

# Internal Control Weaknesses and Credit Ratings: The Moderating Effect of D&O Insurance

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## Abstract

This study mainly examines whether the initial public offering and seasoned equity offering firms (hereafter, IPO/SEO) that disclose internal control weaknesses (hereafter, ICWs) exhibit inferior credit rating levels than non-ICW firms. Moreover, this study uses directors' and officers' (hereafter, D&O) liability insurance coverage to test its impact on the association between ICWs and credit ratings. Our empirical evidence provides support for the notion that ICW firms are more prone to have inferior credit ratings to those without ICWs. In addition, empirical evidence indicates that D&O insurance negatively interacts with ICWs to influence credit ratings. Overall, the findings provide consistent evidence that D&O insurance coverage provides protection to stakeholders and plays an inevitable monitoring role in helping mitigate the consequences of the disclosure of ICWs on corporate credit ratings, thereby improving corporate credit ratings.

Keywords: Internal Control Weakness, Credit Ratings, Directors' and Officers' Liability Insurance, Creditworthiness

JEL Classifications: G22, G24, G34, M48

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## 1. Introduction

The purpose of this article is to examine the association between the ICW disclosures and firm credit ratings and examines the impact of D&O insurance on the relationship between ICWs and credit ratings. Credit ratings are a crucial indicator of creditworthiness and convey additional information content to market participants by reducing the information asymmetry problems (Demirtas and Cornaggia, 2013; Dimitrios and Hang, 2017; Heflin *et al.*, 2011; Hung *et al.*, 2017; Kisgen, 2006). Prior studies have investigated the determinants and economic consequences of credit ratings and suggest that better disclosure quality could result in lower information asymmetry and increase firms' credit ratings (Aman and Nguyen, 2013; Dichev and Piotroski, 2001; Elbannan, 2009; Jung *et al.*, 2013; Poon and Chan, 2008). Moreover, the literature reviews of Schneider *et al.* (2009) and Chalmers *et al.* (2019) conclude that the ICW disclosure was viewed as bad news by the investors and resulted in adverse effects on investors' perceptions of a firm's credit risk after the Sarbanes-Oxley Act (SOX) provisions.

While most of the economic consequences in the ICW literature are based on the US setting, Taiwan provides a good setting outside the US in that it adopts similar regulations when investigating the impact of ICWs on firms' credit ratings. However, only the IPO/SEO firms are mandatorily required to report ICW information in Taiwan. Thus, it is worthwhile to employ a hand-collected data to complement the existing ICW literature. Moreover, in contrast to earlier studies that largely rely on credit rating scores provided by internationally recognized credit rating agencies, in Taiwan, the Taiwan Economic Journal (hereafter, TEJ) credit rating agency is both a regional and niche market rating agency. The TEJ integrates ten different kinds of financial data to derive the credit rating index (hereafter, TCRI) and could serve as a good index to proxy for Taiwanese listed firms' credit ratings (Hwang *et al.*, 2012; Lin and Shen, 2015; Liu and Tsai, 2017). Therefore, in using the TCRI credit ratings provided by the TEJ to proxy for credit ratings, in the first part of our article, we explore the effect of ICWs on credit ratings for Taiwanese IPO/SEO firms.

Various studies suggest that better corporate governance mechanisms have the potential to mitigate agency conflicts and influence credit ratings positively (Alali *et al.*, 2010; Aman and Nguyen, 2013; Ashbaugh-Skaife *et al.*, 2006; Bhojraj and Sengupta, 2003; Feki and Walid, 2016; Liu and Tsai, 2017). Moreover, evidence from academic studies focusing on the corporate governance mechanism has indicated that D&O insurance is a particular type of corporate governance mechanism and a hedging tool used to provide protection for D&Os and firms (Chen *et al.*, 2017; Chung *et al.*, 2013; Holderness, 1990; Kalelkar and Nwaeze, 2015; Liou *et al.*, 2017; O'Sullivan, 1997; Park, 2018). The D&O insurance disclosure could reduce information asymmetry between managers and market investors (Luo and Krivogorsky, 2017).

To enhance and improve the quality of corporate governance, the Taiwan Stock Exchange Corporation and the Taipei Exchange (TWSE/TPEX) mandate IPO applicants to take out D&O insurance from 2018 onwards. The Taiwanese institutional background provides a unique setting in testing the governance mechanism of D&O insurance. For the reason that there has been little literature that has analyzed the role played by D&O insurance on the basis of the association between ICWs and credit ratings. Thus, the second part of our study is to examine the moderating effect of D&O insurance coverage on ICWs and credit ratings in the cases of Taiwanese firms.

Our results show that the reporting of ICW is relevant to users of financial statements in the firm's internal control system quality evaluation. Our empirical evidence provides support for the notion that ICW firms are more prone to have inferior credit ratings to those without ICWs and is consistent with prior studies (Aman and Nguyen, 2013; Elbannan, 2009). In addition, the provision of D&O insurance could supply a better corporate governance mechanism and more protection to the firms and shareholders, thereby moderating the negative effect of ICWs on firm credit ratings. The findings indicate that firms tailor their demand on insurance in regards to the risky conditions that they face and thereby protecting firms' value (Chung *et al.*, 2013; Park, 2018).

Our study provides several contributions to the extant literature. First, our study complements the existing literature by providing consistent evidence that D&O insurance plays a vital governance role in helping to mitigate the relationship between ICWs and corporate credit ratings. Second, our findings point out that D&O insurance coverage could improve investors' and creditors' risk assessments and enable them to better understand the link between ICWs and credit ratings. Finally, our results also add to the understanding that the disclosure of ICWs and D&O insurance coverage convey additional information to reduce information asymmetry between individual parties in the assessment of firms' credit ratings.

The rest of our paper is organized as follows. Section 2 provides a review of the related literature and introduces the hypotheses, and Section 3 details the research design. Section 4 reports the sample description. Section 5 summarizes this study's major empirical results and Section 6 concludes.

## **2. Literature and Hypothesis**

### ***2.1. Internal Control Weaknesses and Credit Ratings***

Credit ratings provide an evaluation of credibility by experts and offer additional information to the investors apart from what is publicly disclosed. Therefore, credit ratings are a good indicator of creditworthiness and contribute to narrowing the information gap between firms and investors, thereby playing an important part in contract law and in capital markets (Demirtas and Cornaggia, 2013; Dimitrios and Hang, 2017; Heflin *et al.*, 2011; Hung *et al.*,

2017; Kisgen, 2006). Prior studies have focused on the economic causes and effects of credit ratings. Studies investigating the consequences of credit ratings have shown that the rating announcements significantly influence both stock and bond valuations and provide additional information content to market participants by reducing the information asymmetry problems (Dichev and Piotroski, 2001; Jung *et al.*, 2013; Poon and Chan, 2008).

The significant reaction to rating changes leads to strong incentives to stimulate managers to increase or maintain corporate credit ratings (Graham and Harvey, 2001; Graham *et al.*, 2005). For example, Feki and Walid (2016) and Kisgen (2009) document that managers adjust the degree of leverage to target corporate credit ratings. Recent research also suggests that managers undertake earnings management activities to affect their credit ratings (Alissa *et al.*, 2013; Demirtas and Cornaggia, 2013; Dimitrios and Hang, 2017; Iatridis, 2018; Jiang, 2008; Jung *et al.*, 2013; Lin and Shen, 2015). Beyond managerial accounting discretions, some research proposes that industry concentration and financial factors are important determinants of companies' credit ratings (Gray *et al.*, 2006; Gupta *et al.*, 2017). The literature reviews by Chalmers *et al.* (2019) and Schneider *et al.* (2009) conclude that the ICW disclosure has been viewed by the market as bad news and has resulted in adverse effects on investors' perceptions of the firm's credit risk after the implementation of the SOX.

Moreover, Gupta and Nayar (2007) document that ICW disclosures are negatively related to a stock price response. Ogneva *et al.* (2007) document that ICW firms are in association to a higher implied cost of equity than non-ICW firms. Ashbaugh-Skaife *et al.* (2009) posit that internal control deficiencies result in less reliable financial reporting, thereby enlarging the information risk faced by investors that is demonstrated in a higher cost of equity. Elbannan (2009) documents that ineffective internal control quality negatively affects bond credit ratings. El-Gazzar *et al.* (2011) indicate that the ICW reporting is significantly linked to debt ratings and can lead to the firm's outstanding debt to face a downgrade. Therefore, ICW disclosures do indeed convey valuation-relevant information and are informational events that may alter assessments of creditors' default risk, thereby affecting firms' credit ratings.

While most of the economic consequences presented in the ICW literature are derived in US setting, in an effort to improve the efficiency and effectiveness of the operations of public companies in Taiwan, the Taiwan's FSC followed SOX in promulgating the "Regulations Governing the Establishment of Internal Control Systems by Public Companies" in 2002. As in SOX Section 404, the FSC mandates that Taiwanese public companies shall establish internal controls and procedures for financial reporting. However, the audit reports produced by the CPA firms in association to the internal control practice represented in the "Internal Control System Statement" do not disclose the types of ICWs. The types of ICWs and corrective recommendations issued by the CPAs when carrying out special audits of internal control practices are only available for IPO/SEO firms. Therefore, Taiwan provides a good research

setting outside the US in that it adopts similar regulations when investigating the impact of ICWs on firms' credit ratings.

Credit ratings are issued by credit rating agencies that engage in rating credit risk degrees. In Taiwan, aside from the subsidiaries of the international credit rating companies, such as, for example, Standard & Poor's Ratings Services, the TEJ credit rating agency is a regional and niche rating agency. In contrast to the solicited ratings, which are requested and involve the payment of rating fees by issuers, the TEJ integrates ten different kinds of financial data to derive the TCRI and has routinely provided quarterly unsolicited ratings for Taiwanese listed firms since 1996. The TCRI is a good and reliable credit risk proxy for firms (Hwang *et al.*, 2012; Lin and Shen, 2015; Liu and Tsai, 2017).

Thus, based on prior research as mentioned above, the first objective of our paper is to explore the impact of ICWs on credit ratings for firms listed in Taiwan. We concentrate on the reporting of ICWs and its influence on credit ratings because ICWs are potentially considered to be a critical determinant in assessing a firm's credit risk and hence the firm's credit ratings. Based on a study by Elbannan (2009), Aman and Nguyen (2013) suggest that better disclosure quality could result in lower information asymmetry and increase firms' credit ratings. This leads us to hypothesize that firms with ICW disclosure have inferior credit ratings compared to non-ICW firms. Thus, we construct our first hypothesis as follows:

H1: Firms with ICW disclosures are positively associated with inferior credit ratings compared to non-ICW firms.

## **2.2. D&O Liability Insurance**

It is widely believed that the perfect corporate governance mechanisms can improve the objectivity of managerial decision making, curb managerial opportunistic behavior, and benefit the interests of stakeholders. Moreover, the effective governance decreases the probability of default drawing on superior credit ratings. Using a constructed governance index to proxy for corporate governance, prior studies have identified that better corporate governance is affiliated with better credit ratings and have documented that the level of governance mechanisms should affect the gauging of the likelihood of welshing and hence credit ratings (Alali *et al.*, 2010; Ashbaugh-Skaife *et al.*, 2006). In addition, previous literature indicates that better corporate governance mechanisms have the potential to alleviate agency conflicts and attenuate the risk to debtholders, thereby influencing credit ratings positively and resulting in more favorable credit ratings (Aman and Nguyen, 2013; Bhojraj and Sengupta, 2003; Bonsall IV *et al.*, 2017; Cornaggia *et al.*, 2017; Feki and Walid, 2016; Liu and Tsai, 2017).

Apart from the governance surrogates mentioned above, much of the prior work has argued that D&O insurance is a special kind of corporate governance mechanism that may provide strong incentive ramifications on D&Os. Core (1997) shows that Canadian firms that face a

greater litigation risk are more likely to buy insurance. In a later study, Core (2000) indicates that Canadian firms with weaker governance structures pay higher D&O premiums. Chen and Pang (2008) argue that the mainly reasons that Taiwanese firms take out D&O insurance are its ability to reduce litigation risk and retain their executives. Chen and Li (2010) indicate that the demand for D&O insurance among Taiwanese firms is positively related to corporate litigation risk. Firms purchase D&O insurance to protect D&Os for claims made against them while they serve on the firm's board of directors or as officers.

In Taiwan, TWSE/TPEX-listed firms were advised in 2007 to purchase directors' and supervisors' liability insurance related liabilities following the exercise of their duties during their terms of occupancy. Furthermore, listed companies have since 2008 been recommended to detail the insured contents of the liability insurance bought or renewed for D&Os at the next board meeting. Following the financial fraud involving game developer XPEC Entertainment Inc. and other listed firms, from 2018 onwards, IPO applicants are mandatorily required by the TWSE/TPEX to buy D&O insurance that aims to reduce and spread the risk of material harm to a firm and its shareholders. Thus, we conclude that the government views D&O insurance as a good corporate governance mechanism to reduce the risks of D&Os. Therefore, the Taiwanese institutional background provides an interesting setting when investigating the role played by the voluntary acquire of D&O insurance for Taiwanese listed firms. Among earlier works, Bradley and Chen (2011) noted that firms that supply limited liability and remediation for their D&Os enjoy better credit ratings and lower yield spreads. Although the prior studies examine the direct link between D&O insurance and credit ratings, little emphasis to testing the role that the voluntary purchase of D&O insurance plays in respect of the relationship between ICWs and credit ratings for Taiwanese listed firms.

Accordingly, our second purpose is to investigate the effects of the amount of D&O insurance coverage on the association between ICWs and credit ratings. While ICW disclosure has been perceived by the market as bad news and could result in lower credit ratings, nevertheless, D&O insurance is a good governance mechanism and a hedging tool used to provide protection and reduce the risks that the D&Os face (Chen *et al.*, 2017; Chung *et al.*, 2013; Park, 2018). Consequently, this study proposes that the voluntary purchase of D&O insurance acts like a governance device in weakening and moderating the negative effects of ICWs on Taiwanese firms' credit ratings. Thus, the second hypothesis can be made:

H2: The effects of ICWs on corporate credit ratings are weaker for firms with more D&O insurance coverage amounts.

### 3. Research Design

#### 3.1. Empirical Models

In order to test the hypothesis H1, this study employs the following ordinal logistic regression model (1) to explore the impact of ICWs on credit ratings. Since firms with the incidence of ICWs are more inclined to have inferior credit ratings in comparison with non-ICW firms and firms with lower levels of credit ratings are likely to exhibit better creditworthiness, accordingly, we expect that the coefficient on ICW to be positive and statistically significant ( $\beta_1 > 0$ ). The variable definitions are outlined in Table 1. Where  $i$  represents a firm and  $t$  represents a year.

$$\begin{aligned} TCRI_{it} = & \beta_0 + \beta_1 ICW_{it} + \beta_2 DSOWN_{it} + \beta_3 DSPLED_{it} + \beta_4 CEO3CH_{it} + \beta_5 CFO3CH_{it} \\ & + \beta_6 SIZE_{it} + \beta_7 CASH_{it} + \beta_8 LEV_{it} + \beta_9 BETA_{it} + \beta_{10} ROA_{it} + \beta_{11} BIG4_{it} \\ & + \varphi YEAR + \gamma INDUSTRY + \varepsilon_{it}. \end{aligned} \quad (1)$$

To test H2, we introduce D&O insurance coverage DOTA and its interaction (ICW×DOTA) with ICW to our ordinal logistic regression model. This article adopts the Heckman's (1979) two-stage estimation procedure to ascertain the impact of the endogeneity bias for the D&O insurance purchase choice (Chung *et al.*, 2013). This study employs regression models (2) and (3) and uses Stata software to implement the two-step procedure automatically. In the first stage, the regression model (2) is used to test the determinants of D&O insurance purchase decision. This article employs an indicator variable to serve as the D&O purchase variable (BUY) and it equals a value of 1 if the firms buy D&O insurance, and 0 otherwise. The determinants of a firm's D&O insurance purchase decision are based on prior research (Chung *et al.*, 2013; Core, 1997; Lin *et al.*, 2013; Tsai *et al.*, 2017). The rest of the other variable definitions are similar to those in Table 1.

$$\begin{aligned} Pro(BUY_{it}) = & \alpha_0 + \alpha_1 DSOWN_{it} + \alpha_2 DSPLED_{it} + \alpha_3 CEO3CH_{it} + \alpha_4 CFO3CH_{it} \\ & + \alpha_5 SIZE_{it} + \alpha_6 CASH_{it} + \alpha_7 LEV_{it} + \alpha_8 BETA_{it} + \alpha_9 ROA_{it} + \alpha_{10} BIG4_{it} \\ & + \alpha_{11} IDDSR_{it} + \alpha_{12} DEVSCR_{it} + \alpha_{13} MB_{it} + \alpha_{14} DUAL_{it} + \varphi YEAR \\ & + \gamma INDUSTRY + \varepsilon_{it}. \end{aligned} \quad (2)$$

In the second stage, the following ordinal logistic regression model (3) is used to test whether D&O insurance coverage can mitigate the negative impact of ICW on TCRI. Based on the hypothesis H2, the coefficient of the interaction term ICW×DOTA is expected to be significantly negative ( $\beta_3 < 0$ ). The variable IMR is acquired from Equation (2). The rest of the other variable definitions are alike to those in Table 1.

$$\begin{aligned}
TCRI_{it} = & \beta_0 + \beta_1 ICW_{it} + \beta_2 DOTA_{it} + \beta_3 ICW_{it} \times DOTA_{it} + \beta_4 DSOWN_{it} \\
& + \beta_5 DSPLED_{it} + \beta_6 CEO3CH_{it} + \beta_7 CFO3CH_{it} + \beta_8 SIZE_{it} \\
& + \beta_9 CASH_{it} + \beta_{10} LEV_{it} + \beta_{11} BETA_{it} + \beta_{12} ROA_{it} + \beta_{13} BIG4_{it} \\
& + \beta_{14} IMR_{it} + \varphi YEAR + \gamma INDUSTRY + \varepsilon_{it}.
\end{aligned} \tag{3}$$

Table 1: Variable Definitions

Variable	Definition
TCRI	TCRIEX or TCRIDUM: The TCRIEX is the credit rating index ranging from 1 to 10; and the TCRIDUM is an indicator variable, which takes a value of 1 if the firm's credit rating index is bigger than or equal to its median value, and 0 otherwise.
ICW	An indicator variable, which takes a value of 1 if the firm discloses internal control flaws, and 0 otherwise.
BUY	An indicator variable, which takes a value of 1 if the firms purchase D&O insurance, and 0 otherwise.
DOTA	D&O insurance coverage amount divided by total assets.
DSOWN(%)	The percentage of outstanding shares held by the directors and supervisors.
DSPLED(%)	The ownership-in-pledge percentage of directors and supervisors.
IDDSR	The percentage of independent directors and supervisors.
DEVSCR	The deviations of seat control rights from cash flow rights.
CEO3CH	An indicator variable, which takes a value of 1 if the CEOs changed in the three most recent fiscal years, and 0 otherwise.
CFO3CH	An indicator variable, which takes a value of 1 if the CFOs changed in the three most recent fiscal years, and 0 otherwise.
SIZE	The natural logarithm of total assets.
CASH	The sum of cash and short-term investments divided by total assets.
LEV(%)	Total debt divided by total assets.
BETA	The market risk.
MB	The market value of equity divided by the book value of equity.
ROA(%)	The sum of profit after tax plus interest expense divided by total assets.



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DUAL	An indicator variable, which takes a value of 1 if the CEO is also the chairman of the board, and 0 otherwise.
BIG4	An indicator variable, which takes a value of 1 if the firm is audited by the top-4 auditing firms, and 0 otherwise.
YEAR	Year dummy variables.
INDUSTRY	Industry dummy variables.
IMR	The inverse Mills ratio is acquired from Heckman two-stage regressions to address potential selection bias issues.

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### **3.2. Variable Definitions**

#### **3.2.1. Credit Ratings (TCRI)**

Following prior work (Elbannan, 2009; Hwang *et al.*, 2012; Lin and Shen, 2015; Liu and Tsai, 2017), this study employs the TCRI to proxy for the firms' credit ratings. Our study employs two alternative proxies for the TCRI variable in executing Equations (1) and (3), respectively. The first one is the TCRIEX, which is an ordinal variable varying from 1 to 10, where a lower level denotes lower credit risk and superior credit ratings. The second variable is an indicator variable (TCRIDUM) that divides credit ratings into two classifications to more easily measure the impact of ICW on credit ratings. The classification scheme used in this study differs from the studies such as Ashbaugh-Skaife *et al.*, (2006) and Elbannan (2009) in that they partition credit ratings into two categories, investment- and speculative-grade to estimate their models. In our study, the median of the TCRIEX is 6.000, thus, TCRIDUM is assigned as a value of 1 if the firm's credit rating index is bigger than or equal to its median value, and 0 otherwise.

#### **3.2.2. Internal Control Weakness (ICW)**

In Taiwan, the Financial Supervisory Commission (FSC) requires the CPAs to set forth their suggestions for the enhancement of the internal control system and improvements to major flaws in the prospectuses for the last three calendar years. Therefore, internal control weakness (ICW) is defined as an indicator variable that equals 1 if the IPO/SEO firms disclose internal control flaws in their prospectuses in the sample year, otherwise it equals 0.

#### **3.2.3. D&O Insurance (BUY/DOTA)**

Following a large body of literature (Bradley and Chen, 2011; Chalmers *et al.*, 2002; Core, 1997; Lin *et al.*, 2013; Liou *et al.*, 2017), this study employs two alternative proxies for the D&O insurance variable in executing Equations (2) and (3), respectively. These are D&O insurance purchase option (BUY) and D&O insurance coverage (DOTA). D&O insurance

purchase choice (BUY) is a dummy variable for whether the firm buys D&O insurance, and is used in performing the first stage in Heckman (1979). D&O insurance coverage (DOTA) is a continuous variable that is used in executing the second stage in Heckman (1979) and is calculated as the D&O insurance coverage amount divided by total assets.

### **3.2.4. Control Variables**

To improve the internal accuracy of our ramifications and enable the external generalization of the research outcomes, this study includes a wide set of control variables in the regression models by closely following existing literature on the factors of credit ratings (Aman and Nguyen, 2013; Ashbaugh-Skaife *et al.*, 2006; Bhojraj and Sengupta, 2003; Cornaggia *et al.*, 2017; Feki and Walid, 2016; Gray *et al.*, 2006; Lin and Shen, 2015; Liu and Tsai, 2017).

Specifically, we employ (1) DSOWN, the percentage of stock shares held by the directors and supervisors; (2) DSPLED, the ownership-in-pledge ratio of the directors and supervisors; (3) CEO3CH, the number of changes in the CEOs in the three most recent fiscal years (Bills *et al.*, 2017; Dao *et al.*, 2014; Pan *et al.*, 2015; Wells, 2002); (4) CFO3CH, the number of changes in the CFOs in the three most recent fiscal years (Bills *et al.*, 2017; Dao *et al.*, 2014); (5) SIZE, the natural logarithm of total assets; (6) CASH, the sum of cash and short-term investments divided by total assets; (7) LEV, the leverage ratio of total assets divided by total liabilities; (8) BETA, the risk of the market; (9) ROA, the sum of profit after tax plus interest expense divided by total assets; (10) BIG4, a dummy variable that equals 1 if the firm is audited by the top-4 auditing firms, otherwise it equals 0; (11) YEAR and INDUSTRY, the year and industry fixed effects; and (12) IMR, the inverse Mills acquired from the first-step Equation (2) estimation.

Firms with high values of DSOWN have unfavorable credit ratings because of weak shareholder rights, and monitoring could consequently result in inferior credit ratings. Firms with turnovers of CEO3CH and CFO3CH have unfavorable credit ratings because the changes in top management lead to corporate unstableness and high financial information risk. Firms with high values of CASH, SIZE and ROA have favorable credit ratings because firms that hold more cash, are large in size and have high profitability are superior to endure market unpredictability and this results in less default risk. Firms with high DSPLED, BETA, and LEV values have unfavorable credit ratings because of a high possibility of default risk. Firms with BIG4 have favorable credit ratings because BIG4 auditors are more prone to improve their financial reporting by providing high-quality audits of their earnings. Finally, the non-significant IMR may indicate that there is no serious sample selection bias in the D&O insurance purchase decision estimation.

## 4. Sample Description

### 4.1. Sample Selection

Our sample data are collected from different sources. Data on ICW information are hand-collected from IPO/SEO prospectuses from 2008 to 2017. Our sample period starts with 2008 as the publicly listed firms have been urged by the TWSE/TPEX to report the liability insurance contents for D&Os since 2008. IPO/SEO prospectuses are retrieved from the websites of the Market Observation Post System (hereafter MOPS) of TWSE/TPEX since the data are not publicly available in Taiwan. Data on the credit ratings and financial reporting information are taken from the TEJ database. Due to the unique nature of the regulations and requirements, hence, the finance and insurance industries are excluded. We delete firms without providing required data and observations used in the process of estimating variables. This derives a final sample of 3753 observations drawn by 890 firms to examine our hypotheses. Table 2 shows the sample selection procedure of this paper.

Tables 3 and 4 present the distributions of ICW and BUY by rating year and industry, respectively. In Table 3, the percentages for ICW and BUY are 14.60% and 69.62%, respectively. No clustering of samples occurs by year in this study. We find that the proportion of ICW steadily decreases over the rating period. In contrast to the ICW ratio, the percentage for BUY is increasing over the sample years. Given that BUY is increasing while ICW is declining, our preliminary results suggest that our sample firms seek to improve their credit ratings by decreasing the incidence of ICW and buying D&O insurance. In Table 4, the electronics components industry is the biggest industry and accounts for 14.18% (532/3753) of the full sample. The textiles industry has the highest ICWs with a 45.21% (33/73) of the main ICW sample. The purchasing ratio of the cultural creative industry accounts for 97.14% (34/35) of the main D&O insurance sample.

Table 2: Sample Selection Procedure

Selection Procedure	Number of firm years
Observations providing IPO/SEO prospectuses	6366
Less: Observations missing data	
Credit ratings data	1449
D&O insurance data	36
Market risk data	127
Ownership data	675
Financial data	326
Final available observations	3753

Table 3: Sample Distributions by Year (N=3753)

Year	Obs.	ICW	ICW/Obs.	BUY	BUY/Obs.
2008	407	108	26.54%	239	58.72%
2009	419	96	22.91%	250	59.67%
2010	379	71	18.73%	235	62.01%
2011	418	64	15.31%	273	65.31%
2012	425	72	16.94%	302	71.06%
2013	372	45	12.10%	272	73.12%
2014	312	26	8.33%	232	74.36%
2015	359	32	8.91%	273	76.04%
2016	358	22	6.15%	284	79.33%
2017	304	12	3.95%	253	83.22%
Total	3753	548	14.60%	2613	69.62%

Note: ICW is a dummy variable that takes a value of 1 if the firms disclose internal control weaknesses; BUY is a dummy variable, which equals 1 if the firms buy D&O insurance.

Table 4: Sample Distributions by Industry (N=3753)

Code	Category	n	n/N	ICW	ICW/n	BUY	BUY/n
1	Cement	12	0.32%	0	0.00%	6	50.00%
2	Foods	32	0.85%	6	18.75%	24	75.00%
3	Plastics	39	1.04%	5	12.82%	14	35.90%
4	Textiles	73	1.95%	33	45.21%	25	34.25%
5	Electric	130	3.46%	24	18.46%	71	54.62%
6	Wire	16	0.43%	3	18.75%	11	68.75%
8	Glass	7	0.19%	1	14.29%	0	0.00%
9	Paper	17	0.45%	6	35.29%	9	52.94%
10	Steel	94	2.50%	8	8.51%	41	43.62%
11	Rubber	12	0.32%	1	8.33%	9	75.00%
12	Motor	40	1.07%	7	17.50%	18	45.00%

14	Electrical machinery	205	5.46%	89	43.41%	77	37.56%
15	Construction	84	2.24%	5	5.95%	48	57.14%
16	Marine	52	1.39%	8	15.38%	24	46.15%
18	Tourism	57	1.52%	18	31.58%	25	43.86%
20	Department	192	5.12%	37	19.27%	144	75.00%
21	Chemical	69	1.84%	16	23.19%	30	43.48%
22	Biotech	252	6.71%	44	17.46%	192	76.19%
23	Oil	13	0.35%	1	7.69%	0	0.00%
24	Semiconductor	476	12.68%	21	4.41%	405	85.08%
25	Equipment	292	7.78%	19	6.51%	226	77.40%
26	Optoelectronics	365	9.73%	59	16.16%	269	73.70%
27	Communication	254	6.77%	12	4.72%	203	79.92%
28	Components	532	14.18%	78	14.66%	388	72.93%
29	Electronics channel	111	2.96%	16	14.41%	90	81.08%
30	Information service	53	1.41%	2	3.77%	46	86.79%
31	Other electronics	226	6.02%	25	11.06%	174	76.99%
32	Cultural creative	35	0.93%	2	5.71%	34	97.14%
33	Agricultural	2	0.05%	0	0.00%	0	0.00%
34	E-commerce	11	0.29%	2	18.18%	10	90.91%
Total		3753	100.00%	548	14.60%	2613	69.62%

Note: ICW is a dummy variable that takes a value of 1 if the firms disclose internal control weaknesses; BUY is a dummy variable, which equals 1 if the firms buy D&O insurance.

Table 5: Pearson Correlation Matrix (N=3753)

Variable	TCRIEX	ICW	BUY	DOTA	DSOWN	DSPLED	IDDSR	DEVSCR	CEO3CH	FIN3CH	SIZE	CASH	LEV
ICW	0.203 <sup>a</sup>	1											
BUY	-0.126 <sup>a</sup>	-0.145 <sup>a</sup>	1										
DOTA	-0.168 <sup>c</sup>	-0.066 <sup>a</sup>	0.390 <sup>a</sup>	1									
DSOWN	0.067 <sup>a</sup>	0.027	-0.084 <sup>a</sup>	0.101 <sup>a</sup>	1								
DSPLED	0.069 <sup>a</sup>	0.077 <sup>a</sup>	-0.039 <sup>b</sup>	-0.069 <sup>a</sup>	-0.065 <sup>a</sup>	1							
IDDSR	-0.038 <sup>b</sup>	-0.166 <sup>a</sup>	0.292 <sup>a</sup>	0.135 <sup>a</sup>	0.044 <sup>a</sup>	-0.139 <sup>a</sup>	1						
DEVSCR	-0.161 <sup>a</sup>	-0.082 <sup>a</sup>	0.136 <sup>a</sup>	-0.014	-0.174 <sup>a</sup>	-0.043 <sup>a</sup>	0.044 <sup>a</sup>	1					
CEO3CH	0.118 <sup>a</sup>	0.097 <sup>a</sup>	0.004	0.034 <sup>b</sup>	0.063 <sup>a</sup>	0.003	-0.047 <sup>a</sup>	-0.009	1				
FIN3CH	0.119 <sup>a</sup>	0.061 <sup>a</sup>	0.048 <sup>a</sup>	0.060 <sup>a</sup>	0.051 <sup>a</sup>	-0.040 <sup>b</sup>	0.011	-0.048 <sup>a</sup>	0.190 <sup>a</sup>	1			
SIZE	-0.511 <sup>a</sup>	0.001	0.037 <sup>b</sup>	-0.364 <sup>a</sup>	-0.141 <sup>a</sup>	0.136 <sup>a</sup>	-0.170 <sup>a</sup>	0.191 <sup>a</sup>	-0.001	-0.066 <sup>a</sup>	1		
CASH	-0.214 <sup>a</sup>	-0.174 <sup>a</sup>	0.202 <sup>a</sup>	0.248 <sup>a</sup>	-0.019	-0.123 <sup>a</sup>	0.229 <sup>a</sup>	0.073 <sup>a</sup>	-0.037 <sup>b</sup>	-0.006	-0.222 <sup>a</sup>	1	
LEV	0.206 <sup>a</sup>	0.175 <sup>a</sup>	-0.095 <sup>a</sup>	-0.179 <sup>a</sup>	0.045 <sup>a</sup>	0.143 <sup>a</sup>	-0.196 <sup>a</sup>	-0.049 <sup>a</sup>	0.076 <sup>a</sup>	0.008	0.357 <sup>a</sup>	-0.506 <sup>a</sup>	1
BETA	-0.169 <sup>a</sup>	-0.066 <sup>a</sup>	0.163 <sup>a</sup>	-0.021	-0.181 <sup>a</sup>	0.022	0.058 <sup>a</sup>	0.150 <sup>a</sup>	-0.055 <sup>a</sup>	-0.020	0.185 <sup>a</sup>	0.155 <sup>a</sup>	-0.152 <sup>a</sup>
MB	-0.142 <sup>a</sup>	-0.081 <sup>a</sup>	0.083 <sup>a</sup>	0.078 <sup>a</sup>	0.107 <sup>a</sup>	-0.074 <sup>a</sup>	0.141 <sup>a</sup>	-0.036 <sup>b</sup>	-0.019	0.014	-0.089 <sup>a</sup>	0.268 <sup>a</sup>	-0.166 <sup>a</sup>
ROA	-0.499 <sup>a</sup>	-0.104 <sup>a</sup>	-0.006	-0.184 <sup>a</sup>	0.037 <sup>b</sup>	-0.080 <sup>a</sup>	0.074 <sup>a</sup>	-0.021	-0.114 <sup>a</sup>	-0.079 <sup>a</sup>	0.115 <sup>a</sup>	0.198 <sup>a</sup>	-0.164 <sup>a</sup>
DUAL	0.079 <sup>a</sup>	0.006	0.042 <sup>a</sup>	0.014	-0.100 <sup>a</sup>	0.009	0.033 <sup>b</sup>	-0.047 <sup>a</sup>	-0.073 <sup>a</sup>	0.021	-0.095 <sup>a</sup>	0.001	-0.040 <sup>a</sup>
BIG4	-0.195 <sup>a</sup>	-0.223 <sup>a</sup>	0.141 <sup>a</sup>	0.022	-0.006	0.002	0.166 <sup>a</sup>	0.024	-0.021	0.007	0.089 <sup>a</sup>	0.124 <sup>a</sup>	-0.055 <sup>a</sup>
<b>Variable</b>	<b>BETA</b>	<b>MB</b>	<b>ROA</b>	<b>DUAL</b>	<b>BIG4</b>								
BETA	1												
MB	0.100 <sup>a</sup>	1											
ROA	0.042 <sup>b</sup>	0.316 <sup>a</sup>	1										
DUAL	0.004	-0.027	-0.028 <sup>c</sup>	1									
BIG4	0.093 <sup>a</sup>	0.050 <sup>a</sup>	0.063 <sup>a</sup>	-0.090 <sup>a</sup>	1								

Note: The variable definitions are shown in Table 1. Statistical significance at the 1%, 5%, and 10% levels are denoted by <sup>a</sup>, <sup>b</sup>, and <sup>c</sup>, respectively.

To minimize the influence of outliers, all continuous variables are winsorized above and below the 99<sup>th</sup> and 1<sup>st</sup> percentiles. Table 5 provides Pearson correlation matrix of the affiliated variables for TCRIEX. As expected, the Pearson correlation between TCRIEX and ICW (0.203) are significantly positive at the 1% level, implying that ICW disclosures are correlated with unfavorable credit ratings. The coefficients of the Pearson correlations for BUY (-0.126) and DOTA (-0.168) are significantly negative at least at the level of 10%, respectively. These results indicate that firms protected by D&O insurance have better credit ratings. The rest of the variables are almost all significantly correlated with the dependent variable TCRIEX at least at the 10% level, respectively. These associations indicate that all of the expository variables are essential in describing the credit ratings. The variance inflation factors of the explanatory variables in our regressions amount to less than 3, which suggests that our variables might not suffer from severe multicollinearity problems.

#### **4.2. Sample Summary Statistics**

Table 6 provides summary statistics for the variables used in our regression analyses. The results of Panel A in Table 6 report the sample characteristics. In Panel A, the mean of the TCRIEX is 5.810 and indicates that our sample firms are in modest credit risk categories. On average, 59% of the sample firms' credit ratings (TCRIDUM) are larger than or equal to their medium value. The means of ICW and BUY are 0.150 and 0.700, respectively, and imply that approximately 15% of the sample firms disclose internal control weaknesses while 70% of the sample firms purchase D&O insurance. The mean of DOTA is 4.130 and its standard deviation is 6.992, showing little variations across sample firms.

In respect of control variables in Panel A, the means of ownership DSOWN and the ownership-in-pledge ratio DSPLED of the directors and supervisors are 21.301% and 7.365%, respectively. On average, the changes in the CEOs, CEO3CH, and CFOs, CFO3CH, in the three most recent fiscal years are 35% and 37%, respectively. The mean of the firms' assets SIZE is 15.362. The mean of cash and short-term investments to total assets, CASH, is 0.193. On average, the firms' leverage, LEV, and return-on-total assets, ROA, are 42.768% and 4.301%, respectively. The mean of the market risk BETA is 0.914. On average, approximately 90% of the firms' auditors belong to the top-4 auditing firms BIG4. On average, approximately 21% of the directors and supervisors IDDSR are independent. The mean of the deviations of seat control rights from cash flow rights DEVSCR is 5.354. The mean of the market-to-book value MB is 1.907. Finally, approximately 32% of the CEOs also act as chairperson of the board as shown by DUAL.

Panel B compares summary statistics of the TCRIEX and TCRIDUM for both ICW and non-ICW firms. The means of the TCRIEX/TCRIDUM for firms with ICWs are 6.54/0.77 and 5.68/0.56 for those without ICWs, respectively. The differences are significant based on either

the t-test (t value, 12.706/9.172) or Wilcoxon rank-sum test (z value, -11.890/-9.072), lending preliminary support for our first hypothesis H1.

Panel C compares summary statistics of the TCRIEX and TCRIDUM for both purchasers and non-purchasers. The means of the TCRIEX/TCRIDUM for purchasers are 5.68/0.55 and 6.09/0.69 for those non-purchasers, respectively. The differences are significant based on either the t-test (t value, -7.755/-7.619) or Wilcoxon rank-sum test (z value, -7.919/-7.562). The results lend preliminary support for our second hypothesis H2.

Table 6: Summary Statistics (N=3753)

Panel A: Descriptive Statistics					
Variable	Mean	Median	Minimum	Maximum	Std. Dev.
TCRIEX	5.810	6.000	1.000	10.000	1.488
TCRIDUM	0.590	1.000	0.000	1.000	0.491
ICW	0.150	0.000	0.000	1.000	0.353
BUY	0.700	1.000	0.000	1.000	0.460
DOTA	4.130	1.650	0.000	42.000	6.992
DSOWN(%)	21.301	17.770	2.370	64.380	13.377
DSPLED(%)	7.365	0.000	0.000	77.300	15.153
CEO3CH	0.350	0.000	0.000	1.000	0.476
CFO3CH	0.370	0.000	0.000	1.000	0.482
SIZE	15.362	15.136	12.683	19.688	1.405
CASH	0.193	0.158	0.005	0.705	0.141
LEV(%)	42.768	43.520	5.200	80.100	17.253
BETA	0.914	0.925	0.046	1.848	0.384
ROA(%)	4.301	4.600	-24.650	25.310	8.327
BIG4	0.900	1.000	0.000	1.000	0.304
IDDSR	0.210	0.210	0.000	1.000	0.139
DEVSCR	5.354	2.500	0.000	75.000	10.284
MB	1.907	1.520	0.380	9.610	1.470
DUAL	0.320	0.000	0.000	1.000	0.468



Panel B: TCRI by ICW groups				
	ICW=1	ICW=0		
	(N= 548)	(N=3205)		
Variable	Mean	Mean	t-value	z-value for Wilcoxon test
TCRIEX	6.54	5.68	12.706***	-11.890***
TCRIDUM	0.77	0.56	9.172***	-9.072***

  

Panel C: TCRI by BUY groups				
	BUY=1	BUY=0		
	(N= 2613)	(N=1104)		
Variable	Mean	Mean	t-value	z-value for Wilcoxon test
TCRIEX	5.68	6.09	-7.755***	-7.919***
TCRIDUM	0.55	0.69	-7.619***	-7.562***

Notes: The variable definitions are shown in Table 1. Statistical significance at the 1%, 5%, and 10% levels are denoted by \*\*\*, \*\*, and \*, respectively.

## 5. Empirical Results

### 5.1. Internal Control Weaknesses and Credit Ratings

To examine the first hypothesis H1, this study first runs regression model (1). The regression results of the incidence of ICWs on corporate credit ratings are detailed in Table 7. In Columns 1 and 2, the coefficients of ICW are 0.615 and 0.469, respectively. Consistent with the literature (Aman and Nguyen, 2013; Elbannan, 2009) and our prediction that the incidence of ICW disclosure is more likely to lead to higher information asymmetry and is related to less favorable credit ratings. The significantly positive results provided in Table 7 therefore lend support to hypothesis H1 in our study.

With regard to the control variables, the results are largely consistent with prior literature (Aman and Nguyen, 2013; Elbannan, 2009; Lin and Shen, 2015; Liu and Tsai, 2017). In Column 1 of Table 7, DSPLD, CEO3CH, CFO3CH, LEV, and BETA are consistently positive and significant. Specifically, firms with high ownership-in-pledge ratios, those with changes in CEOs and CFOs, and those with higher market risk and leverage tend to be associated with significantly unfavorable credit ratings. On the other hand, DSOWN, SIZE, CASH, ROA, and BIG4 are significantly negative. Specifically, firms with higher levels of ownership by directors and supervisors and those large in size, with more cash holdings, those with superior profitability and those audited by a big4 auditor have more favorable credit ratings. In Column

2 of Table 7, CEO3CH, CFO3CH, LEV, and BETA are positively significant. SIZE, CASH, ROA, and BIG4 are negatively significant. The results are largely consistent with the findings of Column 1.

Table 7: Internal Control Weaknesses and Credit Ratings Regression Results (N=3753)

Variable	TCRIEX (Column 1)		TCRIDUM (Column 2)	
	Coefficient	z-statistic	Coefficient	z-statistic
Intercept			27.121	0.040
ICW	0.615	6.310***	0.469	3.370***
DSOWN	-0.007	-3.020***	-0.007	-1.620
DSPLED	0.015	6.990***	0.005	1.570
CEO3CH	0.231	3.460***	0.405	3.910***
CFO3CH	0.273	4.150***	0.343	3.270***
SIZE	-1.520	-41.150***	-1.021	-17.220***
CASH	-2.447	-8.730***	-5.710	-10.240***
LEV	0.047	19.240***	0.050	12.340***
BETA	0.534	5.780***	0.026	0.170
ROA	-0.130	-28.680***	-0.175	-20.880***
BIG4	-0.654	-6.130***	-0.551	-3.450***
YEAR		Included		Included
INDUSTRY		Included		Included
<i>Pseudo R</i> <sup>2</sup>	0.287		0.425	
<i>LR Chi-Squared</i>	3883.350***		1914.040***	

Note: The variable definitions are identical to those in Table 1. Significance at the 1%, 5%, and 10% levels are denoted by \*\*\*, \*\*, and \*, respectively.

## 5.2. The Moderating Effects of D&O Insurance

To test the moderating effects of D&O insurance on the relationship between ICWs and credit ratings, we then perform Heckman's (1979) two-step regression. Table 8 reports the Heckman two-step regression results of credit ratings sensitivity (TCRIEX and TCRIDUM) on ICW, D&O insurance coverage DOTA, the interaction of these two terms, and other control variables, respectively. In Column 1 of Table 8, the first-step results show that the turnover of

CFOs (CFO3CH), firm size (SIZE) and cash holdings (CASH), market risk (BETA), firm profitability (ROA), firm audited by BIG4 auditor, the ratio of independent directors and supervisors (IDDSR), the deviations of seat control rights from cash flow rights (DEVSCR), market to book ratio (MB), and CEO duality (DUAL) are critical factors of D&O insurance purchase choices for the sample firms.

In the second step, the coefficient of the interaction term  $ICW \times DOTA$  on the TCRIEX in column 2 of Table 8 is -0.011 and is significantly negative at the 5% level. The coefficient of the interaction term  $ICW \times DOTA$  on the TCRIDUM in column 3 of Table 8 is -0.007 and is significantly negative at the 1% level. These findings state that the impacts of ICWs on corporate credit ratings are weaker for firms with more D&O insurance coverage amounts. Therefore, the findings provide empirical evidence to support our hypotheses H2. Furthermore, the coefficient of the interaction term  $ICW \times DOTA$  on the TCRIDUM is more significant than that of TCRIEX (1% level and 5% level, respectively). The findings demonstrate that ICW, DOTA and the interaction term could provide greater explanations for the TCRIDUM than the TCRIEX and imply that a dichotomous classification (TCRIDUM) allows a more easily evaluating of the impacts of ICW and D&O insurance in determining credit ratings.

In Table 8, the regression results for the other control variables in columns 2 and 3 are largely in agreement with the results of Table 7, except for the inverse Mills ratio (IMR) variables that are obtained from estimating Equation (2) and are then added to Equation (3) as an additional variable. The coefficients of the inverse Mills ratio (IMR) in columns 2 and 3 of Table 8 are negative but not significant. These findings provide empirical evidence to support and increase our confidence that the endogeneity bias problems are not serious in our sample.

Table 8: Heckman Two-Stage Regression Results (N=3753)

Variable	BUY <sup>(1st)</sup>	TCRIEX <sup>(2nd)</sup>	TCRIDUM <sup>(2nd)</sup>
	(Column1)	(Column 2)	(Column 3)
	Coefficient	Coefficient	Coefficient
	(z-statistic)	(z-statistic)	(z-statistic)
Intercept	-9.777*** (-14.160)	16.236*** (50.450)	3.655*** (26.310)
ICW		0.403*** (6.120)	0.103*** (3.640)
DOTA		-0.001 (-0.340)	0.001 (0.940)
ICW×DOTA		-0.011** (-2.250)	-0.007*** (-3.130)
DSOWN	-0.003 (-1.420)	-0.003** (-2.320)	-0.001 (-1.460)
DSPLED	0.001 (0.510)	0.008*** (6.680)	0.003*** (5.190)
CEO3CH	0.071 (1.390)	0.090** (2.390)	0.056*** (3.410)
CFO3CH	0.194*** (3.800)	0.151*** (3.980)	0.002 (0.120)
SIZE	0.143*** (6.230)	-0.702*** (-38.500)	-0.197*** (-24.990)
CASH	1.327*** (5.850)	-1.096*** (-6.670)	-0.340*** (-4.790)
LEV	0.002 (0.940)	0.022*** (17.530)	0.004*** (7.140)
BETA	0.247***	0.308***	0.080***

	(3.430)	(5.840)	(3.490)
ROA	-0.012***	-0.059***	-0.016***
	(-3.560)	(-26.490)	(-16.720)
BIG4	0.203***	-0.371***	-0.040
	(2.650)	(-5.120)	(-1.290)
IDDSR	2.382***		
	(11.790)		
DEVSCR	0.029***		
	(2.382)		
MB	0.049**		
	(2.260)		
DUAL	0.115**		
	(2.210)		
IMR		-0.070	-0.083
		(-0.570)	(-1.580)
YEAR	Included	Included	Included
INDUSTRY	Included	Included	Included
Wald Chi-Squared		4490.240	2970.660
Rho		-0.080	-0.218
Sigma		0.877	0.380

Note: The variable definitions are identical to those in Table 1. Significance at the 1%, 5%, and 10% levels are denoted by \*\*\*, \*\*, and \*, respectively.

### 5.3. Sensitivity Tests

We perform a diversity of sensitivity analyses to ensure that the empirical evidence results are robust, which we omit from the tables for brevity. First, we consider three different measures of D&O insurance that are used in model (3): (a) the D&O insurance coverage amounts divided by market value, (b) the D&O insurance coverage amounts divided by numbers of the directors and supervisors, and (c) the natural logarithm of D&O insurance coverage amounts. In untabulated results, similar results are found for the three different definitions of D&O insurance. The results are in line with our expectations and with the notion that D&O insurance coverage affects our results.

Second, we rerun our models (1) and (3) by using future credit ratings to test the impacts of ICW, DOTA, and their interaction term on credit ratings in the subsequent year. The coefficients of ICW on  $TCRIEX_{t+1}$  and  $TCRIDUM_{t+1}$  in the regression model (1) are 0.546 and 0.696, respectively, and are statistically significant in the subsequent year. The findings are similar to the results presented in Table 7 (0.615 and 0.469, respectively) and show that the incidence of ICW also impacts the credit ratings of the subsequent year. Furthermore, the coefficients of the interaction terms  $ICW \times DOTA$  on  $TCRIEX_{t+1}$  and  $TCRIDUM_{t+1}$  in regression model (3) are -0.003 and -0.006, respectively, and are statistically significant in the subsequent year. The findings are similar to the results presented in Table 8 (-0.011 and -0.007, respectively). These findings are partially adhered to the prior regression tables and suggest that the effects of D&O insurance on credit ratings are weaker for ICW firms in the subsequent year.

Third, following the approach adopted by prior research (Chalmers *et al.*, 2002; Core, 2000), we employ excess (abnormal) D&O insurance as an alternative definition of D&O insurance to test the moderating effects of D&O insurance on the relationship between ICWs and credit ratings. Excess D&O insurance coverage is embodied in the residuals from a regression of Equation (2) by using the natural logarithm of coverage amounts as the dependent variable. In untabulated results, the coefficients of the interaction term on the  $TCRIEX$  and  $TCRIDUM$  both are statistically significant (coefficients, -0.067 and -0.016, respectively), and are indicative of better effects than the raw coverage amounts divided by total assets (DOTA) in Table 8. The findings confirm that firms with ICWs intend to increase their insurance coverage by relatively more and purchase excess insurance coverage to obtain more insurance protection (Park, 2018).

Finally, in order to further capture the impact of D&O insurance decision on credit ratings, we divide the full sample into four subgroups hinged on the mix of the indicator variables of ICW and BUY and perform multiple Bonferroni comparisons. The four groups are defined as G1, G2, G3, and G4. The G1 group consists of firms with both ICWs and D&O insurance ( $ICW=1$  &  $BUY=1$ ), the G2 group contains firms with ICWs that do not buy D&O insurance ( $ICW=1$  &  $BUY=0$ ), the G3 group is comprised of firms without ICWs that purchase D&O insurance ( $ICW=0$  &  $BUY=1$ ), and the G4 group is made up of the rest of the sample ( $ICW=0$  &  $BUY=0$ ). Table 9 presents the results of multiple comparisons of credit ratings between the mean values across the groups. In Table 9, the mean differences in credit ratings between different groups are statistically significant. Carrying all other explanatory variables constant, the mean results suggest that that firms moving from the G2 to the G3 group obtain the best credit ratings (Means,  $G2 > G1 > G4 > G3$ ;  $6.64 > 6.45 > 5.93 > 5.59$ ). Table 9 reports the impact of ICW on credit ratings and the effect of D&O insurance on the association between ICW and credit ratings. The findings are consistent with our predictions and with the concept that our results are driven by ICWs and D&O insurance purchase decisions.

Table 9: Multiple Comparisons - Subgroups (N=3,753)

Group	Compared Group	TCRI Mean Diff.
G1 (N=293, Mean=6.45)	G2 (N=255, Mean=6.64)	-0.181
	G3 (N=2,320, Mean=5.59)	0.867***
	G4 (N=885, Mean=5.93)	0.521***
G2 (N=255, Mean=6.64)	G3 (N=2,320, Mean=5.59)	1.049***
	G4 (N=885, Mean=5.93)	0.702***
G3 (N=2,320, Mean=5.59)	G4 (N=885, Mean=5.93)	-0.347***

Note: The full sample is divided into four groups according to the mix of the indicator variables ICW and BUY. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

## 6. Conclusion

This article aims to develop and examine hypotheses regarding the relationship between internal control weaknesses and credit ratings and the impacts of the D&O liability insurance on the association between ICWs and credit ratings. We employ a special hand-collected data set on Taiwanese initial and seasoned equity offering firms for the years 2008-2017. Our study shows that firms with ICWs exhibit less favorable credit ratings compared to those of non-ICW firms. Other than that, the empirical evidence also indicates that the effects of observable litigation risk moderate the diminished role of ICWs in affecting credit ratings by offering protection to shareholders. These empirical results are robust to alternative definitions of D&O liability insurance and credit ratings. Therefore, our results support mandatory D&O purchase policy of the TWSE/TPEX that aims to enhance corporate governance quality. As such, our findings have important management implications for regulators and stakeholders. Additionally, our evidence suggests that ICW and D&O insurance disclosures convey important information and would be useful to investors in assessing the overall risks of the IPO/SEO firms.

An inherent limitation of our paper is the relatively short time period over which we hand-collected data and conducted examinations. Future research might prolong the research time span and gather more observations to further execute the tests. Future study may take into account whether the IPO/SEO firms have involved in litigation of the previous period and highlight the corporate management has transferred litigation risk in whole or in part to insurers by offering D&O insurance coverage. In addition, future research might incorporate more credit ratings determinants and corporate governance mechanisms to further verify our propositions. Finally, researchers are advised to employ alternative regressions due to concerns over endogeneity bias in corporate D&O purchase decisions.

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