The results indicate that ethics have a significant impact on CG, and this means that CG has a positive impact on CSR. Since stock price crash risk is affected by ethical behavior of managers, thus using appropriate and effective CG mechanism can be used to improve CSR practices and control bad news hoarding behavior and thus SPCR will be affected.

In general, corporate governance mechanisms have two important components which are board of directors and ownership structure, the composition of company's board of directors can influence the way it manages and implement CSR. El-Bassiouny & El-Bassiouny (2019) explored the effect of corporate structure on the CSR reporting in developing countries (Egypt) and developed countries (USA and Germany). The sample consists of companies listed on the Egyptian EGX30 index, the German DAX 30 index and the US Dow Jones 30 index using annual reports covering year 2014. The findings reveal low level of CSR reporting in Egypt and corporate governance structure differ from one country to another and this means that the driving factors for CSR reporting will differ among countries. In general, the results show that board independence and institutional ownership, foreign BOD, are found to be significant on the CSR disclosure levels in Egypt. On the other hand, no significant influence was found on the level of CSR reporting in the USA and Germany.

Theoretically CG mechanisms can affect the relation between CSR and SPCR, although CG mechanisms is considered to be as important as CSR practices, but CSR practices can be used as a misleading tool in order to hoard some bad news or to achieve personal goals that in turn will enhance the occurrence of SPCR. Maintaining an effective CG mechanism can help companies avoid most of the problems that result from information asymmetry between managers and investors in the market, thus will constrain manager's bad news hoarding behavior and mitigate SPCR. Accordingly, it is believed that the existence of CG mechanisms can moderate the relationship between CSR and SPCR. Therefore, the third hypothesis states that:

Hypothesis 3 (H3). Corporate Governance Significantly Moderates the Relationship between Corporate Social Responsibility Information Disclosure Level and Stock Price Crash Risk.

4. Data sources and sample selection:

The population of the research includes all Egyptian firms listed in the EGX 100 index of August 2018 of the Egyptian stock exchange. EGX 100 index has been used as it includes the most 100 active firms in the market. The final sample includes all sectors except all financial institutions as these firms have different capital structure and investment decisions. Hence, the sample contains nine sectors including telecommunication, healthcare, consumer discretionary, consumer staples, energy, industrials, materials, real estate and utilities.

The final sample used in the analysis is obtained based on three criteria. First, Firms must be listed in the EGX100 during the research period. Second, excluding any company with less than three observations in ESG index during the research study in order to be able to find out whether the company has experienced stock price crash risk or not. (i.e., listed less than three times in the EGX100 during the research period). Third, excluding any company with missing values representing more than 10% of the total observations for any variable. The sample of this research covers a period of seven years from 2015 to 2021. The final sample consists of 62 firms with 347 observations. The distribution of the sample according to sectors is shown in Table (1).

Table (1) The Distribution of the Sample		
Description	Number of observations	Number of Firms
Communication Services	18	3
Consumer Discretionary	71	12
Consumer Staples	63	12
Energy	6	1
Health Care	16	3
Industrials	66	11
Materials	98	18
Real Estate	5	1
Utilities	4	1
Final sample	347	62

Secondary data is used in order to conduct statistical analysis. Data were collected from the Egyptian exchange stock market, Thomson Reuters Database and the official website of EGX.

5. Variables Measurements

The research includes four types of variables which are: first, the dependent variable which is (SPCR), second, the independent variables which are (CSR & CG), third, the moderator variable which is the (CG), fourth, control variables which are the firm size (SIZE), the profitability ratio (ROA), the leverage (LEV), the capital expenditure (CPX), the stock turnover (TURN) and the illiquidity ratio (ILLIQ).

5.1. Dependent Variable

Stock price crash risk (SPCR) is the dependent variable in all empirical models used in this research. According to previous literature, there are different proxies to measure SPCR. Extent literature uses four measures of firm-specific crash risk. The current research adopts the most used proxy of SPCR which is down to up volatility (DUVOL) (Kim *et al.*, 2014; Lee, 2016 & Wang *et al.*, 2021). SPCR measures are based on the firm-specific weekly returns, estimated as the residuals from the market (Chen, Hong & Stein, 2001) to ensures that crash risk measures reflect firm-specific factors rather than broad market movements.

In order to use (DUVOL), first we need to obtain the firm-specific weekly returns for firm (j) in week (t), $W_{j,t}$, is determined by the natural log of one plus the expanded market model residual return as follow:

$$W_{j,t} = \ln(1 + e_{j,t})$$

Where, the expanded market model regression is as follow:

$$r_{j,t} = \alpha_j + \beta_{1j} r_{m,t-1} + \beta_{2j} r_{m,t-2} + \beta_{3j} r_{m,t} + \beta_{4j} r_{m,t+1} + \beta_{5j} r_{m,t+2} + e_{j,t}$$

Here, $r_{j,t}$ is the return on stock j in week t, and $r_{m,t}$ is the return on the value weighted market index in week t, also the lead and the lag for the market index will be included to allow for nonsynchronous trading.

Down-to-up volatility: It measures (DUVOL) of the crash. For each firm j over a fiscal-year period t, firm-specific weekly returns are separated into two groups: “down” weeks when the returns are below the annual mean, and “up” weeks when the returns are above the annual mean then the Standard deviation of weekly returns is calculated for each of these two groups (Dai *et al.*, 2019 & Wu & Hu, 2019). DUVOL is the natural logarithm of the ratio of the standard deviation in the “down” weeks to the standard deviation in the “up” weeks.

$$\text{Where: } DUVOL_{jt} = \log \left(\frac{(n_u - 1) \sum_{down} W_{jt}^2}{(n_d - 1) \sum_{up} W_{jt}^2} \right)$$

Where, n_u and n_d are the number of up and down weeks in year t, respectively. A greater crash risk implies a higher value of $DUVOL_j$.

5.2. Independent Variables

Corporate social responsibility (CSR) and corporate governance (CG) are the two independent variables in this research. In order to enhance Environmental, Social and Governance (ESG) disclosure in Egypt S&P/EGX ESG Index was launched. The researcher is going to use S&P/EGX ESG Index of January 2021 to obtain data for CSR and CG. The index is the responsibility of a committee composed of the Egyptian Institute of Directors, Egyptian Corporate Responsibility Centre, and S&P. It measures the quality of information that companies make available concerning their CG, environment, and social responsibility.

The Egyptian Corporate Responsibility Index is designed to track the performance of the top 100 listed companies on the Egypt Stock Exchange that demonstrates leadership on environmental, social, and CG issues. All EGX100 listed companies are evaluated on an annual basis, in order to select the top 30 that can be listed on the ESG index. Index constituents are ESG score weighted. Two screening processes take place in order to rank the listed companies, one focusing on environment and social indicators and the other one focusing on CG indicators (Indices and Methodology, 2021).

Governance variables are an adaptation of S&P Dow Jones Indices' existing CG methodology to suit the Egyptian market. Companies are evaluated in relation to the following key areas, Ownership Structure and Shareholder Rights, Financial and Operational Information, Board and Management Structure and Process, Business Ethics and Corporate Responsibility Corporate Governance, Corruption, Leadership and Business Ethics. To determine the weight that each company will be given in the index, a quantitative score and a qualitative score that is assigned to evaluate the actual performance of the company on a scale of 5 to 1 (Indices and Methodology, 2021).

Such an index represents a unique setting to examine the economic consequences of ESG practices. A composite score is calculated for each company by summing the qualitative score and the quantitative score. In the current research the two screens of the index (Environmental and social screen, corporate governance screen) are going to be used separately. In order to investigate how CSR (environmental and social dimensions) affect SPCR as well as to evaluate how corporate governance affects the probability of SPCR (Indices and Methodology, 2021).

5.3. Control Variables

Empirical models used in this research include some control variables which are expected to have an effect on SPCR. Based on the prior literature, the control variables include: **Firm Size (SIZE)**; according to Hutton *et al.* (2009) & Kim *et al.* (2014) there is a relationship between firm size and crash risk, the predictive power of firm size has been documented along the literature. It is calculated as the natural logarithm of the market value of equity. **The Profitability Ratio Measured by Return on Assets (ROA)**; Kim *et al.* (2014) found that the companies that have higher ROA are associated with higher future crash risk. It is calculated as income before extraordinary items divided by lagged total assets. **Leverage (LEV)**;

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Table (2) Summary of all the Variables used in the Empirical Study

Variable	Description	Type	Measurement
$DUVOL_{it}$	Down to Up Volatility as a proxy for SPCR	Dependent Variable	Natural logarithm of the ratio of the standard deviation in the “down” weeks to the standard deviation in the “up” weeks
ES_{it-1}	Corporate Social Responsibility (Social & Environmental screen)	Independent Variable	Using SP/EGX100-ESG Environmental and Social Screen Index
CG_{it-1}	Corporate Governance (Governance screen)	Interaction Variable between CSR and SPCR	Using SP/EGX100-ESG Governance Screen index
$SIZE_{it-1}$	Firm Size	Control Variable	It is calculated as the natural logarithm of the market value of equity
ROA_{it-1}	Profitability Ratio measured by Return on Assets (ROA)	Control Variable	It is calculated as income before extraordinary items divided by lagged total assets
LEV_{it-1}	Company Leverage	Control Variable	It is calculated as total liabilities divided by total assets
CPX_{it-1}	Capital Expenditure	Control Variable	It is calculated as net capital expenditure divided by total assets
$TURN_{it-1}$	Stock Turnover	Control Variable	It is calculated as log of (stock turnover value)
$ILLIQ_{it-1}$	The Illiquidity Ratio	Control Variable	It is calculated using log of the Amihud ratio. The Amihud illiquidity measure is defined as the average ratio of the absolute value of daily stock returns to the daily trading volume

Kim & Zhang (2016) & Zhou *et al.* (2021) used leverage as a control variable since they found a significant negative relation between companies that have high leverage and likelihood of SPCR. It is calculated as total liabilities/total assets.

The Capital Expenditure (CPX); referred to as investment opportunity which is the company's ability to continue to grow by investing in various profitable investment options to have future benefits. Investment opportunity affect stock price relying on the idea that if growth prospects of the firm are at least partially impounded in stock prices, then growth firms

will have higher market values relative to assets in place (Kallapur, 2001). According to McGuire, Omer and Wilde (2014) and Firmansyah *et al.* (2022) capital expenditure ratio is one of the proxies for investment opportunities. It is calculated as net capital expenditure divided by total assets.

The Stock Turnover (TURN); is the average monthly share turnover over the current fiscal-year period minus the average monthly share turnover over the previous fiscal-year period, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month (Kim, Li and Zhang, 2011). Stock turnover was calculated as log of stock turnover value.

The Illiquidity Ratio (ILLIQ); the mismatch in the timing and the size of trades creates a need for liquidity. These irregular shocks affect stock prices. In particular, the illiquidity causes the price to decrease, and thus, the price tends to drop significantly, resulting in a price crash (Huang and Wang, 2009). Illiquidity ratio (ILLIQ) is measured by the log of the “Amihud” ratio. The “Amihud” illiquidity measure is defined as the average ratio of the absolute value of daily stock returns to the daily trading volume (Amihud *et al.*, 2015). Table (2) summarizes all the research variables and their proxies.

6. Research Models

In order to test the validity of the developed three hypotheses, generalized least square (GLS) regression will be applied for three multiple regression models using STATA software (version 17).

6.1. Research Model Concerning the Effect of CSR on SPCR

The first multiple regression model is established to test the first hypothesis that addresses the effect of corporate social responsibility on stock price crash risk (using DUVOL as a proxy). It examines whether CSR in year (t-1) significantly affects company-specific future SPCR in year (t). In the current research a one-year lag between the dependent and independent variables is imposed to examine whether CSR in year (t-1) can predict crash risk in year (t). Thus, the first research model is developed as follows:

$$DUVOL_{it} = \alpha + \beta_1(ES_{it-1}) + \beta_2(SIZE_{it-1}) + \beta_3(ROA_{it-1}) + \beta_4(LEV_{it-1}) + \beta_5(CPX_{it-1}) + \beta_6(TURN_{it-1}) + \beta_7(ILLIQ_{it-1}) + \varepsilon_{it} \dots \dots \dots (\text{Model 1})$$

Where, DUVOL is the Down-to-up volatility of firm (i) specific weekly (t) returns, α is the constant, ES is Corporate social responsibility for firm (i) at (t-1), SIZE is firm size at (t-1). ROA is the profitability ratio for firm (i) at (t-1), LEV is leverage ratio for firm (i) at (t-1). CPX is Capital expenditure ratio for firm (i) at (t-1). TURN is stock turnover for firm (i) at (t-1). ILLIQ is the illiquidity ratio for firm (i) at (t-1).

6.2. Research Model Concerning the Effect of CG on SPCR

The Second multiple regression model is established to test the second hypothesis that addresses the effect of corporate governance on stock price crash risk (using DUVOL as a proxy). It examines whether corporate governance in year t-1 (CG) significantly affects company-specific future SPCR in year t. The researcher imposes a one-year lag between the dependent and independent variables to examine whether CG in year t-1 can predict crash risk in year t. Thus, the second research model is developed as follows:

$$DUVOL_{it} = \alpha + \beta_1(CG_{it-1}) + \beta_2(SIZE_{it-1}) + \beta_3(ROA_{it-1}) + \beta_4(LEV_{it-1}) + \beta_5(CPX_{it-1}) + \beta_6(TURN_{it-1}) + \beta_7(ILLIQ_{it-1}) + \varepsilon_{it} \dots \dots \dots (\text{Model 2})$$

Where, CG is the Corporate governance (Governance score) for firm (i) at (t-1), all other variables are the same as in model (1).

6.3. Research Model Concerning the Moderating Effect of CG on the Relationship between CSR and SPCR

The third multiple regression model is established to test the third hypothesis that addresses the moderating effect of corporate governance on the relationship between corporate social responsibility and stock price crash risk (using DUVOL as a proxy). It examines whether corporate governance in year t-1 significantly affects the relationship between corporate social responsibility in year t-1 and future stock price crash risk in year t. The researcher imposes a one-year lag between the dependent and independent variables to examine whether CSR in year t-1 and CG in year t-1 can predict SPCR in year t. Thus, the third research model is developed as follows:

$$DUVOL_{it} = \alpha + \beta_1(ES_{it-1}) + \beta_2(CG_{it-1}) + \beta_3(ES \times CG)_{it-1} + \beta_4(SIZE_{it-1}) + \beta_5(ROA_{it-1}) + \beta_6(LEV_{it-1}) + \beta_7(CPX_{it-1}) + \beta_8(TURN_{it-1}) + \beta_9(ILLIQ_{it-1}) + \varepsilon_{it} \dots \dots \dots (\text{Model 3})$$

Where: $ES \times CG$ is the interaction term for corporate social responsibility and corporate governance for firm (i) at (t-1), all other variables are the same as in model (1).

7. Data Analysis and Hypotheses Testing

This section examines the validity of the developed hypotheses concerning the effect of corporate social responsibility disclosure and corporate governance on stock price crash risk for Egyptian listed firms. Thus, this section presents descriptive statistics, diagnostic statistics, and hypotheses testing. Moreover, STATA 17 is used to conduct all the statistical analyses necessary to examine the research objectives and hypotheses.

7.1. Descriptive Statistics

The importance of descriptive statistics stems from the simplicity of presenting the basic properties of a large set of observations. Also, the appropriate statistical techniques used to analyze the data are chosen based on the underlying characteristics of the data included in the research sample. The main statistical features of all continuous variables used to test the effect of CSR and CG on SPCR are shown in Table (3).

Table (3) Descriptive Statistics for Continuous Variables

Variable		Mean	Std. Dev.	Min	Max	Observations
DUVOL	overall	0.90207	0.098673	0.669266	1.133892	N = 347
	between		0.041855	0.822062	1.008174	n = 62
	within		0.08948	0.66821	1.138178	T-bar = 5.59677
CG	overall	71.58788	9.014647	54.54696	92.65471	N = 347
	between		7.581794	55.83609	88.72882	n = 62
	within		5.070515	56.60237	86.78362	T-bar = 5.59677
ES	overall	74.51551	9.826817	61.88757	97.37509	N = 347
	between		7.587685	64.85089	90.20493	n = 62
	within		5.91145	57.96954	96.54521	T-bar = 5.59677
SIZE	overall	21.19997	1.598097	17.57	24.62	N = 347
	between		1.569202	18.19	24.024	n = 62
	within		0.403197	20.08854	22.63664	T-bar = 5.59677
ROA	overall	0.047197	0.083944	-0.1125	0.2025	N = 347
	between		0.071414	-0.1125	0.2025	n = 62
	within		0.044592	-0.17709	0.270197	T-bar = 5.59677
LEV	overall	1.138336	1.157795	-1.28049	3.432005	N = 347
	between		1.000171	-1.28049	3.432005	n = 62
	within		0.603372	-2.08151	3.258343	T-bar = 5.59677
CPX	overall	0.035136	0.035377	0	0.11058	N = 347
	between		0.02967	0.000928	0.11058	n = 62
	within		0.019499	-0.02335	0.128096	T-bar = 5.59677
TURN	overall	20.64804	1.240432	17.71	23.59	N = 347
	between		0.930861	18.47667	22.53429	n = 62
	within		0.841424	18.48804	23.10137	T-bar = 5.59677
ILLIQ	overall	0.066522	0.087755	0.000378	0.231159	N = 347
	between		0.064515	0.001268	0.231159	n = 62
	within		0.062312	-0.10662	0.260834	T-bar = 5.59677

It can be concluded that descriptive statistics are discussed using three levels, these are, the overall, between and within levels. Regarding the DUVOL, the overall mean (0.90207) reflects the overall mean assuming that the 347 observations belong to a single firm. Thus, the overall level does not reveal the basic features of each firm because the overall level treats all panels as if they are a time series. Therefore, it is essential to use the within and between levels of descriptive statistics in

order to correctly interpret the phenomena under investigation. The overall standard deviation services as an overall measure of the extent to which different firms at a specific point in time (between level) and each firm within a frame of time (within level) varies around the overall mean. Heterogeneity is more pronounced as the standard deviation approaches to exceed 50% of the overall mean.

Furthermore, Table (3) shows that down-to-up volatility (DUVOL) as a measure of SPCR shows an overall mean of (0.90), with a low dispersion around the mean (overall, between, and within), reflecting high homogeneity in the down-to-up volatility of 62 Egyptian listed firms. Moreover, the corporate governance (CG) score shows an overall mean of (71.6), with a low dispersion around the mean (overall, between, and within), reflecting high homogeneity in the disclosure of corporate governance of Egyptian listed firms. The corporate social responsibility (ES) score shows an overall mean of (74.5), with a low dispersion around the mean (overall, between, and within), reflecting high homogeneity in the disclosure of corporate social responsibility of Egyptian listed firms as shown in Table (3).

Additionally, the firm size (SIZE) score shows an overall mean of (21.2), with a low dispersion around the mean (overall, between, and within), reflecting high homogeneity in the firm size of Egyptian listed firms. Moreover, the profitability (ROA) shows an overall mean of (0.047), with a high dispersion around the mean (overall, between, and within), reflecting high heterogeneity in the profitability of Egyptian listed firms. The leverage shows an overall mean of (1.13), with a high dispersion around the mean (overall, between, and within), reflecting high heterogeneity in the capital structure of Egyptian listed firms.

The capital expenditure (CPX) shows in Table (3) an overall mean of (0.035), with a high dispersion around the mean, reflecting high heterogeneity in the investment opportunities of Egyptian listed firms. The stock turnover (TURN) shows an overall mean of (20.64), with a low dispersion around the mean, reflecting a high homogeneity in liquidity of Egyptian listed firms. At last, the illiquidity ratio (ILLIQ) shows an overall mean of (0.066) with a high dispersion around the mean, reflecting a high heterogeneity in the liquidity of Egyptian listed firms.

7.2. Pearson's Correlation Test

The Pearson's correlation coefficient shows the direction and the strength of the linear association between any two variables included in the current research. Moreover, the correlation coefficients in the Pearson correlation matrix presented in Table (4) are used to detect the multicollinearity between any two independent variables used to examine the effect of corporate social responsibility and corporate governance on stock price crash risk. Anh *et al.* (2018) stated that multicollinearity exists if the Pearson correlation coefficient is greater than 70% between any two independent variables. Hence, there is no multicollinearity detected between independent variables used to test the effect of corporate social responsibility and corporate governance on stock price crash risk.

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Table (4) Pearson's Correlation Test

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) DUVOL	1.000								
(2) CG	0.167*** (0.002)	1.000							
(3) ES	-0.015 (0.785)	0.433*** (0.000)	1.000						
(4) SIZE	0.088* (0.103)	0.305*** (0.000)	0.364*** (0.000)	1.000					
(5) ROA	-0.017 (0.750)	0.118** (0.028)	0.158*** (0.003)	0.414*** (0.000)	1.000				
(6) LEV	0.073 (0.177)	0.216*** (0.000)	-0.013 (0.805)	0.114** (0.034)	-0.088* (0.102)	1.000			
(7) CPX	0.108** (0.045)	0.344*** (0.000)	0.277*** (0.000)	0.247*** (0.000)	0.170*** (0.001)	0.061 (0.257)	1.000		
(8) TURN	-0.011 (0.837)	0.249*** (0.000)	0.252*** (0.000)	0.568*** (0.000)	0.147*** (0.006)	0.062 (0.252)	0.080 (0.137)	1.000	
(9) ILLIQ	0.178*** (0.001)	0.087* (0.106)	-0.048 (0.376)	-0.064 (0.238)	0.147*** (0.006)	0.062 (0.247)	0.189*** (0.000)	-0.475*** (0.000)	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

From previous Table (4), it can be concluded that there is a positive significant direct association between corporate governance (CG) and stock price crash risk (DUVOL) ($r=0.167$; $p\text{-value}=0.002$). Also, there is an insignificant direct association between corporate social responsibility disclosure (ES) and stock price crash risk (DUVOL) ($r=-0.015$; $p\text{-value}=0.785$). Furthermore, there is a positive significant direct association between firm size (SIZE) and stock price crash risk (DUVOL) ($r=0.088$; $p\text{-value}=0.10$). However, there is an insignificant direct association between profitability (ROA) and stock price crash risk (DUVOL) ($r=-0.017$; $p\text{-value}=0.75$). Similarly, there is an insignificant direct association between capital structure (LEV) and stock price crash risk (DUVOL) ($r=0.073$; $p\text{-value}=0.177$).

Likewise, there is a positive significant direct association between capital expenditure (CPX) and stock price crash risk (DUVOL) ($r=0.108$; $p\text{-value}=0.045$). Concerning stock turnover, there is an insignificant direct association between stock turnover (TURN) and stock price crash risk (DUVOL) ($r=-0.011$; $p\text{-value}=0.837$). Moreover, there is a positive significant direct association between stock illiquidity (ILLIQ) and stock price crash risk (DUVOL) ($r=0.178$; $p\text{-value}=0.001$) as shown in Table (4).

7.3. Regression Analysis

A linear regression analysis is employed to test the hypotheses of the research. Multiple regression analysis is used to determine the effect of each independent variable on the dependent variable in each empirical model through applying Generalized least squares (GLS) and panel corrected standard error (PCSE) regression analysis.

Testing hypotheses

There is some goodness of fit tests that should be conducted to confirm that the Statistical techniques applied in the current research best fit the sample data. These Tests are multicollinearity, heteroskedasticity, omitted variables, and auto-correlation. If any of the problems (multicollinearity, heteroskedasticity, omitted variables, and auto-correlation) are evidenced, they

should be considered while estimating the final model of the effect of CSR and CG on SPCR.

Table (5) OLS Goodness of Fit (DUVOL model)		
Variable	VIF	1/VIF
TURN	2.138	.468
SIZE	2.019	.495
ILLIQ	1.547	.647
G	1.468	.681
ES	1.384	.723
ROA	1.29	.775
CPX	1.23	.813
LEV	1.104	.906
Mean VIF	1.522	
Heteroskedasticity	p-value	0.3592
Omitted variables	p-value	0.6862
Autocorrelation	p-value	0.6862

Table (5) shows the goodness of fit tests to assess the validity of the pooled OLS regression results. Furthermore, table (5) reveals that there is no multicollinearity among the regressors. As Landau and Everitt (2004) and Field (2005) state multicollinearity exists when the variance inflation factor (VIF) of any independent variable exceeds 10 and when the tolerance factor (1/VIF) is less than 0.10. Therefore, there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient less than 10, and a tolerance coefficient greater than 0.10.

Moreover, Table (5) reveals there is no heteroscedasticity problem which means that the error variances are constant for research models. Therefore, the null hypothesis is accepted because the p-value is greater than 5% reflecting the rejection of the alternative hypothesis which states that the variances of errors are non-constant across observations.

Concerning the specifications, Gujarati (2015) stated that the model specification errors may arise from the omission of essential explanatory variables from the model, the inclusion of irrelevant explanatory variables, or

the incorrect functional form of independent and dependent variables. As shown in Table (5), the p-value of the omitted variables test is greater than 5%. Therefore, the null hypothesis is accepted, which states that the functional form is correct and has no omitted variables in the model of the impact of corporate social responsibility disclosure and corporate governance on stock price crash risk. Hence, it can be concluded that the model is well specified.

In addition, there is no existence of autocorrelation which means that the residuals of the model are not serially correlated because the p-value is greater than 5%. Current research reveals that a curvilinear relationship exists between stock price crash risk (DUVOL) and corporate social responsibility disclosure (ES), which means the existence of an optimal level of corporate social responsibility. Any deviation will lead to negative impact on stock price crash risk; there is U shape between them. The ES parameter is negative (<0) and significant, and the ES squared is positive and significant, as shown in Table (5).

The Hausman Test

The Hausman test is conducted to choose whether the fixed effect model or the random effect model best fits the data of the DUVOL model. As shown in table (6), the Hausman results indicate the acceptance of the null hypothesis, which states that the random effect model should be applied because the p-value is greater than 5%.

Table (6) The Hausman Test	
Test	DUVOL
Chi-square test value	10.745
P-value	0.217

Before accepting the random effect model that has been chosen based on the results of the Hausman test as the fitted DUVOL model, some goodness of fit tests should be conducted to confirm that the statistical techniques applied in the current research best fit sample data. The cut-off of p-values for each model fit test is 5%. Therefore, 5% is the cut-off value for each model acceptance. Table (7) reveals the existence of heteroscedasticity for DUVOL model, which means that the standard errors of an investigated variable are not

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constant within the sample period. In addition, the existence of autocorrelation means that the residuals of the DUVOL model are not serially correlated because the p-value is greater than 5%.

Table (7) Fixed Effect Goodness of Fit Tests (Random effect goodness of fit)		
Test		DUVOL
Heteroskedasticity	p-value	0.000
Autocorrelation	p-value	0.1781

Table (8) Final Fitted Model of the Effect of ES and CG on SPCR (Direct Effect Model)		
Variable	OLS	PCSE
ES	-.02891347***	-.029327***
ES2	.00017461***	.00017721***
CG	.00185228**	.00185383***
SIZE	.01093515**	.01096038**
ROA	-.16279966**	-.16315556**
LEV	0.000	0.000
CPX	0.141	0.143
TURN	-0.001	-0.001
ILLIQ	.2368679***	.23589333***
_constant	1.7042611***	1.7249655***
R-squared	0.109	0.111
Prob > F	0.000	0.000
Obs.	347	347

*** $p < .01$, ** $p < .05$, * $p < .1$

Table (8) shows final fitted model of the effect of corporate social responsibility disclosure (ES) and corporate governance (CG) on stock price crash risk. The overall model can be accepted as a reliable model of stock price crash risk because the Prob > chi2 and Prob > F is less than 5%. Results of generalized least square GLS and panel corrected standard error PCSE are the same for all variables.

In addition, this model can explain 10.9%, 11.1% by using GLS and PCSE, respectively implying that stock price crash risk is driven by corporate social responsibility disclosure and corporate governance. The value of R

square is 10.9%, which means that corporate social responsibility and corporate governance together explain 10.9% of the variation that happened in stock price crash risk using the whole sample as shown in Table (8). This means that other predictors, that are not included in this model could be accepted as other variables as they explain 89.1% of the variation that happened in the stock price crash risk.

Concerning first hypothesis (H1) on the relationship between corporate social responsibility and stock price crash risk, table (8) reveals that a curvilinear relationship exists between stock price crash risk (DUVOL) and corporate social responsibility (ES), which means the existence of an optimal level of the ES disclosure to minimize stock price crash risk (DUVOL). Any deviation will lead to negative impact on stock price crash risk; there is a U shape between them. Where the ES parameter is negative (<0) and significant, and the ES squared is positive and significant, the optimal level of the ES. Thus, the results support and accept the first hypothesis which indicates that there is a significant relationship between corporate social responsibility disclosure level (ES) and stock price crash risk.

Moreover, for the second hypothesis on the relationship between corporate governance and stock price crash risk, the results reflect a positive significant direct effect of corporate governance (CG) on stock price crash risk (DUVOL). Thus, the second hypothesis is accepted which states that there is a significant relationship between corporate governance and stock price crash risk. Regarding the control variables, the results show that there is a positive significant direct effect of firm size (SIZE) on stock price crash risk (DUVOL).

In addition, there is a negative significant direct effect of profitability (ROA) on stock price crash risk (DUVOL). Furthermore, there is no significant direct effect of capital structure (LEV), stock turnover (TURN) and stock illiquidity (ILLIQ) on stock price crash risk (DUVOL) as shown in Table (8). These results are consistent with prior literature (Chen *et al.*, 2007; Zhang *et al.*, 2016 and Zhou *et al.*, 2021).

Table (9) OLS Goodness of Fit (Moderating Effect Model)		
Variable	VIF	1/VIF
ES	1.32	.003
ES_G	4.31	.232
TURN	2.151	.465
SIZE	2.067	.484
ILLIQ	1.554	.643
ROA	1.304	.767
CPX	1.233	.811
LEV	1.105	.905
Mean VIF	1.8805	
Heteroskedasticity	p-value	0.2557
Omitted variables	p-value	0.9769
Autocorrelation	p-value	0.1781

Table (9) shows that there is no multicollinearity among the explanatory variables included in the model as all explanatory variables show a VIF coefficient less than 10, and a tolerance coefficient greater than 0.10. Moreover, table (9) reveals there is no heteroscedasticity problem which means that the error variances are constant for research models. Therefore, the null hypothesis is accepted because the p-value is greater than 5%. As shown in Table (9), the p-value of the omitted variables test is greater than 5%.

Therefore, the null hypothesis is accepted, which states that the functional form is correct and has no omitted variables in the model. Hence, it can be concluded that the model is well specified. In addition, there is no existence of autocorrelation which means that the residuals of the model are not serially correlated because the p-value is greater than 5%. Moreover, curvilinear relationship exists between DUVOL and ES, which means the existence of an optimal level of CSR. Any deviation will lead to negative effect on SPCR; there is U shape between them. The ES parameter is negative (<0) and significant, and the ES squared is positive and significant, as shown in table (9).

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The Hausman test is conducted to choose whether the fixed effect model or the random effect model best fits the data of the DUVOL model. As shown in table (10), the Hausman results indicate the acceptance of the null hypothesis, which states that the random effect model should be applied because the p-value is greater than 5%.

Table (10) Hausman Test	
	DUVOL
Chi-square test value	11.072
P-value	0.132

Table (11) Fixed Effect Goodness of Fit Tests (Random effect goodness of fit)		
Test		DUVOL
Heteroskedasticity	p-value	0.000
Autocorrelation	p-value	0.1781

Before accepting the random effect model that has been chosen based on the results of the Hausman test as the fitted DUVOL model, some goodness of fit tests should be conducted to confirm that the statistical techniques applied in the current research best fit sample data. The cut-off of p-values for each model fit test is 5%. Therefore, 5% is the cut-off value for each model acceptance. Table (11) reveals the existence of heteroscedasticity for DUVOL model, which means that the standard errors of an investigated variable are not constant within the sample period. In addition, the existence of autocorrelation means that the residuals of the DUVOL model are not serially correlated because the p-value is greater than 5%.

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Table (12) Final Fitted Model Concerning the Moderating Effect of CG on the Relationship between CSR and SPCR		
Variable	OLS	PCSE
ES	-.0293483***	-.02981635***
ES2	.00016582***	.00016879***
ES_CG	.00002443**	.00002446***
SIZE	.01123726**	.01127694**
ROA	-.16203633**	-.16252157**
LEV	-0.000	-0.000
CPX	0.147	0.148
TURN	-0.098	-0.098
TURN2	0.002	0.002
ILLIQ	.22610598***	.22494104***
cons	2.7899363***	2.8079076***
R-squared	0.116	0.114
Prob > chi2	0.000	0.000
Obs.	347	347
*** $p < .01$, ** $p < .05$, * $p < .1$		

Table (12) reflects the final fitted model concerning the moderating effect of Corporate Governance on the relationship between Corporate Social Responsibility Disclosure and Stock Price Crash Risk. The overall model can be accepted as a reliable model of stock price crash risk because the Prob > chi2 and Prob > F is less than 5%. Results of generalized least square GLS and panel corrected standard error PCSE are the same for all variables.

In addition, this model can explain 11.6%, 11.4% by using GLS and PCSE, respectively. These results imply that stock price crash risk is driven by corporate social responsibility disclosure, corporate governance and the interaction between them. Results of this research reveals in Table (12) that a curvilinear relationship exists between stock price crash risk (DUVOL) and corporate social responsibility (ES), which means the existence of an optimal level of the ES disclosure to minimize stock price crash risk (DUVOL). Any deviation will lead to negative impact on stock price crash risk; there is a U shape between them. Where the ES parameter is negative (<0) and significant, and the ES squared is positive and significant.

Furthermore, in Table (12) after examining the final fitted model concerning the effect of Corporate Governance on the association between Corporate Social Responsibility Disclosure and on Stock Price Crash Risk the results show that interaction between corporate social responsibility and corporate governance has a positive impact on stock price crash risk, as the coefficient of the interaction is between ES and ES2 coefficient; which means the interaction has a positive side to reach the optimal level of ES.

Finally, on one side there is a positive significant direct effect of firm size (SIZE) on stock price crash risk (DUVOL) and a negative significant direct impact of profitability (ROA) on stock price crash risk (DUVOL) as shown in Table (12). On the other side, there is no significant direct impact of capital structure (LEV), investment opportunities (CPX) and stock turnover (TURN) on stock price crash risk (DUVOL). While stock illiquidity (ILLIQ) shows a positive significant effect on stock price crash risk (DUVOL).

8. Discussion of the Findings

This section discusses the main empirical findings of the current research. Regarding the relationship between corporate social responsibility and stock price crash risk. CSR has witnessed a great attention nowadays all over the world, especially in emerging markets, and investors become more aware of the importance of CSR practice and how it can affect their interest and protect their rights. CSR reflects the concern of the company toward its customers, environment and society as a whole while maintaining its financial growth.

According to previous studies there were different streams of literature examined the relationship between CSR and SPCR. Most of these studies that was conducted revealed that CSR practices can reduce likelihood of SPCR supporting agency theory (Kim, Li and Li, 2014; Lee, 2016 and Wu and Hu, 2019). It states that when the company maintain transparency and managers stop hoarding bad news, investors will be able to take rational decisions (Feng, Goodell and Shen, 2021). Thus, stock prices will follow their normal flow in the market and SPCR will be reduced. Some studies support management

balance theory (CSR is considered as a tool used by management to achieve personal goals rather than meeting needs of stakeholders).

When managers use CSR to hide unethical behavior, information asymmetry arises between companies' managers and investors resulting in SPCR. The effect of CSR information disclosure is controversial. Even listed companies that make CSR reports may use CSR to hoard bad news and divert shareholders' attention for personal gain, which will increase the principal-agent conflict between management and shareholders and increase the SPCR (Wu and Hu, 2019; Hunjra, Mehmood and Tayachi, 2020).

The result shows a curvilinear relationship (U shape) exist between CSR and SPCR, this means that there is an optimal level of ES disclosure to minimize SPCR. Any deviation will lead to negative impact on stock price crash risk. On one side, when the level of CSR information disclosure is low, it makes it difficult to reflect all types of information inside the company (whether it is positive or negative) which means a low level of transparency. The investors will not be able to take rational decision and principal-agent problem will take place between the company and investors which will lead to stock price crash risk (Cui, Jo and Na, 2018).

On the other side, when level of ES increase above the threshold (optimal level of ES), SPCR will take place. Thus, CSR reports are more used as self-interested tools for management. According to previous studies, positive reputation is a strong reason for the companies to extensively engage in CSR practices especially nowadays as investors become more aware of corporate social responsibility practices and how it affects the society and the market as a whole (Wang, Liu and Wu, 2021). Thus, companies will increase their CSR disclosure level as a tool to hide bad news and to maintain its positive image by disclosing only good news. When bad news is accumulated and reaches a certain level it will be released in the market at once resulting in SPCR (Kim, Li and Li, 2014; Zhang, Xie and Xu, 2016).

Generally, to minimize SPCR and have more transparent information environment, the Egyptian companies should have optimal CSR disclosure level. Since CG is an effective tool used to mitigate agency problem that is considered to be one of the main causes of SPCR. Then, CG mechanisms

should be structured in an effective way to achieve its primary goals. After reviewing the first stream of literature, CG mechanisms can mitigate the likelihood of SPCR as it controls managers' behavior and reduce bad news hoarding consequently SPCR will be reduced (Jeon, 2019; Jebran, Chen and Zhang, 2020). Another stream of literature proved that CG enhance SPCR in view of the fact that managers and board of directors can use CG mechanisms as a tool to attain personal goals (Andreou *et al.*, 2016; Qayyum *et al.*, 2020).

Moreover, the agency problem is caused by a decrease in the directors' and supervisors' authority in monitoring a company's operations. The manipulation of company profitability by managers that results in high executive compensation may have a negative impact on operations and increase the agency problem, then enhance SPCR (Huu Nguyen, Thuy Doan and Ha Nguyen, 2020).

By investigating the effect of corporate governance (using CG score from EGX) on SPCR in Egypt as it is considered one of the most popular emerging markets, the results, unexpectedly, show that there is a significant positive relationship between CG and SPCR. This means that the companies that have high corporate governance scores are more likely to face greater SPCR. This result could be due to the excessive control tend to enhance SPCR through withholding unfavorable news. Additionally, the results reflect that CG is used as a mandatory disclosure requirement as to be listed in Egyptian exchange market rather than a controlling tool, hence SPCR will be affected positively.

According to Kim, Li and Li (2014) the relationship between CG and SPCR reflects how the company is dealing with bad news hoarding that in turn affect information symmetry between managers and investors, as CG is considered to be one of the monitoring tools by the boards. Overall conclusion, CG mechanisms should be improved and should be designed to solve traditional agency problem not only as a mandatory requirement. According to previous results, since there is a direct positive significant relationship between corporate governance and SPCR which means when the company has effective level of corporate governance the probability of SPCR will increase. Moreover, there is a direct curvilinear (U shape) relationship

between Corporate social responsibility and SPCR which means at an optimal CSR disclosure level there is a significant negative effect on SPCR.

The test of the moderating effect of corporate governance on the relationship between CSR and SPCR shows that the interaction between CSR and CG has a positive effect on SPCR. This result means that when the company CSR disclosure level deviates from the optimal level that reduces SPCR, CG act as a moderating variable that can restore (positively affect CSR) CSR disclosure level to its optimal level to minimize SPCR. This reflects that the existence of CG can help a company reduce its SPCR through governing the level of CSR disclosure as it can control companies that make extensive CSR reporting to hide bad performance and maintain its reputation.

Moreover, it can motivate companies that have low CSR disclosure level to engage more on CSR practices to reduce risk of stock price crash. Finally, CG enhances the curvilinear relationship between CSR and SPCR to reach its optimal level to reduce SPCR. According to the current research results, Egyptian companies should improve their CG mechanisms to be able to eliminate self-interest practices and to be aware of CG consequences to conduct effective structure that can help the company avoid market risks (SPCR). Whereas the companies need to change their perspective towards CG, as based on research results, they considered it as a mandatory practice in order to be listed in EGX.

Hence, they have to start considering CG mechanisms as a controlling tool and to improve the information environment in the market. Furthermore, since CSR practices have gained great attention in emerging markets currently, then the Egyptian companies also should devote more efforts to be socially responsible and to avoid using CSR as a tool to hoard bad performance and to maintain positive reputation in the market, as it will lead to accumulation of the bad news and when released in the market at once, stock price crash risk takes place.

9. Conclusions

The current research results show a curvilinear relationship (U shape) exists between CSR and SPCR, this means that there is an optimal level of ES disclosure to minimize SPCR. Any deviation will lead to negative impact on stock price crash risk. That is, as the level of CSR information disclosure is low, making it difficult to reflect all types of information inside the company (whether it is positive or negative) which means a low level of transparency. The investors will not be able to take rational decisions and principal- agent problem will take place between the company and investors which will lead to SPCR. On the other side, when the level of ES increase above the threshold (optimal level of ES), SPCR will take place as in this case CSR reports are more used as self-interested tools for management.

Furthermore, by investigating the effect of corporate governance (using CG score from EGX) on SPCR in Egypt as it is considered one of the most popular emerging markets, the results show that there is a significant positive relationship between CG and SPCR. This means that the companies that have high corporate governance scores are more likely to face greater SPCR. Consequently, excessive control tends to enhance SPCR through withholding unfavorable news. Additionally, the results reflect that CG is used as a mandatory disclosure requirement as to be listed in Egyptian exchange market rather than a controlling tool, hence SPCR will be affected positively.

In addition, the results show that the interaction between CSR and CG has a positive effect on SPCR. This means that when the company CSR disclosure level deviates from the optimal level that reduces SPCR, CG act as a moderating variable that can restore (positively affect CSR) CSR disclosure level to its optimal level so as to minimize SPCR. Hence, the existence of CG can help company reduce its SPCR through governing the level of CSR disclosure as it can control companies that make extensive CSR reporting to hide bad performance and maintain its reputation. Moreover, it can motivate companies that have low CSR disclosure level to engage more in CSR practices to reduce SPCR. Finally, CG enhances the curvilinear relationship between CSR and SPCR to reach its optimal level to reduce SPCR.

Finally, Egyptian companies should improve their CG mechanisms to be able to eliminate self-interest practices and to be aware of CG consequences and to conduct effective structure that can help the company avoid market risks (SPCR). Whereas the companies need to change their perspective towards CG, based on research results, they consider it only as a mandatory practice to be listed in EGX. While they have to start considering CG mechanisms as a controlling tool and to improve information environment in the market. Additionally, since CSR practices have gained great attention in emerging markets currently, the Egyptian companies also should devote more efforts to be socially responsible and to avoid using CSR as a tool to hoard bad performance and to maintain positive reputation. Thus, the information environment will be improved and become more transparent and stable as well as investors will be more rational in taking their decisions.

10. Research limitations

Current research has some limitations which may limit the generalization of the results. The results obtained might differ by using different measures for the research main variables such as SPCR can be measured using negative conditional skewness and binary crash risk. Furthermore, CSR could be measured by different types of indices with different dimensions rather than ESG/EGX scoring index. The sample used is limited to non-financial Egyptian listed firms from 2015 to 2021, hence, the results could not be generalized to other countries with different context.

11. Future research

Based on the current results, there are prospects for future research. For example, it could consider other proxies for firm-specific stock price crash risk such as negative conditional skewness and a binary crash risk measure. Further, applying the research to each industrial sector and investigating the effect of each social and environmental dimension of CSR separately could yield more specific results. Using other indexes consisting of other dimensions to test CSR and CG might yield different results. Finally, extending the sample to include financial institutions could provide more informative results.

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