Does Non-Discretionary Conservatism Really Exist in Japan?

－Evidence and Implications from Japanese Listed Companies－

1. Introduction

Conservatism is among the most important characteristics guiding accounting practice. However, researchers continue to discuss the merits of conservatism in accounting practices.

Lawrence, Sloan, and Sun [2013] (LSS hereafter) attribute the rise of conservative accounting, especially the recognition of impairment loss, to the regulatory force of generally accepted accounting principles (GAAP hereafter) (i.e., non-discretionary conservatism). On the other hand, LSS also found that asset write-downs are peculiarly prone to managerial discretion around a book-to-market (BTM hereafter) ratio of one (i.e., discretionary conservatism). It would be impracticable and almost impossible for outside parties, including auditors and scholars, to observe all the procedures performed by management. Consequently, it is possible that management increases their wealth at the expense of shareholders by exercising discretionary accounting without violating related accounting standards. However, LSS emphasized that discretionary conservatism arising from the subjectivity of accounting standards would be eliminated by non- discretionary conservatism and the empirical result is consistent with their expectations.

Despite some differences, Japanese accounting standards also incorporate a two-step approach which requires an impairment test before recognizing an impairment loss on the financial statement. Considering the high similarity between the two standards, there is good reason to expect that a similar correlation may exist between non-discretionary conservatism and the current-period write-downs.

This study presents evidence from Japanese companies that reveals the characteristics of conservatism in Japanese companies and is summarized as follows.

Empirical evidence in this study shows that the implementation of asset write-downs fail to reconcile with the demands for conservatism even when strongly warranted by circumstances. In other words, unlike American companies, non-discretionary conservatism does not seem to be found in Japanese listed companies, which is the most profound difference between this study and that of LSS. Instead, results in this paper confirm that debt contracting, rather than non-discretionary conservatism, is the driving force for asset write-downs in Japanese listed companies. The discrepancy between the USA and Japan is likely due to earnings management and/or the difference in their accounting regimes.

The findings of this study also contribute to the recent debate on the role of unconditional conservatism in financial reporting. Even though Financial Accounting Standards Board (FASB hereafter) and International Accounting Standards Board

(IASB) exhibit strong inclinations to purge conservatism from accounting's conceptual framework,[1] empirical evidence suggests that conservatism is useful because it reduces, rather than increases, information asymmetry between inside managers and outside investors (e.g., LaFond and Watts [2008]). Previous studies also suggest that greater unconditional conservatism (e.g., immediate expensing of intangible assets such as internally developed R&D or excessive depreciation) would reduce subsequent conditional conservatism (e.g., lower of cost or market accounting for inventory and impairment write-downs), because a lower book value of assets results in less assets to be written down later (e.g., Beaver and Ryan [2005], Basu [2005]). Furthermore, the findings of this study reveal that when legal enforcement fails to control reporting incentives and accounting discretion, unconditional conservatism plays a fundamental role in the properties of accounting numbers.

In addition to the classical regression method adopted in LSS, this study provides evidence for non-linearity between beginning-of-period ASSET-BTM and asset write-downs by employing the quantile regression (QR) (e.g., Koenker and Bassett [1978]) and the Adaptive LASSO regularized Quantile Regression (LASSO: Least Absolute Shrinkage Selection Operator) (e.g. Wu and Liu [2009], Fan, Fan, and Barut [2014]). The subjects of financial accounting research are always under the influence of a variety of factors, QR test and QR-LASSO may provide the needed solution to solve conflicting interpretations and divergent opinions documented in previous studies. I choose the QR test as an alternative solution to conventional linear regression because the conditional distribution of beginning-of-period ASSET-BTM and current-period asset write-downs may fail to fulfill the basic assumption of homoscedasticity.[2] The results of the QR test confirmed the presence of a buffer zone. On the other hand, QR-LASSO analysis can detect predictors with the strongest influence on asset write-downs at any quantile. It further confirms that beginning-of-period ASSET-BTM is not the driving force for asset write-downs in Japanese listed companies. Additional details concerning QR and QR-LASSO are provided in Appendix 1.

Although the findings of this study agree with statistical results, this study

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[1] FASB responded to questions on the role of conservatism as follows:

"Financial information needs to be neutral – free from bias intended to influence a decision or outcome. To that end, the common conceptual framework should not include conservatism or prudence among the desirable qualitative characteristics of accounting information. However, the framework should note the continuing need to be careful in the face of uncertainty."

This statement explicitly expresses the concerns of FASB that the existence of conservatism will lead to more information asymmetry.

[2] Homoscedasticity is also referred to as homogeneity of variance. It describes a situation in which dependent variable exhibits similar variance across all values of independent variables. The assumption of homoscedasticity is central to linear regression models.

nonetheless possesses the following limitations. First, all the samples are divided at equal intervals to test the features of each group. Such an artificial subdivision lowers the comparability between groups. However, it is almost impossible to completely remove arbitrariness regardless of the division. Moreover, securing a sufficient number of observations in each group will be difficult if they are broken down at much smaller intervals.

Second, this study adopted the same aggregated measure of ASSET-BTM as that adopted by LSS. The numerator (book value of total assets) is underestimated when those assets are recorded on the balance sheet – an effect attributable to the adoption of unconditional conservatism. In addition, assets subject to other impairment accounting standards, such as software, are included in the equation. Thus, even if the beginning-of-period ASSET-BTM is less than one, impairment accounting procedures for assets other than fixed assets may have been taken according to GAAP. Another concern is that an asset (group) with a beginning-of-period ASSET-BTM higher than one could be overlooked due to the principle of materiality. As a result, the current-period actual impairment loss caused by fixed assets would be lower than the expectations. In other words, the adoption of ASSET-BTM might potentially bias the outcome.

Third, there are still conflicting arguments about the validity about the validity of the "Asymmetric Timeliness coefficient" developed in Basu [1997] (Basu coefficient hereafter). Dietrich, Muller, and Riedl [2007] and Patatoukas and Thomas [2011] assert that Basu coefficient should be avoided because the problem of endogeneity and scale effect. On the other hand, Ball, Kothari, and Nikolaev [2013a] disputed the previous findings on the basis of variable definition. Furthermore, Ball, Kothari, and Nikolaev [2013b] confirmed that the overall accuracy of Basu coefficient can be substantially improved by controlling firm characteristics like size, BTM ratio and leverage. Given that disagreement remains about the validity of some measures for conditional conservatism, I applied T_SCORE (e.g.,Khan and Watts [2009]), the asymmetrically timely recognition of gains and losses using accruals and cash flows from operation (e.g.,Ball and Shivakumar [2006]) to verify the robustness of the findings in this paper.

The remainder of this study is organized as follows. Section 2 overviews some previous studies. Section 3 explains the hypotheses. Section 4 describes the research design of this study. Section 5 presents the statistics. Section 6 summarizes additional discussion of the test results and concludes the study.

2. Previous Research

The approach to understanding conservatism has undergone a dramatic change over the past three decades due to the efforts to empirically quantitate conservatism. One of the most pioneering studies to model conservatism can be attributed to that of Basu [1997]. He defined conservatism as a tendency for bad news to be dealt with in a timelier manner than good news (i.e., accelerate the recognition of loss and defer the recognition of gains) and developed the Basu coefficient for measuring earnings conservatism. In other words, the Basu coefficient captures the different timeliness with which bad and good news are reported in contemporaneous earnings. Among the available empirical methods for evaluating earnings conservatism, Basu's [1997] framework (Basu model hereafter) has become dominant in the literature.

Unconditional conservatism is primarily described as understating the book value of net asset relative to its market value on the balance sheet (i.e., recognition of cost is enforced before real depreciation is observed in asset value) (e.g., Watts [2003a]). Beaver and Ryan [2000] employed the measurement of BTM ratio to examine and explain the nature of unconditional conservatism. They defined conservatism as a systematic and persistent bias in the recognition of income and regressed the BTM ratio on lagged returns to filter out the temporary or transitory effects due to other economic factors.

Another line of thought (e.g., Beaver and Ryan [2005], Pae, Thornton, and Welker [2005]) has attempted to bridge these two conceptual frameworks and examine how the two forms of conservatism interact with each other.

Conservatism can be further divided into conditional conservatism [3] and unconditional conservatism[4] (e.g., Beaver and Ryan [2005]). Previous studies (e.g., Pae, Thornton, and Welker [2005], Roychowdhury and Watts [2007]) have indicated that the two forms of conservatism are negatively connected as the higher the degree of unconditional conservatism that is followed at the beginning of a fiscal year, the lower the degree of conditional conservatism will be during the year. Although the Basu coefficient is expected to positively correlate with the BTM ratio (e.g., Beaver and Ryan [2005]), some studies have presented empirical evidence that contradicts this expectation, thereby questioning the validity of the Basu coefficient (e.g., Givoly and

[3] Conditional conservatism is also referred to as earnings conservatism (e.g., LaFond and Watts [2008], Khan and Watts [2009]); ex post conservatism (e.g., Pope and Walker [2003]); or news-dependent conservatism (e.g., Chandra, Wasley, and Waymire [2004]) in the accounting literature.

[4] Unconditional conservatism is also referred to as stock conservatism (e.g., LaFond and Watts [2008], Khan and Watts [2009]); ex ante conservatism (e.g., Pope and Walker [2003]); or news-independent conservatism (e.g., Chandra, Wasley, and Waymire [2004]) in the accounting literature.

Hayn [2007], Dietrich, Muller, and Riedl [2007]). Roychowdhury and Watts [2007] noted that the annual estimate of the Basu coefficient is affected by firms' failure to record asset write-downs because previous asset value increases were not recorded due to conservatism (the "buffer" problem), and higher asymmetric response to bad news vs good news would eventually generate lower BTM ratio over longer horizons. LSS adds to this line of thought by offering an alternative explanation from the perspective of non-discretionary conservatism that indicates the necessity of controlling the BTM when measuring the Basu coefficient. In particular, they documented a non-monotonic and exceptionally positive relation between asset write-downs and the BTM ratio in region with beginning-of-period BTM ratio greater than one led by the enforcement of GAAP. In this regard, the results of this study are consistent with that of LSS given that the degree of conditional conservatism observed in samples with high beginning-of-period ASSET-BTM is greatly superior to that in those with low beginning-of-period ASSET-BTM.

LSS also integrates the concept of conservatism to relate to the study on earnings management. They found that the incentives to follow accounting standards are positively associated with penalties under enforcement mechanisms. They asserted that although the subjectivity inherent in the accounting standards gives rise to discretional activities, GAAP plays an important role in facilitating contracting efficiency by deterring management from engaging in further discretional activities. As the first follow-up study of LSS, Roychowdhury and Martin [2013] characterized non-discretionary conservatism as "normal conservatism". They indicated that reporting opportunism arising from contractual factors not only has a great impact on discretionary conservatism, but also weighs against non- discretionary conservatism as it can mold the form of "normality".

LSS employed ASSET-BTM as the proxy of non-discretionary conservatism[5] which

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[5] Under US accounting standards, the ratio of an asset's carrying value and its fair value (BTM) is used as a threshold of impairment proceedings. LSS used ASSET-BTM due to the inaccessibility of the underlying asset's fair value.

"In order to model non-discretionary conservatism, we need measures of both the book values and the fair values of firms' assets. The book values are readily available, but the fair values are more difficult to obtain. We address this issue by focusing on the aggregate book values and fair values of firms' assets, where fair values are estimated by summing the market value of common equity and the book values of liabilities. We then model aggregate asset write-downs as a function of the ratio of the aggregate book value to the aggregate market value of a firm's assets (BTM)." (LSS, p. 116)

Under Japanese accounting standards, the book value and the recoverable amount (net realizable value or value in use) of the underlying asset (group) are indispensable in determining whether an asset (group) should be written down. However, while the book value of the fixed asset can be easily identified, the information that management employed to estimate the recoverable amount (i.e., discount rate, future cash flows) is almost impossible to obtain. This constraint in turn affects the denotes the required asset write down.

$$\text{ASSET-BTM} = \frac{\text{total assets}}{\text{market capitalization} + \text{total assets} - \text{common equity}}$$

Roychowdhury and Watts [2007] indicated that conditionally conservative accounting is positively related to beginning-of-period BTM but not necessarily to the end-of-period BTM. Thus, a higher beginning-of-period BTM than the previous period may suggest that the value of certain assets might have declined. Because the end-of-period book value is measured after taking such write-downs, this study followed LSS and used the beginning-of-period BTM as the proxy of non-discretionary conservatism.

Oler [2014] investigated the impact of certain FASB standards (SFAS 87, 106, 121, 142, and 123R[6]) on accounting conservatism (that lower the probability of firms having a BTM ratio greater than one). He found that SFAS 121, as well as SFAS 123R, caused decreases in conservatism, which he attributed to the greater flexibility in SFAS 121 on the timing of an impairment. Ramanna and Watts [2012] focused on the implementation of SFAS 142, which also solely depends on management estimates of goodwill's fair value to determine these write-downs, and indicated that goodwill write-downs are subject to motives predicted by agency theory such as CEO compensation and debt-covenant. The results of this study are closer to that of Oler [2014] and Ramanna and Watts [2012] in that certain accounting standards, however strictly enforced, may not correspond to the expectations of regulators to improve the usefulness of accounting information.

FASB has consistently attempted to marginalize conservatism, reflecting the line or reasoning which holds that understatement of net assets and cumulative profits generated by conservatism presumably interferes in the decision-making process of financial statements users. Movement, actions such as capitalization of development cost, apparently abhorrent to the principle of conservatism has become prevalent in the realm of accounting regulations. In other words, the need for neutrality or relevance prevails over the need for a defense against uncertainty.

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accuracy of the computing result. Considering the above limitation, it can be assumed that the aggregate measure ASSET-BTM can also be applied to the investigation of Japanese companies.

[6] SFAS 87: Employers' Accounting for Pensions;
SFAS 106: Employers' Accounting for Postretirement Benefits Other Than Pension;
SFAS 121: Accounting for the Impairment of Long-Lived Assets and for Long-Lived Assets to Be Disposed Of;
SFAS 142: Goodwill and Other Intangible Assets; and
SFAS 123R: Share Based Payments

However, chances are that management prioritizes their own interests over those of other stakeholders, maintaining unconditional conservatism in accounting practices will offset such managerial opportunism. When book value of assets is kept sufficiently low from the beginning or is not capitalized at all, managers will find few assets subject to accounting discretion if the economic environment changes adversely. Therefore, this study focuses on the effect of accounting discretion on the implementation of impairment accounting standards.

To the best of my knowledge, there still lacks of study on non-discretionary conservatism in Japan. In this work, I try to fill this void. In addition, when impairment accounting is performed, more often than not, the losses run into considerable sums. These significant declines in earnings will be matched by high volatility in the capital markets. Thus, an understanding of how accounting standards affect impairment accounting is of great interests not only to researchers, but also of essential importance to standard setters, shareholders, and lenders. This is the primary motivation for this study.

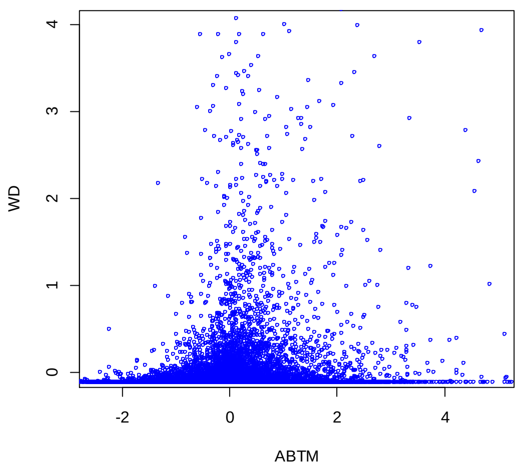
3. Hypotheses

The first question I address is whether impairment accounting standards allow for discretional management in Japanese companies. Beaver and Ryan [2005] suggested that the BTM ratio primarily reflects the extent to which unconditional conservatism forestalls the application of conditionally conservative accounting. Thus, the beginning-of-period BTM is expected to be positively associated with asset write-downs, hereby proxies for conditional conservatism. Although the two-step procedures are expected to serve to prevent the abusive use of impairment (big bath), as well as reduce operational burdens, the abstract recognition criteria involving management subjectivity judgment gives rise to the concern that it will eventually spur the demands for discretional accounting choices (e.g., Bartov, Lindahl, and Ricks [1998], Elliott and Hanna [1996], Rees, Gill, and Gore [1996]). A large body of research has indicated that management has strong incentives to adapt accounting standards in ways that maximize their own benefits (e.g., Dechow, Hutton, and Sloan [1999]). LSS stressed that the closer the beginning-of-period ASSET-BTM approaches one, the more likely it is that discretionary conservatism will be triggered. In accordance with LSS, I also predicted that a discontinuity will exist between the correlation of beginning-of-period ASSET-BTM and current-period write-downs. This leads to my first hypothesis.

H1: The relation between beginning-of-period ASSET-BTM and current-period asset write-downs is positive and nonlinear.

Figure 1 demonstrates the correlation between current-period write-downs on fixed assets (WD plotted on the vertical axis) and beginning-of-period ASSET-BTM ($ABTM$ plotted on the horizontal axis), using past performance figures of Japanese listed companies from fiscal year 2005 to 2014. Figure 1 shows that, as $ABTM$ approaches one, the gentle curve formed from the two indicators undergoes a dramatic rise and WD peaks just after $ABTM$ exceeds one. Thus far, the relation between WD and $ABTM$ conforms to that reported by LSS. In other words, when $ABTM$ is sufficiently low, there is little need to activate conditional conservatism. However, as $ABTM$ moves toward one, the deterrent effect of unconditional conservatism begins to recede. In accordance with LSS, I also predicted that a discontinuity will exist between the correlation of beginning-of-period ASSET-BTM and current-period write-downs.

Figure 1:



Note:
Figure 1 demonstrates the correlation between current-period asset write-downs (WD) and beginning-of-period ASSET-BTM ($ABTM$). Data was standardized for further tests.

However, distribution of asset write-downs seems to deviate from LSS's prediction, as the total impairment loss seems more likely to decline when the beginning-of-period ASSET-BTM moves beyond one.

One of the explanations for the deviation comes from the institutional distinctions between the two accounting regimes. Particularly, U.S. accounting rules prohibit expensing goodwill unless it is deemed impaired. In addition, impairment losses recognized under ASC 360-10 cannot be allocated to goodwill and other non-amortizing intangible assets, even if those assets are included in the asset groups being tested for recoverability. [7] In contrast, Japanese listed companies must amortize goodwill regularly over a period not exceeding 20 years. Because amortized goodwill is recorded as selling, general, and administrative expenses attributable to operating income, extensive amortization of goodwill could squeeze the reported financial performance for years. Proponents of goodwill amortization stress that purchased goodwill should be reflected on income statements before any deterioration in real earning capacity is observed. They argue that goodwill acquired by M&As is non-durable and gradually replaced internally-developed goodwill. It is a reasonable assumption that internally developed synergies need effort to achieve and time to accumulate. Thus, Japanese companies are reluctant to record additional asset impairment losses when they believe an asset (group) is overly depreciated.

The other source of the differences between Japan and the U.S., which were identified in the implementation of asset impairment accounting standards, is reporting incentives. Shaped by capital market forces and institutional factors, financial reporting incentives strongly influence financial reporting because the application of accounting standards involves discretion and judgement (e.g., Watts and Zimmerman [1986], Ball, Robin, and Wu [2003]). Riedl [2004] also suggested that earnings management related to impairment loss tends to rise because of the intrinsic nature of its accounting setting. Therefore, opportunistic behavior in financial reporting by management will not be completely held back as a result of market imperfections, namely information asymmetry and agency conflicts. Consequently, I state my second hypothesis in its null form and expect it would be rejected based on the previous discussion.

H2: The positive relation between the beginning-of-period ASSET-BTM and current-period asset write-downs is stronger for companies whose beginning-of-period ASSET-BTM is greater than one.

4 Research Design

4.1 Grouping

First, all samples will be divided into eight groups according to their

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[7] LSS also identified non-discretionary items in the implementation process for goodwill under ASC 350. Applying the same implementation process to goodwill may have altered the size of the buffer zone but have little influence on non-discretionary items.

beginning-of-period ASSET-BTM at intervals of 0.2.[8] All samples would initially be separated using beginning-of-period ASSET-BTM of one as a dividing line. Then, they will further be divided into smaller groups based on the same interval of 0.2. The eight groups are arranged in an ascending order of beginning-of-period ASSET-BTM. I expected companies belonging to Group 1 would show the least need for asset write-downs, whereas companies belonging to Group 8 would show the opposite tendency. Groups 5 and 6 are the cohorts of most interest as they reflect samples whose beginning-of-period ASSET-BTMs are just less or greater than one.

4.2 Test for non-linearity

4.2.1 the Adaptive LASSO regularized Quantile Regression (QR-LASSO)

In an attempt to refine the Basu model, LSS assumes that management's commitment to accounting conservatism primarily derives from regulatory enforcement compared to other contractual imperatives (i.e., debt contracting) (Watts [2003a]). However, a sizable literature in conservatism empirically supports the assertion that the contracting theory links debt structure and conservatism (Aier, Chen, and Pevzner [2014], Nikolaev [2010], Khan and Watts [2009], Beatty, Weber, and Yu [2008], Zhang [2008], Ball, Robin, and Sadka [2008]), since debt-holders' fixed financial claims on earnings render them the first-order demander for accounting conservatism (e.g., Guay [2006], Roychowdhury and Martin [2013]). On the other hand, LSS also contrasts with agency theory, which characterizes a large body of research in earnings management, that management has ex post incentives to choose aggressive accounting over conservatism.

The issue then arises as to what factors prevent/facilitate departures from conservatism. I apply the Adaptive-LASSO penalized quantile regression (QR-LASSO) (e.g., Wu and Liu [2009]) to address the problem above.

High dimensional data are commonly encountered in accounting studies. However, a large number of predictor variables make it difficult to interpret the model and might decrease its predictive ability. A smaller set of predictors with the strongest effects not only increases prediction accuracy but also boosts a better understanding of how each

[8] The entire sample is divided into eight groups based on their rank of beginning-of-period ASSET-BTM. However this approach is only effective when the companies belonging to the same group have a similar degree of conservatism throughout the entire observation period. In general, the beginning-of-period ASSET-BTM is affected by the accounting procedures executed at the end of the previous fiscal year. For example, if a significant impairment procedure has been performed at the end of the previous fiscal year in a company belonging to a high-ranking group, there is a strong possibility that such a company's beginning-of-period ASSET-BTM would drop sharply. Therefore, test results obtained from the companies belonging to low-ranking groups might have been distorted.

predictor influences the response variable. QR-LASSO is an integrative approach to variable selection which can screen out irrelevant noise for variables affecting asset write-downs by pushing the less significant coefficients to zero and in the meantime evaluate effects of predictor variables on asset write-downs at any quantile. In QR-LASSO, the regularization term is set to be a constant value beneath the weighted $L1$ norm in the OLS solution.

Other than ASSET-BTM ($ABTM$), I examined the following variables, which have been deemed influential in shaping accounting choices for asset impairment and/or conservatism. The variables are firm size ($SIZE$), debt contracting ($LEVMV$), and proportion of goodwill to total assets (GW).

Firm size ($SIZE$) is commonly referred to as the market value of a company's equity. Given the four drivers of conservatism advanced in Watts [2003a],[9] larger companies are more motivated to reduce regulatory cost and litigation risk arising from non-compliance with accounting regulations and corporation law. However, larger firms also enjoy comparative advantages of highly diversified business models and deeply interdependent management structure over smaller firms. Such flexible business environment allows for management to exercise discretion, making it more difficult for outside parties to retrieve information on true economic performance.

Debt covenants are viewed as the one of the primary inputs for conservatism (Watts [2003a]). Earlier studies document robust empirical relations between debt covenants and timely loss recognition. However, debt-contracting incentives might evoke aggressive accounting policies (e.g., LSS, Nikolaev [2010]). Therefore, the question of how tradeoffs affect implementation of asset impairment by listed companies in Japan becomes empirical in nature.

$LEVMV_{t-1}$ represents debt contracting in this study, measured as the ratio of total liabilities[10] to market value of common equity (e.g., Beaver and Ryan [2000]). Goodwill primarily consists of future economic benefits and synergies in existing operations. As stated in Section 3, I added the variable for goodwill (GW) because it indicates one of the differences existing in the two accounting systems.

Viewed in general terms, companies with a high BTM ratio are more likely going

[9] Watts [2003a] hypothesized four resources of conservatism, which are contracting, shareholder litigation, taxation, and regulation.

[10] Instead of market value of total liabilities, I used book value of total liabilities to compute market value leverage ($LEVMV$). Long-term liability such as corporate bonds is required to be recognized at amortized cost under Japanese accounting standards. Other liabilities are also required either to be marked to market (i.e., bank loans) or to be recorded extremely close to their market values (i.e., reserve for retirement allowance). Furthermore, book value of liability is customarily used as proxy for market value in studies of corporate finance (i.e., the calculation of corporation value). In summary, book value of liability is an appropriate substitute for its market value.

through financial distress and, therefore, are in even greater need of financial support. (e.g., Jung, Kim, and Stulz [1996], Smith and Watts [1992]). It is possible that a rise in the amount of equity and/or debt will alter the management's accounting choices. I employed two variables indicating two dominant sources of external financing, $DEBT_{t-1}$ and $EQUITY_{t-1}$, to denote proceeds from debt issuance and sale of common stock in year t−1 (deflated by market capitalization), respectively.

Instead of controlling for industry, I added the proportion of property, plant and equipment assets to total assets in year t−1 (PPE_{t-1}). As accounting standards generally apply to all firms, there is no a priori reason to suppose that conservatism will be higher for a certain industry. On the contrary, failing to control for the size of fixed assets might cause the effects of other variables to be misrepresented.

Finally, as with LSS, I apply two dummy variables to control for the non-discretionary element in conditional conservatism. $WEAK_{t-1}$ takes a value of 1 if $LROA_t$ is below 5% and 0 otherwise. $LROA_t$ is a lag indicator for ROA and is computed as the average value of ROA_{t-1} and ROA_{t-2}. $WEAK$ reveals a company's ability to generate earnings from its investments. $BTLD_{t-2}$ indicates the accounting slack accumulated over time. It takes a value of 1 if $ABTM_{t-2}$ is higher than 1 and 0 otherwise. When both variables take the value of 1, companies with higher than 1 ASSET-BTM in the previous two accounting periods undoubtedly require a higher level of conservative accounting.

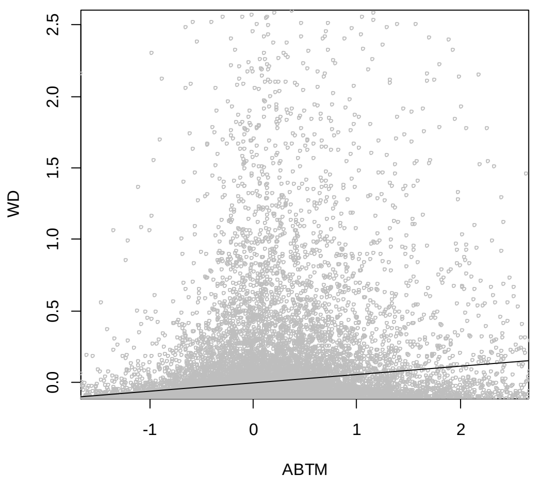
4.2.2 Quantile regression (QR)

To provide evidence of a discontinuity in the relationship between beginning-of-period ASSET-BTM and asset write-downs, I adopt the robust technique of Quantile regression. LSS used the traditional OLS to verify their prediction regarding the relation between current-period asset write-downs and beginning-of-period ASSET-BTM.[11] The empirical distribution of asset write-downs closely approximates a continuous inverted U-shape. Although Ordinary Least Squares (OLS) is a classical and widely used approach in regression analysis, its effectiveness largely depends on strong assumptions about the distribution of residuals. Solutions produced by OLS are highlighted in Figure 2 as the black solid line. Applying OLS in this instance would generate a coefficient estimate that is not fully indicative of the effects on the lower tail of the distribution. On the other hand, quantile regression models heterogeneous effects of variables on a response and allows for heteroscedasticity. I predict that predictors will respond incrementally stronger to the current-period asset write-downs as

[11] Results of the test model applied in LSS are consistent with the findings in this study. Detailed analyses and test results are provided in Appendix 5.

quantiles grows higher. In other words, if asset write-downs increase rapidly after the beginning-of-period ASSET-BTM reaches one, coefficients on $ABTM_{t-1}$ should display a dramatic change between high quantiles for WD.

Figure 2



Note:

Figure A demonstrates the effects of beginning-of-period ABTM on asset write-downs estimated by OLS analysis. WD : asset write-downs measured at the end of fiscal year t /market capitalization measured at the end of fiscal year t－1. $ABTM$: total assets / market capitalization + total assets - common equity, both measured at the end of fiscal year t－1. Data was standardized for further tests.

The QR test uncovers trends among variables across all quantiles on the basis of Eq. 1.

$$Q_{WD_t}(\tau|X_i) = \sum_i \beta_{i,\tau} X_i + \varepsilon_{i,\tau} \qquad \tau \in (0,100) \qquad i \in [1,6] \qquad 1$$

WD_t = current-period asset write-downs

X_i:

$ABTM_{t-1}$ = total assets deflated by the sum of market capitalization and total assets minus common equity, both measured at the end of fiscal year t－1

$SIZE_{t-1}$ = natural logarithm of market value at the end of fiscal year t－1

$LEVMV_{t-1}$ = total liabilities deflated by market value of common equity at the end of fiscal year t－1.

GW_{t-1} = book value of goodwill deflated by total assets, both measured at the end of fiscal year t－1.

$WEAK_{t-1}$ = a dummy variable that takes a value of 1 if $LROA_t$ is below 5% and 0 otherwise. $LROA_{\mathrm{t}}$ is a lag indicator for ROA, computed as the average value of ROA_{t-1} and ROA_{t-2}.

PPE_{t-1} = proportion of property, plant and equipment assets to total assets, measured at the end of year t－1.

$DEBT_{t-1}$ = proceeds from the issuance of bonds in year t－1 deflated by market capitalization of common equity at the end of year t－1.

$EQUITY_{t-1}$ = proceeds from the issuance of common stock in year t－1 deflated by market capitalization of common equity at the end of year t－1.

$BTLD_{\mathrm{t-2}}$ = 1 if $ABTM_{t-2}$ is higher than 1 and 0 otherwise.

Here, τ denotes the quantile, and y represents current-period asset write-downs (WD_t). $\beta_{i,\tau}$ represents the slope coefficient of a specific variable, selected by Step 2, on the dependent variable (WD_t) for a specific quantile τ. For instance, for τ = 75, $\beta_{1,75}$ denotes the effect of $ABTM_{t-1}$ at the 75th percentile of WD_t.

4.3 Test for non-discretionary conservatism

LSS declared that as beginning-of-period ASSET-BTM becomes greater than one, non-discretionary conservatism plays an increasingly influential role. Given the different distributions (Figure 1) shown by samples with respect to Japanese listed companies, I predict that non-discretionary conservatism does not function as effectively in Japanese listed companies as it does in American listed companies. To learn more regarding non-discretionary conservatism, I conducted a close investigation into the three groups with individual ASSET-BTM higher than one. In addition, I trace and compare the levels of all groups' conditional conservatism based on the models applied by Basu [1997], Pae, Thornton, and Welker [2005], Khan and Watts [2009], and Ball and Shivakumar [2006].

5 Sample and Descriptive Statistics

5.1 Sample Selection

The initial sample in this study includes all Japanese listed firms with necessary data on NIKKE NEEDS Financial Quest covering an analysis period from fiscal year 2005 to 2014. I collect stock return data from NPM Daily Return Database (Financial Data Solutions). To reduce analytical complexity, financial institutions, companies with a fiscal year ending other than March; companies who have been delisted; and those who had changed their year-end in the middle of a fiscal year were excluded from the observations. I eliminated a total of 853 firm/year samples which do not have sufficient data to compute the measure of ASSET-BTM (i.e., total assets and market capitalization). A further 22 firm/year samples with negative common equity and one sample with negative asset write-downs were also excluded from the analyses. The final sample includes 17,152 firm/years fulfilling the aforementioned requirements.

Table 1 presents the sample selection process. Table 2 presents the number of samples in each group.

TABLE 1

Process of sample selection

	initial sample
	27670
1 analytical complexity	Δ9643
2 required accounting data	Δ853
3 negative common equity and asset write-downs	Δ22
total	17152

Note:
The required accounting data includes total assets, common equity and market capitalization. In order to reduce analytical complexity, firms with fiscal year ending other than March, companies who have been delisted; and those who had changed their year-end in the middle of a fiscal year were excluded. Samples which do not have sufficient data to compute the measure of ASSET-BTM and those with negative common equity and asset write-downs were also excluded.

TABLE 2
Number of samples in each group

		N	N%
Group1	$ABTM_{t-1}$ <0.2	170	1%
Group2	0.2≤ $ABTM_{t-1}$ <0.4	371	2%
Group3	0.4≤ $ABTM_{t-1}$ <0.6	980	6%
Group4	0.6≤ $ABTM_{t-1}$ <0.8	2280	13%
Group5	0.8≤ $ABTM_{t-1}$<1	4325	25%
Group6	1≤ $ABTM_{t-1}$<1.2	4749	28%
Group7	1.2≤ $ABTM_{t-1}$<1.4	2328	14%
Group8	1.4≤ $ABTM_{t-1}$	1949	11%

Note:
The samples were separated into eight groups using an interval of 0.2. Then, the eight groups were arranged in an ascending order of beginning-of-period ASSET-BTM. I expected companies belonging to Group 1 would show the least need for asset write-downs, whereas companies belonging to Group 8 would show the opposite tendency. $ABTM_{t-1}$: total assets / the sum of market capitalization and total assets minus common equity, both measured at the end of fiscal year t−1. N denotes the number of observations in each ASSET-BTM group. N% denotes the percentage of each group's firm/years in all observations. N% refers to the percentage of each group's firm/years in all observations.

5.2 Descriptive Statistics

Table 3 Panel A reports descriptive statistics for variables of particular importance in this study. WD_t denotes asset write-downs scaled by market capitalization measured at the end of fiscal year t−1. Observing a higher mean value (0.0081) than the median value (0) and 3rd quartile (0.0008) for WD_t indicates the presence of "big bath" – that is, a minor portion of the samples take up the majority of asset write-downs recognized at each year end. $ABTM_{t-1}$ denotes ASSET-BTM measured at the end of fiscal year t−1, computed as the book value of total assets deflated by the sum of market capitalization and total assets minus common equity. $BTMD_{\mathrm{t}-1}$ is a dummy variable which takes a value of 1 if $ABTM_{t-1}$ is higher than 1 and 0 otherwise. The mean value of $ABTM_{t-1}$ and $BTMD_{t-1}$ are 1.0305 and 0.5262, respectively, both of which show that approximately more than half of the samples have lower market values than their book values. This differs hugely from the analysis performed in the study of LSS, who reported that only the upper 25% of the observations were expected to write down their assets.

Panel B of Table 3 compares some important statistical results across groups. First, recall that groups are classified by ASSET-BTM measured at the end of year t－1 in an ascending order. As expected, the mean WD of Groups 6, 7 and 8 are 0.0102, 0.0117, and 0.0218, respectively, all of which noticeably surpass those of groups with a beginning-of-period ASSET-BTM lower than one. This is consistent with the findings of LSS. Firm size ($SIZE$) is calculated as the natural logarithm of market capitalization at the end of fiscal year t－1. From Panel B, a trend toward a rapid decline in $SIZE$ is evident from Group 3 to Group 8, which is consistent with the trend observed in previous research, indicating that larger companies have a preference for more conservative accounting (e.g., Watts and Zimmerman [1986]).

A growing number of studies have shown that debt covenants are a most important reporting incentive to predict loss recognition timeliness. $LEVMV$ peaks in Group 6 (3.7706), but decreases sharply with Group 8 (1.6959) being the lowest among groups with higher than one beginning-of-period ASSET-BTM.

The pecking order theory predicts that management prioritizes debt issuance over equity when external financing is required. In other words, the issue of debt implies underestimation of stock price and the issue of equity otherwise. (e.g., Jung, Kim, and Stulz [1996], Smith and Watts [1992]). Consistent with the pecking order theory, firms from Group 8 issue considerably more new stock than the other groups as leverage ratios decline rapidly through Groups 6 － 8.

Panel C in Table 3 considers the operating performance of all samples. R_{t-1} is the buy-and-hold return on common stock for the 12 months ending three months after the end of fiscal year t－1. Return on assets (ROA) is used extensively to investigate a company’s earning capacity. ROA_t is computed as income before extraordinary items at the end of fiscal year t scaled by the book value of total assets. $LROA_{\mathrm{t}}$ is a lag indicator for ROA, computed as the average value of ROA_{t-1} and ROA_{t-2}. $WEAK_{t-1}$ is a dummy variable, that takes a value of 1 if $LROA_t$ is below 5% and 0 otherwise. PPE_{t-1} denotes proportion of property, plant and equipment assets to total assets, measured at the end of year t－1.

TABLE 3 Descriptive Statistics

Panel A:

	mean	std.	1st quartile	median	3rd quartile
WD_t	0.0081	0.0669	0.0000	0.0000	0.0008
$ABTM_{t-1}$	1.0305	0.3631	0.8281	1.0160	1.1995
$BTMD_{t-1}$	0.5262	0.4993	0	1	1
$SIZE_{t-1}$	10.1709	1.8129	8.8706	9.9396	11.2959

Panel B:

	WD_t	$SIZE_{t-1}$	$LEVMV_{t-1}$	$DEBT_{t-1}$	$EQUITY_{t-1}$	$BTMD_{t-2}$
Group1	0.0002	9.5272	0.3802	0.0035	0.0116	0.3176
Group2	0.0005	9.7000	0.2318	0.0033	0.0171	0.0943
Group3	0.0009	10.2374	0.3783	0.0066	0.0143	0.0918
Group4	0.0015	10.3327	0.7927	0.0105	0.0092	0.1443
Group5	0.0040	10.3913	1.9592	0.0219	0.0120	0.2860
Group6	0.0102	10.1591	3.7706	0.0281	0.0130	0.7412
Group7	0.0117	9.9731	2.4685	0.0140	0.0075	0.9055
Group8	0.0218	9.8699	1.6959	0.0080	0.0217	0.9523

Panel C

	R_{t-1}	DR_t	$LROA_t$	$WEAK_t$	GW_{t-1}	PPE_{t-1}
Group1	0.8041	0.4647	0.0486	0.4471	0.0340	0.1342
Group2	0.1922	0.5499	0.0494	0.3720	0.0136	0.1857
Group3	0.1318	0.5418	0.0473	0.3878	0.0139	0.2349
Group4	0.0695	0.5390	0.0372	0.6408	0.0104	0.2929
Group5	0.0316	0.5618	0.0250	0.8238	0.0068	0.3320
Group6	0.0467	0.5639	0.0186	0.8922	0.0057	0.3031
Group7	－0.0425	0.5438	0.0209	0.8922	0.0040	0.3015
Group8	－0.0695	0.5526	0.0152	0.9112	0.0039	0.2913

Panel D:

	WD_t		$ABTM_{t-1}$	
	mean	3rd quartile	mean	3rd quartile

2005	0.0010	0	0.9630	1.1008
2006	0.0020	0	0.8000	0.9721
2007	0.0005	0	0.8838	1.0649
2008	0.0063	0.0002	0.9886	1.1611
2009	0.0214	0.0061	1.2082	1.3596
2010	0.0112	0.0049	1.1323	1.2782
2011	0.0117	0.0033	1.1278	1.2875
2012	0.0089	0.0029	1.1762	1.3280
2013	0.0114	0.0035	1.0010	1.1723
2014	0.0061	0.0028	1.0047	1.1820

Notes:
WD_t : asset write-downs measured at the end of fiscal year t /market capitalization measured at the end of fiscal year t−1. $ABTM_{t-1}$: total assets / market capitalization + total assets −common equity, both measured at the end of fiscal year t−1. $BTMD_{t-1}$: dummy variable which take a value of 1 if $ABTM_{t-1}$ is higher than 1, and 0 otherwise. R_{t-1}: the buy-and-hold return on common stock for the twelve months ending three months after the end of fiscal year t−1. DR_t: dummy variable, taking a value of 1 if R_{t-1} is negative, and 0 otherwise. ROA_t : income before extraordinary items / book value of total assets, both measured at the end of fiscal year t. $LROA_t$: lag indicator for ROA, computing as an average value of ROA for the previous two accounting periods. $WEAK_{t-1}$: dummy variable, taking a value of 1 if $LROA_t$ is less than 5%, and 0 otherwise. $SIZE_{t-1}$: the natural logarithm of market capitalization at the end of fiscal year t−1. GW_{t-1}: book value of goodwill deflated by total assets, both measured at the end of fiscal year t−1. $LEVMV_{t-1}$: book value of total liabilities deflated by market value of common equity at the end of fiscal year t−1. PPE_{t-1}: proportion of property, plant and equipment assets to total assets, measured at the end of year t−1. $DEBT_{t-1}$: proceeds from debt issuance deflated by market capitalization, both measured at the end of year t−1. $EQUITY_{t-1}$: proceeds from sale of common stock deflated by market capitalization, both measured at the end of year t−1.

R_{t-1} decreases as ASSET-BTM grows and bottoms at −0.0695 in Group 8. $LROA$ negatively interacts with ASSET-BTM, with Group 8 the lowest (0.0152). The result for $WEAK$ is briefly accordant with the rank of beginning-of-period ASSET-BTM. In particular, the financial performance of Groups 5 to Group 8 is relatively weaker than that of the other groups with lower beginning-of-period ASSET-BTM. $WEAK$ for Group 8 runs up to 0.9112, suggesting that more than 90% of the observations belonging to Group 8 suffered depressed financial performance. It is noteworthy that $WEAK$ for US listed companies, as documented by LSS, ranges from 0.603 ($0.3 \le ABTM_{t-1} < 0.5$) to 0.847 ($ABTM_{t-1} > 1.2$). In other words, Japanese listed companies in high ASSET-BTM groups exhibit lower operational effectiveness than their counterparts in America, whereas those in low ASSET-BTM groups enjoy financial performance surpassing their American counterparts.

Panel D compares WD and $ABTM$ on a yearly basis. An economic deterioration, such as the global financial crisis in 2008, which put stock markets around the world on a downward trajectory, can significantly affect the implementations of asset impairment.

The mean value of WD over time shows that asset impairment losses soared to 0.0214 in 2009, which underscores the unprecedented challenges posed by the financial crisis. This is coincident with $ABTM$, which records its peak value (1.2082) in the same accounting period. Although the economy has steadily emerged from the financial crisis (the mean value of $ABTM$ declined from 1.2082 to 1.0305), Japanese listed companies are still struggling as $ABTM$ has remained over 1 since 2009.

Panel A of Table 4 contains the results of the actual asset write-downs in terms of frequency and volume. N denotes the number of observations in each ASSET-BTM group. Among all the observations of 17,152 firm/years, 5,085 sampling firms wrote down their assets. GN represents the number of companies who have written down their assets. $WDN\%$ represents the percentage of such companies in all samples (17,152 firm/years). Group 6, together with Groups 7 and 8, occupy a dominant portion of 53% with respect to $WDN\%$. $WDNG\%$ equals the percentage of companies who have written down their assets in each group. Groups with high beginning-of-period ASSET-BTM (Group 6 through Group 8) do not exhibit a tremendous difference between each other. On the other hand, $SUMWDG$ represents the sum of actual asset write-downs in each group. $SUMWD\%$ compares the amount of actual asset write-downs between the eight groups. In this respect, the three groups with a beginning-of-period ASSET-BTM higher than one (Group 6 through Group 8) constitute approximately 84% of the total actual asset write-downs. In brief, groups with higher ASSET-BTM outrank the other groups not only by the frequency but amount as well. From this, it is clear that when ASSET-BTM exceeds one, the application of impairment standards explodes.

If the "non-discretionary conservatism takes over theory" holds, both the frequency and amount of asset write-downs are expected to increase monotonically from Group 6 to Group 8. However, Groups 7 and 8 only take up 14% and 11% of $WDN\%$, respectively, levels that are inferior to Group 6 (28%) even after Groups 7 and 8 are combined. In addition, the indicator $SUMWD\%$ of Group 6 (35%) is also higher than that of Group 7 (19%) and Group 8 (30%). According to a previous analysis on changes of ASSET-BTM over time, more than 40% of the entire observations have ASSET-BTM greater than one for three years in succession, indicating that a considerable proportion of Japanese listed companies postpone the application of impairment standards when circumstances warrant.

TABLE 4

Panel A:

Results of actual asset write-downs in terms of frequency and volume

	N	GN	$WDN\%$	$WDNG\%$	$SUMWDG$	$SUMWD\%$
Group1	170	18	0.10%	11%	0.0282	0%
Group2	371	66	0.38%	18%	0.1717	0%
Group3	980	197	1.15%	20%	0.8333	1%
Group4	2280	555	3.24%	24%	3.4093	2%
Group5	4325	1260	7.35%	29%	17.4105	12%
Group6	4749	1573	9.17%	33%	48.2238	35%
Group7	2328	742	4.33%	32%	27.1528	19%
Group8	1949	674	3.93%	35%	42.4499	30%
Total	17152	5085	29.65%	100%	139.6795	100%

Panel B:

Further details of groups with beginning-of-period ASSET-BTM greater than one

	N	$N1$	$WD1\%$	$N2$	$WD2\%$
Group6	4749	3176	67%	2336	49%
Group7	2328	1586	68%	1441	62%
Group8	1949	1275	65%	1217	62%

Note:

GN represents the number of companies who have written down their assets. $WDN\%$ represents the percentage of companies who have written down their assets in all samples. $WDNG\%$ equals the percentage of companies who have written down their assets in each group. $SUMWDG$ denotes the sum of actual asset write-downs in each group. $SUMWD\%$ denotes the percentage of each group's actual asset write-downs in the total actual asset write-downs. $N1$ depicts the number of companies who did not record asset write-downs at the end of fiscal year t. $WD1\%$ represents the percentage of companies who delay the application of impairment standards in each group. $N2$ depicts the number of companies who shelved the impairment procedures two fiscal years in a row. $WD2\%$ represents the percentage of companies who shelve the impairment procedures for two fiscal years.

Panel B of Table 4 reports on a deeper examination of groups with beginning-of-period ASSET-BTM greater than one. N denotes the number of observations in each ASSET-BTM group. $N1$ depicts the number of companies who did not record asset write-downs at the end of fiscal year t. $WD1\%$, the third row in Table 4, represents the percentage per group of such companies. Approximately 68% and 65% of the companies in Groups 7 and 8, respectively, potentially delayed the implementation of impairment even when their beginning-of-period ASSET-BTMs strongly imply a decline in the value of their assets. $N2$ depicts the number of companies who shelved the impairment procedures for two fiscal years in a row. $WD2\%$, the last row in Table 4, then represents the percentage of such companies in each group. Although the number of such companies decreases by 18% in Group 6 (from 67% to 49%), the percentage of companies leaving their depreciating assets untouched in Group 7 (62%) and Group 8 (62%)

remains surprisingly high despite the presence of such red flags for two consecutive fiscal years. This is counter to that seen in the study of LSS, but consistent with my expectation that non-discretionary conservatism is not as prevalent in Japanese listed companies as it is in American listed companies.

5.3 Tests of nonlinear relation

5.3.1 the Adaptive LASSO regularized Quantile Regression (QR-LASSO)

Results of the QR-LASSO at the 70th, 75th, 80th, 85th, 90th, and 95th quantiles, respectively, are shown in Figure 3.[12] The upper plots show how the model at a specific quantile evolves through the selection process. Each colored line represents the value taken by a different variable. The vertical axis reveals the fit statistics of the variables and assesses the relative importance of the effects selected at any step of the selection process. The horizontal axis provides information as to when effects of the selected variables enter the model. The lower plot in the panel shows the stopping criterion used to choose the model and how it changes as variables enter or leave the model. The vertical gray line connecting the upper plot and the lower plot indicates the maximum number of steps, which when reached, denotes the termination of the selection process. The effects chosen by then are viewed as the optimal model to explain the response variable for that quantile.

I applied the Adjusted R-square statistic ($Adj. R^2$), Akaike's information criterion (AIC), Corrected Akaike's information criterion (AICC) and Schwarz Bayesian information criterion (SBC) in all the tests to evaluate the quality of the models produced by the QR-LASSO. Eventually, all models are selected by SBC, which favors a smaller model than AIC and AICC. Moreover, because the information criterion is usually used in the context of comparing models, not as an absolute criterion by itself, the magnitude of the information criterion (AIC/SBC) for a specific model is less of interest.

As previously noted, conservative accounting pertaining to asset write-downs disclosure may involve a set of managerial incentives rather than a single constraint. 9 predictors are considered in the model: beginning-of-period ASSET-BTM ($ABTM$), firm size ($SIZE$), financial leverage ($LEVMV$), proportions of goodwill to total assets (GW), the proportion of property, plant and equipment assets to total assets (PPE), operating efficiency ($WEAK$) and accumulated accounting slack ($BTLD$).

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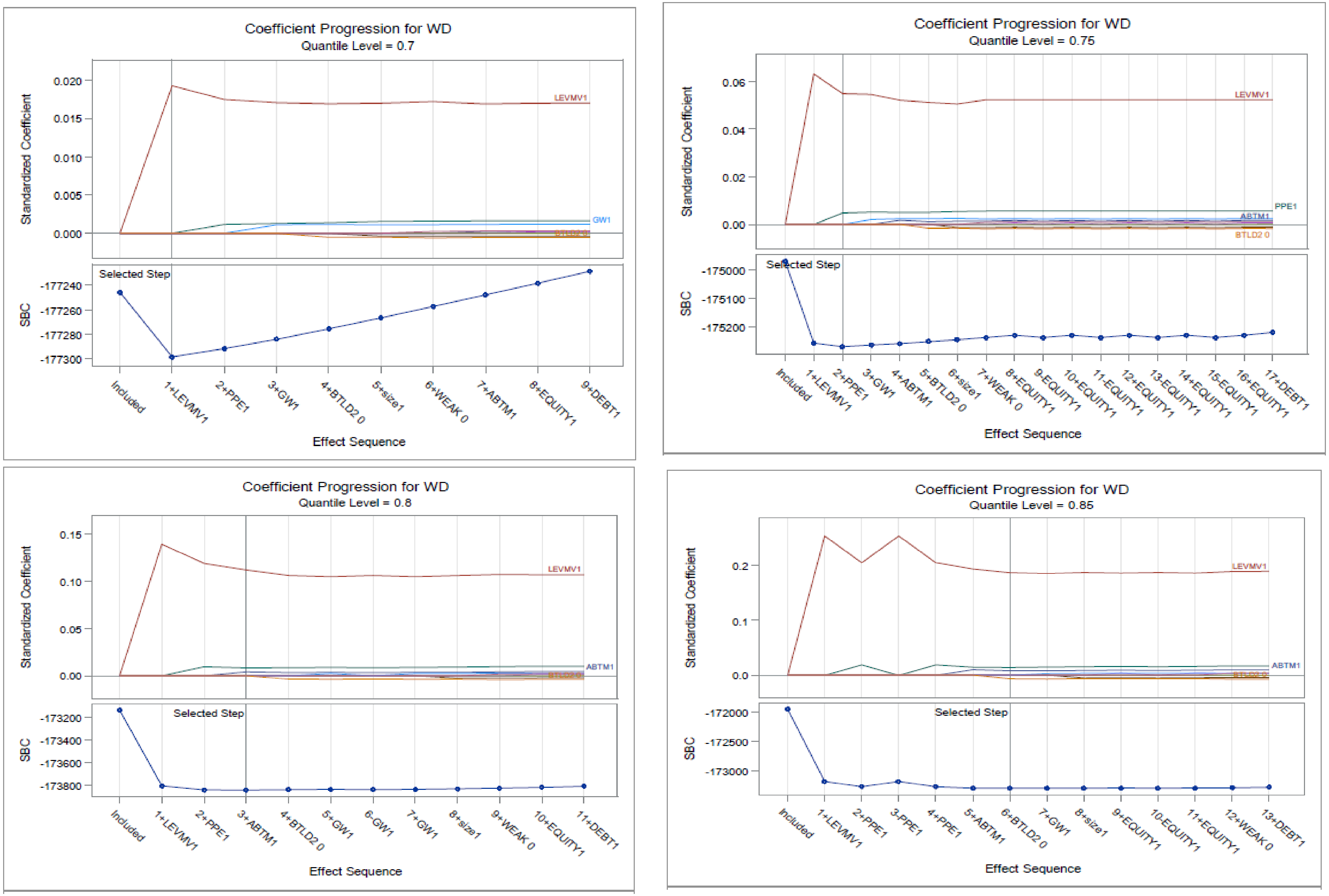
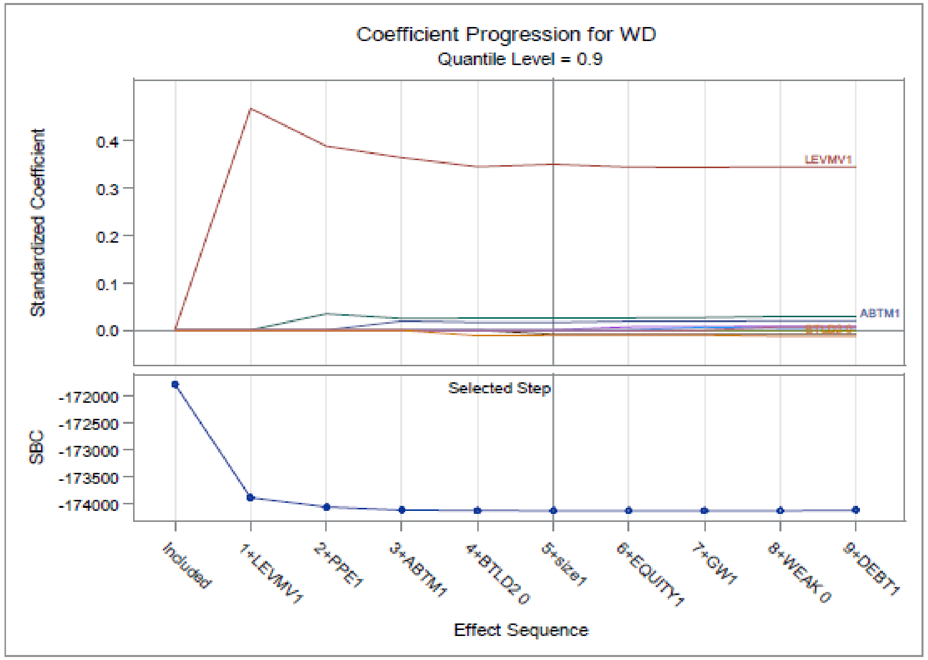
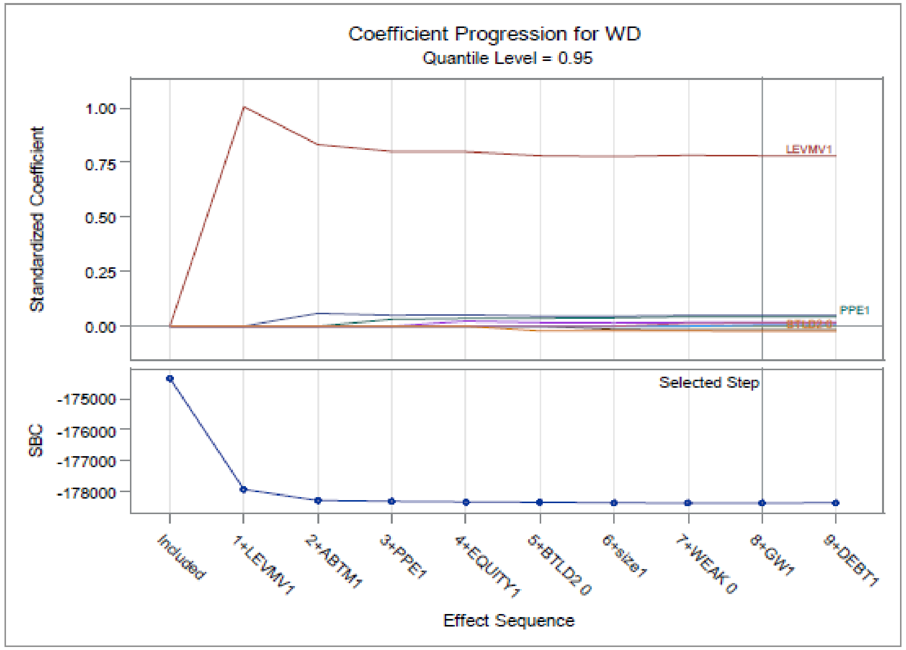
[12] I also performed the tests for samples below the 70th quantile, but no variables are validated as effective at lower than the 70th quantiles.

Figure 3


Coefficient Progression for WD
Quantile Level = 0.7
Standardized Coefficient
0.020
0.015
0.010
0.005
0.000
LEVMV1
GW1
Selected Step
SBC
-177240
-177260
-177280
-177300
Included
1+LEVMV1
2+PPE1
3+GW1
4+BTLD2 0
5+size1
6+WEAK 0
7+ABTM1
8+EQUITY1
9+DEBT1
Effect Sequence
Coefficient Progression for WD
Quantile Level = 0.75
Standardized Coefficient
0.06
0.04
0.02
0.00
LEVMV1
PPE1
ABTM1
BTLD2 0
Selected Step
SBC
-175000
-175100
-175200
Included
1+LEVMV1
2+PPE1
3+GW1
4+ABTM1
5+BTLD2 0
6+size1
7+WEAK 0
8+EQUITY1
9-EQUITY1
10+EQUITY1
11-EQUITY1
12+EQUITY1
13-EQUITY1
14+EQUITY1
15-EQUITY1
16+EQUITY1
17+DEBT1
Effect Sequence
Coefficient Progression for WD
Quantile Level = 0.8
Standardized Coefficient
0.15
0.10
0.05
0.00
LEVMV1
ABTM1
Selected Step
SBC
-173200
-173400
-173600
-173800
Included
1+LEVMV1
2+PPE1
3+ABTM1
4+BTLD2 0
5+GW1
6-GW1
7+GW1
8+size1
9+WEAK 0
10+EQUITY1
11+DEBT1
Effect Sequence
Coefficient Progression for WD
Quantile Level = 0.85
Standardized Coefficient
0.2
0.1
0.0
LEVMV1
ABTM1
Selected Step
SBC
-172000
-172500
-173000
Included
1+LEVMV1
2+PPE1
3-PPE1
4+PPE1
5+ABTM1
6+BTLD2 0
7+GW1
8+size1
9+EQUITY1
10-EQUITY1
11+EQUITY1
12+WEAK 0
13+DEBT1
Effect Sequence





Notes:

The upper plots show how the model at a specific quantile evolves through the selection process. I performed QR-LASSO at the 70th, 75th, 80th, 85th, 90th, and 95th quantile, respectively. The vertical axis reveals the fit statistics of the variables and assesses the relative importance of the effects selected at any step of the selection process. The horizontal axis provides information as to when effects of the selected variables enter the model. The lower plot in the panel shows the stopping criterion used to choose the model and how it changes as variables enter or leave the model. The vertical gray line connecting the upper plot and the lower plot indicates the maximum number of steps, which when reached, denotes the termination of the selection process. I used the Adaptive LASSO as the shrinkage method in the selection process. The horizontal axis represents maximum permissible values of the weighted $L1$ norm. Each colored line represents the value taken by a different variable.

WD : asset write-downs measured at the end of fiscal year t /market capitalization measured at the end of fiscal year t−1. $ABTM1$: total assets / the sum of market capitalization and total assets minus common equity, both measured at the end of fiscal year t−1. $SIZE1$: the natural logarithm of market value at the end of fiscal year t−1. $GW1$: book value of goodwill deflated by total assets, both measured at the end of fiscal year t−1. $LEVMV1$: book value of total liabilities deflated by market value of common equity at the end of fiscal year t−1. $WEAK$: a dummy variable, that takes a value of 1 if $LROA_t$ is below 5% and 0 otherwise. $LROA_t$: lag indicator for ROA, computed as the average value of ROA_{t-1} and ROA_{t-2}. $PPE1$: proportion of property, plant and equipment assets to total assets, measured at the end of year t−1. $BTMD2$: a dummy variable which takes a value of 1 if $ABTM_{t-2}$ is higher than 1 and 0 otherwise. $DEBT1$: proceeds from the issuance of bonds in year t−1 deflated by market capitalization of common equity at the end of year t−1. .$EQUITY1$: proceeds from the issuance of common stock in year t−1 deflated by market capitalization of common equity at the end of year t−1.

SBC = n log(SSE/n) + $p\ log(n)$, where n denotes the number of observations and p denotes the number of parameters including the intercept. SSE is the error sum of squares.

First of all, the financial leverage ($LEVMV$) is the first variable to become active in the effect selection process at all quantiles tested. It can be intuitively observed from all plots that leverage ($LEVMV$), rather than the beginning-of-period ASSET-BTM ($ABTM$), is the dominant impetuses for asset write-downs.

As the amount of shrinkage decreases from left to right on the horizontal axis, the model complexity increases. More predictor variables are retained to explain the extreme asset write-downs. However, the selected effects enter/leave the model in different sequences at different quantiles. Particularly, as indicated in Table 5 Panel B, the beginning-of-period ASSET-BTM exceeds the value of 1 around the 80th quantile from where $ABTM$ begins to show statistically significant effects.

With SBC being the stopping criteria, the lower the SBC value, the more the model fits the given data. Hence, the effect selection process stops when dropping or adding any effect increases the SBC statistic. Cumulatively, the variable that denote impact from intangible assets (GW), debt issuance ($DEBT$), and sale of common stock ($EQUITY$) show almost no contribution to asset write-downs.

5.3.2 Test of nonlinearity by Quantile Regression

In this section, I employ the Quantile Regression (QR hereafter) (Koenker and Bassett [1978]) to identify nonlinearity in the relationship between beginning-of-period ASSET-BTM and asset write-downs. QR estimates conditional quantiles of variables for a probability distribution. Application of QR also paints a broader picture of how asset write-downs interact with the selected variables along lower or upper boundaries.

In Table 5, Panel A reports slope estimates produced by OLS with beginning-of-period ASSET-BTM ($ABTM$) being the only predictor variable as suggested in LSS. Panel B reports the QR solutions (β_{τ}^{*}) when beginning-of-period ASSET-BTM ($ABTM_{t-1}$) is the only predictor for write-downs. Panel C reports QR solutions estimated by models selected by the QR-LASSO. For brevity, only slope coefficients ($\beta_{i,\tau}$) estimated at the 70th, 75th, 80th, 85th, 90th, and 95th quantiles are reported. $Plot$ indicates the plot number corresponding to that quantile. Quantile standard errors are bootstrapped, using 100 replications. WD_{mean} denotes the mean value for the current period asset write-downs, while WD_{τ} denotes the value of the current period asset write-downs at the τth quantile. Similarly, $ABTM_{mean}$ ($ABTM_{median}$) and $Group_{mean}$ ($Group_{median}$) denote the mean value (the median value) of the beginning-of-period ASSET-BTM and the number of subgroup specified in the research design (Step 1), respectively.

TABLE 5

Panel A: Slope estimates produced by OLS								
	Plot	β_{ABTM}	intercept	WD_{mean}	$ABTM_{mean}$	$ABTM_{median}$	$Group_{mean}$	$Group_{median}$
OLS	Fit a/1	0.0173***	−0.001***	0.0081	1.0305	1.0160	6	6

Panel B: Slope estimates produced by QR

$Q_{WD}(\tau|ABTM_{t-1}) = \beta^{*}_{ABTM,\tau}ABTM_{t-1} + \varepsilon_{\tau}$ $\tau \in (0,100)$ 1*

τ	Plot	$\beta^{*}_{ABTM,\tau}$.	intercept	WD_{τ}	$ABTM_{mean}$	$ABTM_{median}$	$Group_{mean}$	$Group_{median}$
70th	—	0.0019***	−0.1179***	0	0.80	0.80	4.52	5
75th	Fit b	0.0097***	−0.1019***	0.0008	0.97	0.95	5.32	5
80th	Fit c	0.0216***	−0.0759***	0.0023	1.03	1.03	5.57	6
85th	Fit d	0.0433***	−0.0269***	0.0051	1.07	1.03	5.73	6
90th	Fit e	0.0813***	0.0647***	0.0107	1.11	1.06	5.93	6
95th	Fit f	0.1870***	0.3329***	0.0281	1.19	1.12	6.25	6

Panel C: Slope estimates for models selected by QR-LASSO

$Q_{WD}(\tau|X_i) = \sum_i \beta_{i,\tau} X_i + \varepsilon_{i,\tau}$ $\tau \in (0,100)$ 1

τ	Plot	$\beta_{LEVMV,\tau}$	$\beta_{PPE,\tau}$	$\beta_{ABTM,\tau}$	$\beta_{BTLD,\tau}$	$\beta_{SIZE,\tau}$	$\beta_{WEAK,\tau}$	$\beta_{EQUITY,\tau}$	$\beta_{GW,\tau}$	intercept
70th	Fit 2	0.02***								−0.11***
75th	Fit 3	0.05***	0.0048***							−0.09***
80th	Fit 4	0.11***	0.0082***	0.004***						−0.06***
85th	Fit 5	0.19***	0.0142***	0.008***	0.0064***					−0.003***
90th	Fit 6	0.35 ***	0.0255***	0.016***	0.0107***	−0.009***				0.103***
95th	Fit 7	0.77 ***	0.0441***	0.047***	0.0274***	−0.016***	−0.013***	0.078*	0.006**	0.383***

Notes:

Panel B reports numerical slope estimates for each variable involved. I performed QR test at the 70th, 75th, 80th, 85th, 90th, and 95th quantile, respectively. X denotes a set of independent variables characterized as predictors of conservatism. $\beta^{*}_{ABTM,\tau}$: coefficients on $ABTM_{t-1}$ at the τth quantile when $ABTM_{t-1}$ is the only predictor in the model. $\beta_{ABTM,\tau}$: coefficient on $ABTM_{t-1}$ at the τth quantile. $ABTM_{t-1}$: the total assets / market capitalization + total assets − common equity, both measured at the end of fiscal year t−1. $\beta_{SIZE,\tau}$: coefficients on $SIZE_{t-1}$ at the τth quantile. $SIZE_{t-1}$: the natural logarithm of market value at the end of fiscal year t−1. $\beta_{GW,\tau}$: coefficients on GW_{t-1} at the τth quantile. GW_{t-1}: book value of goodwill deflated by total assets, both measured at the end of fiscal year t−1. $\beta_{LEVMV,\tau}$: coefficients on $LEVMV_{t-1}$ at the τth quantile. $LEVMV_{t-1}$: book value of total liabilities deflated by market value of common equity at the end of fiscal year t−1. $\beta_{PPE,\tau}$: coefficients on PPE_{t-1} at the τth quantile. PPE_{t-1}: the proportion of property, plant and equipment assets to total assets, measured at the end of year t−1. $\beta_{WEAK,\tau}$: coefficients on $WEAK_{t}$ at the τth quantile. $WEAK_{t}$: a dummy variable, that takes a value of 1 if $LROA_{t}$ is below 5% and 0 otherwise. $LROA_{t}$: lag indicator for ROA, computed as the average value of ROA_{t-1} and ROA_{t-2}. $\beta_{EQUITY,\tau}$: coefficients on $EQUITY_{t-1}$ at the τth quantile. $EQUITY_{t-1}$: sale of common stock deflated by market capitalization, both measured at the end of year t−1. $\beta_{BTLD,\tau}$: coefficients on $BTLD_{t-2}$ at the τth quantile. $BTMD_{t-2}$: a dummy variable which takes a value of 1 if $ABTM_{t-2}$ is higher than 1 and 0 otherwise. WD_{mean}: the mean value for the current period asset write-downs. WD_{τ} : the value of the current period asset write-downs at the τth quantile. $ABTM_{mean}$ ($ABTM_{median}$): the mean value (the median value) of the beginning-of-period ASSET-BTM. $Group_{mean}$ ($Group_{median}$): the mean value (the median value) of the number of subgroup specified in the research design (Step 1). ***, **,* indicate significance at the two-tailed 1%, 5%, 10% confidence level, respectively.

In Panel C, it is noteworthy that the slope coefficient for leverage ($LEVMV$) strengthens incrementally as quantiles increase and outweighs that of beginning-of-period ASSET-BTM ($ABTM$) across all quantiles. Comparison of Panel B ($\beta^*_{ABTM,\tau}$) and Panel C ($\beta_{ABTM,\tau}$) reveals that the influence of beginning-of-period ASSET-BTM markedly decreases along the quantiles tested after specific variables are controlled. For instance, slope coefficients estimated at the 95th quantile plunge from 0.1870*** ($\beta^*_{ABTM,95}$) to 0.047*** ($\beta_{ABTM,95}$). However, effects from the beginning-of-period ASSET-BTM ($ABTM$) do intensify for extreme asset write-downs, as coefficient on $ABTM$ at the 95th quantile ($\beta_{ABTM,95}$) is almost three-fold stronger than that for the 90th quantile ($\beta_{ABTM,90}$ = 0.016***). This is consistent with the prediction in this study that slope coefficients on $ABTM$ estimated at different quantiles do not increase proportionately with gradual growth in their corresponding quantiles. On the other hand, the beginning-of-period ASSET-BTM is not the leading driver for asset impairment even though it does stimulate great asset write-downs. For instance, beginning-of-period ASSET-BTM ($ABTM$) accounts for 1% and 4% of total asset write-downs at the 90th and 95th quantiles, respectively. However, market value leverage ($LEVMV$) accounts for about 35% and 77% of total asset write-downs at the same quantiles.

To summarize, results of QR test suggest that effects from the beginning-of-period ASSET-BTM ($ABTM$) and accumulated accounting slack ($BTLD$) hold positive on asset write-downs, which agree with the results in LSS that GAAP motivates management against arbitrary accounting choices. However, the weak performance ($WEAK$), another variable which is supposed to control for the non-discretionary component in conservatism, shows a countervailing effect on asset write-downs. Furthermore, though beginning-of-period ASSET-BTM accounts for a portion of extreme asset write-downs, it is not the predominant driver of accounting conservatism. This may lead us to conclude that high quality reporting is unlikely to be secured by accounting standards alone, however strictly enforced.

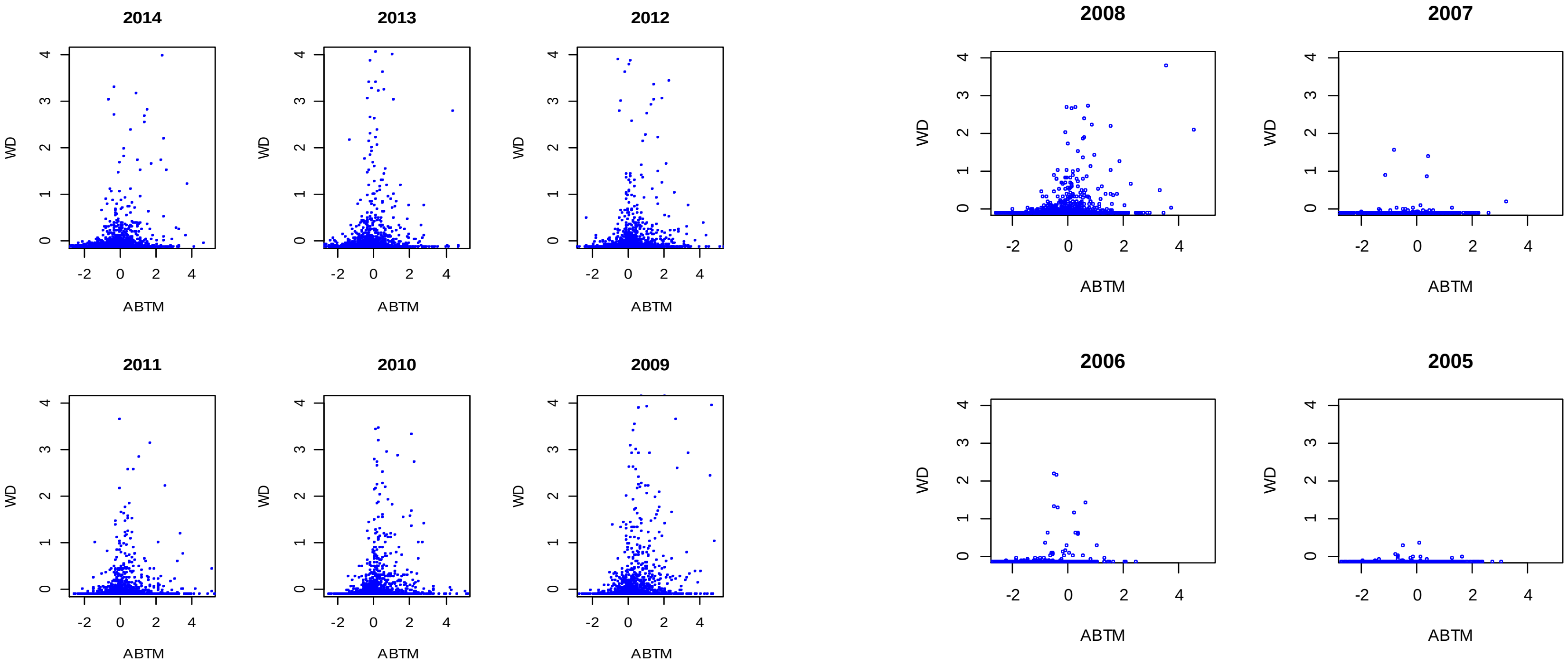
Nevertheless, factors that affect actual asset write-downs are not limited to those proposed in this study. Furthermore, I did not take interaction terms into consideration. Future analyses should explore more variables and employ a better-fitting analytical model.

5.3.3 Effects of the financial crisis

This study investigates the magnitude of discretionary asset write-downs for a random sample of Japanese listed companies. However, it is undeniable that a volatile global stock market and the prospect of recession would affect the management's accounting decisions. This section explores the effects from the financial crisis and the subsequent economic malaise.

Figure 4 demonstrate scatter plots of $ABTM$ and WD for each sample accounting period (2005~2014). As can be inferred from Figure 4, management did not act promptly according to the accounting standards for asset impairment when it came into effect at the end fiscal year of 2005. However, the shape of the scatter plots for fiscal years 2008 —2014 is in line with that displayed in Figure 1. The historical economic downturn, in a sense, improved compliance with established standards. Nonetheless, whether the accounting practice has been performed as required is open to discussion.

Figure 4



Notes:

Figure 4 demonstrates the correlation between current-period write-downs (WD) and beginning-of-period ASSET-BTM (ABTM). WD : asset write-downs measured at the end of fiscal year t /market capitalization measured at the end of fiscal year t−1. $ABTM$: total assets / market capitalization + total assets - common equity, both measured at the end of fiscal year t−1.

5.4 Test for non-discretionary conservatism

5.4.1 Measuring conditional conservatism based on Basu model

In this section, I use four alternative measures to more precisely determine the level of conditional conservatism in each group. If non-discretionary conservatism entails appropriate exertions of asset write-downs after ASSET-BTM exceeds one, as depicted in the study of LSS, all measures of Group 8 should be significantly higher than that of Group 6.

Basu [1997] is one of the seminal studies in the literature on accounting conservatism. The following model is the regression equation employed in the study of Basu [1997].

$$E_{i,t} = \alpha_0 + \alpha_1 DR_{i,t} + \beta_0 R_{i,t} + \beta_1 R_{i,t} * DR_{i,t} \qquad 2$$

Basu [1997] developed a measure of "asymmetric timeliness coefficient" by inversely regressing earnings on returns. E_t denotes the net income in fiscal year t deflated by market capitalization measured at the end of fiscal year t－1. R_t denotes the buy-and-hold return on common stock for the twelve months ending three months after the end of fiscal year t. DR_t is a dummy variable that equals 1 if R_t is negative and is 0 otherwise. In this regression equation, which is also known as the Basu model, the slope coefficient (β_1) represents the difference in sensitivity of earnings for bad news versus good news.

Measure C was proposed in Pae, Thornton, and Welker [2005], resorting to the Basu model. As with Pae, Thornton, and Welker [2005], I further divided the samples of each partition into good news and bad news sets. If the return at the end of fiscal year t was negative, it would be subsumed to the bad news set; and to the good news set otherwise. Then, all the necessary data will be substituted into Eq. 3 and Eq. 4 for each ASSET-BTM partition to calculate measure C — a metric that gauges the degree to which bad news is reported in earnings in a timelier manner than good news.

$$E_{j,t} = \alpha_j + \beta_j R_{j,t} + \varepsilon_{j,t} \qquad 3$$

$$c_j = \beta_j^{BD} - \beta_j^{GD} \qquad 4$$

The dependent variable E_t represents net income for fiscal year t deflated by the market capitalization at the end of fiscal year t－1. R_t, the explanatory variable, represents the buy-and-hold return on common stock for the twelve months ending three months after the end of fiscal year t, and ε_t is the residual. The coefficient β_j on

R_t denotes the measure of asymmetric timeliness (Basu coefficient), which is developed from the study of Basu [1997]. In the given samples, I estimate coefficient β_j for each subset. That is, β_j^{BD} denotes the timeliness with which bad news is reflected on firm j's income statement, and β_j^{GD} denotes the timeliness with which good news is reflected on firm j's income statement. Accordingly, the measure c_j represents the firm-specific degree of conditional conservatism. A higher measure C implies a stronger tendency toward conditional conservatism. The computing results for measure C are summarized in Table 7.

TABLE 7

Computing results of measure C

	interval	β_j^{BD}	β_j^{GD}	$c_j = \beta_j^{BD} - \beta_j^{GD}$
Group1	$ABTM_{t-1}$ <0.2	0.0261	−0.00005	0.0262
Group2	0.2≤ $ABTM_{t-1}$ <0.4	0.0291	−0.0027	0.0318
Group3	0.4≤ $ABTM_{t-1}$ <0.6	0.0498	0.0074	0.0424
Group4	0.6≤ $ABTM_{t-1}$ <0.8	0.0436	0.0149	0.0287
Group5	0.8≤ $ABTM_{t-1}$<1	0.0736	0.0125	0.0611
Group6	1≤ $ABTM_{t-1}$<1.2	0.2484	−0.0612	0.3096
Group7	1.2≤ $ABTM_{t-1}$<1.4	0.8146	−0.0438	0.8584
Group8	1.4≤ $ABTM_{t-1}$	0.3865	−0.4072	0.7937
mean		0.2090	−0.0600	0.2690
t-statistic				(2.4423**)
$ABTM_{t-1}$<1		0.0559	−0.0002	0.0561
$ABTM_{t-1}$ ≥1		0.4125	−0.2046	0.6171

Note:

The samples were separated into eight groups using an interval of 0.2. Then, the eight groups were arranged in an ascending order of beginning-of-period ASSET-BTM. I expected companies belonging to Group 1 would show the least need for asset write-downs, whereas companies belonging to Group 8 would show the opposite tendency. $ABTM_{t-1}$: total assets / the sum of market capitalization and total assets minus common equity, both measured at the end of fiscal year t−1. .E_t represents net income for fiscal year t deflated by market capitalization at the end of fiscal year t−1. β_j^{BD}: the degree with which bad news is reported in earnings for group j. β_j^{GD}: the degree with which good news is reported in earnings for group j. c_j: the degree by which bad news is reported in earnings in a timelier manner than good news. ***, **,* indicate significance at the two-tailed 1%, 5%, 10% confidence level, respectively

In general, the difference between β_j^{BD} and β_j^{GD} is 0.2690, with a significant t-statistic of 2.4423 (5% two-tailed). The measure C for Group 6 is 0.3096, which is extreme, much higher than that of Group 4 (0.0287) and Group 5 (0.0611). This is in line with hypothesis 1 and LSS, that there exists a substantial leap in asset write-downs around region of having a beginning-of-period ASSET-BTM of one. Similarly, measure C for Group 6 is 0.3096, which comprises only about 36% of that found for group 7 (0.8584). However, measure C for Group 8 drops back to 0.7937. Group 8 contains all samples with beginning-of-period ASSET-BTMs greater than 1.4, which is considered to be the group that confronting the most imminent need for asset impairment. The remarkable decline in measure C for Group 8 strongly suggests that non-discretionary conservatism was overridden by the demand for managerial discretion. In other words, the results of this test invalidate hypothesis 2 and broadly support the prediction in this study that non-discretionary conservatism does not acquire the same competence in Japanese listed companies as it does in American listed companies.

To check the robustness of the results of hypothesis 2, I perform an additional analysis by applying C_SCORE (e.g., Khan and Watts [2009]).

Khan and Watts [2009] incorporated three firm-specific characteristics into the Basu model to estimate an annual across-sectional Basu coefficient. These are firm size ($SIZE$), marker-to-book ratio (MTB), and market value leverage ($LEVMV$). G_SCORE in Eq. 5 denotes the timeliness of good news being reflected on income statements, and C_SCORE in Eq. 6 denotes the incremental timeliness of bad news being reflected on income statements. However, Eq. 5 and Eq. 6 are not regression models. Instead, Khan and Watts [2009] substituted them into the Basu model to estimate parameters μ_i and γ_i (i=1~4). Then, μ_i and γ_i (i=1~4) were in turn substituted into Eq. 5 and Eq. 6 as empirical estimators to compute annual G_SCORE and C_SCORE for each firm/year sample. T_SCORE is thus the sum of G_SCORE and C_SCORE, which measures the degree of conditional conservatism.

Unlike Khan and Watts [2009][13], I employed pooling data to verify the robustness of findings. The model applied in this study is outlined below, where $SIZE_t$ represents the natural log of market capitalization; MTB_t represents the ratio of market capitalization to the book value of common equity at the end of the year t. $LEVMV_t$ represents leverage which is calculated as book value of total liabilities deflated by the market capitalization. In this study, E_t, the dependent variable in Eq. 7, denotes the net income in fiscal year t deflated by market capitalization measured at the end of fiscal year t－1. R_t is the buy-and-hold return on common stock for the twelve months ending three months after the end of fiscal year t. As with Basu [1997], DR_t is a dummy variable that equals 1 if R_t is negative and is 0 otherwise.

[13] Khan and Watts [2009] estimated the regressions annually to allow the coefficients to vary annually, and report the mean coefficients over an analysis period of 43 fiscal years.

$$G\_SCORE = \beta_3 = \widehat{\mu_1} + \widehat{\mu_2} SIZE_{i,t} + \widehat{\mu_3} MTB_{i,t} + \widehat{\mu_4} LEVMV_{i,t} \quad 5$$

$$C\_SCORE = \beta_4 = \widehat{\gamma_1} + \widehat{\gamma_2} SIZE_{i,t} + \widehat{\gamma_3} MTB_{i,t} + \widehat{\gamma_4} LEVMV_{i,t} \quad 6$$

$$E_{i,t} = \beta_1 + \beta_2 DR_{i,t} + R_{i,t}(\mu_1 + \mu_2 SIZE_{i,t} + \mu_3 MTB_{i,t} + \mu_4 LEVMV_{i,t}) + DR_{i,t} R_{i,t}(\gamma_1 + \gamma_2 SIZE_{i,t} + \gamma_3 MTB_{i,t} + \gamma_4 LEVMV_{i,t}) + (\delta_1 SIZE_{i,t} + \delta_2 MTB_{i,t} + \delta_3 LEVMV_{i,t} + \delta_4 DR_{i,t} SIZE_{i,t} + \delta_5 DR_{i,t} MTB_{i,t} + \delta_6 DR_{i,t} LEVMV_{i,t}) + \varepsilon_i \quad 7$$

Table 8 reports the regression results for the estimation of Eq. 7. As with prior studies (e.g., Basu [1997], Khan and Watts [2009]), coefficients on bad news companies are all statistically significant. The coefficient on $DR_t * R_t$ (0.8266***) indicates that earnings are generally conservatively processed. Khan and Watts [2009] argued that companies holding greater market values are usually either willing or obliged to provide more internal information to reduce information asymmetries. As a result, larger companies are considered to have lower demands for conservatism. Therefore, the expected sign for $(DR_t * R_t * SIZE_t)$ is negative and the result (−0.0828***) of this study is consistent with that of Khan and Watts [2009]. They also predicted a positive coefficient for $DR_t * R_t * MTB_t$ $(DR_t * R_t * LEVMV_t)$, implying that companies with more growth options (higher leverage) are more in favor of conservative accounting choices. The results of this study (0.0042 and 0.0772***) are identical with their predictions.

Table 11 reports the results for the sum of C_SCORE and G_SCORE (T_SCORE hereafter). Though they do not completely correlate with the rank of ASSET-BTM, Groups 6, 7, and 8 prominently lead in T_SCORE, which is consistent with hypothesis 1. However, when comparing these three groups one by one, their T_SCORE ranking takes up exact the opposite order of that of ASSET-BTM. Group 6 has the highest T_SCORE of 0.2528. This clearly justifies the prediction that non-discretionary conservatism is less directly evident in Japanese listed companies.

TABLE 8

Regression results of Eq. 7

	Exp. sign	pooled data	Khan and Watts[2009]
β_1(intercept)		−0.0106	0.083***
$\beta_2(DR)$		0.0341	−0.024***
$\mu_1(R)$	+	0.0368	0.031
$\mu_2(R * SIZE)$	+	−0.0045	0.005**
$\mu_3(R * MTB)$	−	−0.0002	−0.006**

$\mu_4(R * LEVMV)$	−	−0.0098***	0.005
$\gamma_1(DR * R)$	+	0.8266***	0.237***
$\gamma_2(DR * R * SIZE)$	−	−0.0828***	−0.033***
$\gamma_3(DR * R * MTB)$	+	0.0042	−0.007
$\gamma_4(DR * R * LEVMV)$	+	0.0772***	0.033
N		17152	115516
$Adj.R^2$		0.0394	0.24

Note:

N denotes the number of observations in each ASSET-BTM group. E_t denotes the net income in fiscal year t, deflated by market capitalization at the end of fiscal year t−1. R_t is the buy-and-hold return on common stock for the twelve months ending three months after the end of fiscal year t. DR_t is a dummy variable that equals one if R is negative and is zero otherwise. $SIZE_t$ represents the natural log of market capitalization. MTB_t represents market capitalization to book value of common equity at the end of fiscal year t. $LEVMV_{i,t}$ represents leverage, which is calculated as book value of total liabilities deflated by market capitalization at the end of fiscal year t. ***, **,* indicate significance at the two-tailed 1%, 5%, 10% confidence level, respectively.

5.4.2 Measuring conditional conservatism based on Accruals

Considerable controversy remains as to whether the Basu model yields reliable estimations for conditional conservatism in applying the reverse earnings-on-returns regression. To reduce the noise, I employed the accrual-based regression model proposed in Ball and Shivakumar [2006].

Accruals are required to best reflect the economic effects of changes in expected future cash flows before actual cash flows occur (the gain and loss recognition role of accruals). Examples of loss accruals are accounts receivable write-downs (i.e., decreases in expected future cash collections), inventory write-downs (i.e., decreases in expected future cash flows from the investment in inventory such as physical loss, damage, obsolescence, and declines in market value), decreases in values of trading securities and derivatives, provisions for litigation settlements, and asset impairment losses. Examples of gain accruals are increases in values of trading securities and derivatives.

In line with Basu [1997], Ball and Shivakumar [2006] argue that conservatism also induces asymmetry in the timeliness of gain and loss accrual recognition in which operating cash flows indicate the bad news and the good news. According to their framework, a decline in operating cash flows, more often than not, indicates a reduction in the asset's value (bad news). Hence, loss accruals should be captured in a timelier manner as conservatism requires management to reflect such value deterioration at the time the information arises. Empirical evidence agrees with their prediction that accruals are also asymmetric in the recognition of losses against gains. One of the limitations of the work of Ball and Shivakumar [2006] is that a rapidly growing company may have negative operating cash flows as it expands, whereas a contracting company may exhibit positive cash flows when spending falls at a faster rate than earnings. This dispels the explicit assumption that negative (positive) change in future expected cash flows is positively associated with decreases (increases) in current-period operating cash flows based on which they established the theory.

Ball and Shivakumar [2006] suggest three alternative models (i.e., COF model, Dechow and Dichev [2002] model [DD model],and Jones model) and three different measures (i.e., the level of cash flow, changes in the cash flow, and industry-adjusted cash flow) for asymmetrically timely recognition of gains and losses in different combinations to assess conditional conservatism.

In this study, I employed the Jones Model and the Modified Jones Model to examine the degree of conditional conservatism. Besides its higher explanatory power exhibited in the study by Ball and Shivakumar [2006], only the Jones model controls variations in periodical performance (working capital) that mitigate impact from accrual reversals. Second, it also explains the magnitude of investment in long-lived assets that filter out the effects of depreciation accruals. I don't apply the industry-adjusted measure in this study because all samples had already been divided into smaller groups and further disaggregation would possibly bias the test results for certain groups. Nonetheless, I also found support for H2 in other combinations including the modified Jones model and the COF modified Jones model. In addition to the dependent variable employed by Ball and Shivakumar [2006] ($\mathrm{ACC_t}$), I also applied other accrual measures to each model (i.e., non-operating accruals proposed by Givoly and Hayn [2000], total accruals proposed by Kothari, Leone, and Wasley [2005][14], net income less cash flows from operations ($NI-COF$), and asset impairment losses. The results of those analyses are consistent with the prediction in this study (the results are not documented for brevity). Moreover, consistent with the findings in Ball and Shivakumar [2006], incorporating conditional conservatism into the Jones model appreciably increased the average $R-sq$ value from the non-linear accruals model relative to that based on the traditional linear model. Tables 9 and 10 report the regression results for Eqs. 8 and 9.

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[14] Kothari, Leone, and Wasley [2005] employed the following method to measure total accruals in year t.

$TACC_t = \Delta CA_t - \Delta Cash_t - (\Delta CL_t - \Delta STD_t) - Dep_t$

ΔCA_t : change in current assets

$\Delta Cash_t$: change in cash and cash equivalents

ΔCL_t : change in current liabilities

ΔSTD_t : change in current liabilities transformed from non-current liabilities

Dep_t : depreciation expenses

$$\mathrm{ACC_t} = \alpha_0 + \alpha_1 \Delta CF_t + \alpha_2 \Delta REV_{\mathrm{t}} + \alpha_3 GPPE + + \alpha_4 D\Delta CF_t + \alpha_5 D\Delta CF_{\mathrm{t}} * \Delta CF_{\mathrm{t}} + controls + \varepsilon_t \quad 8$$

$$\mathrm{ACC_t} = \alpha_0 + \alpha_1 \Delta CF_t + \alpha_2 (\Delta REV_{\mathrm{t}} - \Delta AR) + \alpha_3 GPPE + + \alpha_4 D\Delta CF_t + \alpha_5 D\Delta CF_{\mathrm{t}} * \Delta CF_{\mathrm{t}} + controls + \varepsilon_t \quad 9$$

$\mathrm{ACC_t}$ denotes total accruals in year t. It is computed as earnings before extraordinary items minus cash flow from operation. ΔCF_t denotes changes in cash flows from operations. $D\Delta CF_t$ is a dummy variable, taking the value of 1 if ΔCF_t is negative and 0 otherwise. ΔREV_t denotes changes in net sales in year t. $GPPE_{\mathrm{t}}$ denotes gross property, plant, and equipment. ΔAR denotes changes in accounts receivable and $controls$ includes all the interaction terms. The variables employed in Eqs. 8 and 9 are all deflated by average total assets in year t. As in Jones model, changes in sales control for non-discretionary accruals of current assets and liabilities, while property, plant and equipment control for the non-discretionary component of depreciation expenses. Again, as with Basu [1997], $D\Delta CF_{\mathrm{t}} * \Delta CF_{\mathrm{t}}$ measures the extent to which firms are conservative. Under conservative reporting, $D\Delta CF_{\mathrm{t}} * \Delta CF_{\mathrm{t}}$ is expected to be positive.

Table 11 reports the comparison of the computing results for the degree of conditional conservatism by each methodology. Columns ticked with boxes are the group with the highest value for that measure. Taken as a whole, groups with higher beginning-of-period ASSET-BTM possess a higher degree of conditional conservatism. However, none of those measures exhibit a monotonic rise in pace with the rise in ASSET-BTM, which confirms the prediction of this study regarding the features of non-discretionary conservatism peculiar to Japanese listed companies. These lines of evidence indicate that Japanese impairment accounting practices fit better to the curve shown in Panel B Figure 5.

It goes without saying that impairment accounting only constitutes one part of conditional conservatism. Since each measure captures conditional conservatism in its entirety, it is quite possible that impairment proceedings may have been performed properly in high-rank groups even if their values turn out to be lower. However, once impairment accounting procedures are conducted, a substantial amount of extraordinary loss would be recorded at the end of that fiscal year, accompanied by a rapid decrease in the underlying assets' (group's) book value. It seems evident that impairment accounting produces a great influence on accounting conservatism. In conclusion, the application of those measures, as in this study, is fully justified.

TABLE 9

Results of the Jones Model

$ACC_t = \alpha_0 + \alpha_1\Delta CF_t + \alpha_2\Delta REV_t + \alpha_3 GPPE + + \alpha_4 D\Delta CF_t + \alpha_5 D\Delta CF_t * \Delta CF_t + controls + \varepsilon_t$					8			
	Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8
$D\Delta CF_t$	0.0386	−0.005	0.0023	−0.0018	−0.0019	0.0021	−0.0012	0.0124**
ΔCF_t	−0.3544***	−0.5106***	−0.49***	−0.3464***	−0.2971***	−0.6122***	−0.505***	−0.2935***
$D\Delta CF_t * \Delta CF_t$	0.2181	0.0544	0.0924	−0.2416***	−0.4639***	0.2372***	−0.0251	−0.1673**
ΔREV_t	−0.0015	0.0737***	0.0424**	0.019***	0.0375***	0.0247***	0.088***	0.1363***
$GPPE_t$	0.0168	−0.0733	−0.0789	−0.0571***	−0.0681***	−0.1191***	−0.0596**	−0.0432
$intercept$	0.0077	0.0083	0.0051	−0.0094	−0.0069	0.0109***	−0.0106	−0.0201**
$R - sq$								
within	0.6546	0.871	0.5604	0.576	0.5371	0.5275	0.5381	0.5425
between	0.054	0.3649	0.2197	0.2929	0.5662	0.2798	0.2962	0.1404
overall	0.2092	0.5932	0.3246	0.4121	0.4925	0.391	0.403	0.3414
F	8.467	74.718	42.9994	121.1591	227.3128	247.0901	109.8803	107.988
$R - sq\ within^*$	0.5309	0.8142	0.4411	0.5601	0.4737	0.5041	0.5041	0.4664
$\hbar ausman$								
chi2(15)	37.04	36.67	105.08	49.33	97.02	214.57	46.94	321.47
Prob > chi2	0.0012	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$breusc\hbar\&\ pagan$								
chibar2(01)	8.90	53.07	112.35	158.83	317.83	344.12	81.79	47.07
Prob > chibar2	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note:

ACC_t denotes total accruals in year t. It is computed as earnings before extraordinary items minus cash flow from operation. ΔCF_t denotes changes in cash flows from operations. $D\Delta CF_t$ is a dummy variable, taking the value of 1 if ΔCF_t is negative and 0 otherwise. ΔREV_t denotes changes in net sales in year t. $GPPE_t$ denotes gross property, plant, and equipment. Variables are all deflated by average total assets in year t. $\hbar ausman$ indicates results for the Hausman test which differentiates between fixed effects model and random effects model in panel data. $breusc\hbar\&\ pagan$ indicates results for the Breusch–Pagan test which checks for the linear form of heteroscedasticity. Coefficients on interaction terms are omitted for brevity.

TABLE 10

Results of the Modified Jones Model

$ACC_t = \alpha_0 + \alpha_1 \Delta CF_t + \alpha_2 (\Delta REV_t - \Delta AR) + \alpha_3 GPPE + + \alpha_4 D\Delta CF_t + \alpha_5 D\Delta CF_t * \Delta CF_t + controls + \varepsilon_t$ 9

	Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8
$D\Delta CF_t$	0.1571***	−0.0439**	−0.003	−0.003	−0.0141***	−0.0063	−0.0166*	0.0221**
ΔCF_t	0.8644***	−0.4736***	−0.496***	−0.3222***	−0.2932***	−0.6216***	−0.6481***	−0.1337*
$D\Delta CF_t * \Delta CF_t$	−1.0754**	−0.157	−0.1452	−0.2979***	−0.6655***	0.2106***	0.1693	−0.2749**
$\Delta REV_t - \Delta AR$	−0.0346	0.0306	−0.0493*	0.0201***	0.0261***	0.0267***	0.0578***	0.0224
$GPPE_t$	−0.3301	−0.4324***	−0.0988*	−0.0428*	−0.0444***	−0.1004***	−0.0316	0.2219***
$intercept$	−0.0579	0.084***	0.0081	−0.0195**	−0.0131**	0.0045	−0.0199*	−0.1005***
$R - sq$								
within	0.4726	0.7746	0.4451	0.4382	0.4727	0.4471	0.4406	0.2982
between	0.1011	0.1314	0.1399	0.21	0.5211	0.2192	0.1948	0.0186
overall	0.1419	0.3104	0.2687	0.2965	0.4383	0.3275	0.2537	0.0801
F	4.0024	38.0233	27.0567	69.5762	175.6174	178.9539	74.2986	38.6954
$hausman$								
chi2(15)	72.43	69.70	117.40	26.26	80.39	116.97	91.11	89.39
Prob > chi2	0.0000	0.0000	0.0000	0.0354	0.0000	0.0000	0.0000	0.0000
$breusch \& pagan$								
chibar2(01)	0.00	22.73	69.87	141.93	256.98	288.73	41.40	32.53
Prob > chibar2	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Prob > F	0.1216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note:

ACC_t denotes total accruals in year t. It is computed as earnings before extraordinary items minus cash flow from operation. ΔCF_t denotes changes in cash flows from operations. $D\Delta CF_t$ is a dummy variable, taking the value of 1 if ΔCF_t is negative and 0 otherwise. ΔREV_t denotes changes in net sales in year t. $GPPE_t$ denotes gross property, plant, and equipment. Variables are all deflated by average total assets in year t. $hausman$ indicates results for the Hausman test which differentiates between fixed effects model and random effects model in panel data. $breusch \& pagan$ indicates results for the Breusch–Pagan test which checks for the linear form of heteroscedasticity. Coefficients on interaction terms are omitted for brevity.

TABLE 11

Comparison of measure for conditional conservatism

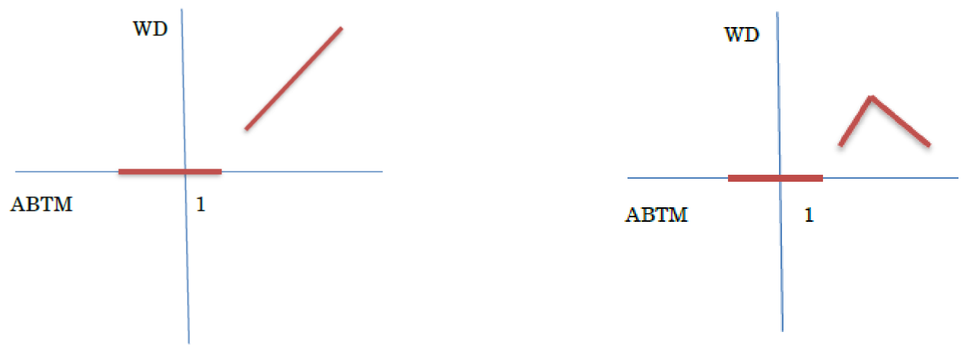
	c_j	T_SCORE	$D\Delta CF * \Delta CF$	
			Jones model	Modified Jones model
Group 1	0.0262	0.0098	0.2181	−0.748***[15]
Group 2	0.0318	−0.0601	0.0544	−0.157
Group 3	0.0424	−0.0824	0.0924	−0.1452
Group 4	0.0287	−0.0382	−0.2416***	−0.2979***
Group 5	0.0611	0.0860	−0.4639***	−0.6655***
Group 6	0.3096	$\boxed{0.2528}$	$\boxed{0.2372}$***	$\boxed{0.2106}$***
Group 7	$\boxed{0.8584}$	0.2069	−0.0251	0.1693
Group 8	0.7937	0.1828	−0.1673**	−0.2749**

Note:

The samples were separated into eight groups using an interval of 0.2. Then, the eight groups were arranged in an ascending order of beginning-of-period ASSET-BTM. I expected companies belonging to Group 1 would show the least need for asset write-downs, whereas companies belonging to Group 8 would show the opposite tendency. c_j: measure of conditional conservatism proposed in Pae, Thornton, and Welker [2005]. T_SCORE: the sum of C_SCORE and G_SCORE (measure of conditional conservatism proposed inKhan and Watts [2009]). $D\Delta CF_t * \Delta CF_t$: measure of conditional conservatism proposed in Ball and Shivakumar [2006].

Figure 5

Panel A: U.S. Panel B: JAPAN



Notes:

$ABTM$ denotes ASSET-BTM, which is computed as follows: total assets / the sum of market capitalization and total assets minus common equity, both measured at the end of fiscal year t−1. WD is asset write-downs, measured at the end of fiscal year t deflated by market capitalization measured at the end of fiscal year t−1.

[15] Result of Breusch and Pagan test for Group 1 suggests that the ordinary least squares analysis is preferred. Hence, I replaced the test result for Group 1 by fixed effect model (−1.0754**) with that produced by OLS (−0.748***).

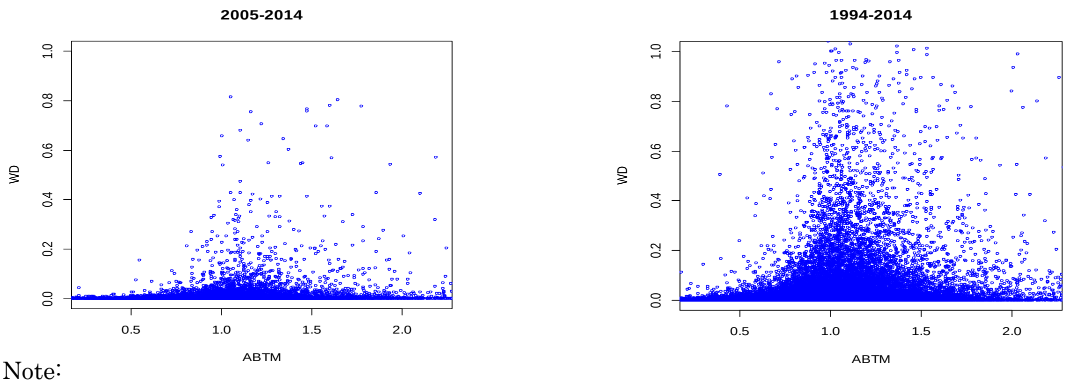
6 Discussion of the test results and Conclusions

6.1 Effects of the convergence of accounting standards

Academia was generally divided regarding how the mandatory adoption of IFRS affects the quality of earnings (e.g., Ahmed, Neel, and Wang [2013], Barth, Landsman, Lang, and Williams [2012]). Among them is Skinner [2008], which focused on the adoption of deferred tax accounting in 1998. He found that deferred tax assets are used as a tool of regulatory forbearance to give the major Japanese banks the appearance of financial health when in fact many were insolvent. Skinner [2008] attributed increases in deferred tax assets to the unique business environment in Japan and managers' overly optimistic estimations of future earnings. His findings also indicate that the application of GAAP-mandated accounting principles might submit to both political and regulatory incentives and firmly established conventionality (e.g., Garrod, Kosi, and Valentincic [2008], Iatridis [2012],and Salter, Kang, Gotti, and Doupnik [2013]).

In addition to my findings presented in Section 2, I further extended the analysis period back to fiscal year 1994. Because asset write-down data are separately available only from the year end of 2005, I substituted the extraordinary loss for impairment loss for the accounting period between 1994 and 2004.

Figure 6:



Note:

Figure 6 demonstrates the correlation between current-period write-downs (WD) and beginning-of-period ASSET-BTM (ABTM). WD : asset write-downs measured at the end of fiscal year t /market capitalization measured at the end of fiscal year t−1. $ABTM$: total assets / market capitalization + total assets - common equity, both measured at the end of fiscal year t−1.

Both charts demonstrate the correlation between WD_{t} (plotted on the vertical axis) and $ABTM_{\mathrm{t}-1}$ (plotted on the horizontal axis), using past performance figures of Japanese listed companies from fiscal year 2005 (1994) to 2014, respectively. While the data points are more clustered in the 1994-2014 analysis period, the tendencies observed in the areas of an $ABTM_{t-1}$ ratio higher than 1 are identical. This finding confirms the management's reluctance to record extraordinary losses in Japanese listed companies. If changing the accounting rules is not sufficient to alter customary financial reporting practice, then the adoption of commonly agreed-upon accounting principles around the world might, on all accounts, fail to bring into being a standardized financial reporting system with the same level of reliability.

6.2 Sources of variations in accounting conservatism between Japan and the U.S.

I predict that the differences in accounting standards and/or contractual incentives lead to the discrepancy existing in the practice of asset impairment accounting. I found some support for the opportunistic reporting hypothesis. For instance, firm size ($SIZE$) and weak performance ($WEAK$), which are both supposed to control for the non-discretionary component in conservatism, show countervailing effects in domains with extremely high ASSET-BTM. This result reasonably justifies the opportunistic reporting hypothesis that the effect generated by non-discretionary conservatism may have been nullified; otherwise, actual asset write-downs might have been higher than reported in Japanese listed companies. However, the impact of these two factors is, though statistically significant, limited. Furthermore, significantly negative predictors for middle level asset write-downs (i.e., the 70^{th}－85^{th} quantiles) are indistinct. One of the alternative explanations for this is the unquantifiable differences that exist in accounting practice.

Under GAAP in the United States, impairment tests for assets held for use differ from those held for sale.[16] Japan accounting standards, in contrast, delineate no specific treatments for fixed assets held for sale in. Even so, changes in the stated reason for holding fixed asset can be considered indications of impairment; therefore, Japanese accountants are subjecting more assets to impairment tests. Conceivably, the more assets assigned to an asset group, the more easily can estimation of the entire value of the group be adjusted. In other words, increases in target assets may abet managerial discretion under Japanese accounting standards.

Moreover, under Japanese impairment standards, when more than one business unit is acquired in a deal wherein goodwill is recognized, the book value of that goodwill is allocated pro-rata across business units. Also, the impairment test is performed on a larger unit including both the asset group and its related goodwill. If the amount recoverable from a business unit is below its carrying amount, impairment losses are allocated first to reduce book value of goodwill assigned to it. Any excess over book value

[16] Assets held for sale must be sold within one year from the date they are classified; hence, they are exempt from impairment tests. Furthermore, they are also reassessed at their book value or net fair value, whichever is lower. Hence, even such assets are subject to impairment tests, and the impact of such an experiment on LSS is negligible.

of goodwill is distributed pro-rata to the other assets based on their book value. In other words, goodwill is removed from the balance sheet ahead of physical assets. Consequently, higher proportions of goodwill potentially enable management to delay decisions to declare assets impaired.

Additionally, management can also signify its confidence in an asset's (group's) earnings potential by not impairing it, even if it shows signs of depreciation under current assumptions for goodwill amortization. The drawback is that the management can abuse the hypothesis of slowly accumulating internally-developed goodwill to inflate estimates of future cash flow. In other words, amortization of goodwill invites manipulation in recognizing impairments.

Japanese accounting standards tally impairment losses as the carrying amount of an asset (group) minus its recoverable value (the higher of net realizable value or value in use).[17] Since calculation of value in use involves management discretion (i.e., amount of future cash flow, discount rate, and useful life of the primary asset in an asset group), management can minimize impairment losses by adjusting its estimation. In other words, impairment losses recognized by Japanese listed companies can be much lower than those recognized in the United States, other conditions being equal.[18]

Taken as a whole, current accounting practices in Japan may have induced more discretion (although the cause for this change is not limited to these factors), which eventually induced a trend counter to the original prediction of LSS. However, some of the effects are empirically difficult to quantize using financial data.

6.3 Future research

To detect non-discretionary conservatism in impairment accounting as a characteristic of Japanese listed companies, I applied QR test, coupled with the QR-LASSO, to evaluate the impact of multiple factors on accounting choices for asset impairment. It provides more detailed insights which cannot be achieved by other ordinary methods prevailing in most previous research. However, the results of this study are only partly consistent with LSS's findings and substantiate my prediction

[17] Recoverable value = net realizable value or value in use , whichever is higher.
Net realizable value= Market Value − Sale-Related Expenses

$$\text{Value in use} = \sum_n \frac{\text{future cash flows}_n}{(\text{discount rate})^n}$$

where n represents the useful life of the primary asset in an asset group.

[18] Unlike USA accounting rules, the cash flow estimation period under Japanese GAAP is the primary asset's remaining useful life or 20 years, whichever is shorter. Japanese impairment standards do not exclude infinite-lived or non-depreciable assets (e.g., land) from candidates for the primary asset of an asset group. Hence, in general, the longer the period of estimated cash flow, the greater future cash in-flows will be. In regards to audit practice, the impact of this difference in estimation period is hard to determine.

that non-discretionary conservatism is insufficient in eliminating managerial discretion. The tests also show that asset write-downs are more sensitive to debt covenants than to beginning-of-period ASSET-BTM, which complements the argument presented in Roychowdhury and Martin [2013].

LSS argued that the unbiased application of accounting principles embodies non-discretionary conservatism. In addition, non-discretionary conservatism, when embarked upon, will invalidate discretionary conservatism and eventually affiliate efficient contracts stemming from information asymmetries. However, evidence found in this study runs counter to that found by LSS. The most prominent property I found in Japanese listed companies is that management might have studiously avoided certain asset write-downs even when the beginning-of-period ASSET-BTM suggests a dire need for impairment. As pointed out in prior studies, impairment accounting comprises certain amount of estimates and judgements. Other assets (i.e., goodwill and inventories) that are under the influence of such an accounting process are probably also subordinated to managerial discretion. Moreover, management is now empowered to capitalize development costs on the balance sheets, which will contribute to a growing precariousness of earnings in counties that adopt international financial reporting standards. In other words, the argument contained herein breeds new wariness of conditional conservatism and underlines the need to embrace unconditional conservatism to mitigate further volatility in reporting earnings under uncertain economic environments.

I found evidence for the presence of a buffer zone, which indicates managerial opportunism in the timing of asset write-downs. It is also possible that management postpones timely loss recognition out of proper judgements based on its exclusive understanding of the company, which Roychowdhury and Martin [2013] refers to as “normal conservatism”. However, neither LSS nor the method employed in this study manages to distinguish the normal component from the buffer zone. On the other hand, despite arduous attempts to accurately measure the degree of conservatism, especially conditional conservatism, no widely accepted metric exists that can properly reflect the degree of conservatism. Until such metric comes into being the development of further research on conservatism will suffer. I will work toward these causes while pursuing fundamental determinants and traits of conservatism in Japanese companies in my future research.

Appendix 1: Introduction to Quantile Regression (QR)

This appendix relates to the technical discussions on Quantile Regression (QR) tests in Section 5. Introduced by Koenker and Bassett [1978] as a location model, QR is a convenient statistical method for estimating conditional quantile functions. A significant feature of QR is that it can provide more accurate information about how each predictor drives the response variable at any quantile. In other words, OLS derives parameter estimates from the conditional mean of the response variable, whereas QR employs the conditional median or any other quantile of the response variable. A typical QR function can be expressed as follows:

$$Q_{Y|X}(\tau) = X\beta_\tau + \varepsilon_\tau \text{ [19]} \qquad 1.$$

where X denotes a design matrix of p predictors and ε_τ denotes the error term for the τth quantile.

For n independent observations, the τth quantile splits the observations into areas τ and 1−τ. QR estimates (β_τ) are determined by solving this optimization problem:

$$\beta_\tau = \min_{\beta_\tau} \frac{1}{n}\left\{\sum_{i:y_i \geq x_{i\beta}}^{n} \tau|y_i - x_i\,\beta_\tau| + \sum_{i:y_i < x_{i\beta}}^{n}(1-\tau)|y_i - x_i\,\beta_\tau|\right\}$$

$$= \min_{\beta_\tau} \sum_{i=1}^{n} \rho_\tau(y_i - x_i^T\,\beta_\tau) \text{ [20]} \qquad 2.$$

where $\rho_\tau(u) = u \cdot \{\tau - I(u < 0)\}$ is the tilted absolute function shown in Figure A,

[19] Suppose Y is a random variable following a cumulative distribution function $F(y) = P(Y \leq y)$. The τth quantile of Y is defined as follows:

$Q_Y(\tau) = F^{-1}(\tau) = \inf\{y \in R\,|F(y) \geq \tau\}$, where $\tau \in (0,1)$ 3.

[20] The conditional expectation loss function for QR is shown as follows:

$$L = E[\rho_\tau(Y - \hat{y})] = (\tau - 1)\int_{-\infty}^{\hat{y}}(y - \hat{y})dF(y) + \tau\int_{\hat{y}}^{\infty}(y - \hat{y})dF(y) \qquad 4.$$

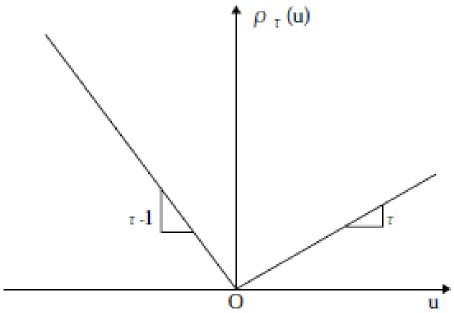
A specific quantile can be found for variable Y by setting the derivative of the expected loss function to 0.

$$\frac{\partial L}{\partial \hat{y}} = (1-\tau)\int_{-\infty}^{\hat{y}} dF(y) - \tau\int_{\hat{y}}^{\infty} dF(y) = 0$$

$$F(\hat{y}) = \tau \qquad 5.$$

and $I\,(u < 0)$ is the usual indicator function.[21] Thus far, quantile regression also can be viewed as the extension of LAD,[22] which minimizes a sum of asymmetrically weighted absolute residuals by giving asymmetric penalties $(1-\tau)|\varepsilon_i|$ for over-predicted observations and $\tau|\varepsilon_i|$ for under-predicted observations.

Figure A: Quantile Regression ρ Function



Note: $\rho_\tau(u) = u \cdot \{\tau - I(u < 0)\}$ is the tilted absolute function. τ denotes the τth quantile.

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21 $I\,(u < 0) = \begin{cases} I\,(u < 0) = 1 \; if\; u < 0 \\ I\,(u < 0) = 0 \; if\; u \geq 0 \end{cases}$ 6.

22 For n independent observations, each observation includes a response and a vector of p predictors. A linear regression function is defined as follows:

$$y_i = \beta_0 + \sum_{j=1}^{p} \beta_j x_{ij} + \varepsilon_i\,,\; i = 1,2,\ldots,n. \quad (\, E[\varepsilon_i] = 0\,, E[\varepsilon_i^2] = \sigma^2\,) \qquad 7.$$

ε_i denotes the error term for observation i, measuring the vertical distance between the ith observation (y_i, x_i) and the corresponding point on the regression line. OLS provides solutions that minimize the residual sum of squared errors (RSS).

$$\mathrm{RSS}\,(\beta) = \sum_{i=1}^{n} (y - \beta_0 - \sum_{j=1}^{p} \beta_j x_{ij})^2 = \sum_{i=1}^{n} {\varepsilon_i}^2 \qquad 8.$$

For the OLS estimators to approximate the unknown parameters, values of ε_i must be both independent (exogeneity assumption) and identically distributed (homoscedasticity assumption). Hence, OLS may fail to offer optimal estimators (although still valid) when the homoscedasticity assumption is violated.

The least absolute deviations (LAD) is an alternative to OLS which minimizes the sum of absolute errors (SAE). Unlike RSS, SAE represents the sum of the absolute values of the vertical distance between points in the data set and the corresponding points on the regression line.

$$\mathrm{SAE}(\beta) = \sum_{i=1}^{n} \left| y - \beta_0 - \sum_{j=1}^{p} \beta_j x_{ij} \right| = \sum_{i=1}^{n} |\varepsilon_i| \qquad 9.$$

The symmetry of the piecewise linear absolute loss function implies that minimizing the sum of squared residuals is equivalent to minimizing the median of the absolute residuals. Note that the median is also the 50th quantile. Therefore, we might also define other quantiles as solutions to an optimization problem by imposing an asymmetric penalty on the absolute residuals as quantiles differ from median.

Appendix 2: Introduction to Least Absolute Shrinkage Selection Operator (LASSO)

This appendix relates to the technical discussion on Least Absolute Shrinkage Selection Operator (LASSO) and the adaptive LASSO in Section 5. Developed by Tibshirani [1996] and Belloni and Chernozhukov [2011], LASSO is a shrinkage method that imposes an $L1$ norm penalty on parameters of an objective function. Shrinkage methods are a kind of continuous subset selection by adding constraints on the value of coefficients. It minimizes the sum of squared errors, subject to the constraint that the sum of absolute values of coefficients ($L1$ norm of the parameter vector) is less than a constant. This constraint removes less important parameters from the model by reducing their coefficients to 0, thereby generating a more sophisticated function. The rationale of shrinkage methods is to trade some unbiasedness for lower variance to improve overall prediction accuracy and to retain variables with impacts large enough to appear in the fitted model. LASSO is highly efficacious in selecting independent variables of greater importance and estimating regression parameters simultaneously. LASSO has been applied to archival research in economics and medicine but not financial accounting.

Consider a linear model for n independent observations, each of which includes a response (y_i) and a vector of p predictors ($x = (\mathrm{x}_1, x_2, \dots, x_p)^T$).

$$y_i = \beta_0 + \sum_{j=1}^{p} \beta_j x_{ij} + \varepsilon_i, \ i = 1,2,\dots,n. \qquad 7.$$

$\beta = (\beta_0, \beta_1, \dots, \beta_p)^T$ represents a vector of unknown regression coefficients, and ε_i indicates the error term for the ith observation. LASSO estimators are determined by solving the following optimization problem:

$$\min_\beta \{\sum_{i=1}^{n} (y - \beta_0 - \sum_{j=1}^{p} \beta_j x_{ij})^2 + \gamma \sum_{j=1}^{p} |\beta_j|\} \qquad 10.$$

$\gamma \sum_{j=1}^{p} |\beta_j|$ is the nonnegative penalty term, in which $\gamma \geq 0$ is a tuning parameter that controls the amount of shrinkage: the larger the value of γ, the greater the shrinkage. When γ =0, the estimator is equal to the OLS solution. As γ increases, more shrinkage is imposed on the regression coefficients and the coefficients are shrunk from OLS solution toward 0. Since the intercept β_0 was left out of a penalty term, predictor variables must be standardized in order to strike the intercept. However, the classical L1 norm penalty has been criticized for not being able to simultaneously achieve the oracle property, namely unbiasedness, sparsity and consistency (e.g., Fan and Li [2001]), as it equally penalizes coefficients. For example, large parameters can be overly penalized which induces unnecessary bias into the estimation, while small parameters be under-penalized at the cost of sparsity. Furthermore, the LASSO solutions tend to remove highly correlated variables altogether or select them all. When related variables are all included in the model, they enter the model with different signs.

The Adaptive LASSO is proposed by Zou [2006] as an extension of the LASSO to attenuate the aforementioned limitations. The Adaptive LASSO overcomes the selection bias in the standard LASSO by assigning a consistent weight to each variable. In other words, such weights can adjust the amount of penalty imposed on each parameter on the basis of their relative importance. The superiority of the Adaptive LASSO has been confirmed in various fields of study. The estimators regularized by the Adaptive LASSO are determined by solving the following optimization problem:

$$\min_{\beta}\left\{\sum_{i=1}^{n}(y - \beta_0 - \sum_{j=1}^{p}\beta_j x_{ij})^2 + \gamma\sum_{j=1}^{p} w_j \left|\beta_j\right|\right\} \tag{11.}$$

where weights are set to be $w_j = |\hat{\beta}_j|^{-\lambda}$ $(\lambda > 0)$.

On the other hand, neither LASSO or the Adaptive LASSO is robust to high-dimensional data set with error distribution (e.g., Li and Zhu [2008]). The Adaptive LASSO regularized quantile regression can be then viewed as a solution to alleviate the drawbacks of LASSO regularized conditional mean regressions. It performs effect selection in the framework of quantile regression. The rationale behind it is to penalize the coefficients at different quantiles by using adaptive weights (e.g., Wu and Liu [2009], Fan, Fan, and Barut [2014]). For a specific tuning parameter γ, the QR-LASSO finds the solution to the following optimization problem at the τth quantile:

$$\min_{\beta_\tau} \sum_{i=1}^{n}\rho_\tau(y_i - x_i^T\beta_\tau) + \gamma\sum_{j=1}^{p}\widetilde{w}_j\left|\beta_\tau\right| \tag{12.}$$

where weights are set to be $\widetilde{w}_j = |\hat{\beta}_\tau|^{-\lambda}$ $(\lambda > 0)$.

Appendix 3: Differences in the process of impairment recognition

Table A presents differences that are considered as important between US GAAP and Japan GAAP.

TABLE A

Differences considered as important

USA GAAP	JAPAN GAAP
Under USA GAAP, the impairment tests for assets to be held and used differ from those held for sale.	Japan impairment standards do not have such a separation for assets tested for impairment.
The impairment provisions of ASC 360-10 generally apply to long-lived assets other than goodwill or other intangible assets that are not being amortized. However, asset groups may include assets and liabilities outside the scope of ASC 360-10 (for example, goodwill — if certain conditions are met — and other non-amortizing intangible assets). In this case, the impairment loss will reduce the carrying amount of the long-lived assets of a group covered by ASC 360-10 on a pro-rata basis using the relative carrying amounts of those assets. Thus, in no circumstance will goodwill, indefinite-lived intangibles or other assets excluded from the scope of ASC 360-10 (or liabilities if part of an asset group) be affected by an impairment loss recognized under ASC 360-10, even if those assets or liabilities are included in the asset group being tested for recoverability.	Japanese impairment standards also apply to goodwill. Furthermore, when more than one business units is acquired in the deal where goodwill is recognized, the book value of that goodwill shall be allocated to those business units on a pro-rata basis, and the impairment test should be performed to a larger unit including both the asset group and its related goodwill. Finally, the amount of impairment loss increased by adding goodwill to an asset (group) should be allocated to goodwill first, and the excess amount over the book value of the goodwill will be allocated to the other assets on a pro-rata basis.
According to ASC 360-10, only long-lived tangible asset being depreciated (or identifiable intangible asset being amortized) can be the primary asset of an asset group, which means property such as lands, which do not have a valid period, cannot be a primary asset.	Japanese impairment standards for fixed assets do not exclude non-depreciable assets as asset candidates for the primary asset. Therefore, while the cash flow estimation period is based upon the primary asset's remaining useful life under USA GAAP, the cash flow estimation period under Japan GAAP is determined by

	either remaining useful life of the primary asset or 20 years, whichever is shorter.
When an asset (group) is deemed unrecoverable, ASC360-10 requires management to calculate impairment loss as the excess of the carrying amount of an asset (group) over its fair value.	Japan requires management to calculate it as the excess of the carrying amount of an asset (group) over its recoverable value (either net realizable value or value in use, whichever is higher[23]).

[23] Recoverable value = net realizable value or value in use , whichever is higher.
Net realizable value= Market Value − Sale-Related Expenses
Value in use = Σ_n (future cash flows$_n$/discount rate^n)
where n represents the useful life of the primary asset in an asset group

Appendix 4: Similarities in the process of impairment recognition

1. Both USA and Japan standards require management to group assets at the lowest level where there are identifiable cash flows that are largely independent of the cash flows of other assets (groups). Moreover, they both acknowledge that grouping assets involves a significant amount of judgement.

2. To assist management in determining when assets should be reviewed for impairment, both USA and Japan standards provide examples of events or changes in circumstances that indicate that impairment might exist. However, the list is not meant to be all-inclusive and management should be alert to potential impairment indicators unique to its business circumstances.

3. A fixed asset (group) is tested for recoverability only when indicators of impairment are present.

4. After an impairment loss is recognized, the adjusted carrying amount of the asset shall be its new accounting basis. Thus, future depreciation or amortization would be based on the asset's new cost basis.

5. Impairment loss is recognized if the undiscounted cash flows used in the test for recoverability are less than fixed assets' (group's) carrying amount

6. Companies may use their own assumptions in estimating future cash flows. Such estimations of future cash flows are used in both impairment tests and the measurement of impairment loss. ASC820 employ the same approaches to estimate fair value for long-lived assets as Japanese standards use to estimate use value for fixed assets (estimate future cash flows are adjusted to present value by a certain discounted rate).

7. Subsequent reversal of a previously recognized impairment loss is prohibited.

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