

IFRS Adoption and Investment-Cash Flow Sensitivity: Evidence from Japan

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Abstract

The purpose of this study is to examine the economic consequences of voluntary adoption of International Financial Reporting Standards (IFRS) in Japan. In this study, a multiple regression equation is estimated by pooling data before and after the adoption of the IFRS in four ways. All results show that adoption of IFRS has the effect of increasing corporate investment. We also find that corporate investment sensitivity to internal cash flows decreases with the introduction of IFRS. Overall, the results suggest that IFRS adoption in Japan improves financial constraints and lowers investment-cash flow sensitivity to internal funds.

Keywords: IFRS, cash flow, investment-cash flow sensitivity, investment efficiency, information asymmetry.

1. Introduction

In the past few years, there has been frequent allusion to the decline in the usefulness of accounting information (Collins et al. 1997, Lev and Zarowin 1999, Lev and Gu 2016, Usui 2015, Tan 2018), a phenomenon that has even been dubbed “the end of accounting” (Lev and Gu 2016). This gradual decline in the usefulness of accounting information for decision making has made it more difficult for external capital providers to predict future corporate performance using a firm’s annual accounting information. Moreover, as there is an increase in the extent of capital activities that extend beyond borders because of economic globalization, it is becoming more difficult for managers within companies to procure investment capital from external sources, which hinders sustainable corporate development.

Against this background, there has been growth in the discussions in various countries on accounting system reform to improve the quality of financial reporting. The International Accounting Standards Board (IASB), with its goal of “achieving a single set of high-quality international accounting standards,” developed International Financial Reporting Standards (IFRS). As a result, IFRS are now the world’s most widely adopted financial reporting standards. According to a recent IASB survey, approximately 87% (144) of the 166 jurisdictions in the world now require most of their companies to adopt IFRS (IFRS

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Foundation 2018).

Because of the so-called accounting big-bang that has been taking place since 1997 and following the global trend, accounting standards in Japan have been revised to harmonize with IFRS. In 2013, the Japanese government set a mid-term goal of having 300 companies adopt IFRS by 2016; further, it has studied multiple policies to achieve this goal¹. As a result, at the end of July 2019, 198 companies have adopted IFRS, and 16 companies have decided to adopt them; this means a total of 214 companies have either already adopted IFRS or will do so in the future (Japan Exchange Group 2019). Although the 2013 mid-term goal has yet to be achieved, it is a fact that the number of companies, particularly listed ones, that adopt IFRS is increasing every year.

One of the purposes of adopting IFRS is to improve the quality of accounting information. Since 2000, many empirical studies have reported that adopting IFRS improves investment decision making because high-quality accounting information can be accessed by external capital investors (Barth et al. 2008, Armstrong et al. 2010, Chalmers et al. 2011, Landsman, et al. 2012, Mukai 2013, Yamaji 2016, Tan 2017).

Moreover, high-quality accounting information is gathering attention as an effective means of improving the information disparity — the so-called information asymmetry — between managers and external capital providers. High-quality accounting information enables monitoring of management behavior, and the procurement of investments at lower cost by mitigating the effects of moral hazard problems and adverse-selection issues associated with information asymmetry; further, it creates the expectation of appropriate investments.

Schleicher et al. (2010) offers a pioneering study on the impact of adopting IFRS on corporate investment behavior. Through an analysis of listed companies in EU countries where adoption of IFRS is mandatory, they report that the quality of accounting information in an insider economy improved, together with its investment efficiency. This raises similar questions in Japan — a country in which adoption of IFRS is voluntary.

First, what changes in investment behavior at the corporate level have occurred as a result of adopting IFRS?

Second, has the IFRS adoption improved investment efficiency at the corporate level?

However, in Japan, answers to these questions have yet to be elucidated. This study examines changes in corporate investment behavior caused by the adoption of IFRS by listed Japanese companies. In particular, the analysis focuses on the role played by IFRS in improving corporate investment efficiency. The aim is to provide first evidence by

¹ Liberal Democratic Party Political Investigation Committee Financial Investigation Subcommittee on Corporate Accounting (2013), p.6.

quantitatively investigating the effects of IFRS adoption on Japanese companies' investment behavior.

2. Related research and hypothesis development

2.1 Investment-cash flow sensitivity and financing constraints

All companies must raise funds to conduct business and expand. Generally, there are two funding sources: cash flows generated by business activities and funds raised from capital providers outside the company. In Japan, corporate fundraising is centered on cash flows from business activities and long-term borrowing, funds raised through stocks and bonds account for less than 10% of the total (Kagaya 2010). The Financial Services Agency (2015) also points out that facilitating funding is an important reason for the decision by Japanese companies to adopt IFRS.

In the ideal state, when there is a perfect capital market, investment activities at the corporate level are independent of a company's internal cash flows; investment decisions can be separated from funding decisions. However, this ideal situation is not typically found in the real world because there are many factors in external capital markets that hinder the procurement of funding by businesses. In many cases, companies deviate from the optimal level of investment (Ohlson and Juettner-nauroth 2005).

For managers, using internal funds is cheaper and more convenient than issuing fresh equity or raising funds through borrowing. One important reason is information asymmetry that exists between external capital providers, which entrusts the funds, and the managers that act as trustees. Fazzari et al. (1988) points out that information asymmetry leads to disparities in the use of internal and external funds, and gives rise to a pecking order or financing hierarchy of funding procurement. Moreover, many previous studies suggest that this information asymmetry is caused by moral hazard and adverse selection problems. Further, there is a positive correlation between corporate investment behavior and internally generated cash flows (Fazzari et al. 1988, Richardson 2006, Biddle and Hilary 2006, Biddle et al. 2009). As a result, most of the funds required for investment at the corporate level are internal funds (Brealey et al. 2019).

Thus, information asymmetry leads to funding constraints. Because the cost of raising funds from external investment markets is higher than that of internal funds, company investment behaviors are largely dependent on internal funds. Indeed, empirical study of investment sensitivity to internal funds began in the late 1980s. Fazzari et al. (1988) were the first to attempt to empirically analyze this issue.

Fazzari et al. (1988) assess the extent of funding constraints faced by companies using investment-cash flow sensitivity, which is the degree of investment dependence on internal cash flow fluctuations, after controlling for the various factors that affect investment. Where

investment-cash flow sensitivity is high, the degree of investment dependence on cash flows is high, and it is judged that those companies face high financial constraints. In other words, this is validation that, in an imperfect capital market, costs for external and internal funds are different, so the amount of cash flow possessed by a company contributes to investment. Hubbard (1998) uses investment-cash flow sensitivity as a proxy variable for investment efficiency where management neither underinvests nor overinvests (herein, investment-cash flow sensitivity and investment efficiency are used interchangeably). Where investment-cash flow sensitivity is high, investment efficiency is low; companies with high investment efficiency have low investment-cash flow sensitivity.

Since the original Fazzari et al. (1988) study, many studies have used the positive correlation between internal cash flows and investment to infer the presence of financial constraints (Clear and D'Espallier 2007, Hovakimian and Hovakimian 2009).

2.2 IFRS adoption and investment-cash flow sensitivity

Adopting IFRS improves the quality of accounting information, reduces information asymmetry, and alleviates the issues of moral hazard and adverse selection (Barth et al. 2008). Although few in number, empirical studies exist that assess the impact of IFRS implementation on corporate investment.

Schleicher et al. (2010) examine the economic consequences of mandatory adoption of IFRS in EU countries. They find that the investment-cash flow sensitivity of insider economies is higher than that of outsider economies pre-IFRS and that IFRS reduces the investment-cash flow sensitivity of insider economies more than that on outsider economies. They also find that small firms in insider economies have the highest sensitivity of investment to lagged cash flow pre-IFRS, and that they are no longer sensitive to lagged cash flow post-IFRS.

Lenger et al. (2011) examine the impact of adopting IFRS on European public and private firms' investment efficiency. They find that adopting IFRS offers an advantage for the investment efficiency of public firms. For private firms' investment efficiency, they find that private IFRS firms exhibit less overinvestment than private local GAAP firms. Therefore, they point out that not only the adoption of IFRS, but also their enforcement, plays a role in the degree of investment efficiency benefits.

Chen et al. (2013) examine the externalities of mandatory IFRS adoption on firms' investment efficiency in 17 European countries. They find that the spillover effect on the firm's investment efficiency of a firm's ROA difference versus its foreign peers, but not its domestic peers increases after IFRS adoption. They also find that increased disclosure by both foreign and domestic peers after IFRS adoption has a spillover effect on a firm's investment efficiency.

Biddle et al. (2016) examine whether IFRS adoption enhances capital investment efficiency as measured by investment-cash flow sensitivity, and value enhancing risk-taking. They examine a comprehensive sample comprised of 10,340 mandatory and voluntary IFRS adoptions across 26 countries during the pre-financial crisis period of 2001-2008, and find a positive association between mandatory IFRS adoption and capital investment efficiency. Their findings have implications for standards setters, regulators and research design, as they lend support to the enhancement of firm-level capital investment efficiency by mandatory but not voluntary IFRS adoption, particularly in countries with weaker investor protections that mitigate capital market effects.

Relative to firms from countries that do not require mandatory adoption of IFRS, Gao and Sidhu (2018) find that the probability of underinvestment in capital expenditure declines for firms from 23 countries that do require mandatory adoption of IFRS; meanwhile, the probability of over-investment remains unchanged. They also find the reduction in suboptimal investments is driven by firms with high incentives to provide transparent financial reports from countries where the existing legal and enforcement systems are strong. Finally, they find that after mandatory IFRS adoption, capital investment becomes more value-relevant, less sensitive to the availability of free cash flows, and more responsive to growth opportunities.

These studies prove that adoption of IFRS enables disclosure and the use of high quality accounting information; further, by reducing the information asymmetry, funding constraints are eased and investment efficiency improves. However, despite these pioneering studies, their targets are mostly companies obliged to adopt IFRS; studies elucidating the impact of introducing IFRS on investment efficiency in countries such as Japan, where adoption of IFRS is voluntary, have yet to be carried out in Japan or elsewhere. Therefore, this study establishes the following hypothesis, and by focusing on Japanese companies that have adopted IFRS, reports the results of a quantitative analysis of the effects of IFRS implementation on corporate investment behavior.

Hypothesis: Voluntary adoption of IFRS reduces companies' investment-cash flow sensitivity.

3. Research design

3.1 Investment-cash flow sensitivity model

To test the hypothesis, this study uses three linear models (Model1-basic model, Model 2- extended model and Model 3- additional test model) related to corporate investment and internal cash flows.

The first model (Model1-basic model) relates cash flow to investment after controlling for industry-specific and year-specific effects, and is used as a starting point for discussions

to confirm the ability of cash flow (CF) to explain investment. Then, based on previous research (Fazzari et al. (1988), Hovakimian and Hovakimian (2009), and Schleicher et al. (2010)), we examine the relationship between $Investment_{it}$ (firm (i)'s investment in period t), CF_{it} (firm (i)'s cash flow in the same period), and CF_{it-1} (firm (i)'s cash flow in the previous period). Empirical evidence suggests the average length of time from an investment decision to project completion is about one year (Mayer 1958, Hovakimian and Hovakimian 2009, Schleicher et al. 2010). Therefore, rather than using investment and cash flow in the same period, the relationship between investment and cash flow with a one-year lag is stronger, and, thus, the most appropriate approach (Schleicher et al. 2010). In other words, we recognize that corporate investment is affected by cash flows in the current period, and also that there is a correlation with the previous period's cash flows. However, since we cannot deny the possibility that a high degree of correlation exists between CF_{it} and CF_{it-1} , we incorporate the two variables into the basic investment model separately and validate it using equations (1-1) and (1-2).

If the results of the regression analysis show that the values of the two regression coefficients (α_1 and β_1) are significantly different from zero, the cash flows in the current (CF_{it}) and previous periods (CF_{it-1}) can be considered variables that affect investment. In other words, α_1 and β_1 are measured values of investment-cash flow sensitivity. Moreover, it was judged that the higher these measurement values, the higher the sensitivity of corporate investment to internal cash flows, and the higher the impact of funding constraints.

Model 1- basic model

$$Investment_{it}/TA_{it-1} = \alpha_0 + \alpha_1 CF_{it}/TA_{it-1} + \sum_{3050}^{9050} \alpha_{2j} DIndustry_{it} + \sum_{2007}^{2019} \alpha_{3y} DYear_{it} + \varepsilon_{it} \quad (1-1)$$

$$Investment_{it}/TA_{it-1} = \beta_0 + \beta_1 CF_{it-1}/TA_{it-1} + \sum_{3050}^{9050} \beta_{2j} DIndustry_{it} + \sum_{2007}^{2019} \beta_{3y} DYear_{it} + \varepsilon_{it} \quad (1-2)$$

The second model (Model 2- extended model) verifies how investment-cash flow sensitivity has changed as a result of the introduction of IFRS.

Model 2- extended model

$$\begin{aligned}
Investment_{it}/TA_{it-1} = & \alpha_0 + \alpha_1 CF_{it}/TA_{it-1} + \alpha_2 DIFRS_{it} + \alpha_3 DIFRS_{it} \times (CF_{it}/TA_{it-1}) + \\
& \alpha_4 Growth_{it-1} + \alpha_5 Size_{it-1} + \alpha_6 Lev_{it-1} + \alpha_7 ROE_{it-1} + \\
& \sum_{3050}^{9050} \alpha_{8j} DIndustry_{it} + \sum_{2007}^{2019} \alpha_{9y} DYear_{it} + \varepsilon_{it} \quad (2-1)
\end{aligned}$$

$$\begin{aligned}
Investment_{it}/TA_{it-1} = & \beta_0 + \beta_1 CF_{it-1}/TA_{it-1} + \beta_2 DIFRS_{it} + \beta_3 DIFRS_{it} \times (CF_{it-1}/TA_{it-1}) + \\
& \beta_4 Growth_{it-1} + \beta_5 Size_{it-1} + \beta_6 Lev_{it-1} + \beta_7 ROE_{it-1} + \\
& \sum_{3050}^{9050} \beta_{8j} DIndustry_{it} + \sum_{2007}^{2019} \beta_{9y} DYear_{it} + \varepsilon_{it} \quad (2-2)
\end{aligned}$$

The explained variable common to the two study models (Model1 and 2), $Investment_{it}$, is a firm's (i) investment level in accounting year (t), calculated using the total amount of expenditure on fixed asset investment and research and development activity in period t. To bring the explained variable as close to a normal distribution as possible, we divide it by the total value of assets at the beginning of period t (TA_{it-1}). The explanatory variables CF_{it} and CF_{it-1} are the cash flows from business activities of company (i) in accounting year (t) and accounting year (t-1), respectively, ending in March; further, as with the explained variables, the explanatory variables (CF_{it} and CF_{it-1}) are values divided by the value of total assets at the beginning of period t.

High-quality accounting information can improve investment efficiency, this is because it eases the issues of moral hazard and adverse selection that accompany asymmetric information (Bushman and Smith 2001, Biddle and Hilary 2006, Biddle et al. 2009). Therefore, the accounting information is expected to cause changes in investment-cash flow efficiency when IFRS is introduced.

To verify whether such a change has occurred, we first use a dummy variable, $DIFRS_{it}$, in Model 2, which represents whether IFRS has been introduced. $DIFRS_{it}$ is a dummy variable that equals 1 in accounting year (t) in which a company (i) introduces IFRS, and zero for accounting years (t) in which IFRS is not followed. The regression coefficients on $DIFRS_{it}$ (α_2 and β_2) capture the effects of IFRS adoption by companies on investment behavior.

The main aim of this study is to determine whether the degree of dependence of corporate investment on internal cash flows changes as a result of IFRS adoption. We add the dummy variable ($DIFRS_{it}$), which indicates whether IFRS have been adopted, and the cross-term between $DIFRS_{it}$ and either CF_{it} or CF_{it-1} to the basic model. In analysis results, we judge whether the value of the regression coefficients of the two cross-terms (α_3 and β_3)

are significantly different from zero; this is done to verify that introduction of IFRS has affected investment-cash flow sensitivity. The regression coefficients on the two cross-terms capture the change in the one-to-one relationship between investment, the current period cash flow, and the previous period's cash flow (the direct effect of adopting IFRS on investment-cash flow sensitivity).

To control for the influence of factors other than cash flow and the dummy variables for the introduction of IFRS on corporate investment, several control variables were added to Models 2-1 and 2-2. $Growth_{it-1}$, which is used to control for companies' latent investment potential, is the ratio of a company's (i) sales at the end of fiscal year t-1 ending in March to those in the previous year. $Size_{it-1}$, which is the logarithmic value of firm (i)'s total asset value at the end of fiscal year t-1 ending in March, is used to control for company size. While the debt ratio Lev_{it-1} (debt capital / total capital) is used to control for financial risk. ROE_{it-1} is the return on equity for firm (i) during fiscal year (t-1) ending in March. $DIndustry_{it}$ is an industry dummy variable used to control for industry-specific effects using the industry classification code set by the Securities Code Association. $DYear_{it}$ is an annual dummy variable to control for year-specific effects.

3.2 Verification procedure

In this study, we estimate a multiple regression equation by pooling the data observed in sample companies before and after adoption of IFRS in four ways — Cases A, B, C, and D. The year in which companies begin adopting IFRS differs. We take year “T” to be the year in which adoption of IFRS is begun; T-3, T-2, T-1, T+1, and T+2 represent three years before, two years before, one year before, the year after, and two years after, respectively. The entire sample consists of data for a total of six years — three years prior to IFRS adoption and three years following it.

In Case A (All periods / All industries), we estimate Models 1 and 2 by changing the subscript t to T-3, T-2, T-1, T, T+1, and T+2, in order, and using all observed values of all sample companies (i) for the six-year period surrounding the adoption of IFRS.

In a similar manner, Case B (Pre- vs T) uses all observed values for the four-year period that includes the first year of IFRS adoption (T) and the three-year period preceding it. Case C (Pre- vs T+1) uses all observed values for the year following the introduction of IFRS (T+1) and the three years preceding the year of introduction. Case D (Pre- vs T+2) uses all observed values for two years following the adoption of IFRS (T+2) and the three years preceding the year of introduction. The reason for including Cases B through D is to identify the sustainability of the effects on investment-cash flow sensitivity following the introduction of IFRS.

In all cases, we first estimate using Model 1 and confirm the investment-cash flow

sensitivity in the current and previous periods. If the obtained regression coefficients α_1 and β_1 are significantly different from zero, the effects of CF_{it} and CF_{it-1} on corporate investment cannot be rejected. Next, using Model 2, we identify whether the adoption of IFRS affect investment-cash flow sensitivity.

3.3 Data and sample selection

In this study, we analyze only those companies that had complete data for the six-year period from T-3 to T+2. According to a survey by the Japan Exchange Group, 198 Japanese companies had adopted IFRS up to July 2019. Among these, 34 introduced IFRS for the first time in 2019. Because the financial data available at the time of performing the analysis is for the fiscal year ending in March 2019, companies that have data for the three-year period (T - T+2) including the year of IFRS introduction (T) are companies that, at the latest, adopted IFRS during fiscal year 2017. IFRS was first implemented by Japanese companies in 2010.² There are 117 companies that introduced IFRS between 2010 and 2017; after excluding 29 companies that do not have March as their fiscal year end, and 32 for which uninterrupted financial data could not be obtained, 56 companies were used to test this study's hypothesis. Since data were required for a six-year period including the year of IFRS adoption (T=0) for each company, 336 firm-years of data were sourced. However, because of the trend of sharp reductions in investment value owing to the effects of the 2008 Lehman Shock, 2008 and 2009 are considered abnormal periods; thus, of the 56 companies analyzed, the three companies with data from these two years in their validation period were excluded. As a result, 53 companies were actually used in analysis, with a total of 318 firm-years.

The necessary financial and stock data were obtained from NEEDS Financial Quest2.0, which is managed by Nikkei Digital Media.

4. Results

4.1 Summary statistics of variables

Table 1 offers the summary statistics of the main and control variables used in this analysis over a six-year period. Table 2 shows the summary statistics for each variable before and after the introduction of IFRS, as well as the statistical test results of the difference in the average and median for each variable caused by the introduction of IFRS.

Changes in each variable can be seen in the period before and after the adoption of IFRS, and the changes that were confirmed as statistically significant were $Investment_{it} / TA_{it-1}$,

² Nihon Dempa Kogyo announced its financial results for March 2010 following the adoption of IFRS on May 13th, 2010.

Table 1. Descriptive statistics 1

	Mean	Median	Std. Dev.	Minimum	Maximum
$Investment_{it} / TA_{it-1}$	0.086	0.084	0.052	0.000	0.268
CF_{it} / TA_{it-1}	0.090	0.086	0.078	-0.157	0.867
CF_{it-1} / TA_{it-1}	0.083	0.079	0.057	-0.102	0.377
$Growth_{it-1}$	0.068	0.043	0.189	-0.603	1.784
ROE_{it-1}	0.083	0.077	0.086	-0.584	0.413
$Size_{it-1}$	13.136	13.125	1.540	8.308	15.951
Lev_{it-1}	0.471	0.470	0.195	0.063	0.943

Table 2. Descriptive statistics 2

	Pre-IFRS					post-IFRS					t-value	z-value
	Mean	Median	Std. Dev.	Minimum	Maximum	Mean	Median	Std. Dev.	Minimum	Maximum		
$Investment_{it} / TA_{it-1}$	0.095	0.098	0.058	0.000	0.268	0.077	0.079	0.044	0.000	0.181	-3.083***	-2.927***
CF_{it} / TA_{it-1}	0.097	0.084	0.091	-0.070	0.867	0.084	0.087	0.063	-0.157	0.342	-1.456	-0.535
CF_{it-1} / TA_{it-1}	0.082	0.075	0.059	-0.060	0.377	0.084	0.084	0.054	-0.102	0.268	0.304	1.006
$Growth_{it-1}$	0.091	0.063	0.189	-0.603	1.343	0.045	0.024	0.186	-0.264	1.784	-2.152**	-3.112***
ROE_{it-1}	0.081	0.069	0.075	-0.143	0.413	0.085	0.084	0.096	-0.584	0.382	0.506	1.706*
$Size_{it-1}$	13.011	12.997	1.564	8.308	15.867	13.260	13.193	1.510	8.613	15.951	1.439	1.387
Lev_{it-1}	0.468	0.467	0.199	0.063	0.860	0.473	0.473	0.191	0.071	0.943	0.226	0.338
N	159					159						

***, ** and * Coefficients are significant at 1%, 5% and 10% levels, respectively.

$Growth_{it-1}$, and ROE_{it-1} . The mean and median values for $Investment_{it} / TA_{it-1}$ were 0.095 and 0.098, respectively, prior to IFRS introduction; these fell to 0.077 and 0.079, respectively, following the introduction of IFRS. The statistical test results show a positive difference in the mean ($t = 3.083$) and median ($z = 2.927$) values of investment before and after introducing IFRS with significance at the 1% level. This indicates that the value of companies' investments falls following the introduction of IFRS.

The mean and median values of companies' potential growth opportunities $Growth_{it-1}$ were 0.091 and 0.063, respectively, prior to introducing IFRS; these fell to 0.045 and 0.024, respectively, following the adoption of IFRS. The results of the statistical tests show a difference in the mean ($t=2.152$) and median ($z=3.112$) values of $Growth_{it-1}$ before and after the introduction of IFRS. This is significant at least at the 5% level, indicating that companies' potential growth opportunities decrease significantly following the introduction of IFRS.

The mean and median values of corporate profitability ROE_{it-1} were 0.081 and 0.069, respectively, prior to the introduction of IFRS, and change to 0.085 and 0.084, respectively, following its introduction. Statistical test results of the difference in the mean value of profitability before and after the introduction of IFRS are not significant ($t=0.506$), although the difference in median value ($z=1.706$) is significant at the 10% level.

However, we did not find a significant change in the mean and median values of CF_{it} / TA_{it-1} , CF_{it-1} / TA_{it-1} , $Size_{it-1}$, and Lev_{it-1} before and after companies adopted IFRS.

4.2 Correlation coefficients

Table 3 is a correlation matrix for the main variables over the six-year period.

The values above (below) the diagonal are Spearman (Pearson) correlation coefficients. All correlation coefficient values are below the value 0.8 that points to potentially serious multicollinearity problems (Gujarati and Porter, 2009). However, the Spearman correlation coefficient between CF_{it} / TA_{it-1} and CF_{it-1} / TA_{it-1} is 0.681 and their Pearson correlation coefficient is 0.692; both of these are statistically significant at the 1% level. Therefore, when measuring the sensitivity of investments against CF_{it} / TA_{it-1} and CF_{it-1} / TA_{it-1} , we chose to incorporate the two variables into the model separately.

In addition, a positive correlation, statistically significant at the 1% level, can be seen between $Investment_{it} / TA_{it-1}$ and CF_{it} / TA_{it-1} , as well as between $Investment_{it} / TA_{it-1}$ and CF_{it-1} / TA_{it-1} . This means the greater a company's internal cash flows, the more aggressively the company invests. $Growth_{it-1}$, ROE_{it-1} , and $Size_{it-1}$ do not have a statistically significant correlation with $Investment_{it} / TA_{it-1}$. Lev_{it-1} has a statistically significant negative relationship with $Investment_{it} / TA_{it-1}$.

Table 3. Correlation among variables

	$Investment_{it} / TA_{it-1}$	CF_{it} / TA_{it-1}	CF_{it-1} / TA_{it-1}	$Growth_{it-1}$	ROE_{it-1}	$Size_{it-1}$	Lev_{it-1}
$Investment_{it} / TA_{it-1}$		0.308***	0.324***	-0.025	0.027	-0.007	-0.264***
CF_{it} / TA_{it-1}	0.183***		0.681***	0.248***	0.473***	-0.204***	-0.461***
CF_{it-1} / TA_{it-1}	0.250***	0.692***		0.051	0.567***	-0.170***	-0.463***
$Growth_{it-1}$	-0.059	0.305***	0.059		0.099*	-0.156***	-0.123**
ROE_{it-1}	-0.007	0.527***	0.606***	0.186***		-0.062	-0.301***
$Size_{it-1}$	-0.006	-0.209***	-0.168***	-0.143**	-0.037		0.265***
Lev_{it-1}	-0.232***	-0.391***	-0.459***	-0.057	-0.322***	0.243***	

***, ** and * Coefficients are significant at 1%, 5% and 10% levels respectively. The values above (below) the diagonal are Spearman (Pearson) correlation coefficients.

4.3 Analysis results

Tables 4-1 and 4-2 show the results of the multiple regression analyses.

In the four cases, pooled data for the following six-year periods were used to produce the regression results: three years prior to IFRS adoption and three years adoption (Case A: All periods / All industries); three years prior to IFRS adoption and the year adoption (Case B: Pre- vs T); three years prior to IFRS adoption and the year following IFRS adoption (Case C: Pre- vs T+1); and three years prior to IFRS adoption and two years following IFRS adoption (Case D: Pre- vs T+2).

First, looking at the regression results of model 1-1 and 1-2, the two cash flow values (CF_{it} / TA_{it-1} and CF_{it-1} / TA_{it-1}) in all four cases were, as expected, positively linked to

Table 4-1. Regression results (Case A and Case B)

	Case A: All periods / All industries				Case B: Pre- vs T			
	model 1-1	model 1-2	model 2-1	model 2-2	model 1-1	model 1-2	model 2-1	model 2-2
<i>Constant</i>	0.104 [14.769]***	0.104 [14.870]***	0.113 [4.619]***	0.104 [4.379]***	0.119 [13.294]***	0.107 [12.098]***	0.113 [3.412]***	0.098 [3.094]***
CF_{it} / TA_{it-1}	0.122 [3.159]***		0.132 [3.104]***		0.146 [3.515]***		0.138 [2.650]***	
CF_{it-1} / TA_{it-1}		0.268 [5.951]***		0.348 [5.534]***		0.344 [5.763]***		0.399 [5.225]***
$DIFRS_{it}$			0.020 [2.303]**	0.024 [2.751]***			0.011 [0.855]	0.004 [0.331]
$DIFRS_{it} \times (CF_{it} / TA_{it-1})$			-0.118 [-1.868]*				-0.082 [-0.840]	
$DIFRS_{it} \times (CF_{it-1} / TA_{it-1})$				-0.183 [-2.487]**				-0.035 [-0.298]
$Growth_{it-1}$			-0.020 [-1.473]	-0.009 [-0.725]			-0.007 [-0.432]	0.007 [0.493]
ROE_{it-1}			0.034 [1.079]	-0.019 [-0.594]			0.018 [0.413]	-0.064 [-1.450]
$Size_{it-1}$			0.001 [0.504]	0.002 [0.242]			0.001 [0.328]	-0.000 [-0.021]
Lev_{it-1}			-0.032 [-1.690]*	-0.020 [-1.064]			-0.035 [-1.420]	-0.019 [-0.786]
<i>DIndustry</i>	yes	yes	yes	yes	yes	yes	yes	yes
<i>DYear</i>	yes	yes	yes	yes	yes	yes	yes	yes
<i>Adj.R²</i>	0.546	0.577	0.540	0.571	0.537	0.582	0.525	0.572
<i>N</i>	318				212			

***, ** and * Coefficients are significant at 1%, 5% and 10% levels, respectively.

corporate investment ($Investment_{it} / TA_{it-1}$) with high significance (1% level). It was possible to confirm the positive impact of companies' internal cash flow on corporate investment and the existence of financial constraints on investment among Japanese companies was also confirmed.

Thus, it can be inferred that Japanese companies have a tendency to invest: the more abundant a company's internal cash flows, the easier it is to invest, whereas companies that lack internal capital suppress investment, this is because of the financial constraints on investment.

Next, we consider the results of the regression of model 2-1 and 2-2. From the analysis of the results of Case A (All periods / All industries), the value of the coefficient on the

Table 4-2. Regression results (Case C and Case D)

	Case C: Pre- vs T + 1				Case D: Pre- vs T + 2			
	model 1-1	model 1-2	model 2-1	model 2-2	model 1-1	model 1-2	model 2-1	model 2-2
<i>Constant</i>	0.118 [13.218]***	0.107 [12.136]***	0.136 [4.452]***	0.126 [4.258]***	0.119 [12.245]***	0.106 [11.329]***	0.120 [3.690]***	0.111 [3.497]***
CF_{it} / TA_{it-1}	0.138 [3.449]***		0.167 [3.231]***		0.130 [3.047]***		0.162 [2.890]***	
CF_{it-1} / TA_{it-1}		0.316 [5.494]***		0.381 [4.761]***		0.282 [4.727]***		0.361 [4.384]***
$DIFRS_{it}$			0.027 [2.031]**	0.031 [2.240]**			0.041 [2.469]**	0.050 [2.994]***
$DIFRS_{it} \times (CF_{it} / TA_{it-1})$			-0.191 [-1.932]*				-0.191 [-1.718]*	
$DIFRS_{it} \times (CF_{it-1} / TA_{it-1})$				-0.228 [-2.070]**				-0.278 [-2.313]**
$Growth_{it-1}$			-0.043 [-2.207]***	-0.019 [-1.129]			-0.049 [-2.260]***	-0.025 [-1.309]
ROE_{it-1}			0.064 [1.400]	-0.020 [-0.391]			0.052 [0.990]	-0.024 [-0.433]
$Size_{it-1}$			-0.001 [-0.301]	-0.001 [-0.498]			0.001 [0.296]	0.000 [0.095]
Lev_{it-1}			-0.032 [-1.369]	-0.018 [-0.780]			-0.043 [-1.733]*	-0.027 [-1.094]
<i>DIndustry</i>	yes	yes	yes	yes	yes	yes	yes	yes
<i>DYear</i>	yes	yes	yes	yes	yes	yes	yes	yes
<i>Adj.R²</i>	0.529	0.569	0.540	0.568	0.526	0.556	0.536	0.560
<i>N</i>	212				212			

***, ** and * Coefficients are significant at 1%, 5% and 10% levels, respectively.

dummy variable ($DIFRS_{it}$) expressing whether IFRS has been adopted is positive and statistically significant, at least at the 5% level. Looking at all companies, it emerges that adoption of IFRS has increased corporate investment.

In addition, we confirmed the results of the regression of model 2-1 and 2-2 for each period. In Case B (Pre- vs T), the value of the coefficient on the dummy variable expressing whether IFRS has been introduced ($DIFRS_{it}$) is not statistically significant. Corporate investment was not affected in the initial stage of IFRS adoption (the first year of introduction). However, the impact on corporate investment that appeared in the second (T+1) and third years (T+2) following the adoption of IFRS can be judged from the fact that the value of the $DIFRS_{it}$ coefficient in Cases C (Pre- vs T+1) and D (Pre- vs T+2) is a statistically significant positive value, at least at the 5% level. In other words, adopting IFRS led to a rise in corporate investment from the second year following its introduction.

On the other hand, the existence of the effects of adopting IFRS can be seen in the values of the regression coefficients on the cross-term items $DIFRS_{it} \times (CF_{it} / TA_{it-1})$ and $DIFRS_{it} \times (CF_{it-1} / TA_{it-1})$. First, the value of the regression coefficient on the cross-term $DIFRS_{it} \times (CF_{it} / TA_{it-1})$ is negative and statistically significant at the 10% level in all cases except Case B (Pre- vs T), where it is not statistically significant. Next, looking at the value of the regression coefficient on the cross-term $DIFRS_{it} \times (CF_{it-1} / TA_{it-1})$, the value was negative but statistically significant at the 5% level in three cases (Cases A (All periods / All industries), C (Pre- vs T+1) and D(Pre- vs T+2)). In Case B (Pre- vs T), the value of the regression coefficient on the cross-term was not statistically significant.

These empirical results are consistent with the interpretation that corporate investment sensitivity to (dependency on) internal funds decreases with IFRS adoption. The introduction of IFRS produces high-quality accounting information, thereby allowing managers to provide the market with useful, high-quality decision-making materials related to investment projects. Based on the high-quality information, capital providers can more accurately predict future cash flow from the investment behavior. In other words, IFRS adoption may have lowered information asymmetry and eased the financial constraints on investment. This study's findings on cash flow are in line with the results of prior studies.

5. Additional test

In the previous section, it was revealed that IFRS adoption improves financial constraints and lowers investment sensitivity to internal funds; this was validated using the linear stock price Model 2 with $DIFRS_{it} \times (CF_{it} / TA_{it-1})$ and $DIFRS_{it} \times (CF_{it-1} / TA_{it-1})$ as the main explanatory variables.

In this section, based on Schleicher et al. (2010), we estimate regression third model (Model 3-additonal test model) below, and we do this separately for pre-IFRS and post-

IFRS periods. Model 3 is estimated using data for the three-year period prior to adopting IFRS (pre-IFRS periods: T-3 to T-1); further, it is estimated using data from the three-year period including the year on IFRS adoption, and the two years following adoption (post-IFRS periods: T, T +1 and T+2). We analyze which of the period have a higher internal cash flow coefficient, and consider the effects of IFRS adoption on internal cash flow and corporate investment.

Model 3- additional test model

$$Investment_{it}/TA_{it-1} = \alpha_0 + \alpha_1 CF_{it}/TA_{it-1} + \alpha_2 Growth_{it-1} + \alpha_3 Size_{it-1} + \alpha_4 Lev_{it-1} + \alpha_5 ROE_{it-1} + \sum_{3050}^{9050} \alpha_{6j} DIndustry_{it} + \sum_{2007}^{2019} \alpha_{7y} DYear_{it} + \varepsilon_{it} \quad (3-1)$$

$$Investment_{it}/TA_{it-1} = \beta_0 + \beta_1 CF_{it-1}/TA_{it-1} + \beta_2 Growth_{it-1} + \beta_3 Size_{it-1} + \beta_4 Lev_{it-1} + \beta_5 ROE_{it-1} + \sum_{3050}^{9050} \beta_{6j} DIndustry_{it} + \sum_{2007}^{2019} \beta_{7y} DYear_{it} + \varepsilon_{it} \quad (3-2)$$

The results in Table 5 show that the standardized coefficient and t value of CF_{it} / TA_{it-1} are smaller after IFRS adoption than they were before; they are statistically significant at least at the 5% level. Moreover, the same results can be seen for CF_{it-1} / TA_{it-1} . These results suggest the degree of dependence of investment on internal cash flow decreases following IFRS adoption. It is understood from these results that adoption of IFRS, which

Table 5. Regression results for the additional test

	model 3-1 (All periods/All industries)						model 3-2 (All periods/All industries)					
	Pre-adoption			Post-adoption			Pre-adoption			Post-adoption		
	coefficient	Std. coefficient	t-value	coefficient	Std. coefficient	t-value	coefficient	Std. coefficient	t-value	coefficient	Std. coefficient	t-value
<i>Constant</i>	0.139		3.685***	0.070		2.342**	0.127		3.478***	0.061		2.071**
CF_{it} / TA_{it-1}	0.187	0.296	2.878***	0.136	0.196	2.092**						
CF_{it-1} / TA_{it-1}							0.401	0.413	4.158***	0.221	0.275	3.140***
$Growth_{it-1}$	-0.045	-0.146	-1.783*	-0.013	-0.057	-0.905	-0.013	-0.044	-0.644	-0.010	-0.044	-0.703
ROE_{it-1}	0.046	0.159	0.718	-0.035	-0.076	-1.011	-0.051	-0.066	-0.726	-0.051	-0.112	-1.484
$Size_{it-1}$	0.000	0.004	-0.053	0.003	0.093	1.075	-0.001	-0.022	-0.274	0.003	0.089	1.055
Lev_{it-1}	-0.045	-0.157	-1.603	-0.036	-0.155	-1.384	-0.027	-0.092	-0.954	-0.031	-0.134	-1.233
<i>D Industry</i>	yes			yes			yes			yes		
<i>D Year</i>	yes			yes			yes			yes		
<i>Adj.R²</i>	0.542			0.593			0.571			0.610		
N	159			159			159			159		

***, ** and * Coefficients are significant at 1%, 5% and 10% levels, respectively.

are high-quality accounting standards, has the effect of improving financial constraints and investment efficiency.

6. Conclusion

This study examines the economic consequences of voluntary IFRS adoption in Japan. This study has results that show a highly significant discovery.

First, IFRS adoption has the effect of increasing corporate investment. However, the effect becomes evident in the year following its adoption, instead of appearing immediately in the year IFRS is introduced.

Second, because the coefficient on the cross-term between dummy variable $DIFRS_{it}$ and cash flow is both negative and statistically significant, the connection between cash flow and investment is weakened by adding a significantly negative interaction effect to the so-called main effect of cash flow under the conditions of IFRS adoption. However, this effect was observed for the first time in the year following the year in which IFRS is adopted (T+1 and T+2), and not in the year of its introduction (T). As investors gradually recognize accounting information based on IFRS, the information asymmetry that existed prior to IFRS adoption is gradually lowered. Therefore, the accuracy of future cash flow forecasts for investment projects will gradually improve, creating an environment for procuring funds from external providers. As a result, the effect of reducing the dependency of investment on internal cash flow through adopting IFRS becomes manifest in stages.

Strengthening the findings obtained in this paper using a larger sample is an exercise left for the future.

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