GROUP-AFFILIATED ANALYSTS AND FUTURE STOCK PRICE CRASH RISK: EVIDENCE FROM KOREA

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ABSTRACT

Based on the governance role of analysts and bad news hoarding theory of stock crash risk, this study examines the effect of group-affiliated analyst following on subsequent stock price crash risk using non-financial firms listed in the Korea Stock Exchange market, by focusing governance role of analysts as one of the main cause of the crash risk. In particular, we explore if subsequent stock price crash risk is affected when analysts are hired by a securities firm within a business group (chaebol) and the earnings forecast is for an affiliate of that business group. It is meaningful to investigate determinants of the crash risk which has significant influence on going concern and sustainable growth of the firm, specifically in emerging countries such as Korea. The regression results show that group-affiliated analysts help a firm lower its stock price crash risk by utilizing their sufficient source of internal information to effectively monitor managers and discourage them from hiding bad news.

Keywords: Analyst Following, Group-Affiliated Analysts, Large Business Group, Stock Price Crash Risk.

INTRODUCTION

This study aims to examine the relationship between group-affiliated analyst following and future stock price crash risk. We focus on investigating how financial analysts who serve as the information intermediary in the capital market also perform external corporate governance functions to provide effective monitoring of managers and, ultimately, how such role influences the capital market. Particularly, we explore if subsequent stock price crash risk is affected when analysts are hired by a securities firm within a business group (chaebol) and the earnings forecast is for an affiliate of that business group using special research setting in Korea. Such focus was motivated by the existing accounting academic research which suggested that analysts play critical roles on firm's sustainability (Yu, 2008; Chen et al., 2015), anecdotal evidence, and the bad news hoarding theory of stock price crash risk (Jin & Myers, 2006; Hutton et al., 2009; Kim et al., 2011a).

When the accumulated negative information about the firm crosses a certain threshold, the excessive negative information would unexpectedly penetrate the capital market as bad news, causing a stock price crash (Hutton et al., 2009). This sudden stock price crash can cause significant losses to investors who make reasonable investment decisions based on accessible corporate information. Hence, investors, regulators, and policy makers have shown an increasing interest in the determinants of stock price crash risk, and in fact, many studies have explored them on several levels (Jin & Myers, 2006; Hutton et al., 2009; Kim et al., 2011a; Hamm et al., 2013; Xu et al., 2013; Jo, Moon & Choi, 2015; Kim & Zhang, 2016). In addition, anecdotal evidence of managerial bad news hoarding in listed firms is available. A case in point is Enron, a

company that concealed the possession of money-losing assets for quite some time using special-purpose vehicles before it went bankrupt due to unsustainable losses arising from the assets (Powers et al., 2002). In line with this view, it is important to analyze the factors of stock price crash risk which would have substantial impact on doubt on going concern. However, most of these previous studies primarily focused on specific factors at the firm or industry level, and only a few considered external factors as the determinants. Therefore, we focus on the role of analysts, especially group-affiliated analysts, on corporate sustainability as one of the main causes of the crash risks.

In a separate strand of the literature, Yu (2008) concluded that in the case of the US capital market, the more analyst coverage, the less earnings manipulation by managers. In Yu's (2008) study, he explained that the analysts track their company's financial statements on a regular basis by using their financial expertise and substantial industry background knowledge and raise questions on company's earnings numbers. In this way, they conduct external corporate governance roles to monitor managers in an effective manner. In another study by Chen et al. (2015), they stated that when analyst coverage increases in a firm, the firm's shareholders expand cash holdings and its CEO receives less compensation, thus eventually lowering agency problems within the firm. On the basis of these previous findings, we aim to confirm whether the existence of analysts and their forecast activity contribute to lowering stock price crash risk, assuming they play a role in external corporate governance that effectively prevents management from hiding bad news. In general, analysts in South Korea are known to have limited roles compared with others in advanced foreign capital markets such as the US market. Although certain criticisms exist about the role of analysts, we see the evidence that they play a positive role in monitoring managers.

The Korean capital market has a considerably unique form of an economic entity called large business group, which is also known as chaebol, such as Samsung, LG, and SK. On the influence of chaebol on Korea's capital market, there are conflicting views; some literature suggest that chaebol have been conducive to corporate development by carrying out efficient management activities based on ample funds (Shin & Park, 1999; Khanna, 2000; Khanna & Yafeh, 2005) whereas others argue that they hinder the firm's sustainable growth due to canonical adherence, circulating contribution, and agency problems arising from conflicts between major shareholders and minority shareholders (Johnson et al., 2000; Bertrand et al., 2002; Baek et al., 2006). In this context, it is meaningful to look at the impact of the role of group-affiliated analysts, which are associated with chaebol among financial analysts, on crash risk, ultimately survival of firms and soundness of capital markets. In fact, as of 2015, earnings forecast issued by analysts affiliated with certain business groups was reported to represent 40% of all forecast information. According to Chung et al. (2006), these business group-affiliated analysts have more access to corporate information compared with non-affiliated analysts because of certain economic relationships within their business group. If group-affiliated analysts would monitor managers on the basis of such internal information, managers would be less likely to withhold bad news because they would know the analysts already have a sufficient amount of information to see what is going on within the firm. Thus, analyst coverage would reduce stock price crash risk by addressing the firm's information opaqueness regarding bad news as long as analysts effectively perform the external corporate governance functions.

Meanwhile, other studies suggest earnings forecasts and recommendations issued by group-affiliated analysts tend to be more positive and favorable than those by non-affiliated analysts (Francis & Philbrick, 1993; Dugar & Nathan, 1995; Lin & McNichols, 1998). In the

case of Korean business groups, each affiliate within a group is a separate legal entity, however economically, they are closely associated in diverse aspects and thus act as a single economic entity. Therefore, for group-affiliated analysts, conducting earnings forecast of a firm affiliated with the same business group is almost synonymous with conducting an internal forecast. Under such circumstances, group-affiliated analysts tend to put a positive spin on earnings forecasts and recommendations for a firm within the same business group because of certain economic relationships within the group (Jeong et al., 2006). Given these conflicting views, it is reasonable to expect that group-affiliated analysts would have either positive or negative consequences on firm's future stock price crash risk. In other words, we expect that group-affiliated analysts may have two competing reporting incentives: (1) group-affiliated analysts would utilize their internal information to effectively monitor managers and provide more accurate earnings forecast, thereby leading to a lower stock price crash risk; (2) group-affiliated analysts may provide more optimistic earnings forecast and favorable opinions for an affiliated companies, ultimately increase stock price crash risk. Although much literature on the issue of analyst coverage and stock price crash risk is available, only a few paid attentions to how group-affiliated analysts would affect the possibility of a firm's future stock price crash.

We conducted our empirical analysis by examining 6,355 firm-year observations listed on KOSPI and KOSDAQ from 2000 to 2015 using two primary measures for future stock price crash risk following the prior literature (Chen et al., 2001; Hutton et al., 2009). Our analysis reveals a significant negative association between group-affiliated analyst coverage and future stock price crash risk, implying that group-affiliated analysts help a firm lower its stock price crash risk by utilizing their sufficient source of internal information to effectively monitor managers and discourage them from hiding bad news. We also find that the negative relationship between group-affiliated analyst following and crash risk is more evident in the firms with lower managerial ownership. Furthermore, we find that the association between group-affiliated analyst following and crash risk strengthened in the firms with a low level of information asymmetry. In addition, our empirical results are robust to Heckman's (1979) two-stage selection model.

This study contributes to the extant literature in many ways. First, to our knowledge, no study has been previously conducted to assess the association between group-affiliated analyst following and subsequent stock price crash risk in Korea. Thus, we believe that our empirical results shed light on how group-affiliated analysts following influences stock price crash risk. In this respect, this study complements the previous studies with new evidence that a specific environment an affiliation with a business group would affect analyst forecasts and, eventually, stock price crash risk. Second, this study extends the findings of Yu (2008) and Chen et al. (2015) by presenting those group-affiliated analysts conduct an effective governance role with their sufficient internal information. We provide that the understanding of potential external governance role of the group-affiliated analysts, which can be significant in mitigating bad news hoarding of managers, ultimately reduce the subsequent stock price crash risk. Third, we extend the previous research on the determinants of stock price crash risk with an empirical finding that group-affiliated analyst following contributes to lowering stock price crash risk. Specifically, our study is different from previous studies because none of them examined the effect of group-affiliated analysts following, which is one of the external corporate governance factors on stock price crash risk. Thus, this paper complements the evidence of previous Korean research on stock price crash risk.

The remainder of this paper is organized as follows. The literature review and hypotheses development section reviews prior research and develops our hypotheses, and the research

Model section provides the sample and research models. Moreover, the empirical analyses section shows the results of our empirical analyses, whereas the additional analyses section provides the results of our collaborating analyses and several robustness tests. Finally, the conclusion is presented.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Stock Price Crash Risk

Firm-specific stock price crash refers to an event in which stock prices descend rapidly because of the sudden release of excessive negative information when bad news accumulates within companies and reaches a certain threshold (Jin & Myers, 2006; Hutton et al., 2009). The determinants of stock price crash risk have been identified as internal and external factors.

Some previous studies have found stock price crash determinants inside companies. Kim et al. (2011b) showed that tax avoidance, which provides managers with a means to conceal negative information, increases stock price crash. Kim & Zhang (2016) presented the relationship between conditional conservatism and firm-level stock price crash. Their results showed that stock price crash risk decreases as the degree of conservative accounting policies increases, and this relationship is stronger in an environment with large information asymmetry as measured by R&D costs, industrial competitiveness, and financial analysts' numbers. Hutton et al. (2009) studied the effect of the quality of financial statements on crash risk by using discretionary accruals as a proxy for corporate opacity; their empirical result documented that firms with more opaque financial reporting are more prone to have a higher risk of stock price crash. Hamm et al. (2013) showed a positive relationship between earnings guidance and stock price crash risk, which suggests that earnings guidance, is more opportunistic rather than informative. Other studies especially focus on managerial characteristics as internal determinants of stock price crash risk. Kim et al. (2016) examined that overconfident CEOs are more likely to experience stock price crashes, indicating their tendency to overestimate future cash flow from a project, misinterpret investments with negative net present value as incremental investments, and ignore negative feedback. Andreou et al. (2017) explored the relationship between CEO's age and stock price crash risks and showed that firms with younger CEOs are more likely to be associated with stock price crashes. This finding implies that CEOs have incentives to hoard bad news earlier in their career, ultimately increasing the crash risk. Park & Jung (2017) reported the negative association between the CEO's ability and crash risks, indicating that the managers with higher ability release more voluntary disclosure, thereby ultimately lowering the future crash risk.

Some researchers have focused on the external monitoring of institutional investor and financial analysts as an external governance mechanism that can have an impact on crash risks. Callen & Fang (2013) presented evidence that institutional investor stability is negatively associated with subsequent stock price crash risk, implying that institutional investors play monitoring and supervising roles. Xu et al. (2013), using the Chinese database as an emerging market, showed that the larger the firm's analyst coverage, the higher the crash risk. As financial analysts in the emerging markets provide more optimistic earnings forecasts and general market information, insufficient firm-specific information can lead to an increase in price crash.

To the best of our knowledge, no studies have been conducted yet that directly focus on the impact of group-affiliated analysts on stock price crash risk as a governance mechanism. Therefore, this study focuses on the role of group-affiliated analyst as a determinant that influences stock price crash risk.

Group-affiliated Analysts

Financial analysts serve as the information intermediaries between firms and investors by collecting firms' corporate information, analyzing it with diverse methodologies, and providing timely and accurate analysis results to investors. At the same time, analysts play a monitoring role within a firm (Healy & Palepu, 2001; Yu, 2008; Chen et al., 2015). According to previous studies, analysts generally have superior ability to forecast future earnings (Brown & Rozeff, 1978), and investors tend to make investment decisions based on the information provided by the financial analysts (Stickel, 1995; Barber et al., 2001). Given that analysts help reduce the firms' capital cost by addressing information asymmetry, researchers have actively discussed the factors that contribute to the improvement of analysts' forecast accuracy. Many studies investigate the association between forecast accuracy and analyst affiliation, and the empirical results are mixed. Furthermore, some studies explain that when analysts have a certain affiliation with their research targets, they are likely to issue optimistic forecast and investment recommendations. On the contrary, others suggest that the accuracy of analysts' forecast and recommendations may improve because they are motivated to maintain their professional reputation and compensation by issuing accurate corporate information. Although analysts can be affiliated with a firm in diverse ways, it is important to pay attention to a specific form of affiliation, which is the affiliation with a business group. In South Korea, a unique form of the business group is called Chaebol. What makes Chaebol different from business groups in other countries is that financial subsidiaries, such as securities and insurance firms, may be owned within the group, and the parent of such subsidiaries does not have to be a financial company. Considering that the Monopoly Regulation and Fair Trade Act provides the definition of a business group as a group of companies whose economic interests are substantially connected, we may reasonably conclude that business group-affiliated analysts are subject to an economic motivation when they analyze the group's affiliates, particularly when analysts are employed by a securities firm in a business group and they issue forecast for an affiliate of their employer. A good example is the analysts from Samsung Securities providing earnings forecast and investment advice on Samsung Electronics. According to some researchers, these group-affiliated analysts may issue more accurate forecasts compared with non-affiliated independent analysts because they have easier access to internal information of their research targets (Dugar & Nathan, 1995; Cowen et al., 2006; Jacob et al., 2008). Meanwhile, the accuracy of analysts' forecast has been found to depend on many factors, including analysts' experience, ability, and task complexity concerns and the environmental factors associated with their securities firm (Mikhail et al., 1997; Clement, 1999; Jacob et al., 1999). For example, analysts from large securities firms are more likely to issue accurate earnings forecast because competent analysts are concentrated in large securities firms that have sufficient resources to conduct an analysis compared with small and medium-sized securities firms. Kwak & Mo (2019) suggest that group-affiliated analysts issue more accurate and less optimistic earnings forecasts for the affiliated firms when the level of information asymmetry is low. By contrast, the group-affiliated analysts may issue more optimistic earnings forecast because of certain interests inherent within a business group. Lim & Jung (2012) and Song et al. (2012) indicate that group-affiliated analysts are more likely to issue optimistic earnings forecasts and positive investment recommendations for a firm within their business group than the non-affiliated ones.

Prior research extensively focuses on the benefits of analysts, however, only a few studies focus on the direct association between analyst affiliations and economic consequences for investors and the capital markets. As information intermediaries, analysts play important

roles in monitoring the management (Yu, 2008; Chen et al., 2015); however, it would be interesting to explore the group-affiliated analysts' influence on stock price crash risk with respect to their role in monitoring management's reporting choices that might hoard bad news. In addition, given that financial analysts in emerging markets tend to provide more market-wide information than entity-specific information (Chan & Hameed, 2006), it is suggested that research on the impact of analysts on stock price crash risk needs to be conducted in countries with different capital market characteristics.

Hypothesis Development

When making earnings forecast, analysts refer to all publicly available information and even internal information of research targets. For most investors, undisclosed internal information is only indirectly accessible through information intermediaries such as analysts (Healy & Palepu, 2001). In this respect, we can say that analysts play an important role as information intermediaries in the capital market. Meanwhile, managers and employees in the same business group may actively share internal information about firms within the business group through group-wide communication channels, internal media, and their close personal ties (Lim & Jung, 2012), and analysts hired by a securities firm of a business group may easily obtain internal information about the group's affiliates. In this exclusive environment, analysts can better understand the affiliated firms' business practice and their overall business operation, identify each firm's specific risks more effectively, and improve the accuracy of their earnings forecast. Considering that information intermediaries such as analysts and rating agencies help detect managers' misconduct in certain firms in the course of analyzing their internal information (Healy & Palepu, 2001), business group-affiliated analysts will enhance the quality of financial information by monitoring managers and constraining their earnings manipulation as long as they function well as information intermediaries and perform effective corporate governance functions (Yu, 2008). This will make managers hard to withhold bad news about their firms from the capital market; thus, we can deduce that firms' future stock price crash risk is likely to be mitigated. In this case, group-affiliated analysts following is negatively related to future stock price crash risk, as they effectively conduct the governance role and monitor the managers' bad news hoarding behavior promptly. For this reason, we propose the following hypothesis:

H1a: Group-affiliated analysts following is negatively associated with subsequent stock price crash risk.

By contrast, several studies indicate that analysts who have certain interests in their research targets are likely to put a positive spin on their earnings forecast and stock recommendations. For instance, Francis & Philbrick (1993) explained that analysts tend to issue optimistic earnings forecast with the aim of maintaining good relations with managers of their research firms in order for them to have better access to internal information. Similarly, Dugar & Nathan (1995) and Lin & McNichols (1998) found that when analysts' employer is associated with their research targets through an underwriting relationship, they are more inclined to issue favorable research reports than non-affiliated analysts. To sum up, business group-affiliated analysts have a tendency to issue positive earnings forecast and stock recommendations because of economic interests between firms within a business group (Lim & Jung, 2012; Song et al., 2012). On the basis of these findings, we can assume that if analysts continue to provide inaccurately biased information, outside information users are not likely to be notified of the bad news about the business group firms in a timely manner. Given that firms experience a stock

price crash when accumulated bad news crosses a certain tipping point and all the negative information is released into the market at once (Jin & Myers, 2006; Hutton et al., 2009), we may reasonably expect that group-affiliated analyst following will lead to a stock price crash. Hence, we proposed the following hypothesis:

H1b: Group-affiliated analysts following is positively associated with subsequent stock price crash risk.

RESEARCH MODEL

Sample and Data

The sample consists of companies covered by analysts and listed on KOSPI and KOSDAQ for periods between 2000 and 2015[1], and a total of 6,355 firm-years were used. We collected the financial data from TS-2000 and KIS-Value, whereas the data on stock return and analyst following were collected from DataGuidePro. We then identified the group affiliations by using the list of business groups distributed by the Korea Fair Trade Commission[2]. Financial institutions, firms with the fiscal year ended other than December, and companies with missing data were excluded for consistency of the sample. All continuous variables are winsorized at top and bottom one-percentile of the pooled data to mitigate influential extreme observations and possible data error. Table 1 shows the sample distribution by year, industry. Panel A in Table 1 shows the sample distribution and mean value of one year ahead stock crash risk measures ($NCSKEW_{t+1}$ and $DUVOL_{t+1}$) by year. One year ahead stock price crash risk measures are highest in 2007, which reflects the financial crisis in 2008. Panel B in Table 1 presents the industry distribution of the sample. Most companies (61.64%) are in the manufacturing industry.

Table 1
SAMPLE DISTRIBUTION BY YEAR AND INDUSTRY

Panel A. Sample distribution by year				
Year	Frequency	Percent (%)	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
2000	250	3.93	-0.337	-0.186
2001	274	4.31	-0.381	-0.197
2002	261	4.11	-0.463	-0.249
2003	243	3.82	-0.405	-0.2
2004	266	4.19	-0.468	-0.261
2005	361	5.68	-0.293	-0.16
2006	397	6.25	-0.401	-0.212
2007	432	6.8	-0.113	-0.071
2008	424	6.67	-0.479	-0.256
2009	495	7.79	-0.445	-0.24
2010	512	8.06	-0.346	-0.194
2011	398	6.26	-0.215	-0.132
2012	288	4.53	-0.143	-0.09
2013	482	7.58	-0.255	-0.146
2014	596	9.38	-0.353	-0.205
2015	676	10.64	-0.323	-0.169
Total	6,355	100	-0.339	-0.186
Panel B. Sample distribution by industry				
Industry			Frequency	Percent (%)
Agriculture, forestry, and fishing			22	0.35
Manufacturing			3917	61.64

Table 1 SAMPLE DISTRIBUTION BY YEAR AND INDUSTRY		
Electricity, gas, steam, and water supply	77	1.21
Sewage, waste management, and materials recovery	9	0.14
Construction	282	4.44
Wholesale and retail trade	433	6.81
Transportation	138	2.17
Accommodation and food service activities	2	0.03
Information and communication	538	8.47
Real estate activities	805	12.67
Professional, scientific, and technical activities	55	0.87
Public administration and defense; compulsory social security	33	0.52
Human health and social work activities	44	0.69
Total	6,355	100

Measurement of Stock Price Crash Risk

This study examines the relationship between group-affiliated analyst following and future stock price crash risk. To investigate this relationship, we used two primary measures of firm-specific stock price crash risk for each firm-year observation, following the previous studies (Chen et al., 2001; Hutton et al., 2009): (1) the negative coefficient of skewness of firm-specific daily returns (*NCSKEW*) and (2) the down-to-up volatility of firm-specific daily returns (*DUVOL*).

Specifically, we first estimated the firm-specific weekly returns using the following expanded market model regression (Hutton et al., 2009):

$$\gamma_{i,t} = \beta_0 + \beta_{1,t}\gamma_{m,t-2} + \beta_{2,t}\gamma_{m,t-1} + \beta_{3,t}\gamma_{m,t} + \beta_{4,t}\gamma_{m,t+1} + \beta_{5,t}\gamma_{m,t+2} + \beta_{6,t}\gamma_{k,t-2} + \beta_{7,t}\gamma_{k,t-1} + \beta_{8,t}\gamma_{k,t+1} + \beta_{9,t}\gamma_{k,t+2} + \epsilon_{i,t} \tag{1}$$

where $r_{i,t}$ is the return on stock i in week t, $r_{m,t}$ is the return on the KOSPI or KOSDAQ value-weighted market index in week t, and $r_{k,t}$ is the return on the value-weighted industry index based on two-digit the Korean Standard Industrial Classification codes. Lead and lag variables for the market index are included to allow for non-synchronous trading (Dimson, 1979). We defined the firm-specific weekly return for firm i in week t ($W_{i,t}$) as the natural logarithm of 1 plus the residual return in Equation (1), that is, $W_{i,t} = \ln[1+\epsilon_{i,t}]^3$.

Our first measure of firm-specific stock price crash risk, *NCSKEW*, is computed as the negative of the third moment of firm-specific weekly returns each sample year and divided by the standard deviation of firm-specific weekly returns raised to the third power. Thus, for each firm i in year t, *NCSKEW* is computed as

$$NCSKEW_{i,t} = -[n(n-1)^{\frac{3}{2}}\sum W_{i,t}^3 / [(n-1)(n-2)(\sum W_{i,t}^2)^{3/2}] \tag{2}$$

where $W_{i,t}$ is firm-specific weekly return as defined above and n is observation numbers of firm-specific returns during the fiscal year t. A negative sign is placed in front of the third moment such that a larger value of *NCSKEW* signifies greater crash risk.

The second measure of firm-specific crash risk is called the down-to-up volatility measure (*DUVOL*).

$$DUVOL_{i,t} = \log\{(n_u - 1)\sum_{down}^{W_{i,t}^2} / (n_d - 1)\sum_{up}^{W_{i,t}^2}\} \tag{3}$$

where n_u and n_d are the number of up and down weeks in year t, respectively. A higher value of *DUVOL* corresponds to a higher stock price crash risk. More specifically, for each firm i over a fiscal-year period t, we separated all the weeks with firm-specific weekly returns into two groups: when the returns are below (above) the annual mean, they are called ''down'' (''up'') weeks. We further computed the standard deviation for the two predefined groups separately. We then calculated the natural logarithm of the ratio of the standard deviation of the "down" weeks to the standard deviation in the ''up'' weeks.

Empirical Methodology and Variable Definitions

To test the effect of group-affiliated analyst following on future stock price crash risk, we estimated the following model (4):

$$CRASH_{i,t+1} = \beta_0 + \beta_1\, GAGF_{i,t} + \beta_2\, SIZE_{i,t} + \beta_3\, MB_{i,t} + \beta_4\, ROA_{i,t} + \beta_5\, TRADING_{i,t} + \beta_6\, MNRET_{i,t}$$
$$+ \beta_7 STDRET_{i,t} + \beta_8 BETA_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} OPAQUE_{i,t} + \beta_{11} BIG4_{i,t} + \beta_{12} COVERAGE_{i,t} \quad (4)$$

where *NCSKEW* is the negative skewness of firm-specific weekly returns, *DUVOL* is the log of the ratio of the standard deviations of down-week to up-week firm-specific weekly returns, and *GAGF* is the number of group-affiliated analyst following of company ''i'' (affiliate of that business group) in year ''t''[4]. Furthermore, *SIZE* is the logarithm of total assets value of a firm, and *MB* is the market value of equity divided by the book value of equity. *ROA* denotes return on assets to measure the firms' performance, and *TRADING* denotes increment in monthly turnover rate year on year. *MNRET* and *STDRET* denote the arithmetic average and standard deviation of firm-specific weekly returns, respectively. *BETA* represents the beta index of the market model during the previous 60 months, *LEV* is the firm leverage measures as the ratio of total liabilities to total asset, and *OPAQUE* denotes the 3-year moving sum of the absolute value of annual performance-adjusted discretionary accruals. *BIG4* is the indicator variable for hiring Big 4 audit firms, and *COVERAGE* is the number of analyst following of company ''i'' in year ''t''.

$NCSKEW_{t+1}$ and $DUVOL_{t+1}$ are used as a dependent variable $CRASH_{t+1}$, and the number of group-affiliated analyst following ($GAGF_t$) is applied as a main independent variable for testing hypothesis.

The following set of control variables are included in the model as they have been shown to affect subsequent stock price crash risk based on the previous studies (Chen et al., 2001; Hutton et al., 2009; Callen and Fang, 2013, 2015): $SIZE_t$, MB_t, ROA_t, $TRADING_t$, $MNRET_t$, $STDRET_t$, $BETA_t$, LEV_t, $OPAQUE_t$, $BIG4_t$, $COVERAGE_t$, $NCSKEW_t$, $DUVOL_t$, Year Dummy, and Industry Dummy.

$SIZE_t$, which was calculated by the logarithm of total assets value of a firm in year t, was included in the model to control for size effect because the size of companies has a significantly positive effect on stock price crash risk (Chen et al., 2001). The future prospect for growth has a positive relation with stock price crash risk (Kim et al., 2014); therefore, MB_t was controlled in the model. Hutton et al. (2009) showed that operating performance is positively related to stock price crash risk; thus, the profitability measured by return on asset (ROA_t) was included in the model. $TRADING_t$ is a proxy for the disagreement among investor opinions, which is defined as the increment in monthly share turnover rate year on year in the fiscal year t. Higher *TRADING* values, which implies a larger difference in opinions amongst investors, have a positive effect on the risk of stock price crash (Chen et al., 2008) and was therefore included in

the model. *STDRET* $_t$ and *MNRET* $_t$ are defined as the standard deviation and arithmetic average of firm-specific weekly returns in year t, respectively. A higher past mean return increases future stock price crash risk (Chen et al., 2001); therefore, *MNRET* $_t$ were controlled. To control systematic risk, *BETA* $_t$ was included in the model (Jo et al., 2015). Financial leverage has a positive effect on stock price crash risk (Kim et al., 2014); hence, *LEV* $_t$ was included in the model. *OPAQUE* $_t$, the three-year moving sum of the absolute value of discretionary accruals, can be used as a proxy for financial reporting opacity and was included in the model because of the positive relation with stock price crash risk (Hutton et al., 2009). The companies hiring the Big 4 audit firms have a lower stock price crash risk (Jo et al., 2015), and *BIG4* $_t$ was thus controlled. Analyst following has a positive or negative effect on stock price crash risk (Xu et al., 2013; Bae et al., 2016); hence, *COVERAGE* $_t$ was included in our model. *CRASH* $_t$ was included because *CRASH* $_t$ has a positive relation with future *CRASH* measures (Kim et al., 2016). Lastly, year and industry indicators are included to control for time and industry fixed effects.

EMPIRICAL ANALYSES

Descriptive Statistics

Table 2 shows the descriptive statistics of the variables used in our model. The mean (median) value of *NCSKEW* $_{t+1}$ and *DUVOL* $_{t+1}$, subsequent stock price crash risk measures, are −0.334 (−0.307) and −0.184 (−0.185), respectively. These values are similar to the mean (median) value found in the study of Bae et al. (2016) that used Korean firms' data. The mean (median) value of *GAGF* $_t$, the number of group-affiliated analyst following for a company within the same business group, is 0.053 (0.000). The mean (median) value of *SIZE* $_t$, which is measured by the logarithm of total assets value of a firm, and the mean (median) value of *MB* $_t$, which is the ratio of market value to book value, are 19.707 (19.392) and 1.478 (1.081), respectively. In the sample, the market value of equity is greater than the book value of equity. The mean (median) value of *ROA* $_t$, which indicates return on assets, is 0.043(0.046). The mean (median) value of *TRADING* $_t$, which is the increment in monthly turnover rate year on year, is -0.001 (-0.000). The mean (median) value of *MNRET* $_t$ and *STDRET* $_t$ are −0.001 (−0.002) and 0.057 (0.054), respectively, which are similar to the estimates found in the study of Park and Jung (2017). The mean (median) value of *LEV* $_t$, the ratio of total liabilities to total asset, is 0.414 (0.419). The mean (median) value of *OPAQUE* $_t$, the sum of discretionary accruals over the previous 3 years, is 0.158 (0.131). The mean (median) value of *BIG4* $_t$, an indicator for hiring BIG4 audit firm, is 0.632 (1.000), which implies that 63.2% of the sample hires BIG4 audit firms. The mean (median) value of *COVERAGE* $_t$, the number of analyst following, is 7.594 (4.000), which indicates about 7.6 analysts forecast earnings for a company, which is comparable with the value reported by Bae et al. (2016).

Table 3 reports the Pearson correlation coefficients for the variables that are used in our model. *NCKEW* $_{t+1}$ and *DUVOL* $_{t+1}$ are highly correlated with each other, and this result is similar to that of Chen et al. (2001). *GAGF* $_t$ and *COVERAGE* $_t$ have a significantly positive relation with *NCKEW* $_{t+1}$ and *DUVOL* $_{t+1}$, implying that the higher the group-affiliated analyst following or analyst following, the more likely the firm will experience subsequent stock price crash risk. Some correlations between variables are similar with the predicted signs based on the previous studies, but other correlations are not the same with the predicted ones. However, *NCSKEW* $_{t+1}$ and *DUVOL* $_{t+1}$ are reported to have a significant correlation with other controlled variables set in the empirical model; hence, drawing a definitive conclusion on the hypothesis is limited.

Therefore, the results of the final empirical analysis are reported in the following section on the basis of the multivariate regression analysis.

Variables	Mean	Std. Dev.	25%	MED.	75%	Min	Max
$NCSKEW_{t+1}$	−0.334	0.743	−0.711	−0.307	0.065	−5.571	4.586
$DUVOL_{t+1}$	−0.184	0.344	−0.410	−0.185	0.037	−1.605	1.925
$GAGF_t$	0.053	0.272	0	0	0	0	3.000
$SIZE_t$	19.707	1.580	18.514	19.392	20.605	16.592	24.711
MB_t	1.478	1.377	0.666	1.081	1.792	−0.248	11.859
ROA_t	0.043	0.125	0.015	0.046	0.083	−3.478	3.364
$TRADING_t$	−0.001	0.023	−0.003	−0.000	0.002	−0.207	0.265
$MNRET_t$	−0.001	0.008	−0.006	−0.002	0.003	−0.030	0.027
$STDRET_t$	0.057	0.020	0.043	0.054	0.068	0.020	0.154
$BETA_t$	0.909	0.411	0.629	0.907	1.190	−0.148	2.019
LEV_t	0.414	0.193	0.260	0.419	0.561	0.017	1.038
$OPAQUE_t$	0.158	0.119	0.079	0.131	0.210	0	0.889
$BIG4_t$	0.632	0.482	0	1.000	1.000	0	1.000
$COVERAGE_t$	7.594	8.645	1.000	4.000	11.000	1.000	42.000

Table 2
DESCRIPTIVE STATISTICS OF MAIN VARIABLES

Note: All variables are winsorized at top and bottom one-percentile of the pooled data.

Table 3
PEARSON CORRELATION COEFFICIENTS BETWEEN VARIABLES ANALYZED

	$NSKEW_{t+1}$	$DUVOL_{t+1}$	$GAGF_t$	$SIZE_t$	MB_t	ROA_t	$TRADING_t$
$NSKEW_{t+1}$	1.000	0.949***	0.033***	0.165***	0.104***	0.038***	0.012
$DUVOL_{t+1}$		1.000	0.032**	0.170***	0.106***	0.040***	0.015
$GAGF_t$			1.000	0.292***	0.043***	0.016	0.009
$SIZE_t$				1.000	−0.084**	0.023*	0.005
MB_t					1.000	0.036***	0.049***
ROA_t						1.000	−0.019
$TRADING_t$							1.000
$MNRET_t$							
$STDRET_t$							
$BETA_t$							
LEV_t							
$OPAQUE_t$							
$BIG4_t$							
$COVERAGE_t$							
	$MNRET_t$	$STDRET_t$	$BETA_t$	LEV_t	$OPAQUE_t$	$BIG4_t$	$COVERAGE_t$
$NSKEW_{t+1}$	0.060***	−0.095***	−0.008	0.020	−0.048***	0.065***	0.158***
$DUVOL_{t+1}$	0.061***	−0.106***	−0.014	0.011	−0.053***	0.070***	0.165***
$GAGF_t$	0.004	−0.091***	0.073***	0.060***	−0.058***	0.126***	0.340***
$SIZE_t$	−0.009	−0.334***	0.067***	0.289***	−0.201***	0.354***	0.663***
MB_t	0.225***	0.186***	0.193***	−0.006	0.111***	0.044***	0.118***
ROA_t	0.171***	−0.143***	−0.064***	−0.261***	−0.003	0.024*	0.092***
$TRADING_t$	0.163***	0.100***	−0.022*	0.009	−0.011	0.017	-0.008
$MNRET_t$	1.000	0.169***	0.286***	0.152***	0.181***	−0.202***	0.010
$STDRET_t$		1.000	0.003	−0.007	−0.013	−0.012	-0.218***
$BETA_t$			1.000	0.112***	0.166***	0.053***	0.124***
LEV_t				1.000	0.021*	0.029**	0.063***
$OPAQUE_t$					1.000	−0.041***	-0.086***
$BIG4_t$						1.000	0.250***

COVERAGE t							1.000

Note: ***, **, and * denote significance levels (two-tailed) of 1%, 5%, and 10% or less, respectively.

Regression Analysis Results

Table 4 presents our multivariate analysis result on whether the subsequent stock price crash risk is impacted by the group-affiliated analyst following. The coefficient estimates on *GAGF $_t$* in columns (1) and (2) are −0.069 and −0.037, which are significant at 10% and 5%, respectively. This result indicates that group-affiliated analysts effectively play the role of monitoring the managers' reporting choices within the same business group and preventing the bad news hoarding with sufficient internal information, thereby ultimately reducing subsequent stock crash risk.

Turning to the control variables, we also find that coefficient on *SIZE $_t$*, *MB $_t$*, and *MNRET $_t$* are significantly positive, which is consistent with the findings of Chen et al. (2001). The coefficients on *BETA $_t$*, which represents a linear correlation between the stock returns and the market returns of the firm, and *STDRET $_t$*, which denotes the overall volatility that does not separate the rise and fall of stock return, have significantly negative coefficients, similar to the findings of Lee & Choi (2017); this finding is opposite to Chen et al. (2001)'s finding possibly because of the different sample market. *COVERAGE $_t$* has a positive relation with future stock price crash risk, which is consistent with the findings of Xu et al. (2013). Analysts in emerging market tend to provide more market-wide information than firm-specific information (Chan & Hameed, 2006); thus, Xu et al. (2013) predicted and found that analyst coverage has a positive relation with stock price crash risk. Considering that Korea is still regarded as an emerging market, this positive relationship between *COVERAGE $_t$* and *CRASH $_{t+1}$* could be considered plausible. *NCSKEW $_t$* and *DUVOL $_t$* have positive coefficients, indicating that price crash risk is generally persistent.

ADDITIONAL ANALYSIS

Effect of Internal Governance Mechanism on the Relationship between Group-affiliated Analysts Following and Stock Price Crash Risk: Subsample Analysis by the Managerial Ownership

In Table 4, we provide evidence that group-affiliated analysts tend to play an external governance role effectively to monitor managers' behavior as demonstrated in a reduced stock price crash risk. In this section, we specifically investigate the role of internal governance mechanism in the association between group-affiliated analysts and subsequent stock price crash risk by dividing the sample by the percentage of managerial ownership.

Some studies (Mak, 1991; Eng & Mak, 2003) showed a significant negative relationship between managerial ownership and the level of disclosure because of weaker pressure for disclosure. As managerial ownership increases to align the interests of shareholders and managers, there would be less agency problem between them (Jensen & Meckling, 1976), which reduces the need for supervising the management and ends up compromising the level of disclosure.

Table 4
RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP-AFFILIATED ANALYSTS ($GAGF_t$) ON STOCK PRICE CRASH RISK ($NCSKEW_{t+1}$ and $DUVOL_{t+1}$).

$$CRASH_{i,t+1} = \beta_0 + \beta_1\,GAGF_{i,t} + \beta_2\,SIZE_{i,t} + \beta_3\,MB_{i,t} + \beta_4\,ROA_{i,t} + \beta_5\,TRADING_{i,t} + \beta_6\,MNRET_{i,t} + \beta_7\,STDRET_{i,t}$$
$$+ \beta_8\,BETA_{i,t} + \beta_9\,LEV_{i,t} + \beta_{10}\,OPAQUE_{i,t} + \beta_{11}\,BIG4_{i,t} + \beta_{12}\,COVERAGE_{i,t} + \beta_{13}\,CRASH_{i,t}$$
$$+ YEAR\ DUMMY + INDUSTRY\ DUMMY$$

Dep Var=	(1) $NCSKEW_{t+1}$ Coefficient (t-statistics)	(2) $DUVOL_{t+1}$ Coefficient (t-statistics)
Intercept	−0.663*** (-2.89)	−0.292*** (-2.76)
GAGF $_t$	−0.069* (-1.94)	−0.037** (-2.26)
SIZE $_t$	0.033*** (3.30)	0.016*** (3.43)
MB $_t$	0.048*** (6.00)	0.022*** (6.06)
ROA $_t$	−0.014 (-0.18)	−0.014 (-0.40)
TRADING $_t$	0.294 (0.74)	0.184 (1.00)
MNRET $_t$	6.420*** (4.89)	3.387*** (5.58)
STDRET $_t$	−2.088*** (-3.44)	−1.182*** (-4.24)
BETA $_t$	−0.061** (-2.31)	−0.029** (-2.42)
LEV $_t$	−0.015 (-0.27)	−0.023 (-0.88)
OPAQUE $_t$	−0.053 (-0.64)	−0.023 (-0.62)
BIG4 $_t$	−0.009 (-0.41)	−0.004 (-0.39)
COVERAGE $_t$	0.009*** (5.33)	0.004*** (5.45)
NSKEW(DUVOL) $_t$	0.049*** (3.44)	0.056*** (4.18)
Year	Fixed	
Industry	Fixed	
Adjusted R^2	0.070	0.081
No. of samples	6,355	

Note: ***, **, and * denote significance levels (two-tailed) of 1%, 5%, and 10% or less, respectively.

Sepasi et al. (2016) discovered that managerial ownership has a significant negative effect on disclosure quality. In this case, group-affiliated analysts are able to play an effective governance role by using more sufficient internal information in monitoring managers, preventing bad news hoarding of managers, and reducing stock price crash risk in the firm with higher managerial ownership. By contrast, another study Nagar et al. (2003) presents that in cases where managers with higher ownership are more strongly motivated to maximize corporate values, they publicly disseminate their information to the market. In other words, there would be more room for group-affiliated analysts to conduct a governance role to monitor manager's behavior in the firms with lower managerial ownership as bad news is more likely to be withheld in this situation. In line with this view, group-affiliated analysts are negatively related to future stock price crash risk when the firm has a lower percentage of managerial ownership.

We classify the sample firms into two subsamples on the basis of percentage of managerial ownership, namely the "Low" (below median) group and the "High" group (above median), and then re-run the regression model. As shown in columns (1) and (2) in Table 5, the coefficient of $GAGF_t$ is significantly negative for the firms with low managerial ownership (LOW), whereas the coefficient for firms with high managerial ownership (HIGH) is insignificant. This finding suggests that managers with lower ownership have incentives not to disclose their information to the market because of the high agency problem, and group-affiliated analysts might perform effective corporate governance function for companies with low managerial ownership, thereby ultimately reducing subsequent stock price crash risk.

Table 5
RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP-AFFILIATED ANALYSTS (*GAGF $_t$*) ON STOCK PRICE CRASH RISK (HIGH MANAGERIAL OWNERSHIP VS. LOW MANAGERIAL OWNERSHIP).

	High		Low	
Dep Var=	(1) NCSKEW $_{t+1}$ *Coefficient (t-statistics)*	(2) DUVOL $_{t+1}$ *Coefficient (t-statistics)*	(1) NCSKEW $_{t+1}$ *Coefficient (t-statistics)*	(2) DUVOL $_{t+1}$ *Coefficient (t-statistics)*
Intercept	−0.861** (-2.43)	−0.391** (-2.41)	−0.501 (-1.50)	−0.210 (-1.36)
GAGF $_t$	0.001 (0.01)	0.002 (0.03)	−0.070* (-1.73)	−0.039** (-2.10)
SIZE $_t$	0.055*** (3.55)	0.027*** (3.77)	0.019 (1.25)	0.008 (1.23)
MB $_t$	0.046*** (3.95)	0.019*** (3.65)	0.047*** (4.09)	0.024*** (4.47)
ROA $_t$	0.093 (0.81)	0.047 (0.91)	−0.094 (-0.78)	−0.051 (-0.91)
TRADING $_t$	0.364 (0.71)	0.293 (1.26)	−0.057 (-0.08)	−0.059 (-0.19)
MNRET $_t$	6.154*** (3.34)	3.320*** (3.91)	7.051*** (3.58)	3.482*** (3.83)
STDRET $_t$	−1.373 (-1.54)	−0.846** (-2.08)	−3.140*** (-3.52)	−1.668*** (-4.08)
BETA $_t$	−0.034 (-0.91)	−0.014 (-0.84)	−0.083** (-2.13)	−0.040** (-2.21)
LEV $_t$	−0.058 (-0.74)	−0.036 (-1.01)	0.056 (0.66)	0.003 (0.07)
OPAQUE $_t$	−0.059 (-0.52)	−0.023 (-0.45)	−0.059 (-0.46)	−0.024 (-0.41)
BIG4 $_t$	−0.002 (-0.07)	0.001 (0.05)	−0.009 (-0.26)	−0.003 (-0.19)
COVERAGE $_t$	0.010*** (3.80)	0.005*** (4.10)	0.009*** (3.68)	0.004*** (3.76)
NSKEW (DUVOL) $_t$	0.039* (1.90)	0.039** (2.01)	0.048** (2.35)	0.061*** (3.16)
Year	Fixed		Fixed	
Industry	Fixed		Fixed	
Adjusted R^2	0.068	0.079	0.065	0.079
No. of samples	3,069		3,060	

Note: ***, **, and * denote significance levels (two-tailed) at 1%, 5%, and 10% or less, respectively.

Subsample Analysis by the Level of Information Asymmetry

Kwak & Mo (2019) investigated whether the issuance of optimistic earnings forecasts by the affiliated analysts strategically occurred according to the level of information asymmetry. The result shows that the group-affiliated analysts issue more accurate and less optimistic earnings forecasts for the affiliated firms when the level of information asymmetry is low. Under the circumstance that the level of information asymmetry is low, the act of optimistic bias in an analysts' forecasts would be easily detected by the investors. In this case, although group-affiliated analysts cannot conduct an information intermediary role, they would still be able to provide an effective governance role by monitoring the managers to enhance their quality of earnings forecast. Consequently, their reputation is maintained with more accurate forecasts, resulting in reduced subsequent crash risk. Therefore, we expect that the negative relationship between group-affiliated analysts following and future stock price crash risk is pronounced for the firm with low information asymmetry. By contrast, many studies have shown that the analysts reduce information asymmetry by providing public information to market participants (Yohn, 1998; Frankel & Li, 2004). Furthermore, Lobo et al. (2012) showed that analyst coverage is associated with a decrease in accrual quality and an increase in information asymmetry. This finding suggests that investors have a higher demand for financial analysts' services when there is more information asymmetry. In line with this view, the group-affiliated analyst is able to play an effective role in reducing stock price crash risk with their sufficient internal information for the firms with high information asymmetry. To test these conjectures, we divide the sample firms

into two subsamples on the basis of whether the firm's level of information asymmetry proxied by stock return volatility is lower than the sample median. As shown in Table 6, the coefficient of *GAGF $_t$* is significantly negative only for the firm with low information asymmetry (LOW). This result indicates that group-affiliated analysts provide effective governance function by monitoring the manager's behavior and preventing the delay of bad news, thereby cutting the crash risk for the firms with low information asymmetry.

Table 6 RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP-AFFILIATED ANALYSTS (*GAGF $_t$*) ON STOCK PRICE CRASH RISK (HIGH INFORMATION ASYMMETRY VS. LOW INFORMATION ASYMMETRY).				
	High		Low	
Dep Var=	(1) NCSKEW $_{t+1}$ *Coefficient (t-statistics)*	(2) DUVOL $_{t+1}$ *Coefficient (t-statistics)*	(1) NCSKEW $_{t+1}$ *Coefficient (t-statistics)*	(2) DUVOL $_{t+1}$ *Coefficient (t-statistics)*
Intercept	−0.169 (-0.52)	−0.053 (-0.35)	−1.336*** (-3.99)	−0.620*** (-3.97)
GAGF $_t$	−0.041 (-0.66)	−0.023 (-0.82)	−0.073* (-1.66)	−0.038* (-1.86)
SIZE $_t$	0.017 (1.15)	0.008 (1.21)	0.056*** (3.90)	0.026*** (3.86)
MB $_t$	0.039*** (3.80)	0.017*** (3.68)	0.070*** (5.08)	0.034*** (5.30)
ROA $_t$	−0.031 (-0.36)	−0.021 (-0.55)	0.128 (0.57)	0.051 (0.48)
TRADING $_t$	0.510 (1.16)	0.241 (1.21)	−1.082 (-0.98)	−0.265 (-0.51)
MNRET $_t$	5.588*** (3.35)	3.023*** (3.96)	8.371*** (3.72)	4.619*** (4.39)
STDRET $_t$	−2.463*** (-2.78)	−1.242*** (-3.11)	−0.688 (-0.44)	−0.325 (-0.45)
BETA $_t$	−0.054 (-1.49)	−0.023 (-1.36)	−0.086* (-1.89)	−0.039* (-1.82)
LEV $_t$	0.060 (0.75)	0.006 (0.17)	−0.109 (-1.31)	−0.055 (-1.41)
OPAQUE $_t$	−0.048 (-0.44)	−0.015 (-0.31)	−0.091 (-0.69)	−0.048 (-0.79)
BIG4 $_t$	0.005 (0.17)	−0.004 (0.32)	−0.026 (-0.83)	−0.015 (-1.06)
COVERAGE $_t$	0.011*** (4.14)	0.005*** (4.46)	0.006** (2.48)	0.003** (2.41)
NSKEW(DUVOL) $_t$	0.053*** (2.78)	0.061*** (3.30)	0.035 (1.63)	0.043** (2.21)
Year	Fixed		Fixed	
Industry	Fixed		Fixed	
Adjusted R^2	0.058	0.067	0.078	0.086
No. of samples	3,175		3,180	

Note: ***, ** and, * denote the significance level (two-tailed) at 1%, 5%, and 10% or less, respectively.

Exclusion of Confounding Effect of the 2008 Financial Crisis

Our sample includes the 2008 financial crisis, so there may be a confounding effect of the results. Hence, to exclude the confounding effect, we exclude the year 2008 samples and re-run our analysis[5]. As shown in columns (1) and (2) in Table 7, the coefficient on *GAGF $_t$* is significantly negative, which is consistent with that of our main result in Table 4.

Table 7 RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP-AFFILIATED ANALYSTS (*GAGF $_T$*) ON STOCK PRICE CRASH RISK (EXCLUSION OF THE YEAR 2008).		
Dep Var=	(1) NCSKEW $_{t+1}$ *Coefficient (t-statistics)*	(2) DUVOL $_{t+1}$ *Coefficient (t-statistics)*
Intercept	−0.663*** (-2.75)	−0.296*** (-2.68)
GAGF $_t$	−0.061* (-1.65)	−0.033* (-1.95)
SIZE $_t$	0.033*** (3.12)	0.016*** (3.35)
MB $_t$	0.048*** (5.94)	0.022*** (6.00)

Table 7 RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP-AFFILIATED ANALYSTS ($GAGF_T$) ON STOCK PRICE CRASH RISK (EXCLUSION OF THE YEAR 2008).		
ROA_t	−0.002 (-0.02)	−0.009 (-0.25)
TRADING_t	0.221 (0.53)	0.148 (0.77)
MNRET_t	6.435*** (4.71)	3.286*** (5.21)
STDRET_t	−2.154*** (-3.40)	−1.194*** (-4.12)
BETA_t	−0.062** (-2.29)	−0.031** (-2.47)
LEV_t	−0.012 (-0.20)	−0.022 (-0.83)
OPAQUE_t	−0.068 (-0.77)	−0.031 (-0.77)
BIG4_t	−0.012 (-0.50)	−0.005 (-0.50)
COVERAGE_t	0.009*** (5.08)	0.004*** (5.11)
NSKEW(DUVOL)_t	0.046*** (3.10)	0.055*** (3.92)
Year	Fixed	
Industry	Fixed	
Adjusted R^2	0.067	0.078
No. of samples	5,931	

Note: ***, ** and, * denote the significance level (two-tailed) at 1%, 5%, and 10% or less, respectively.

Endogeneity Consideration

One concern for our empirical analysis is reverse causality. We assume that the governance role of group-affiliated analysts influences crash risk. However, one may argue that group-affiliated analysts are less likely to cover the firm with high crash risk. In our regressions, in order to address the reverse causality issue, the independent variables are lagged by one year relative to the measures of stock price crash risk. We also control for lagged crash risk ($NCSKEW_t$ and $DUVOL_t$) in the regression.

As an additional robustness check, we conduct the Heckman (1979) two-stage least squares (2SLS) regression analysis to mitigate potential endogeneity problem. In the first stage, we employed various variables that could affect analyst coverage following previous papers (Yu, 2008; Chun & Shin, 2018; Mo & Lee, 2019) and conducted the analysis. The first stage regression model is as follows.

$$GAGF_{i,t} = \beta_0 + \beta_1 MV_{i,t} + \beta_2 ROA_{i,t} + \beta_3 GROWTH_{i,t} + \beta_4 STDOCF_{i,t} + \beta_5 FINANCING_{i,t} + \beta_6 INDMEANAC_{i,t} + \beta_7 KOSPI200_{i,t} + YEAR\ DUMMY + INDUSTRY\ DUMMY \quad (5)$$

where $GAGF$ is the number of group-affiliated analyst following of company "i" (affiliate of that business group) in year "t". Furthermore, MV is the market value of a firm, and ROA denotes return on assets to measure the firms' performance. $GROWTH$ is the growth rate of assets and $STDOCF$ denotes standard deviations of operating cash flow scaled by assets. $FINANCING$ represents net cash proceeds from equity and debt financing scaled by total assets, $INDMEANAC$ is the industry mean value of analyst coverage for firms in the same industry as company "i" in year "t", and $KOSPI200$ is indicator variable for KOSPI200 firms. In the second-stage regression, the residuals from the first-stage regression is included as independent variables of interest. The results of the first and second step regressions are illustrated in Table 8. The results show that the group-affiliated analyst following are negatively and significantly associated with crash risk. The results corroborate that our empirical results are robust to endogeneity concerns.

Table 8
RESULTS OF MULTIVARIATE REGRESSION ANALYSIS OF THE EFFECT OF GROUP AFFILIATED ANALYSTS (GAGF T) ON STOCK PRICE CRASH RISK WITH TWO-STAGE LEAST SQUARES (2SLS) REGRESSION

Panel A. Regression result of first stage

$$GAGF_{i,t} = \beta_0 + \beta_1\ MV_{i,t} + \beta_2\ ROA_{i,t} + \beta_3\ GROWTH_{i,t} + \beta_4\ STDOCF_{i,t} + \beta_5\ FINANCING_{i,t} + \beta_6\ INDMEANAC_{i,t} + \beta_7\ KOSPI200_{i,t} + YEAR\ DUMMY + INDUSTRY\ DUMMY$$

Dep Var=	GAGF
	Coefficient (t-statistics)
Intercept	-0.144 (-2.98)
MV $_t$	0.023*** (2.83)
ROA $_t$	-0.000(-0.02)
GROWTH $_t$	0.001 (0.10)
STDOCF $_t$	0.149* (1.85)
FINANCING $_t$	-0.014** (-2.30)
INDMEANAC $_t$	0.004 (1.26)
KOSPI200 $_t$	0.171*** (18.84)
Year	Fixed
Industry	Fixed
Adjusted R^2	0.109
# of Samples	6,355

Panel B. Regression result of second stage

$$CRASH_{i,t+1} = \beta_0 + \beta_1\ RES\_GAGF_{i,t} + \beta_2\ SIZE_{i,t} + \beta_3\ MB_{i,t} + \beta_4\ ROA_{i,t} + \beta_5\ TRADING_{i,t} + \beta_6\ MNRET_{i,t} + \beta_7 STDRET_{i,t} + \beta_8 BETA_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} OPAQUE_{i,t} + \beta_{11} BIG4_{i,t} + \beta_{12} COVERAGE_{i,t} + \beta_{13} CRASH_{i,t} + YEAR\ DUMMY + INDUSTRY\ DUMMY$$

Dep Var=	(1) NCSKEW $_{t+1}$	(2) DUVOL $_{t+1}$
	Coefficient (t-statistics)	*Coefficient (t-statistics)*
Intercept	-0.928*** (-3.39)	-0.416** (-3.30)
RES_GAGF $_t$	-0.361** (-2.01)	-0.171** (-2.07)
SIZE $_t$	0.046*** (3.73)	0.022*** (3.84)
MB $_t$	0.051*** (6.27)	0.024*** (6.30)
ROA $_t$	-0.011 (-0.14)	-0.013 (-0.36)
TRADING $_t$	0.264 (0.66)	0.166 (0.91)
MNRET $_t$	6.388*** (4.86)	3.256*** (5.39)
STDRET $_t$	-1.988*** (-3.27)	-1.139*** (-4.07)
BETA $_t$	-0.066** (-2.51)	-0.032*** (-2.69)
LEV $_t$	-0.029 (-0.52)	-0.032 (-1.21)
OPAQUE $_t$	-0.052 (-0.63)	-0.024 (-0.64)
BIG4 $_t$	-0.007 (-0.34)	-0.003 (-0.31)
COVERAGE $_t$	0.009*** (5.20)	0.004*** (5.37)
NSKEW(DUVOL) $_t$	0.049*** (3.46)	0.025*** (3.86)
Year	Fixed	
Industry	Fixed	
Adjusted R^2	0.069	0.080
# of Samples	6,355	

Note: ***, ** and * denote the significance level (two-tailed) at 1%, 5% and 10% or less, respectively.

CONCLUSION

This study examines the relationship between group-affiliated analyst coverage and stock price crash risk by utilizing 6,355 observations of KOSPI and KOSDAQ listed firms over the period from 2000 to 2015. The Korean capital market has a unique form of family-run

conglomerate economic entity called a business group, which is also known as chaebol. On the basis of the findings of Yu (2008) and Chen et al. (2015), this study explores how subsequent stock price crash risk is affected when analysts are hired by a securities firm within a business group known as group-affiliated analysts who have external corporate governance functions to monitor managers and prevent bad news hoarding behaviors. We find that there is a significantly negative relationship between group-affiliated analyst following and subsequent stock price crash. The result reveals that group-affiliated analysts with sufficient internal information effectively play the governance role over managers, thereby reducing one-year-ahead stock price crash risk. The results are robust with several additional tests.

Our study not only contributes to the group-affiliated analyst literature but also to the emerging stock price crash risk literature. Despite increasing attention to the issue of analyst coverage, there is remarkably little empirical research on how group-affiliated analysts would affect the possibility of a firm's future stock price crash by conducting their governance role. We focus on the unique role of group-affiliated analyst following as one of the factors of crash risk enhancing the corporate sustainability and provide the evidence of the effect of large business group, that is, chaebol, on the stock price crash risk. This study clarifies the effectiveness of the group-affiliated analysts' corporate governance role in monitoring management actions and the impact of group-affiliated analyst coverage on subsequent stock price crash risk in Korea's stock market.

ENDNOTE

1. Regulation Fair Disclosure (Reg. FD, hereafter), which was adopted in November 2002 in Korea, requires companies to disclose material private information to all market participants and prohibits selective disclosure of important information. To exclude the effect of Reg. FD on the activities of group-affiliated analysts, we performed the regression analysis using the sample from 2002 to 2015 and the results are qualitatively similar (untabulated).
2. According to the Korea Fair Trade Commission, a collection of companies that functions as one economic entity with a common source of control such as a single controlling shareholder, his/her relatives, or their affiliated companies owning more than 30% of the total equity value of the company is defined as a business group. In addition, companies with total assets of at least 5 trillion Korean Won (KRW) are designated as a large business group.
3. The residuals from Equation (1) is highly skewed; hence, the logarithm transformation is performed to obtain a more symmetric distribution (Hutton et al., 2009).
4. We performed the sensitivity test including the dummy variable for group-affiliated analyst (GAGF_D) in model (4) and the results are consistent with the results using GAGF variable (untabulated).
5. Additionally, we separated our sample into two sub-periods, for the fiscal years of 2002–2007 and 2009–2014, and replicate our analyses for the sub-period; the regression analyses present similar results (untabulated).

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