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IMPACT OF FAIR VALUE MEASUREMENT ON CORPORATE INVESTMENT: OTHER COMPREHENSIVE INCOME*

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Abstract

Fair value measurement (FVM) has been criticized for its pro-cyclical effect, especially during the financial crisis of 2008. In this study, we extend the concept of pro-cyclicality to business firms and explore whether and how such FVM affects corporate investment. Specifically, we use other comprehensive income (OCI) as an aggregated metric of fair value adjustments and regard this as a potential financing constraint on investment. In a sample of Japanese listed firms, we find that negative OCI — in particular, negative OCI on foreign currency translations — results in lower capital investment. Moreover, we report that a decline in foreign currency translations is more likely to inhibit a firm's over-investment rather than to encourage under-investment. Overall, our findings suggest that FVM provides timely and useful information to managers in terms of their investment decision-making.

Topics: Financial Accounting, Corporate Finance
Keywords: fair value measurement, comprehensive income, investment
JEL Classification: G31, M41

I. *Introduction*

With the convergence toward and/or adoption of International Financial Reporting Standards (IFRS), fair value measurement (FVM) has emerged as one of the most controversial issues in the setting of accounting standards and in financial accounting research (Ball 2006; Plantin et al. 2008; Kothari et al. 2010). Specifically, FVM is heavily criticized for having a pro-cyclical effect, especially during the financial crisis of 2008. The American Bankers Association (2009, p.6) argues that FVM — in particular, mark-to-market accounting for financial instruments — is pro-cyclical by its very nature: that is, loan and security market

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losses caused by credit concerns unnecessarily erode capital, causing further lending to be restrained, stifling economic growth, and increasing unemployment, thus ultimately resulting in borrower default, which triggers the cycle again. Although subsequent studies highlight that it is unlikely that FVM added to the severity of the financial crisis (Ryan 2009; Laux and Leuz 2010; Badertscher et al. 2012),[1] much attention has been given to the pro-cyclicality of FVM.

In light of this argument, we extend the concept of the pro-cyclical effect to business firms and examine whether and how FVM affects firm-level capital investment. Given that unrealized gains and losses (UGL) generated from FVM indicate changes in a firm's future cash flow, such UGL have an impact on the firm's available investment funds. As concerned in the banking industry, in the presence of negative UGL, a firm experiences a higher debt-to-equity ratio and faces relatively severe financing constraints. By contrast, when UGL are positive, a firm can improve its investment capabilities through either liquidating the relevant assets or accessing further external funds with increased value of assets/net assets. This expectation is theoretically supported by the financial accelerator effect proposed by Bernanke et al. (1996), which predicts changes in the market value of net assets affect a firm's investment. To the extent that UGL reflect temporal changes in capital and currency markets (Plantin et al. 2008; Bamber et al. 2010), FVM is likely to amplify market fluctuations and make the real economy more volatile, especially when managers determine their levels of capital investment depending on such UGL. From this reasoning, we examine the pro-cyclical effect of FVM in a business firm and whether and how FVM affects firm-level capital investment.

Regarding the association of accounting measurements and corporate investment, previous studies have focused on the effects of financial reporting quality and/or accounting attributes. For instance, Biddle and Hilary (2006) show that higher quality of accounting enhances investment efficiency by reducing information asymmetry between managers and outside suppliers of capital. Biddle et al. (2009) find that the relationship between financial reporting quality and corporate investment is conditional on a firm's cash-holding and leverage. Further, in the context of accounting conservatism, Ishida and Ito (2014) and Nakano et al. (2015) report that while more conditional conservatism leads to a lower level of investment, more unconditional conservatism results in higher investment. Kravet (2014) shows that, under more conservative accounting, managers make less risky corporate acquisitions. While there is evidence to suggest that the quality of financial reporting and accounting attributes influence corporate investment, whether and how FVM affects the firm-level investment policy remains an open question.

This study regards other comprehensive income (OCI) as an aggregated metric of fair value adjustments.[2] OCI includes UGL on (1) available-for-sale securities; (2) foreign currency translations; (3) pension obligations; and (4) certain hedging and derivative activities. Bamber et al. (2010) argue that these UGL stem from uncontrollable and volatile market forces (stock market trends, changes in currency exchange rates, and interest rates) and thus are temporal.[3]

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[1]These studies indicate that there is little evidence of FVM directly resulting in asset sales, forcing banks to take excessive write-downs and under-valuations for their loans, and lowering banks' regulatory capital.

[2]FVM includes assets/liabilities measurements involving market prices and an entity's own data (IFRS 13 *Fair Value Measurements*). OCI is generally generated from mark-to-market accounting, which applies the quoted market price for either identical or similar assets/liabilities. In this sense, OCI can be regarded as an aggregated metric of FVM and it is consistent with concerns expressed by the American Bankers Association.

[3]Previous studies have shown that CI/OCI are generally more volatile and temporal than net incomes (Barth et al.

Hence, if OCI has a positive effect on firm-level capital investment, it suggests that managers are likely to make their investments based on unrealized and temporal gains and losses stemming from FVM.

We analyze the relationship between OCI and capital investment in a sample of more than 13,000 firm-year observations of Japanese listed companies from 2004 to 2013. Our regression analyses show that negative OCI — in particular, negative OCI on foreign currency translations — is more likely to result in lower capital investment. Furthermore, our additional analyses reveal that negative foreign currency translations are more likely to inhibit a firms' over-investment than to encourage under-investment. These results are robust to a number of sensitivity checks, including alternative variables and estimations. Overall, our results show that FVM provides timely and useful information toward efficient investment decision-making.

This study contributes to the literature. Prior studies on comprehensive income (CI) have extensively examined its value relevance,[4] leaving other aspects unexamined. This study is the first to directly investigate whether and how OCI affects corporate investment. Further, the evidence contributes to the existing literature on the economic consequences of FVM. Many studies have examined the consequences of FVM from the perspectives of capital markets and accounting attributes, yet not much is known about the extent to which FVM affects managerial behavior (Beatty 2007; Brüggemann et al. 2013). Similarly, our evidence contributes to the literature on accounting conservatism by suggesting that timely loss recognition enhances the efficiency of corporate investment (Watts 2003). Finally, we provide insightful evidence related to the argument about the pro-cyclical effect of FVM. While there have been concerns that FVM, at least in part, fostered the severity of financial crisis, we show that fair value adjustments lead to efficient capital investment rather than amplifying the economic fluctuations.

This study is structured as follows. Section Ⅱ reviews the literature and presents our hypotheses. Section Ⅲ describes our research design, sample, and variables. Section Ⅳ discusses the results of our analyses and their interpretation. Section Ⅴ conducts additional analyses on over- and under-investment. Section Ⅵ concludes the study.

II. *Hypothesis Development*

1. Determinants of Capital Investment

In the neo-classical framework, capital investment depends on the marginal Q ratio (Yoshikawa 1980; Hayashi 1982; Abel 1983). A firm makes an investment until the marginal benefit of the capital investment equals the marginal cost (adjustment and instalment costs); managers obtain financing for positive net present value (NPV) projects at the prevailing interest rate and return excess cash to investors (Biddle et al. 2009). However, since the theory is subject to perfect information among market participants and to external funds being perfect substitutes for internal funds (i.e., the assumptions of the Modigliani and Miller theory), it leaves open the possibility of the firm departing from this optimal level of investment.

1995; Bamber et al. 2010; Ito and Kochiyama 2014).

[4]See Ito and Kochiyama (2014) for a review of the literature on CI and OCI.

As the agency theory emerged, subsequent research identified two imperfections — moral hazard and adverse selection — caused by the existence of information asymmetry between managers and outside capital suppliers, which could affect the efficiency of capital investment. In the presence of information asymmetry, Jensen (1986) argues that managers maximizing their personal benefits tend to make investments that are not in the best interests of shareholders; and these managers have incentives to consume the free cash flow in their hands and grow their firms beyond the optimal size. Moreover, if managers are better informed than capital suppliers about their firm's prospects, they will try to time the issue of capital such that they can overprice their own securities (i.e., the lemon market problem), which can subsequently result in over-investment (Biddle et al. 2009).

As suggested, when there is information asymmetry between managers and outside capital suppliers, external funds are more costly than internal funds; and firms face financing constraints in terms of capital investment. As postulated by the "pecking order" and "financing hierarchy" theories (Myers and Majluf 1984), the excess cost of external funds results in manager's preference for internal funds over external funds. The seminal work of Fazzari et al. (1988) extend Tobin's Q theory by considering the level of a firm's internal cash flow and find that internal funds affect the level of capital investment.[5] Subsequent empirical studies have shown that financing constraints, as measured by leverage, firm size, and change in working capital, influence capital investment (Hachiya and Luo 2005; Hori et al. 2006).

2. Hypothesis Development

OCI includes unrealized fair value adjustments for available-for-sale securities, foreign currency translations, pension obligations, and certain hedging and derivative activities. These are the results of FVM from the current changes in the market prices and/or intrinsic values of relevant assets and liabilities. Therefore, OCI, by its very nature, directly affects a firm's future cash flow and the value of its net assets.

Regarding the relationship between asset price changes and capital investment, Bernanke et al. (1996) argue that, in the existence of information symmetry, changes in the market value of a firm's net assets affect its ability to borrow funds for investment because less-informed lenders require borrowers to show more collateral. Based on this reasoning, Bernanke et al. (1996) highlight that current changes in asset prices affect a firm's capital investment, which results in a feedback loop between the real economy and financial markets: that is, falling asset prices; deteriorating balance sheets; tightening financing conditions; and declining capital investment and economic activity (i.e., the financial accelerator effect).[6] Similarly, Kiyotaki and Moore (1997) theoretically show that highly credit-constrained firms, which have borrowed heavily against their collateral assets, are forced to cut back on their investment expenditures when, for any reason, the value of their assets/net assets are damaged. In this regard, using Japanese manufacturing firms, Suzuki (2001) empirically finds that changes in land values affect a firms'

[5]Hayashi and Inoue (1991) also argue that the level of internal funds can affect corporate investment behavior. Hubbard (1998) reviews relevant literature on capital investment.

[6]In this regard, Kochiyama and Nakamura (2014) report that Japanese banks tend to use "net worth covenant" for loan contracts, suggesting a change in borrower's net assets is a key indicator in determining the debt financing conditions.

capital investment.

Based on these arguments, we predict that, as long as OCI reflects changes in the values of relevant assets and liabilities and directly affects the amount of net assets, it can influence firm-level capital investment. Specifically, we consider OCI to be a proxy for potential financing constraints in at least two ways. First, given that OCI captures changes in future cash flow, the amount of OCI indicates potential internal funds that managers can generate at their discretion. For example, managers can liquidate relevant assets (for instance, available-for-sale securities) with positive UGL to retain funds available for investment. Second, given that OCI reflects changes in the values of assets and liabilities by its very nature, it can indicate a firm's accessibility to external funds. When OCI is negative, the firm is likely to experience lower collateral and a higher debt-to-equity ratio, which then results in tighter financing conditions. From this discussion, we develop the first hypothesis:

HYPOTHESIS 1: *OCI has a positive relationship with capital investment.*

Although the above-mentioned hypothesis states that OCI has a positive relationship with capital investment, the impact of OCI may depend on whether it is positive or negative. For example, using a sample of Japanese firms, Ito and Kochiyama (2014) show that while positive OCI does not affect a firm's dividends, negative OCI is more likely to result in lower dividends. In this regard, the study proposes two possible explanations: managers may treat OCI conservatively in terms of distributing their internal funds; and managers may opportunistically utilize negative OCI to justify their reduced dividends. Many other studies have examined how conditional accounting conservatism affects firm-level capital investment (Ishida and Ito 2014; Kravet 2014; Nakano et al. 2015). Although they do not focus on positive fair value adjustments, they show that a firm with more timely loss recognition is more likely to decrease capital investment. The results imply that a sharp decline in net assets deriving from reduced economic income can inhibit corporate investment.[7] Assuming that OCI is subject to timely recognition of UGL (i.e., mark-to-market accounting at the end of the fiscal year), negative OCI is more likely to affect capital investment in the same manner as conditional conservatism. These arguments lead to our second hypothesis:

HYPOTHESIS 2: *Negative OCI has a positive relationship with capital investment.*

It is possible that OCI reflects only changes in the economic environment as it stems from fluctuations in capital and currency markets. In this case, OCI cannot be a proxy for potential financing constraints; rather, it is a proxy for economic cycles or fluctuations. We attempt to control for the macroeconomic effect on capital investment so that OCI indicates firm-specific financing constraints.

[7]Roychowdhury (2010) suggests that conditional conservatism inhibits investment, arguing that if managers are risk-averse and sensitive to reputation, they are less likely to invest in a project *ex ante* because losses from an investment are reported faster than gains.

III. *Research Design*

1. Estimation Model

To test the relationship between OCI and capital investment, we estimate the following pooled regression model with firm- and year-fixed effects:

$$\begin{aligned} \text{Invest}_{i,t+1} = {} & \alpha_0 + \alpha_1 \text{OCIX}_{i,t} + \alpha_2 \text{TobinQ}_{i,t} + \alpha_3 \text{OCF}_{i,t} + \alpha_4 \text{Cash}_{i,t} + \alpha_5 \text{Lev}_{i,t} \\ & + \alpha_6 \text{Interest}_{i,t} + \alpha_7 \text{WC}_{i,t} + \alpha_8 \text{Size}_{i,t} + \alpha_9 \text{FinOwn}_{i,t} + \alpha_{10} \text{Global}_{i,t} \\ & + \alpha_{11} \text{ExcRisk}_{i,t} + \alpha_{12} \text{OCF\_Vol}_{i,t} + \alpha_{13} \text{Trend}_{k,t} + \alpha_i + \alpha_t + \varepsilon_{i,t+1} \qquad \text{Eq.(1)} \end{aligned}$$

$$\text{where } \text{OCIX}_{i,t} = \{\text{OCI}_{i,t}, \text{OthSec}_{i,t}, \text{Hedges}_{i,t}, \text{ForExc}_{i,t}\}$$

The dependent variable is $\text{Invest}_{i,t+1}$, which denotes capital expenditure for firm *i* in year $t+1$. Since corporate capital investment and Tobin's Q are theoretically in a relation of simultaneous-decision, we should use the values of capital investment and Tobin's Q at the same time point. However, this kind of estimation can distort the estimation results because of endogeneity from simultaneous causality. Therefore, we use the value of investment at year $t+1$ (Suzuki 2001; Ishida and Ito 2014). The variable is scaled by total assets at the end of fiscal year *t*.

The independent variables include OCI ($\text{OCIX}_{i,t}$) and 12 control variables related to capital investment. Our variable of interest is $\text{OCIX}_{i,t}$, which comprises the following four variables: $\text{OCI}_{i,t}$, $\text{OthSec}_{i,t}$, $\text{Hedges}_{i,t}$, and $\text{ForExc}_{i,t}$.[8] $\text{OCI}_{i,t}$ denotes annual changes in other comprehensive income in year *t*. Following previous studies on CI (Dhaliwal et al. 1999; Wang et al. 2006), we decompose $\text{OCI}_{i,t}$ into three components. That is, $\text{OthSec}_{i,t}$ denotes annual changes in available-for-sale securities adjustments; $\text{Hedges}_{i,t}$ denotes annual changes in deferred gains and losses on certain hedge activities; and $\text{ForExc}_{i,t}$ denotes annual changes in foreign currency translations. In Japan, fair value adjustments for pension obligations were not reported as a component of OCI until April 2013. Hence, we exclude this from our analysis to maintain the time consistency of estimation.

We incorporate 12 control variables. First, following the neoclassical framework, we include (1) $\text{TobinQ}_{i,t}$ as a proxy for Tobin's Q. Next, as discussed in Section II, we control the level of a firm's internal funds and the degree of financing constraints by including (2) operating cash flow ($\text{OCF}_{i,t}$), (3) cash and its equivalent ($\text{Cash}_{i,t}$), (4) total debts ($\text{Lev}_{i,t}$), (5) interest rates for long-term debts ($\text{Interest}_{i,t}$), (6) changes in working capital ($\text{WC}_{i,t}$), (7) firm size ($\text{Size}_{i,t}$), and (8) financial institution ownership ($\text{FinOwn}_{i,t}$). Moreover, to control for the degree of direct overseas investment and business uncertainty, we add (9) the ratio of foreign sales ($\text{Global}_{i,t}$), (10) foreign exchange gains and losses ($\text{ExcRisk}_{i,t}$), and (11) volatility of operating cash flow for the past five years ($\text{OCF\_Vol}_{i,t}$). As noted above, firm-level capital investment can also depend on macroeconomic circumstances and economic trends. To control for this, we include (12) $\text{Trend}_{k,t}$ which is an industry-year variable based on the diffusion index issued in "the Bank of Japan's National Short-Term Economic Survey of Enterprises." Finally, α_i and α_t represent firm- and year-fixed effects, respectively. Table 1 summarizes the

[8] In Japan, CI has been disclosed in income statements as of March 2011. Before that, relevant information was given either in the statement of equity and/or balance sheets. As our sample period begins from 2004, we calculate OCI based on the information in balance sheets. This is referred as "*as-if* OCI" in early prior studies (e.g., Dhaliwal et al. 1999).

details of the testing variables.

We include these variables in Eq.(1) and test the relationship between OCI and corporate investment. If OCI has a positive effect on investment, in accordance with our first hypothesis, then the coefficients of $OCIX_{i,t}$ (α_1) are expected to be positive and statistically significant. For the second hypothesis, we construct two sub-samples based on the sign of OCI and estimate Eq. (1), respectively. In this study, all *t*-statistics are corrected for heteroskedasticity using a two-way cluster at both firm and year levels (Petersen 2009).

TABLE 1. DEFINITIONS OF TESTING VARIABLES

Description	*Variable*	*Definition*
Capital Investment	$Invest_{i,t+1}$	Capital expenditure (investment cash out flow) scaled by the total assets at the end of period *t*.
	$NetInv_{i,t+1}$	Capital expenditure minus cash receipts from sales of property, plant, and equipment (PPE), scaled by the total assets at the end of period *t*.
	$InvR\&D_{i,t+1}$	The sum of capital and research and development (R&D) expenditure, scaled by the total assets at the end of period *t*.
	$NetInvR\&D_{i,t+1}$	The sum of capital and R&D expenditure minus cash receipts from sales of PPE, scaled by the total assets at the end of period *t*.
OCI (Potential Financing Constraints)	$OCI_{i,t}$	The sum of **OthSec**, **Hedges**, and **ForExc**.
	$OthSec_{i,t}$	The total amount of available-for-sale securities adjustments changes from year *t−1* to year *t*, scaled by the total assets at the end of period *t*.
	$Hedges_{i,t}$	The total amount of deferred gains and losses on certain hedge activities changes from year *t−1* to year *t*, scaled by the total assets at the end of period *t*.
	$ForExc_{i,t}$	The total amount of foreign currency translations changes from year *t−1* to year *t*, scaled by the total assets at the end of period *t*.
Tobin's Q	$TobinQ_{i,t}$	The ratio of the sum of market value of equity and interest-bearing debts to the sum of net assets and the interest-bearing debts. Interest-bearing debts are the sum of short- and long-term borrowings, bonds, and lease obligations.
Financing Constraints, Liquidity Constraints	$OCF_{i,t}$	Operating cash flow, scaled by the total assets at the end of period *t*.
	$Cash_{i,t}$	The sum of cash, its equivalent, and trading securities, scaled by the total assets at the end of period *t*.
	$Lev_{i,t}$	Total debts, scaled by the total assets at the end of period *t*.
	$Interest_{i,t}$	The average interest rate for long-term debts (%).
	$WC_{i,t}$	Working capital changes from year *t−1* to year *t*, scaled by the total assets at the end of period *t*. Working capital is calculated as current assets minus current liabilities.
	$Size_{i,t}$	The natural log of total assets at the end of period *t*.
	$FinOwn_{i,t}$	The ratio of shares owned by financial institutions to total outstanding shares at the end of period *t*.
Globalization, Business Uncertainty	$Global_{i,t}$	The ratio of foreign sales to total sales for period *t*.
	$ExcRisk_{i,t}$	Foreign exchange gains and losses, scaled by the total sales for period *t*.
	$OCF\_Vol_{i,t}$	The standard deviation of cash flow from operations for the past five years (from year *t−4* to year *t*).
Macro-Economic Environment	$Trend_{k,t}$	An industry-year variable based on the industry-classified diffusion index for large firms in March, issued by the Bank of Japan (*the Bank of Japan's National Short-Term Economic Survey of Enterprises*).

2. Sample and Descriptive Statistics

We analyze our hypotheses using a sample of Japanese listed firms that meet the following criteria from 2004 to 2013:[9]

1. The firm should be listed on Japanese stock markets.
2. The firm should comply with Japanese accounting standards.
3. The fiscal year should end in March.
4. The fiscal period should have 12 months.
5. The firm should be non-financial (other than banking, securities, and insurance).
6. All data necessary for Eq.(1) should be available.
7. The net assets of the firm should be more than zero.

We use financial data from the Nikkei Inc. database called the NEEDS Financial-QUEST. When a firm's consolidated financial statements are absent, we use individual accounting data for the firm. For the variable of $Trend_{k,t}$, we use the diffusion index in "the Bank of Japan's National Short-Term Economic Survey of Enterprises."[10] The final sample comprises 13,341 firm-year observations.

Table 2 reports the descriptive statistics. To rule out the impact of outliers, we use data that have been winsorized at the bottom 1% and top 99% levels for each variable (except $Trend_{k,t}$). For the dependent variable of $Invest_{i,t+1}$, the mean and median are 0.042 and 0.032,

TABLE 2. DESCRIPTIVE STATISTICS

	N	Mean	St. Dev.	Min.	Q1	Median	Q3	Max.
$Invest_{i,t+1}$	13,341	0.042	0.036	0.001	0.017	0.032	0.055	0.287
$OCI_{i,t}$	13,341	0.000	0.018	−0.125	−0.006	0.000	0.007	0.091
$OthSec_{i,t}$	13,341	0.001	0.013	−0.084	−0.003	0.000	0.004	0.086
$Hedges_{i,t}$	13,341	0.000	0.001	−0.015	0.000	0.000	0.000	0.012
$ForExc_{i,t}$	13,341	−0.001	0.010	−0.098	−0.002	0.000	0.001	0.055
$TobinQ_{i,t}$	13,341	1.045	0.612	0.200	0.709	0.922	1.200	8.153
$OCF_{i,t}$	13,341	0.057	0.054	−0.240	0.030	0.059	0.088	0.299
$Cash_{i,t}$	13,341	0.149	0.107	0.004	0.071	0.125	0.200	0.635
$Lev_{i,t}$	13,341	0.497	0.203	0.055	0.340	0.505	0.652	0.980
$Interest_{i,t}$	13,341	0.015	0.011	0.000	0.009	0.015	0.020	0.070
$WC_{i,t}$	13,341	0.011	0.063	−0.402	−0.017	0.012	0.040	0.342
$Size_{i,t}$	13,341	10.731	1.458	7.167	9.683	10.563	11.617	15.156
$FinOwn_{i,t}$	13,341	0.216	0.136	0.000	0.107	0.195	0.312	0.637
$Global_{i,t}$	13,341	0.205	0.227	0.000	0.000	0.139	0.358	0.878
$ExcRisk_{i,t}$	13,341	−0.001	0.005	−0.050	−0.001	0.000	0.000	0.048
$OCF\_Vol_{i,t}$	13,341	0.039	0.030	0.005	0.021	0.031	0.047	0.291
$Trend_{k,t}$	13,341	0.021	0.234	−0.830	−0.040	0.050	0.160	0.510

Note: Data sample represents 13,341 firm-year observations of Japanese listed firms. To rule out the impact of outliers, we use data winsorized at the bottom 1% and top 99% levels for each variable except $Trend_{k,t}$. See Table 1 for the definitions of all variables.

[9] Fair value measurements for financial instruments were mandated in April 2001 and accounting for foreign currency translations in April 2000. As we use lagged variables in our estimation, our sample period begins from 2004.

[10] For consistency with firms' fiscal year-end, we use the index at the time of March for every year. As the industry classification used for the index differs from that of the financial database, we adjust industry classifications on the basis of the Nikkei Middle Classification of Industries.

respectively. This implies that firms with higher investment initiatives are likely to enhance the mean. For $OCI_{i,t}$ and its components, we observe that the mean and median are close to zero. This is because our sample includes firms that do not possess available-for-sale securities and do not operate overseas. Moreover, based on the absolute value, the minimum value of $OCI_{i,t}$ is smaller than the maximum. This results from sharp declines in foreign currency translations caused by the rapid rise in the exchange rate of the yen after the financial crisis.[11] Furthermore, as the absolute value of $Hedges_{i,t}$ is relatively smaller among the three components, we can

TABLE 3. PEARSON AND SPEARMAN CORRELATIONS

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Invest_{i,t+1}$	(1)		**0.024**	**0.026**	**−0.015**	**0.023**	0.198	0.342	−0.127	−0.014
$OCI_{i,t}$	(2)	**0.035**		0.852	0.099	0.604	0.165	0.013	−0.003	−0.002
$OthSec_{i,t}$	(3)	**0.022**	0.812		0.065	0.237	0.139	0.031	0.021	−0.009
$Hedges_{i,t}$	(4)	**−0.001**	0.120	0.050		0.027	0.004	0.012	0.016	0.001
$ForExc_{i,t}$	(5)	**0.036**	0.706	0.173	0.032		0.134	−0.014	−0.032	−0.004
$TobinQ_{i,t}$	(6)	0.192	0.118	0.094	0.003	0.088		0.196	−0.060	0.247
$OCF_{i,t}$	(7)	0.275	−0.006	0.019	0.001	−0.030	0.150		0.106	−0.144
$Cash_{i,t}$	(8)	−0.113	−0.005	0.010	0.008	−0.021	0.095	0.070		−0.471
$Lev_{i,t}$	(9)	−0.008	0.003	−0.007	−0.001	0.014	0.084	−0.125	−0.493	
$Interest_{i,t}$	(10)	0.042	−0.054	−0.042	−0.012	−0.042	0.038	−0.007	−0.214	0.354
$WC_{i,t}$	(11)	0.007	0.095	0.053	0.032	0.093	0.168	0.164	0.078	−0.009
$Size_{i,t}$	(12)	0.175	−0.023	0.005	−0.006	−0.043	0.101	0.187	−0.153	0.070
$FinOwn_{i,t}$	(13)	0.109	−0.006	0.031	−0.008	−0.047	0.096	0.136	−0.159	0.062
$Global_{i,t}$	(14)	0.191	−0.065	−0.021	−0.009	−0.086	0.156	0.135	0.124	−0.036
$ExcRisk_{i,t}$	(15)	0.018	0.280	0.117	0.015	0.344	0.057	0.003	−0.025	0.016
$OCF\_Vol_{i,t}$	(16)	−0.031	0.005	−0.004	0.000	0.013	0.165	−0.081	0.173	0.033
$Trend_{k,t}$	(17)	0.128	0.370	0.244	0.019	0.340	0.274	0.016	−0.042	0.013

		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
$Invest_{i,t+1}$	(1)	0.016	0.016	0.287	0.201	0.243	0.008	−0.093	0.132
$OCI_{i,t}$	(2)	−0.068	0.093	−0.006	0.015	−0.043	0.327	−0.002	0.256
$OthSec_{i,t}$	(3)	−0.072	0.085	0.014	0.040	−0.020	0.186	0.001	0.195
$Hedges_{i,t}$	(4)	−0.004	0.012	−0.026	−0.022	−0.031	0.006	0.010	0.000
$ForExc_{i,t}$	(5)	−0.035	0.066	−0.039	−0.037	−0.055	0.417	−0.002	0.255
$TobinQ_{i,t}$	(6)	0.096	0.145	0.214	0.198	0.184	0.108	0.060	0.361
$OCF_{i,t}$	(7)	−0.034	0.172	0.186	0.137	0.164	−0.036	−0.009	0.019
$Cash_{i,t}$	(8)	−0.192	0.089	−0.160	−0.116	0.107	−0.062	0.109	−0.058
$Lev_{i,t}$	(9)	0.428	−0.033	0.048	0.049	−0.029	0.034	0.059	0.012
$Interest_{i,t}$	(10)		−0.023	0.083	0.116	0.085	−0.047	−0.022	0.020
$WC_{i,t}$	(11)	0.008		0.017	0.004	0.016	0.035	0.026	0.095
$Size_{i,t}$	(12)	0.117	0.019		0.671	0.361	−0.037	−0.262	0.013
$FinOwn_{i,t}$	(13)	0.134	0.005	0.651		0.280	−0.037	−0.263	0.035
$Global_{i,t}$	(14)	0.095	0.001	0.351	0.244		−0.138	0.052	0.046
$ExcRisk_{i,t}$	(15)	−0.042	0.071	−0.005	−0.014	-0.109		−0.002	0.142
$OCF\_Vol_{i,t}$	(16)	−0.054	0.015	−0.245	−0.250	0.065	−0.001		−0.014
$Trend_{k,t}$	(17)	0.012	0.138	0.008	0.028	−0.003	0.130	−0.010	

Note: Pearson correlations appear below the diagonal; Spearman correlations appear above the diagonal. All variables are defined in Table 1.

[11]In Japan, a strong yen generally decreases the amount of foreign currency translations.

infer that the other two components ($OthSec_{i,t}$ and $ForExc_{i,t}$) substantially determine the level of $OCI_{i,t}$ in Japan.

Table 3 provides a correlation matrix of the testing variables. The correlation coefficient between $Invest_{i,t+1}$ and $OCI_{i,t}$ is positive though small. This is consistent with our hypothesis. Similarly, the correlations between $Invest_{i,t+1}$ and the two OCI components ($OthSec_{i,t}$ and $ForExc_{i,t}$) are also positive. In contrast, $Hedges_{i,t}$ indicates a negative correlation with $Invest_{i,t+1}$. While some variables used in Eq. (1) show relatively high correlation coefficients, the value of the variance-inflation factor (VIF) is less than two for every estimate, which suggests that multi-collinearity is not a big concern.

IV. *Results*

1. Tests of the Relationship between Capital Investment and OCI

Table 4 reports the results of the estimation of Eq. (1). To test the second hypothesis, which predicts that negative OCI has an impact on capital investment, we divide our sample on the basis of the signs of $OCI_{i,t}$. As a result, Table 4 provides three estimation results using different observations: the full sample, observations with positive OCI, and observations with negative OCI.

First, from the result using the full sample, the coefficient of $OCI_{i,t}$ is positive but not strongly statistically significant (*t*-value = 1.740). Hence, while this is supportive of our first hypothesis, the result should be carefully interpreted. Columns (2) and (3) present the results for the two subsamples: observations with positive OCI and negative OCI, respectively. Each subsample comprises almost the same number of observations, which implies that they are not largely biased. Let us compare columns (2) and (3). While the coefficient of $OCI_{i,t}$ is small and not statistically significant for the positive OCI group, the coefficient for the negative OCI group is approximately twice as large as that of the result for the full sample and statistically significant at the 1% level. These results support our second hypothesis. Furthermore, the results are consistent with Ito and Kochiyama (2014), who find that negative, not positive, OCI affects the level of a firm's dividends. Therefore, considering these findings together, the results in Table 4 suggest that Japanese managers are likely to treat OCI/UGL conservatively in terms of the distribution of internal funds. Hence, there is consistency in managements' decision making with regard to UGL.

For control variables, although some variables are not statistically significant, most of them are consistent with investment theory and our prediction. It is worth noting that $OCF_{i,t}$ has insignificant coefficients while $Cash_{i,t}$ presents positive and statistically significant coefficients. This suggests that, contrary to what investment theory suggests (Fazzari et al. 1988), Japanese managers tend to determine their investment levels based on cash holdings (i.e., stock at the end of the fiscal year) rather than on operating cash flow. Indeed, Hanaeda and Serita (2014) conduct a survey on capital budgeting practices among Japanese firms and report that they rarely use the NPV technique in determining investment levels. Instead, Japanese firms are more likely to focus on the "payback period" and "accounting rate of return." Therefore, our results may reflect unique Japanese practices that substantially deviate from standard investment theory.[12] Further, the variable of $Trend_{k,t}$, which controls the macroeconomic environment in

Table 4. Tests of the Relationship between OCI and Capital Investment

		(1) Full Sample		(2) Subsample: OCI > 0		(3) Subsample: OCI < 0	
	Predict	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
$OCI_{i,t}$	+	**0.050**	**1.740***	**−0.004**	**−0.077**	**0.116**	**3.279*** **
$TobinQ_{i,t}$	+	0.012	6.171***	0.011	6.363***	0.015	6.067***
$OCF_{i,t}$	+	0.000	0.036	0.007	0.802	−0.006	−0.564
$Cash_{i,t}$	+	0.031	2.119**	0.033	2.309**	0.028	1.319
$Lev_{i,t}$	−	−0.037	−5.011***	−0.047	−4.508***	−0.030	−3.418***
$Interest_{i,t}$	−	−0.076	−2.187**	−0.044	−0.662	−0.106	−2.757***
$WC_{i,t}$	−	−0.022	−4.055***	−0.016	−1.585	−0.023	−2.626***
$Size_{i,t}$	−	−0.003	−1.242	−0.002	−0.643	−0.002	−0.653
$FinOwn_{i,t}$	+	0.021	2.011**	0.022	1.693*	0.015	1.019
$Global_{i,t}$	?	−0.000	−0.056	−0.012	−1.373	0.010	1.814*
$ExcRisk_{i,t}$	?	0.001	0.031	−0.026	−0.236	−0.019	−0.220
$OCF\_Vol_{i,t}$	?	0.000	0.009	0.021	0.671	−0.050	−1.658*
$Trend_{k,t}$	+	0.013	6.366***	0.006	1.051	0.014	6.523***
Firm FE		YES		YES		YES	
Year FE		YES		YES		YES	
Adj.R^2		0.527		0.554		0.519	
N		13,341		6,641		6,214	

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variable is $Invest_{i,t+1}$, which denotes capital expenditure for firm *i* in year *t+1*. All variables are as defined in Table 1. All *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009).

each industry, has positive and statistically significant coefficients for estimations using the full sample and the negative OCI group. Consequently, the results suggest that OCI is likely to affect a firm's capital investment even after controlling for the macroeconomic trends. This implies that the information provided by OCI can affect managerial decision-making.

For more specific implications of OCI, we decompose OCI into three components (i.e., $OthSec_{i,t}$, $Hedges_{i,t}$, and $ForExc_{i,t}$) and test whether and how each component relates to capital investment. Table 5 presents the results. Among OCI components, only $ForExc_{i,t}$ has statistically significant coefficients. Specifically, the coefficients are positive and significant at the 5% level when using the full sample and at the 1% level when using the negative OCI subsample. Considering these results together with those in Table 4, the results from our previous analyses (i.e., columns (1) and (3) in Table 4) largely stem from the effect of $ForExc_{i,t}$. Overall, our evidence suggests that negative OCI on foreign currency translations is more likely to result in lower capital investment.

[12]When we replace $OCF_{i,t}$ with $ROA_{i,t}$, which denotes operating income scaled by lagged total assets, we observe positive and significant coefficients on this variable. Yet, we confirm that our main results do not change materially.

TABLE 5. TESTS OF THE RELATIONSHIP BETWEEN CAPITAL INVESTMENT AND OCI COMPONENTS

		(1) Full Sample		(2) Subsample: OCI > 0		(3) Subsample: OCI < 0	
	Predict	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
$OthSec_{i,t}$	+	**0.011**	**0.476**	**0.002**	**0.039**	**−0.006**	**−0.091**
$Hedges_{i,t}$	+	**0.178**	**0.637**	**−0.116**	**−0.296**	**0.506**	**1.002**
$ForExc_{i,t}$	+	**0.114**	**2.137****	**0.041**	**0.349**	**0.206**	**4.201*****
$TobinQ_{i,t}$	+	0.012	6.029***	0.011	6.334***	0.015	5.839***
$OCF_{i,t}$	+	0.001	0.064	0.007	0.802	−0.006	−0.551
$Cash_{i,t}$	+	0.031	2.122**	0.033	2.311**	0.029	1.355
$Lev_{i,t}$	−	−0.037	−5.006***	−0.047	−4.509***	−0.030	−3.396***
$Interest_{i,t}$	−	−0.076	−2.176**	−0.045	−0.665	−0.109	−2.863***
$WC_{i,t}$	−	−0.023	−4.153***	−0.016	−1.592	−0.024	−2.806***
$Size_{i,t}$	−	−0.003	−1.273	−0.002	−0.682	−0.002	−0.568
$Inst_{i,t}$	+	0.021	2.042**	0.022	1.677*	0.016	1.048
$Global_{i,t}$	?	−0.000	−0.042	−0.012	−1.423	0.012	1.993**
$ExcRisk_{i,t}$	?	−0.025	−0.783	−0.034	−0.315	−0.042	−0.442
$OCF\_Vol_{i,t}$	?	0.001	0.033	0.021	0.678	−0.050	−1.689*
$Trend_{k,t}$	+	0.013	6.537***	0.006	1.070	0.014	6.297***
Firm FE		YES		YES		YES	
Year FE		YES		YES		YES	
Adj.R^2		0.527		0.554		0.520	
N		13,341		6,641		6,214	

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variable is $Invest_{i,t+1}$, which denotes capital expenditure for firm *i* in year *t+1*. All variables are as defined in Table 1. All *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009).

2. Robustness Tests

We conduct a number of tests to evaluate the robustness of our empirical results. First, since we use the total amounts of capital expenditure as our dependent variable, we do not consider cash receipts from sales of assets (Biddle et al. 2009). Moreover, as well as capital investment, research and development (R&D) expenditure is also important in business firms (Nakano et al. 2015). Therefore, we construct three different dependent variables and test whether our results change. The new testing dependent variables are as follows: (1) $NetInv_{i,t+1}$, which denotes capital expenditure minus cash receipts from sales of property, plant, and equipment (PPE) for firm *i* in year *t+1*; (2) $InvRD_{i,t+1}$, which denotes the sum of capital and R&D expenditure for firm *i* in year *t+1*; and (3) $NetInvRD_{i,t+1}$, which denotes the sum of capital and R&D expenditure minus cash receipts from sales of PPE for firm *i* in year *t+1*. All these variables are scaled by total assets at the end of fiscal year *t*.

Second, the previous analyses are naïve in terms of constructing subsamples. As we divide our sample on the basis of the signs of $OCI_{i,t}$, it is possible that observations with a certain negative OCI component are classified in the positive OCI group, and *vice versa*. This is simply because $OCI_{i,t}$ is an aggregated metric of three different components. Hence, we divide our sample based on the signs of each OCI component and test whether this changes our

Table 6. Summary of Robustness Tests

Dependent Variable	Independent Var. ($OCIX_{i,t}$)	Full Sample	Subsample of $OCIX_{i,t} > 0$	Subsample of $OCIX_{i,t} < 0$
$Invest_{i,t+1}$	$OCI_{i,t}$	positive / 10%	N/S	positive / 1%
	$OthSec_{i,t}$	N/S	N/S	N/S
	$ForExc_{i,t}$	positive / 5%	N/S	positive / 1%
$NetInv_{i,t+1}$	$OCI_{i,t}$	positive / 5%	N/S	positive / 1%
	$OthSec_{i,t}$	N/S	N/S	N/S
	$ForExc_{i,t}$	positive / 5%	N/S	positive / 1%
$InvRD_{i,t+1}$	$OCI_{i,t}$	N/S	N/S	positive / 1%
	$OthSec_{i,t}$	N/S	N/S	N/S
	$ForExc_{i,t}$	positive / 10%	N/S	positive / 1%
$NetInvRD_{i,t+1}$	$OCI_{i,t}$	N/S	N/S	positive / 1%
	$OthSec_{i,t}$	N/S	N/S	N/S
	$ForExc_{i,t}$	positive / 10%	N/S	positive / 1%

Note: Each cell presents the signs and statistical significance for the coefficient of $OCIX_{i,t}$ when estimating Eq. (1) with corresponding variables. "N/S" indicates that the coefficient is not statistically significant at any level. All variables are as defined in Table 1. In each estimate, all *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009).

results. We omit the analysis for $Hedges_{i,t}$, as the information on deferred gains and losses of hedge activities is available only since March 2007, which means a smaller sample size for estimations.

Table 6 summarizes the results for the robustness tests. As the combinations of our robustness tests are vast and redundant (36 combinations and estimations), we present only the signs and statistical significance for the coefficient of $OCIX_{i,t}$. The results in Table 6 are similar to those in Tables 4 and 5, which imply that the previous results are robust for alternatives. A noteworthy difference drawn from the estimations using $OCI_{i,t}$ in the full sample is that, while the coefficient of $OCI_{i,t}$ indicates a stronger significance when $NetInv_{i,t+1}$ is included as a dependent variable, it does not exhibit statistical significance when $InvRD_{i,t+1}$ and $NetInvRD_{i,t+1}$ are used. Therefore, as implied in our previous analyses, we do not find strong and consistent evidence in support of our first hypothesis.

V. *Additional Analyses on Over- and Under-Investment*

Our evidence suggests that negative OCI — in particular, negative OCI on foreign currency translations — results in lower corporate investment. However, it does not tell us whether such FVM truly leads to under-investment as suggested in the literature on pro-cyclicality. On this point, we additionally examine whether OCI on foreign currency translations is linked to over- or under-investment. Specifically, we follow Richardson (2006) and Biddle et al. (2009) and measure a firm's deviation from the expected level of investment as follows:

$$Invest_{i,t+1} = \beta_0 + \beta_1 TobinQ_{i,t} + \beta_2 OCF_{i,t} + \beta_3 Cash_{i,t} + \beta_4 Lev_{i,t} + \beta_5 Interest_{i,t} + \beta_6 WC_{i,t} + \beta_7 Size_{i,t} + \beta_8 FinOwn_{i,t} + \zeta_{i,t+1} \quad \text{Eq.(2)}$$

$$Invest_{i,t+1} = \gamma_0 + \gamma_1 Sales\_Growth_{i,t} + \eta_{i,t+1} \quad \text{Eq.(3)}$$

All variables used in Eq. (2) are as defined in Table 1. We here consider that corporate investment is a function of growth opportunities expressed as $TobinQ_{i,t}$ and of financing constraints. Based on prior studies, Richardson (2006) argues that the expected level of corporate investment is substantially determined by factors such as leverage, firm size and the level of cash. We use a set of variables indicating a firm's financing constraints to capture the effects on investment.

On the other hand, Biddle et al. (2009) apply a simpler model to measure a firm's level of over- and under-investment. They discuss that a firm-specific investment is a function of growth opportunities as measured by sales growth. One of their reasons for using sales growth as a proxy for growth opportunities is that Tobin's marginal Q is notoriously difficult to measure (Biddle et al. 2009, footnote 5). To ensure the robustness of our estimations, we also use Eq.(3) with $Sales\_Growth_{i,t}$, annual changes in total sales from year $t-1$ to year t, as an alternative.

We estimate both Eq.(2) and Eq.(3) for each industry-year based on our Nikkei Middle Classification of Industries (33 industries) and use the residuals as a firm-specific proxy for deviations from expected investment (Biddle et al. 2009). We then classify each firm-year based on the magnitude of the residual and OCI on foreign currency translations. In other words, we construct four groups using the signs of the residuals ($\zeta_{i,t+1}$ and $\eta_{i,t+1}$) and $ForExc_{i,t}$ as shown in Fig. 1. The groups that are of interest to us are Groups 2 and 3, in which firms are more likely to make over- and under-investment, respectively, in the presence of negative OCI on foreign currency translations. Finally, to examine whether negative OCI on foreign currency translations results in under-investment, we estimate modified Eq.(1) in which we replace the dependent variable with firm-specific investment residuals, $ResInvQ_{i,t+1}$ and $ResInvSG_{i,t+1}$, obtained from Eq.(2) and Eq.(3), respectively.

Table 7 reports the results using $ResInvQ_{i,t+1}$ as a dependent variable. In each estimation, we exclude the independent variables that are incorporated in Eq.(2). With regard to $ForExc_{i,t}$, it is for Groups 2 and 4 that we observe positive and statistically significant coefficients. Specifically, the coefficient for Group 2 is the highest among all and significant at the 1% level. Given that firms in Group 2 are characterized as over-investment and negative OCI on foreign

FIGURE 1. CLASSIFICATIONS OF SUBSAMPLES FOR ADDITIONAL TESTS

Group 2 = ($\zeta_{i,t+1} > 0$ & $ForExc_{i,t} < 0$) or = ($\eta_{i,t+1} > 0$ & $ForExc_{i,t} < 0$)	Group 1 = ($\zeta_{i,t+1} > 0$ & $ForExc_{i,t} > 0$) or = ($\eta_{i,t+1} > 0$ & $ForExc_{i,t} > 0$)
Group 3 = ($\zeta_{i,t+1} < 0$ & $ForExc_{i,t} < 0$) or = ($\eta_{i,t+1} < 0$ & $ForExc_{i,t} < 0$)	Group 4 = ($\zeta_{i,t+1} < 0$ & $ForExc_{i,t} > 0$) or = ($\eta_{i,t+1} < 0$ & $ForExc_{i,t} > 0$)

Note: $\zeta_{i,t+1}$ and $\eta_{i,t+1}$ denote firm-specific investment residuals obtained from industry-year estimations of Eq.(2) and Eq.(3), respectively. $ForExc_{i,t}$ is as defined in Table 1. We divide and classify our sample into four groups based on the signs of $\zeta_{i,t+1}$, $\eta_{i,t+1}$ and $ForExc_{i,t}$.

TABLE 7. ADDITIONAL TESTS USING INVESTMENT RESIDUALS FROM Eq.(2)

	(1) Group 1 ($\zeta_{i,t+1} > 0$ & $ForExc_{i,t} > 0$)	(2) Group 2 ($\zeta_{i,t+1} > 0$ & $ForExc_{i,t} < 0$)	(3) Group 3 ($\zeta_{i,t+1} < 0$ & $ForExc_{i,t} < 0$)	(4) Group 4 ($\zeta_{i,t+1} < 0$ & $ForExc_{i,t} > 0$)
$ForExc_{i,t}$	**−0.087**	**0.139**	**0.029**	**0.100**
	[−0.640]	**[3.260]***	**[0.824]**	**[1.790]***
$Global_{i,t}$	−0.034	−0.009	0.001	−0.008
	[−2.347]**	[−0.742]	[0.264]	[−1.348]
$ExcRisk_{i,t}$	0.018	−0.178	−0.015	−0.046
	[0.061]	[−1.065]	[−0.255]	[−0.569]
$OCF\_Vol_{i,t}$	0.113	0.050	−0.022	0.007
	[1.311]	[0.997]	[−1.255]	[0.284]
$Trend_{k,t}$	−0.004	0.015	−0.005	0.002
	[−0.319]	[1.843]*	[−2.590]***	[0.679]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Adj. R^2	0.247	0.295	0.281	0.290
N	1,725	2,113	2,711	2,370

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variable is $ResInvQ_{i,t+1}$, which denotes firm-specific investment residual obtained from Eq. (2). We exclude the independent variables used in Eq. (2). All other variables are defined in Table 1. All *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009). Approximately 4,000 firm-years are dropped from analyses because the foreign currency translations of these observations are zero.

currency translations, the results imply that negative OCI on foreign currency translations is likely to inhibit a firm's over-investment. By contrast, we do not observe the same for Group 3, which suggests that negative OCI on foreign currency translations is unlikely to lead to under-investment.

Next, Table 8 shows the results using $ResInvSG_{i,t+1}$ as a dependent variable. In terms of $ForExc_{i,t}$, we can observe similar results to those in Table 7. That is, for Group 2, the coefficient is positive and significant at the 5% level. Again, the result implies that negative OCI on foreign currency translations is likely to inhibit a firm's over-investment rather than lead to under-investment.

To check the robustness of the above results in Tables 7 and 8, we use alternative measures for corporate investment as given in the previous section. That is, we use three different dependent variables ($NetInv_{i,t+1}$, $InvRD_{i,t+1}$, $NetInvRD_{i,t+1}$) for Eq.(2) and Eq.(3) and test whether this materially changes our results. Table 9 summarizes the results. Again, we present only the signs and statistical significance for the coefficient of $ForExc_{i,t}$ for the same reason as that in Table 6. In Panel A, we estimate firm-specific investment residuals by Eq.(2) using three alternative dependent variables. For Group 2, the coefficients of $ForExc_{i,t}$ are consistently positive and significant at the 1% levels. However, we also observe positive and significant coefficients for $ResInvRDQ_{i,t+1}$ and $ResNetInvRDQ_{i,t+1}$ in Group 3. This is different from the results in Table 7 and suggests that negative OCI on foreign currency translations can lead to under-investment, especially when we include R&D expenditure as corporate investment.

In Panel B of Table 9, we apply alternative investment measures and different definitions for $Sales\_Growth_{i,t}$ in Eq.(3). That is, we test all possible combinations of investment measures

TABLE 8. ADDITIONAL TESTS USING INVESTMENT RESIDUALS FROM Eq.(3)

	(1) Group 1 ($\eta_{i,t+1} > 0$ & $ForExc_{i,t} > 0$)	(2) Group 2 ($\eta_{i,t+1} > 0$ & $ForExc_{i,t} < 0$)	(3) Group 3 ($\eta_{i,t+1} < 0$ & $ForExc_{i,t} < 0$)	(4) Group 4 ($\eta_{i,t+1} < 0$ & $ForExc_{i,t} > 0$)
$ForExc_{i,t}$	**0.010**	**0.173**	**0.030**	**0.017**
	[0.056]	**[2.336]****	**[0.952]**	**[0.392]**
$TobinQ_{i,t}$	0.011	0.014	−0.001	−0.000
	[2.951]***	[3.691]***	[−0.661]	[−0.125]
$OCF_{i,t}$	−0.051	−0.005	0.012	0.012
	[−1.316]	[−0.310]	[1.410]	[1.711]*
$Cash_{i,t}$	0.090	0.032	−0.005	0.012
	[2.542]**	[1.004]	[−1.167]	[1.400]
$Lev_{i,t}$	−0.067	−0.037	−0.010	−0.007
	[−2.800]***	[−2.227]**	[−1.843]*	[−1.070]
$Interest_{i,t}$	−0.063	−0.084	−0.059	0.010
	[−0.569]	[−0.925]	[−1.388]	[0.333]
$WC_{i,t}$	−0.048	−0.034	−0.010	−0.010
	[−2.325]**	[−1.587]	[−2.092]**	[−2.864]***
$Size_{i,t}$	−0.004	−0.015	0.001	−0.002
	[−0.442]	[−2.077]**	[1.101]	[−0.674]
$FinOwn_{i,t}$	0.022	−0.001	0.007	−0.005
	[0.818]	[−0.069]	[1.118]	[−0.678]
$Global_{i,t}$	−0.017	0.013	0.005	−0.008
	[−1.057]	[0.851]	[1.412]	[−1.888]*
$ExcRisk_{i,t}$	−0.007	−0.202	0.129	−0.059
	[−0.031]	[−1.009]	[1.848]*	[−0.907]
$OCF\_Vol_{i,t}$	0.080	−0.070	−0.017	−0.011
	[0.565]	[−1.043]	[−1.291]	[−0.550]
$Trend_{k,t}$	−0.011	0.008	0.000	0.000
	[−1.036]	[0.803]	[0.048]	[0.017]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Adj. R^2	0.330	0.391	0.436	0.502
N	1,763	2,160	2,664	2,332

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variable is $ResInvSG_{i,t+1}$, which denotes firm-specific investment residual obtained from Eq.(3). All other variables are defined in Table 1. All *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009). Approximately 4,000 firm-years are dropped from analyses because the foreign currency translations of these observations are zero.

($Invest_{i,t+1}$, $NetInv_{i,t+1}$, $InvRD_{i,t+1}$, $NetInvRD_{i,t+1}$) and calculations of $Sales\_Growth_{i,t}$ (annual changes, the geometric average of sales growth for the past three and five years). We find that the result in Table 8 is robust for every alternative: only for Group 2, $ForExc_{i,t}$ exhibits positive and significant coefficients. This is in contrast to Panel A and implies that the relationship between OCI and investment residuals in Group 3 is not consistent. Overall, our evidence suggests that negative OCI — in particular, negative OCI on foreign currency translations — results in lower capital investment and inhibits a firms' over-investment.

Table 9. Robustness Tests for Over- and Under-Investment

Panel A: Robustness Tests for Table 7

Dependent Variable	Group 1	Group 2	Group 3	Group 4
$ResNetInvQ_{i,t+1}$	0.005	0.180	0.047	0.043
	[0.041]	[2.894]***	[1.261]	[0.514]
$ResInvRDQ_{i,t+1}$	−0.091	0.190	0.073	0.128
	[−0.671]	[2.882]***	[2.108]**	[1.950]*
$ResNetInvRDQ_{i,t+1}$	−0.017	0.196	0.096	0.109
	[−0.105]	[3.097]***	[2.049]**	[0.812]

Panel B: Robustness Tests for Table 8

Dependent Variable	Definition of $Sales\_Growth_{i,t}$	Group 1	Group 2	Group 3	Group 4
$ResInvSG_{i,t+1}$	Annual Change	0.010	0.173	0.030	0.017
		[0.056]	[2.336]**	[0.952]	[0.392]
	Ave. Changes in Past 3 years	−0.024	0.151	0.019	−0.003
		[−0.155]	[2.019]**	[0.597]	[−0.063]
	Ave. Changes in Past 5 years	0.005	0.208	0.028	−0.015
		[0.027]	[2.407]**	[0.847]	[−0.356]
$ResNetInvSG_{i,t+1}$	Annual Change	0.157	0.190	0.040	0.066
		[0.824]	[3.091]***	[1.012]	[0.434]
	Ave. Changes in Past 3 years	0.147	0.218	0.055	0.046
		[0.897]	[2.909]***	[1.215]	[0.368]
	Ave. Changes in Past 5 years	0.217	0.264	0.068	−0.004
		[1.251]	[3.270]***	[1.466]	[−0.039]
$ResInvRDSG_{i,t+1}$	Annual Change	−0.053	0.146	−0.028	0.073
		[−0.344]	[3.319]***	[−0.861]	[1.067]
	Ave. Changes in Past 3 years	0.034	0.115	0.005	0.043
		[0.284]	[2.238]**	[0.164]	[0.714]
	Ave. Changes in Past 5 years	0.043	0.139	0.006	0.036
		[0.349]	[2.899]***	[0.130]	[0.659]
$ResNetInvRDSG_{i,t+1}$	Annual Change	0.002	0.135	0.013	0.047
		[0.009]	[2.760]***	[0.297]	[0.383]
	Ave. Changes in Past 3 years	0.113	0.133	0.024	0.049
		[0.754]	[2.375]**	[0.698]	[0.415]
	Ave. Changes in Past 5 years	0.143	0.177	0.051	0.011
		[1.052]	[2.926]***	[1.325]	[0.077]

Note: Each cell presents the signs and statistical significance for the coefficient of $ForExc_{i,t}$ when estimating Eq.(1) with corresponding variables for each group (see Tables 7 and 8 for model specification). $ResNetInvQ_{i,t+1}$, $ResInvRD\_Q_{i,t+1}$, and $ResNetInvRDQ_{i,t+1}$ denote firm-specific residuals obtained from industry-year estimations of Eq. (2) using $NetInv_{i,t+1}$, $InvRD_{i,t+1}$, and $NetInvRD_{i,t+1}$ as dependent variables, respectively. $ResInvSG_{i,t+1}$, $ResNetInvSG_{i,t+1}$, $ResInvRDSG_{i,t+1}$, and $ResNetInvRDSG_{i,t+1}$ denote firm-specific residuals obtained from industry-year estimations of Eq.(3) using $Invest_{i,t+1}$, $NetInv_{i,t+1}$, $InvRD_{i,t+1}$, and $NetInvRD_{i,t+1}$ as dependent variables, and corresponding definitions of $Sales\_Growth_{i,t}$, respectively. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All *t*-statistics are corrected for heteroskedasticity using a two-way cluster at the firm and year levels (Petersen 2009).

VI. *Concluding Remarks*

FVM has been criticized for its pro-cyclical effect, amplifying market fluctuations and making the real economy more volatile. In this study, we extend the concept of pro-cyclicality to business firms and examine whether and how FVM affects firm-level capital investment. Using OCI as an aggregated metric for fair value adjustments, we hypothesize that OCI has a positive effect on corporate investment. Specifically, we consider OCI as a proxy for a firm's potential financing constraint, which have been claimed to be a determinant of capital investment. To the extent that OCI captures changes in future cash flow, the amount of OCI indicates potential internal funds that the firm can generate at its discretion. Similarly, considering that OCI is, by its very nature, changes in the values of assets and liabilities, it can indicate a firm's accessibility to external funds.

We test this hypothesis using a sample of Japanese listed firms. Our regression analyses indicate that negative OCI on foreign currency translations results in lower capital investment. Furthermore, we document that negative OCI on foreign currency translations is more likely to inhibit a firm's over-investment than to encourage under-investment. These are robust to a number of sensitivity checks including alternative variables and estimations.

Regarding why only OCI on foreign currency translations affects corporate investment, we propose two possible explanations. The first revolves around our sample period. For the sample period 2003–2013 under consideration, Japanese managers faced large fluctuations in currency exchange rates. The yen's exchange rate against the US dollar declined sharply after the financial crisis (from approximately 120 yen to 80 yen in three years) and then increased rapidly to 125 yen due to "*Abenomics*." Therefore, during this period, managers may have been very sensitive to currency exchange rates, which eventually links changes in foreign currency adjustments to capital investment. The second revolves around our sample characteristics. We use Japanese listed firms whose fiscal year ends in March. In Japan, large and thus more globalized firms traditionally have their fiscal year ending in March. Therefore, the firms in our sample may be relatively more vulnerable to changes in currency exchange rates than to fluctuations in stock markets. In this regard, our findings may be biased and therefore should be interpreted carefully.

The findings of this study imply that FVM is not likely to affect firm-level capital investment in the way as suggested by the literature on pro-cyclicality and the financial accelerator. Rather, the timely recognition of losses by FVM can mitigate the problem of over-investment. In the context of accounting conservatism, Watts (2003) argues that an accounting system that forces managers to recognize losses in a timely manner improves corporate investment decision-making. This is because managers who can delay the timing of recognizing losses tend to make more investment regardless of the NPV of the investment (Jensen 1986). Our findings support this view that FVM provides timely and useful information in terms of managerial decision-making.

This study makes several contributions to the literature. Prior studies have largely examined the value relevance of OCI, leaving other aspects unexamined. To the best of our knowledge, this study is the first to directly investigate whether and how OCI affects corporate investment. Further, the evidence presented contributes to the existing literature on the economic consequences of FVM. A large body of studies have examined the consequences of

FVM from the perspectives of capital markets and accounting attributes, yet not much is known about the extent to which FVM affects managerial behavior (Beatty 2007; Brüggemann et al. 2013). Similarly, our evidence contributes to the literature on accounting conservatism by suggesting that timely loss recognition through FVM enhances the efficiency of corporate investment. Finally, we provide insightful evidence to arguments for the pro-cyclical effect of FVM. While there have been concerns that FVM, at least in part, added to the severity of the financial crisis, we show that fair value adjustments lead to efficient capital investment rather than amplifying the economic fluctuations.

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