Income Smoothing and the Cost of Bank Loans
ーThe Effect of Information Asymmetryー

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May 2012

No.143

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Abstract

This study investigates the link between income smoothing behavior and the cost of bank loans. In particular, this study focuses on information asymmetry between a firm and financial institutions and analyzes the effect of this information asymmetry on the link between income smoothing behavior and the cost of bank loans. Through the analysis, the current study provides three new pieces of empirical evidence. First, this study finds that income smoothing behavior by management lowers the cost of bank loans. Second, when considering information asymmetry, the statistically significant relation between income smoothing and the cost of bank loans in middle- and high-information asymmetry firms can be found. Finally, in the low-information asymmetry firms, a statistically significant relation between income smoothing and the cost of bank loans cannot be observed. These results imply that information asymmetry strongly affects the link between income smoothing and the cost of bank loans.

Keywords: Income Smoothing; Cost of Bank Loans; Information Asymmetry; Delegated Monitor; Private Information

1. Introduction

This study investigates the link between income smoothing behavior and the cost of bank loans. In particular, this paper focuses on the information asymmetry between a firm and financial institutions and analyzes the effect of information asymmetry on the link between income smoothing behavior and the cost of bank loans.

Although prior studies investigate the effect of income smoothing on credit ratings (Gu and Zhao [2006]; Jung et al. [2009]), a few studies have directly investigated the effect of income smoothing on the cost of bank loans. However, because a large number of firms are highly dependent on bank loans, bank loans are a very important factor in managing firms. In this study, I attempt to fill a gap between income smoothing behavior and the cost of bank loans.

In addition to analyzing the relation between income smoothing and the cost of bank loans, by focusing on the information production function of main banks, this study investigates the effect of information asymmetry between firms and financial institutions on the link between income smoothing behavior and the cost of bank loans.

This study provides three new pieces of empirical evidence. First, this study finds that income smoothing behavior by management lowers the cost of bank loans. Second, when considering the information asymmetry, the statistically significant relation between income smoothing and the cost of bank loans in middle- and high-information asymmetry firms can be found. Finally, in the low-information asymmetry firms, a statistically significant relation between income smoothing and the cost of bank loans cannot be observed. These results imply that information asymmetry strongly affects the link between income smoothing and the cost of bank loans.

This research has three implications. First, this study finds the relation between income smoothing behavior and the cost of bank loans. Prior literature focuses mainly on the effect of income smoothing on credit ratings. This study seems to be the first study to empirically investigate the impact of income smoothing on the cost of bank loans. In addition, this study reveals that the effect of income smoothing on the cost of bank loans changes depending on the information asymmetry between firms and financial institutions; this study also identifies one part of the mechanism of income smoothing effect on the cost of bank loans.

Second, this study provides a suggestion for accounting standard setting from the viewpoint of loan contracts. As mentioned by Holthausen and Watts [2001], prior value relevance studies mainly focus on equity investors. Because of this fact, the implications of these prior studies tend to be limited to the informativeness of accounting information for equity investors. This study investigates the effect of income smoothing from the viewpoint of loan contracts and provides evidence that information provided by income smoothing behavior is beneficial to loan contracting. Management discretion in the accrual accounting process is one of the most important issues in accounting standard setting and occasionally becomes a target for criticism. However, this study implies that discretionary income smoothing behavior in accounting processes might be beneficial to users of accounting information.

Finally, this study has an implication for research on the cost of capital. The current study shows the information asymmetry between a firm and financial institutions affects the linkage between income smoothing and the cost of bank loans. This controlling for the level of the information asymmetry can be applicable to other study about the cost of capital. This methodology might extend our knowledge about the cost of capital.

The remainder of this paper is organized in the following manner. Section 2 reviews the literature and presents the hypotheses. Section 3 provides details about the research design. Section 4 explains the sampling methodology. Section 5 presents the analysis results. Section 6 conducts robustness checks. Section 7 summarizes the paper and provides concluding remarks.

2. Prior Literature and Hypothesis Development

(1) Prior literature

As mentioned above, to the best of my knowledge, there are no studies that directly investigate the link between income smoothing behavior and the cost of bank loans. The study of Bharath et al. [2008] seems to be most similar to this study. They investigate the link between accounting quality and the cost of bank loans, focusing on accruals reported under the accrual accounting process and define the first principle component of the absolute values of residuals from three standard abnormal operating accrual metrics (Dechow et al. [1995]; Teoh et al. [1998]; Dechow and Dichev [2002]) as their measure of accounting quality. This measure could capture earnings management because the residuals calculated from the model given by Dechow et al. [1995] have been used as the proxy variable of earnings management in prior accounting literature. Using this variable, Bharath et al. [2008] report that the cost of bank loans decreases as accounting quality increases. This implies that earnings management might increase the cost of bank loans. On the other hand, Gu and Zhao [2006], Jung et al. [2009], and Martinez and Castro [2010] analyze the link between income smoothing behavior and credit ratings and find that firms whose income is smoothed by management tend to be classified into higher grades.

In addition to analysis of the income smoothing effect on the cost of bank loans, this study investigates whether this linkage changes according to the degree of information asymmetry between firms and financial institutions. Some studies (Francis et al. [2005]; Graham et al. [2008]; Cassar et al. [2008]) analyze the effect of information asymmetry on the cost of bank loans. Using firm data for 34 countries, Francis et al. [2005] investigate the relation between the levels of voluntary disclosure and the cost of bank loans. They assume that voluntary disclosure lowers information asymmetry between the firm and funders and would decrease the cost of capital. Through their analysis, they find that even after controlling the difference in legal environments among countries, firms' costs of bank loans decrease as the level of voluntary disclosure increases.

Graham et al. [2008] focus on firms' financial restatements and test the hypothesis that financial restatements exacerbate information problems between firms and funders. Through their analysis, they find that compared with loans initiated before restatement, loans initiated after restatement have significantly higher spreads. In addition to this finding, they also find that the increase in loan spread is significantly larger for fraudulent restating firms than for other restating firms. These findings imply that restatement poses information problems; in particular, fraudulent restatement poses more information problems.

Cassar et al. [2008] investigate whether the voluntary use of accrual accounting provides more information to funders than cash accounting. They focus on U.S. small businesses because these firms have discretion in their choice between cash accounting and accrual accounting. Many studies have provided evidence that accruals provide incremental information to users above cash components. Cassar et al. [2008] focus on small businesses in the US that face severe information problems and have discretion in their choice between cash and accrual accounting in order to test their hypothesis that accruals accounting mitigates information asymmetry between firms and funders to lower the firm's cost of bank loans. Through their analysis, they find evidence that supports their hypothesis.

These three studies investigate the link between information asymmetry and the cost of bank loans and find that the larger information asymmetry is, the higher the firm's cost of bank loans demanded by financial institutions is.

(2) Hypothesis development

Why can income smoothing behavior by management affect a firm's cost of bank loans demanded by financial institutions? Graham et al. [2005] obtain an answer from an interview with a firm's financial executive.

“In fact, one CFO of a private firm that relies on extensive bank financing mentions that earnings need to be smoothed so that the bank does not get nervous about the firm’s credit worthiness.”

(Graham et al. [2005, p. 47])

If this CFO’s understanding is right, this means that income smoothing behavior by management can change financial institutions’ opinion of a firm’s credit worthiness. When the financial institution “gets nervous” about the firm’s creditworthiness, this anxiety might result in an increase in the firm’s cost of bank loans in the future. If so, why do smoothed earnings affect financial institutions’ evaluation of the firm’s creditworthiness?

Given an amount of investment, a capital provider’s investment decision is dependent on the present value of this investment, particularly the estimated value of the future cash flow and the discount rate of the expected cash flow. Given debt contracting, it is reasonable for financial institutions to set the interest rate such that the net present value of lending exceeds the amount of lending. Because financial institutions can collect their claims unless the creditor goes bankrupt, the examination by financial institutions could be equal to the evaluation of default risk. The Japan Credit Rating Agency (JCR), a rating agency that analyzes firms’ default risk, expresses the evaluation of firms’ credit worthiness in the following manner.

“When assessing credit strength, focus is placed on two main issues. The first is the business foundations (business risks)—whether the obligor will be able to maintain and eventually expand its business foundations over time and generate the required cash flow. The second is the financial foundations (financial risks)—whether the obligor’s financial situation will adversely affect the ability to repay obligations.”

(JCR [2012, p. 2])

If financial institutions use the same process to assess a firm’s credit worthiness, income smoothing behavior might provide financial institutions information that is beneficial to assessing firms’ business risks. Prior literature on income smoothing (Francis et al. [2004]; Tucker and Zarowin [2006]) finds that income smoothing behavior communicates private information regarding future earnings because managers use private information to decide whether to smooth current earnings. Many prior studies (Francis et al. [2004]; Tucker and Zarowin [2006]; Nakajima [2008]; Nakano and Takasu [2011]) have provided evidence that supports this perspective. Francis et al.

[2004] report that the more income is smoothed, the lower the firm's cost of equity capital is. Tucker and Zarowin [2006] use the future earnings response coefficient and find that the change in the current stock price of higher-smoothing firms contains more information regarding their future earnings than does that of lower-smoothing firms. Nakajima [2008] reports that the more earnings are smoothed through accruals, the less volatile the firm's future cash flow is. This implies that current earnings stability is positively correlated with the stability of future cash flow. Nakano and Takasu [2011] find that the current earnings of higher-smoothing firms have more explanatory power for future cash flow than do those of lower-smoothing firms.

Furthermore, in addition to business risks and financial risks, capital providers have to bear the estimation risk, which is the difference between the estimated risk and the actual risk. He et al. [2010] and Nakano and Takasu [2012] find that analysts' forecast accuracy of higher-smoothing firms is higher than that of lower-smoothing firms. Because improving predicting power could reduce the estimation risk, this evidence implies that income smoothing behavior by management could reduce the estimation risk[1].

On the other hand, some studies have expressed opposition to the above perspective. The basis of this opposing argument is that income smoothing garbles earnings. From this viewpoint, management smoothes earnings in order to gain private benefit (e.g., compensation or career advancement). If so, income smoothing might increase earnings opacity (Leuz et al. [2003]; Bhattacharya et al. [2003]). Moreover, McInnis [2010] points out a problem with the research design that Francis et al. [2004] adopt. He shows that there is no statistically significant relation between income smoothing behavior and the cost of equity capital in the above problem.

As stated above, although both the arguments and the empirical results are not conclusive, there is the possibility that income smoothing by management could communicate private information with regard to future business stability to financial institutions and reduce the estimation risk borne by financial institutions. From the above discussions, hypothesis 1 is developed.

H1: Higher-smoothing firms' costs of bank loans are lower than those of

[1] Based on common financial theory, whether this estimation risk is actually priced is dependent on whether the risk is diversifiable. There are a number of theoretical studies that discuss the link between information and the cost of capital (e.g., Diamond and Verrechia [1991]; Easley and O'Hara [2004]; Lambert et al. [2007]). In particular, Lambert et al. [2007] price the estimation risk using model analysis. However, Takehara [2008] identifies a problem with these analytical models and argues, "It is difficult to prove that disclosure lowers the cost of capital using the theoretical model, and therefore researchers can only show the correlation empirically" (Takehara [2008, p. 486], translated into English by the present author).

lower-smoothing firms.

In addition, because accounting information is part of the information set available for the evaluation of firms' creditworthiness by capital providers, it is expected that the information environment in capital providers affects the informativeness of accounting information for evaluation. In particular, under the condition that information asymmetry between the firm and financial institutions is large, it might be difficult for financial institutions to estimate future business risk of firms, and they would thus bear high estimation risk. Under that condition, private information communicated through income smoothing behavior to outsiders could contain relatively more incremental information than under the condition that the information asymmetry is low. From this viewpoint, hypothesis 2 is developed.

H2: The larger the information asymmetry between the firm and financial institutions, the further the extent to which income smoothing behavior reduces the firm's cost of bank loans.

3. Research Design

(1) Proxy for income smoothing behavior

This study defines "income smoothing" as a manager's decreasing of net income volatility (hereafter *VNI*) compared to pre-discretionary income volatility (hereafter *VPDI*). The proxy variable of the degree of smoothing is defined as firm-specific historical *VNI*, which is calculated as the standard deviation of net income (hereafter *NI*) over the last five years, divided by *VPDI*, which is calculated as the standard deviation of pre-discretionary income (hereafter *PDI)* over the last five years. Both *NI* and *PDI* are deflated by total assets at the beginning of the year. This proxy variable is used by Hunt et al. [2000] and Nakano and Takasu [2011, 2012]. The smaller this variable is, the more likely it is that managers smooth income. Leuz et al. [2003] and Francis et al. [2004] use a similar variable: the volatility of reported income divided by the volatility of cash flow from operations.

In order to use this proxy variable, I first define the discretionary portion. Prior literature has provided two definitions of the discretionary portion. Some studies regard cash flow from operations as pre-discretionary income and total accruals as the discretionary portion. In contrast, other studies focus on the discretionary portion of total accruals (i.e., discretionary accruals) and regard net income minus discretionary accruals as pre-discretionary income. Which method should be used in earnings management studies is an open question. Although total accruals can be specified relatively easily, it is difficult to distinguish the portions generated in normal accounting processes from the discretionary portions. Conversely, discretionary accruals are believed to be the discretionary portions of total accruals. However, some researchers (e.g., Obinata [2007]) have pointed out the measurement error problem in estimation models of normal accruals. This study regards discretionary accruals as the discretionary portion of total accruals. In order to address the measurement error problem, I also regard total accruals as the discretionary portion and perform a robustness check.

In this study, total accruals (hereafter *TAC*) and cash flow from operations (hereafter *CFO*) are estimated as below. In equation (1), Δ indicates the change in the amount from the beginning of the fiscal year to the end of the fiscal year.

Total accrual (*TAC*) = (Δcurrent assets – Δcash and cash equivalents) – (Δcurrent liabilities – Δfinancing item[2]) – Δother allowance[3] – depreciation (1)

Cash flow from operations (*CFO*) = *NI* − *TAC* (2)

In order to define total accruals, many studies (e.g., Gomez et al. [2000]; Shuto [2010]) use an estimation model like equation (1). Other studies (e.g., Aoki [2011]) define total accruals as net income minus cash flow from operations collected from the cash flow statement. In order to use the latter method, cash flow statement is needed. However, in Japan, cash flow statements are available only after 2000. In this study, in order to calculate the proxy for income smoothing, I have to estimate the discretionary accruals over the last five years. Therefore, if I use the latter method, the sample used to test the hypotheses is limited after 2004. In order to ensure a longer estimation window, I use the former method (equation (1)) to define *TAC*.

Discretionary accruals (hereafter *DAC*) are estimated as *TAC* minus nondiscretionary accruals (hereafter *NDAC*). *NDAC* is estimated via a regression-based approach, following Kothari et al. [2005]. In particular, this study estimates *NDAC* by industry-year from Model (3):

[2] Δfinancing is the sum of the change in short-term debt, change in commercial paper, and change in the current portion of bonds and convertible bonds.

[3] Δother allowance is the sum of the change in allowance for doubtful accounts classified as fixed assets and the change in long-term provision.

$$TAC_t = \delta_0 + \delta_1(1/A_{t-1}) + \delta_2(\varDelta S_t - \varDelta REC_t) + \delta_3 PPE_t + \delta_4 ROA_t + \varepsilon_t \quad (3)$$

TAC_t = total accruals in Fiscal Year t, deflated by total assets at the beginning of Fiscal Year t

A_{t-1} = total assets at the end of Fiscal Year t – 1

$\varDelta S_t$ = the change in sales from Fiscal Year t -1 to t, deflated by total assets at the beginning of Fiscal Year t

$\varDelta REC_t$ = the change in accounts receivables from Fiscal Year t -1 to t, deflated by total assets at the beginning of Fiscal Year t

PPE_t = gross plant, property and equipment at the end of Fiscal Year t, deflated by total assets at the beginning of Fiscal Year t

ROA_t = net income before extraordinary items in Fiscal Year t, deflated by total assets at the beginning of Fiscal Year t

DAC is defined as the residual of Model (3). *PDI* is defined as *NI* minus *DAC*, as shown below.

$$PDI_t = NI_t - DAC_t \qquad (4)$$

NI_t : net income in fiscal year *t*, deflated by total assets at the beginning of Fiscal Year *t*.

Finally, this study's proxy variable of income smoothing is calculated as *VNI* divided by *VPDI* (i.e., *SMTH* in equation (5)).

$$SMTH_t = \frac{VNI_t}{VPDI_t} \qquad (5)$$

VNI_t : the firm-specific volatility of earnings that is calculated as the standard deviation of *NI* over the last five years.

$VPDI_t$: the firm-specific volatility of pre-discretionary income that is calculated as the standard deviation of *PDI* over the last five years.

In order to control for industry and time effects, following Tucker and Zarowin [2006], this study uses a firm's reversed fractional ranking[4] of income smoothing

[4] A reversed fractional ranking is the reversed raw rank divided by the number of observations. For example, the reversed fractional rankings of 1 to 10 among the numbers 1 to 10 are 1 and 0.1, respectively.

(between 0 and 1) within its industry-year[5] and refers to it as income smoothing (*IS*)[6]. Higher-*IS* firms aggressively smooth income in the industry-years to which they belong. Hereafter, this study uses *IS* as a measure of degree of income smoothing[7]. In Section 6, we conduct several robustness checks with three additional *IS* measures: *IS2*, *IS3*, and *IS4*.

(2) Definitions of variables relevant to debt contracts

In this section, I define the variables relevant to debt contracts (the cost of bank loans and debt maturity). This study uses the weighted average long-term interest rate at the end of fiscal year $t + 1$ collected from the detailed statement in the firm's annual report as the proxy variable for the firm's cost of bank loans and labels it $LTIR_{t+1}$. This study focuses on the long-term interest rate because it is expected that information about future performance communicated through income smoothing behavior and the uncertainty in future performance would be better reflected in the long-term interest rate than the short-term interest rate.

Prior literature on debt contracting (e.g., Coleman et al. [2006]; Bharath et al. [2008]; Graham et al. [2008]) uses each debt contract as an observation. Hence, some observations can belong to a certain firm because the firm closes several debt contracts. However, in this study, I use each firm as an observation because of data restrictions. Furthermore, there is a problem with using each debt contract as an observation because this method causes correlation across observations within the firm. In addition, this method might weight the firms that close several debt contracts more heavily. These problems would bias the results. However, when each firm is regarded as an observation, the debt contracts negotiated before the observation of the income smoothing behavior might be reflected in the calculation of the weighted average long-term interest rate. I address this issue in the robustness check.

As with the cost of bank loans, the proxy variable for debt maturity must be defined because this study regards each firm as an observation instead of each contract. This study uses weighted average loan maturity (hereafter *MAT*), which is calculated on the basis of the amounts of short-term loans and the schedule of repayment of long-term loans from the detailed statement in the firm's annual report. In particular, short-term

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5 This paper uses the industry codes of the Securities Identification Code Committee in Japan, which relate to 33 different industries.

6 For example, assume an industry-year that includes three firms (A, B, and C). If A's value of the proxy of income smoothing (*SMTH*) is higher than those of the others and C's value is lower than those of the others, we rank A, B, and C as 1, 2, and 3, respectively, and divide each ranking by the number of observations in the industry-year. Therefore, 1/3, 2/3, and 3/3 are the *IS* values of A, B, and C, respectively.

7 Even when $SMTH_t$ is used instead of IS_t, the empirical results remain unchanged.

loans and the current portion of long-term loans are regarded as the current portion of loans (i.e., loans that are repaid in the next fiscal year). The amounts of loans that are repaid in the second, third, fourth, and fifth fiscal years are collected from the detailed statement in the firm's annual report. The amounts of loans repaid after the fifth fiscal year are calculated by the amounts of long-term loans from the firm's balance sheet minus the sum of the loans repaid within the next five years. Using these values, MAT_t is estimated from equation (6).

$$MAT_t = \frac{1 \times \text{current portion of loans} + \sum_{i=2}^{5} i \times (\text{loans repaid in } i\text{th fiscal year}) + 6 \times \text{loans repaid after the fifth fiscal year}}{\text{Short-term loans} + \text{Current portion of long-term loans} + \text{Long-term loans}} \quad (6)$$

(3) Measurement of information asymmetry

In this section, I define the proxy variable for information asymmetry between the firm and financial institutions. This study regards the firm's concentration ratio of lenders (hereafter CR_t) as the proxy variable for the information asymmetry.

Diamond [1984] points out that it is beneficial for the entire economy that a certain financial institution (e.g., a main bank) becomes a delegated monitor to monitor and acquire information regarding the borrower. The reason for this is that monitoring and acquiring information about the borrower by each financial institution would cause resource allocation overlap. Moreover, because information is a public good, the free-rider problem, which means that no financial institutions monitor the borrower, might occur if a certain financial institution does not play the role of the delegated monitor. However, because there is a cost to delegate the monitoring role to the financial institution, it is important that the financial institution that may become the delegated monitor have the incentive to bear the delegation cost.

In this study, I assume that the financial institution that has most of claims against the borrower has the incentive to bear the delegation cost, plays the role of delegated monitor, and acquires information regarding the borrower. I hypothesize that the greater the financial institution's portion of claims against the borrower, the more the incremental benefit to acquire information regarding the borrower increases, and thus the incremental benefit can exceed the delegation cost. On the other hand, if the claims against the borrower are widely dispersed among financial institutions and each has few claims, the incremental benefit might be small and below the delegation cost.

Horiuchi and Fukuda [1987] discuss the information acquired by the delegated monitor as public goods. They analyze the role of the main banks in Japan and point out that main banks play a role in the production of information regarding borrowers. In addition, they indicate that other financial institutions that are not main banks benefit from information produced by main banks through observation of the debt contract between the main bank and the borrower based on acquiring information. Because it would appear that the main bank has more claims against the borrower than other banks, there is a high possibility that the main bank serves as the delegated monitor.

As discussed above, the delegated monitor searches and acquires information regarding the borrower and acquired information is used in debt contracting. This means that more information is used in debt contracting in the presence of the delegated monitor, and thus it is expected that information asymmetry between the firm and financial institutions is smaller than in the case without the delegated monitor. Therefore, this study regards *CR* (concentration ratio) as the proxy for information asymmetry between the firm and financial institutions.

Insert Table I

CR_t is calculated as the square sum of the share of claims against the borrower among financial institutions. The higher CR_t is, the greater the number of claims against the borrower a financial institution has, and thus it would appear that this financial institution plays the role of delegated monitor and produces information regarding the borrower. Therefore, in this study, it is expected that the higher CR_t is, the smaller information asymmetry between the firm and financial institutions will be. In particular, CR_t is calculated on the basis of the loan amounts borrowed from each financial institution at the end of fiscal year t, collected from the Nikkei NEEDS Financial QUEST2.0. Table I presents an example of the calculation of CR_t.

In order to cope with the time effect on CR_t, this study uses a firm's reversed fractional ranking of CR_t (between 0 and 1) within its year and refers to this as information asymmetry (Hereafter IA_t) [8]. Higher IA_t firms are high-information asymmetry firms in year t. Hereafter, this study uses IA_t as a measure of the degree of information asymmetry between the firm and financial institutions.

(3) Framework of analysis

① Test for Hypothesis 1

This study analyzes the link between income smoothing behavior (*IS*) and the

[8] For example, assume a year that includes three firms (A, B, and C). If A's value of CR_t is higher than those of the others and C's value is lower than those of the others, we rank A, B, and C as 1, 2, and 3, respectively, and divide each ranking by the number of observations in the year. Therefore, 1/3, 2/3, and 3/3 are the IA_t values of A, B, and C, respectively.

weighted average long-term interest rate (*LTIR*) through univariate and regression analyses.

First, I perform univariate analysis in order to test hypothesis 1. In particular, I divide the full sample into five subsamples on the basis of the extent of *IS* and compare the average and median values of $LTIR_{t+1}$ among the subsamples. In this univariate test, other factors that affect a firm's long-term interest rate are not taken into account. It is expected that a firm's profitability, growth, uncertainty, size, and macro-economic factors should affect the firm's cost of bank loans. It must be tested whether hypothesis 1 is accepted even if these factors are controlled. Therefore, in addition to univariate analysis, I perform regression analysis, in which the long-term interest rate at the end of fiscal year $t + 1$ ($LTIR_{t+1}$) is regressed on the independent variable (IS_t) and control variables. This study includes eleven control variables, which are based on prior research (e.g., Chen et al. [2007]; Graham et al. [2008]), which indicates the variables' explanatory power on the cost of debt (not only the cost of bank loans but also the cost of bonds). Specifically, profitability ($EBITDA_t$), the volatility of business ($VPDI_t$), growth ($Ln(PBR_t)$), safeness ($Ln(D/E_t)$, $ZSCORE_t$), size ($SIZE_t$), loan maturity (MAT_{t+1}), lagged long-term interest rate ($LTIR_t$), and macroeconomic factors (term spread ($RFSP_{t+1}$), credit spread (BSP_{t+1}), and yield of Japanese government bonds (RF_{t+1})) are included. Each control variable is defined below.

$EBITDA_t$ = (operating income for fiscal year t + depreciation cost for fiscal year t) ÷ total assets at the beginning of fiscal year t.

$VPDI_t$ = the firm-specific volatility of PDI that is calculated as the standard deviation of PDI over the last five years.

$Ln(PBR_t)$ = the natural logarithm of the ratio of the market value to the book value of equity at the end of fiscal year t.

$Ln(D/E_t)$ = the natural logarithm of the ratio of the book value of total debts to the book value of equity at the end of fiscal year t.

$ZSCORE_t$ = (1.2 × operating capital (receivables + inventory - payables) at the end of fiscal year t + 1.4 × retained earnings at the end of fiscal year t + 3.3 × operating income for fiscal year t + 0.999 × sales for fiscal year t) ÷ total assets at the end of fiscal year t.

$SIZE_t$ = the natural logarithm of total assets at the end of fiscal year t.

MAT_t = the weighted average loan maturity at the end of fiscal year t (see section 3(2)).

$LTIR_t$ = the weighted average long-term interest rate at the end of fiscal year t (see section 3(2)).

$RFSP_{t+1}$ = the difference between the 10-year Japanese government bond yield and the two-year Japanese government bond yield at the end of fiscal year t+1.

BSP_{t+1} = the difference between the AAA corporate bond yield whose current maturity is from three years to four years and the BBB corporate bond yield whose current maturity is from three to four years at the end of fiscal year t+1.

RF_{t+1} = the 10-year Japanese government bond at the end of fiscal year t+1.

Following Graham et al. [2008], this study uses a modified Altman [1968] Z-score that does not include the ratio of the market value of equity to the book value of total debt because similar terms, $Ln(PBR_t)$and $Ln(D/E_t)$, enter the regressions as separate variables. The reason only corporate bond yield whose current maturity is from three to four years is used to calculate BSP_{t+1} is to control the effect of different current maturities on credit spread. In addition, it would appear that longer current maturity is suitable for analyzing the effect of credit spread on long-term interest rate. Moreover, I was unable to collect some bond yield data whose current maturity is over four years.

Using these variables, I estimate regression (7) to test hypothesis 1. In order to control for industry effects, industry dummy variables are included in regression (7)[9].

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[9] This paper uses the industry codes of the Securities Identification Code Committee in Japan, which relate to 33

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\begin{aligned}
LTIR_{t+1} = \alpha_0 &+ \beta_1 IS_t + \beta_2 EBITDA_t + \beta_3 VPDI_t + \beta_4 Ln(PBR_t) + \beta_5 Ln(D/E_t) \\
&+ \beta_6 SIZE_t + \beta_7 ZSCORE_t + \beta_8 MAT_{t+1} + \beta_9 LTIR_t + \beta_{10} RFSP_{t+1} \\
&+ \beta_{11} BSP_{t+1} + \beta_{12} RF_{t+1} \\
&+ \sum_{i=1}^{24} \alpha_i Industry_i + \varepsilon_t \qquad (7)
\end{aligned}
$$

② Test for Hypothesis 2

In addition to the test for hypothesis 1, I perform matrix analysis and regression analysis in order to test hypothesis 2.

First, I perform matrix analysis in order to test hypothesis 2. Each observation is ranked on a scale of 1 to 5 on the basis of the extent of IS_t (specifically, observations whose values of IS_t are 0.2 or lower are assigned 1, those whose values of IS_t are over 0.2 but less than 0.4 are assigned 2, those whose values of IS_t are over 0.4 but less than 0.6 are assigned 3, those whose values of IS_t are over 0.6 but less than 0.8 are assigned 4, and those whose values of IS_t are over 0.8 are assigned 5). In the same manner, each observation is ranked on a scale of 1 to 5 on the basis of the extent of IA_t. Therefore, all observations are divided into 25 subsamples (5 × 5 matrix). Subsequently, I compare the average values of $LTIR_{t+1}$ among the subsamples.

As with the univariate test for hypothesis 1, this matrix analysis does not take into account other factors that affect a firm's long-term interest rate. Hence, in order to control for other factors, this study also performs multiple regression. In particular, information asymmetry dummy variables ($IA^L{}_t$、$IA^H{}_t$) and their interaction terms with IS ($IS_t xIA^L{}_t$、$IS_t xIA^H{}_t$) are inserted into regression (7). Thus, I estimate regression (8) in order to test hypothesis 2.

$$
\begin{aligned}
LTIR_{t+1} = \alpha_0 &+ \beta_1 IS_t + \beta_2 IS_t xIA_t^L + \beta_3 IS_t xIA_t^H + \beta_4 IA_t^L + \beta_5 IA_t^H \\
&+ \beta_6 EBITDA_t + \beta_7 VPDI_t + \beta_8 Ln(PBR_t) + \beta_9 Ln(D/E_t) + \beta_{10} SIZE_t + \beta_{11} ZSCORE_t \\
&+ \beta_{12} MAT_{t+1} + \beta_{13} LTIR_t + \beta_{14} RFSP_{t+1} + \beta_{15} BSP_{t+1} + \beta_{16} RF_{t+1} \\
&+ \sum_{i=1}^{24} \alpha_i Industry_i + \varepsilon_t \qquad (8)
\end{aligned}
$$

different industries. However, because of the requirements in the screening process, this study's sample includes 25 industries.

$$IA_t^L:\ \ 1 \text{ if } IA_t \text{ is 0.2 or lower, and 0 otherwise}$$
$$IA_t^H:\ \ 1 \text{ if } IA_t \text{ is 0.8 or higher, and 0 otherwise}$$

IA^L_t is a dummy variable that is 1 if a firm-year's IA_t is 0.2 or lower, and 0 otherwise. IA^H_t is a dummy variable that is 1 if a firm-year's IA_t is 0.8 or higher, and 0 otherwise. If a firm-year's value of IA^L_t is 1, information asymmetry between the firm and financial institutions is low. On the other hand, if a firm-year's value of IA^H_t is 1, information asymmetry between the firm and financial institutions is high.

The coefficient of IS_t (β_1) in regression (8) reflects the average effect of income smoothing behavior on the long-term interest rate ($LTIR_{t+1}$). The coefficient of $IS_t xIA^L_t$ (β_2) in regression (8) shows the difference between the effect of income smoothing behavior on $LTIR_{t+1}$ in low-information asymmetry firms (i.e., $IA_t < 0.2$) and the average effect of income smoothing on $LTIR_{t+1}$. In turn, The coefficient of $IS_t xIA^H_t$ (β_3) in regression (8) shows the difference between the effect of income smoothing behavior on $LTIR_{t+1}$ in high-information asymmetry firms (i.e., $IA_t > 0.8$) and the average effect of income smoothing on $LTIR_{t+1}$. Therefore, with regard to low- and high-information asymmetry firms, the net effects of income smoothing on $LTIR_{t+1}$ are reflected in the sum of the coefficients, particularly $\beta_1 + \beta_2$ and $\beta_1 + \beta_3$.

In regressions (7) and (8), in order to explain the long-term interest rate at the end of fiscal year t + 1, control variables relevant to accounting numbers ($EBITDA_t$, $VCFO_t$, $Ln(PBR_t)$, $Ln(D/E_t)$, $SIZE_t$) and information asymmetry (IA_t) are calculated from financial and market data at the end of fiscal year t. On the other hand, control variables relevant to debt contracting (MAT_{t+1}) and macro-economic conditions ($RFSP_{t+1}$, BSP_{t+1}, RF_{t+1}) are calculated from data for the end of fiscal year t + 1. This is because it is expected that the definite values of accounting numbers will be available at the end of fiscal year; however, other factors (i.e., MAT_{t+1}, $RFSP_{t+1}$, BSP_{t+1}, and RF_{t+1}) are available at the point of negotiating debt contracts. Hence, this study matches the timing of measuring $LTIR_{t+1}$ and that of measuring these control variables. The reason why the proxy for information asymmetry is calculated from the data at the end of fiscal year t is that it is expected that information produced by the delegated monitor before negotiating the debt contract will be reflected in the debt contract. Therefore, this study uses the lagged proxy (i.e., IA_t) to capture that information.

In this study, all t-statistics in the regression analysis are corrected for heteroscedasticity, cross-sectional dependence, and time-series dependence of residuals using a two-way cluster at the firm and year levels, as proposed by Petersen [2009] (see also Gow et al. [2010]).

4. Sampling Procedures and Data Sources

(1) Sampling procedures

The empirical analysis is based on Japanese non-financial firms over the 1997–2011 period (i.e., 15 years). Data are screened according to the following criteria:

①Fiscal year-end should be in March.
②The firms should be compliant with Japanese accounting standards.
③All data must be available for *DAC* estimation.
④In order to ensure that the results are not outlier-sensitive, variables in the top and bottom 0.5 percent have been eliminated from the estimation of Model (3).
⑤Firms that are in the industry-year that includes over 10 firms.
⑥All financial and market data are available.
⑦In order to ensure that the results are not sensitive to outliers, variables in the top and bottom 0.5 percent have been eliminated from the estimation of Models (7) and (8).

Through the use of these criteria, a final sample of 9,068 firm-year observations from 2002[10] to 2010 is generated[11].

The data is collected from Nikkei NEEDS Financial QUEST 2.0 with regard to firms' financial and equity market data, historical data reported by Ministry of Finance Japan with regard to term spread and the yield of Japanese government bonds, and the rating matrix[12] reported by the Japan Securities Dealers Association with regard to credit spread.

(2) Descriptive statistics and correlation matrix

Table II provides descriptive statistics and Table III presents a correlation matrix of variables used in regressions (7) and (8).

High correlations are observed between the cross terms ($IS_t xIA^L_t$, $IS_t xIA^H_t$) and dummy variables (IA^L_t, IA^H_t). In order to cope with multicollinearity issues, I calculate

10 The data for calculating BSP_{t+1} collected from the Rating Matrix reported by the Japan Securities Dealers Association is available after August 2002. Therefore, the sample period begins from 2002.

11 The top and bottom 0.5 percent of the regression variables are truncated twice (i.e., criteria ④ and ⑨), not only to prevent outliers from affecting the estimations of Regression (3), but also to obtain a large sample to test the hypotheses.

12 The rating matrix is the matrix representation of each rating-current maturity's compound interest yield by each rating agency published by the Japan Securities Dealers Association. In December 2011, both the rating matrix of the Japan Credit Rating Agency, Ltd. (JCR) and that of Rating and Investment Information (R&I) are available. However, because of missing data, I cannot calculate *BSP* for several years when the rating matrix of R&I is used. Therefore, the rating matrix of JCR is used in this paper.

VIF (variance inflation factor); the VIFs for these variables are approximately 5. Although the VIFs are less than 10—the level suspected in the presence of multicollinearity—they seem to be high. However, further analysis reveals that the results remain the same even when excluding the dummy variables from regression (8). Hence, it would appear that the effect of multicollinearity issues is negligible. Therefore, this study presents the results using regression (8). Multicollinearity issues are addressed again in the robustness check (see section 6).

Insert Table II

Insert Table III

5. Results

(1) Test for Hypothesis 1

① Univariate analysis

Table IV indicates firms' long-term interest rates by IS_t groups. Group 1 includes the firms whose IS_t is 0.2 or lower (i.e., the firms that smooth income the least). Group 5 includes the firms whose IS_t is 0.8 or higher (i.e., the firms that smooth income the most). Table IV indicates that the difference between the long-term interest rates at the end of fiscal year $t + 1$ of higher income smoothing firms and that of lower income smoothing firms is statistically significant (p-value < 0.001). In particular, $LTIR_{t+1}$ of the firms that smooth income the most are lower than that of the firms that smooth income the least by 0.201 (average) and 0.180 (median). This result supports hypothesis 1. However, in this univariate test, other factors that affect the long-term interest rate are not controlled for. It must be checked whether income smoothing has a lowering effect on the long-term interest rate after controlling for other factors.

Insert Table IV

② Regression analysis

Table V presents the estimation results of regression (7). The table indicates that even after controlling for other factors, the coefficient of IS_t is negative and statistically significant (p-value < 0.001). The value of the coefficient, -0.056, implies that, *ceteris paribus*, the long-term interest rate of the firm that smoothes income the most ($IS_t = 1$) in the firm-year is lower than that of the firm that smoothes income the least ($IS_t \fallingdotseq 0$) by approximately 5 basis points (0.05%). Although this difference is economically small, income smoothing might affect the long-term interest rate more. It is expected that one of causes of this small effect is the inclusion of $LTIR_t$ as one of the control variables in regression (7). Because there is a high possibility that the firms that smooth income the most (IS_t = 1) have had a stable earnings path in the past, the information regarding future performance communicated through income smoothing has already been reflected in $LTIR_t$. If this is so, including $LTIR_t$ in regression (7) lowers the effect of current income smoothing captured by the coefficient of IS_t[13].

With regard to the control variables, the coefficient of loan maturity (β_8) is negative and statistically significant. Because there is a positive correlation between the interest rates and loan maturities in general (Graham et al. [2008]), this result indicates the opposite effect. However, in this study, MAT_{t+1} is defined as the weighted average loan maturity. Hence, this measure does not capture the one-to-one relation between the interest rate and the loan maturity, but captures the credibility of the firm based on how financial institutions make long-term lending decisions. In this case, it is possible that the coefficient of MAT_{t+1} is negative.

From Table V, it is evident that hypothesis 1, which states that higher-smoothing firms' cost of bank loans is lower than those of lower-smoothing firms, is supported.

Insert Table V

(2) Test for Hypothesis 2

① Matrix analysis

Table VI compares the average values of the weighted average interest rates among IS_txIA_t groups (25 groups) by locating the extent of income smoothing behavior on the ordinate and the extent of information asymmetry between the firm and financial institutions on the abscissa. In this table, the least (most) income smoothing and lowest (highest) information asymmetry firm group is shown in the upper left (lower right). The values indicated in the second-from-the-bottom section of the table show the differences of average long-term interest rates between the firms that smooth the most and those that smooth the least for those whose levels of information asymmetry are in the same range.

Table VI shows that in the firms with the least information asymmetry (the second row from the left), the difference of average $LTIR_{t+1}$ between the most and the least income smoothing firms is slightly statistically significant (p-value = 0.093). In the groups of firms with other levels of information asymmetry (from the third to sixth rows

[13] Without $LTIR_t$ in regression (7), the coefficient of ISt is -0.196.

from the left), the differences of average $LTIR_{t+1}$ between the most and the least income smoothing firms are statistically significant (p-value < 0.001). In sum, although these results suggest that the significance levels are dependent on the extent of information asymmetry, further analysis is needed. In particular, because other factors that affect the long-term interest rate are not taken into account in the matrix analysis, these factors should be controlled for.

Insert Table VI

② Regression analysis

Table VII presents the estimation result of regression (8). This table suggests that on average, income smoothing has a lowering effect on the long-term interest rate (the coefficient of IS_t, β_1). This is consistent with Tables IV and V. With regard to interaction terms, the coefficient of $IS_t xIA^L{}_t$ is positive and statistically significant. This implies that there is significant deviation between the average effect of income smoothing and the effect in the firms with the lowest information asymmetry. In addition, because the coefficient of IS_t (β_1) is negative and the coefficient of the cross term (β_2) is positive, the coefficient of the cross term works against the effect of income smoothing. However, the coefficient of $IS_t xIA^H{}_t$ is not statistically significant, which implies that there is no difference between the average effect of income smoothing and the effect in the firms with the highest information asymmetry.

The sum of the coefficient of IS_t and each coefficient of the cross term ($IS_t xIA^L{}_t$ or $IS_t xIA^H{}_t$) and its significance level are presented at the bottom of the table. These sums of the two coefficients indicate the net effect of income smoothing on the cost of bank loans in each information asymmetry group. From the table, the net effect of income smoothing in the lowest information asymmetry firms is 0.019, which is not statistically significant. In other words, there is no significant relation between income smoothing and the cost of bank loans in the lowest information asymmetry firms. On the other hand, the net effect of income smoothing in the highest information asymmetry firms is -0.093, which is statistically significant. This result suggests that income smoothing behavior by management could affect the long-term interest rate in the high-information asymmetry firms.

These results indicate that, on average, income smoothing behavior could affect the long-term interest rate and that the extent of the effect of income smoothing is dependent on the extent of information asymmetry between the firm and financial institutions after controlling for other factors. In particular, I could not observe statistically significant relations between income smoothing and the cost of bank loans in low-information asymmetry firms. These results suggest that the larger information asymmetry between the firm and financial institutions is, the more income smoothing behavior reduces the firm's cost of bank loans; this supports hypothesis 2.

Insert Table VII

6. Robustness Check

In section 5, hypothesis 1 is tested through estimation of regression (7) and the results that smoothed earnings could lower the long-term interest rate are presented. Moreover, hypothesis 2 is tested through estimation of regression (8). From the estimation, the results that smoothed earnings could lower the long-term interest rate in high-information firms and that there is no such relation between income smoothing and the long-term interest rate in low-information asymmetry firms are reported. In this section, I perform robustness tests with regard to these findings.

(1) The change in the timing of measurement of the long-term interest rate

Insert Table VIII

In this study, the weighted average long-term interest rate at the end of the fiscal year is used as the proxy for the cost of bank loans. This study assumes that financial institutions use information regarding future performance communicated through income smoothing behavior from fiscal year t – 4 to t to make lending decisions in fiscal year t + 1. Hence, this study sets the weighted average long-term interest rate at the end of fiscal year t + 1 as the dependent variable. However, this variable has a problem: the weighted average long-term interest rate at the end of fiscal year t + 1 might reflect the loan contracts made before the observation of the income smoothing behavior. Therefore, the interest rate information before observing income smoothing behavior might cause a measurement error in the dependent variable used in this study. One way to resolve this problem is to delay measuring the weighted average long-term interest rate. This procedure would relatively decrease past loan contract information and increase current and future loan contract information. Because it is expected that the information communicated through income smoothing behavior would affect current and future loan contracting, this procedure would mitigate the above problem. In this section, each weighted average long-term interest rate at the end of fiscal year t + 2, t +

3, t + 4, and t + 5 (i.e., $LTIR_{t+2}$, $LTIR_{t+3}$, $LTIR_{t+4}$, and $LTIR_{t+5}$) is used to estimate regressions (7) and (8) again.

Table VIII indicates the estimation results for regression (7), where each variable ($LTIR_{t+2}$, $LTIR_{t+3}$, $LTIR_{t+4}$, and $LTIR_{t+5}$) is used as the dependent variable. From the table, there is a significant relation between income smoothing and the long-term interest rate for each of the four alternative dependent variables. These results support hypothesis 1. Further, the adjusted R-squared becomes lower as the dependent variable is measured farther into the future. This suggests that the long-term interest rate measured farther into the future would better incorporate information reported after fiscal year t.

Insert Table IX

Table IX indicates the estimation results of regression (8), where each variable ($LTIR_{t+2}$, $LTIR_{t+3}$, $LTIR_{t+4}$, and $LTIR_{t+5}$) is used as the dependent variable. From the bottom of the table, in any of these four alternative dependent variables, there is no statistically significant relation between income smoothing and the long-term interest rate in the low-information asymmetry firms. On the other hand, in the high-information asymmetry firms, income smoothing behavior lowers the long-term interest rate significantly in any of these four alternative dependent variables. This is consistent with Table VII and supports hypothesis 2.

The above results indicate that the estimation results presented in section 5 are robust even when the timing of measuring the long-term interest rate is changed.

(2) Estimation by subsamples based on information asymmetry

In regression (8), estimated in section 5, the dummy variables ($IA^L{}_t$ and $IA^H{}_t$) and the interaction terms ($IS_t xIA^L{}_t$, $IS_t xIA^H{}_t$) are highly correlated (see Table III). In section 5, because these variables' VIFs are less than 10 and the results remain the same even when the dummy variables are excluded from regression (8), this study uses dummy variables and cross terms to estimate regression (8). In this section, I give further consideration to multicollinearity. By dividing the sample into three groups on the basis of the extent of IA_t and estimating regression (7), I analyze the effect of information asymmetry on the linkage between income smoothing and the cost of bank loans without dummy variables and cross terms. In particular, I define the firm-year whose IA_t is 0.2 or lower as the low-information asymmetry subsample, the firm-year whose IA_t is 0.8 or higher as the high-information asymmetry subsample, and the other firm-years as the middle-information asymmetry subsample[14].

Insert Table X

Table X presents the estimation results of regression (7) for each subsample. From the table, it is evident that there is no significant relation between income smoothing and the long-term interest rate in the low-information asymmetry firms (the coefficient of IS_t in the left row on the table). On the other hand, there are lower effects of income smoothing on the long-term interest rate in the middle- and high-information asymmetry firms (the coefficients of IS_t at the center and right rows in the table).

The above results are consistent with the estimation results of regression (8). This implies that in this study, the multicollinearity issue does not distort the estimation results of regression (8).

(3) Other proxy variables for income smoothing behavior

In this study, the degree of smoothing is defined as the firm-specific historical volatility of net income divided by volatility of pre-discretionary income ($VNI_t/VPDI_t$). In this section, I use other definitions of income smoothing in order to test the robustness of the income smoothing measurement. In particular, the following three alternative measures are used: (1) the firm-specific volatility of *NI* divided by the volatility of *CFO* (Francis et al. [2004]; McInnis [2010]), (2) the correlation coefficient between the change in *DAC* and the change in *PDI* in the last five years (Tucker and Zarowin [2006]; Habib et al. [2011]), and (3) the correlation coefficient between the change in *TAC* and the change in *CFO* in the last five years (Tucker and Zarowin [2006]; Habib et al. [2011]). These three variables are defined below.

$$SMTH2_t = \frac{VNI_t}{VCFO_t} \tag{9}$$

$$SMTH3_t = \rho(\Delta PDI, \Delta DAC)_t \tag{10}$$

$$SMTH4_t = \rho(\Delta CFO, \Delta TAC)_t \tag{11}$$

14 Even when I define the firm-year whose IA_t is 0.1 (or 0.33) or lower as the low-information asymmetry subsample, the firm-year whose IA_t is 0.8 (or 0.67) or higher as the high-information asymmetry subsample, and the other firm-years as the middle-information asymmetry subsample, the results remain unchanged.

$VCFO_t$ = the firm-specific volatility of CFO that is calculated as the standard deviation of CFO over the last five years.

$\rho(\Delta PDI, \Delta DAC)_t$: the correlation between ΔPDI_t (PDI_t - PDI_{t-1}) and ΔDAC_t (DAC_t - DAC_{t-1}) over the last five years.

$\rho(\Delta CFO, \Delta TAC)_t$: the correlation between ΔCFO_t (CFO_t - CFO_{t-1}) and ΔTAC_t (TAC_t - TAC_{t-1}) over the last five years.

As with $SMTH_t$, these alternative proxy variables ($SMTH2_t$, $SMTH3_t$, and $SMTH4_t$) are standardized with regard to each industry-year ($IS2_t$, $IS3_t$, and $IS4_t$, respectively)[15]. The untabulated results suggest that the estimation results are the same with Table VII even when these three alternatives are used. Therefore, this study's results are robust with regard to the proxy variable for income smoothing.

(4) Controlling for industry-year effects on the proxy for information asymmetry

In section 5, the proxy for information asymmetry is standardized by years. However, this standardization method cannot consider the variation in information asymmetry across industries; thus, a certain industry might consist mostly of the high- (low-) information asymmetry groups. In order to consider this possibility, the proxy for information asymmetry (CR_t) is standardized by industry-years in this section and regression (8) is estimated again using the alternative standardized variable. In particular, as with the method for standardization of *SMTH*, a firm-year's reversed fractional ranking of CR_t (between 0 and 1) within its industry-year is referred to as $IA^{industry}_t$. Untabulated results suggest that the estimation results are the same as in Table VII even when this standardizing method is used. Therefore, this study's results are robust with regard to the standardizing method for information asymmetry.

7. Conclusion

This study investigates the link between income smoothing behavior and the cost of bank loans. In particular, this study focuses on the information asymmetry between a firm and financial institutions and analyzes the effect of the information asymmetry on the link between income smoothing behavior and the cost of bank loans. From the analyses in this study, it is revealed that income smoothing behavior by managers could lower the long-term interest rate (acceptance of H1). In addition, focusing on the information asymmetry between the firm and financial institutions, I cannot find a significant relation between income smoothing and the long-term interest rate in low-information asymmetry firms. On the other hand, it is observed that income

[15] Even when $SMTH2_t$, $SMTH3_t$, and $SMTH4_t$ are used instead of $IS2_t$, $Is3_t$, and $IS4_t$, the results remain unchanged.

smoothing behavior would lower the long-term interest rate in middle- and high-information asymmetry firms (acceptance of H2). It is possible that the reason why these results are obtained is that the relative informativeness of income smoothing decreases in low-information asymmetry firms compared with the other firms because their main banks tend to conduct information production activity energetically in low-information asymmetry firms.

Although four robustness checks (measures of the long-term interest rate, multicollinearity, different proxies of income smoothing, and different standardized methods in the proxy for information asymmetry) are conducted in section 6, the results of these robustness tests are consistent with the primary estimation results in section 5; thus, the findings in this study are reasonably robust.

This research has three implications. First, this study finds the relation between income smoothing behavior and the cost of bank loans. Prior literature focuses mainly on the effect of income smoothing on credit ratings. This study seems to be the first to investigate the impact of income smoothing on the cost of bank loans empirically. In addition, this study reveals that the effect of income smoothing on the cost of bank loans changes depending on the information asymmetry between firms and financial institutions and identifies one part of mechanism of income smoothing effect on the cost of bank loans.

Second, this study provides a suggestion for accounting standard setting from the viewpoint of loan contracts. As mentioned by Holthausen and Watts [2001], prior value relevance studies mainly focus on equity investors. Because of this, the implications of these prior studies tend to be limited to the informativeness of accounting information for equity investors. This study investigates the effect of income smoothing from the viewpoint of loan contracts and provides evidence that information provided by income smoothing behavior is beneficial to loan contracting. Management discretion in accrual accounting processes is one of the most important issues in accounting standard setting and occasionally becomes a target for criticism. However, this study implies the possibility that discretionary income smoothing behavior in accounting processes might be beneficial to users of accounting information.

Finally, this study has an implication for research on the cost of capital. The current study shows the information asymmetry between a firm and financial institutions affects the linkage between income smoothing and the cost of bank loans. This controlling for the level of the information asymmetry can be applicable to other study about the cost of capital. This methodology might extend our knowledge about the cost of capital.

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＜Table I＞ An example of calculation of CR_t

CR_t of NEC Corporation (fiscal year 2010)

Financial Institutions	Long-term loans	Share of long-term loans	Square of share of long-term loans
Bank of Tokyo-Mitsubishi UFJ	35,250	18.9%	0.0356
Sumitomo Mitsui Banking Corporation	60,750	32.5%	0.1058
Mizuho Corporate Bank	11,000	5.9%	0.0035
The Hokkaido Bank	5,000	2.7%	0.0007
The Gunma Bank	0	0.0%	0.0000
Bank of Yokohama	5,800	3.1%	0.0010
Nanto Bank	0	0.0%	0.0000
Mitubishi UFJ Trust and Banking Corporation	22,200	11.9%	0.0141
Sumitomo Trust Bank	40,700	21.8%	0.0475
Sumitomo Life Insurance Company	6,025	3.2%	0.0010
Sum of long-term loans	186,725	$CR_t = 0.2093$	

＜Table II＞ **Descriptive Statistics**

stats	MEAN	Std.Dev	MIN	25%	MEDIAN	75%	MAX	N
$LTIR_{t+1}$	1.827	0.605	0.440	1.430	1.760	2.110	5.790	9,068
$LTIR_{t}$	1.851	0.599	0.400	1.460	1.800	2.160	5.690	9,068
$VNI/VPDI_{t}$	0.539	0.381	0.010	0.268	0.461	0.719	4.485	9,068
CR_{t}	0.338	0.223	0.054	0.194	0.264	0.396	1.000	9,068
$EBITDA_{t}$	0.073	0.046	-0.081	0.042	0.067	0.099	0.300	9,068
$VPDI_{t}$	0.048	0.029	0.007	0.028	0.042	0.061	0.203	9,068
PBR_{t}	1.166	0.899	0.137	0.600	0.910	1.437	10.19	9,068
D/E_{t}	2.598	3.836	0.207	1.034	1.682	2.864	90.21	9,068
$SIZE_{t}$	10.77	1.365	7.608	9.766	10.64	11.61	14.68	9,068
$ZSCORE_{t+1}$	1.700	0.595	0.080	1.314	1.652	2.016	5.172	9,068
MAT_{t+1}	1.930	0.643	1.000	1.441	1.833	2.261	4.604	9,068
$RFSP_{t+1}$	1.004	0.226	0.645	0.848	1.047	1.228	1.316	9,068
BSP_{t+1}	1.272	1.248	0.114	0.528	0.826	1.744	4.512	9,068
RF_{t+1}	1.352	0.283	0.705	1.285	1.342	1.434	1.754	9,068

$LTIR_t$ = the weighted average long-term interest rate at the end of fiscal year t (see section 3(2)).

NI_t = the net income for fiscal year t, deflated by the total assets at the beginning of fiscal year t.

VNI_t = the firm-specific volatility of earnings that is calculated as the standard deviation of NI over the last five years.

TAC_t = total accrual that is defined as (change in current assets – change in cash and cash equivalents) – (change in liabilities – change in financing item) – change in other allowance – depreciation for fiscal year t, deflated by the total assets at the beginning of fiscal year t.

$NDAC_t$ = nondiscretionary accrual that is estimated by using Kothari et al. [2005]'s model.

DAC_t = discretionary accrual that is definded by TAC_t minus $NDAC_t$.

PDI_t = the pre-discretionary income that is defined as NI_t minus DAC for fiscal Year t.

$VPDI_t$ = the firm-specific volatility of PDI that is calculated as the standard deviation of PDI over the last five years.

$VNI_t/VPDI_t$ = the ratio of VNI_t to $VPDI_t$

CR_t = the square sum of the share of claims against the borrower among financial institutions (see section 3(3)).

$EBITDA_t$ = (operating income for fiscal year t + depreciation cost for fiscal year t) ÷ total assets at the beginning of fiscal year t.

PBR_t = the ratio of the market value to the book value of equity at the end of fiscal year t.

D/E_t = the ratio of the book value of total debts to the book value of equity at the end of fiscal year t.

$SIZE_t$ = the natural logarithm of total assets at the end of fiscal year t.

$ZSCORE_t$ = (1.2 × operating capital (receivables + inventory - payables) at the end of fiscal year t + 1.4 × retained earnings at the end of fiscal year t + 3.3 × operating income for fiscal year t + 0.999 × sales for fiscal year t) ÷ total assets at the end of fiscal year t.

MAT_t = the weighted average loan maturity at the end of fiscal year t (see section 3(2)).

＜Table II—*continued*＞

$RFSP_{t+1}$ = the difference between the 10-year Japanese government bond yield and the two-year Japanese government bond yield at the end of fiscal year $t+1$.

BSP_{t+1} = the difference between the AAA corporate bond yield whose current maturity is from three years to four years and the BBB corporate bond yield whose current maturity is from three to four years at the end of fiscal year $t+1$.

RF_{t+1} = the 10-year Japanese government bond at the end of fiscal year $t+1$.

＜Table III＞ Correlation Matrix

(N=9068)	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰
① $LTIR_{t+1}$		0.819	-0.125	0.068	-0.067	0.071	-0.060	-0.148	0.070	0.014	0.291	-0.061	-0.235	0.002	-0.094	0.119	-0.047
② $LTIR_t$	0.777		-0.116	0.064	-0.064	0.067	-0.059	-0.130	0.072	-0.019	0.299	-0.053	-0.243	0.030	-0.050	0.097	-0.116
③ IS_t	-0.109	-0.102		0.082	0.073	0.033	0.012	0.054	0.171	-0.063	-0.054	0.030	0.117	-0.002	0.002	0.002	-0.001
④ $IS_t xIA^L_t$	0.077	0.073	0.245		-0.236	0.993	-0.238	-0.032	0.080	-0.031	-0.146	-0.105	0.090	-0.145	-0.001	-0.002	0.009
⑤ $IS_t xIA^H_t$	-0.086	-0.077	0.252	-0.175		-0.238	0.991	0.026	-0.053	0.081	0.144	0.236	-0.066	0.127	-0.002	0.002	-0.005
⑥ IA^L_t	0.098	0.096	0.033	0.861	-0.204		-0.240	-0.036	0.075	-0.029	-0.142	-0.111	0.084	-0.146	0.000	-0.003	0.009
⑦ IA^H_t	-0.072	-0.068	0.012	-0.206	0.849	-0.240		0.027	-0.067	0.087	0.146	0.240	-0.071	0.129	-0.003	0.004	-0.003
⑧ $EBITDA_t$	-0.097	-0.079	0.045	-0.005	0.020	-0.027	0.026		-0.076	0.394	-0.285	0.113	0.327	0.166	-0.021	0.010	0.099
⑨ $VPDI_t$	0.089	0.084	0.124	0.095	-0.021	0.086	-0.071	-0.047		0.072	0.041	-0.184	-0.012	-0.118	0.043	-0.056	-0.011
⑩ $Ln(PBR_t)$	0.061	0.034	-0.090	-0.029	0.022	-0.010	0.063	0.317	0.158		0.200	0.206	0.013	0.116	-0.142	-0.036	0.153
⑪ $Ln(D/E_t)$	0.151	0.156	-0.048	-0.066	0.037	-0.060	0.054	-0.190	0.070	0.284		0.137	-0.309	0.036	0.023	-0.008	-0.017
⑫ $SIZE_t$	-0.050	-0.038	0.019	-0.067	0.179	-0.103	0.229	0.098	-0.187	0.161	0.129		-0.098	0.231	-0.011	0.006	-0.005
⑬ $ZSCORE_t$	-0.189	-0.198	0.119	0.097	-0.037	0.072	-0.060	0.316	-0.026	-0.031	-0.168	-0.105		-0.141	-0.021	0.070	0.054
⑭ MAT_{t+1}	-0.013	0.032	0.010	-0.072	0.076	-0.090	0.094	0.138	-0.091	0.082	-0.013	0.262	-0.132		0.014	-0.007	0.010
⑮ $RFSP_{t+1}$	-0.096	-0.048	0.002	-0.004	0.002	0.000	-0.003	-0.030	0.033	-0.128	0.019	-0.013	-0.002	0.023		-0.603	0.458
⑯ BSP_{t+1}	0.082	0.082	0.001	0.000	-0.005	-0.006	0.004	0.051	-0.054	-0.069	-0.029	0.009	0.087	0.007	-0.440		-0.144
⑰ RF_{t+1}	-0.056	-0.137	-0.003	0.010	-0.009	0.010	-0.003	0.144	-0.009	0.167	-0.078	-0.004	0.083	0.031	0.478	-0.258	

Pearson (Spearman) correlations are reported below (above) the diagonal.

IS_t = the within-industry-year reversed fractional ranking (between 0 and 1) of $VNI_t/VPDI_t$ for fiscal year t (see section 3(1)).

IA_t = the within-industry-year reversed fractional ranking (between 0 and 1) of IA_t for fiscal year t (see section 3(3)).

IA^L_t = 1 if IA_t is 0.2 or lower, and 0 otherwise.

IA^H_t = 1 if IA_t is 0.8 or higher, and 0 otherwise.

$IS_t xIA^L_t$ = interaction term between IS_t and IA^L_t.

$IS_t xIA^H_t$ = interaction term between IS_t and IA^H_t.

＜Table III—*continued*＞

$Ln(PBR_t)$	=	the natural logarithm of PBR_t.
$Ln(D/E_t)$	=	the natural logarithm of D/E_t.

<Table IV> Univariate Test for Hypothesis 1

IS_t Group	IS_t level	AVERAGE	MEAN	Std.Dev	N
1	$0 < IS_t \leqq 0.2$	1.937	1.870	0.619	1,678
2	$0.2 < IS_t \leqq 0.4$	1.859	1.800	0.607	1,825
3	$0.4 < IS_t \leqq 0.6$	1.816	1.760	0.577	1,816
4	$0.6 < IS_t \leqq 0.8$	1.800	1.730	0.594	1,831
5	$0.8 < IS_t \leqq 1$	1.735	1.690	0.610	1,918
Difference		0.201	0.180		
(*p*-value)		(<0.001)	(<0.001)		

Group 1 is the lowest income smoothing group, and group 5 is the highest income smoothing group. The difference means that average (median) value of $LTIR_{t+1}$ in group 1 minus that in group 5.

The *p*-values for the differences are derived from a *t*-test (AVERAGE) and a Mann-Whitney test (MEDIAN).

<Table V> Estimation Result of Regression (7)

	Coefficient	[*t*-value]	(*p*-value)
Cons	0.543	[5.33]***	(<0.001)
IS_t	-0.056	[-3.73]***	(<0.001)
$EBITDA_t$	-0.276	[-1.31]	(0.190)
$VPDI_t$	0.482	[2.71]***	(0.007)
$Ln(PBR_t)$	-0.011	[-0.64]	(0.520)
$Ln(D/E_t)$	0.028	[2.46]**	(0.014)
$SIZE_t$	-0.007	[-1.17]	(0.243)
$ZSCORE_t$	-0.033	[-2.28]**	(0.023)
MAT_{t+1}	-0.030	[-3.28]***	(0.001)
$LTIR_t$	0.770	[43.04]***	(<0.001)
$RFSP_{t+1}$	-0.313	[-3.68]***	(<0.001)
BSP_{t+1}	0.002	[0.22]	(0.822)
RF_{t+1}	0.249	[2.77]***	(0.006)
Industry		Yes	
R-squared			0.623
Adj-R-squared			0.622
N			9,068

Industry indicates industry dummy variables (25 industries).

All *t*-statistics are corrected for heteroskedasticity and cross-sectional and time-series correlations using a two-way cluster at the firm and year level proposed by Petersen [2009].

*** and ** indicate significance at the 1% and 5% levels, respectively.

<Table VI> Matrix Analysis for Hypothesis 2

<Average value of $LTIR_{t+1}$>

	IA_t group	1	2	3	4	5
IS_t group	IS_t level＼IA_t level	$0 < IA_t \leqq 0.2$	$0.2 < IA_t \leqq 0.4$	$0.4 < IA_t \leqq 0.6$	$0.6 < IA_t \leqq 0.8$	$0.8 < IA_t \leqq 1$
1	$0 < IS_t \leqq 0.2$	2.012	1.970	1.949	1.903	1.856
2	$0.2 < IS_t \leqq 0.4$	1.926	1.919	1.897	1.797	1.770
3	$0.4 < IS_t \leqq 0.6$	1.941	1.825	1.795	1.769	1.761
4	$0.6 < IS_t \leqq 0.8$	1.978	1.816	1.760	1.774	1.682
5	$0.8 < IS_t \leqq 1$	1.916	1.712	1.703	1.683	1.666
Difference		0.097	0.258	0.246	0.220	0.190
(p-value)		(0.093)	(<0.001)	(<0.001)	(<0.001)	(<0.001)

IS_t group 1 is the lowest income smoothing group, and IS_t group 5 is the highest income smoothing group.

As with IS_t grouping, IA_t group 1 is the lowest information asymmetry group, and IA_t group 5 is the highest information asymmetry group.

Each difference means that average value of $LTIR_{t+1}$ in IS_t group1 minus that in IS_t group 5 within the same IA_t group.

The p-values for the differences are derived from a t-test.

<Table VII> Estimation Result of Regression (8)

	Coefficient	[t-value]	(p-value)
Cons	0.540	[5.20]***	(<0.001)
IS_t	-0.067	[-4.54]***	(<0.001)
$IS_t xIA^L{}_t$	0.086	[3.04]***	(0.002)
$IS_t xIA^H{}_t$	-0.026	[-0.97]	(0.331)
$IA^L{}_t$	-0.011	[-0.46]	(0.643)
$IA^H{}_t$	-0.005	[-0.38]	(0.704)
$EBITDA_t$	-0.254	[-1.18]	(0.237)
$VPDI_t$	0.450	[2.56]**	(0.010)
$Ln(PBR_t)$	-0.012	[-0.73]	(0.467)
$Ln(D/E_t)$	0.033	[3.19]***	(0.001)
$SIZE_t$	-0.006	[-0.90]	(0.366)
$ZSCORE_t$	-0.036	[-2.46]**	(0.014)
MAT_{t+1}	-0.028	[-3.21]***	(0.001)
$LTIR_t$	0.765	[43.07]***	(<0.001)
$RFSP_{t+1}$	-0.313	[-3.68]***	(<0.001)
BSP_{t+1}	0.002	[0.24]	(0.807)
RF_{t+1}	0.248	[2.76]***	(0.006)
Industry		Yes	
R-squared			0.624
Adj-R-squared			0.623
N			9,068

	Coefficient	[t-value]	(p-value)
$IS_t + IS_t xIA^L{}_t$	0.019	[0.62]	(0.534)
$IS_t + IS_t xIA^H{}_t$	-0.093	[-3.58]***	(<0.001)

$IS_t + IS_t xIA^L t$ ($IS_t + IS_t xIA^H{}_t$) means the linear combination of the coefficient of IS_t and that of $IS_t xIA^L{}_t$ ($IS_t xIA^H{}_t$).

All t-statistics are corrected for heteroskedasticity and cross-sectional and time-series correlations using a two-way cluster at the firm and year level proposed by Petersen [2009].

*** and ** indicate significance at the 1% and 5% levels, respectively.

<Table VIII> Robustness Check for the Timing of Measuring *LTIR* in Regression (7)

Dependent Variable	$LTIR_{t+2}$			$LTIR_{t+3}$			$LTIR_{t+4}$			$LTIR_{t+5}$		
	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)
Cons	0.834	[7.71]***	(<0.001)	1.046	[6.80]***	(<0.001)	1.341	[6.68]***	(<0.001)	1.005	[6.68]***	(<0.001)
IS_t	-0.099	[-3.98]***	(<0.001)	-0.072	[-1.94]*	(0.052)	-0.069	[-2.03]**	(0.043)	-0.076	[-1.87]*	(0.061)
$EBITDA_t$	-0.749	[-2.92]***	(0.004)	-1.072	[-4.33]***	(<0.001)	-1.106	[-3.14]***	(0.002)	-1.001	[-2.69]***	(0.007)
$VPDI_t$	0.950	[2.85]***	(0.004)	0.827	[2.50]**	(0.012)	0.910	[2.34]**	(0.019)	1.045	[2.37]**	(0.018)
$Ln(PBR_t)$	-0.010	[-0.58]	(0.560)	0.026	[0.97]	(0.330)	0.003	[0.12]	(0.903)	-0.011	[-0.51]	(0.610)
$Ln(D/E_t)$	0.029	[1.60]	(0.110)	0.024	[1.22]	(0.221)	0.021	[1.01]	(0.312)	0.012	[0.51]	(0.612)
$SIZE_t$	-0.007	[-0.80]	(0.422)	-0.016	[-1.53]	(0.126)	-0.015	[-1.21]	(0.228)	-0.013	[-1.16]	(0.246)
$ZSCORE_t$	-0.041	[-2.27]**	(0.023)	-0.051	[-2.38]**	(0.017)	-0.030	[-1.05]	(0.292)	-0.028	[-1.23]	(0.219)
MAT_{t+1}	-0.034	[-1.98]**	(0.048)	-0.020	[-0.86]	(0.392)	-0.019	[-0.84]	(0.399)	-0.024	[-1.07]	(0.283)
$LTIR_t$	0.600	[27.10]***	(<0.001)	0.482	[18.92]***	(<0.001)	0.403	[14.24]***	(<0.001)	0.348	[10.12]***	(<0.001)
$RFSP_{t+1}$	-0.527	[-10.10]***	(<0.001)	-0.273	[-1.57]	(0.117)	-0.043	[-0.32]	(0.750)	0.372	[6.89]***	(<0.001)
BSP_{t+1}	-0.025	[-4.95]***	(<0.001)	-0.053	[-6.70]***	(<0.001)	-0.165	[-3.13]***	(0.002)	0.065	[5.67]***	(<0.001)
RF_{t+1}	0.461	[13.84]***	(<0.001)	0.372	[4.06]***	(<0.001)	0.128	[2.12]**	(0.034)	-0.025	[-1.16]	(0.246)
Industry		Yes			Yes			Yes			Yes	
R-squared			0.363			0.271			0.197			0.164
Adj-R-squared			0.360			0.267			0.192			0.158
N			7,809			6,718			5,652			4,595

$LTIR_{t+i}$ = the weighted average long-term interest rate at the end of fiscal year *t*+i (see section 3(2)).

All *t*-statistics are corrected for heteroskedasticity and cross-sectional and time-series correlations using a two-way cluster at the firm and year level proposed by Petersen [2009].

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

<Table IX> Robustness Check for the Timing of Measuring *LTIR* in Regression (8)

Dependent Variable	$LTIR_{t+2}$			$LTIR_{t+3}$			$LTIR_{t+4}$			$LTIR_{t+5}$		
	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)
Cons	0.821	[7.37]***	(<0.001)	1.025	[6.29]***	(<0.001)	1.303	[6.41]***	(<0.001)	0.951	[5.82]***	(<0.001)
IS_t	-0.104	[-4.63]***	(<0.001)	-0.084	[-1.87]*	(0.062)	-0.063	[-1.63]	(0.104)	-0.053	[-0.97]	(0.334)
$IS_t xIA^L_t$	0.099	[1.59]	(0.111)	0.112	[1.17]	(0.240)	0.086	[0.95]	(0.343)	0.032	[0.20]	(0.842)
$IS_t xIA^H_t$	-0.071	[-0.94]	(0.347)	-0.048	[-0.68]	(0.499)	-0.109	[-1.32]	(0.188)	-0.140	[-1.63]	(0.102)
IA^L_t	0.009	[0.34]	(0.733)	0.008	[0.17]	(0.868)	0.021	[0.33]	(0.741)	0.033	[0.39]	(0.694)
IA^H_t	0.004	[0.10]	(0.921)	-0.035	[-1.11]	(0.269)	-0.010	[-0.20]	(0.840)	-0.006	[-0.09]	(0.928)
$EBITDA_t$	-0.706	[-2.67]***	(0.008)	-1.022	[-4.04]***	(<0.001)	-1.051	[-2.87]***	(0.004)	-0.954	[-2.52]**	(0.012)
$VPDI_t$	0.895	[2.69]***	(0.007)	0.759	[2.30]**	(0.022)	0.828	[2.15]**	(0.032)	0.983	[2.19]**	(0.029)
$Ln(PBR_t)$	-0.013	[-0.72]	(0.473)	0.024	[0.89]	(0.372)	0.001	[0.03]	(0.978)	-0.013	[-0.61]	(0.543)
$Ln(D/E_t)$	0.039	[2.16]**	(0.031)	0.036	[1.93]*	(0.054)	0.033	[1.61]	(0.108)	0.022	[1.02]	(0.308)
$SIZE_t$	-0.005	[-0.50]	(0.617)	-0.012	[-1.04]	(0.300)	-0.010	[-0.73]	(0.463)	-0.007	[-0.64]	(0.520)
$ZSCORE_t$	-0.045	[-2.42]**	(0.015)	-0.055	[-2.53]**	(0.011)	-0.035	[-1.21]	(0.226)	-0.032	[-1.37]	(0.171)
MAT_{t+1}	-0.031	[-1.83]*	(0.067)	-0.016	[-0.70]	(0.484)	-0.015	[-0.68]	(0.499)	-0.019	[-0.91]	(0.364)
$LTIR_t$	0.591	[25.98]***	(<0.001)	0.470	[18.67]***	(<0.001)	0.391	[13.77]***	(<0.001)	0.338	[9.28]***	(<0.001)
$RFSP_{t+1}$	-0.528	[-10.29]***	(<0.001)	-0.274	[-1.57]	(0.115)	-0.043	[-0.32]	(0.751)	0.370	[6.74]***	(<0.001)
BSP_{t+1}	-0.025	[-4.98]***	(<0.001)	-0.053	[-6.55]***	(<0.001)	-0.163	[-3.11]***	(0.002)	0.065	[5.67]***	(<0.001)
RF_{t+1}	0.460	[13.86]***	(<0.001)	0.371	[4.03]***	(<0.001)	0.125	[2.04]**	(0.041)	-0.028	[-1.20]	(0.229)
Industry		Yes			Yes			Yes			Yes	
R-squared			0.365			0.275			0.201			0.168
Adj-R-squared			0.362			0.270			0.195			0.161
N			7,809			6,718			5,652			4,595

	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)
$IS_t + IS_t xIA^L_t$	-0.005	[-0.09]	(0.925)	0.028	[0.32]	(0.750)	0.023	[0.24]	(0.807)	-0.021	[-0.15]	(0.880)
$IS_t + IS_t xIA^H_t$	-0.175	[-2.43]**	(0.015)	-0.132	[-2.22]**	(0.026)	-0.172	[-2.41]**	(0.016)	-0.193	[-2.24]**	(0.025)

<Table IX—*continued*>

All *t*-statistics are corrected for heteroskedasticity and cross-sectional and time-series correlations using a two-way cluster at the firm and year level proposed by Petersen [2009].

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

<Table X>Robustness Check for Standardization of Information Asymmetry

IA_t Level	$0 < IA_t \leqq 0.2$			$0.2 < IA_t \leqq 0.8$			$0.8 < IA_t \leqq 1$		
	Low-Information Asymmetry			Middle-Information Asymmetry			High-Information Asymmetry		
	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)	Coefficient	[*t*-value]	(*p*-value)
Cons	0.671	[4.96]***	(<0.001)	0.487	[4.25]***	(<0.001)	0.819	[3.55]***	(<0.001)
IS_t	-0.004	[-0.14]	(0.891)	-0.068	[-4.43]***	(<0.001)	-0.100	[-3.94]***	(<0.001)
$EBITDA_t$	-0.186	[-0.57]	(0.566)	-0.382	[-1.95]*	(0.051)	-0.039	[-0.11]	(0.916)
$VPDI_t$	0.715	[2.80]***	(0.005)	0.428	[1.93]*	(0.053)	0.475	[1.44]	(0.149)
$Ln(PBR_t)$	0.017	[0.87]	(0.385)	-0.019	[-1.13]	(0.257)	-0.021	[-1.03]	(0.301)
$Ln(D/E_t)$	0.012	[0.49]	(0.622)	0.034	[2.88]***	(0.004)	0.057	[2.23]**	(0.026)
$SIZE_t$	-0.008	[-1.00]	(0.319)	-0.006	[-0.67]	(0.506)	-0.016	[-1.69]*	(0.092)
$ZSCORE_t$	0.013	[0.46]	(0.649)	-0.040	[-2.96]***	(0.003)	-0.073	[-2.89]***	(0.004)
MAT_{t+1}	-0.047	[-1.67]*	(0.095)	-0.024	[-2.34]**	(0.019)	-0.016	[-0.63]	(0.527)
$LTIR_t$	0.781	[26.82]***	(<0.001)	0.764	[37.37]***	(<0.001)	0.705	[13.72]***	(<0.001)
$RFSP_{t+1}$	-0.399	[-3.93]***	(<0.001)	-0.288	[-3.36]***	(0.001)	-0.319	[-4.20]***	(<0.001)
BSP_{t+1}	-0.017	[-1.50]	(0.133)	0.004	[0.52]	(0.600)	0.014	[2.84]***	(0.005)
RF_{t+1}	0.175	[2.12]**	(0.034)	0.267	[2.83]***	(0.005)	0.250	[2.85]***	(0.004)
Industry		Yes			Yes			Yes	
R-squared			0.623			0.630			0.610
Adj-R-squared			0.615			0.628			0.602
N			1,648			5,556			1,864

The low-information asymmetry subsample consists of firm-years whose IA_t are 0.2 or lower, the high-information asymmetry subsample comprises firm-years whose IA_t are 0.8 or higher, and the middle-information asymmetry subsample consists of the other firm-years.

All *t*-statistics are corrected for heteroskedasticity and cross-sectional and time-series correlations using a two-way cluster at the firm and year level proposed by Petersen [2009].

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.