Article

Earnings Management of Insolvent Firms and the Prediction of Corporate Defaults via Discretionary Accruals

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Abstract: Studies on the characteristics of insolvent firms' earnings management are critical, as the ripple effects of a firm's opportunistic accounting and insolvency on society can be widespread and significant. This study divides a dataset of unlisted firms into four groups (large firms that have received external audits; small- and medium-sized enterprises (SMEs) that received external audits; SMES that did not receive external audits; private businesses that did not receive external audits) and analyzes whether there are differences in terms of the discretionary accruals between groups. This study also uses discrete time logit regression to determine if the use of discretionary accruals is predictive of whether unlisted firms would become insolvent. This study used several models (a modified Jones model, a Kothari model, and performance matching model by ROA group) to measure discretionary accruals, which was used as a proxy for earnings management. The results of our study showed that, in the one year prior to insolvency, discretionary accruals were largest among non-externally audited private firms, followed by those of non-externally audited SMEs, externally audited SMEs, and externally audited large firms. The discretionary accruals of non-insolvent firms were larger than those of insolvent firms from the period of one year to three years preceding insolvency, and this difference increased as insolvency approached. The discretionary accruals were shown to have the ability to predict whether or not firms would become insolvent in two to three years before the occurrence of insolvency, but they did not support prediction for one year before the occurrence of insolvency. The findings suggest that additional accounting information should be used together to predict insolvency for unlisted firms.

Keywords: unlisted firms; discretionary accruals; insolvent firms; earnings management

1. Introduction

Insolvency does not necessarily represent the end of a business's life, as even an insolvent business may still attract new investors or obtain fresh loans. Insolvent businesses that have not declared bankruptcy may take advantage of these opportunities and impose a high social cost, in the form of losses to stakeholders. In many cases, this is unproblematic, but in situations where the 'rescue' of an insolvent business is predicated on fraudulent accounting, the absorption of these costs by third parties is egregious. Research into earnings management at insolvent firms can prevent creditor losses by identifying whether an insolvent firm's accounting information has been manipulated or is unreliable in advance. Such research would also help policy-making bodies establish more efficient and effective accounting policies. In addition, these studies can also provide auditors with the knowledge that they should conduct audits with greater attention for insolvent firms.

It is particularly important that such studies are performed in countries like South Korea, where accounting information is regarded as less reliable than that of advanced countries (Oh 2016; Lee and Hong 2017). In South Korea, high-profile insolvency and

fraudulent accounting cases for large firms, such as Daewoo Shipbuilding & Marine Engineering Co. Ltd., which is located in Geoje-si, South Korea, highlighted the significant ripple effects that such events can have across society. Studying the characteristics of earnings management at insolvent firms is necessary to avoid and mitigate such outcomes. Further, we used the sample of Korean firms in response to the demand for the study of insolvent firms. South Korea is well-placed to examine the characteristics of insolvent firms in countries other than major developed economies, such as the U.S. In emerging markets, South Korea is one of the leading countries with well-developed capital markets and global business players.

Previous studies concerning the accounting choices and earnings management of firms in financial distress or those that have violated debt contracts were undertaken (Watts and Zimmerman 1990; DeAngelo et al. 1994). If the contents of accounting choices or the characteristics of earnings management by firms that have become insolvent compared to non-insolvent firms are revealed, this will greatly help investors, creditors, and financial analysts understand and interpret the accounting information of insolvent firms.

Many of the studies into the issue of firm insolvency by South Korean researchers, produced inconsistent findings (Nah and Choi 2000; Roh 2007; Oh 2016; Lee and Hong 2017). Although this may be due to differences between insolvent firm samples or the analytical methods used in previous studies, the primary reason for this was presumed to be low result reliability due to the use of very small datasets for insolvent firms. To address this problem, we relied on a larger dataset of firms. Among the data for unlisted firms during the period from 2003 to 2015 as held by the Korea Credit Guarantee Fund, firms with an asset size smaller than four billion won were excluded from the analysis, considering the issue of the lack of the reliability of the financial data. The final number of samples was 134,724, of which 4013 were insolvent enterprise samples.

To ensure the reliability of our results, we also used three measurement models (a modified Jones model, a Kothari model, and performance-matched model via a ROA group) to calculate discretionary accruals, which were used as a proxy for earnings management. That is, we attempted to improve the robustness of the research results by comparing the results of analyses that applied the discretionary accruals of the three measurement models. Our study examined whether practices related to discretionary accruals vary between corporate groups (distinguished based on the external audit status and firm size) and insolvency status, and whether discretionary accruals predict unlisted firm insolvency.

In Korea, previous studies analyzed insolvent firms' earnings management using samples of listed firms (KOSPI and KOSDAQ market); however, this study instead analyzed earnings management behaviors for insolvent and unlisted firms. In addition, this study divided data into four groups (externally audited large firms, externally audited small-and-medium-sized enterprises (SMEs), non-externally audited SMEs, and non-externally audited private business operators). This study also analyzed the differences in discretionary accruals among the groups and used discrete-time logit regression analysis to explore whether discretionary accruals unlisted firm insolvency (Altman and Sabato 2007).

We have found that, as of one year prior to insolvency, discretionary accruals were largest among non-externally audited private business operators, followed by non-externally audited SMEs, externally audited SMEs, and externally audited large firms. The discretionary accruals of non-insolvent firms were larger than those of insolvent firms between one and three years prior to insolvency, with the differences increasing as insolvency approached. Discretionary accruals were shown to have the ability to predict whether firms would become insolvent in the timespan of two to three years before the occurrence of insolvency, but the ability to predict insolvency one year before its occurrence was not confirmed.

The remainder of this study is organized as follows: In Section 2, we review the background and prior literature related to insolvent firms' earnings management. In Section 3, we discuss our research design. Section 4 presents the empirical results of our study, and Section 5 sets out our conclusions and the limitations of the study.

2. Background and Literature Review

2.1. Firm Insolvency and Earnings Management

The precise definition of firm insolvency varies depending on the relevant laws or administrative rules. Generally, the term refers to the three related concepts of Table 1:

Table 1. The concept of firm insolvency.

Division	Definition of Firm Insolvency	Process of Firm Insolvency
Economic Insolvency	• Total revenue less than total cost • Return on investment less than capital cost • Actual return less than expected return	Deterioration of profit ability
Financial Insolvency	• Technical insolvency, i.e., being unable to repay debts at maturity due to the lack of corporate liquidity • Substantive insolvency, i.e., capital impairment	Declined ability to pay
Legal Insolvency	Suspension of business activities as a result of substantive insolvency (i.e., liquidation or bankruptcy)	Legal bankruptcy (in the narrow sense of the concept)

This study extracted insolvent firm data by applying the provisions related to insolvent firms from the Korea Credit Guarantee Fund, which included the concept of an insolvent firm as defined by the Korea Financial Services Commission. The Korea Financial Services Commission defines an insolvent firm as a firm that either (1) falls under legal management, (2) defer payments, (3) suspends current account transactions, (4) undertakes in liquidation procedures, (5) applies for and commences company reorganization, (6) applies for and confirms the decision for composition, or (8) applies for bankruptcy. Consequently, the insolvent firms used in this study are firms that are either:

- regulated as insolvent companies by the credit guarantee insolvency management regulations of the Korea Credit Guarantee Fund;
- registered as insolvent companies or companies for which payments by subrogation have been made with the Korea Technology Credit Guarantee Fund;
- registered as companies for which payments by subrogation have been made with the Korea Regional Credit Guarantee Foundation;
- registered as firms whose credit management information is on file with the Korea Federation of Banks.

A number of hypotheses were proposed to explain the accounting practices of firms, including the income smoothing hypothesis, the bonus plan hypothesis, the debt covenant hypothesis, and the political cost hypothesis. According to the income smoothing hypothesis, a manager seeks to reduce earnings volatility by adjusting earnings such that excessively low and high earnings are respectively increased or decreased with the goal of reaching a level that is considered 'normal'. Beidleman (1973), and Trueman and Titman (1988) identified that the motivation for income smoothing arises from smaller changes in earnings lowering the cost of capital and the capitalization rate such that the corporate value is higher. Where a compensation system of a particular business is structured such that the behavior of the manager cannot be observed, Lambert (1983) showed that

income smoothing is the optimal equilibrium behavior that maximizes benefits to both shareholders and the manager.

The bonus plan hypothesis, which was first presented by Watts and Zimmerman (1990) posits that if other conditions are constant, managers will adjust earnings to maximize their own compensation. In the bonus plan hypothesis, when earnings are low, the manager increases earnings to increase his or her compensation, but when earnings are low enough to push the manager below the lower limit of compensation, the manager will write down a significant amount of losses to further reduce the earnings (a technique known as the 'big bath' technique). Studies by Healy (1985), and McNicols and Wilson (1988) supported the bonus plan hypothesis, while Gaver et al. (1995) obtained results that better support the income smoothing hypothesis.

The debt covenant hypothesis states that as a debt ratio rises, the possibility of increases in contract costs due to the violation of debt provisions also rise, and as a result, a manager will select an accounting procedure that will increase reported earnings when the debt ratio is higher in order to minimize the contract cost. In the case of the debt covenant hypothesis, supporting study findings were published by Watts and Zimmerman (1990). Other authors found that the higher the debt ratio, the more likely it is for a manager to make accounting choices that would increase reported earnings (Daley and Vigeland 1983; DeFond and Jiambalvo 1994; Sweeney 1994; Hwang 1996).

The political cost hypothesis states that if other conditions are constant, firms that adjust earnings to report a low net income minimize the risks of paying high political costs. In general, as the scale of a company increases, its social impact also increases. Because large firms are more likely to become attractive targets, political risks increase with firm size. This hypothesis assumes that larger firms are more politically sensitive (Watts and Zimmerman 1990).

More concretely, the actual practice of earnings management is divided into firms that use real activities and firms that use accruals. Earnings management using real activities includes sales manipulation (by changing credit conditions for credit sales), the management of the cost of sales and inventory assets (through increases or decreases in production activities), and the management of cash flows (through actual expenditures) (Roychowdhury 2006). Earnings management using discretionary accruals, in contrast, means that managers may opportunistically select accounting treatments at their discretion (Healy and Wahlen 1999). In this study, the earnings management method using accruals was selected for consideration. The presence of discretionary accruals (which are widely used as a proxy for earnings management) was used to measure the degree of earnings management. Discretionary accruals were measured here using three models (a modified Jones model, a Kothari model, and a performance-matched model via a ROA group) and the analyses were compared to prove the robustness of the findings.

2.2. Earnings Management at Insolvent Firms in Practice

In Korea, prior studies on the earnings management practices of insolvent firms were mainly conducted using datasets that were constructed from lists of exchange-listed firms alone (KOSPI and KOSDAQ market). Those studies classified businesses that were placed in administration or delisted as 'insolvent'. These studies did not report consistent findings. This may be partially attributed to differences in their datasets for insolvent firms or variations in their analytical methods, but a significant reason for the inconsistency was thought to be the very small sample sizes. The results of these previous studies are summarized below.

A number of studies showed that insolvent firms engage in upward earnings management. Jang (1997) analyzed 42 listed and insolvent firms that went bankrupt, were designated as issues for administration, or applied for a liquidation or legal management between 1991 and 1994. According to the study, the profitability of insolvent firms deteriorated for three years and then significantly improved for the final two years before insolvency. It was determined that the most likely reason for this was that the insolvent

firms adjusted their accounting practices to maximize earnings. Kim et al. (2015) conducted an empirical analysis of the earnings management behaviors of firms delisted from the KOSDAQ using discretionary accruals and real activities. According to this study, delisted firms attempted upward earnings management using discretionary accruals in the years prior to delisting, and the accrual amounts increased in the year immediately before the delisting when compared to two years prior to delisting.

Oh (2016) set out to verify the validity of an expanded auditor designation system, and in the course of doing so analyzed whether insolvent firms at high risk of a forced designation by auditors performed positive earnings management to avoid such an outcome. According to the study, firms that satisfied one or more criteria of insolvency were more likely to report greater positive earnings management than non-insolvent firms. Firms with a debt ratio exceeding 1.5 times the average debt ratio of the same type of business, or those with an earned interest ratio below 1 reported greater positive earnings management than firms with a debt ratio exceeding 200%. The authors also found that companies that satisfied all three conditions for insolvency performed greater positive earnings management than companies that only satisfied one or two conditions. Lee and Hong (2017) analyzed the earnings management practices of firms designated as subjects of administration or those that were delisted between 1995 and 2013. They identified problems with the research methodologies applied in previous studies and the possibility of errors in prior analysis. They highlighted the importance of additional studies from which more consistent conclusions could be drawn. Their analysis resulted in the discovery of upward earnings management behaviors for insolvent firms, and the authors identified that these practices became increasingly more prominent in the two years leading up to insolvency.

A second group of studies concluded that insolvent companies do not perform upward earnings management, but rather choose accounting treatments that reduce earnings. DeAngelo et al. (1994) predicted that firms that were more likely to violate debt contracts would make accounting choices that would increase profits; however, the results of their study showed that those firms reduced their earnings rather than increasing them. Researchers interpreted this phenomenon to be a consequence of a firm's intention to show stakeholders the difficult situation of the firm without misleading stakeholders. Choi and Jeong (1998) confirmed that the financial conditions and business performances of bankrupt firms were poorer compared than those of control firms, and that business performance deteriorated drastically in the year immediately before bankruptcy, such that net profits decreased while cash flows increased. They attributed their results to firms focusing on securing cash flows by disposing of inventory rather than earnings management in order to prevent bankruptcy.

Meanwhile, Nah and Choi (2000) tested whether insolvent firms adjusted profits before insolvency and whether the discretionary accruals used as substitutes for earnings management feature useful information. They selected a total of 44 firms from 1990 to 1996 that were subjected to a suspension of business activities, bankruptcy, or a suspension of transactions with banks, or those that had applied for corporate rehabilitation and therefore fell within the criteria for delisting. They estimated the discretionary accruals of firms using a model that added a cash flow variable to a Jones model. Their results showed that insolvent firms did not continuously adjust their earnings upward prior to insolvency, but rather reported smaller discretionary accruals than insolvent firms for both two and one year prior to insolvency. They interpreted their results as reflecting that insolvent firms were either trying to secure cash rather than accounting accruals, were required to submit true financial reports in the process of financial negotiations, or were experiencing a period of heightened regulatory surveillance. Roh (2007) analyzed the earnings management practices of insolvent firms using a dataset of firms delisted from the KOSDAQ between 2003 and 2005. Out of 57 firms, the author selected those that belonged to the same industry groups as various control firms. His study found no statistically significant differences between firms in the timespan of three to two years prior

to delisting, but the delisted firms did report statistically significant lower discretionary accruals compared to the control firms. His interpretation of the data was that insolvent firms performed downward earnings management immediately before delisting, and that firms that cannot be recovered because they have become insolvent do not have the capacity to perform earnings management for positive discretionary accruals unlike normal firms.

The final group of studies includes those that suggested that an insolvent firm's upward or downward earnings management varies depending on the timing of the insolvency and characteristics of the businesses in the sample. Kim and Park (1999) confirmed that whereas statistically significant upward earnings management was observable between eight to two years before insolvency, no statistically significant earnings management was observable in the year immediately before the occurrence of insolvency. They explained this result as suggesting that since insolvent firms had continuously attempted upward earnings management before insolvency, the options for earnings management had narrowed as insolvency approached. Lee (2007) analyzed insolvent firms' earnings management behaviors using correlations between the financial statement indicators of insolvent firms. He selected 13 delisted firms that were subject to the suspension of business activities, bankruptcy, or suspension of transactions with banks, or those that had applied for company reorganization procedures between 2001 and 2004. He found that a significant level of earnings management was visible as a sudden improvement in profitability indicators three years before insolvency. He also stated that insolvent firms, compared to non-insolvent firms, showed relatively large discretionary accruals three years before insolvency, but showed relatively small discretionary accruals in the second to first year before insolvency. Kim and Lee (2012) analyzed the earnings management patterns of delisted KOSDAQ firms for three years before delisting. They confirmed that the delisted firms reported higher discretionary accruals than those of the control firms in the timespan of three to two years before delisting, but they did not show consistent results for one year before delisting.

Meanwhile, Sohn and Yum (2013) conducted analysis to see whether earnings management is performed using accruals or real activities when the risk of delisting is high. They reported that the discretionary accruals of firms with a high risk of delisting and control firms did not show statistically significant differences for all three years. They interpreted the reason why such results appeared as firms with a higher risk of delisting more greatly preferring upward earnings management using real activities rather than accruals in order to avoid surveillance and consequent sanctions by regulatory authorities. Campa (2020) investigated whether there is a relationship between the severity of financial difficulties of active firms and their level of earnings management. He reported that firms with more severe financial problems exhibit higher levels of income-increasing earnings manipulation.

Summarizing the preceding studies, earnings management is commonly used in predicting the financial distress of business. Distressed businesses often have a tendency towards earning manipulation covering their situation from stakeholders (Karas and Reznakova 2020). Therefore, insolvent firms may experience unusual income-increasing practices that seek to conceal, or at least postpone, the disclosure of firms' real performance deterioration (Franz et al. 2014; Campa 2019). In this regard, we analyzed the earnings management behavior of insolvent firms for unlisted firms in Korea.

2.3. Differentiation of this Study from Previous Studies

In Korea, previous studies primarily analyzed the characteristics of insolvent firms' earnings management with listed firms (KOSPI or KOSDAQ). Generally, listed firms are large in size, have a high level of stakeholders' demands on the firm information, and show large ripple effects of managers' decision making. The pressure of stakeholder groups surrounding firms affects the quality of earnings produced by firms (Ball and Shivakumar 2005). Prior studies showed that unlisted firms have lower financial reporting quality (FRQ) than do listed firms (Ball and Shivakumar 2005; Burgstahler et al. 2006). So, we

employ a dataset sourced from unlisted firms' records related to earnings management and insolvency.

DeAngelo (1981) argued that independent external auditing reduces stakeholders' information asymmetry problems. Reynolds and Francis (2000) found that firms employing auditors have a greater quality of financial reporting. Auditing is a constraint on managers' opportunistic and inadequate accounting in financial reporting (Park et al. 2017). Therefore, we expected the default rate for firms that hire auditors to decrease. In this regard, we classified the dataset into four groups (D1: externally audited large firms with annual sales greater than 60 billion won; D2: externally audited SMEs with less than 60 billion won in annual sales; D3: non-externally audited SMEs with less than 60 billion won in annual sales; D4: non-externally audited private business operators). Using dummy regression analysis, it was determined whether there were differences in discretionary accruals between the considered groups. Discrete-time logit regression analysis was used to verify whether discretionary accruals were predictive of insolvency.

Whereas previous studies relied on very small sample sizes, leading to a lack of reliability for their results, this study secured a sufficiently large number of insolvent enterprise samples using the unlisted firm data held by the Korea Credit Guarantee Fund. This study also relied on diverse measurement models (a modified Jones model, a Kothari model, and a performance-matched model via a ROA group) to estimate discretionary accruals with the aim to improve the robustness of the study.

3. Research Design and Sample Selection

3.1. Research Hypotheses

The first hypothesis was to classify unlisted firms into four groups according to whether external audits are conducted and asset sizes and to verify whether there are differences in discretionary accruals between groups. To this end, the entire samples of unlisted firms were divided into externally audited firms and non-externally audited firms, where the external audit firms were divided into external audit small- and medium-sized enterprises (SMEs) and external audit large firms according to the firm size, and the non-external audit firms were divided into non-external audit SMEs and non-external audit private firms according to whether the firms were incorporated or not.

Stakeholders of large firms require high financial reporting quality on firm information because equity trading is frequent and external financial reporting is relatively more important. Due to the relatively large number of stakeholders, large firms have heavy costs (firm reputation, financing, stock prices, and legal action) when opportunistic behavior is discovered (Chen et al. 2011; Park et al. 2017). Therefore, prior studies provided the evidence that large firms have higher financial reporting quality and report more conservative accounting (Chen et al. 2011; Park et al. 2017).

Since external audit large firms are larger and their internal control is expected to be work more effective compared to external audit SMEs, it can be estimated that their financial statements are highly reliable and that their arbitrary earnings management by managers is less likely to occur. On the other hand, since non-external audit firms are not audited by certified public accountants, the reliability of their financial statements is relatively low compared to external audit firms, and, therefore, it can be estimated that arbitrary earnings management activities by managers are relatively more frequent when compared to external audit firms (Oh 2016; Lee and Hong 2017). Reynolds and Francis (2000) found that firms employing auditors have a greater quality of financial reporting. Auditing is a constraint on managers' opportunistic and inadequate accounting in financial reporting (Park et al. 2017).

In addition, it can be estimated that the possibility of occurrence of earnings management in private firms among non-external audit firms is higher compared to incorporated firms because their sizes are smaller and the reliability of their financial statements is lower due to problems such as the inadequate internal control and the lack of the ability to prepare financial statements (Oh 2016; Lee and Hong 2017). Consequently, when unlisted

firms are classified into four groups according to whether they are externally audited and the firm size, it is estimated that smaller firms not audited by external auditors are more likely to attempt earnings management using discretionary accruals. Therefore, we set the following hypothesis:

Hypothesis 1 (H1). *For unlisted firms, external audits and firm size will affect the difference in discretionary accruals.*

Our next task was to classify unlisted firms by solvency and analyze whether there were differences in discretionary accruals between the groups during in the one to three years preceding insolvency. In general, it was expected that insolvent firms would attempt greater earnings management than financially non-insolvent firms, and that this behavior would become more severe as insolvency neared.

Interestingly, previous studies did not report consistent findings regarding this practice. According to some studies, insolvent firms report positive earnings through positive discretionary accruals before insolvency management (Jang 1997; Kim et al. 2015; Oh 2016; Lee and Hong 2017). Other studies indicated that insolvent firms do not perform positive earnings management, but rather select accounting treatments that reduce earnings (DeAngelo et al. 1994; Choi and Jeong 1998; Nah and Choi 2000; Roh 2007). Nah and Choi (2000) presented a study finding indicating that insolvent firms reported negative discretionary accruals from four years before the occurrence of insolvency, and that the negative discretionary accruals increased as the year of insolvency neared. They interpreted the reason for the appearance of the result to be that the insolvent firms either tried to secure cash rather than accounting accruals or were required to submit true financial reports in the process of debt or financial negotiations, or additionally because surveillance over earnings management was reinforced by regulatory authorities. Sohn and Yum (2013) reported that firms with a higher risk of delisting more highly prefer upward earnings management using real activities rather than accruals in order to avoid surveillance and sanctions by regulatory authorities.

Finally, there were studies that suggested that different forms of upward or downward earnings management manifest depending on the time of insolvency or the particular characteristics of the firms included in the datasets (Kim and Park 1999; Lee 2007; Kim and Lee 2012; Sohn and Yum 2013). Kim and Park (1999) reported that there were statistically significant upward earnings management behaviors from eight years to two years before the occurrence of insolvency, but there was no statistically significant earnings management behavior in the year immediately before the occurrence of insolvency. They interpreted the reason for the appearance of the result as such as the fact that because insolvent firms continuously attempt upward earnings before insolvency occurs, the available earnings management measures decrease as the year of occurrence of insolvency comes closer. To sum up the results of the above studies, although the form of earnings management of insolvent firms differs due to the time of insolvency or the sample characteristics, it was predicted that insolvent firms engage in more opportunistic management behaviors to escape financial difficulties than non-insolvent firms. Therefore, we set a hypothesis as follows:

Hypothesis 2 (H2). *Before insolvency, insolvent firms will have more discretionary accruals than non-insolvent firms.*

Our third hypothesis pertains to testing whether discretionary accruals have the ability to predict the insolvency of unlisted firms. Based on the logic of H2, it can be expected that insolvent firms' managers may attempt earnings management behaviors more frequently due to financial difficulties compared to healthy firms (Watts and Zimmerman 1990; DeAngelo et al. 1994), but unlike the general expectation as such, previous studies did not report consistent findings (Nah and Choi 2000; Roh 2007; Sohn and Yum 2013; Oh 2016; Lee and Hong 2017). Previous studies reported that discretionary accruals may have a

positive or negative relevance in predicting whether a firm will become insolvent in the future and that there are differences in discretionary accruals according to the period before the occurrence of insolvency. Therefore, we set a hypothesis as follows:

Hypothesis 3 (H3). *In the case of unlisted firms, discretionary accruals have the ability to predict future corporate insolvency, and there will be difference in terms of the ability to predict insolvency.*

3.2. Empirical Models

Equation (1) is a research model intended to verify H1. The dependent variable is discretionary accruals, which is measured using three discretionary accrual measurement models (Dechow et al. 1995; Kothari et al. 2005). Since the purpose of H1 is to identify differences in the size of discretionary accruals as a function of external audit status and firm size, only the data at the time point of one year before the occurrence of insolvency were analyzed. As financial data for insolvent firms do not exist for the year of insolvency (τ), the variables as of one year before the occurrence of insolvency are designated here as $\tau-1$, those as of 2 years before the occurrence of insolvency as $\tau-2$, and those as of 3 years before the occurrence of insolvency as $\tau-3$. We applied the following formula:

$$DA_{k,\ \tau-1} = \beta_0 + \beta_1 D1_{\tau-1} + \beta_2 D3_{\tau-1} + \beta_3 D4_{\tau-1} + \beta_4 SIZE_{\tau-1} + \beta_5 LEV_{\tau-1} + \beta_6 CFO_{\tau-1} + \beta_7 GRW_{\tau-1} + \beta_8 LagTA_{\tau-2} + \beta_9 LOSS_{\tau-1} + \sum YD + \varepsilon_{i,t} \tag{1}$$

where $DA_k, \tau-1$ denotes the discretionary accruals, which is measured using three models (a modified Jones model, a Kothari model, and a performance-matched model by ROA group); $D1\tau-1$ is an indicator variable equal to 1 if externally audited firms had greater than 60 billion won in annual sales, 0 if not; $D3\tau-1$ is an indicator variable equal to 1 if non- externally audited firms had less than 60 billion won in annual sales, 0 if not; $D4\tau-1$ is an indicator variable equal to 1 if the private business operators did not undergo an external audit, 0 if not; $SIZE\tau-1$ is firm size, the natural log of total assets; $LEV\tau-1$ is firm leverage, the ratio of total debt to total assets; $CFO\tau-1$ is the ratio of cash flow of operations in $\tau-1$ to total assets in $\tau-2$; $GRW\tau-1$ is the growth rate, measured as the sales in $\tau-1$ minus sales in $\tau-2$, divided by total assets in $\tau-2$; $LagTA\tau-2$ is the ratio of total accruals in $\tau-2$ to total assets in $\tau-3$; $LOSS\tau-1$ is an indicator variable equal to 1 if firms report a loss (net income < 0), 0 if not. Finally, YD is included to control the effects of year on discretionary accruals.

Equations (2) through (4) are research models intended to verify H2. To determine differences in discretionary accruals between insolvent and non-insolvent firms by time point before the occurrence of insolvency, regression analyses were carried out for individual time points from one year ($\tau-1$) to three years before the occurrence of insolvency ($\tau-3$), respectively. The variable of interest is $BUDO\tau-1\sim3$, which is an indicator variable equal to 1 a firm is an insolvent, 0 if it is not. The variables $SIZE\tau-1$, $LEV\tau-1$, $CFO\tau-1$, $GRW\tau-1$, $LagTA\tau-1$, and $LOSS\tau-1$ were added to the regression model to control factors affecting discretionary accruals. Dimitropoulos (2020) argued that larger firms are more likely to prefer downward earnings management because they are more prone to regulatory scrutiny. On the contrary, large firms are more motivated to smooth their earnings because of more instability of their operations (Palacios-Manzano et al. 2019). We expected that $SIZE$ has both a positive and negative relation with earnings management. High leveraged firms are more likely to engage in upward earnings management to avoid debt covenant violations (Van Tendeloo and Vanstraelen 2005). We expected that LEV have positive relation with earnings management. Cash flows are equally value relevant with earnings in determining stock return movements (Dimitropoulos and Asteriou 2010). We expected CFO to have a positive relation with earnings management. Lee et al. (2006) provided evidence that high growth firms are more likely to manipulate earnings. We expected that GRW had a positive relation with earnings management. Firms exhibiting weak financial performance have incentives to engage in income-increasing earnings management (Dechow et al. 2010).

We expected *LOSS* to have a positive relation with earnings management. The dependent variable was discretionary accruals, and it was measured using three discretionary accrual measurement models. We applied the following formula:

$$DA_{k,\ \tau-1} = \beta_0 + \beta_1 BUDO_{\tau-1} + \beta_2 D1_{\tau-1} + \beta_3 D3_{\tau-1} + \beta_4 D4_{\tau-1} + \beta_5 SIZE_{\tau-1} + \beta_6 LEV_{\tau-1} + \beta_7 CFO_{\tau-1} + \\ \beta_8 GRW_{\tau-1} + \beta_9 LagTA_{\tau-2} + \beta_{10} LOSS_{\tau-1} + \sum YD + \varepsilon_{i,t} \tag{2}$$

$$DA_{k,\ \tau-2} = \beta_0 + \beta_1 BUDO_{\tau-2} + \beta_2 D1_{\tau-2} + \beta_3 D3_{\tau-2} + \beta_4 D4_{\tau-2} + \beta_5 SIZE_{\tau-2} + \beta_6 LEV_{\tau-2} + \beta_7 CFO_{\tau-2} + \\ \beta_8 GRW_{\tau-2} + \beta_9 LagTA_{\tau-3} + \beta_{10} LOSS_{\tau-2} + \sum YD + \varepsilon_{i,t} \tag{3}$$

$$DA_{k,\ \tau-3} = \beta_0 + \beta_1 BUDO_{\tau-3} + \beta_2 D1_{\tau-3} + \beta_3 D3_{\tau-3} + \beta_4 D4_{\tau-3} + \beta_5 SIZE_{\tau-3} + \beta_6 LEV_{\tau-3} + \beta_7 CFO_{\tau-3} + \\ \beta_8 GRW_{\tau-3} + \beta_9 LagTA_{\tau-4} + \beta_{10} LOSS_{\tau-3} + \sum YD + \varepsilon_{i,t} \tag{4}$$

Equations (5) through to (7) are research models intended to verify H3. To verify whether discretionary accruals differ in their ability to predict whether or not firms will become insolvent in future, discrete-time logit analyses were carried out for individual time points from one year ($\tau-1$) to three years before the occurrence of insolvency ($\tau-3$), respectively. The variable of interest is $DA_{k,\tau-t}$ and it was measured using three discretionary accrual measurement models. $CASH_{\tau-1}$, $RETA_{\tau-1}$, $SDBV_{\tau-1}$, $ICR_{\tau-1}$, and $ETA_{\tau-1}$ were reflected as control variables in the models because they are variables selected as those useful in the prediction of the insolvency of unlisted SMEs in a study conducted by Altman and Sabato (2007). Corporate group dummy variables ($D1_{\tau-1} \sim D4_{\tau-1}$) and a size variable ($SIZE_{\tau-1}$) were added as control variables to control size effects. The dependent variable Y_τ is a dummy variable indicating whether or not insolvency occurred. We applied the following formula:

$$Y_\tau = \beta_0 + \beta_1 DA_{k,\ \tau-1} + \beta_2 D1_{\tau-1} + \beta_3 D3_{\tau-1} + \beta_4 D4_{\tau-1} + \beta_5 SIZE_{\tau-1} + \beta_6 CASH_{\tau-1} + \beta_7 RETA_{\tau-1} + \\ \beta_8 SDBV_{\tau-1} + \beta_9 ICR_{\tau-1} + \beta_{10} ETA_{\tau-1} + \varepsilon_{i,t} \tag{5}$$

$$Y_\tau = \beta_0 + \beta_1 DA_{k,\ \tau-2} + \beta_2 D1_{\tau-1} + \beta_3 D3_{\tau-1} + \beta_4 D4_{\tau-1} + \beta_5 SIZE_{\tau-1} + \beta_6 CASH_{\tau-1} + \beta_7 RETA_{\tau-1} + \\ \beta_8 SDBV_{\tau-1} + \beta_9 ICR_{\tau-1} + \beta_{10} ETA_{\tau-1} + \varepsilon_{i,t} \tag{6}$$

$$Y_\tau = \beta_0 + \beta_1 DA_{k,\ \tau-3} + \beta_2 D1_{\tau-1} + \beta_3 D3_{\tau-1} + \beta_4 D4_{\tau-1} + \beta_5 SIZE_{\tau-1} + \beta_6 CASH_{\tau-1} + \beta_7 RETA_{\tau-1} + \\ \beta_8 SDBV_{\tau-1} + \beta_9 ICR_{\tau-1} + \beta_{10} ETA_{\tau-1} + \varepsilon_{i,t} \tag{7}$$

where $Y\tau$ is an indicator variable equal to 1 if it is an insolvent firm, 0 if it is not; $D1_{\tau-1}$ is an indicator variable equal to 1 if externally audited firms had greater than 60 billion won in annual sales, 0 if not; $D3_{\tau-1}$ is an indicator variable equal to 1 if firms that were not externally audited had less than 60 billion won in annual sales, 0 if not; $D4_{\tau-1}$ is and indicator variable equal to 1 if the private business operators did not undergo an external audit, 0 if not; $SIZE_{\tau-1}$ is firm size, the natural log of total assets; $CASH_{\tau-1}$ is the ratio of cash and cash equivalents in $\tau-1$ to total assets in $\tau-1$; $RETA_{\tau-1}$ is the ratio of retained earnings in $\tau-1$ to total assets in $\tau-1$; $SDBV_{\tau-1}$ is measured as short-term borrowings in $\tau-1$ plus current liabilities in $\tau-1$, divided by equity capital in $\tau-1$; $ICR_{\tau-1}$ is (the ratio of EBITDA in $\tau-1$ to interest expenses in $\tau-1$) $\times$ 1/100; $ETA_{\tau-1}$ is the ratio of EBITDA in $\tau-1$ to total assets in $\tau-1$.

3.3. Earnings Management Tools

The most popular empirical model for estimating discretionary accruals is the modified Jones model, which was proved to be more efficient in detecting earnings management relative to other accrual models in the literature (Dechow et al. 1996; Dimitropoulos 2020). For this reason, we estimated the cross-sectional Jones (1991) model, as modified by Dechow et al. (1996) and Kothari et al. (2005), to extract the discretionary accruals (Dim-

itropoulos 2020). This model estimates discretionary accruals as a function of the difference between change in sales and change in accounts receivables, the level of property, plant and equipment, and the level of return on assets by estimating the following cross-sectional ordinary least squares equation (Kothari et al. 2005; Dimitropoulos 2020):

$$DA_{it-1} = \beta_0 + \beta_1(1/TA_{t-1}) + \beta_2(\Delta SALES_i - \Delta REC_i) + \beta_3(PPE_i/TA_{i-1} + \beta_5 ROA_i + \varepsilon_{i,t}) \qquad (8)$$

where *ACC* is total accruals defined as the difference between net income and operating cash flows; $\Delta SALES$ is the change in net sales deflated by lagged total assets; ΔREC is the change in accounts receivables; PPE is the level of property plant and equipment for each year: *ROA* is the return on assets estimated as net income over total assets; *TA* is the firm's total assets at the end of the fiscal year (Kothari et al. 2005; Dimitropoulos 2020). Discretionary accruals are defined as the residuals from the estimating Model (8). A higher value of discretionary accruals indicates a greater level of earnings management.

3.4. Samples and Data

In this study, firms that satisfied the following conditions were selected as samples from the unlisted firm data held by the Korea Credit Guarantee Fund: firms of which the size of total assets was greater than 4 billion won, which had financial statements for five consecutive years during the period from 2003 to 2015; firms that settled their accounts at the end of December, excluding public institutions and financial institutions.

Firms with total assets less than 4 billion won were excluded because of concerns over the reliability of their financial statements, as smaller firms tend to suffer from poor internal controls and an inability to adequately prepare financial statements. Even firms in which the size of assets was greater than 4 billion won were excluded where the reliability of their financial statements was in doubt or where their identification information was not available, as was the case, for example, where their industrial classification codes were omitted. With these criteria, data for nine years from 2007 to 2015 were finally selected as a sample, and, based on the year of insolvency, the period from 2008 to 2016 was applicable. The final samples used in our study were 134,724 firm-years (31,419 firms).

To be classified as SMEs, firms should satisfy both the size and independence criteria (Article 2 of the Minor Enterprises Act and Article 3 of the Enforcement Decree of the same act). The size criterion was based on the sales size (sales more than 40 billion won and not larger than 150 billion won), the number of permanent workers, and capital, which is prescribed differently by business type. Since the reliable number of permanent workers cannot be identified every year, this study divided firms into SMEs and large firm group by referring to the criterion for division between large firms and SMEs that is applicable in South Korea (sales amount 60 billion won) under the new Basel Accord for convenience.

We then divided our dataset into two additional groups depending on whether the firms underwent an external audit, ending up with four groups (externally audited large firms, externally audited SMEs, non-externally audited SMEs, and non-externally audited private business operators):

D1:   externally audited large firms that had annual sales greater than 60 billion won in annual sales (2120 firms);
D2:   externally audited SMEs that had less than 60 billion won in annual sales (6893 firms);
D3:   non-externally audited SMEs that had less than 60 billion won in annual sales (20,434 firms);
D4:   non-externally audited private business operators (1972 firms).

Table 2 shows the sample distribution by year. The default rates were calculated by dividing the number of firms that became insolvent in the relevant year by the total number of samples in the year immediately before the relevant year, showing values of approximately 1 to 5%. By reviewing the default rates by year, we noted that the default rate in 2008 was 4.93%, which is far higher when compared to the average value 2.98%. This was attributable to the unusually high incidence of insolvency due to the effects of

the global financial crisis at that time. In particular, the default rate for non-external audit SMEs was shown to exceed 5%, indicating that non-external audit SMEs were affected most by the financial crisis.

Table 2. Sample distribution by year.

Year	Full Sample		D1		D2		D3		D4	
	N	Default Rate	N	Default Rate	N	Default Rate	N	Default Rate	N	Default Rate
2008	11,308	4.93%	871	3.56%	3312	5.04%	6639	5.18%	486	3.29%
2009	12,553	2.67%	1021	1.67%	3622	2.54%	7323	2.96%	587	1.53%
2010	14,471	3.39%	1066	2.35%	3316	3.32%	9392	3.63%	697	2.15%
2011	15,789	3.50%	1254	2.15%	3528	3.74%	10,213	3.66%	794	2.39%
2012	16,714	3.08%	1400	2.07%	3792	3.56%	10,748	3.14%	774	1.81%
2013	15,859	2.65%	1245	1.69%	3534	2.12%	10,377	2.92%	703	2.99%
2014	16,100	2.28%	1241	2.10%	3547	2.42%	10,633	2.30%	679	1.47%
2015	16,689	2.24%	1269	1.58%	3777	2.14%	10,925	2.43%	718	1.11%
2016	15,241	2.63%	1068	1.69%	3299	3.12%	10,269	2.60%	605	2.15%
Total	134,724	2.98%	10,435	2.05%	31,727	3.09%	86,519	3.11%	6043	2.07%

Column (D1): externally audited large firms that had annual sales no less than 60 billion won in annual sales; Column (D2): externally audited small- and medium-sized enterprises (SMEs) that had less than 60 billion won in annual sales; Column (D3): non-externally audited SMEs that had less than 60 billion won in annual sales; Column (D4): non-externally audited private business operators.

Table 3 shows the firm industry distribution. The business types were divided into 15 categories according to the Standard Industrial Classification (SIC). Since the numbers of samples and the default rates were evenly distributed amongst business types, it was expected that there will be no bias due to business type bias in the results of our analysis.

Table 3. Sample industry distribution.

Industry	Full Sample	
	N	Default Rate
Agriculture, forestry, fishing, and mining	693	1.73%
Food, beverage, and tobacco	4489	3.01
Textiles, clothing, leather, bags, and shoes	5371	3.05
Wood and furniture	2479	4.15
Paper, printing, recording, and media	3167	2.05
Petroleum, chemical, rubber, and non-metallic minerals	14,287	2.03
Primary metal and metallic processing	14,067	3.04
Electronic, electrical, communication, and medical equipment	12,608	3.28
Cars, other machines, and transportation equipment	21,041	2.53
Electricity, gas, water, and raw material recycling	1624	1.97
Construction industries (including residential building supply business)	16,393	4.90
Wholesale	28,798	2.70
Retail excluding cars	1172	2.90
Transportation and other service industries	4666	1.76
Knowledge-based and manufacturing-related service industries	3869	3.62
Total	134,724	2.98%

4. Empirical Results

4.1. Descriptive Statistics

Panels A through E in Table 4 show the descriptive statistics of the major variables. The entire sample set consisted of 134,724 firm-years of data. In total, we found 86,619 non-externally audited SMEs, 31,727 externally audited SMEs, 10,436 externally audited large firms, and 6043 non-externally audited private firms.

Table 4. Descriptive statistics.

Panel A: Full Sample						
Variable	N	Mean	Median	Std.	Min	Max
DA M. Jones	134,724	0.00	−0.01	0.14	−0.55	0.67
DA Kothari	134,724	0.00	0.00	0.14	−0.57	0.67
DA ROA	134,724	0.00	0.00	0.13	−0.60	0.68
SIZE	134,724	9.24	8.98	0.89	8.29	18.95
LEV	134,724	0.61	0.65	0.19	0.08	0.95
CFO	134,724	0.06	0.06	0.14	−0.39	0.54
GRW	134,724	0.14	0.07	0.58	−1.76	2.62
LagTA	134,724	−0.01	−0.02	0.15	−0.44	0.51
LOSS	134,724	0.09	0.00	0.28	0.00	1.00
CASH	134,724	0.06	0.03	0.08	0.00	0.45
RETA	134,724	0.26	0.23	0.20	−0.21	0.79
SDBV	134,724	0.85	0.49	1.17	0.00	7.50
ICR	134,724	0.14	0.04	0.39	−0.09	2.12
ETA	134,724	0.09	0.08	0.07	−0.13	0.35

Panel B: D1 (N = 10,435)					Panel C: D2 (N = 31,727)				
Variable	Mean	Median	Std.	Min	Max	Mean	Median	Std.	Min	Max
DA M. Jones	0.00	0.00	0.14	−0.50	0.66	-0.01	−0.01	0.13	−0.47	0.64
DA Kothari	0.01	0.01	0.14	−0.53	0.64	0.00	0.00	0.12	−0.53	0.64
DA ROA	0.01	0.01	0.13	−0.53	0.64	0.00	0.00	0.12	−0.51	0.68
SIZE	11.18	11.13	1.10	8.30	18.95	9.92	9.83	0.56	8.29	13.87
LEV	0.61	0.64	0.19	0.08	0.95	0..63	0.67	0.20	0.08	0.95
CFO	0.06	0.06	0.14	−0.39	0.54	0.06	0.06	0.12	−0.39	0.54
GRW	0.30	0.14	0.72	−1.76	2.62	0.06	0.04	0.40	−1.76	2.62
LagTA	−0.01	−0.02	0.15	−0.44	0.51	−0.03	−0.03	0.14	−0.44	0.51
LOSS	0.14	0.00	0.34	0.00	1.00	0.18	0.11	0.39	0.00	1.00
CASH	0.06	0.03	0.07	0.00	0.45	0.05	0.02	0.07	0.00	0.45
RETA	0.26	0.23	0.20	−0.21	0.79	0.22	0.19	0.22	−0.21	0.79
SDBV	0.93	0.63	1.12	0.00	7.50	1.24	0.83	1.46	0.00	7.50
ICR	0.22	0.04	0.50	−0.09	2.12	0.15	0.03	0.41	−0.09	2.12
ETA	0.10	0.08	0.08	−0.13	0.35	0.08	0.08	0.07	−0.13	0.35

Panel: D3 (N = 86,519)					Panel: D4 (N = 6043)				
Variable	Mean	Median	Std.	Min	Max	Mean	Median	Std.	Min	Max
DA M. Jones	0.00	−0.01	0.14	−0.56	0.67	−0.02	−0.02	0.12	−0.49	0.54
DA Kothari	0.00	0.00	0.14	−0.57	0.67	−0.02	−0.03	0.12	−0.55	0.53
DA ROA	0.00	0.00	0.14	−0.60	0.66	−0.02	−0.02	0.13	−0.52	0.53
SIZE	8.78	8.76	0.32	8.29	12.89	8.79	8.65	0.47	8.29	12.87
LEV	0.59	0.63	0.19	0.08	0.95	0.68	0.71	0.18	0.08	0.95
CFO	0.06	0.06	0.15	−0.39	0.54	0.11	0.10	0.14	−0.39	0.54
GRW	0.15	0.07	0.62	−1.76	2.62	0.10	0.05	0.40	−1.76	2.62
LagTA	0.00	−0.01	0.15	−0.44	0.51	−0.04	−0.05	0.14	−0.44	0.51
LOSS	0.05	0.00	0.22	0.00	1.00	0.03	0.00	0.16	0.00	1.00
CASH	0.06	0.03	0.08	0.00	0.45	0.04	0.01	0.07	0.00	0.45
RETA	0.29	0.26	0.19	−0.21	0.79	0.00	0.00	0.03	−0.07	0.79
SDBV	0.68	0.37	0.98	0.00	7.50	0.95	0.35	1.53	0.00	7.50
ICR	0.14	0.04	0.37	−0.09	2.12	0.09	0.04	0.25	−0.09	2.12
ETA	0.10	0.09	0.07	−0.13	0.35	0.12	0.11	0.08	−0.13	0.35

Note: This table shows descriptive statistics for the variables used in the regression analyses. Variable definitions: DA is discretionary accruals, which is measured using three models (a modified Jones model, a Kothari model, and a performance-matched model by ROA group); $SIZE_{\tau-1}$ is firm size, the natural log of total assets; $LEV_{\tau-1}$ is firm leverage, the ratio of total debt to total assets; $CFO_{\tau-1}$ is the ratio of cash flow of operations in $\tau-1$ to total assets in $\tau-2$; $GRW_{\tau-1}$ is the growth rate, measured as the sales in $\tau-1$ minus sales in $\tau-2$, divided by total assets in $\tau-2$; $LagTA_{\tau-2}$ is the ratio of total accruals in $\tau-2$ to total assets in $\tau-3$; $LOSS_{\tau-1}$ is an indicator variable equal to 1 if firms report a loss (net income < 0), 0 if not; $CASH_{\tau-1}$ is the ratio of cash and cash equivalents in $\tau-1$ to total assets in $\tau-1$; $RETA_{\tau-1}$ is the ratio of retained earnings in $\tau-1$ to total assets in $\tau-1$; $SDBV_{\tau-1}$ is measured as short-term borrowings in $\tau-1$ plus current liabilities in $\tau-1$, divided by equity capital in $\tau-1$; $ICR_{\tau-1}$ is (the ratio of EBITDA in $\tau-1$ to interest expenses in $\tau-1$) × 1/100; $ETA_{\tau-1}$ is the ratio of EBITDA in $\tau-1$ to total assets in $\tau-1$. D1: externally audited large firms that had annual sales greater than 60 billion won in annual sales; D2: externally audited SMEs that had annual sales less than 60 billion won in annual sales; D3: non-externally audited SMEs that had annual sales less than 60 billion won in annual sales; D4: non-externally audited private business operators.

Panel A shows descriptive statistics related to the entire dataset. The average values for all three discretionary accrual measurement models are shown to be '0'. This indicates that the average residual value in the models for estimating discretionary accruals was '0', and that there was no problem for the discretionary accrual estimation models. Panels B through E show the descriptive statistics of the four sample groups, and show that discretionary accruals varied in size across groups. In addition, the medians of the size variable (SIZE) were the largest among externally audited large firms, followed by externally audited SMEs, non-externally audited SMEs, and non-externally audited private business operators. This indicated that the sample classification method (by size and audit status) was valid. Extreme values of financial data were processed by winsorizing at a ±1% level.

Table 5 shows the descriptive statistics related to firm insolvency. Panel A shows the descriptive statistics of financially non-insolvent firms from four groups (divided by audit status and size), while Panel B shows the descriptive statistics of insolvent firms from four groups. On reviewing the average values of the variables SIZE, CASH, CFO, ICR, and ETA, the values of non-insolvent firms were larger than those of insolvent firms across all of the samples from among all four groups. In addition, the average values of the variables LOSS, LEV, and SDBV were higher among insolvent firms as compared to non-insolvent firms. This indicated that the financial ratio variables of insolvent and non-insolvent enterprises were different across all variables. Meanwhile, the discretionary accruals of insolvent firms were shown to be larger than those of non-insolvent firms in the case of externally audited large firms and externally audited SMEs although the discretionary accruals were somewhat different depending on the measurement models.

4.2. T-Test

Table 6 shows the results of t-tests (insolvent firm means and non-insolvent firm means) for the variables between insolvent and non-insolvent firms. The discretionary accruals of insolvent firms were significantly larger than those of financially non-insolvent firms across three groups (externally audited SMEs, non-externally audited SMEs, and non-externally audited private business operators), but not for externally audited large firms and externally audited SMEs one year before insolvency. Specifically, in the cases of non-externally audited SMEs and non-externally audited private business operators, the discretionary accruals of insolvent firms were significantly larger than those of financially non-insolvent firms in the entire one to three year period preceding insolvency. These results confirmed that insolvent firms continuously attempt upward earnings before insolvency occurs (Oh 2016; Lee and Hong 2017).

Table 5. Descriptive statistics according to insolvent classification.

	Panel A: Non-Insolvent Firms									
	Full Sample (N = 130,711)		**D1 (N = 10,221)**		**D2 (N = 30,746)**		**D3 (N = 83,826)**		**D4 (N = 5918)**	
Variable	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
DA $_{\text{M. Jones}}$	0.00	−0.01	0.00	0.00	−0.01	−0.01	0.00	−0.01	−0.02	−0.02
DA $_{\text{Kothari}}$	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	−0.02	−0.03
DA $_{\text{ROA}}$	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	−0.02	−0.02
SIZE	9.24	8.98	11.18	11.13	9.92	9.83	8.78	8.76	8.79	8.65
LEV	0.61	0.64	0.61	0.64	0.62	0.66	0.59	0.63	0.68	0.71
CFO	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.12	0.11
GRW	0.14	0.07	0.30	0.14	0.06	0.04	0.15	0.08	0.10	0.05
LagTA	−0.01	−0.02	−0.01	−0.02	−0.03	−0.03	0.00	−0.01	−0.04	−0.05
LOSS	0.09	0.00	0.13	0.00	0.18	0.00	0.05	0.00	0.02	0.00
CASH	0.06	0.03	0.06	0.03	0.05	0.02	0.06	0.03	0.04	0.02
RETA	0.26	0.24	0.26	0.23	0.22	0.19	0.29	0.26	0.00	0.00
SDBV	0.83	0.48	0.92	0.62	1.20	0.81	0.67	0.37	0.94	0.34
ICR	0.15	0.04	0.22	0.04	0.15	0.03	0.14	0.04	0.09	0.04
ETA	0.10	0.09	0.10	0.08	0.09	0.08	0.10	0.09	0.12	0.11

Table 5. *Cont.*

	Panel B: Insolvent Firms									
	Full Sample (N = 4013)		D1 (N = 214)		D2 (N = 981)		D3 (N = 2693)		D4 (N = 125)	
Variable	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
DA $_{M. Jones}$	−0.01	−0.01	−0.01	−0.02	−0.04	−0.03	0.01	0.00	−0.01	−0.01
DA $_{Kothari}$	0.00	0.00	0.01	0.00	0.03	0.02	0.01	0.01	−0.01	−0.01
DA $_{ROA}$	0.01	0.01	0.02	0.02	0.00	0.01	0.02	0.01	0.00	−0.01
SIZE	9.19	8.97	11.09	11.08	9.89	9.80	8.80	8.77	8.74	8.63
LEV	0.69	0.72	0.73	0.75	0.76	0.79	0.66	0.69	0.73	0.76
CFO	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.07	0.08
GRW	0.06	0.01	0.37	0.17	−0.05	−0.02	0.07	0.01	−0.01	0.00
LagTA	0.00	−0.01	−0.02	−0.01	−0.02	−0.03	0.01	0.00	−0.02	−0.03
LOSS	0.18	0.00	0.32	0.00	0.41	0.00	0.10	0.00	0.04	0.00
CASH	0.03	0.01	0.03	0.01	0.02	0.01	0.03	0.01	0.03	0.01
RETA	0.16	0.16	0.13	0.14	0.06	0.07	0.20	0.19	0.00	0.00
SDBV	1.42	0.91	1.69	1.21	2.47	1.76	1.01	0.65	1.42	0.66
ICR	0.03	0.02	0.05	0.02	0.03	0.02	0.03	0.02	0.04	0.02
ETA	0.06	0.06	0.07	0.07	0.04	0.05	0.07	0.07	0.09	0.09

Note: This table shows descriptive statistics for according to whether or not firms became insolvent. Please see Table 4 for variable definitions. Column (D1): externally audited large firms that had annual sales greater than 60 billion won in annual sales; Column (D2): externally audited SMEs that had less than 60 billion won in annual sales; Column (D3): non-externally audited SMEs that had less than 60 billion won in annual sales; Column (D4): non-externally audited private business operators.

However, since t-tests are univariate analyses that do not take account for other factors affecting discretionary accruals, this study used regression analysis to verify whether there were differences in discretionary accruals between insolvent and non-insolvent firms.

4.3. Multivariate Results

4.3.1. Differences in Discretionary Accruals According to External Audits and Firm Size (H1)

Table 7 shows the results of analysis of H1, which was intended to verify whether there were differences in discretionary accruals based on the presence of external audits and across firm sizes. To carry out regression analysis, three measured values of discretionary accruals were set as dependent variables, and dummy variables according to whether or not the firms received external audits and the given firm size were added to the independent variables. In the regression analysis model, externally audited SMEs (D2) were set as a reference variable. D1 is a dummy variable that has a value of 1 in the case of external audit large firms, and the regression coefficients of D1 were reported to be significant negative values in all models that considered three discretionary accruals as dependent variables. This suggested that the discretionary accruals of externally audited large firms were smaller than those of externally audited SMEs. D3 was a dummy variable that has a value of 1 in the case of non-externally audited SMEs, and D4 was a dummy variable that had a value of 1 in the case of non-externally audited private business operators. In all models that considered the three discretionary accruals to be dependent variables, both the regression coefficients of D3 and D4 were reported to be significant positive values. This indicated that the discretionary accruals of non-externally audited SMEs (D3) and non-externally audited private business operators (D4) were larger than those of externally audited SMEs (D2). In summary, the findings confirmed that discretionary accruals of non-externally audited firms were larger than those of externally audited firms, and that the discretionary accruals of small firms were larger than those of large firms.

Table 6. T-test between insolvent and non-insolvent firms.

	Variable	D1 (N = 10,435)		D2 (N = 31,727)		D3 (N = 86,519)		D4 (6043)	
		t-Value		t-Value		t-Value		t-Value	
One Year before In-solvency	DA M. Jones	−0.85		−5.88	***	3.16	***	1.25	
	DA Kothari	−0.22		−4.99	***	4.34	***	1.48	
	DA ROA	0.87		−1.78	*	5.99	***	1.80	*
	SIZE	−1.30		−1.44		2.14	**	−1.55	
	CASH	−6.35	***	−20.66	***	−21.42	***	−1.40	
	RETA	−11.51	***	−31.89	***	−28.86	***	−0.37	
	SDBV	6.50	***	18.58	***	14.04	***	2.79	***
	ICR	−14.30	***	−19.77	***	−44.37	***	−2.84	***
	ETA	−4.35	***	−16.03	***	−21.03	***	−7.65	***
Two Year before In-solvency	DA M. Jones	−0.90		0.89		4.24	***	0.77	
	DA Kothari	−0.81		1.67	*	5.28	***	0.87	
	DA ROA	−0.09		3.31	***	6.08	***	1.13	
	SIZE	−1.52		0.49		1.68	*	−1.02	
	CASH	−6.55	***	−11.45	***	−16.03	***	−1.41	
	RETA	−8.88	***	−24.41	***	−24.23	***	−0.12	
	SDBV	3.73	***	10.82	***	11.57	***	2.32	**
	ICR	−10.51	***	−32.40	***	−38.19	***	−2.85	***
	ETA	−3.12	***	−11.36	***	−16.92	***	−6.54	***
Three Year before In-solvency	DA M. Jones	0.16		2.39	**	6.48	***	3.19	***
	DA Kothari	0.29		3.10	***	7.11	***	3.36	***
	DA ROA	0.43		3.95	***	7.84	***	3.29	***
	SIZE	−1.98	**	−1.96	**	−0.31		−1.89	*
	CASH	−5.22	***	−8.40	***	−10.85	***	−1.15	
	RETA	−6.97	***	−19.56	***	−20.46	***	0.25	
	SDBV	2.37	***	7.32	***	10.07	***	2.10	**
	ICR	−13.87	***	−19.48	***	−28.02	***	−0.55	
	ETA	−1.21	***	−7.35	***	−12.25	***	−3.34	***

Note: This table shows the results of t-tests in the variables between insolvent and non-insolvent firms. *, **, and *** represent significance at the 10, 5, and 1% levels, respectively. Please see Table 4 for variable definitions. Column (D1): externally audited large firms that had annual sales greater than 60 billion won in annual sales; Column (D2): externally audited SMEs that had less than 60 billion won in annual sales; Column (D3): non-externally audited SMEs that had less than 60 billion won in annual sales; Column (D4): non-externally audited private business operators.

4.3.2. Differences in Discretionary Accruals between Insolvent and Non-insolvent Firms (H2)

Table 8 shows the results of the regression analysis for H2, which was intended to verify whether there were differences in discretionary accruals between insolvent and non-insolvent firms. Panels A through C report the results of regression analyses carried out after calculating the discretionary accruals, which were dependent variables, using three discretionary accrual measurement models, and adding a dummy variable (BUDOτ) with a value of 1 in the case of insolvent firms to the independent variables.

In Panels A through C, significant negative values were apparent as the regression coefficients of the variable BUDOτ over the entire period (one to three years prior to insolvency), and because they became smaller negative values as insolvency approached. This was identical to the results of previous studies (DeAngelo et al. 1994; Nah and Choi 2000; Choi and Jeong 1998) that analyzed data from listed firms, indicating that, even in the case of unlisted firms, insolvent firms produce smaller discretionary accruals than financially non-insolvent firms, and that their use of discretionary accruals decrease as insolvency approaches. These results can be interpreted as the effect of a reversal of accruals occurring just before insolvency, and firms that have undergone significant financial distress have no room for earnings management by discretionary accruals (Roh 2007).

Meanwhile, the dummy variables (corporate groups based on external audits and firm size) were added as control variables. With the exception of non-externally audited SMEs at two and three years prior to insolvency, the discretionary accruals of non-externally audited SMEs (D3) and non-externally audited private business operators (D4) were larger than those of externally audited SMEs (D2). This result was similar to Table 7, which shows the differences between corporate groups at one year before the occurrence of insolvency. The results of regression analyses for other control variables were as follows: SIZE and GRW had significant positive effects on discretionary accruals, and LEV, CFO, LagTA, and LOSS had significant negative effects on discretionary accruals. This result was the same as other results from previous studies.

Table 7. Differences in discretionary accruals according to external audits and firm size.

$$DA_{k,\ \tau-1} = \beta_0 + \beta_1 D1_{\tau-1} + \beta_2 D3_{\tau-1} + \beta_3 D4_{\tau-1} + \beta_4 SIZE_{\tau-1} + \beta_5 LEV_{\tau-1} + \beta_6 CFO_{\tau-1}$$
$$+ \beta_7 GRW_{\tau-1} + \beta_8 LagTA_{\tau-2} + \beta_9 LOSS_{\tau-1} + \sum YD + \varepsilon_{i,t}$$

Variable	DA M. Jones			DA Kothari			DA ROA		
	Coefficient	t-Value		Coefficient	t-Value		Coefficient	t-Value	
Intercept	−0.044	−12.10	***	−0.069	−20.27	***	−0.053	−17.13	***
D1	−0.017	−19.81	***	−0.019	−24.30	***	−0.018	−24.44	***
D3	0.009	15.04	***	0.004	7.60	***	0.007	13.38	***
D4	0.038	38.21	***	0.028	30.51	***	0.031	36.39	***
SIZE	0.015	42.23	***	0.018	54.60	***	0.015	48.76	***
LEV	−0.073	−76.92	***	−0.064	−72.86	***	−0.042	−52.51	***
CFO	−0.839	−669.91	***	−0.846	−725.24	***	−0.863	−818.12	***
GRW	0.040	126.70	***	0.039	133.55	***	0.031	−116.72	***
LagTA	−0.039	−32.82	***	−0.052	−46.61	***	−0.036	−36.25	***
LOSS	−0.114	−176.44	***	−0.108	−179.43	***	−0.055	−101.71	***
Year Dummy	Included			Included			Included		
N	134,724			134,724			134,724		
Adj.R²	0.780			0.806			0.836		
F-value	28,071.80			32,834.80			40,282.70		

Note: This table reports the results of differences in discretionary accruals according to external audits and firm size. *** represent significance at the 1% level. Please see Table 4 for variable definitions.

Table 8. Differences in discretionary accruals between insolvent and non-insolvent firms.

$$DA_{k,\ \tau-t} = \beta_0 + \beta_1 BUDO_{\tau-t} + \beta_2 D1_{\tau-t} + \beta_3 D3_{\tau-t} + \beta_4 D4_{\tau-t} + \beta_5 SIZE_{\tau-t} + \beta_6 LEV_{\tau-t}$$
$$+ \beta_7 CFO_{\tau-t} + \beta_8 GRW_{\tau-t} + \beta_9 LagTA_{\tau-t} + \beta_{10} LOSS_{\tau-t} + \sum YD + \varepsilon_{i,t}$$

Panel A: DA M. Jones

Variable	Insolvency One Year Ago (t−1)			Insolvency Two Years Ago (t−2)			Insolvency Three Years Ago (t−3)		
	Coefficient	t-Value		Coefficient	t-Value		Coefficient	t-Value	
Intercept	−0.045	−12.17	***	0.014	3.64	***	0.030	8.62	***
BUDO	−0.014	−13.57	***	−0.009	−8.10	***	−0.006	−5.62	***
D1	−0.017	−19.93	***	−0.016	−17.76	***	−0.018	−19.41	***
D3	0.009	15.21	***	−0.006	−9.47	***	−0.012	−18.97	***
D4	0.038	38.16	***	0.025	24.42	***	0.021	19.30	***
SIZE	0.015	42.27	***	0.010	27.46	***	0.009	26.18	***
LEV	−0.072	−75.86	***	−0.076	−77.76	***	−0.083	−80.95	***
CFO	−0.839	−670.42	***	−0.843	−682.75	***	−0.842	−691.86	***
GRW	0.040	126.51	***	0.040	131.25	***	0.039	134.32	***
LagTA	−0.039	−32.48	***	−0.038	−32.84	***	−0.038	−33.28	***
LOSS	−0.114	−175.76	***	−0.119	−166.05	***	−0.125	−158.13	***
Year Dummy	Included			Included			Included		
N	134,724			134,724			134,724		
Adj.R²	0.780			0.785			0.789		
F-value	26,558.50			28,942.60			31,474.80		

<div align="center">**Table 8.** *Cont.*</div>

	Panel B: DA Kothari								
Variable	**Insolvency One Year Ago (t−1)**			**Insolvency Two Years Ago (t−2)**			**Insolvency Three Years Ago (t−3)**		
	Coefficient	**t-Value**		**Coefficient**	**t-Value**		**Coefficient**	**t-Value**	
Intercept	−0.070	−20.33	***	−0.024	−7.03	***	−0.008	−2.51	***
BUDO	−0.011	−11.53	***	−0.006	−6.40	***	−0.005	−4.44	***
D1	−0.020	−24.41	***	−0.020	−23.92	***	−0.021	−25.24	***
D3	0.004	7.74	***	−0.006	−9.89	***	−0.010	−16.99	***
D4	0.028	30.46	***	0.020	20.70	***	0.017	17.18	***
SIZE	0.018	54.64	***	0.014	40.96	***	0.013	39.72	***
LEV	−0.063	−71.93	***	−0.067	−72.85	***	−0.073	−75.40	***
CFO	−0.847	−725.55	***	−0.849	−735.29	***	−0.847	−740.66	***
GRW	0.039	133.38	***	0.039	137.95	***	0.038	−140.43	***
LagTA	−0.051	−46.32	***	−0.051	−46.94	***	−0.050	−46.83	***
LOSS	−0.108	−178.81	***	−0.113	−168.44	***	−0.119	−159.99	***
Year Dummy	Included			Included			Included		
N	134,724			134,724			134,724		
Adj.R^2	0.780			0.806			0.836		
F-value	28,071.80			32,834.80			40,282.70		
	Panel C: DA ROA								
Variable	**Insolvency One Year Ago (t−1)**			**Insolvency Two Years Ago (t−2)**			**Insolvency Three Years Ago (t−3)**		
	Coefficient	**t-Value**		**Coefficient**	**t-Value**		**Coefficient**	**t-Value**	
Intercept	−0.070	−20.33	***	−0.024	−7.03	***	−0.008	−2.51	***
BUDO	−0.011	−11.53	***	−0.006	−6.40	***	−0.005	−4.44	***
D1	−0.020	−24.41	***	−0.020	−23.92	***	−0.021	−25.24	***
D3	0.004	7.74	***	−0.006	−9.89	***	−0.010	−16.99	***
D4	0.028	30.46	***	0.020	20.70	***	0.017	17.18	***
SIZE	0.018	54.64	***	0.014	40.96	***	0.013	39.72	***
LEV	−0.063	−71.93	***	−0.067	−72.85	***	−0.073	−75.40	***
CFO	−0.847	−725.55	***	−0.849	−735.29	***	−0.847	−740.66	***
GRW	0.039	133.38	***	0.039	137.95	***	0.038	−140.43	***
LagTA	−0.051	−46.32	***	−0.051	−46.94	***	−0.050	−46.83	***
LOSS	−0.108	−178.81	***	−0.113	−168.44	***	−0.119	−159.99	***
Year Dummy	Included			Included			Included		
N	134,724			134,724			134,724		
Adj.R^2	0.780			0.806			0.836		
F-value	28,071.80			32,834.80			40,282.70		

Note: This table reports the results of differences in discretionary accruals between insolvent and non-insolvent firms. *** represent significance at the 1% level. Please see Table 4 for variable definitions.

4.3.3. Predictability of Discretionary Accruals for Insolvent Firms (H3)

Table 9 shows the results of discrete-time logit analyses to determine whether discretionary accruals have the ability to predict whether firms will become insolvent in the future. Panels A through C shows the results of discrete time logit analyses carried out for the period of one year to three years before insolvency after constructing verification models for the three discretionary accruals. In this study, the five variables (CASH, RETA, SDBV, ICR, and ETA) that were selected by Altman and Sabato (2007) as variables useful in the prediction of insolvency of unlisted SMEs were treated as control variables in the models. In addition, the firm size variable (SIZE) and the corporate group dummy variables (D1, D3, D4) were added.

Table 9. Predictive capacity of discretionary accruals for insolvent firms.

Control Model:	$Y_\tau = \beta_0 + \beta_1 D1_{\tau-1} + \beta_2 D3_{\tau-1} + \beta_3 D4_{\tau-1} + \beta_4 SIZE_{\tau-1} + \beta_5 CASH_{\tau-1}$ $+\beta_6 RETA_{\tau-1} + \beta_7 SDBV_{\tau-1} + \beta_8 ICR_{\tau-1} + \beta_9 ETA_{\tau-1} + \varepsilon_{i,t}$
Verification Model:	$Y_\tau = \beta_0 + \beta_1 DA_{k,\ \tau-t} + \beta_2 D1_{\tau-t} + \beta_3 D3_{\tau-t} + \beta_4 D4_{\tau-t} + \beta_5 SIZE_{\tau-t}$ $+\beta_6 CASH_{\tau-t} + \beta_7 RETA_{\tau-t} + \beta_8 SDBV_{\tau-t} + \beta_9 ICR_{\tau-t}$ $+\beta_{10} ETA_{\tau-t} + \varepsilon_{i,t}$

Panel A: DA $_{M.Jones}$ Added to the Control Model												

				Insolvency One Year Ago (t−1)			Insolvency Two Years Ago (t−2)			Insolvency Three Years Ago (t−3)		
	Coeff.	Chi-Square		Coeff.	Chi-Square		Coeff.	Chi-Square		Coeff.	Chi-Square	
Intercept	−2.434	47.7	***	−2.434	47.7	***	−2.400	46.3	***	−2.382	45.6	***
$DA_{\tau-1}$				0.090	0.4							
$DA_{\tau-2}$							0.541	23.2	***			
$DA_{\tau-3}$										0.861	68.0	***
D1	−0.122	1.8		−0.121	1.8		−0.121	1.8		−0.122	1.9	
D3	0.286	26.4	***	0.283	26.4	***	0.283	26.4	***	0.282	25.7	***
D4	−0.505	22.5	***	−0.508	22.5	***	−0.508	22.5	***	−0.511	22.9	***
SIZE	−0.045	1.7		−0.046	1.7		−0.046	1.7		−0.051	2.1	
CASH	−4.193	127.0	***	−4.169	127.0	***	−4.169	127.0	***	−4.135	123.4	***
RETA	−1.664	203.3	***	−1.671	203.3	***	−1.671	203.3	***	−1.731	217.6	***
SDBV	0.109	94.3	***	0.109	94.3	***	0.109	94.3	***	0.108	92.4	***
ICR	−2.215	44.9	***	−2.129	44.9	***	−2.129	44.9	***	−2.105	44.4	***
ETA	−3.427	158.1	***	−3.428	158.1	***	−3.428	158.1	***	−3.319	147.9	***
Likelihood		2107.7	***		2108.1	***		2130.6	***		2130.6	***
−2Log L	33,998.4			33,998.0	(Δ0.4)		33,975.5	(Δ22.9)		33,931.8	(Δ66.7)	
AUC	70.87%			70.90%	(0.03%)		70.99%	(0.12%)		71.23%	(0.36%)	

Panel B: DA $_{Kothari}$ added to the Control Model												

				Insolvency One Year Ago (t−1)			Insolvency Two Years Ago (t−2)			Insolvency Three Years Ago (t−3)		
	Coeff.	Chi-Square		Coeff.	Chi-Square		Coeff.	Chi-Square		Coeff.	Chi-Square	
Intercept	−2.434	47.7	***	−2.410	46.6	***	−2.392	46.0	***	−2.379	45.5	***
$DA_{\tau-1}$				0.148	1.5							
$DA_{\tau-2}$							0.579	25.9	***			
$DA_{\tau-3}$										0.880	69.4	***
D1	−0.122	1.8		−0.121	1.8		−0.124	1.9		−0.122	1.9	

Table 9. *Cont.*

Panel B: DA Kothari added to the Control Model											
				Insolvency One Year Ago (t−1)				Insolvency Two Years Ago (t−2)			Insolvency Three Years Ago (t−3)
	Coeff.	Chi-Square		Coeff.	Chi-Square			Coeff.	Chi-Square		Coeff.	Chi-Square
D3	0.286	26.4		0.282	25.6			0.282	25.8	***	0.283	25.9
D4	−0.505	22.5		−0.508	22.7			−0.506	22.5	***	−0.503	22.3
SIZE	−0.045	1.7		−0.048	1.9			−0.050	2.1		−0.052	2.2
CASH	−4.193	127.0	***	−4.149	123.2	***		−4.141	123.8	***	−4.136	123.6	***
RETA	−1.664	203.3	***	−1.675	204.6	***		−1.704	211.2	***	−1.719	215.2	***
SDBV	0.109	94.3	***	0.109	94.8	***		0.109	94.3	***	0.108	92.6	***
ICR	−2.215	44.9	***	−2.131	45.0	***		−2.114	44.5	***	−2.103	44.4	***
ETA	−3.427	158.1	***	−3.424	157.3	***		−3.343	149.5	***	−3.299	146.0	***
Likelihood		2107.7	***		2109.1	***			2133.3	***		2175.8	***
−2Log L	33,998.4			33,997.0	(Δ1.5)			33,972.8	(Δ25.6)		33,930.4	(Δ68.1)
AUC	70.87%			70.92%	(0.05%)			71.00%	(0.13%)		71.24%	(0.37%)

Panel C: DA ROA added to the Control Model											
				Insolvency One Year Ago (t−1)				Insolvency Two Years Ago (t−2)			Insolvency Three Years Ago (t−3)
	Coeff.	Chi-Square		Coeff.	Chi-Square			Coeff.	Chi-Square		Coeff.	Chi-Square
Intercept	−2.434	47.7	***	−2.418	47.0	***		−2.409	46.7	***	−2.396	46.2	***
$DA_{\tau-1}$				0.149	1.4							
$DA_{\tau-2}$								0.544	21.8	***		
$DA_{\tau-3}$											0.834	59.5	***
D1	−0.122	1.8		−0.121	1.8			−0.123	1.9		−0.121	1.8
D3	0.286	26.4		0.282	25.7			0.283	26.0	***	0.284	26.1
D4	−0.505	22.5		−0.507	22.6			−0.501	22.1	***	−0.495	21.5
SIZE	−0.045	1.7		−0.047	1.8			−0.049	2.0		−0.052	2.2
CASH	−4.193	127.0	***	−4.147	122.9	***		−4.137	123.5	***	−4.128	123.1	***
RETA	−1.664	203.3	***	−1.672	204.4	***		−1.684	207.3	***	−1.688	208.4	***
SDBV	0.109	94.3	***	0.109	94.4	***		0.109	93.5	***	0.108	92.4	***
ICR	−2.215	44.9	***	−2.132	45.0	***		−2.108	44.4	***	−2.097	44.4	***
ETA	−3.427	158.1	***	−3.393	152.9	***		−3.334	148.7	***	−3.308	146.9	***
Likelihood		2107.7	***		2109.1	***			2129.2	***		2166.2	***
−2Log L	33,998.4			33,997.0	(Δ1.4)			33,976.9	(Δ21.6)		33,939.9	(Δ58.6)
AUC	70.87%			70.92%	(0.05%)			70.98%	(0.11%)		71.19%	(0.32%)

Note: This table reports the results of predictive capacity of discretionary accruals for insolvent firms. *** represent significance at the 1% levels. Please see Table 4 for variable definitions.

The method of verification of H3 through discrete time logit analysis is given as follows. In the verification model, if the coefficient (β_1) of discretionary accruals (hereinafter referred to as 'the DA variable') shows a statistically significant value, and the -2Log L (likelihood) value, which is reduced by the addition of the DA variable, is not smaller than the threshold value on the right of the chi-square distribution table ($\alpha = 0.01$, 10.8 for df = 1), then the DA variable input will be interpreted to have additional predictive power. If, on the other hand, the coefficient of the DA variable is not statistically significant, or if the -2Log L value reduced by the addition of the DA variable is smaller than the threshold value, the DA variable input will be interpreted to have no additional explanatory power.

On reviewing Panels A through C, both the discretionary accruals of two to three years ago show statistically significant positive values, and the value of -2Log L as reduced by the addition of the DA variable to the control model is 21.6 (DA $_{M. Jones}$ as of two years before insolvency) at a minimum and 68.1 (DA $_{Kothari}$ as of three years before insolvency) at a maximum. These results indicated that the DA variables used in the verification model had predictive power. In other words, according to this analysis, discretionary accruals predict whether firms become insolvent two and three years prior to insolvency.

Panels A through C show that the coefficient of the DA variable for two years prior to insolvency became smaller than that of three years prior to insolvency. In particular, the coefficient of the DA variable for one year prior to insolvency was drastically lower than that of two years prior to insolvency and was not statistically significant, and all the -2Log L values reduced by the addition of DA variables to the control model were shown to be smaller than 10.8 (DA$_{M. Jones}$: 0.4, DA $_{Kothari}$: 1.5, DA $_{ROA}$: 1.4). Accordingly, the DA variable for one year before insolvency did not predict which firms would become insolvent. Moreover, when the DA variables were added to such cases, the measured value of the discrimination capacity (area under the curve; AUC) was shown to increase slightly from 70.87 to 70.92%, indicating that the DA variables had virtually no additional discrimination capacity

We attribute these findings to the verification of H2, which indicates that the number of discretionary accruals of insolvent firms continues to decrease as insolvency nears. In other words, since insolvent firms engage in earnings management using accruals from as far out as three years before insolvency, and as the use of accruals decreases as insolvency approaches, accruals are shown to have no predictive capacity to distinguish between non-insolvent and insolvent firms in the year immediately prior to insolvency. These results can be attributed to a significant decrease in the means of earnings management that can be used just before insolvency because insolvent firms continue to try to manage their earnings (Kim and Park 1999). In addition, these results can be interpreted as an effect of securing cash flows rather than earnings management due to strengthened monitoring by regulatory authorities (Nah and Choi 2000).

5. Conclusions

The purpose of this study was to analyze the characteristics of the discretionary accruals of unlisted firms and the earnings management of insolvent firms. To that end, dummy regression analyses were conducted to determine whether practices related to discretionary accruals varied between four corporate groups (differentiated by their external audit status and firm size) and their insolvency status. Discrete-time logit analyses were used to verify whether discretionary accruals were predictive of insolvency among unlisted firms. Unlike the previous studies that have relied on small sample sizes with mainly publicly listed firms, we used a dataset comprised of many unlisted firms. This study also aimed to improve the strength of its findings by using three measurement models (Dechow et al. 1995; Kothari et al. 2005) to calculate discretionary accruals as a proxy for earnings management.

This study showed that among the discretionary accruals of non-externally audited private business operators, those one year from insolvency were largest, followed by those of non-externally audited SMEs, externally audited SMEs, and externally audited large firms. These results confirmed that the discretionary accruals of non-externally audited

firms are larger than those of externally audited firms, and that the discretionary accruals of small firms are larger than those of large firms. The discretionary accruals of financially non-insolvent firms were larger than those of insolvent firms from the timespan of one year to three years before the occurrence of insolvency and the differences became larger as insolvency approached. This is identical to the results of previous studies (DeAngelo et al. 1994; Nah and Choi 2000; Choi and Jeong 1998) that analyzed data from listed firms, indicating that even in the case of unlisted firms, the discretionary accruals for insolvent firms were smaller than financially non-insolvent firms, and that discretionary accruals decreased as insolvency approached.

Discretionary accruals were predictive of whether firms would become insolvent two or three years prior to insolvency but had no predictive value at one year prior to insolvency. This is assumed to be attributable to the fact that the discretionary accruals of insolvent firms decrease as insolvency approaches. In other words, because insolvent firms perform earnings management through accruals from at least three years prior to insolvency, accruals decrease as insolvency approaches, and as such there is no predictive capacity to determine whether firms would become insolvent in the year immediately prior to insolvency. Ultimately, this suggests that pieces of accounting information other than discretionary accruals should be used to predict the insolvency of unlisted firms.

In previous studies, the study of earnings management for insolvent firms was mainly conducted with listed firms, whereas our study analyzed data from unlisted firms. A notable contribution of this study was the division of samples into four groups (differentiated by external audit status and firm size) in order to analyze whether discretionary accruals were different among groups and verify whether discretionary accruals had a predictive capacity for insolvency.

Managers of insolvent firms have an incentive to increase earnings using discretionary accruals in order to prevent or delay the occurrence of default. However, in the year immediately preceding the insolvency, the possibility of alternative accounting treatment is already reduced, so the available discretionary accruals will decrease. Consequently, it can be seen that in the case of insolvent firms, accounting distortion has already occurred several years before insolvency and transparency of accounting information is reduced. In this regard, it was found that firms with severe distortion of accounting information have a high possibility of ultimately leading to firm insolvency, so managers' accounting manipulation can be seen as a sign of it. We have a limitation that there is still a problem of omitted variables in the empirical model for corporate insolvency. Future research can extend the results of the current study by considering industrial characteristics and corporate insolvency associated to them.

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