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## The Effect of Management Disclosure and Analysis on the Stock Crash Risk: Evidence from Korea

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### Abstract

The purpose of this study is to investigate the effect of quality of management discussion and analysis (MD&A) disclosure on stock price crash risk. The MD&A can be seen to reflect the management's intention on public announcement and reveals directly what the management says to communicate with outside investors. A firm's high-quality MD&A implies the management's commitment to communicating with the market, not allowing the managers to have incentives to hoard unfavorable news, which if revealed to the public, may lead to downward stock price corrections, damaging corporate values. The high-quality MD&A is, thus, likely to reduce the stock price crash risk. We use a logistic regression to test whether MD&A influences crash risk using listed companies in the Korean Stock Exchange (KSE) stock market between 2010 and 2013. Findings of the empirical test show that the higher the quality of MD&A, the less likely crash risk appears, implying that the MD&A disclosed adequately can be one of the factors mitigating firm's stock price crash risk. This study has implications as it presents the MD&A disclosure as a factor influencing stock price crash risk and suggests voluntary disclosure as well as mandatory disclosure acts as a variable that explains the risk of stock price crash.

**Keywords:** Management Disclosure and Analysis, Stock Crash Risk, Capital Market, Korea.

**JEL Classification Code:** D52, G30, M41.

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### 1. Introduction

The purpose of this study is to investigate the effect of the quality of management discussion and analysis (MD&A) disclosure on stock price crash risk. DeFond, Hung, Li, and Li (2015) defined stock price crash risk as "the frequency of extreme negative stock returns." Hutton, Marcus, and Tehranian (2009) regarded stock price changes falling in the lower 0.1% of the distribution of returns as stock price crash risk. Chen, Hong, and Stein (2001) defined stock price crash risk with the negative skewness of the third moment of stock

returns. To sum up, stock price crash risk is a probability of a substantial stock price drop to a region of extremely low returns. Hutton et al. (2009) saw tail risk as stock price crash risk. The tail risk is a concept from a normal distribution of statistics. In a normal distribution, it is the most probable an observed value appears near the mean value, while it becomes less probable the observation appears in a region away from the mean value. The tail risk refers to an event that an observed value is found in a region extremely away from a mean value, namely a risk unlikely to happen and difficult to predict. Stock price crash is normally unlikely to happen and difficult to predict and if happens, results in very low stock returns and ruins investment portfolios, so stock price crash risk is a significant consideration for market participants.

The MD&A provides explanatory and analytic information from a management's point of view, thus offering investors a chance to reflect on the firm and serving as a channel of communication between the firm and investors. It is a source of valuable information necessary to analyze

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financial statements. Since just checking figures and brief explanation of notes in financial statements is not enough for investors to predict firm's future performance and the quality of profits, the MD&A aims to provide an interpretive explanation of financial statements from a management's perspective (Lee et al., 2012). The MD&A is a mandatory section in a business report but can be thought of as voluntary because a firm is allowed to decide its content and form. Firms make a voluntary announcement in diverse ways like investor relations and management forecast. Among diverse notices a firm makes, the MD&A reflects well the management's intention regarding public announcement, namely its will to communicate with the market as it reveals directly the words and writings of the management that tries to communicate with outside investors.

Using MD&A disclosure as the proxy for voluntary disclosure, this study analyzed the effects of the quality of MD&A disclosure on stock price crash risk. According to the agency theory, managers have incentives to delay disclosing adverse information on the firm for such reasons as performance-related compensation contracts and maintenance of reputation (Healy & Palepu, 2001). Since the management is likely to conceal adverse information, such information becomes accumulated over an extended period of time and fails to be reflected in stock prices, allowing the prices to be overvalued. The concealed adverse information, when reaching a threshold level, becomes disclosed to the market, all at once, and the overvalued stock prices in turn crash (Jin & Myers, 2006). The management, which has superior information regarding the firm, seeks to enhance the communication with outside investors by supplying information on firm's intrinsic values to the market through lots of official notices (Healy & Palepu, 1993). Management's efforts for continuous communication with the capital market, therefore, enable official announcements to be published adequately in time in the market, contributing to reducing stock price crash risk. Risk-averse investors are sensitive to a risk and demand higher risk premiums as compensation for an increased risk, which ultimately leads to increase in the cost of capital. Therefore, continuous communication with the market through sufficient official announcement plays an important role to help the capital market operate seamlessly by reducing stock price crash risk and decreasing the cost of capital.

This study has important implications. First, it was found out that MD&A disclosure acts as a determinant of stock price crash risk. Since MD&A disclosure is a significant variable that reflects a management's philosophy on public announcement, the MD&A can serve as a communication channel of the management and when announced adequately, mitigate the firm's stock crash risk. Second, Hutton et al. (2009) used earnings management

(discretionary accruals) as the proxy for negative information hoarding activities and analyzed its relation with stock price crash risk. This study is differentiated as it used the quality of MD&A disclosure, not earnings management. Earnings management is a proxy to measure the quality of firm's mandatory disclosure, whereas MD&A disclosure represents firm's voluntary disclosure. Therefore, findings of this study have meanings as the study viewed voluntary disclosure as a variable that is able to explain the firm's stock price crash risk as well as mandatory disclosure.

## 2. Literature Review and Hypothesis

Hutton et al. (2009) said that high opacity of a firm's financial reporting makes it difficult to use the firm-specific information that influences stock returns. So highly opaque firms come to have a lower volatility of stock returns than the volatility of market returns. Such accumulated firm-specific information, if revealed to the market all at once, is, however, highly likely to recognize extreme returns. In other words, if the unfavorable information that has been concealed to an extreme degree by a firm through earnings management is revealed to the market inevitably, it increases stock price crash risk. The management, which has superior information regarding the firm, seeks to enhance the communication with outside investors by supplying information on firm's intrinsic values to the market through lots of official notices (Healy & Palepu, 1993). Management's efforts for continuous communication with the capital market, therefore, enable official announcements to be published adequately in time in the market, contributing to reducing stock price crash risk. The MD&A provides not only explanatory and analytic information of financial statements but also additional future-oriented inside information that is unlikely to be completely reflected in previous or current financial statements (Park & Lee, 2016). In this sense, the MD&A transforms firm's inside information into outside information and acts as an important means of full disclosure (Scott, 2009). MD&A disclosure can be seen to show the management's will to communicate with the market and perform a positive role in corporate values. Lee and Kim (2014) examined the effect of the quality of MD&A disclosure on the cost of debt and presented empirical evidence that MD&A disclosure can reduce the cost of capital. According to them, MD&A disclosure quality is positively associated with firm's credit ratings and negatively associated with borrowing rates. In addition, Park and Lee (2016) confirmed a positive (+) relationship of MD&A disclosure with the management's predictions on sales, business profits and net profit during

the corresponding period. These studies show MD&A disclosure provides positive information for investors of the capital market although in a limited way. It can be thought that a firm with high-quality MD&A disclosure has the management that values the communication with the market and so the managers have relatively fewer incentives to conceal unfavorable information and ruin corporate values through substantial stock crash, ultimately reducing stock price crash risk. Based on that, a hypothesis is formulated as follows:

**Hypothesis:** High-quality MD&A disclosure of a firm reduces stock price crash risk.

### 3. Research Methods

#### 3.1. Selection of Samples

This study selected enterprises listed in the Korean Stock Exchange (KSE) stock market between 2010 and 2013. We collect data through KIS-Value database provided by NICE Credit Evaluation, Inc. The final sample consisted of 2,056 firm-year observations.

#### 3.2. Measurement of Variables

##### 3.2.1. Measurement of Crash Risk

To measure stock price crash risk, firm-specific weekly returns where impacts of the market are excluded were estimated. To be specific, consistent with the method by Hutton et al. (2009) and by Kim, Li, and Zhang (2011), the following regression (1) was used where the dependent variable is weekly returns on an individual firm's stock  $j$  during the period  $t$  while the independent variable is the value weighted market index during the period  $t$  and during the terms prior to and after that. The reason that the value weighted market indexes during the two prior and two following terms were also included is to estimate firm-specific weekly returns by controlling non-synchronous trading.

$$y_{j,t} = \alpha_0 + \beta_1 y_{m,t-2} + \beta_2 y_{m,t-1} + \beta_3 y_{m,t} + \beta_4 y_{m,t+1} + \beta_5 y_{m,t+2} + \epsilon_{it} \quad (1)$$

In the equation (1), the estimated residuals had a highly skewed distribution, so to make it a roughly symmetrical distribution, 1 was added to the residuals and their algebraic sum was regarded as the firm-specific weekly returns (Hutton et al., 2009; Kim et al., 2011). Based on these firm-

specific weekly returns, whether to experience stock price crash risk or not (CRASH) and the negative conditional skewness of returns were used to measure the stock price crash risk. CRASH, the measure of stock price crash risk, is a dummy variable on stock crash. If any of the firm-specific weekly returns during the year  $t$  is less than the negative (-) of the standard deviation of the distribution of mean weekly returns during the year  $t$ , multiplied by 3.09, the firm was considered to experience stock crash. The CRASH variable was coded 1 if the firm experiences one or more stock price crash or zero otherwise. The 3.09 cutoff was chosen because the frequency of events falling in the lower 0.1% of the distribution of mean weekly returns is extremely low (Hutton et al., 2009; Kim et al., 2011).

##### 3.2.2. Measurement of MD&A

Barron (1999) used the degree of compliance with the SEC's MD&A standards, as rated on a continuous scale by SEC personnel as a proxy of MD&A quality. Lee, Kim, and Chun (2013) measured Korean firms' MD&A disclosure quality by checking the degree of compliance with the MD&A guideline suggested by Korea Financial Supervisory Service and assign MD&A rating. Lee et al. (2013) based their MD&A disclosure score on the information firms provide in 'the management discussion and analysis' and 'other useful information to protect investors' of the annual reports.

The following three measures developed by Lee et al. (2013) as the proxy of the MD&A disclosure quality are used in this study. Lee et al. (2013) constructed detailed checklist of 153 items to measure a cross-sectional MD&A disclosure score. They read the MD&A section of the annual report for each firm and score(code) as '1' if the firm disclosed and '0' otherwise for each 153 item. Through these processes for each of 153 item, they could calculate total score of the firm by the summation of the total number of points awarded to the firm for 153 items and obtained the first proxy of MD&A disclosure quality(TSCORE), which was converted to 1 point scale, for each firm. In measuring TSCORE, they we put the 3 times weight additionally on the items related to the forward looking, such as future operations, capital expenditure, new business plan, uncertainties and risk, and put the 2 times weight on the items related to the interpretative disclosures such as analytical information about prior year's financial performance. To minimize the possibility of the measurement error caused by the arbitrary weighting and scoring method, they obtained the second proxy of MD&A disclosure quality(TSCORE\_NON) by taking no additional weighting on the items related to forward-looking and interpretative disclosures. And the third proxy of MD&A

disclosure quality(TSCORE\_NEW) was measured by the method that the firm which discloses clearly “Not Applicable” for the specific item is taken 1 score to the item on the weight of 1, not 0.5. These three proxies were the qualitative measurements of the MD&A disclosure quality.

### 3.3. Research Model

We use a logistic regression to test whether MD&A influences crash risk as outlined in equation (2) below:

$$\begin{aligned} CRASH_{it+1} &= \beta_0 + \beta_1 TSCORE \text{ or } TSCORE_{NEW} \text{ or } TSCORE_{NON}it \\ &+ \beta_2 DTRUN_{it} + \beta_3 SIGMA_{it} + \beta_4 RET_{it} + \beta_5 MB_{it} \\ &+ \beta_6 LEV_{it} + \beta_7 ROA_{it} + \epsilon_{it} \end{aligned} \quad (2)$$

The dependent variable, Stock Crash Risk engagement, is measured in equation (1) as a dummy variable CRASH. If a firm-year experiences stock crash risk, it takes a value of 1, and otherwise 0. We include control variables that affect CRASH according to the protocol in prior studies (see Table 1).

**Table 1:** Variable Definitions

Variable	Definition
CRASH	= 1 if a firm-year that experiences one or more firm-specific weekly returns falling 3.09 standard deviations below the mean firm-specific weekly returns over the fiscal year, with 3.09 chosen to generate frequencies of 0.1% in the normal distribution, and 0 otherwise.
TSCORE	= total score of the firm by the summation of the total number of points awarded to the firm for 153 MD&A items, which was converted to 1 point scale
TSCORE_NEW, TSCORE_NON	= adjusted TSCORE to minimize the possibility of the measurement error caused by the arbitrary weighting and scoring method
DTURN	= the average of monthly turnover ratio
SIGMA	= the standard deviation of weekly return
RET	= The average weekly return multiplied by 100
MB	= the ratio of the book value to market value
LEV	= the ratio of the total debt to total assets
ROA	= the ratio of the net income to total assets
i, t	= firm, year

## 4. Empirical Results

### 4.1. Descriptive Statistics and Correlation Analysis

The sample includes 2,056 firm-year observations. Table 2 summarizes descriptive statistics of major variables used to test the hypothesis of this study. We winsorize continuous values among the independent variables and dependent variables at the 1% and 99% levels to minimize the effects of outliers. The mean of the independent variable, CRASH, is 0.134, which implies that 13.4% of listed companies in Korea Stock Exchange Market experience stock crash more than once through year.

**Table 2:** Descriptive Statistics(n=2,056)

Variable	Mean	Standard deviation	Minimum	Median	Maximum
CRASH	0.134	0.341	0	0	1
TSCORE	0.143	0.053	0.011	0.14	0.392
TSCORE_NEW	0.147	0.056	0.011	0.144	0.409
TSCORE_NON	0.165	0.059	0.011	0.163	0.434
DTURN	-0.001	0.02	-0.085	0	0.087
SIGMA	0.069	0.009	0.057	0.071	0.079
RET	-0.239	0.057	-0.302	-0.257	-0.163
SIZE	25.651	1.628	23.161	25.303	30.603
MB	2333.19	6239.12	9.629	887.865	50781.4
LEV	0.425	0.204	0.026	0.424	0.932
ROA	0.012	0.099	-0.476	0.027	0.204

Table 3 shows the correlation among variables used in this study. Variable TSCORE, TSCORE\_NEW AND TSCORE\_NON consistent with the hypothesis by showing a significant negative (-) correlation at 1% significance level with CRASH. Correlations among most control variables were less than 0.5, and VIF(Variation Inflation Factor) shows that the multicollinearity problem is minimal.

### 4.2. Multivariate Regression Analysis

Table 4 reports the results of the analysis of the effect of TSCORE which indicates the total score of the firm by the summation of the total number of points awarded to the firm for 153 MD&A items on stock crash risk measured as dummy variable according to the method of Hutton et al. (2009).

The interest factor  $\beta_1$  showing the effect of TSCORE on CRASH is negative and significant at the 5% level ( $\beta_1 = -3.775$ ,  $t = 4.7398$ ). This implies that as the MD&A score in firms increases, stock crash risk increases. These findings provide more support for our hypothesis that an increase in the MD&A score reduces cost asymmetry.

**Table 3:** Pearson's correlation(n=2,056)

	TSCORE	TSCORE_NEW	TSCORE_NON	DTURN	SIGMA	RET	SIZE	MB	LEV	ROA
CRASH	-0.101 (<.001)	-0.106 (<.001)	-0.100 (<.0001)	0.074 (<.001)	0.035 (0.057)	-0.033 (0.073)	-0.154 (<.001)	0.105 (<.001)	0.169 (<.001)	-0.347 (<.001)
TSCORE		0.980 (<.001)	0.982 (<.001)	-0.047 (0.032)	-0.066 (0.002)	0.067 (0.004)	0.280 (<.001)	-0.004 (0.866)	0.094 (<.001)	0.084 (0.001)
TSCORE_NEW			0.963 (<.001)	-0.045 (0.040)	-0.069 (0.001)	0.069 (0.001)	0.280 (<.001)	-0.007 (0.757)	0.089 (<.001)	0.085 (0.001)
TSCORE_NON				-0.040 (0.066)	-0.075 (0.001)	0.075 (0.006)	0.276 (<.001)	-0.008 (0.702)	0.082 (0.002)	0.088 (<.001)
DTURN					0.076 (<.001)	-0.076 (<.001)	0.022 (0.236)	0.027 (0.149)	0.010 (0.575)	-0.009 (0.616)
SIGMA						-1.000 (<.001)	-0.067 (0.003)	0.190 (<.001)	-0.004 (0.814)	0.015 (0.410)
RET							0.065 (0.005)	-0.187 (<.001)	0.003 (0.873)	-0.016 (0.398)
SIZE								0.348 (<.001)	-0.022 (0.244)	0.246 (<.001)
MB									0.045 (0.015)	-0.065 (0.004)
LEV										-0.333 (<.001)

Variable definitions: refer to <Table 1>. Values in parentheses are p-values.

**Table 4:** Effect of TSCORE on Crash Risk

$$CRASH_{it+1} = \beta_0 + \beta_1 TSCORE_{it} + \beta_2 DTRUN_{it} + \beta_3 SIGMA_{it} + \beta_4 RET_{it} + \beta_5 MB_{it} + \beta_6 LEV_{it} + \beta_7 ROA_{it} + \epsilon_{it}$$

Variables	Coefficient	wald $\chi^2$ value
Intercept	-5.616	0.3063
TSCORE	-3.775	4.7398**
DTURN	4.654	1.2982
SIGMA	340.000	1.091
RET	53.900	1.0875
SIZE	-0.302	20.6167***
MB	0.000	13.8481***
LEV	1.873	20.8912***
ROA	-7.019	74.0672***
Industry dummy	Included	
Year dummy	Included	
Likelihood Ratio	261.72***	
Pseudo Adjusted R <sup>2</sup>	0.193	
N	2,056	

Table 5 and 6 reports the results of the analysis of the effect of TSCORE\_NEW and TSCORE\_NON which indicate adjusted TSCORE to minimize the possibility of the measurement error caused by the arbitrary weighting and scoring method on stock crash risk measured as dummy variable according to the method of Hutton et al. (2009).

The interest factor  $\beta_1$  of Table 5 showing the effect of TSCORE\_NON on CRASH is negative and significant at the

5% level ( $\beta_1 = -3.754$ ,  $t = 5.0697$ ). Coefficient of TSCORE\_NON in Table 6,  $\beta_1$  shows negative relationship between TSCORE\_NON and CRASH in the 5% significance level.

This implies that as the MD&A score in firms increases, stock crash risk increases. These findings provide more support for our hypothesis that an increase in the MD&A score reduces cost asymmetry.

**Table 5:** Effect of TSCORE\_NEW on Crash Risk

$$CRASH_{it+1} = \beta_0 + \beta_1 TSCORE_{NEW_{it}} + \beta_2 DTRUN_{it} + \beta_3 SIGMA_{it} + \beta_4 RET_{it} + \beta_5 MB_{it} + \beta_6 LEV_{it} + \beta_7 ROA_{it} + \epsilon_{it}$$

Variables	Coefficient	wald $\chi^2$ value
Intercept	-5.902	0.3373
TSCORE_NEW	-3.754	5.0697**
DTURN	4.645	1.2959
SIGMA	347.500	1.137
RET	55.143	1.1353
SIZE	-0.298	20.0907***
MB	0.000	13.5666***
LEV	1.874	20.8806***
ROA	-7.002	73.6276***
Industry dummy	Included	
Year dummy	Included	
Likelihood Ratio	262.09***	
Pseudo Adjusted R <sup>2</sup>	0.193	
N	2,056	



**Table 6:** Effect of TSCORE\_NON on Crash Risk

$CRASH_{it+1} = \beta_0 + \beta_1 TSCORE_{NONit} + \beta_2 DTRUN_{it} + \beta_3 SIGMA_{it} + \beta_4 RET_{it} + \beta_5 MB_{it} + \beta_6 LEV_{it} + \beta_7 ROA_{it} + \epsilon_{it}$		
Variables	Coefficient	wald $\chi^2$ value
Intercept	-5.182	0.2619
TSCORE_NON	-3.210	4.533**
DTURN	4.752	1.3575
SIGMA	328.200	1.0198
RET	52.057	1.0178
SIZE	-0.304	21.0908***
MB	0.000	14.0925***
LEV	1.858	20.6434***
ROA	-7.023	74.1594***
Industry dummy	Included	
Year dummy	Included	
Likelihood Ratio	261.53***	
Pseudo Adjusted R <sup>2</sup>	0.193	
N	2,056	

## 5. Conclusions

This study investigated the effect of the quality of MD&A disclosure on firms' stock price crash risk. The findings of the empirical research showed that the quality of MD&A disclosure is negatively (-) related with stock price crash risk, implying that MD&A disclosure performs an important role as a determinant of stock crash risk. This study has important implications because it was found MD&A disclosure is a significant variable to reflect a management's philosophy on public announcement and that the MD&A can serve as a communication channel of the management and when announced adequately, mitigate the firm's stock crash risk. In addition, firm's voluntary disclosure was presented as a variable that is able to explain stock price crash risk as well as mandatory disclosure.

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