The Association between Earnings Quality and Firm-specific Return Volatility: Evidence from Japan

Abstract

This study investigates the cross-sectional association between earnings quality and firm-specific return volatility for a large sample of Japanese manufacturing firms for the period 2003-2012. Using idiosyncratic volatility estimated as the variance of residual from the market model and asynchronicity estimated as the inverse R^2 from the market model as two seemingly comparable proxies for firm-specific return volatility, I find contradictory results. This contradiction is related to another debate in accounting and finance literature about whether firm-specific return volatility captures firm-specific information or noise. Initially I obtain conflicting results because the systematic risk, one of the components of asynchronicity, is highly correlated with earnings quality. After controlling for the systematic risk, I find that higher earnings quality is associated with lower firm-specific return volatility. My finding is consistent with noise based explanation of firm-specific return volatility. I also disentangle earnings quality into innate component driven by economic fundamentals and discretionary component driven by managerial discretionary behavior. I find that both components have significant impact on firm-specific return volatility but innate component has significantly stronger effect than discretionary component.

Keywords: Earnings quality, Idiosyncratic volatility, Asynchronicity.

1. Introduction

The factors affecting firm-specific return volatility have stimulated considerable interest among financial economists and accountants in recent years since the publication of Campbell *et al.* (2001) paper exploring a surprising result that the aggregate firm-specific return volatility has increased noticeably while the aggregate market volatility remained basically unchanged through time in the U.S. stock market. Several studies explore the role of accounting fundamentals to explain this phenomenon and offer competing explanations such as firm fundamentals having become more volatile (Wei and Zhang, 2006), fundamental cash flow shocks due to product markets becoming more competitive (Irvine and Pontiff, 2009), earnings opacity (Hutton *et al.,* 2009), and deteriorating financial reporting quality (Rajgopal and Venkatachalam, 2011). This paper investigates the role of earnings quality in explaining cross-sectional differences in firm-specific return volatility for a sample of firms listed in Japanese stock markets. In particular, this study is motivated by Hutton *et al.* (2009) and Rajgopal and Venkatachalam (2011) findings that earnings opacity or poor earnings quality is strongly associated with firm-specific return volatility in the cross-section of U.S. stocks.

In Japanese stock markets, the behavior of aggregate firm-specific return volatility stands in sharp contrast to that of U.S. markets. Hamao *et al.* (2003) reports a dramatic fall in firm-level volatility immediately after market crash in the 1980s and an increase in market-wide volatility. They attribute this unusual structure of firm-specific return volatility to sharp increase in earnings homogeneity among Japanese firms post-crash period. The Japanese stock market has long been the second largest financial market in terms of market capitalization after U.S. markets (Chang *et al.*, 2010). Given the contrasting behavior of firm-specific return volatility in the U.S. and the Japanese markets, the evidence from Japan is expected to enhance the robustness and assess the external validity of the results found in the U.S. markets. While Chang and Dong (2006) investigate the role of firm-level earnings in explaining cross-sectional differences in idiosyncratic volatility using Japanese data, this paper relates the more specific notion of "earnings quality" to cross-sectional differences in firm-specific return volatility. Moreover, this study also helps identify underlying reasons for the rise or fall in market aggregate firm-specific return volatility. While the extant literature demonstrates a link between earnings quality and firm-specific return volatility, this study also investigates the relation between firm-specific return volatility and two distinct components (innate versus discretionary component) of earnings quality to shed light on which component of earnings quality drives the association between earnings quality and firm-specific return volatility.

Prior researches use two different proxies for firm-specific return volatility interchangeably: (1) idiosyncratic volatility, and (2) asynchronicity but make different assumptions about what they capture although theoretically both are intended to capture the same underlying construct. These assumptions are critical in developing testable hypotheses about the association between firm-specific return volatility and earnings quality. The existing literature offers two contradictory views on what firm-specific return volatility captures. One view claims that greater firm-specific return volatility implies more firm-specific information being impounded in stock prices (Information Hypothesis). Consistent with this assumption of firm-specific return volatility, Hutton *et al.* (2009) show that earnings opacity or poor earnings quality is associated with lower asynchronicity or higher R^2 (higher R^2 is treated as lower firm-specific return volatility). If firm-specific return volatility captures firm-specific information, I would observe a positive relation between firm-specific return volatility and earnings quality since high quality earnings represent transparent financial reporting and good information environment. The opposing view contends that higher volatility implies more pricing errors and noise (Noise Hypothesis). Consistent with this assumption of firm-specific return volatility, Rajgopal and Venkatachalam (2011) find that poor earnings quality is associated with higher idiosyncratic volatility (higher firm-specific return volatility). If firm-specific return volatility captures noise, I would expect a negative relation between firm-specific return volatility and earnings quality.

I use two different proxies for firm-specific return volatility: (1) idiosyncratic volatility based on variance of the residual from market model, and (2) asynchronicity or lack of synchronicity based on the coefficient of determination (R^2) from market model. Building on Li *et al.* (2014) argument, I posit that if firm-specific return volatility represents more firm-specific information, then it should be associated with proxies for better information environment. On the other hand, firm-specific return volatility should be associated with proxies for poor information environment if it reflects noise. I use bid-ask spread, Amihud (2002) illiquidity, liquidity risk, institutional ownership and zero return days as suitable surrogates for information environment, and find that both measures of firm-specific return volatility are correlated with higher bid-ask spreads, higher level of illiquidity and liquidity risk, lower institutional ownership, and more zero return day implying poor information environment. Therefore, I conclude that the evidence is more consistent with noise based explanation.

I also use two different proxies for earnings quality to test my hypotheses, both of which are inverse measures of earnings quality in that higher value implies lower quality: (1) accrual quality based on Dechow-Dichev (2002) model, and (2) absolute abnormal accruals based on Kasznik (1999) version of modified Jones (1991) model. Using both measures of earnings quality, I report mixed results initially. Consistent with prior literature, I find a negative relation between idiosyncratic volatility and earnings quality supporting noise hypothesis but positive relation between asynchronicity and earnings quality supporting information hypothesis. This finding echoes Li *et al.* (2014) contention that the presumed equivalence between these two apparently comparable variables is problematic. Based on the decomposition of asynchronicity into its individual components, Li *et al.* (2014) show that this contradiction can arise from the use of asynchronicity as the dependent variable in empirical tests if stock's beta, a component of asynchronicity, is strongly related with the independent variable of interest, and suggest controlling for firm-specific beta in cross-sectional setting when asynchronicity is the preferred dependent variable. Following Li *et al.* (2014) suggestion, I find that earnings quality is significantly negatively related with beta. After controlling beta in the idiosyncratic volatility and asynchronicity regression, I find that coefficients on both earnings quality measure are positive and statistically significant implying that high quality earnings reduce firm-specific return volatility. Thus, my empirical analyses suggest that firm-specific return volatility resembles noise, and high earnings quality mitigates noise.

I extend these analyses by investigating whether the firm-specific return volatility effect differs depending on the component of earnings quality. Following Francis *et al.* (2005), I use two methods to isolate the components of earnings quality. Regardless of the method used to distinguish the components of earnings quality, I find that innate component has significantly larger effect on firm-specific return volatility than discretionary component. This finding is consistent with earnings quality having larger effect when it is driven by firm-specific operating and environmental characteristics than when it is associated with discretionary decisions. Finally, I examine the sensitivity of the result to alternative asset pricing model. I measure idiosyncratic volatility and asynchronicity based on variance of residuals and R^2 from Fama-French (1993) three-factor model and show that the results from traditional CAPM consistent asset pricing model are not sensitive to the alternative firm-specific return volatility measures estimated from Fama-French (1993) three-factor model.

This study contributes to the literature on the firm-specific return volatility consequences of earnings quality in several ways. First, the study highlights on the empirical linkage between firm-specific return volatility and earnings quality, and shows that firms with poor earnings quality experience high firm-specific return volatility. Second, while some studies attempt to explore the association between firm-specific return volatility and earnings quality, they provide inconsistent findings that limit our understanding of the true relation between firm-specific return volatility and earnings quality. By providing strong evidence on the negative relation between firm-specific return volatility and earnings quality of a firm, this paper also sheds light on the debate on whether greater firm-specific return volatility captures value-relevant firm-specific information or noise. The result lends credibility to noise based explanation of firm-specific return volatility. Third, this study attempts to distinguish the effect of two components of earnings quality on firm-specific return volatility. Although there is no cohesive theory that differentiates the impact of two components of earnings quality, based on prior research on discretionary accounting choices, I hypothesize and find that innate earnings quality has larger effect on firm-specific return volatility than discretionary earnings quality. Finally, this study can help financial reporting constituencies better understand the implications of providing high quality information in reducing firm-specific return volatility which generally affects portfolio diversification, arbitrage trading and option pricing.

The rest of the paper is organized as follows. Section 2 discusses the related literature and develops hypotheses. Section 3 describes the measurement of variables. Section 4 describes the sample and summary statistics. The empirical results and related discussions are presented in section 5. Section 6 concludes.

2. Literature Review and Hypothesis Development

2.1 Earning quality and firm-specific return volatility

Although the literature on determinants and consequences of earnings quality is abundant, studies that examine firm-specific return volatility effect of earnings quality are few, and the results are mixed. The mixed results are attributable to the different interpretation of what firm-specific return volatility captures. The nature and direction of association between earnings quality and firm-specific return volatility are also related to a larger debate in accounting and finance literature on whether firm-specific return volatility reflects firm-specific information or noise.

Roll (1988) was the first to formalize the idea that stock return synchronicity (asynchronicity), a measure of firm-specific return volatility, is negatively (positively) associated with the amount of firm-specific information being impounded into individual stock price. Morck *et al.* (2000) find that synchronicity is higher in countries with less developed financial systems and weaker private property rights. Jin and Myers (2006) document positive associations between synchronicity and several measures of financial information opacity for a cross section of countries. Durnev *et al.* (2003), Ferreira and Laux (2007), and Hutton *et al.* (2009) find results similar to Jin and Myers (2006) in the U.S. context. These studies conclude that poor earnings quality is associated with lower firm-specific return volatility, measured by asynchronicity. That is, when earnings quality is low, less firm-specific information is available and synchronicity (asynchronicity) is higher (lower). It is interesting to note that prior studies that rely on information based explanation of return volatility invariably used R^2 based measure, and some studies interpret lower R^2 as equivalent to higher firm-specific return volatility [1]. If lower R^2 (higher asynchronicity) is associated with more firm-specific information and better information environment, and higher earnings quality is a key feature of better information environment (higher quality earnings is associated with lower PIN, lower bid-ask spread and greater liquidity), I predict that higher earnings quality will be associated with higher asynchronicity. Thus, I propose the following hypothesis, stated in the alternative form:

Information Hypothesis (H1a): Earnings quality is positively associated with firm-specific return volatility.

In contrast, a parallel body of research argues that more firm-specific return volatility captures noisier stock prices (West, 1988; Teoh *et al.,* 2008). Pastor and Veronesi (2003) model the relation between uncertainty about a firm's average profitability and return volatility, and show that higher uncertainty induces larger return volatility. If managers distort the reported earnings through discretionary choices, the resulting information risk can potentially increase investors' uncertainty about future profitability of the firm and thus affect return volatility. Rajgopal and Venkatachalam (2011) find that poor financial reporting quality is significantly associated with higher idiosyncratic volatility in cross-section and over time. Bartram *et al.* (2012) directly examine the relation between idiosyncratic return volatility and corporate disclosure quality, and find a negative association between the two. Chen *et al.* (2012) examine the importance of managerial discretion in determining idiosyncratic volatility, and show that idiosyncratic return volatility is negatively associated with information quality revealed in managerial discretion. The above-cited papers argue primarily for a negative association between earnings quality and firm-specific return volatility in the sense that high quality earnings reduce firm-specific return volatility by eliminating informational uncertainty. Most of these studies use residual variance from an asset pricing model as a measure of firm-specific return volatility. If higher firm-specific return volatility represents more pricing error which is common in poor information environment, and lower earnings quality is symptomatic of poor information environment, it can be inferred that higher earnings quality will be associated with lower idiosyncratic volatility consistent with noise-based explanation. This discussion leads to a competing hypothesis on the relation between earnings quality and firm-specific return volatility, stated in the alternative form:

Noise Hypothesis (H1b): Earnings quality is negatively associated with firm-specific return volatility.

2.2 Innate versus discretionary component of earning quality and firm-specific return volatility

The existing empirical studies suggest an association between total earnings quality and firm-specific return volatility. However, Francis *et al.* (2005) assert that earnings quality is driven not only by the discretionary reporting choices of the managers (discretionary component) but also by the innate features of the firm's business model and operating environment (innate component). Although there is no theoretical and empirical literature examining the impact of innate versus discretionary component of earnings quality on firm-specific return volatility that is expected to shed light on whether the observed association between earnings quality and firm-specific return volatility is primarily driven by the innate component or discretionary component or both, I form an intuition from Francis *et al.* (2005) who investigate the differential impact of innate versus discretionary component of accrual quality on the cost of equity. Literature on managerial discretion offers three competing views on the intent of exercising discretion (Holthausen, 1990) - to reveal managers' private information about the future prospects of a firm, to conceal the true underlying economic performance of the firm, and to minimize contracting costs amongst the various contracting parties. Guay *et al.* (1996) also recognize that discretionary accruals reflect a mixture of three distinct effects - managerial attempts to signal firm performance, earnings management and pure noise. In a broad cross-section of firms, some managers will use accruals to convey private information while some managers will use accruals opportunistically (Healy, 1996). Thus, I expect that discretionary component of earnings quality will reflect a blend of performance effect, opportunism and noise. As a result of this, the net effect of management's discretionary choices could be positive, negative or neutral depending on which effect dominates. Considering this possibility, I expect that the effect of discretionary component will be less pronounced than that of innate component. My second hypothesis is based on the prediction of differential effects between innate and discretionary component of earnings quality, stated in alternative form:

H2: The innate component of earnings quality has larger impact on firm-specific return volatility than discretionary component of earnings quality

3. Variable Measurement

3.1 Firm-specific return volatility

Prior research uses either idiosyncratic volatility (Rajgopal and Venkatachalam, 2011) or asynchronicity (Hutton *et al.*, 2009) as substitute measures of firm-specific return variation. I estimate both measures and describe the estimation procedure below in greater details.

3.1.1 Idiosyncratic volatility

The idiosyncratic volatility of a stock is not directly observable. Moreover, it is related to asset pricing models as it is estimated relative to the systematic volatility of the stock. This approach of estimating idiosyncratic volatility using residuals from an asset pricing model is more popular and widely used in the finance and accounting literature. I use the standard market model derived from CAPM to estimate idiosyncratic volatility:

$$R_i = \alpha_i + \beta_i R_m + e_i \qquad (1)$$

In equation (1), R_i is the return on stock i, and R_m is the return on a market index. I estimate above equation for every firm included in the sample for each year using daily firm-specific return data and return on market index over a period of 12 months ending on three months after fiscal year end in order to ensure that information about firm's earnings quality is available to the market [2]. I use TOPIX return data as market return. I measure idiosyncratic volatility [σ_e^2] as the variance of the error term in equation (1). Specifically, [σ_e^2] is the variance of residuals from a firm-specific regression of stock returns on market index return on a daily basis over a 12 month period ending on three months after fiscal year *t*. Since the fiscal year end of most Japanese firms is March, return calculations begin at the end of June, three months after the fiscal year end. I take the natural logarithm of the idiosyncratic volatility measure for empirical analyses. A high value of idiosyncratic volatility implies greater firm-specific return volatility.

3.1.2 Asynchronicity

Roll (1988) was the first to formalize that R^2 from the market model or some of its variants can be used as a measure of stock return synchronicity. Several studies treat higher synchronicity as equivalent to lower idiosyncratic volatility (i.e., high R^2 from the market model is equivalent to low residual variance from the market model) and vice versa. Asynchronicity is the lack of synchronous movement of a firm's stock return with the market return, and is measured using a transformed R^2 variable that captures the lack of return synchronicity (1-R^2). Since R^2 is bounded between zero and one, it creates complications for empirical estimation. I follow common practice in the literature (Morck *et al.,* 2000; Hutton *et al.,* 2009) and define asynchronicity using a logistic transformation of (1-R^2), which can range from negative to positive infinity:

$$\text{Asynchronicity } (\Phi) = \ln[(1-R^2)/R^2]$$

Here, R^2 is the coefficient of determination from the estimation of equation (1). The log transformation of R^2 creates an unbounded continuous variable out of a variable originally bounded by 0 and 1. Thus, a high value of asynchronicity indicates a high level of firm specific return volatility.

3.2 Earnings quality

I use two measures of earnings quality: Dechow and Dichev (2002) accrual quality (DDSTD) and Kasznik (1999) version of modified Jones (1991) absolute abnormal accruals (KZABS). These measures are described in greater detail below.

3.2.1 Accrual quality (DDSTD) measure based on Dechow and Dichev (2002)

My first measure of earnings quality is accrual quality (DDSTD), which is based on an approach proposed by Dechow and Dichev (2002) and implemented by Francis *et al.* (2005). This approach relies on the idea that working capital accruals reflect managers' anticipation of current and future cash flows realizations or reversal of past cash flows, and the ability of accruals to reflect such pattern could be severely affected by the estimation errors in accruals, regardless of management intent. Such estimation error could arise from managerial incentives to manipulate earnings or from environmental uncertainty and management lapses although the source of the error is not relevant in this approach. The ultimate aim of this method is to determine the extent of accruals estimation error in the mapping of accruals into past, present and future cash flows as modeled by Dechow and Dichev (2002):

$$TCA_{i,t} = \varphi_0 + \varphi_1 CFO_{i,t-1} + \varphi_2 CFO_{i,t} + \varphi_3 CFO_{i,t+1} + \nu_{i,t} \quad (2)$$

where TCA is the total current accruals computed as ΔCA – ΔCL – ΔCash + ΔSTDEBT, ΔCA is the change in current assets, ΔCL is the change in current liabilities, ΔCash is the change in cash, ΔSTDEBT is the change in short-term debt included in current liabilities. CFO is the cash flows from operations calculated as NI-TCA+DEP, where NI is the net income, TCA is the total current accruals and DEP is the depreciation and amortization expense. Subscripts i and t are the firm and time subscripts, respectively.

McNichols (2002) proposes that adding change in sales revenues and the level of property, plant and equipment leads to a better specified model and improves the accrual quality measure. So, I augment equation (2) as follows (all variables excluding the intercept are scaled by average total assets):

$$TCA_{i,t} = \varphi_0 + \varphi_1 CFO_{i,t-1} + \varphi_2 CFO_{i,t} + \varphi_3 CFO_{i,t+1} + \varphi_4 \Delta REV_{i,t} + \varphi_5 PPE_{i,t} + \nu_{i,t} \quad (2a)$$

where ΔREV is the change in revenues and PPE is the gross value of property, plant and equipment. I estimate equation (2a) for every industry-year in each of 15 Nikkei two-digit industry groups in which I require at least 10 firms in each year. Finally the earnings quality ($DDSTD_{i,t}$) metric is defined as the standard deviation of firm i's residuals, calculated over years t-4 through t, i.e., $DDSTD_{i,t} = \sigma(\upsilon_{i,t-4,t})$. Larger standard deviation of residuals indicates poor accruals and earnings quality.

3.2.2 Absolute abnormal accruals (KZABS) based on Kasznik (1999) model

Another widely used accrual based measure of earnings quality is the absolute value of abnormal accruals generated by different versions of Jones (1991) approach. This measure relies on the association between accruals and accounting fundamentals to separate an accruals measure into normal and abnormal component. The portion of accruals, which is not well explained by firm fundamentals, is deemed abnormal, and such abnormal accruals are presumed to reduce the quality of accruals and earnings. To determine abnormal accruals, I apply Kasznik version of modified Jones (1991) model and estimate the following regression for each of 15 Nikkei two-digit industry groups with at least 10 firms in each year (all variables excluding the intercept are scaled by average total assets):

$$TA_{i,t} = \delta_0 + \delta_1(\Delta REV_{i,t} - \Delta AR_{i,t}) + \delta_2 PPE_{i,t} + \delta_3 \Delta CFO_{i,t} + \eta_{i,t} \quad (3)$$

where TA is the firm *i*'s total accruals, computed as TCA-DEP, TCA is the total current accruals, DEP is the depreciation and amortization expense, ΔREV is the change in revenues, ΔAR is the change in accounts receivable, PPE is the gross value of property, plant and equipment, and ΔCFO is the change in cash flows from operation. Equation (3) is a modified and extended version of Jones (1991) model, which describes total accruals as a function of the change in revenue and the level of property, plant and equipment. Following the suggestion of Dechow *et al.* (1995), Kasznik adjusts the sales revenue variable for the change in accounts receivable. Kasznik also includes the change in operating cash flows as an explanatory variable based on Dechow's (1994) finding that cash flow from operation is significantly negatively correlated with total accruals. I prefer Kasznik version over modified Jones version because the former version considers significant correlation between cash flows from operation and total accruals in addition to two fundamental accounting variables used by the latter version, and results into higher adjusted R^2. I treat the residual, $\eta_{i,t}$, from equation (3) as abnormal accruals and use the absolute value of abnormal accruals, i.e., $KZABS_{i,t} = |\eta_{i,t}|$ as my second proxy for earnings quality. I interpret higher (lower) values of KZABS as measures of lower (higher) earnings quality.

3.3 Control Variables

In analyzing the relation between firm-specific stock return volatility and earnings quality, I attempt to account for two confounding factors that can cause changes in firm-specific return volatility (Rajgopal and Venkatachalam, 2011), and control for other variables that are posited to influence firm-specific return volatility in the cross section. Two confounding factors that have an effect on firm-specific return volatility are the revelation of additional value-relevant information around earnings announcement and the informativeness of earnings quality for future cash flows. Following Rajgopal and Venkatachalam (2011), I control for the extended disclosure of value-relevant information by the squared annual buy and hold return (RET^2) and include the next year's operating cash flows (CFO) as a proxy for the information about future cash flows revealed by the quality of earnings. Past studies show that firm-specific stock return volatility is related to the volatility of cash flows (Vuolteenaho, 2002) or to the volatility of accounting return on equity (Wei and Zhang, 2006). I control for the effect of variability of cash flows through cash flows volatility (VCFO). Some studies find that firm performance is significantly negatively associated with firm-specific return volatility (Wei and Zhang, 2006; Hutton *et al.,* 2009). To control for operating performance of a firm, I use accounting return on equity (ROE) [3]. Based on the evidence that small firms experience higher return volatility (Pastor and Veronesi, 2003), I control for firm size. Given the findings that highly levered firms are more likely to experience higher stock-return volatility (Hutton *et al.*, 2009), I control for financial leverage (LEV). I use book-to-market (BM) ratio as an inverse proxy for growth firms as firms with greater growth opportunities are likely to experience greater stock return volatility (Rajgopal and Venkatachalam, 2011). Since stock return volatility and stock return performance is negatively related (Rajgopal and Venkatachalam, 2011), I control for contemporaneous annual buy and hold returns. Stock return volatility might be higher for loss firms because the quality of earnings is expected to be low for loss firms if the loss results from excessive use of negative accruals. I use a dummy variable (LOSS) to capture the effect of reporting losses on return volatility. Finally based on the findings of Jin and Myers (2006), I include contemporaneous skewness (SKEW) and kurtosis (KURT) as control variables. Appendix A summarizes the measurement of each of these variables.

4. Data and Descriptive Statistics

4.1 Data

The sample period for this study spans the time-period 2003-2012, and the sample consists of 12,284 firm-year observations representing 1,490 individual firms across 15 industries that have the required data. Data for the dependent variable, variable of interest and control variables come from variety of sources. Accounting data come from Nikkei NEEDS Financial Quest Database, and stock price and return data come from Nikkei Portfolio Master Return Database [4]. The sample consists of only manufacturing companies listed in any one of the Japanese Stock Exchanges (Tokyo, Osaka, Nagoya etc.) and primarily covers all firms from 15 industries based on Nikkei two-digit industrial codes. I do not include financial institutions, insurance companies and firms in service industries since earnings quality empirical models used in this study do not reflect their activities. Because estimation of parameters for the Dechow and Dichev (2002) model requires lead and lag values of cash flows from operation and measures of earnings quality require five annual residuals, initially I collect necessary data for the 18-year period (1996-2013) to compute earnings quality measures. After restricting my sample to firms with complete data for all the dependent, independent and control variables by eliminating firm-years due to missing information on any of the variables, I end up with 12,284 firm-year observations for the final sample period. All of my empirical analyses are based on 12,284 firm-years.

4.2 Descriptive statistics

Table 1 reports summary statistics on the key variables used in the study. I winsorize all the variables at the 1 and 99 percent levels to avoid the effects of influential outliers. Panel A shows that both idiosyncratic volatility and asynchronicity exhibit substantial cross-sectional variation. The correlation between two measures of firm-specific return volatility is moderate at 0.24 (unreported) implying that two measures might capture different aspect of the same construct and emphasizes the need to use both measures as proxies for firm-specific return volatility. The correlation (untabulated) between the two proxies of earnings quality is 0.45 over the sample period. The correlation is not high enough to make one of these proxies redundant. Therefore, I use both proxies in empirical analysis. Panel C shows that the average firm has operating cash flows of 5.3% of average total assets, book-to-market ratio of about 1.311, return on equity of 2.4%, and financial leverage of 20.6% of average total assets. On average, 20% of the sample firms report negative earnings in a year. Untabulated result shows that the average firm has a market capitalization of 129,569 million yen.

[Insert Table 1]

5. Empirical Results

5.1 Relation between firm-specific return volatility and the information environment

In order to provide preliminary evidence on what firm-specific return volatility captures, I form quintile portfolios based on idiosyncratic volatility and asynchronicity, and examine how the characteristics of information environment behave in the extreme portfolios. For this purpose, I compute the following proxies for the firm's information environment: bid-ask spread (SPREAD), Amihud (2002) illiquidity measure (ILLIQUID), volatility of the Amihud (2002) liquidity measure (LIQUIDVOL), institutional ownership (INSTITUTE) and zero return days (ZRDAYS). Appendix A lists the definition of these variables. I predict that if higher firm-specific return volatility reflects greater informational efficiency of stock market, then I should find that firms with higher volatility will have lower SPREAD, ILLIQUID, LIQUIDVOL, ZRDAYS, and higher INSTITUTE. On the other hand, if higher firm-specific return volatility represents noisy stock prices, then I should find the opposite. The results (Panel A and B, Table 2) show that firms in the highest quintile portfolio exhibit greater levels of SPREAD, ILLIQUID, LIQUIDVOL, ZRDAYS, and lower level of INSTITUTE relative to the lowest quintile portfolio. Thus, the results suggest that firm-specific return volatility reflects noise in returns, not firm-specific information being impounded in stock prices.

[Insert Table 2]

5.2 Empirical test of the relation between firm-specific return volatility and earnings quality

Prior studies rely on two proxies of firm-specific return volatility: (1) idiosyncratic volatility and (2) asynchronicity. These two measures are used interchangeably in the literature. Following prior literature, I use both the measures as proxies for firm-specific return volatility as the dependent variable, and estimate the following regression that relates these proxies of firm-specific return volatility with two proxies of earnings quality after incorporating the control variables identified in Section 3.3 in order to test my first hypothesis:

$$VOL_{i,t} = \alpha_0 + \alpha_1 EQ_{i,t-1} + \alpha_2 RET^2_{i,t-1} + \alpha_3 CFO_{i,t+1} + \alpha_4 VCFO_{i,t-1} + \alpha_5 ROE_{i,t-1} + \alpha_6 SIZE_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 BM_{i,t-1} + \alpha_9 RET_{i,t} + \alpha_{10} LOSS_{i,t-1} + \alpha_{11} SKEW_{i,t} + \alpha_{12} KURT_{i,t} + \zeta_{i,t} \qquad \text{Eq. (4)}$$

where, VOL represents idiosyncratic volatility ($\ln[\sigma_e^2]$) and asynchronicity (Φ) estimated using the market model (CAPM), EQ is a measure of inverse earnings quality (DDSTD and KZABS), and all other variables are defined in Appendix A. Following Rajgopal and Venkatachalam (2011), I lag EQ by one year relative to VOL to avoid picking up mere contemporaneous associations between firm-specific return volatility and earnings quality. I calculate *t*-statistics on the basis of industry and year clustered robust standard errors for drawing valid inference in all subsequent regressions (Petersen, 2009; Gow *et al.,* 2010).

Table 3 presents the results of estimating Eq. (4). The result shows that the coefficient on EQ is positive and statistically significant for both measures of earnings quality when idiosyncratic volatility is used as the dependent variable. This finding is consistent with the noise hypothesis suggesting that the higher the earnings quality the lower the idiosyncratic volatility. When I use asynchronicity instead of idiosyncratic volatility as the dependent variable, I find negative and significant coefficient for DDSTD measure and negative (but not significant) coefficient for KZABS measure suggesting that the higher the earnings quality the higher the asynchronicity. This finding is consistent with information hypothesis. Overall, the results are incongruous when I use two different but commonly used measures of firm-specific return volatility as dependent variable keeping the explanatory variables unaltered.

[Insert Table 3]

Li *et al.* (2014) suggest an approach to explain and resolve this inconsistency using asynchronicity decomposition model. Starting with the standard market model (Eq. 1) and using simple arithmetic, they decompose asynchronicity (Φ), into three components:

$$\text{Asynchronicity } (\Phi) = \ln[(1-R^2)/R^2] = \ln[\sigma_e^2] - \ln[\beta^2] - \ln[\sigma_{rm}^2] \qquad \text{Eq. (5)}$$

Equation (5) shows that increase in idiosyncratic risk (σ_e^2), decrease in stock beta (β^2) or market-wide return volatility (σ_{rm}^2) will lead to an increase in asynchronicity. Since volatility of market return (σ_{rm}^2) is a cross-sectional constant in a firm-level analysis within a country for a given year, equation (5) reduces to:

$$\text{Asynchronicity } (\Phi) = \ln[(1-R^2)/R^2] = \ln[\sigma_e^2] - \ln[\beta^2] \qquad \text{Eq. (6)}$$

Thus, the association between asynchronicity and earnings quality can be positive if the relation between idiosyncratic return volatility (σ_e^2) and earnings quality is positive; the relation between stock beta (β) and earnings quality is negative; or the negative relation between β and earnings quality outweighs the negative relation between σ_e^2 and earnings quality. Following Li *et al.* (2014), I use stock beta ($\ln[\beta^2]$) as the dependent variable in Eq. (4) to examine its relation with earnings quality. The $\ln[\beta^2]$ column in Table 3 shows that the coefficient on DDSTD and KZABS is positive and statistically significant. More importantly, the positive coefficient on DDSTD and KZABS in the $\ln[\beta^2]$ regression is greater than the positive coefficient on DDSTD and KZABS in the $\ln[\sigma_e^2]$ regression. Thus, consistent with Li *et al.* (2014), I conclude that the negative coefficient on DDSTD and KZABS when asynchronicity is the dependent variable is driven by the overriding impact of earnings quality on beta relative to the impact of earnings quality on idiosyncratic volatility. Note that DDSTD and KZABS represent inverse measures of earnings quality, and thus a positive (negative) coefficient implies negative (positive) association between dependent and independent variables.

Li *et al.* (2014) recommend two non-mutually exclusive solutions when the results using idiosyncratic volatility and asynchronicity are not consistent: (i) triangulate results with measures of information environment; and (ii) control for firm-year beta in cross-sectional settings. In section 5.1, I show that both measures of firm-specific return volatility are associated with characteristics of poor information environment, supporting noise hypothesis. Here, I use the second approach and re-estimate the regressions reported in Table 4 after controlling for firm-specific beta. Specifically, I estimate the following regression:

$$VOL_{i,t} = \alpha_0 + \alpha_1 EQ_{i,t-1} + \alpha_2 RET^2_{i,t-1} + \alpha_3 CFO_{i,t+1} + \alpha_4 VCFO_{i,t-1} + \alpha_5 ROE_{i,t-1} + \alpha_6 SIZE_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 BM_{i,t-1} + \alpha_9 RET_{i,t} + \alpha_{10} LOSS_{i,t-1} + \alpha_{11} SKEW_{i,t} + \alpha_{12} KURT_{i,t} + \alpha_{13} \ln[\beta^2]_{i,t} + \zeta_{i,t} \qquad \text{Eq. (7)}$$

Table 4 presents the results of estimating Eq. (7). It is noteworthy that the relation between earnings quality and idiosyncratic volatility doesn't change even after controlling for beta while the coefficient on earnings quality in the asynchronicity regression changes sign and become significantly positive reflecting negative relation between earnings quality and asynchronicity. The result is now consistent for two different measures of firm-specific return volatility. Thus the contradiction of results shown in Table 3 is resolved through inclusion of stock beta in the regression that uses asynchronicity as an alternative measure of firm-specific return volatility. On the whole, the results indicate that firm-specific return volatility captures noise in return, not firm-specific information being impounded into stock prices.

[Insert Table 4]

5.3 Empirical test of the relation between firm-specific return volatility and two distinct components of earnings quality

Testing the second hypothesis requires estimates of innate and discretionary component of earnings quality. The innate component of earnings quality is determined by operational uncertainty and business model whereas discretionary component is driven by management's discretionary choices and judgments. Francis *et al.* (2005) suggested two methods to investigate the differential impact of innate versus discretionary component of earnings quality. Under the first method (Method 1), a measure of earnings quality is regressed on innate factors that prior researchers believe describe the firm's business model and its operating environment. For this purpose, I use eight innate factors such as total assets (ASSET), cash flows volatility (VCFO), sales volatility (VSALES), length of operating cycle (OPCYCLE), incidence of negative earnings realizations (NEG), intangible intensity (INTAN), intangible dummy (INTANDUM) and capital intensity (CPITAL) as outlined in Francis *et al.* (2005) and Francis *et al.* (2004). The detailed measurement of each of these variables is given in Appendix A. Method 1 estimates the following equation annually:

$$EQ_{i,t} = \gamma_0 + \gamma_1 ASSET_{i,t} + \gamma_2 VCFO_{i,t} + \gamma_3 VSALES_{i,t} + \gamma_4 OPCYCLE_{i,t} + \gamma_5 NEG_{i,t} + \gamma_6 INTAN_{i,t} + \gamma_7 INTANDUM_{i,t} + \gamma_8 CAPITAL_{i,t} + \mu_{i,t} \quad \text{Eq. (8)}$$

The fitted values from equation (8) generate an estimate of the innate component of earnings quality and the residuals from equation (8) are the estimate of the discretionary component of earnings quality. This method yields distinct estimates for each of the two components of earnings quality and allows for direct comparison between these two components.

In order to test my second hypothesis, I estimate the following regression of two proxies of firm-specific return volatility on two distinct components of both earnings quality measures after controlling for other determinants of firm-specific return volatility identified in Section 3.3:

$$VOL_{i,t} = \alpha_0 + \alpha_1 InnateEQ_{i,t-1} + \alpha_2 DiscEQ_{i,t-1} + \alpha_3 RET^2_{i,t-1} + \alpha_4 CFO_{i,t+1} + \alpha_5 VCFO_{i,t-1} + \alpha_6 ROE_{i,t-1} + \alpha_7 SIZE_{i,t-1} + \alpha_8 LEV_{i,t-1} + \alpha_9 BM_{i,t-1} + \alpha_{10} RET_{i,t} + \alpha_{11} LOSS_{i,t-1} + \alpha_{12} SKEW_{i,t} + \alpha_{13} KURT_{i,t} + \alpha_{14} \ln[\beta^2]_{i,t} + \zeta_{i,t} \quad \text{Eq. (9)}$$

where, VOL represents idiosyncratic volatility ($\ln[\sigma_e^2]$) and asynchronicity (Φ) estimated using market model (CAPM). InnateEQ and DiscEQ are fitted values and residuals from equation (8) respectively. All other variables are described in Appendix A. According to my hypothesis, I conjecture that InnateEQ will have larger effect on firm-specific return volatility than DiscEQ. An evidence that α_1 is significantly larger than α_2 from equation (9) will support my second hypothesis. I include both components of earnings quality in the same model to ensure that the effect of one component on return volatility remains significant even after controlling for the effect of other [5]. I also control beta in the regression because the results in Table 4 underscore the importance of controlling beta when asynchronicity is used as dependent variable.

Table 5, column Method 1, reports the result of the estimation of Eq. (9). The result shows that the coefficients on InnateEQ and DiscEQ for both measures of earnings quality are positive and significant at 1 percent level for idiosyncratic volatility and asynchronicity. Consistent with my hypothesis, I find that InnateEQ has larger impact on idiosyncratic volatility and asynchronicity than DiscEQ as the coefficient of InnateEQ is significantly greater than the coefficient of DiscEQ for both DDSTD and KZABS measure (F-stat is reported at the bottom of Table 5, column Method 1). Overall, the results suggest that firm-specific return volatility is higher for firms with poor earnings quality that is driven by innate factors relative to managerial discretion.

Francis *et al.* (2005) suggest another method (Method 2) in which innate factors affecting earnings quality are included in the original volatility regression as additional explanatory variables. According to Method 2, the model appears like the following [6]:

$$VOL_{i,t} = \alpha_0 + \alpha_1 EQ_{i,t-1} + \alpha_2 RET^2_{i,t-1} + \alpha_3 CFO_{i,t+1} + \alpha_4 VCFO_{i,t-1} + \alpha_5 ROE_{i,t-1} + \alpha_6 SIZE_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 BM_{i,t-1} + \alpha_9 RET_{i,t} + \alpha_{10} LOSS_{i,t-1} + \alpha_{11} SKEW_{i,t} + \alpha_{12} KURT_{i,t} + \alpha_{13} VSALES_{i,t-1} + \alpha_{14} OPCYCLE_{i,t-1} + \alpha_{15} NEG_{i,t-1} + \alpha_{16} INTAN_{i,t-1} + \alpha_{17} INTANDUM_{i,t-1} + \alpha_{18} CAPITAL_{i,t-1} + \alpha_{19} \ln[\beta^2]_{i,t} + \zeta_{i,t} \quad \text{Eq. (10)}$$

One difficulty with Method 2 is that it does not provide a distinct estimate of two components of earnings quality. Rather, in this extended regression, the coefficient on EQ (DDSTD and KZABS) captures the effect of discretionary component on firm-specific return volatility in addition to the effect captured by the innate factors.

Column Method 2 of Table 5 reports the result of estimating Eq. (10) when idiosyncratic volatility is the dependent variable. I continue to find positive and significant coefficient on EQ for both measures even after controlling for the innate factors. Placing these results with respect to those for total earnings quality (reported in Table 4), I find that the effect of discretionary earnings quality is less than the effect of total earnings quality which reflects both innate and discretionary effects. This finding is indicative of weaker effect of discretionary component relative to innate component of earnings quality. I re-estimate Eq. (10) using asynchronicity as the dependent variable. The results presented in Table 5 indicate that the coefficient on EQ for DDSTD measure is positive but not significant while the coefficient on EQ for KZABS measure is significantly positive. Both the coefficients are smaller in magnitude compared to their counterparts in Table 4. Thus, Method 2 provides indirect evidence that innate component of earnings quality has larger impact on firm-specific return volatility than discretionary component.

[Insert Table 5]

5.4 Sensitivity tests

I examine the sensitivity of the results using idiosyncratic volatility and asynchronicity calculated from Fama-French (1993) three-factor model residuals and R^2. Specifically, I estimate annual firm-specific regression of daily excess return on daily market excess return, SMB factor return and HML factor return, and use the residuals and R^2 to calculate idiosyncratic volatility and asynchronicity. Table 6 reports the results of regression of Fama-French (1993) three-factor model based idiosyncratic volatility and asynchronicity on earnings quality and other control variables before and after controlling for beta. I include all control variables identified in section 3.3 but do not report their coefficients for the sake of brevity. The result shows that when idiosyncratic volatility is used as dependent variable, the coefficient on earnings quality is positive and significant before and after controlling of beta. But when asynchronicity is used as dependent variable, the coefficient on earnings quality is negative before controlling beta and changes to positive after controlling beta for both measures of earnings quality. This result reinforces the importance of controlling for beta when asynchronicity is the dependent variable, and supports noise hypothesis. Unreported results show that innate component has significantly larger impact on firm-specific return volatility than discretionary component under Method 1 except for asynchronicity when DDSTD is a measure of earnings quality. Under Method 2, the coefficient on earnings quality capturing discretionary effect is positive and smaller than the coefficient on total earnings quality implying weaker effect of discretionary component. Therefore, the results are not sensitive to the alternative firm-specific return volatility measures estimated from Fama-French (1993) three-factor model.

[Insert Table 6]

6. Conclusion

This study investigates the cross-sectional relation between firm-specific return volatility and earnings quality of Japanese manufacturing firms for the period 2003-2012. Using idiosyncratic volatility and asynchronicity as proxies for firm-specific return volatility, I document that higher volatility is associated with greater information asymmetry, higher illiquidity and liquidity risk, lower institutional shareholdings and more zero return day, consistent with firm-specific return volatility reflecting noise. However, in an examination of the association between earnings quality and firm-specific return volatility using multivariate regression analysis, I find puzzling results. When I use idiosyncratic volatility as dependent variable, I find negative association between idiosyncratic volatility and earnings quality. When I use asynchronicity as dependent variable, I find that the association between asynchronicity and earnings quality is positive. Then applying the suggestion of Li *et al.* (2014), I show that the contradiction arises because earnings quality is related to both the beta and idiosyncratic volatility components of asynchronicity, with a stronger relation with beta. Thus, when I control for beta in the empirical specification, the contradiction is resolved, and I find significant negative association between firm-specific return volatility and earnings quality. I interpret this evidence as consistent with noise hypothesis as opposed to information hypothesis.

Then, I provide new evidence on the relationship between firm-specific return volatility and two distinct components of earnings quality. Both innate and discretionary components of earnings quality are significantly associated with firm-specific return volatility with innate component having larger effect than discretionary component. This finding indicates that firm-specific return volatility is likely to be higher for firms operating in an uncertain environment and for firms whose managers use their discretion over accruals opportunistically. The significantly larger effect of innate component is consistent with the conjecture that in a broad cross-section of firms, discretionary component may contain performance subcomponent, opportunistic subcomponent or noise confounding the net effect. These findings are insensitive to the firm-specific return volatility measures estimated from alternative Fama-French (1993) three-factor asset pricing model. Overall, the results are consistent with the existence of a significant cross-sectional association between firm-specific return volatility and two accrual-based proxies of earnings quality. However, I suggest that examining and relating the time-series behavior of earnings quality with overtime changes in firm-specific return volatility can be an important avenue for future research for a deeper understanding of the relation between these two variables.

Notes

1. One such study is Piotroski and Roulstone (2004) who argue that insiders may be more inclined to sell their shares if their firm's stock displays excessive idiosyncratic risk or low stock return synchronicity (p-1130).
2. I define the end of fiscal year as the end of third month after fiscal year end because Japanese firms are required to submit audited financial statements within three months of the fiscal year end.
3. The inferences are unaltered whether I use operating cash flows or accounting return on assets (ROA) instead.
4. Nikkei NEEDS Financial Quest Database and Nikkei Portfolio Master Return Database in Japan correspond to Compustat and CRSP in the U.S., respectively.
5. In an unreported result, I also include each component individually and find significant effect of each.
6. Since firm size and cash flows volatility are already included in the original regression as determinants of firm-specific return volatility, I do not include the innate factor ASSET which also captures size, in equation (10) to avoid duplication of the same construct, and include cash flows volatility once.

References

Amihud, Y. (2002), "Illiquidity and stock returns: cross-section and time-series effects", *Journal of Financial Markets*, Vol. 5 No. 1, pp. 31-56.

Bartram, S.M., Brown, G. and Stulz, R.M. (2012), "Why are U.S. stocks more volatile?", *Journal of Finance*, Vol. 67 No. 4, pp. 1329-1370.

Campbell, J.Y., Lettau, M., Malkiel, B.G. and Xu, Y. (2001), "Have individual stocks become more volatile? an empirical exploration of idiosyncratic risk", *Journal of Finance*, Vol. 56 No. 1, pp. 1-43.

Chang, E.C. and Dong, S. (2006), "Idiosyncratic volatility, fundamentals, and institutional herding: evidence from the Japanese stock market", *Pacific-Basin Finance Journal*, Vol. 14, pp. 135-154.

Chang, Y.Y., Faff, R. and Hwang, C. (2010), "Liquidity and stock returns in Japan: new evidence", *Pacific-Basin Finance Journal*, Vol. 18, pp. 90-115.

Chen, C., Huang, A.G. and Jha, R. (2012), "Idiosyncratic return volatility and the information quality underlying managerial discretion", *Journal of Financial and Quantitative Analysis*, Vol. 47 No. 4, pp. 873-899.

Dechow, P.M. (1994), "Accounting earnings and cash flows as measures of firm performance: the role of accounting accruals", *Journal of Accounting and Economics*, Vol. 18 No. 1, pp. 3-42.

Dechow, P.M., Sloan, R.G. and Sweeney, A.P. (1995), "Detecting earnings management", *The Accounting Review*, Vol. 70 No. 2, pp. 193-225.

Dechow, P.M. and Dichev, I.D. (2002), "The quality of accruals and earnings: the role of accrual estimation errors", *The Accounting Review*, Vol. 77 (Supplement) No. s-1, pp. 35-59.

Durnev, A., Morck, R., Yeung, B. and Zarowin, P. (2003), "Does greater firm-specific return variation mean more or less informed stock pricing?" *Journal of Accounting Research*, Vol. 41 No. 5, pp. 797-836.

Fama, E.F. and French, K.R. (1993), "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, Vol. 33 No. 1, pp. 3-56.

Ferreira, M.A. and Laux, P.A. (2007), "Corporate governance, idiosyncratic risk, and information flow", *Journal of Finance*, Vol. 62 No. 2, pp. 951-989.

Francis, J., LaFond, R., Olsson, P. and Schipper, K. (2004), "Cost of equity and earnings attributes", *The Accounting Review*, Vol. 79 No. 4, pp. 967-1010.

Francis, J., LaFond, R., Olsson, P. and Schipper, K. (2005), "The market pricing of accruals quality", *Journal of Accounting and Economics*, Vol. 39 No. 2, pp. 295-327.

Gow, I., Ormazabal, G. and Taylor, D. (2010), "Correcting for cross-sectional and time-series dependence in accounting research", *The Accounting Review*, Vol. 85 No. 2, pp. 483-512.

Guay, W.R., Kothari, S.P. and Watts, R.L. (1996), "A market-based evaluation of discretionary accrual models", *Journal of Accounting Research*, Vol. 34 (supplement), pp. 83-105.

Hamao, Y., Mei, J. and Xu, Y. (2003), "Idiosyncratic risk and creative destruction in Japan", Working paper 9642, National Bureau of Economic Research, Cambridge, April.

Healy, P. (1996), “Discussion of a market-based evaluation of discretionary accrual models”, *Journal of Accounting Research*, Vol. 34 (supplement), pp. 107-115.

Holthausen, R.W. (1990), “Accounting method choice: opportunistic behavior, efficient contracting, and informational perspectives”, *Journal of Accounting and Economics*, Vol. 12 No. 1-3, pp. 207-218.

Hutton, A.P., Marcus, A.J. and Tehranian, H. (2009), “Opaque financial reports, R^2, and crash risk”, *Journal of Financial Economics*, Vol. 94 No. 1, pp. 67-86.

Irvine, P.J. and Pontiff, J. (2009), “Idiosyncratic return volatility, cash flows, and product market competition”, *Review of Financial Studies* Vol. 22 No. 3, pp. 1149-1177.

Jin, L. and Myers, S.C. (2006), “*R*-squared around the world: new theory and new tests”, *Journal of Financial Economics*, Vol. 79 No. 2, pp. 257-292.

Jones, J.J. (1991), “Earnings management during import relief investigations”, *Journal of Accounting Research*, Vol. 29 No. 2, pp. 193-228.

Kasznik, R. (1999), “On the association between voluntary disclosure and earnings management”, *Journal of Accounting Research*, Vol. 37 No. 1, pp. 57-81.

Li, B., Rajgopal, S. and Venkatachalam, M. (2014), “R^2 and idiosyncratic risk are not interchangeable”, *The Accounting Review*, Vol. 89 No. 6, pp. 2261-2295.

McNichols, M. (2002), “Discussion of the quality of accruals and earnings: the role of accrual estimation errors”, *The Accounting Review*, Vol. 77 (Supplement) No. s-1, pp. 61-69.

Morck, R., Yeung, B. and Yu, W. (2000), “The information content of stock markets: why do emerging markets have synchronous stock price movements?”, *Journal of Financial Economics*, Vol. 58 No. 1-2, pp. 215-260.

Pastor, L. and Veronesi, P. (2003), “Stock valuation and learning about profitability”, *Journal of Finance*, Vol. 58 No. 5, pp. 1749-1789.

Petersen, M.A. (2009), “Estimating standard errors in finance panel data sets: comparing approaches”, *Review of Financial Studies*, Vol. 22 No. 1, pp. 435-480.

Piotroski, J.D. and Roulstone, D.T. (2004), “The influence of analysts, institutional investors, and insiders on the incorporation of market, industry, and firm-specific information into stock prices”, *The Accounting Review*, Vol. 79 No. 4, pp. 1119-1151.

Rajgopal, S. and Venkatachalam, M. (2011), “Financial reporting quality and idiosyncratic return volatility”, *Journal of Accounting and Economics*, Vol. 51 No. 1-2, pp. 1-20.

Roll, R. (1988), “R^2”, *Journal of Finance*, Vol. 43 No. 3, pp. 541-566.

Teoh, S.H., Yang, Y. and Zhang, Y. (2008), “R-square: noise or firm-specific information?”, Working paper, University of California, Irvine.

Vuolteenaho, T. (2002), “What drives firm-level stock returns?”, *Journal of Finance*, Vol. 57 No. 1, pp. 233-264.

Wei, S.X. and Zhang, C. (2006), “Why did individual stocks become more volatile?”, *Journal of Business*, Vol. 79 No. 1, pp. 259-292.

West, K.D. (1988), “Bubbles, fads and stock price volatility tests: a partial evaluation”, *Journal of Finance*, Vol. 43 No. 3, pp. 639-656.

Appendix A: Definition of Variables

Variable		Definition
		Control Variables
Earnings related value-relevant information	RET^2	The squared annual buy and hold return.
Informativeness of earnings quality for future cash flows	CFO	Net income less total accruals scaled by average total assets.
Cash flows volatility	VCFO	The standard deviation of rolling five-year cash flows from operation, scaled by average total assets.
Operating performance	ROE	Net income divided by lagged book value of equity.
Firm size	SIZE	Natural logarithm of market capitalization. Market capitalization is calculated as the closing price at fiscal year-end times the number of shares outstanding at fiscal year-end.
Leverage	LEV	Ratio of long-term debt to total assets.
Book-to-market ratio	BM	Ratio of fiscal-year-end book value of equity to market value of equity.
Stock return performance	RET	Contemporaneous buy and hold returns.
Loss firms	LOSS	A dummy variable that is set to 1 if the firm-year reports negative earnings or losses and 0, otherwise.
Return skewness	SKEW	Skewness of the firm-specific daily return.
Return kurtosis	KURT	Kurtosis of the firm-specific daily return.
		Information Environment Variables
Bid-ask spread	SPREAD	The average of daily relative bid-ask spread. The relative spread is calculated as the difference between ask price and bid price, deflated by the mid-point of ask and bid price.
Amihud (2002) illiquidity measure	ILLIQUID	Annual average of the daily ratio of absolute return to yen trading volume.
Liquidity risk	ILLIQVOL	Annual standard deviation of the daily ILLIQUID measure.
Institutional ownership	INSTITUTE	The proportion of shares held by institutional investors.
Zero return days	ZRDAYS	The ratio of total number of days yielding zero returns to total number of trading days in that fiscal year.
		Earnings Quality Determinants Variables
Total assets	ASSET	The natural log of total assets of a firm.
Cash flows volatility	VCFO	As defined in control variables section.
Sales volatility	VSALES	The standard deviation of rolling five-year sales revenues, scaled by average total assets.
Length of operating cycle	OPCYCLE	The natural log of the sum of days accounts receivable and days inventory. Days accounts receivable = 360/(Sales/Average accounts receivable). Days inventory = 360/(Cost of goods sold/Average inventory)
Incidence of negative earnings realization	NEG	Proportion of losses over the prior five years.
Intangible intensity	INTAN	The sum of reported R&D and advertising expense as a proportion of sales revenues; missing values of R&D and advertising expense are set to zero.
Absence of reported intangible	INTANDUM	An indicator variable, INTANDUM, which is equal to 1 for firms with INTAN = 0, and 0, otherwise.
Capital intensity	CAPITAL	The ratio of net book value of property, plant, and equipment to total assets.

Table 1: Descriptive Statistics

This table reports the descriptive statistics of key variables used in this study. All variables are winsorized at the bottom and top 1% levels. The number of observations is 12,284 for the sample period 2003-2012.

Variable		Mean	Std. Dev.	Q1	Median	Q3
Panel A: ***Volatility measures***						
Idiosyncratic volatility	$[\sigma_e^2]$	1.474	0.828	0.894	1.437	2.023
Asynchronicity	Φ	2.162	1.895	0.768	1.651	3.152
Panel B: ***Earnings quality measures***						
Dechow-Dichev accrual quality	DDSTD	0.022	0.015	0.012	0.018	0.028
Kasznik absolute abnormal accrual	KZABS	0.026	0.024	0.009	0.019	0.036
Panel C: ***Control variables***						
Earnings related value-relevant information	RET^2	0.226	0.528	0.012	0.058	0.191
Informativeness of earnings quality for future cash flows	CFO	0.053	0.059	0.025	0.056	0.086
Cash flows volatility	VCFO	0.046	0.032	0.026	0.038	0.057
Operating performance	ROE	0.024	0.132	0.009	0.042	0.080
Firm size (in log)	SIZE	9.898	1.793	8.575	9.677	10.990
Leverage	LEV	0.206	0.169	0.054	0.178	0.323
Book-to-market ratio	BM	1.311	0.848	0.722	1.097	1.653
Stock return performance	RET	0.091	0.468	-0.205	0.000	0.278
Loss firms	LOSS	0.201	0.401	0.000	0.000	0.000
Return skewness	SKEW	0.381	0.977	-0.105	0.274	0.780
Return kurtosis	KURT	6.491	7.508	1.814	3.821	8.126

Table 2: Information Environment Variables across Quintiles of Idiosyncratic Volatility and Asynchronicity

Panel A and B report the averages for each variable capturing different aspects of firms' information environment in quintile portfolios formed on idiosyncratic volatility and asynchronicity covering the period 2003–2012. Quintile portfolios are formed each fiscal year separately for the two measures of firm-specific return volatility ($\ln[\sigma_e^2]$ and Φ). *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the .01, .05, and .10 level, respectively.

Panel A: Mean of information environment variables across quintiles of idiosyncratic volatility ($\ln[\sigma_e^2]$)

Variable	Quintiles based on $\ln[\sigma_e^2]$					Mean diff.	(t-
	(1)	(2)	(3)	(4)	(5)	(5) – (1)	statistic)
SPREAD	0.006	0.007	0.010	0.013	0.020	0.014***	(23.82)
ILLIQUID	0.033	0.052	0.091	0.147	0.289	0.256***	(27.16)
LIQUIDVOL	0.056	0.091	0.161	0.263	0.532	0.476***	(27.29)
INSTITUTE	21.023	22.271	18.642	13.852	7.900	-13.124***	(-30.12)
ZRDAYS	0.144	0.149	0.165	0.186	0.210	0.066***	(12.76)

Panel B: Mean of information environment variables across quintiles of asynchronicity (Φ)

Variable	Quintiles based on Φ					Mean diff.	(t-
	(1)	(2)	(3)	(4)	(5)	(5) – (1)	statistic)
SPREAD	0.005	0.007	0.010	0.018	0.029	0.024***	(29.21)
ILLIQUID	0.002	0.010	0.039	0.182	0.379	0.377***	(41.88)
LIQUIDVOL	0.003	0.013	0.070	0.345	0.672	0.669***	(40.29)
INSTITUTE	31.709	22.732	15.606	8.893	4.647	-27.062***	(-70.44)
ZRDAYS	0.052	0.071	0.100	0.209	0.412	0.360***	(82.15)

Table 3: Regression of Traditional CAPM Based Idiosyncratic Volatility, Asynchronicity and Beta on Earnings Quality and Other Control Variables

This table reports estimation of Eq (4). *t*-statistics are calculated based on industry and year clustered robust standard errors and presented in parentheses. ***, **, and * indicate statistical significance at the .01, .05, and .10 level, respectively.

		Idiosyncratic Volatility ($\ln[\sigma_e^2]$)		**Asynchronicity (Φ)**		**Beta Squared $\ln[\beta^2]$**	
Variable	Expected Sign	EQ=DDSTD measure	EQ=KZABS measure	EQ=DDSTD measure	EQ=KZABS measure	EQ=DDSTD measure	EQ=KZABS measure
$EQ_{i,t-1}$	(+)	6.384*** (9.53)	2.087*** (6.58)	-11.873*** (-8.12)	-1.103 (-1.50)	19.090*** (11.15)	2.944*** (3.38)
$RET^2_{i,t-1}$	(+)	0.069** (2.29)	0.076** (2.52)	-0.112* (-1.77)	-0.127** (-1.98)	0.440*** (6.99)	0.462*** (7.26)
$CFO_{i,t+1}$	(-)	-0.011 (-0.07)	-0.060 (-0.37)	0.424 (1.50)	0.521* (1.85)	-1.031*** (-3.03)	-1.185*** (-3.50)
$VCFO_{i,t-1}$	(+)	1.109*** (3.94)	2.085*** (7.82)	3.793*** (7.33)	1.212** (2.37)	-2.226*** (-3.66)	1.601*** (2.73)
$ROE_{i,t-1}$	(-)	0.042 (0.48)	0.046 (0.52)	-0.059 (-0.35)	-0.006 (-0.03)	-0.119 (-0.62)	-0.179 (-0.93)
$SIZE_{i,t-1}$	(-)	-0.150*** (-18.11)	-0.154*** (-18.78)	-0.652*** (-33.21)	-0.644*** (-32.84)	0.533*** (23.73)	0.521*** (23.11)
$LEV_{i,t-1}$	(+)	0.932*** (15.84)	0.963*** (16.22)	-0.849*** (-7.04)	-0.898*** (-7.46)	1.757*** (12.45)	1.840*** (13.07)
$BM_{i,t-1}$	(-)	0.026 (1.25)	0.019 (0.88)	-0.058 (-1.64)	-0.043 (-1.20)	0.009 (0.21)	-0.015 (-0.32)
$RET_{i,t}$	(-)	-0.100 (-1.28)	-0.096 (-1.21)	-0.091 (-1.03)	-0.096 (-1.05)	0.469*** (6.15)	0.478*** (5.95)
$LOSS_{i,t-1}$	(+)	0.256*** (8.22)	0.266*** (8.56)	-0.087 (-1.40)	-0.117* (-1.83)	0.312*** (4.56)	0.357*** (5.08)
$SKEW_{i,t}$	(+)	0.233*** (14.41)	0.236*** (14.31)	0.072 (0.94)	0.065 (0.85)	0.190** (2.31)	0.201** (2.41)
$KURT_{i,t}$	(+)	-0.003 (-1.23)	-0.003 (-1.27)	0.021** (2.00)	0.021** (2.01)	-0.031*** (-2.67)	-0.032*** (-2.67)
Intercept		2.412*** (19.45)	2.498*** (20.24)	8.815*** (31.97)	8.616*** (31.29)	-7.240*** (-21.79)	-6.940*** (-20.85)
N		12,284	12,284	12,284	12,284	12,284	12,284
Adjusted R^2		39.67%	39.17%	39.71%	39.20%	27.28%	26.20%

Table 4: Regression of Traditional CAPM Based Idiosyncratic Volatility and Asynchronicity on Earnings Quality and Other Control Variables after Controlling for Beta

This table reports estimation of Eq. (7). *t*-statistics are calculated based on industry and year clustered robust standard errors and presented in parentheses. ***, **, and * indicate statistical significance at the .01, .05, and .10 level, respectively.

		Idiosyncratic Volatility ($\ln[\sigma_e^2]$)		**Asynchronicity (Φ)**	
Variable	Expected Sign	EQ = DDSTD measure	EQ = KZABS measure	EQ = DDSTD measure	EQ = KZABS measure
$EQ_{i,t-1}$	(+)	4.639*** (7.38)	1.809*** (6.15)	2.534*** (3.99)	1.114*** (3.62)
$RET^2_{i,t-1}$	(+)	0.029 (1.09)	0.032 (1.22)	0.220*** (9.30)	0.222*** (9.31)
$CFO_{i,t+1}$	(-)	0.083 (0.52)	0.052 (0.33)	-0.355** (-2.05)	-0.371** (-2.14)
$VCFO_{i,t-1}$	(+)	1.312*** (4.73)	1.933*** (7.48)	2.113*** (7.70)	2.418*** (9.37)
$ROE_{i,t-1}$	(-)	0.053 (0.65)	0.062 (0.77)	-0.149** (-2.24)	-0.141** (-2.14)
$SIZE_{i,t-1}$	(-)	-0.199*** (-25.77)	-0.204*** (-26.63)	-0.249*** (-30.63)	-0.252*** (-31.19)
$LEV_{i,t-1}$	(+)	0.771*** (12.90)	0.789*** (13.11)	0.477*** (7.51)	0.487*** (7.70)
$BM_{i,t-1}$	(-)	0.025 (1.31)	0.020 (1.03)	-0.051*** (-2.86)	-0.054*** (-3.00)
$RET_{i,t}$	(-)	-0.143* (-1.93)	-0.141* (-1.89)	0.263*** (5.29)	0.264*** (5.34)
$LOSS_{i,t-1}$	(+)	0.227*** (7.85)	0.233*** (8.10)	0.149*** (4.40)	0.151*** (4.52)
$SKEW_{i,t}$	(+)	0.215*** (14.47)	0.217*** (14.42)	0.216*** (11.23)	0.216*** (11.26)
$KURT_{i,t}$	(+)	0.000 (0.03)	0.000 (0.04)	-0.002 (-0.90)	-0.002 (-0.90)
$\ln[\beta^2]_{i,t}$	(+/-)	0.091*** (11.77)	0.094*** (12.26)	-0.755*** (-76.84)	-0.753*** (-77.34)
Intercept		3.078*** (27.12)	3.153*** (28.13)	3.351*** (29.91)	3.390*** (30.78)
N		12,284	12,284	12,284	12,284
Adjusted R^2		43.35%	43.16%	87.65%	87.64%

Table 5: Regression of Traditional CAPM Based Idiosyncratic Volatility and Asynchronicity on Innate and Discretionary Components of Earnings Quality after Controlling for Beta

This table reports estimation of Eq (9) and Eq (10). *t*-statistics are calculated based on industry and year clustered robust standard errors and presented in parentheses. ***, **, and * indicate statistical significance at the .01, .05, and .10 level, respectively.

		Idiosyncratic Volatility ($\ln[\sigma_e^2]$)				Asynchronicity (Φ)			
		EQ = DDSTD measure		EQ = KZABS measure		EQ = DDSTD measure		EQ = KZABS measure	
Variable	Expected Sign	Method 1 Eq. (9)	Method 2 Eq. (10)	Method 1 Eq. (9)	Method 2 Eq. (10)	Method 1 Eq. (9)	Method 2 Eq. (10)	Method 1 Eq. (9)	Method 2 Eq. (10)
$InnateEQ_{i,t-1}$	(+)	10.574*** (4.33)		16.676*** (6.30)		7.653*** (3.72)		6.956*** (3.07)	
$DiscEQ_{i,t-1}$	(+)	3.455*** (7.03)		1.314*** (5.15)		1.486*** (2.68)		0.840*** (3.08)	
$EQ_{i,t-1}$	(+)		3.458*** (6.11)		1.569*** (5.79)		0.785 (1.33)		0.973*** (3.49)
$RET^2_{i,t-1}$	(+)	0.023 (0.86)	0.021 (0.77)	0.029 (1.12)	0.020 (0.77)	0.215*** (9.38)	0.202*** (9.07)	0.220*** (9.22)	0.201*** (9.06)
$CFO_{i,t+1}$	(-)	0.162 (1.01)	0.239 (1.45)	0.151 (0.95)	0.237 (1.45)	-0.294* (-1.73)	-0.166 (-1.05)	-0.332* (-1.89)	-0.167 (-1.07)
$VCFO_{i,t-1}$	(+)	0.153 (0.95)	0.953*** (3.65)	-0.497 (-1.05)	1.264 (5.26)	1.416*** (4.19)	1.909*** (7.28)	1.463*** (3.85)	1.824*** (7.69)
$ROE_{i,t-1}$	(-)	0.061 (0.75)	0.057 (0.71)	0.122 (1.48)	0.072 (0.88)	-0.141** (-2.15)	-0.129* (-1.94)	-0.117* (-1.82)	-0.112* (-1.71)
$SIZE_{i,t-1}$	(-)	-0.189*** (-21.58)	-0.192*** (-25.89)	-0.182*** (-22.87)	-0.194*** (-26.40)	-0.240*** (-24.94)	-0.239*** (-28.13)	-0.243*** (-26.33)	-0.239*** (-28.33)
$LEV_{i,t-1}$	(+)	0.790*** (14.02)	0.794*** (15.92)	0.850*** (15.09)	0.797*** (15.93)	0.493*** (8.02)	0.386*** (7.11)	0.511*** (8.21)	0.388*** (7.09)
$BM_{i,t-1}$	(-)	0.031 (1.58)	0.029 (1.51)	0.023 (1.19)	0.025 (1.33)	-0.047*** (-2.68)	-0.054*** (-3.14)	-0.053*** (-2.93)	-0.055*** (-3.18)
$RET_{i,t}$	(-)	-0.145* (-1.96)	-0.147** (-2.02)	-0.138* (-1.86)	-0.146** (-2.01)	0.261*** (5.25)	0.252*** (5.24)	0.266*** (5.40)	0.253*** (5.28)
$LOSS_{i,t-1}$	(+)	0.192*** (6.00)	0.185*** (5.87)	0.163*** (6.51)	0.175*** (5.67)	0.119*** (3.28)	0.050 (1.64)	0.124*** (4.12)	0.046 (1.52)
$SKEW_{i,t}$	(+)	0.214*** (14.49)	0.213*** (15.00)	0.215*** (14.69)	0.213*** (14.93)	0.215*** (11.15)	0.208*** (11.16)	0.216*** (11.20)	0.208*** (11.15)
$KURT_{i,t}$	(+)	-0.000 (-0.04)	0.000 (0.15)	0.000 (0.10)	0.000 (0.16)	-0.002 (-0.95)	-0.002 (-0.87)	-0.002 (-0.88)	-0.002 (-0.86)

$VSALES_{i,t-1}$	(+)		0.530*** (3.30)		0.587*** (3.63)		0.278* (1.67)		0.278* (1.67)
$OPCYCLE_{i,t-1}$	(+)		0.119** (2.33)		0.119** (2.36)		0.090* (1.94)		0.089* (1.93)
$NEG_{i,t-1}$	(+)		0.121** (2.17)		0.169*** (3.02)		0.384*** (7.62)		0.395*** (7.90)
$INTAN_{i,t-1}$	(+)		-0.008 (-0.11)		0.001 (0.02)		0.090 (1.04)		0.089 (1.03)
$INTANDUM_{i,t-1}$	(+)		0.020 (0.45)		0.013 (0.30)		0.077* (1.69)		0.075 (1.65)
$CAPITAL_{i,t-1}$	(-)		-0.152 (-1.39)		-0.165 (-1.50)		-0.024 (-0.28)		-0.023 (-0.26)
$\ln[\beta^2]_{i,t}$	(+/-)	0.089*** (11.86)	0.085*** (11.72)	0.090*** (12.15)	0.087*** (11.98)	-0.756*** (-76.68)	-0.761*** (-77.39)	-0.755*** (-77.88)	-0.761*** (-77.49)
Intercept		2.871*** (21.66)	2.412*** (8.23)	2.637 (19.24)	2.447*** (8.41)	3.172*** (22.43)	2.778*** (9.81)	3.186*** (21.81)	2.779*** (9.84)
N		12,284	12,284	12,284	12,284	12,284	12,284	12,284	12,284
Adjusted R^2		43.51%	43.98%	43.99%	43.94%	87.67%	87.82%	87.66%	87.83%
F-stat (p value) H_0: $\alpha_1 = \alpha_2$ H_1: $\alpha_1 > \alpha_2$		8.24*** (0.000)		35.88*** (0.000)		8.37*** (0.000)		7.53*** (0.000)	

Table 6: Regression of Fama-French 3-Factor Model Based Idiosyncratic Volatility and Asynchronicity on Earnings Quality and Other Control Variables before and after Controlling for Beta

This table reports estimation of Eq (4) and Eq (7). *t*-statistics are calculated based on industry and year clustered robust standard errors and presented in parentheses. ***, **, and * indicate statistical significance at the .01, .05, and .10 level, respectively.

		Idiosyncratic Volatility ($\ln[\sigma_e^2]$)				**Asynchronicity (Φ)**			
		EQ = DDSTD measure		EQ = KZABS measure		EQ = DDSTD measure		EQ = KZABS measure	
Variable	Expected Sign	Before controlling beta Eq. (4)	After controlling beta Eq. (7)	Before controlling beta Eq. (4)	After controlling beta Eq. (7)	Before controlling beta Eq. (4)	After controlling beta Eq. (7)	Before controlling beta Eq. (4)	After controlling beta Eq. (7)
$EQ_{i,t-1}$	(+)	6.135*** (8.92)	4.551*** (6.92)	2.105*** (6.48)	1.835*** (6.00)	-9.223*** (-7.64)	0.878 (1.37)	-0.444 (-0.78)	1.225*** (4.42)
Other Control Variables		Included	Included	Included	Included	Included	Included	Included	Included
N		12,284	12,284	12,284	12,284	12,284	12,284	12,284	12,284
Adjusted R^2		39.77%	43.16%	39.36%	42.99%	36.96%	80.22%	36.46%	80.24%