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The impact of idiosyncratic risk on accrual management

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Abstract

Purpose – The purpose of this paper is to add an important new dimension to the earnings management literature by establishing a link between idiosyncratic risk and the degree of accrual management.
Design/methodology/approach – Based on a comprehensive sample of 44,599 firm-year observations during the period spanning 1987-2009, the study offers robust empirical evidence of the importance of firm-specific idiosyncratic volatility as a determinant of earnings manipulation. The authors use standard measures of earnings management and idiosyncratic volatility. The authors test the hypotheses with robust econometrics techniques.
Findings – The authors document a strong positive relationship between idiosyncratic risk and accruals management. Further, the authors find a positive association between residual volatility and discretionary accruals whether accruals are income inflationary or income deflationary. The findings are robust to alternate idiosyncratic risk proxies and variables associated with earnings management.
Originality/value – Overall, the knowledge derived from this study provides additional tools to assess the degree of earnings management by firms, and hence the quality of the financial reporting. Thus the findings will enable standard setters, financial market regulators, analysts, and investors to make more informed legislative, regulatory, resource allocation, and investment decisions.

Keywords Earnings management, Volatility

Paper type Research paper

1. Introduction

Roll (1988) initiated a debate regarding whether "synchronicity" (high R^2) or low idiosyncratic volatility is associated with more transparency or more opacity of firm-specific information. This debate remains as animated but inconclusive till date. Roll (1988) points out that his empirical finding of low R^2 for US firms could imply either "private information or occasional frenzy unrelated to concrete information." Several studies subsequent to that find corroborating evidence that low idiosyncratic volatility is related to poor information environment of the firm (e.g. see West, 1988; Ashbaugh-Skaife *et al.*, 2006; Bartram *et al.*, 2009; Wei and Zhang, 2006; Ali *et al.*, 2003; Kelly, 2007). In contrast several papers argue that low R^2 measure could capture a firm's informational transparency (e.g. see Bakke and Whited, 2010; Fernandes and Ferreira, 2008; Jin and Myers, 2006; Hutton *et al.*, 2009).

This debate has assumed greater significance recently as several studies have found world-wide increase in the firm-level of idiosyncratic risk. For example, Campbell *et al.* (2001) find a significant increase in firm-level volatility relative to market volatility[1]. The evidence in Campbell and Shiller (1988) and Vuolteenaho (2002) point to idiosyncratic volatility being affected by cost shocks that affect the firm's underlying cash flows. Other studies document dramatic increases in idiosyncratic risk following deregulation of product markets and rise in global competition, intensifying the forces of creative destruction in the economy (see Gaspar and Massa, 2006; Irvine and Pontiff, 2009; Chun *et al.*, 2008).

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Factors such as firm size, reduced corporate earnings and higher volatility, the nature of firms and their stage in life-cycle at the time of coming to capital market, increased product market competition, rise in institutional ownership over time, increase in growth options for firms are advanced as some of the possible causes for increase in the idiosyncratic volatility of a typical firm (e.g. Brown and Kapadia, 2007; Wei and Zhang, 2006; Malkiel and Xu, 2003; Bennett and Sias, 2006; Cao *et al.*, 2008; Fink *et al.*, 2010). Thus argument could be made that cross-sectional variation in idiosyncratic volatility across firms and its secular increase over time is largely beyond the direct control of firm's management. However if the increased idiosyncratic volatility is associated with poor information environment and to the extent investors demand greater risk premium for holding stocks with greater idiosyncratic volatility, then such firms face higher cost of capital. In addition if this idiosyncratic volatility accompanies variability in earnings as well that may exacerbate the poor information for such firms. In such circumstances management may have the incentive to manage earnings as a tool to dampen the negative consequence of increased idiosyncratic volatility on firm's share price and financing costs. Alternatively such "smoothed" earnings could help convey better information about the firm's prospects as Watts and Zimmerman (1986), Subramanyam (1996) argue that earnings management improves earnings informativeness. In contrast if increased idiosyncratic volatility helps improve firm's information environment then firm's management has lesser incentive to manage earnings. The primary focus of this study is to address whether idiosyncratic risk influences the degree to which corporate managers manipulate earnings.

Past research on earnings management has examined and identified an array of motivations that lead to earnings manipulation (see Healy and Wahlen, 1999). It has also been shown that firms opportunistically manipulate earnings for a host of reasons that range from attempting to influence bonuses (Healy, 1985; Guidry *et al.*, 1999; Gaver *et al.*, 1995) to inflating earnings prior to seasoned equity offerings (SEOs) and initial public offerings (Teoh *et al.*, 1998a, b; Rangan, 1998; Shivakumar, 2000)[2]. Hayn (1995) and Burgstahler and Dichev (1997) find evidence of earnings management consistent with income smoothing while Holthausen *et al.* (1995) conclude that managers may use accruals to shift earnings over time[3]. Firms use earnings management to boost the firm's stock price (Collins and Hribar, 2000), and to obtain lower cost financing (Dechow *et al.*, 1996). Other work has shown that managers inflate earnings in stock-financed acquisitions (Erickson and Wang, 1999) and prior to management buyouts (Perry and Williams, 1994). Beneish and Vargus (2002) present evidence that high accruals are associated with insider sales of shares while Bergstresser and Philippon (2006) report high accruals in firms where CEOs' compensation is tied to the value of stock and option holdings. It has also been documented that firms close to violating debt covenants manage their earnings to avoid default (Defond and Jiambalvo, 1994)[4]. In contrast to this strand of research which focuses on managerial discretion in reported earnings around a certain event, the focal point in this study is whether an inherent firm attribute, namely, idiosyncratic risk, is a major driving force behind earnings management. While the impact of these aforementioned linkages to earnings management has been well documented, the association between idiosyncratic risk of the firm and the degree to which the firm engages in earnings management remains unexplored. Our study bridges two important literatures, namely the idiosyncratic volatility literature that has recently gained significant attention among researchers with the body of research on earnings management.

Based on a comprehensive sample of 44,599 firm-year observations during the period spanning 1987-2009, our study offers robust empirical evidence of the importance of firm-specific idiosyncratic volatility as a determinant of earnings manipulation. We document compelling evidence that firms with high idiosyncratic volatility, or low synchronicity, are associated with greater degree of earnings management. Specifically, we find that the

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degree of discretionary accruals management for firms in the highest idiosyncratic volatility quintile is more than twice that for the lowest firm-specific risk quintile. Further, we document that the positive linkage between residual volatility and discretionary accruals is positive for both income-increasing and income-decreasing accruals.

Our results are robust to three different measures of firm-specific volatility including residuals from the Fama-French (1993) three-factor model, Carhart (1997) model, as well as the capital asset pricing model (CAPM). Our findings hold after controlling for firm characteristics that are known to influence earnings management, other types of volatility measures, asymmetric information proxies, market microstructure effects, and the firm's information environment proxied by institutional holdings and analyst following. Taken together, our analysis supports the view that firms that exhibit high idiosyncratic return variability strive to reduce what they perceive as "noise" volatility in their stock price by managing income in both directions.

It is important to note that our findings are in contrast to Hutton *et al.* (2009) who examine the link between stock return synchronicity with the market and the opacity of financial statements. They argue that when less firm-specific information is publicly available, individual stock returns follow the broad market more closely, resulting in higher stock price synchronicity with the market. They find positive link between opacity and synchronicity. Our paper uses different and more robust measures of opacity and synchronicity along with more reliable econometrics techniques than Hutton *et al.* (2009) study. More importantly in a recent paper, Datta *et al.* (2013, 2014) show that Hutton *et al.* (2009) results are weak at best or reverse under arguably more robust measures of opacity and econometric techniques. To the extent idiosyncratic volatility is associated with product market competition (see Gaspar and Massa, 2006), our results are consistent with a recent study of Datta *et al.* (2013, 2014) who find that firms with weak market power or industries with more intense competitive forces are associated with greater earnings management.

Overall, the evidence casts doubt on the view that high idiosyncratic volatility (low R^2) implies that the stock price is more efficient at capturing firm-specific information. Our analysis is consistent with Ashbaugh-Skaife *et al.* (2006) and Bartram *et al.* (2009) that high firm-specific uncertainty contributes to noise volatility undermining the informativeness of stock prices.

The paper is organized as follows. In the next section, we discuss the recent literature on idiosyncratic volatility and present testable hypotheses relating idiosyncratic risk to accruals management. Section 3 details the sample formation process, sample description, and the measures used to capture idiosyncratic risk and earnings management. The empirical findings are presented in Section 4. Section 5 concludes.

2. Background and hypotheses development

Idiosyncratic volatility has a role either in information transparency or opacity. According to Roll (1988), "synchronicity" (high R^2) or low idiosyncratic volatility could be associated with more transparency or more opacity of firm-specific information. On one side of this debate, several studies document that high idiosyncratic volatility firms are associated with poor information environment (see e.g. West, 1988)[5]. Generally, idiosyncratic volatility literature uses R^2 or volatility of the residuals obtained from a regression of stock returns on either a market index or return from a multifactor asset-pricing model to measure idiosyncratic volatility. Bartram *et al.* (2009) document that firm-specific variability is lower in countries with greater transparency. They also find that idiosyncratic volatility declines as transparency increases. Further, Wei and Zhang (2006) and Kelly (2007) document that US firms with poor information environments display greater volatility and conclude that low R^2 is not an index for stock price informativeness. Analyzing six developed countries with large equity markets, Ashbaugh-Skaife *et al.* (2006) find no support for the

argument that R^2 is a measure of firm-specific information being impounded into stock prices. Further, Pastor and Veronesi's (2003) learning model predicts that younger firms exhibit higher idiosyncratic risk which declines with time as investors learn more about the firm's profitability prospects indicating that higher idiosyncratic volatility implies lack of information.

Earnings management is one avenue for managers to proactively diminish firm-specific risk and limit the associated negative consequences on share price and financing costs. Watts and Zimmerman (1986) posit that earnings management could provide more information about earnings and hence enhance the precision of the earnings signal. Subramanyam (1996) concludes that managerial discretion in earnings management improves earnings informativeness. It has been established that earnings management can be beneficial to the price discovery process by improving earnings informativeness as managers use their discretion in conveying their assessment of future earnings (see Ronen and Sadan, 1981; Sankar and Subramanyam, 2001; Kirschenheiter and Melumad, 2002; Tucker and Zarowin, 2006). Further, Badertscher *et al.* (2008) show that accruals can be more or less informative depending on the motivation behind earnings management, namely whether it is opportunistic or informational. If firm-level volatility is unduly high, then the role of stock price as a "signal" of the true value of the firm is diminished and therefore managers will rely on accruals management to enhance the informativeness of earnings. Given the above evidence, we reason that firms with high idiosyncratic volatility are motivated to improve the informativeness of their earnings through accruals management to reduce the spillover of volatility into stock returns and posit the following hypothesis:

H1. Firms with higher idiosyncratic volatility will engage in more earnings (discretionary accruals) management.

On the other side of the idiosyncratic volatility and information transparency debate it is argued that high firm-specific volatility, and hence low R^2, reflects more transparency as firm-specific price movements capturing private information is capitalized more efficiently into stock prices and future earnings by informed risk arbitrageurs (see Morck *et al.*, 2000; Durnev *et al.*, 2003; Ferreira and Laux, 2007). Morck *et al.* (2000) find price synchronicity in emerging economies is greater than that in developed countries and attribute this to the strong investor property rights in developed economies. Durnev *et al.* (2000) show that higher firm-specific uncertainty corresponds to informed trading which they conclude leads to stock prices tracking fundamentals more closely.

More recently, Jin and Myers (2006) and Hutton *et al.* (2009) conclude that R^2 increases with information opacity. It is argued that when there is a lack of firm-specific information transparency, investors will rely more on publicly available information that contribute to higher correlation between stock price and the market. Jin and Myers (2006) posit that information opacity shifts firm-specific risk from investors to managers[6]. One can argue that if high idiosyncratic volatility is associated with greater information, then managers have lesser need to manage earnings to help investors in price discovery. Based on the above argument, we propose the following hypothesis, as an alternative to *H1*:

H2. Firms with higher idiosyncratic volatility will engage in less earnings (discretionary accruals) management.

3. The sample and measurements of key variables

3.1 Sample formation

Our sample selection process starts by including all firms in the Compustat database during the period 1987-2009. The beginning of our sample period is determined by the availability of the key variable, cash flow from operations, to estimate accruals. We also require that the

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sample firms be covered in the Center for Research in Securities Prices (CRSP) monthly files and trade on NYSE, Amex, and Nasdaq exchanges and whose securities correspond to common equity (CRSP share code between 10 and 19). We drop firms that changed their fiscal year-end during the sample and confine our analysis to firms based in the USA. To remove the effect of small firms, we restrict our attention to firms that have at least $1 million in sales and assets. We define each firm's industry based on Fama-French 49 industry classification. We drop financials ("banks," "trading," "insurance," and "real estate") from our sample because of the differential nature of their financial statements and also eliminate utilities as they are subject to regulations. Finally, we delete all firm-years with inadequate data to calculate discretionary accruals or any of the variables needed to estimate the cross-sectional modified Jones model with Kothari *et al.*'s (2005) adjustment for firm performance. The above selection criteria yield a maximum sample of 44,599 firm-year observations representing 6,157 unique firms spanning 36 (Fama-French) industries.

3.2 Measuring idiosyncratic volatility

We construct two metrics of idiosyncratic volatility using the residuals from the three-factor Fama and French (1993) model and the Carhart (1997) four-factor model (which includes Fama and French's three factors plus momentum)[7]. The residual volatility is defined as the sum of the squared residuals obtained from each of the two aforementioned models. We follow the computational method of Malkiel and Xu (2004) and Gaspar and Massa (2006) to obtain the residuals. To compute the daily residuals for the Fama-French model, we simply regress daily return on the market index, firm size, and book-to-market ratio factors for each month and each stock in the sample period. The daily residuals for the four-factor model are computed by adding the momentum factor to the Fama-French model. Idiosyncratic return volatility for the current month is the sum of the squares of the daily residuals. The annual idiosyncratic volatility is the sum of the monthly idiosyncratic volatilities within the year. We analyze residual volatility with accruals derived on the basis of fiscal year, the yearly residual volatility here is based on the fiscal year. For example, if a firm had the fiscal year ending on December 31, 1995, the residual volatility for the year 1995 for this firm is computed by summing preceding 12 months' residual volatility. Our regressions use the log of idiosyncratic volatility to address the concerns raised in the literature (Goyal and Santa-Clara, 2003; Malkiel and Xu, 2003).

3.3 Measurement of earnings management

To estimate accruals management we have to distinguish between two types of accruals: non-discretionary accruals that are indispensible accounting adjustments and discretionary accruals made at the discretion of managers to manipulate earnings. Because not all accruals are the result of opportunistic manipulation by managers, we first estimate non-discretionary accruals and extract it from total accruals to derive the discretionary component. We use the Kothari *et al.* (2005) model to capture discretionary accruals. Discretionary accruals are estimated using the cash flow data from the statement of cash flow in Compustat[8].

This methodology derives discretionary accruals in two stages. First, total accruals variable (defined as the difference between net income and cash flows from operations) is regressed on key variables that are expected to influence it. Specifically, we estimate non-discretionary accruals from cross-sectional regressions of total accruals (TACC) on changes in sales minus change in receivables, property, plant, and equipment (PPE), and lagged return on assets (ROA) for each Fama-French industry SIC classification. We include lagged ROA as an additional regressor to control for the effect of performance on a firm's accruals. We run the following cross-sectional OLS regression using Fama-French industry code to estimate the coefficients α_1, α_2, and α_3 in each fiscal year. These cross-sectional regressions

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require a minimum of 15 observations for each year and Fama-French industry combination. Our methodology of running cross-sectional OLS regressions using minimum number of firms in each year and industry classification is consistent with vast literature on earnings management. This methodology is based on the assumption that firms in an industry at a certain point in time are homogeneous with respect to their underlying operations and structure and thus the estimated coefficients α_1, α_2, and α_3 apply to all firms:

$$\frac{TA_{it}}{A_{it-1}} = \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta AR_{it}}{A_{it-1}} \right) + \alpha_3 \frac{PPE_{it}}{A_{it-1}} + \alpha_4 ROA_{it-1} + \varepsilon_{it} \quad (1)$$

where i indexes firms, t indexes time. TA_{it} is the net income (Compustat variable, NI) – cash flow from operations (Compustat variable, OANCF). ΔREV_{it} is the changes in sales (Compustat variable, SALE), ΔAR_{it} is the change in receivables (Compustat variable, RECT), and PPE is the total property, plant, and equipment (Compustat variable, PPEGT). All these variables are scaled by lagged value of assets (Compustat variable, AT). ROA_{it-1} in (1) is measured using $NetIncome_{it-1}/A_{it-1}$. We use the estimated coefficients $\hat{\alpha}_1$, $\hat{\alpha}_2$, $\hat{\alpha}_3$, and $\hat{\alpha}_4$ to compute discretionary accrual as follows:

$$DA_{it} \equiv \varepsilon_{it} = \frac{TA_{it}}{A_{it-1}} - \left(\hat{\alpha}_1 \frac{1}{A_{it-1}} + \hat{\alpha}_2 \left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta AR_{it}}{A_{it-1}} \right) + \hat{\alpha}_3 \frac{PPE_{it}}{A_{it-1}} + \hat{\alpha}_4 ROA_{it-1} \right) \quad (2)$$

Large values of discretionary accruals are generally construed to indicate earnings management. Because discretionary accruals could be positive (when firms inflate earnings) or negative (when in good years managers conceal earnings for future use), both positive and negative values capture earnings management. To reduce the influence of outliers, we winsorize the variables at 1 and 99 percent levels.

3.4 Sample description

Panel A of Table I we present several salient descriptive statistics for our sample firms. All the variables are defined in the Appendix. The sample firms have a median (mean) market capitalization of $191 million ($1,972 million). The median (mean) asset growth rate for our sample is 6.50 (17.67) percent. We compute four metrics of volatility: volatility of sales, volatility of ROA, volatility of cash flow, and standard deviation of daily returns. The medians for ROA volatility and cash flow volatility are similar in magnitude at 4.22 and 4.54 percent, respectively, while the median sales volatility is 13.62 percent. The median proportion of institutional holdings is 41.24 percent with an average of three analysts following our sample firms.

Also in Panel A of Table I we present summary statistics for our measures of firm-specific risk and absolute discretionary accruals. Because the three residual volatility measures are very close in magnitude and in their impact on discretionary accruals, for parsimony, we only report statistics for residuals obtained from the three and four factor models. The means for both measures of residual volatility are of similar magnitude with 4.45 percent for that obtained from four-factor model and 4.18 percent obtained from the Fama-French model. The medians are close in value to the mean residuals. The mean and median discretionary accruals of −0.116 and −0.177 percent, respectively, indicate that the size of negative accruals that firms engage in is greater than the size of positive accruals. The mean absolute level of discretionary accruals for our sample is 9.22 percent of lagged assets, similar to figures reported in the literature.

Panel B of Table I reports the firm characteristics of the two subsamples based on whether the firm engages in income-increasing or income-decreasing accruals management. Consistent with previous results in the literature, the absolute value of positive discretionary

Panel A: firm characteristics, earnings management and idiosyncratic risk metrics

Variables	Observations	Mean	Median	SD	25th percentile	75th percentile
Firm characteristics						
Market capitalization ($ millions)	44,599	1,972.15	191.01	8,290.61	43.93	864.21
Asset growth	44,599	17.67	6.50	58.30	−3.88	22.31
Leverage	44,478	15.87	10.78	17.10	0.22	26.74
Market-to-book ratio	44,599	3.19	1.98	11.84	1.16	3.90
Return on assets (ROA)	44,599	−3.07	3.10	24.00	−4.32	7.53
Sales volatility (%)	40,192	21.18	13.62	24.39	6.06	26.21
ROA volatility (%)	44,599	9.98	4.22	17.75	1.75	10.67
Cash flow volatility (%)	38,985	6.76	4.54	7.32	2.39	8.36
Standard deviation of daily return (%)	44,599	4.10	3.54	2.62	2.38	5.14
Institutional holdings (%)	42,111	43.46	41.24	29.78	16.48	67.81
Number of analysts	44,599	5.48	3.00	6.85	0.00	8.00
Earnings management and idiosyncratic risk metrics						
Discretionary accrual	44,599	−0.116	−0.177	22.08	−5.593	5.445
Absolute discretionary accrual	44,599	9.220	5.518	12.54	2.420	11.170
Fama-French idiosyncratic risk	44,599	4.449	1.466	8.96	0.541	4.121
Four-factor idiosyncratic risk (Carhart)	44,599	4.176	1.361	8.45	0.502	3.852

Panel B: statistics for income-increasing and income-decreasing accruals subsamples

	Income-increasing accruals ($N = 21,844$)		Income-decreasing accruals ($N = 22,755$)	
Variables of interest	Mean	Median	Mean	Median
Absolute discretionary accruals	9.39	5.61	9.08	5.42
Fama-French idiosyncratic risk	4.37	1.51	4.53	1.43
Four-factor idiosyncratic risk	4.10	1.40	4.25	1.33
Market capitalization	1,965.43	164.13	1,978.61	223.20
Asset growth	20.83	8.63	14.64	4.52
Leverage	16.03	10.96	15.71	10.58
Market-to-book ratio	3.12	1.97	3.25	1.98
ROA	−0.27	3.88	−5.74	2.21
Sales volatility (%)	21.95	13.91	20.47	13.34
ROA volatility (%)	9.76	4.05	10.20	4.39
Cash flow volatility (%)	6.84	4.48	6.69	4.60
Standard deviation of daily returns	4.13	3.57	4.08	3.52
Institutional holdings (%)	40.99	37.98	45.81	44.56
Number of analysts	5.07	3.00	5.87	3.00

Notes: This table reports summary statistics for some salient focus-relevant characteristics of our sample. The statistics are based on maximum of 44,599 firm-year observations drawn from the Compustat database spanning the period 1987-2009 for firms meeting our data requirements. These represent 6,157 unique firms spanning 36 Fama-French industries. In Panel B, we report mean values with medians in parentheses. All variables are as defined in Appendix

Table I.
Descriptive statistics

accruals are on average larger in magnitude (median 5.61%) than the absolute value of negative discretionary accruals (median 5.42%). However, we find that the incidence of income-decreasing accruals is about 4 percent more than that of income-increasing activities. These two subsamples are indistinguishable in terms of market capitalization, idiosyncratic volatility, market-to-book ratio, leverage, and volatility (regardless of whether volatility is measured in terms of sales, cash flow, ROA, or stock returns). However, the two subgroups differ along a few characteristics, such as the growth in assets and ROA where income-increasing firms experience greater growth and higher ROA. Further, the income-increasing subsample exhibits lower institutional holdings and analyst coverage indicating that external monitoring of the firm reduces the likelihood of these firms engaging in income-enhancing activities.

4. Empirical findings

4.1 Univariate analysis of the linkage between idiosyncratic volatility and accruals management

This section presents univariate results on the association between firm-specific volatility (from four-factor model) and earnings management. Table II reports the Pearson correlations between the variables used in the analysis. The residual volatility is not correlated with market-to-book ratio (−0.009) while mildly related to firm size (−0.081), leverage (−0.06), asset growth (−0.068), and volatility of sales (0.07). Correlation between ROA and firm-level volatility is significantly negative (−0.275) which is in support of Wei and Zhang's (2005) results of a strong negative link between profitability and idiosyncratic volatility[9]. As expected, the higher the institutional holdings, the larger the number of analyst following with a correlation of 0.50 between these two variables. Finally, firms with higher idiosyncratic volatility are characterized with lower institutional holdings (correlation −0.227) and fewer analysts' coverage (−0.196). This finding corroborates the results in Kelly (2007) and supports the view that firms with high firm-specific risk have a worse information environment.

In Table III, we stratify firms at the end of each fiscal year into firm-specific volatility quintiles in ascending order based on contemporaneous four-factor model residuals (Panel A) and Fama-French model residuals (Panel B). For each quintile, we report the time-series mean and median absolute level of discretionary accruals. It is noteworthy that the mean absolute level of discretionary accruals for each quintile is significantly different from zero. The univariate results for the whole sample show that the absolute level of discretionary accruals increases monotonically with firm-level volatility. Specifically, for four-factor model residuals in Panel A, the median absolute level of discretionary accruals for the highest idiosyncratic volatility group, 8.27 percent of firm assets, is more than twice the level of accruals for firms with the lowest firm-specific uncertainty (3.87 percent). The difference between the medians and means of absolute level of accruals for the two extreme quintiles are highly statistically significant ($< 1\%$ level).

The results in Panel B are almost identical to those in Panel A, confirming that the relationship between firm-specific volatility and earnings management is robust to different idiosyncratic volatility measures. In unreported results, we also find that the same relationship holds when we use residuals obtained from the CAPM. Overall, the results presented in this section are robust and consistent with the notion that firms that experience lower (higher) idiosyncratic volatility display a lower (higher) propensity to engage in earnings management.

Columns 4-7 of Table III, which report income-decreasing and income-increasing discretionary accruals for the same idiosyncratic volatility quintiles, reveal a number of interesting empirical findings. First, we observe that the results for the two subsamples, partitioned by income-decreasing and income-increasing accruals, echo those obtained for the whole sample. These results indicate that the linkage between firm-specific risk and discretionary accruals is positive regardless of whether accruals are income inflationary or deflationary in nature. Second, the data show that, for the first four quintiles, the mean magnitude of income-increasing discretionary accruals is consistently larger than those in the corresponding quintile with income-decreasing accruals (for both measures of firm-specific volatility). This suggests a slightly greater tendency to inflate (rather than deflate) earnings across the four lowest firm-specific risk groups. Interestingly, firms experiencing the highest level of idiosyncratic variability have net negative accruals.

4.2 Multivariate analysis

4.2.1 All accruals. In this section we examine the link between idiosyncratic volatility and accruals management in a multivariate setting, controlling for the standard salient

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Table II.
Pearson correlation between various independent variables

Variables	Market capitalization	Asset growth	Leverage	Market-to-book	Return on assets (ROA)	Sales volatility	ROA volatility	Cash volatility	SD of returns	Institutional holdings	Number of analysts
Four-factor idiosyncratic risk	*−0.081*	*−0.068*	*−0.060*	−0.009	*−0.275*	*0.070*	*0.195*	*0.159*	*0.611*	*−0.226*	*−0.196*
Market capitalization		*0.017*	*0.022*	*0.034*	*0.096*	*−0.061*	*−0.079*	*−0.100*	*−0.153*	*0.170*	*0.446*
Asset growth			*0.031*	*0.048*	*0.157*	*0.342*	0.007	*0.232*	*−0.021*	*0.037*	*0.049*
Leverage				*0.003*	*0.062*	*−0.103*	*−0.133*	*−0.209*	*−0.114*	*0.111*	*0.087*
Market-to-book ratio					*−0.046*	*0.035*	*0.067*	*0.108*	*0.011*	*0.013*	*0.034*
Return on assets						*0.038*	*−0.576*	*−0.229*	*−0.389*	*0.238*	*0.177*
Sales volatility (%)							*0.137*	*0.335*	*0.152*	*−0.129*	*−0.101*
ROA volatility (%)								*0.425*	*0.341*	*−0.214*	*−0.155*
Cash flow volatility (%)									*0.305*	*−0.236*	*−0.201*
SD of daily returns										*−0.398*	*−0.323*
Institutional holdings (%)											*0.502*

Notes: This table reports the Pearson correlations between key focus-relevant characteristics of our sample. The statistics are based on maximum of 44,599 firm-year observations drawn from the Compustat database spanning the period 1987-2009 for firms meeting our data requirements. See Appendix for variable definitions. Correlations significant at 1% level are in italic

Idiosyncratic risk	Observations	Mean (median)	Observations	Mean (median)	Observations	Mean (median)
Panel A: four-factor residual idiosyncratic risk and absolute discretionary accruals						
Quartiles of volatility	All discretionary accruals		Income decreasing accruals		Income increasing accruals	
Lowest	8,875	6.01 (3.87)	4,610	5.70 (3.92)	4,265	6.35 (3.83)
R2	8,944	7.34 (4.67)	4,662	7.13 (4.70)	4,282	7.57 (4.62)
R3	8,943	8.96 (5.57)	4,487	8.63 (5.31)	4,456	9.28 (5.85)
R4	8,941	10.87 (6.67)	4,479	10.71 (6.57)	4,462	11.04 (6.77)
Highest	8,896	12.91 (8.27)	4,517	13.25 (8.43)	4,379	12.56 (8.15)
Panel B: three-factor residual idiosyncratic risk and absolute discretionary accruals						
Lowest	8,875	5.98 (3.86)	4,599	5.65 (3.93)	4,276	6.32 (3.81)
R2	8,941	7.28 (4.60)	4,680	7.08 (4.58)	4,261	7.51 (4.63)
R3	8,946	9.08 (5.61)	4,491	8.81 (5.43)	4,455	9.36 (5.84)
R4	8,940	10.81 (6.70)	4,471	10.61 (6.61)	4,469	11.01 (6.78)
Highest	8,897	12.94 (8.20)	4,514	13.28 (8.32)	4,383	12.59 (8.16)

Notes: This table shows the summary statistics of absolute level of all discretionary accruals, as well as income decreasing and increasing accruals partitioned by idiosyncratic volatility quintiles during the sample period 1987-2009. We use two measures of idiosyncratic volatility based on Fama and French (1993) three-factor and Carhart (1997) four-factor models. The first (last) quintile represents firms with the lowest (highest) idiosyncratic volatility. The idiosyncratic volatility measures are defined in Appendix. The firm-years are divided into income increasing and income decreasing on the basis of the sign of discretionary accruals. The sample consists of maximum of 44,599 firm-year observations. The number of observations in each quintile varies slightly due to ties

Table III.
The effect of idiosyncratic volatility on the absolute level of discretionary accruals

determinants of discretionary accruals. To test our hypotheses, we estimate various configurations of the following model:

$$Absolute\ Discretionary\ Accruals_{jt} = \alpha + \gamma + \beta_1\ Idiosyncratic\ volatility_{jt} + \lambda\ Controls_{jt} + \varepsilon_j \quad (3)$$

where, α represents year dummies to control for business cycle effects, γ captures industry fixed effects to control for differences across industries, and ε is the error term. *Controls* represents a vector of firm-level control variables. All the standard errors in the regressions are clustered at the firm level. The dependent variable in the regression is the absolute discretionary accruals deflated by previous year's total assets while our focus variable is the logarithmic-transformed idiosyncratic volatility generated from the four factor asset pricing model. We measure idiosyncratic volatility for the same fiscal year for which discretionary accruals are computed.

In choosing the control variables, we utilize firm characteristics documented in the literature to be relevant to earnings management. Specifically, we include firm size, leverage, growth in assets, market-to-book ratio, and a number of volatility variables. *Market Cap* is the natural logarithmic transformation of contemporaneous market capitalization. It has been argued that larger firms have lesser incentives to manipulate earnings as political costs for such action is higher for these firms while smaller firms have greater propensity to manage earnings because of limited access to capital markets. *Asset Growth* is calculated as the change in assets scaled by one-year lagged assets. We include leverage in the model specification because firms with high leverage have been associated with proximity to the violation of debt covenants, such firms may use discretionary accruals to manage earnings upward (Defond and Jiambalvo, 1994). *Leverage* is defined as the ratio of contemporaneous long-term debt divided by one-year lagged assets. We include natural logarithm of equity market-to-book ratio to control for growth opportunities. Equity *Market-to-Book* ratio is defined as contemporaneous market

capitalization to book value of the equity. Sales *Volatility*, *ROA Volatility* and *Cash Flow Volatility* are calculated as the standard deviation of actual sales, ROA, and cash flow for the preceding three-year period, respectively, scaled by one-year lagged assets.

To the extent that non-systematic stock price volatility is derived from volatility in fundamental firm factors (such as sales or cash flows), the inclusion of sales and cash flow volatility measures as control variables will reduce the influence of our residual variable that proxies for firm-specific risk. We include these three volatility measures in the regression explaining absolute discretionary accruals as per Hribar and Nichols (2007). When explaining positive and negative accruals separately, we include only one of these variability measures as an independent variable.

The results for various regression specifications are presented in Table IV. In the basic model (Model 1) without any control variables, the coefficient estimate for the firm-specific uncertainty is positive, 1.67, and highly significant (p-value < 0.0001). In Model 2, we include a set of control variables shown in the literature to be important determinants of discretionary accruals. The findings reveal that even after controlling for firm characteristics our analysis documents that there is a strong positive association between idiosyncratic volatility and absolute discretionary accruals. In particular, we show that idiosyncratic volatility has significant incremental explanatory power beyond the variables that capture additional information on firm's riskiness, namely *Sales Volatility*, *ROA Volatility*, *Cash Flow Volatility*, *Market-to Book* ratio, and *Leverage*. Confirming results from our univariate analysis and in support of *H1*, the multivariate results establish for the first time that there is a strong positive relationship between firm-specific volatility and the degree of discretionary accruals management.

These findings support the notion that managers' dislike of firm-specific volatility induces them to engage in earnings management in an attempt to diminish investor perceptions of fluctuations in earnings. Another plausible interpretation of these results arises from the findings in John *et al.* (2008). They argue that managers in poorly governed firms pass up value enhancing risky projects and instead opt for conservative investments in order to protect private benefits. Their study finds that better governance is associated with higher firm-level riskiness. Our results imply that managers from better-governed firms might have incentives to reduce earnings volatility through accruals management.

The signs of the coefficients for the control variables are consistent with expectations. Across all models, the coefficients of the control variable *Asset Growth* indicates that firms with higher growth engage more aggressively in accruals management. The negative coefficient for *Leverage* indicates that firms with higher leverage have lower propensity to manage earnings which does not corroborate Defond and Jiambalvo's (1994) proposition that highly levered firms are closer to violating debt covenants and hence are more likely to manage earnings. The results also reveal a significant inverse relation between market capitalization and earnings management, which we interpret to imply that larger firms, typically subject to a greater degree of monitoring by market participants, engage in less earnings manipulation. All coefficients on the different volatility variables (sales, cash flow, and ROA) are significant and positively related to the degree of accruals-based earnings management, consistent with Bergstresser and Philippon (2006).

In Model 3, we include the cross-product term *Idio-Risk* × *Market cap* to examine whether our results are driven by smaller firms with high idiosyncratic volatility that may have greater incentives to manipulate earnings due to more limited access to capital markets. The significant coefficient on the interaction term indicates that smaller firms with higher firm-specific volatility manage discretionary accruals more. However our main variable of interest, that is firm-specific uncertainty continues to show positive and significant coefficients.

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Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Idio-Risk	1.665 (< 0.0001)	0.388 (< 0.0001)	0.602 (< 0.0001)	0.271 (0.0001)	0.507 (< 0.0001)	0.223 (0.006)	0.348 (< 0.0001)	0.389 (< 0.0001)	0.232 (0.002)
Idio-Risk × *Market Cap*			−4.512 (0.020)						
Idio-Risk × *Market-to-book*				21.905 (< 0.0001)					
Institutional Holdings					−0.037 (< 0.0001)				
Idio-Risk × *Institutional Holdings*					−0.542 (0.001)				
Number of analysts						−0.1175 (0.134)			
Idio-Risk × *Nasdaq*							0.187 (< 0.0001)		
Idio-Risk × *SEO (SEO = 1)*								0.071 (0.091)	
Log (SD Daily Returns)						0.9104 (0.024)			0.6730 (0.009)
Market Cap		−0.491 (< 0.0001)	−0.702 (< 0.0001)	−0.471 (< 0.0001)	−0.357 (< 0.0001)	−0.223 (0.023)	−0.562 (< 0.0001)	−0.488 (< 0.0001)	−0.448 (< 0.0001)
Market-to-Book		0.694 (< 0.0001)	0.719 (< 0.0001)	1.514 (< 0.0001)	0.623 (< 0.0001)	0.401 (0.002)	0.766 (< 0.0001)	0.696 (< 0.0001)	0.667 (< 0.0001)
Sales Volatility		0.007 (0.046)	0.007 (0.050)	0.007 (0.036)	0.006 (0.075)	0.006 (0.113)	0.007 (0.049)	0.007 (0.045)	0.007 (0.055)
Cash Flow Volatility		0.158 (< 0.0001)	0.157 (< 0.0001)	0.157 (< 0.0001)	0.141 (< 0.0001)	0.207 (< 0.0001)	0.157 (< 0.0001)	0.158 (< 0.0001)	0.156 (< 0.0001)
ROA Volatility		0.187 (< 0.0001)	0.187 (< 0.0001)	0.187 (< 0.0001)	0.218 (< 0.0001)	0.195 (< 0.0001)	0.186 (< 0.0001)	0.187 (< 0.0001)	0.186 (< 0.0001)
Asset Growth		4.007 (< 0.0001)	4.057 (< 0.0001)	3.976 (< 0.0001)	4.225 (< 0.0001)	3.995 (< 0.0001)	4.091 (< 0.0001)	4.033 (< 0.0001)	3.995 (< 0.0001)
Leverage		−1.621 (< 0.0001)	−1.629 (< 0.0001)	−1.578 (< 0.0001)	−1.434 (0.000)	−1.427 (0.001)	−1.987 (< 0.0001)	−1.610 (< 0.0001)	−1.642 (< 0.0001)
Intercept	0.1282 (< 0.0001)	0.1055 (< 0.0001)	0.1166 (< 0.0001)	0.0998 (< 0.0001)	0.1152 (< 0.0001)	0.1124 (< 0.0001)	0.1095 (< 0.0001)	0.1054 (< 0.0001)	0.1210 (< 0.0001)
R^2	0.113	0.238	0.238	0.238	0.245	0.244	0.238	0.238	0.238
Observations	44,525	38,809	38,809	38,809	36,761	28,740	38,809	38,809	38,809

Notes: This table reports the results of OLS regressions examining the impact of idiosyncratic volatility on absolute discretionary accruals. The statistics are based on maximum of 44,599 firm-year observations spanning 1987-2009. The dependent variable is the absolute level of discretionary accruals measured using Kothari *et al.* (2005) model. *Idio-Risk*, *Market Cap*, *Market-to-Book*, and *Number of Analysts* variables are in the logarithmic form of the respective variables. All variables are divided by 100 except for *Sales Volatility*, *Cash Flow Volatility*, *ROA Volatility*, and dummy variables *Nasdaq* and *SEO*. Variables are defined in Appendix. Regressions include industry and year effects. *t*-statistics (in parentheses) are computed with standard errors adjusted for firm-level clustering

Table IV.
Multivariate analysis explaining the impact of idiosyncratic risk on earnings management

4.2.2 Robustness checks. In this section, we conduct a battery of robustness checks to validate the importance of idiosyncratic volatility as a determinant of the degree of earnings management. Our results could be influenced by idiosyncratic volatility being correlated with asymmetric information. Generally speaking, the literature considers firms with high growth opportunities to be associated with high informational asymmetry. We control for this possibility by including market-to-book ratio in all the models that include the vector of control variables (Models 2-9). The results based on all specifications indicate that firms with higher growth opportunities engage in more discretionary accruals activities. Model 4 introduces an interaction term between firm specific risk and growth opportunities. This interaction term is also positive and highly significant. Given that innovative firms exhibit larger idiosyncratic risk (Pastor and Veronesi, 2003), the coefficients on this variable imply that high growth firms with high idiosyncratic volatility are more likely to engage in larger accruals management. Our test variable, idiosyncratic volatility, remains statistically significant indicating that it has incremental explanatory power over and above all the previously identified determinants of accruals management, as well as the informational asymmetry variable.

We consider other variables that have a bearing on informational asymmetry arising from the firm's information environment. The private information search activities and scrutiny by investment professionals, such as institutional holdings and analyst coverage serve to diminish informational asymmetry as well as reduce the propensity of the firm to engage in earnings management. Previous work has shown that analysts' following and institutional holdings play a key role in monitoring and disseminating information on the firm and thereby reducing informational uncertainties. Empirical evidence shows that larger number of analysts following corresponds with larger amount of information produced about the firm (see e.g. Lang and Lundholm, 1996).

To control for private information produced by institutions and analysts, we include institutional holdings in Model 5 and employ the number of analysts following the firm to measure analyst coverage in Model 6. In Model 5, we also incorporate an interaction term between institutional holdings and idiosyncratic volatility. The coefficient for institutional holdings and the interaction term in Model 4 are both negative and significant indicating that institutional holdings have an impact on the degree of accruals management undertaken by the firms. Similarly, the coefficient for the number of analyst following is also negative indicating that firms with greater analysts following are less likely to engage in earnings manipulation; however, it is not statistically significant at conventional levels. In both models, the central test variable remains robustly significant.

In Models 6 and 9 we incorporate another risk measure, namely, the logarithm of standard deviation of daily stock returns. Again, the firm-specific volatility coefficient is positive and significant. In summary, by incorporating variables such as firm size, market-to-book ratio, cash flow volatility, analyst coverage, institutional holdings, and other volatility measures, we demonstrate that these proxies for information uncertainty do not drive our central finding.

Another potential concern is that microstructure issues of small and illiquid stocks may be influencing our results. Previous work contrasts NYSE and Nasdaq markets and concludes that there are significant and key microstructure and institutional differences between the two markets in terms of trading costs, transparency of trading, and informational fragmentation (see e.g. Biais, 1993; Christie and Huang, 1994). To test for this possibility, we employ a dummy variable to proxy for liquidity effects. In one specification, Model 7, we include an interaction term between idiosyncratic volatility and an exchange dummy variable, Nasdaq, which takes the value of one if the firm trades on the Nasdaq and zero otherwise. Our test variable remains robust to the inclusion of this interaction term, indicating that exchange related factors do not drive the results[10].

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Further, we control for the fact that management of reported earnings can sometimes cloud the firms' true fundamentals by rendering earnings less informative. Teoh *et al.* (1998a) document that opportunistic earnings management is more likely when a firm undertakes a SEO. A possible concern may be that our findings are perhaps capturing the possibility of firms with higher firm-specific risk being engaged in SEOs. To address this issue, we obtain all SEOs made during our sample period from the Securities Data Company. We find that 568 of our sample firms made 824 SEOs in the same fiscal year of their earnings management.

In Model 8, we include an interaction term between idiosyncratic volatility and a dummy variable, SEO, that takes a value of one if the firm made a secondary equity offering and zero otherwise. While the coefficient of this interaction term is significantly positive, 0.07, our idiosyncratic volatility focus variable remains significant, indicating that our finding is not limited to managers opportunistically managing accruals prior to SEOs.

We also re-estimate the models in Table IV using alternative estimates of residual volatility. In unreported results, we obtain analogous results using estimates of idiosyncratic volatility obtained from the CAPM and the Fama-French multifactor model, indicating that our results are robust to alternative measures of idiosyncratic volatility. In sum, the robustness tests indicate that our results are invariant to different measures of idiosyncratic volatility and different set of independent variables that control for asymmetric information, market microstructure effect, managerial opportunism, and information search activities by institutional holdings and analysts' following. These findings offer compelling empirical support for the hypothesis that earnings management is a mechanism that is used more aggressively by firms with high firm-specific volatility[11].

4.2.3 Idiosyncratic volatility effect on income-increasing and income-decreasing accruals. Managers use their discretionary power to increase reported earnings as well as to manage them lower. To establish whether firm-specific risk is associated with both types of discretionary accruals, we re-estimate the regression models in Table IV by partitioning our sample firms into those that engaged in income-decreasing and increasing accruals. The dependent variable in these regression specifications is the absolute discretionary accruals deflated by previous year's total assets.

The results in Panels A and B of Table V affirm our earlier results for both positive and negative discretionary accruals of a strong positive association between firm-specific volatility and earnings management. The magnitude of the estimates for our focus variable, *Idio-Risk*, is somewhat larger for the income-decreasing accruals subsample indicating a greater influence of idiosyncratic volatility on downward management of reported earnings. These findings confirm the view that firms with high idiosyncratic volatility strive to reduce what they perceive as "noise" volatility by managing income in both directions with the aim of reducing the stock price volatility of the firm.

All control variables are of the expected sign and significant in all the models. The coefficients are of similar magnitude with the exception of the market capitalization coefficient that is generally two and a half times larger for income-increasing accruals, while the ROA volatility coefficients are about twice as high for the income-decreasing accruals sample indicating differences in relevance of some firm characteristics. We conduct all the tests done in Table IV by controlling for informational asymmetry, private information production activity, managerial opportunism, and market microstructure effect. The results echo those obtained for the full sample except for the analyst coverage variable. In particular, we find that greater scrutiny from more analyst coverage significantly decreases income-increasing activity. Interestingly, firms' income-decreasing activity is higher in the presence of greater analyst coverage. We also find our results are robust to alternate measures of idiosyncratic volatility (obtained from CAPM and Fama-French model) and to accruals estimated using modified Jones model.

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Table V.
Influence of idiosyncratic risk on income-decreasing and income-increasing discretionary accruals

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Panel A: income-decreasing discretionary accruals									
Idio-Risk	1.887 (< 0.0001)	0.777 (< 0.001)	1.100 (< 0.0001)	0.714 (< 0.0001)	1.009 (< 0.0001)	0.208 (0.046)	0.739 (< 0.0001)	0.777 (< 0.0001)	0.325 (0.001)
Idio-Risk × *Market cap*			−6.824 (0.001)						
Idio-Risk × *Market-to-book*				11.692 (0.055)					
Institutional Holdings					−0.039 (0.001)				
Idio-Risk × *Institutional Holdings*					−0.847 (0.000)				
Number of Analysts						0.380 (0.007)			
Idio-Risk × *Nasdaq*							0.144 (0.000)		
Idio-Risk × *SEO (SEO = 1)*								0.174 (0.101)	
Log (SD Daily Returns)						2.404 (< 0.0001)			1.955 (< 0.0001)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.113	0.276	0.276	0.276	0.288	0.292	0.276	0.276	0.277
Observations	22,724	22,650	22,650	22,650	21,447	17,288	22,650	22,650	22,650
Panel B: income-increasing discretionary accruals									
Idio-Risk	1.426 (< 0.0001)	0.214 (< 0.0001)	0.689 (< 0.0001)	0.003 (0.470)	0.443 (0.000)	0.258 (0.023)	0.117 (0.079)	0.214 (0.010)	0.167 (0.050)
Idio-Risk × *Market cap*			−10.596 (0.000)						
Idio-Risk × *Market-to-book*				39.067 (< 0.0001)					
Institutional Holdings					−0.064 (< 0.0001)				
Idio-Risk × *Institutional Holdings*					−0.812 (0.000)				
Number of Analysts						−0.513 (0.000)			
Idio-Risk × *Nasdaq*							0.363 (< 0.0001)		
Idio-Risk × *SEO (SEO = 1)*								0.151 (0.012)	
Log (SD Daily Returns)		0.201 (0.026)				0.183 (0.321)			0.201 (0.026)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.127	0.218	0.219	0.220	0.221	0.214	0.221	0.219	0.218
Observations	21,801	21,754	21,754	21,754	21,754	15,561	21,754	21,754	21,754

Notes: This table reports the results of OLS regressions examining the impact of idiosyncratic volatility on discretionary accruals. The statistics are based on maximum of 44,599 firm-year spanning 1987-2009. The dependent variable is the absolute level of discretionary accrual using Kothari *et al.* (2005) model. Coefficients for intercept and firm characteristics not reported for brevity. All models include year and industry effects. Variables are defined in earlier tables. *p*-Values in the parentheses are computed with standard errors adjusted for firm-level clustering

Taken together, our analysis indicates that idiosyncratic volatility is relevant to both income-increasing and income-decreasing discretionary accruals. Our empirical evidence supports the findings of Graham *et al.* (2005) that managers favor smooth earnings because volatile earnings lead to higher estimation risk, and hence, to greater risk premia. Hence, our study offers evidence that managers consider idiosyncratic volatility to be important in their decision to smooth earnings. Our findings contrast with Hutton *et al.*'s (2009) study in which they conclude that firms that use earnings management more aggressively tend to be firms with low idiosyncratic volatility.

5. Conclusions

This study adds an important new dimension to the earnings management literature by establishing a link between idiosyncratic risk and the degree to which firms manage their earnings. Based on a comprehensive sample of 44,599 firm-year observations during the period spanning 1988-2009, we document that firm-specific volatility is positively associated with earnings management. Simply put, high idiosyncratic risk induces managers to more aggressively manage earnings. Furthermore, we find that this holds true for both income-increasing and income-decreasing accruals management. Our analysis supports the view that managers will strive to reduce what they perceive as "noise" volatility by managing income in both directions with the aim of reducing the stock price volatility.

In contrast to previous studies that document evidence of earnings manipulations prior to a certain event, this study points to a firm attribute, namely idiosyncratic risk, as a significant determinant of earnings management. This suggests that earnings reported by firms with higher idiosyncratic risk may be relatively less reliable because they are prone to greater earnings manipulation than their counterparts with less asset-specific risk.

Overall, the knowledge derived from this study provides additional tools to assess the degree of earnings management by firms, and hence the quality of the financial reporting. Thus our findings will enable standard setters, financial market regulators, analysts, and investors to make more informed legislative, regulatory, resource allocation, and investment decisions.

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Notes

1. The time trend in idiosyncratic risk has also been examined for other countries. Guo and Savickas (2008) provide evidence that the value-weighted idiosyncratic volatility in G7 countries increased in the late 1990s but later reversed to pre-1990s level. Examining the diversification benefits in China, Xu (2003) argues that in recent years more stocks were needed to achieve a given level of risk, a sign of higher idiosyncratic risk. Bartram *et al.* (2009) document that the median foreign firm has lower idiosyncratic risk than a comparable US firm over the period of 1991-2006 and show that firm characteristics help explain variation in the level of idiosyncratic risk, more so than country characteristics.
2. For a survey of the earnings management literature see Healy and Wahlen (1999), Fields *et al.* (2001), and Kothari (2001).
3. Defond and Jiambalvo (1994) and Kasznik (1999) are some of the other studies that document empirical evidence of earnings management.
4. Other work in this area argues that earnings management allows firms to enhance their reputation with stakeholders, such as customers, suppliers, and creditors, hence affording them the ability to extract better terms of trade (Bowen *et al.*, 1995; Burgstahler and Dichev, 1997). Further, some studies show that a weak disciplinary environment allows managers to engage in more earnings manipulation (see Bowen *et al.*, 2008; Klein, 2002; Guidry *et al.*, 1999).
5. This measure is widely used to capture a firm's informational environment or information transparency. While a number of studies use low R^2 as an index of information transparency

(Bakke and Whited, 2010; Fernandes and Ferreira, 2008), other researchers assume the opposite, namely high firm-specific volatility (low R^2) proxies for poor information environment (see e.g. Ali *et al.*, 2003).

6. A number of studies provide explanations for the increasing trend in idiosyncratic return volatility – such as changing sample composition (Brown and Kapadia, 2007), earnings uncertainty (Wei and Zhang, 2006), cash flow volatility due to increased competition (Irvine and Pontiff, 2009), and earnings quality (Rajgopal and Venkatachalam, 2011), among others.
7. For robustness, we also estimated idiosyncratic volatility using CAPM-based residuals. All our results based on CAPM residuals are qualitatively similar.
8. Kothari *et al.* (2005) model include lagged ROA as an additional regressor to control for the effect of performance on a firm's accruals as prior research finds that performance affects accruals for a firm (also see Ronen and Yaari, 2008). In particular Kothari *et al.* (2005) document that modified Jones model without adjustment for mean industry performance are miss specified.
9. Because of the use of panel data, the significance of the correlations is most likely overstated.
10. In untabulated regressions, we introduce a macroeconomic independent variable that captures the change in gross domestic product to control for real economic activity and the possibility that a certain proportion of our measure of earnings management is non-discretionary (motivated by changes in economic conditions). The coefficient of our focus variable remains statistically significant.
11. In unreported regressions, we control for the passage of the Sarbanes-Oxley Act in 2002 which introduces additional monitoring of management that can curb managerial urge to manage earnings. Our central results concerning firm-level risk variable are invariant to the inclusion of this dummy variable.

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Appendix

Variable definitions

Idiosyncratic risk is the logarithm of the volatility of the residuals obtained from Carhart (1997) four-factor model. We simply regress the daily stock excess return on the daily market portfolio's excess returns, firm size, book-to-market ratio, and momentum factors for each month (downloaded from Kenneth French's website). We follow a similar procedure to calculate a residual based on Fama and French (1993) three-factor model, which does not include the momentum factor in the regressions. Idiosyncratic volatility is calculated monthly as the sum of the squares of the daily residuals and these monthly volatilities are summed to arrive at yearly idiosyncratic volatility.

Asset growth is calculated as the change in total assets (data item no. 6) scaled by one-year lagged assets (data item no. 6).

Market-to-book is the logarithm of one-year lagged ratio of market capitalization (data item no. 25 times data item no. 199) to the book value of the firm (data item no. 60).

Leverage is calculated as the long-term debt (data item no. 9) divided by assets (data item no. 6).

Market cap is estimated as the logarithm of the one-year lagged market capitalization (which is computed as the product of the number of shares outstanding (data item no. 25) and the closing stock price (data item no. 199) on the last trading day of previous fiscal year. For robustness, we also use CRSP data for the number of shares outstanding and the closing stock price to calculate market capitalization because CRSP information of these variables is usually more accurate than the corresponding information in Compustat.

Nasdaq is an exchange dummy variable which takes the value of one if the firm trades on the Nasdaq and zero otherwise.

Return on assets (ROA) is the one-year lagged ratio of income (data item no. 18) to assets (data item no. 6).

Sales volatility, ROA volatility, and cash flow volatility are the standard deviation of actual sales, return on assets, and cash flows, respectively, calculated over the preceding three-year period scaled by one-year lagged assets (data item no. 6).

SEO is a dummy variable that takes a value of one if the firm engaged in a seasoned equity offering and zero otherwise.

Standard deviation of daily returns is measured as the logarithm of the one-year lagged standard deviation of stock returns.

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