Income Smoothing and Idiosyncratic Volatility

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Abstract

In this paper we empirically evaluate the widespread belief of managers that income smoothing results in lower stock market risk. Multivariate regressions with a robust set of covariates confirm such a relationship, while controlling for past and future levels of cash flow risk, past levels of idiosyncratic risk, governance structures and CEO equity holdings, and multiple measures of firm-level risk and information. These results hold in a fixed-effects specification, in a long-run changes specification, and when the potential endogeneity between income smoothing and idiosyncratic volatility is considered. We further identify CEO incentives to smooth, where smoothing firms have a lower likelihood of forced CEO turnover, and the smoothing/idiosyncratic volatility relationship intensifies as the *ex ante* probability of CEO firing increases, and the costs of smoothing decrease.

"The No. 1 job of management is to smooth out earnings" (Loomis, Fortune, August 2, 1999)

1. Introduction

In the field study carried out by Graham et al. (2005), more than 96% of respondents indicate that they prefer a smooth earnings path, since lower firm risk as perceived by investors is one of the most popular motivations for income smoothing. This paper examines this widespread belief. We investigate the association between income smoothing, defined as the utilization of accounting discretion to reduce earnings variability, and the firm specific component of stock return volatility. We document that income smoothing is negatively related to idiosyncratic risk.

Standard finance theory suggests that because risk-averse undiversified managers are subject to total firm volatility, but rewarded (through expected returns) for only the portion of risk that is systematic (Meulbroek, 2001), they can be expected to eschew idiosyncratic volatility. Managers are expected to be motivated to reduce idiosyncratic volatility to alleviate job security concerns. For example, Gordon (1964) points out that the CEOs' utility increases with job security, and Fudenberg and Tirole (1995) theoretically demonstrate that income smoothing can arise in equilibrium if managers are concerned about job security. Empirically, Ahmed et al. (2008) find that income smoothing is higher in competitive industries, while Bushman et al. (2010) show that CEO turnover increases with idiosyncratic volatility. Accordingly, we argue that CEOs benefit from income smoothing that reduces idiosyncratic risk, and we find evidence that CEOs who smooth income lower their probability of forced turnover.

Previous literature has documented a positive relationship between the extent of earnings variability and stock price variability (Lev and Kunitzky, 1974). However, the relationship between income smoothing practices and stock prices is not clear *a priori*. On one hand, income smoothing can lower the cost of equity and debt finance (Trueman and Titman, 1988; Francis et al. 2004); or, through the signaling property of smoothing, can reduce uncertainty about future profitability (Ronen and Sadan, 1981; Tucker and Zarowin, 2006), which is positively related to stock return volatility (Pastor and

Veronesi, 2003). On the other hand, Rajgopal and Venkatachalam (2008) (RV) argue that a lack of transparency (garbling of earnings), results into higher share price volatility. To our knowledge, no study has examined the relationship between income smoothing and idiosyncratic volatility.

Using a sample of approximately 88,000 firm-year observations, our results indicate that income smoothing is negatively related to idiosyncratic volatility. These results are robust across multiple standard measures of income smoothing and idiosyncratic volatility, and to multiple covariates. Our results persist after controlling for risk proxies such as the past (and future) deviation of cash flows from operations, firm leverage, accounting losses, and lagged idiosyncratic volatility. Our results also persist after controlling for information proxies such as revisions and dispersion in analyst forecasts, bid-ask spreads, and measures of private information contained in stock prices such as *PIN* (Easley et al., 2002) and *Private* (Llorente et al., 2002). Hence, even after controlling for standard measures of risk and information, our results suggest that income smoothing plays an important, independent role in relation to lowering share price volatility. Results are robust to the inclusion of firm fixed-effects, to a changes-in-variables analysis, and after controlling for the endogeneity in the relationship between smoothing and volatility. Our results are also robust to the inclusion of a large number of controls including corporate governance, earnings quality, executive compensation, insider trading, and corporate acquisitions.

Further analysis reveals that job security concerns underlie managers' attempts to smooth income in order to reduce idiosyncratic volatility: after replicating the results of Bushman et al. (2010), who show that higher idiosyncratic volatility is related to CEO firing, we find that income smoothing is negatively related to the probability of CEO turnover. We also find that the income smoothing/idiosyncratic volatility relationship is more pronounced in firms where the *ex-ante* probability of CEO firing is high. This result helps identify incentives for managers to engage in costly income smoothing actions. We also find that managerial smoothing actions undertake rational cost/benefit patterns: the strength of the income smoothing/idiosyncratic volatility relationship decreases as the costs of income smoothing increase due to

high external monitoring by institutional investors and sell-side analysts. Conversely, the smoothing/volatility relationship is strengthened given high levels of operational and other risks.

Given that we are interested in capturing discretion, and not the smoothness of earnings due to underlying economic fundamentals, we dig further into the isolation of the discretionary component of smoothing. We statistically parse out the effects of natural smoothness by using a simultaneous regression procedure similar to Francis et al. 2004, where in the first stage we regress income smoothness on firm-level economic fundamentals, and in the second stage use residuals from such a model to proxy for discretionary smoothing. Results indicate that such a measure of discretionary smoothing is also negatively related to share price volatility. We next use the Tucker and Zarowin (2006) measure of income smoothing that partitions smoothing into a discretionary and non-discretionary component, consequently we find that this discretionary smoothing is negatively related to idiosyncratic volatility. We finally show that our results are incremental to the results of RV, since we show that controlling for their measures of earnings quality, our negative relationship between smoothing and idiosyncratic volatility persists.

To further understand the link between smoothing and volatility, we examine the consequences of smoothing that can also have an effect on idiosyncratic volatility. We look at the relationship between smoothing and the standard deviation of revisions in analyst forecasts, one year-ahead earnings surprises, share turnover, the dispersion in forecasts, institutional holdings, and institutional trading. We find that income smoothing is negatively related to the standard deviation of revisions in analyst forecasts, and lower one year-ahead earnings surprises, both of which have been shown to move prices (Stickel, 1991; Ball and Shivakumar, 2008). We also show that income smoothing is related to lower share turnover, which is related to lower share price volatility (Jones et al. 1994). RV argue that higher earnings dispersion is positively related to idiosyncratic volatility, in turn, we show that smoothing is related to lower levels of dispersion, hence indirectly to lower volatility. Finally, we show that smoothing is positively related to institutional holdings, and controlling for institutional holdings, to higher levels of

trading by institutional investors, both of which are associated with lower levels of volatility (Reilly and Wachovicz, 1979).

The analyses of this paper provide a number of contributions to the existing literature. This paper contributes to the survey evidence obtained by Graham et al. (2005), where managers overwhelmingly indicate that they are prepared to take costly action in order to reduce perceptions of risk. Our results are consistent with managers' statements. From a valuation perspective, McInnis (2009) finds that income smoothing is not related to a lower cost of capital, while Rountree et al. (2008) provide some evidence that income smoothing is value destroying. As such, our results identify a prime reason as to why managers smooth although it might not be related to firm valuation. We find that managers smooth to reduce idiosyncratic risk, which in turn increases managerial job security.

The study also complements the recent evidence provided by Rajgopal and Venkatachalam (2008), who find that a time trend dominates both the deterioration of earnings quality and a corresponding increase in share volatility. Our evidence is incremental to RV's results as the documented negative relationship between income smoothing and idiosyncratic volatility holds after controlling for the relevant research variables used in their study, and is robust to yearly regressions and to sub-periods where there are no time trends in our research variables. RV also argue that a deteriorating earnings quality results into less precise analyst forecasts (more dispersion), and therefore more reliance on idiosyncratic private information signals and consequently a higher volatility. In contrast to them, we find that income smoothing results into lower forecast dispersion. As such, a corollary of our findings, in conjunction with RV's, is that income smoothing, *de facto*, is higher earnings quality.

This study also has relevance for the literature on the informational role of accounting numbers. Ronen and Sadan (1981) posit that income smoothing succeeds in conveying information about future profitability, and Tucker and Zarowin (2006) argue that income smoothing impounds future information into contemporaneous returns. Given that volatility is partly a function of the uncertainty regarding future profitability (Pastor and Veronesi, 2003), income smoothing seems to convey information in relation to

firm-level uncertainty. Also, within the information framework, our findings contribute to prior finance research that relates information to stock-specific return variation (Ferreira and Laux, 2007). Ball and Shivakumar (2008) argue that earnings provide modest information around quarterly earnings announcements. In our analysis, we find that income smoothing is related to lower levels of idiosyncratic volatility even if we exclude share price variation around quarterly earnings announcement periods. Hence, we provide evidence that the informational effect of earnings extends to non-announcement dates.

Our paper contributes to the literature on the economic effects of financial reporting by relating income smoothing to share price volatility. Lev and Kunitzky (1974) show that the extent of earnings variability is positively related to stock market variability. However, these authors do not distinguish between the natural smoothness of operations, and smooth income streams resultant from financial reporting discretion. In our study we attempt to isolate accounting based income smoothing from the smoothness of earnings generated by other production, investment, and financing decisions.

Finally, our study contributes to research on portfolio diversification, asset pricing, and option valuation, where the idiosyncratic component of risk plays a central role. Our results are relevant to these research areas by showing how financial reporting decisions affect the non-systematic component of share price volatility. Given that investors care about idiosyncratic volatility only if it affects asset returns, and given that there is significant debate in the literature on whether idiosyncratic volatility is priced or not (Goyal and Santa Clara, 2003; Guo and Savickas, 2008; Ang et al., 2009; Fu, 2009), our study provides a rationale and evidence for a relationship between financial reporting and returns, through the role of idiosyncratic volatility. In fact, if idiosyncratic volatility is priced, our results suggest that financial (mis)reporting can lead to (at least temporary) mispricing. As such, the current study contributes to the literature on the pricing of earnings quality, by providing evidence on the existence of a robust relationship between financial reporting and firm specific risk, contributing to the conflicting results found in Francis et al. (2004), Rountree et al. (2008), and McInnis (2009), as to whether smoothing is related to firm value.

The rest of the paper is structured as follows. The next section discusses the prior literature and presents our primary hypothesis. Section 3 details the research design, the measurement of the variables, the sample selection and the data sources used in the analyses. Section 4 contains the descriptive statistics and the main results of our empirical analysis. Section 5 discusses CEO incentives in smoothing, and resulting effects on job turnover. Section 6 presents robustness analysis, and section 7 examines some of the consequences of smoothing that can influence volatility. Section 8 presents additional tests. Finally, section 9 provides a summary of the findings, main contributions and some concluding comments.

2. Literature Review and Hypothesis Development

2.1 Income Smoothing and Idiosyncratic Volatility

Income smoothing is the utilization of accounting discretion to reduce income stream variability (Fudenberg and Tirole, 1995). Smoothing moderates year-to-year fluctuations in income by shifting earnings from peak years to less successful ones, making earnings fluctuations less volatile (Copeland, 1968). *Idiosyncratic volatility* is the component of share price volatility that is independent of market-wide fluctuations, and is related to firm-level characteristics. A large body of evidence both from academics and practitioners alike suggests that these two are related.

It is evident that over the past twenty years, the corporate community has given the issue of income smoothing a high priority. This is partly due to the expansive growth of financial markets and market risk, as well as the adverse effects of share price volatility on shareholder value (RiskMetrics, 1999). Loomis (1999) quoting a Fortune 500 CEO: "*the No. 1 job of management is to smooth out earnings*" clearly illustrates the emphasis on the importance of earnings volatility, and managers' efforts to temper it. Similarly, recent academic literature argues for the stability of short-term earnings, which improves the situation of investors (e.g. Beltratti and Corvino, 2007).

In the field study carried out by Graham et al. (2005), more than 96% of respondents indicate that they prefer a smooth earnings path, since lower firm risk as perceived by investors is one of the most popular motivations for income smoothing. Similarly, Lui et al. (2007) argue that earnings quality is significantly related to sell-side analysts' assessment of firm riskiness. Given that recent studies find that systematic volatility is a fraction of total firm volatility (Shin and Stulz, 2000; Ferreira and Laux, 2007), and that idiosyncratic volatility cannot be diversified away by a CEO through trading on their private account, incentives to temper idiosyncratic volatility, rather than systematic volatility, are expected to dominate.

A large number of studies suggest the existence of incentives to reduce the volatility of both stock price and earnings. Stock price volatility has been associated with an increased cost of capital (Beaver et al., 1970; Minton and Schrand, 1999; Gebhardt et al., 2001), while earnings volatility has been linked to the valuation of firms, often with conflicting findings (Gordon, 1964; Beaver et al., 1970; Beidleman, 1973; Dye, 1988; Wang and Williams, 1994; Barth et al., 1995; Gebhardt et al., 2001; Sadka, 2007; Rountree et al. 2008; McInnis, 2009). More recent evidence suggests that idiosyncratic volatility has been increasing over recent decades (Campbell et al., 2001), partly due to deteriorating earnings quality (Rajgopal and Venkatachalam, 2008), with important implications for portfolio diversification, corporate incentive systems, and CEO behavior.

2.2 Research Question

Given managers' and investors' preference for smooth earnings/stock price streams, a number of avenues could affect the income smoothing/idiosyncratic volatility relationship.[1] As discussed below, the relationship between income smoothing and stock prices is not clear *a priori*. To our knowledge, no study has yet looked at this relationship.

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[1] Alternatively, rather than smooth income, managers may affect real operating performance to temper risk, which some studies claim to be more costly (e.g., Cohen and Zarowin, 2008), although evidence is not always consistent with this prediction (e.g., Chen et al., 2008). We do not address this issue, since we focus on accounting based income smoothing.

On one hand, Smoothing can be negatively related to volatility because smoothing has been linked with lower operational risks, and higher firm-level informativeness. Risk increases the cost of doing business, including operational inefficiencies and adjustment costs. Additionally, risk increases costs on various stakeholders who need to be compensated (Miller and Chen, 2003). Prior research suggests that income smoothing lowers operational risk, such as staving off bankruptcy and lowering the cost of debt (Trueman and Titman, 1988); hence, it has a real economic effect. As such, income smoothing can have an effect on idiosyncratic volatility by reducing real firm-level risk. Additionally, income smoothing could be related to idiosyncratic volatility through the informational properties of accounting earnings. Prior research shows that income smoothing succeeds in conveying information about future profitability (Arya et al., 2003; Sankar and Subramanyam, 2003; Turcker and Zarowin, 2006). Given that Pastor and Veronesi (2003) argue that there is a positive relationship between stock return volatility and uncertainty about future profitability, and since income smoothing reduces uncertainty about future earnings, a negative relationship between smoothing and volatility can be expected.

On the other hand, income smoothing can be positive to volatility because it has been linked to increased firm opaqueness. Income smoothing is viewed as a mechanism that garbles information (in contrast to the signaling view discussed above). Jayaraman (2008) finds that earnings that are less volatile than cash flows garble information. Similarly, Leuz et al. (2003) argue that in economies with less enforcement and more private benefits of control, companies smooth income to conceal private information. Rajgopal and Venkatachalam (2008) (RV) argue that to the extent that reported income numbers do not reflect underlying operational activities, a lack of transparency (or garbling) induces a larger dispersion of beliefs regarding firm prospects, hence, a larger weight on idiosyncratic private earnings signals, and a resulting higher share price volatility. Consistent with such an argument, RV find that idiosyncratic volatility is positively related to analyst forecast dispersion, and negatively related to earnings quality. An implication of these findings is that income smoothing, being a special case of earnings management (Tucker and Zarowin, 2006), should be positively related to idiosyncratic volatility.

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2.3 CEO Motivations underlying the Smoothing/Volatility Relationship

For managers to take costly financial reporting decisions, the necessary incentives need to be present. As such, we examine whether the link between income smoothing and idiosyncratic volatility is a function of managerial incentives. Gordon (1964) points out that a CEO's utility increases with job security, which would create incentives to smooth income numbers. In the same vein, Fundenberg and Tirole (1995) theoretically demonstrate that income smoothing can arise in equilibrium if managers are concerned about job security. DeFond and Park (1997) provide indirect empirical evidence consistent with Fundenberg and Tirole's theory: they find that discretionary accruals are income increasing (income decreasing) in firms with poor (good) current performance and expected good (poor) future performance. Ahmed et al. (2008) investigate the link between job security and income smoothing in a more direct way by identifying corporate settings where job security concerns are more severe (highly competitive industries, and more uncertain operating environments), confirming Fundenberg and Tirole (1995). Recently, Bushman et al. (2010) show that job security concerns increase with idiosyncratic volatility. In particular, they find that after controlling for realized firm performance, (1) the probability of CEO turnover increases with the proportion of idiosyncratic risk, and (2) the sensitivity of CEO turnover to firm performance is higher as idiosyncratic risk increases. These findings confirm the impact of idiosyncratic volatility on the information content of realized performance, also pointed out in Ferreira and Laux (2007). As idiosyncratic volatility is driven primarily by factors related to unobservable CEO talent, it will allow firm performance to be indicative about such talent, and so boards will discover and replace low talent incumbents (Bushman et al., 2010: 2).[2] Overall, the Bushman et al. (2010) findings suggest that lowering idiosyncratic volatility would result into higher CEO job security. Accordingly, we expect that CEOs would benefit from income smoothing by reducing idiosyncratic risk.

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[2] In contrast, Bushman et al. (2008) state that systematic volatility, which is driven by factors unrelated to CEO talent, would limit a board's ability to infer CEO talent from performance. Consistently, they find that CEO turnover is negatively related to systematic volatility.

Given that income smoothing necessitates costly action that might not be advantageous from a cost/benefit perspective, more closely monitored firms would gain less from smoothing. Thus, firms with more monitoring from large shareholders, or from sell-side analysts, are expected to smooth less. Alternatively, sophisticated monitors would partly undo the consequences of the smoothing actions of managers. This line of thought can be extended to a number of firm-specific scenarios, where we expect firms that have higher underlying operational volatilities, or firms whose riskiness is less observable, or future performance is less predictable, to be likely to smooth more in order to reduce idiosyncratic risk. Therefore, we also examine the role of job security concerns, and various firm level characteristics, in testing the relationship between income smoothing and idiosyncratic volatility.

3. Research Design, Variable Measurement, and Sample Selection

3.1 Research Design

Our study examines the relationship between income smoothing and firm level idiosyncratic risk. We present their relationship in the following formulation:

Idiosyncratic Volatility $= f$ (Income Smoothing, Control variables)   (1)

One potential issue regarding the measurement of our theoretical constructs is time-consistent matching of our research variables. Given that income smoothing is performed over multiple time periods, and it manifests over a long cycle, the effects on the market should be observed after a lag. From this perspective, reductions in idiosyncratic volatility follow observable income streams. Therefore in our research design, we measure income smoothing using current and past data, and match it to contemporaneous idiosyncratic volatility. However, our results are robust to alternative designs, including lagged and changes specifications.

3.2 Variable Measurement

3.2.1 Measuring Idiosyncratic Volatility

Our idiosyncratic volatility variable is calculated following RV. We measure *Volat* by calculating the average monthly variance of market adjusted returns. This is done by taking the excess of daily stock returns over the daily return on the value weighted market portfolio, consistent with the market adjustment procedure of Campbell et al. (2001). In subsequent robustness tests, we also calculate *Volat2* as residuals from market model regressions, *Volat3* using the Fama and French (1992) three-factor model, and *Volat4* from industry level regression residuals.

3.2.2 Measuring Income Smoothing

Consistent with prior studies, we use two measures for income smoothing: the volatility of income with respect to the volatility of cash flows, and the correlation between changes in accruals and changes in cash flows. Our first income smoothing measure is the ratio of the variability of income to the variability of cash flows, σ_{NI}/σ_{CFO} (hereafter *Dev*). This has been used in Leuz et al. (2003) and Myers and Skinner (1999). The more income smoothing, the less the variability of income with respect to the variability in cash flows; hence a lower value of *Dev* would signify a smoother income stream. We obtain financial statement data from *Compustat*, and we require data to be present for three consecutive years for the annual calculations. We use income before extraordinary items as the earnings measure, and cash flow from operations as the cash flow measure. We calculate *Dev* over a three-year period, since a longer time period would result in fewer observations and a noisier matching process with the volatility data. Therefore, we match contemporaneous and lagged income smoothing data with current idiosyncratic volatility data (i.e., Dev_t is calculated using data from *t*-2 to *t*, and is matched with $Volat_t$, which refers to data of year *t*). In alternative tests, we match current idiosyncratic volatility ($Volat_t$) with lagged income smoothing (Dev_{t-1}) to maintain the hypothesized causality of the constructs.

The second measure of income smoothing used is the correlation between changes in accruals[3] and

cash flows from operations, $\rho[\Delta Acc, \Delta CFO]$ (hereafter *Corr*), also used in Myers and Skinner (1999) and

Leuz et al. (2003). The underlying intuition is that the variability of cash flows is smoothed through the

usage of accruals. Therefore, a more negative correlation would signify a smoother income stream in

relationship to the underlying fundamentals. We again calculate this variable over a three-year period, and

match it with idiosyncratic volatility in a similar way to *Dev* above.

Since lower numbers of *Dev* and *Corr* indicate higher levels of income smoothing, in our tests we use

the inverted sign of *Corr* (*iCorr*) and the reciprocal of *Dev* (*iDev*) to ease the interpretation of the results.[4]

Higher values of our income smoothing variables therefore indicate more income smoothing. Our results

are also robust to the smoothing measures of Tucker and Zarowin (2006), and Jayaraman (2008).

3.2.3 Control Variables

We employ a number of controls in our statistical tests, based on variables identified in prior literature

as related either to income smoothing or to stock price volatility. *LogMktVal* denotes the logarithm of the

market value of equity, used as a control for visibility and information asymmetry.[5] Return on assets,

ROA, is used as a control for profitability, calculated as net income before extraordinary items divided by

total assets. We control for a firm's investment opportunity set and growth opportunities by calculating

MB, which is the market value of equity divided by the book value of equity. *Institution* is the percentage

of shares held by institutional investors. *DevCFO* is the standard deviation of cash flows, calculated using

quarterly data over a period of 12 quarters. We also employ dummy variables for industry, classified into

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[3] We calculate accruals as the difference between net income before extraordinary items and cash flows from operations.

[4] For the descriptive statistics, however, we maintain the classical representation to facilitate comparisons with other studies.

[5] As firm size is an important regressor, we checked for the robustness of our results using various alternative specifications of our firm size variable. When we re-run our regressions using the non-logarithmic form of our size variable (*MktVal*), results remain the same. When we employ firm assets in lieu of the market value of equity, results are qualitatively similar. Finally, instead of *LogMktVal* we employ 10 (and 40) dummies for the various size deciles; results are again unchanged.

23 industries according to Core and Guay (1999),[6] since managers with similar risk preferences and utility functions self-select into similar industries (Lambert et al, 1991), and risk varies across industries. Finally, we also control for year effects using year dummies. Other variables used in the robustness tests and other analyses are discussed in the respective sections. The main variables are summarized in Table 1. For a timeline of our variables see Figure 1.

(Insert Table 1 about here)

(Insert Figure 1 about here)

3.3 Sample Selection and Data Sources

We utilize *CRSP* daily data to calculate idiosyncratic volatility. We merge the *CRSP* database with *Compustat* data to calculate our income smoothing variables and control variables. Additionally, we use data from *CDA Spectrum* for the institutional data. A cross-section of these data gives us about 88,577 observations for the base level analysis over the period 1989-2006. Details of the sample selection are provided in Table 2.

(Insert Table 2 about here)

The sample varies according to the choice of tests and controls used, where the introduction of governance, compensation, and firm-level information data dents the sample size. For the robustness analysis, we use *Compustat* data to calculate risk measures such as firm leverage, and a dummy variable indicating losses. We employ data from *I/B/E/S* to calculate dispersion in earnings forecasts, and monthly revisions in analyst forecasts. We use data provided on Andrew Metrick's website to calculate the Gompers et al. (2003) governance variables. Additionally, we utilize data from *Institutional Shareholder Services* to calculate variables related to board structure and independence. We utilize the *Execucomp* database to calculate executive compensation variables. Finally, to control for price informativeness, we

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[6] Using 48 Fama and French industry groupings leaves results unchanged.

obtain the probability of informed trade (*PIN*) values from Easley et al. (2002), and we estimate a

measure of informed private trading (*Private*) according to Llorente et al. (2002).

4. Statistical Model, Descriptives, and Results

In our research design we argue that idiosyncratic volatility is a function of managerial income

smoothing decisions and other control variables. Therefore we represent our main statistical model as

follows (for simplicity, coefficients and firm and time subscripts are suppressed):

$$Volat = iCorr \text{ (or } iDev) + ROA + MB + Institution + LogMktVal + DevCFO +$$
$$Industry\ Controls + Year\ Controls \qquad (2)$$

As discussed above, *ROA* and *MB* control for the past and future performance-related effects on

volatility. *LogMktVal* controls for firm size, and *Institution* controls for shareholder preferences regarding

observed firm risk, while *DevCFO* controls for operational risk. We estimate equation (2) both by

Ordinary Least Squares (OLS) and including firm fixed effects (FE), which controls for unobserved firm

specific heterogeneity. In further analysis, we also utilize a three-stage least squares estimate, and a long-

run changes specification.

4.1 Descriptives and Main Results

Table 3 presents the descriptive statistics. All variables are winsorized at 1% and 99%. *Volat* has a

mean of 0.046 and a median of 0.023, similar to Rajgopal and Venkatachalam (2008), whose estimation

methodology we copy. They report a mean of 0.041 and a median of 0.016, slightly lower than ours, but

this could be explained by differences in sample size and period, since their sample selection is from an

earlier period characterized by lower idiosyncratic volatility. Mean *Corr* is -0.55 (median = -0.89)

indicating that the negative correlation between change in accruals and change in cash flows is high. *Dev*

has a mean of 1.47 indicating that on average there is larger variability in net income as compared to

operating cash flows; however, the median is 0.82, thus evidencing that this variable is right skewed. Both the mean and medians of our income smoothing variables compare well with Zarowin (2002). *MktVal* has a mean of about $1.47 billion with a median of about $175 million; this figure is right skewed because of the very large valuations of the largest firms. Institutional holding is about 38%, which is typical of the large sample size and extended time period. In unreported analysis, we see that firm size and institutional ownership increase throughout the sample period, mirroring changes in US capital market characteristics.

(Insert Table 3 about here)

As an initial indication, we plot the relationship between idiosyncratic volatility and income smoothing. Figure 2 displays the mean level of idiosyncratic volatility by deciles of our two income smoothing measures. A monotonic negative relationship between income smoothing and idiosyncratic risk is observed. The mean idiosyncratic volatility (*Volat*) in the lowest and highest deciles of *iDev* is 0.071 and 0.024, respectively, the difference being statistically significant at the 1% level (*t*-statistic equals 38.06). Similarly, the mean of *Volat* in the lowest and highest deciles of *iCorr* is 0.072 and 0.030, respectively, again the difference being statistically significant at the 1% level (*t*-statistic equals 33.85).

(Insert Figure 2 about here)

Additionally, unreported correlations (both Pearson and Spearman) indicate preliminary and univariate evidence. *Volat* is negatively correlated to both *iDev* and *iCorr*: higher levels of income smoothing are related to less idiosyncratic volatility. Nevertheless, it is difficult to obtain any meaningful inferences at the univariate level since there are high correlations among the variables: both *LogMktVal* and *ROA* are highly correlated with *Volat*, *iDev*, and *iCorr*. To go beyond the statistical limitations of the univariate analysis, we employ further statistical techniques as discussed below.

We now turn our attention to our multivariate analysis. Table 4 presents our main findings, where *Volat* is regressed on income smoothing and control variables. Model (1) presents our base OLS regression model with *iDev* as the income smoothing variable, while Model (2) repeats the same regression with *iCorr*. Our model includes as control variables: *LogMktVal*, *ROA*, *MB*, *Institution*, *DevCFO*, and industry and year dummies. We find that the coefficients on *iDev* and *iCorr* are negative and statistically significant (*t*-statistics are -18.4 and -12.2 respectively).[7] Evidence obtained so far points out that income smoothing and idiosyncratic volatility are negatively related, more smoothing by managers results into lower levels of market risk.

(Insert Table 4 about here)

Results for control variables are also as predicted and consistent with prior literature: *LogMktVal* is negatively related to *Volat*, which indicates that larger firms have lower levels of idiosyncratic risk; the same can be said about firm profitability (*ROA*), which is again as expected; *Institution* is negatively related to *Volat*, which accurately describes the risk appetite of institutional investors on average; *MB* is positively related to *Volat*, indicating that firms with more growth opportunities exhibit higher levels of idiosyncratic volatility. Finally, as expected, *DevCFO* is positive to idiosyncratic volatility, indicating that firms with higher levels of operational risk have higher share price volatility.

In Model (3) we include firm fixed-effects to control for unobservable firm-specific heterogeneity. Although our ensuing robustness tests attempt to control for a multitude of correlated and omitted factors, examining a fixed-effects model is a more stringent test for our purported relationships. Re-running our tests with the same control variables, we see that the coefficient on *iDev* is still negative and significant (*t*-statistics is -11.6): even after controlling for unobservable firm specific characteristics, such as firm

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[7] We also re-run our models employing a lagged specification of all our independent variables (as per Panel B of Figure 1). In this way, we completely isolate the measurement periods of idiosyncratic risk and income smoothing: now, only lagged income smoothing is tested against contemporaneous idiosyncratic risk. Untabulated results confirm our previous findings: income smoothing is negatively related to idiosyncratic volatility. Finally, using a base model of 88,577 observations, where the only control variables are firm size, and industry and year dummies, results remain unchanged.

specific risk or information, income smoothing is negatively related to idiosyncratic volatility, implying a

structural relationship between the two[8]. Regarding the economic significance of our findings, a one

standard deviation increase in income smoothing results in a decrease in idiosyncratic volatility between

0.23% and 0.38%, depending on the model estimated.[9]

Next, we perform a changes analysis among our variables (Model 4 of Table 4). If income smoothing

has a negative effect on idiosyncratic volatility, we should also observe a link between changes in income

smoothing patterns and ensuing volatility. To explore this, we examine the association between long-term

changes in idiosyncratic volatility and income smoothing. If a CEO's income smoothing decisions have a

significant influence on idiosyncratic volatility as our results have implied so far, then as income

smoothing changes over time, we would expect to see a corresponding change in volatility. That is, we

would expect to see increases in income smoothing to be associated with decreases in idiosyncratic

volatility in our sample period.

For all variables in Model (1) of Table 4, including both the dependent variable and the regressors, we

calculate changes by taking the difference with three-year lagged values. In other words, changes in

variable X in year t (Ch_X_t) are calculated as the difference between the variable in year t and the variable

in year t-3 (X_t - X_{t-3}). Results, presented in Model 4, indicate that changes in our income smoothing

variables are also negatively and significantly related to changes in idiosyncratic volatility.

It can be argued that income smoothing is itself an endogenous function of firm-level risk: A manager

observes a high level of idiosyncratic volatility (or operational volatility), and consequently smoothes

income. To control for this potential endogeneity problem in the association between income smoothing

and idiosyncratic risk, we use a three-stage least squares methodology to estimate the following system of

equations:

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[8] Unreported results on *iCorr* are qualitatively similar; we report results only on *iDev* in all tests where the two are
qualitatively equivalent.
[9] Economic significance for models 1-3 is calculated as 0.0011*3.839 = 0.38%, 0.0060*0.630 = 0.38%, and
0.0006*3.839 = 0.23% respectively.

$$iDev \text{ (or } iCorr) = lagged\ Volat + lagged\ MB + lagged\ LogMktVal + DevCFO$$
$$+ Industry\ Controls + Year\ Controls \tag{3}$$

$$Volat = iCorr \text{ (or } iDev) + ROA + MB + Institution + LogMktVal + DevCFO$$
$$+ Industry\ Controls + Year\ Controls \tag{4}$$

The first level equation (equation 3) measures the amount of income smoothing carried out, given a level

of past idiosyncratic volatility.[10] The second level equation (equation 4), in turn, measures the subsequent

effect of smoothing on idiosyncratic volatility (this is identical to equation 2 above). Results are tabulated

in Model 5 of Table 4 (we only report results on the second stage regression). *iDev* is negatively related to

Volat, (t-statistic is -35.4), confirming our previous findings. Therefore, when we control for the

endogenous relationship between income smoothing and idiosyncratic volatility, we find that they are still

negatively related. The economic implications of these results are in stark contrast to the modest

economic effects obtained in models 1 to 3: a one standard deviation increase in smoothing can result in a

decrease in volatility of up to 25.6%.[11] We see a large variation in economic effects depending on the

statistical model used. Although correct inferences are obtained when using the correct *a priori*

theoretical model, we do not take a position on the efficiency of our models, and present results using

OLS, firm fixed-effects, changes, and a three-stage least squares.

   Next, we take advantage of the time dimension in our panel data set and include the lagged dependent

variable as an additional right-hand-side variable. Therefore, we analyze only the explanatory power of

the independent variable above and beyond the explanatory power included in lagged values of the

dependent variable itself. This would be a test in the spirit of Granger (1969), where we attempt to

investigate the effect of income smoothing on volatility beyond the time series dependencies of

Volat/iCorr/iDev. We utilize both *LagVolat* (the three-year lagged value of *Volat*) and *iCorr* (or *iDev*) in

the same regression specification. Untabulated results show that our income smoothing measures are still

negative and significant.

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[10] Using the standard deviation of cash flows, instead of idiosyncratic volatility, yields qualitatively similar results.
[11] The economic significance is calculated as 3.855*0.0.663 = 25.6%.

Cumulatively, the results presented in this section support the hypothesis that risk-related incentives influence income-smoothing decisions, since income smoothing is negatively related to idiosyncratic volatility using OLS, fixed effects, a changes analysis, and three stage least squares. Finally, Granger (1969) type tests also confirm our results.

5. CEO Incentives in Tempering Idiosyncratic Volatility

5.1 The Role of CEO Career Concerns

In the following section we present results on possible CEO motivations to utilize discretions in financial reporting in order to reduce idiosyncratic volatility, by examining the role of CEO career concerns. In light of the arguments in Bushman et al. (2010) and DeFond and Park (1997), we first examine whether income smoothing alleviates CEO career concerns given idiosyncratic volatility. To this end, we first replicate the methodology and findings of Bushman et al. (2010) by carrying out a probit analysis where CEO forced turnover (*Forced*) is expressed as a function of idiosyncratic volatility and control variables. As in Bushman et al. (2010), in Model (1) of Panel A of Table 5 we show that *Volat* is positively related to CEO turnover (t = 4.92), with a marginal effect of 0.37, indicating that a 100% increase in idiosyncratic volatility increases the probability of CEO turnover by 37%. In Models (2) and (3) we replicate the Bushman et al. (2010) analysis while introducing *iDev* and *iCorr* respectively as additional regressors. Results indicate that *iDev*, but not *iCorr*, significantly explains CEO turnover (t-statistic on *iDev* is -5.03), where firms with higher income smoothing have lower CEO turnover. However, the marginal effect is small (less than 1%). Although this incremental effect is small, it should be noted that income smoothing has two effects on CEO turnover – one is a direct effect as identified in this analysis – and a second indirect effect, through a reduction of idiosyncratic volatility. It should also be noted that the small marginal effect of smoothing on turnover could be a result of our research design.

Smoothing could exist in all situations where the probability of CEO dismissal is high. However, in our previous tests we only measure instances where forced turnover is recorded, adding noise to our estimation methodology.

(Insert Table 5 about here)

To further examine the role of CEO career concerns on the previously documented relationship between income smoothing and idiosyncratic volatility, we perform an additional analysis consisting of estimating the *ex ante* CEO firing probability for our sample firms and comparing the effect of income smoothing on idiosyncratic volatility in high *versus* low levels of this variable. If career concerns underlie managers' smoothing behavior to temper idiosyncratic volatility, we should observe the negative effect of income smoothing on *Volat* to be stronger as the probability of CEO firing increases. We construct four different measures of CEO *ex-ante* firing probability (*CFP*), all estimated in two steps: First, in the subsample where CEO turnover data is available, we estimate a logistic regression to model forced CEO turnover. We use four alternative specifications, where the independent variables are as follows: Model (1) contains CEO ownership, *ROA*, 3-year trend in *ROA*, volatility of cash flows and returns, institutional holdings, and year dummies; Model (2) is the same except it utilizes share returns instead of *ROA*; Model (3) does not utilize CEO ownership, while Model (4) is the same as Model (2) without CEO ownership, the variable that most dents the sample; Second, using the full sample, we utilize the predicted values from the logit regression (the logarithm of the odds ratios), which are subsequently transformed into probabilities.

Next, we estimate our main model in the highest and lowest quartiles of each *ex-ante* CEO firing probability measure (*CFP1...CFP4*). Panel B of Table 5 presents the results. We see that in all cases the relationship between income smoothing and idiosyncratic volatility is stronger in the sub-sample of firms where the *ex-ante* probability of CEO firing is higher. The difference in coefficients on *iCorr* and *iDev*

across the highest and the lowest quartile of all the four *ex-ante* CEO firing measures is statistically

significant at $p < 0.01$.

5.2 Cost/Benefits of Smoothing

Given that CEOs smooth to temper the effects of risk, these effects should be most pronounced in

firms that have a high cost/benefit relationship regarding the outcomes of smoothing. Given the benefits

of smoothing to the CEO, we expect to observe a lower propensity to smooth in firms where smoothing is

costly, or not as beneficial. From this perspective, we expect smoothing to be more effective when there

are fewer sophisticated investors, and when monitoring (both internal and external) of the CEO is lower.

In contrast, we expect smoothing to be more effective when benefits are higher.

Panel A of Table 6 presents the results of our sub-sample analysis examining the effect of

institutional investor ownership on the smoothing/idiosyncratic volatility relationship. This analysis

consists of estimating our base model (Model 1 of Table 4) in the highest and lowest quartiles of that

variable (*Institution*).[12] Institutional investors are sophisticated investors who have been shown to be able

to see through accounting numbers (Ke and Ramalingegowda, 2005; Chung et al., 2002). Therefore, their

presence would render CEO smoothing activities less effective, shifting upward the cost/benefit ratio of

smoothing. We see that the coefficient of *iCorr* on *Volat* is about four times higher in the quartile with the

lowest number of institutional investors, as compared to the highest quartile. The Wald statistic is 27.8,

indicating that the difference between the two coefficients is statistically significant at the 1% level.

Inferences remain the same when examining *iDev*. One caveat of this analysis is that institutional holding

is heavily correlated with firm size. However, repeating the analysis while adjusting institutional holding

for firm size leaves results unchanged.

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[12] An alternative statistical approach is to run regressions including an interaction of the income smoothing variable and a dummy variable indicating high/low institutional ownership (without splitting the sample). This approach is not taken as Chow tests indicate the superior efficiency of the statistical methodology we adopt for all five panels of Table 6.

(Insert Table 6 about here)

In Panel B of Table 6 we repeat the sub-sample analysis, using a measure of monitoring by institutions as the partitioning variable. Similar to Hartzell and Starks (2003), we calculate the Herfindahl index of the top 5 institutional holdings (*Inst_herf*), and utilize it as a measure of monitoring. Higher levels of institutional monitoring would increase the costs of smoothing to the CEO. Results indicate that the coefficient on smoothing is more negative when there are fewer institutional monitors, indicating a more pronounced relationship between smoothing and idiosyncratic volatility.

In Panel C of Table 6, we examine the role of financial analysts (*Analysts*) in the smoothing/volatility relationship. Yu (2008) argues that analysts serve as external monitors, where firms that are followed by more analysts manage their earnings less. Results indicate that, as expected, the relationship between smoothing and idiosyncratic volatility is weaker given a higher incidence of financial analysts.

Our findings in Panels A to C of Table 6 open up possibilities for alternative explanations. Since institutional owners and analysts follow more visible firms, it could altogether be the case that firm visibility, and the availability of firm-specific information, is driving our results. To exclude this possibility, we split our sample firms by two measures of private information: *PIN* and *Private* (see Easley et al., 2002; and Llorente et al., 2002). Results indicate that the relationship between income smoothing and idiosyncratic risk is not different in high *versus* low information environments. Therefore, we conclude that our results in Panels A to C of Table 6 are not driven by the inability of market participants to observe the riskiness of operations and cash flows.

Finally, in Panels D and E we examine the influence on the relationship between smoothing and *Volat* of two measures of risk: *DevCFO* and *VIX*. In Panel D we see that in the highest quartile of operational risk (*DevCFO*) the relationship between smoothing and volatility is stronger. Finally, Panel E shows the

results using *VIX*, the implied volatility index using option values[13], as the sample partitioning variable. *VIX* can be used as an exogenous measure of risk. Results indicate that the higher the exogenous risk, the stronger the relationship between smoothing and volatility. This indicates that managers try to reduce firm-specific risk more vigorously when market risk is high.

In sum, results in Table 6, together with those reported in Table 5, indicate that smoothing decisions are a function of a rational cost/benefit analysis. We find that the strength of the income smoothing/idiosyncratic volatility relationship increases (decreases) as the benefits (costs) of income smoothing increase.

6. Robustness Analyses

In this section we employ a number of statistical tests to enhance the validity of our results, including separating the innate from the discretionary component of smoothing, and controlling for the earnings quality measures used by Rajgopal and Venkatachalam (2008).

6.1 Innate Versus Discretionary Smoothing?

Our arguments so far have implied an opportunistic role for smoothing, given that the smoothing/volatility relationship is strongest in firms where CEO motivations are highlighted. We next dig further into this opportunistic role of smoothing, by isolating the innate vs. discretionary component of smoothing according to Francis et al. (2004), and by using an alternative methodology to calculate smoothing which only measures its discretionary component (see Tucker and Zarowin, 2006).

First, we statistically parse out the effects of natural smoothness by using a two-stage regression model similar to Francis et al. 2004, where in the first stage we regress income smoothness on firm-level

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[13] Data is freely available and is drawn from the Chicago Board Options Exchange. For an overview of this index see Whaley (2008).

economic fundamentals (we use the standard deviation of cash, the standard deviation of sales, a dummy for losses, the log of assets, firm operating cycle, capital intensity, firm intangible intensity and its dummy, and year and industry dummies), and in the second stage we use the residual from such a model to proxy for discretionary smoothing. Results reported in Model 1 of Table 7 indicate that such a measure of discretionary smoothing (*Res_iDev*) is also negative to idiosyncratic volatility, hence indicating that our results in Table 4 are not driven by the innately smooth earnings patterns of firms.

(Insert Table 7 about here)

Next, we use *iCorrZ* as an alternative measure of income smoothing in our basic model. *CorrZ* is calculated according to Tucker and Zarowin (2006) as the correlation between changes in "managed earnings" and changes in "unmanaged earnings"; in other words, the correlation of the change in discretionary accruals with the change in pre-discretionary income. We measure discretionary accounting decisions through the modified Jones model (Dechow et al., 1995),[14] adjusted for future earnings growth as per Phillips et al. (2003), and also adjusted for changes in cash holdings as per Chan et al. (2006).[15] Since we cannot observe managerial income smoothing actions, this measure has the advantage that it partitions accruals into discretionary and non-discretionary components, and assumes discretionary accruals proxy for active managerial decisions to smooth underlying "unsmooth" earnings. Results regarding our main finding remain unchanged: *iCorrZ* is negatively related to idiosyncratic volatility (t = -9.76).

6.2 Controls for Earnings Quality

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[14] Basically, discretionary accruals are calculated as total accruals minus non-discretionary accruals (accruals that are related to sales growth, receivables, and PPE). The calculation is done for each firm on a yearly basis, adjusting for industry membership.

[15] Measuring discretionary accruals is controversial, and prone to error. A number of authors claim the supremacy of their developed models, and it is not our intention to suggest a preferred measure. Nevertheless, the original modified Jones model as developed by Dechow et al. (1995) provides us with the same results.

This set of tests aims to distinguish our results from those of Rajgopal and Venkatachalam (2008), who find that idiosyncratic volatility has been increasing through time and attribute this to a decline in earnings quality.[16] If income smoothing is construed as lower earnings quality, our findings may be seen to conflict with RV. However, the relationship of income smoothing to earnings quality is unclear. To confirm the uniqueness of our findings and contribution, we re-run our tests controlling for the three earnings quality variables used in RV: the Dechow and Dichev (2002) measure of earnings quality (*DD*); the absolute value of discretionary accruals (*AbsAcc*) calculated *ala* modified Jones (Dechow et al., 1995); and the dispersion in analyst forecasts regarding upcoming earnings (*Dispersion*). Consistent with RV's results, we find that *DD* is positive to *Volat* (Model 3 in Table 7), while *AbsAcc* is not significant.[17] Untabulated results show that *Dispersion* is positively and significantly related to *Volat*. These results, cumulatively, indicate that lower earnings quality is related to higher idiosyncratic volatility. More importantly, our measures of income smoothing are still negative and significant (Model 3 of Table 7 shows results using *iDev*. Untabulated results show the same using *iCorr*).

In unreported results, we also show that our results are robust to time trends in earnings quality/idiosyncratic volatility, as our results are also obtained in yearly regressions, and in sub-periods where there are no time trends in the relevant variables. Furthermore, RV argue for a positive relationship between earnings quality and idiosyncratic volatility, because to the extent that reported income numbers do not reflect underlying operational activities, a lack of transparency (or garbling) induces a larger dispersion of beliefs regarding firm prospects, hence, a larger weight on idiosyncratic private earnings signals, and a resulting higher share price volatility. Nevertheless, this line of argument does not hold in

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[16] Rajgopal and Venkatachalam (2008) try to explain the intriguing results in studies that show an increasing trend in idiosyncratic volatility in the US market over the last 40 years (Campbell et al., 2001). However, Bekaert et al. (2008) state that efforts made to explain the increasing trend in idiosyncratic volatility are premature since there is no such trend.

[17] When running *DD* and *AbsAcc* separately we find them to be individually significant. However, when using *iCorr* to measure income smoothing *AbsAcc* is positively and significantly related to *Volat* while *DD* is positive but not significant, but by excluding *iCorr* from the regression, *DD* becomes significant.

our analysis, as we find that for our sample firms, income smoothing is negatively related to analyst forecast dispersion (see Model 4 of Table 8), hence income smoothing relates to more precise forecasts.

Collectively, results can be interpreted as follows: lower earnings quality results in higher volatility; however, discretionary managerial actions to smooth income work in the other direction, and result into lower volatility. The effects are incremental to each other, raising a number of possibilities: that managers smooth income to counter the effects of poor earnings quality, or that the signaling embedded in income smoothing renders higher quality earnings (in which case, our measures of earnings smoothing would be an alternative measure of earnings quality orthogonal to those of Rajgopal and Venkatachalam, 2008).

7. The Consequences of Smoothing

In this section we try to further understand the link between smoothing and volatility that our prior results have revealed. To do so, we examine the consequences of smoothing that can have an effect on idiosyncratic volatility. Correspondingly, we look at the relationship between smoothing and the standard deviation of revisions in analyst forecasts, one year ahead earnings surprises, share turnover, the dispersion in analysts' forecasts, institutional holdings, and institutional trading.

In Model 1 of Table 8 we examine the relationship between smoothing and the standard deviation of revisions in analyst forecasts, *Deviation_Forecasts*, calculated contemporaneously over a 12 month period in the same fiscal year. Results show that *Deviation_Forecasts* is negatively related to *iDev* (t-statistic = -14.04). Concurrently, in Model 2 of Table 8 we provide evidence that smoothing results into lower one year-ahead earnings surprises (t-statistic = -8.19), $Surprise_{t+1}$, calculated as actual earnings minus consensus analyst forecasts normalized by share prices. Both of these dependent variables (*Deviation_Forecasts* and $Surprise_{t+1}$) have been shown to move prices (Stickel, 1991; Ball and Shivakumar, 2008): lower magnitudes of those relate to lower share price volatility. Therefore the

relationship between smoothing and these factors may indicate an indirect effect of smoothing on share volatility.

<div align="center">(Insert Table 8 about here)</div>

In Model 3 of Table 8, we show that income smoothing is negatively related to share turnover (*Turnover,* calculated as shares traded during the year divided by total shares outstanding), where turnover itself is positively related to share price volatility (Jones et al. 1994). Therefore, the negative smoothing/turnover relationship provides for another indirect link between smoothing and volatility.

RV argue that higher earnings dispersion is positively related to idiosyncratic volatility, as such, Model 4 of Table 8 shows that income smoothing is related to lower levels of dispersion (t-statistic = -13.34), corroborating our arguments in section 6.2. This provides evidence that our income smoothing variable does not result into larger dispersion among analysts, and consequently larger idiosyncratic beliefs. In fact, evidence points out that the lower dispersion should result into lower share volatility (see discussion in section 2.2).

In Models 5 and 6 of Table 8 we show that smoothing is positively related to institutional holdings (*Institution*) (t-statistic = 2.89), and that controlling for institutional holdings, smoothing relates to higher levels of trading by institutional investors (*Institution_Trading*) (t-statistic = 3.86).[18] Although the link between institutional owners and share volatility is unclear, some studies argue that both institutional holding and institutional trading are associated with lower volatility (Reilly and Wachovicz, 1979; Lakonishok et al. 1992). In a similar vein, Sias and Starks (1997) find that institutional trading reflects information, and speeds price adjustment, hence, implying less price deviations from fundamentals, and a lower level of volatility induced by noise traders.

Finally, in Model 7 of Table 8 we show the results of the estimation of our basic model including all the dependent variables in the rest of the models as additional independent variables. This way we see whether any of these firm characteristics subsume the documented relationship between smoothing and

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[18] Institutional trading is calculated similar to Ferreira and Laux (2007), using quarterly changes in individual institutional holdings, divided by total shares outstanding.

idiosyncratic volatility. We see that smoothing remains negative and significant (t-statistic = -5.67).

Results in Model 7 indicate that revisions in analyst forecasts, earnings surprises, and share turnover, as expected, are positively related to share volatility. On the other hand, institutional trading results into lower share price volatility. This result provides indirect confirmation of our results in Model 5, suggesting that smoothing leads to more trading by informed institutions, which in turn is negatively related to volatility.

Altogether, results in this section provide evidence that the negative relationship found between smoothing and idiosyncratic volatility is possibly due to lower revisions of forecasts and earnings surprises, lower share turnover, and higher institutional holdings and trading. However, results in Model 7 of Table 8 also indicate that these covariates, when run concurrently with smoothing, do not completely eliminate its relationship to volatility. Therefore, although we have attempted to explain the smoothing/volatility link by examining the consequences of smoothing that can affect volatility, our explanations are incomplete, and other factors exist that mediate our purported relationships.

8. Other Unreported Robustness Analyses

8.1 Controls for Firm Level Governance Structures

We start our robustness tests by including controls for the governance structure of firms. Governance structures have been linked to CEO turnover, where stronger monitoring and shareholder control have been related to CEO turnover during periods of poor financial performance (DeFond and Hung, 2004). Apart from the role of corporate governance as a possible alternative test for CEO career concerns, it has also been widely linked to the financial reporting characteristics of host firms (see Klein, 2002, for a seminal study). Governance is simultaneously related to financial reporting and to volatility (Ferreira and Laux, 2007; Philippon, 2003). Hence firms' corporate governance structure could be a correlated omitted variable driving our observed results. We calculate *B.Indep*, which measures the percentage of

independent directors on the board. Untabulated results show that *B.Indep* is negatively related to *Volat*, indicating that firms with better governance structures are also less volatile. The significance and direction of our income smoothing variable remains unchanged. We also examine two additional governance measures: the *GIM* index, which represents an aggregation of firm-level governance characteristics as developed by Gompers et al. (2003), and *InstConc*, which measures the percentage of shares held by the top 5 institutional investors (see Hartzell and Starks, 2003), a proxy for monitoring. Consistent with findings in prior studies, both *GIM* and *InstConc* are negatively and significantly related to idiosyncratic volatility. Again, in these tests our income smoothing measures remain negatively and significantly related to *Volat*.

8.2 Controls for CEO Equity Holdings

We next test for the robustness of our results to CEO equity holdings. Previous research indicates that shareholdings and stock options are affected by the level of firm risk (Abdel-Khalik, 2007; Carpenter, 2000; Knopf et al., 2002); hence, equity holdings provide incentives to influence risk. Additionally, equity incentives are simultaneously related to financial reporting decisions (Bergstresser and Philippon, 2006; Cheng and Warfield, 2005; Kadan and Yang, 2004), and to firm risk. Undiversified managers who hold shares in a firm are risk averse and prefer lower volatility (Grossman and Hart, 1983), while options whose values are increasing in volatility provide incentives to increase risk (Lambert, 1986; Smith and Stulz, 1985). In other words, the equity incentives of CEOs might be driving both the operational and financial reporting decisions of the firm. To control for this possibility, we introduce two additional control variables: *Shares*, which measures the percentage of firm shares held by the CEO; and *Options*, which is the logarithmic form of the dollar value of all options held by the CEO. Untabulated results indicate that neither shareholdings nor option holdings affect the relationship between income smoothing and idiosyncratic volatility. *Shares* is negatively related to volatility, indicating that managers who have high stakes in a firm prefer less volatility (or they accept more share payments when risk is lower).

Options is positive to *Volat*, indicating that riskier firms award options more intensely, or managers increase volatility to benefit from options' convex payoffs (Core and Guay, 1998). In other untabulated tests we examine a number of other measures of equity holdings: the dollar value of shares, options held divided by total shares outstanding, and the logarithmic form of the dollar value of equity holdings (shares plus options). Results are qualitatively similar. We find no evidence that the inclusion of equity incentives as statistical covariates eliminates the relationship between income smoothing and idiosyncratic volatility.

8.3 Tests for Risk/Information proxies

In section 2.2 we argued that the relationship between income smoothing and volatility could be due to risk, or due to the informational properties of earnings (including garbling). Given that our tests in section 7 do not provide a complete view on the smoothing/volatility relationship (in Table 8, the relationship between smoothing and volatility is robust although controlling for a host of mediating characteristics), in this section we do a number of unreported tests in this regard, testing for proxies of both risk and information. From a risk perspective we introduce controls for firm leverage (to control for adverse selection and equity risk), the probability of bankruptcy (using the Altman (1968) probability of bankruptcy measure), future operational volatility, and accounting losses. As proxies for the informativeness of smoothing, we control for private measures of information such as *PIN* (Easley et al., 2002) and *Private* (Llorente et al., 2002).

If smoothing affects volatility by affecting real firm risk, then controlling for risk factors should render the smoothing to volatility relationship insignificant. In untabulated results we find that, as expected, all of our risk measures above are positive and jointly significant in relation to share volatility, providing evidence that these measures capture different aspects of underlying firm risk. Our measures of smoothing remain negative and significant, indicating that income smoothing provides an extra dimension in relation to *Volat*. As an additional analysis for the influence of *ex-ante* risk on smoothing decisions, we

split our sample into high/low levels of R&D expenditures.[19] Untabulated results indicate that inferences are qualitatively similar: income smoothing is more related to idiosyncratic volatility in firms where R&D expenditures are higher. In a final untabulated set of tests regarding the role of firm risk, we control for both industrial diversification and competition. Industrial diversification reduces idiosyncratic volatility, while product-market competition increases it. Correspondingly, they may also affect financial reporting decisions. Our results indicate that when controlling for both these factors, inferences remain unchanged.

Next, we control for measures of private information such as *PIN* (Easley et al., 2002) and *Private* (Llorente et al., 2002). If income smoothing affects firm risk by providing information, then controlling for information should render the smoothing to volatility relationship insignificant. In regressions similar to Table 4, controlling for both *PIN* and *Private*, our smoothing measures remain negatively related to idiosyncratic volatility. In unreported analyses, we examine three other aspects of the informational role of earnings. First, Ball and Shivakumar (2008) argue that earnings provide information around the quarterly earnings announcement, which in turn moves stock prices. To show that our results are not solely based around four quarterly earnings announcement periods during the year, we re-calculate idiosyncratic volatility by excluding all share variation around earnings announcements. To this effect, we calculate volatility by excluding all share variation 10 days before earnings announcement periods, and up to 3 days after the earnings announcement date. Our results are robust to this recalculated idiosyncratic volatility variable. Therefore, we show that income smoothing provides information that is beyond that of the earnings announcement period. Second, it could be the case that the relationship is driven by the information content of insider trading, which is related to both earnings properties (Bergstresser and Philippon, 2006), and share price movements (Fidrmuc et al., 2006). Therefore, we control for insider trading by calculating the amount of insider sales plus purchases, normalized by total shares outstanding, and we include it as an additional regressor. Our inferences remain the same. Finally, since firms that

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[19] Since R&D takes a lot of zero values, the median is considered as the breaking point to split low and high levels of R&D expenditures.

perform acquisitions experience share price volatility, and also have unique earnings properties (Erickson and Wang, 1999), we exclude all firms that perform acquisitions during the sample period; results remain unchanged.[20]

In sum, using various proxies for risk and information, our results remain robust, and inferences are unchanged: smoothing is negatively related to idiosyncratic volatility.

8.3.4 Other Tests

Having established a robust relationship between income smoothing and idiosyncratic volatility, we perform additional checks on the validity of our results. First, we use alternative estimation methods for our idiosyncratic volatility variable. Second, we use alternative measures of income smoothing. Third, we run a sub-sample analysis for thinly traded firms. Finally, we examine the effect of income smoothing on systematic volatility, as compared to that on idiosyncratic volatility.

We re-run the regressions in Table 4 using alternative estimation methods of idiosyncratic volatility: *Volat2* is calculated using the Fama and French (1992) three-factor model, and *Volat3* using residuals from market model regressions. Both *Volat2* and *Volat3* are calculated using daily data aggregated over a calendar year, while *Volat4* utilizes residuals from industry level regressions. Untabulated results indicate that our income smoothing measures, *iCorr* and *iDev*, are also significantly and negatively related to *Volat2*, *Volat3,* and *Volat4.* Therefore, our results so far are not sensitive to alternative specifications of our idiosyncratic risk variable.

Next, we use alternate measures of income smoothing. Jayaraman (2008) suggests that measures of income smoothing that are calculated as the ratio of the volatility of earnings to the volatility of cash flows are problematic (Jayaraman 2008, section 6.3, p.843). As a remedy, we also successfully replicate our results using his measure of volatility, *ACEV*, which is the difference between the volatility of

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[20] We also control for bid-ask spreads as a measure of firm-level information availability. Results are discussed in section 7.4

earnings and the volatility of cash flows. Finally, our descriptives indicate that both *iCorr* and *iDev* are skewed, which could be potentially problematic in terms of the efficiency of our estimation. Therefore, we also employ ranks of these variables, by ranking them into 10 groups adjusted for industry and year effects.[21] Again results remain the same.

Additionally, we examine the effect of illiquid firms. The presence of illiquid firms can distort our results because of their unique trading patterns, which could be correlated with their earnings characteristics. Ashbaugh-Skaife et al. (2006) find that 20% of US firms do not trade on any given day. To test for the possibility that these illiquid firms are driving our results, we perform three alternative tests. First, we re-estimate our main regressions in Table 4 on the subsample of firms with above-median share turnover for the year (shares traded during the year divided by total shares outstanding). Second, we introduce share turnover (*Turnover*) as a control variable in our regressions. Third, we control for bid-ask spreads by using the measure utilized by Amihud and Mendelson (1986). In all cases, our results are qualitatively unchanged: income smoothing is negatively related to idiosyncratic volatility.

Finally, in our final set of tests, we examine whether income smoothing is related to systematic volatility as it is with idiosyncratic risk. Lev and Kunitzky (1974) show that the extent of earnings smoothness is positively associated to systematic risk, interpreting this as evidence of stockholders preferring smoothed income series. This risk aversion perspective can itself be used as a motivation for income smoothing. Furthermore, Jin's (2002) results suggest that under specific circumstances, like facing binding short-selling constraints, incentives of performance based compensation contracts are negatively related to systematic risk. To explore these possibilities further, we examine whether the incentives to reduce idiosyncratic volatility are above and beyond incentives to reduce systematic volatility, and if not, whether the incentives to reduce both types of risk exist independently. To this end, we run separate regressions with each type of risk as the dependent variable, and then compare the

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[21] This method of ranking by industry and year is also advantageous as it potentially provides for a stronger control in filtering out systematic factors in income streams.

strengths of the effects of our income smoothing measures on the systematic/idiosyncratic risk specifications. Our untabulated results indicate that the coefficient of income smoothing on idiosyncratic volatility is larger (more negative), and statistically stronger, as compared to the coefficient of income smoothing on systematic volatility. Additionally, and depending on the model utilized, income smoothing is sometimes not significant when tested against systematic volatility. These results are compatible with the Jin (2002) and Bushman et al. (2010) findings. Jin (2002) shows that idiosyncratic and systematic risks react differently to incentives in performance based compensation contracts: while incentives are always negatively related to idiosyncratic volatility, only under specific circumstances this is the case for systematic risk. Similarly, Bushman et al. (2010) show that the probability of CEO turnover is increasing in idiosyncratic volatility while decreasing in systematic volatility.

9. Conclusions and Limitations

Given CEO career concerns, we examine whether managers have incentives to smooth income in order to reduce idiosyncratic volatility through the use of financial reporting flexibility. By relating income smoothing to the idiosyncratic component of stock price volatility we add to the still scarce literature on the economic effects of income smoothing. In addition, our study improves understanding of the determinants of idiosyncratic risk, which in turn benefits the accounting and finance literatures related to earnings quality, firm risk, portfolio theory, asset pricing models, and option valuation.

We empirically test the association between income smoothing and idiosyncratic volatility by regressing current idiosyncratic risk on current and past income smoothing data, controlling for a robust set of covariates. OLS and fixed effects regression results reveal a negative association between income smoothing and idiosyncratic risk, which we interpret as evidence that income smoothing practices are implemented in order to reduce stock price idiosyncratic volatility. Our main result also holds when the

endogeneity in the association between income smoothing and idiosyncratic volatility is considered, by using a three-stage least squares estimation technique. A changes analysis also indicates that increases in income smoothing are related to decreases in idiosyncratic volatility.

Our results indicate that the income smoothing/idiosyncratic volatility relationship is robust to controls for firm-specific risk, and the firm-specific information environment. This suggests that income smoothing adds a further dimension to share price movements that is beyond the signaling/information role of earnings, and beyond that proscribed by cash flow risk, perhaps by affecting investor sentiment. In further analysis, we find evidence of a rational cost/benefit tradeoff underlying the documented negative relationship between income smoothing and idiosyncratic volatility. On one hand, our findings support the role of CEO career concerns as a potential motivation to incur in costly income smoothing practices to reduce idiosyncratic volatility. On the other hand, the relationship between income smoothing and idiosyncratic risk is weaker as the costs of smoothing increase. Finally, robustness analysis indicates that results remain unchanged when controlling for firm level governance characteristics, equity holdings, and earnings quality.

The study has a number of limitations. Further analysis is needed on the role of CEO equity holdings, as it constitutes an important link for the income smoothing/volatility relationship, due to the risk aversion of CEOs' equity holdings. According to standard finance theory, idiosyncratic risk can be cancelled out by diversification. However, in addition to human capital risk, CEOs typically hold large portfolios in their own companies that make them unable to fully diversify their exposure to firm specific risk. Therefore, it can be argued that reducing idiosyncratic risk through income smoothing would reduce the cost of loss diversification faced by the CEO. Although the expected positive relationship between income smoothing and shareholdings could be entirely true for CEOs shareholdings, CEOs' preference for volatility is not clear when they hold executive stock options (Carpenter, 2000; Knopf et al., 2002;

Rajgopal et al., 2004; Rogers, 2002; Tufano, 1996). Therefore, the role of equity holdings in relation to firm volatility and income smoothing remains unclear.

Furthermore, although we document a robust relationship between smoothing and volatility, and we provide for some possible avenues that mediate this link, our explanations remain incomplete. Smoothing is thought of as both providing information, and reducing risk. However, controlling for various proxies of firm risk and information, our relationships remain robust. This indicates that (a) our explanations regarding our smoothing/volatility relationship remains incomplete, (b) that smoothing provides for additional factors that affect volatility, above and beyond standard proxies for risk and information examined in the literature (perhaps affecting risk perceptions, or investor sentiment, that cannot be easily controlled for given our research design). We leave for further research, the issue as to whether smoothing affects volatility through risk or information.

Our statistical model and measured variables are subject to a number of limitations that could affect the results. First, we treat a number of variables as exogenous although they could be endogenously determined. Second, some of the proxies for the theoretically guided factors such as information/firm risk could be incomplete. Where such variables are measured with error, or are incomplete, our inferences remain prone to error. Finally, our results are valid as long as no omitted variable is correlated with our income smoothing and idiosyncratic volatility variables.

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Figure 1: Timeline of Variable Definitions

Volat refers to idiosyncratic volatility, IS refers to income smoothing, Controls refer to the control variables utilized in Table 4. Income smoothing is calculated over three years, and matched contemporaneously with volatility. Income smoothing is calculated over the time period t-3 to t, while volatility is calculated over t-1 to t. Control variables are calculated at time t (Panel A). In Panel B, and in order to keep the calculation of income smoothing and volatility separate, we calculate income smoothing over t-4 to t-1, and we calculate volatility over time period t-1 to t. Both matching processes produce identical results.

Panel A: Current and Past Income Smoothing Related to Current Idiosyncratic Volatility

$Volat_t$

T - 4   T - 3   T - 2   T - 1   T

IS_t

$Controls_t$

Panel B: Past Income Smoothing Related to Current Idiosyncratic Volatility

$Volat_t$

T - 4   T - 3   T - 2   T - 1   T

IS_{t-1}

$Controls_{t-1}$
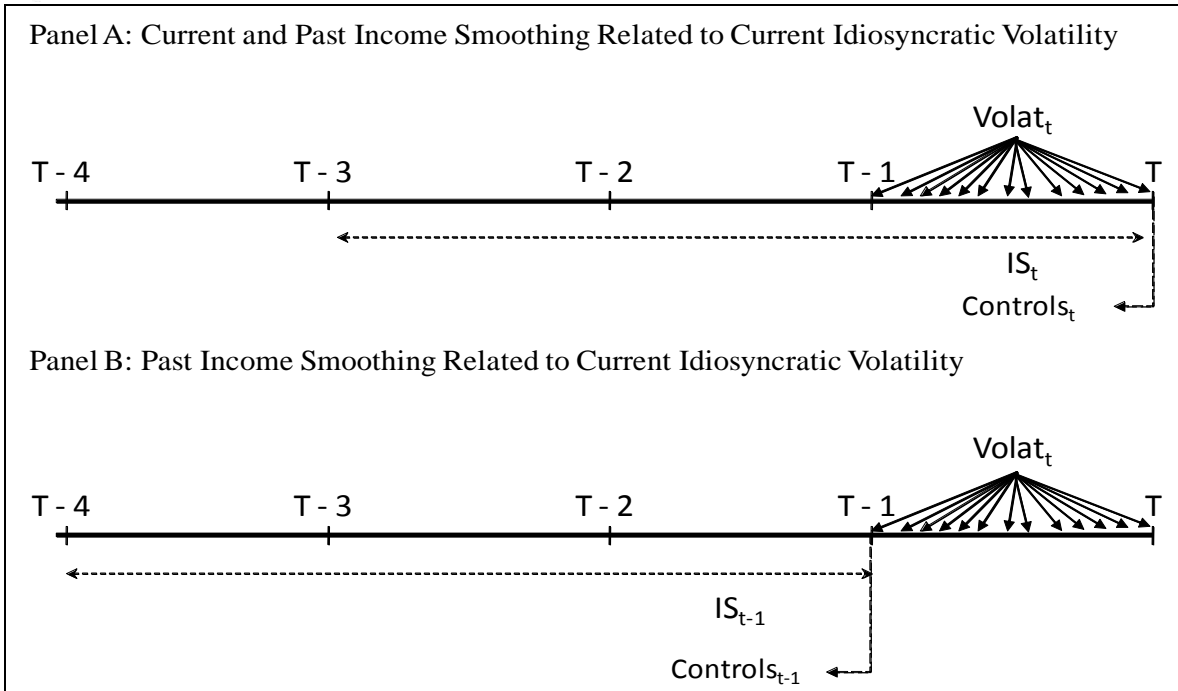
Figure 2: Income Smoothing and Idiosyncratic Volatility

This figure shows the mean values of idiosyncratic volatility (*Volat*) by deciles of our two main income smoothing measures: *iCorr* is the inverted sign of *Corr* (the correlation between change in accruals and change in cash flows from operations, calculated over a three-year period); and *iDev* is the inverse of *Dev* (the standard deviation of net income before extraordinary items, divided by the standard deviation of cash flows from operations, both calculated over a three-year period).

Table 1: Select Variable Definitions

Research Variables:

Volat = Idiosyncratic volatility, estimated for each firm and year as the annual average of monthly variance of daily market-adjusted returns. Daily market-adjusted returns are the excess of daily stock return for the corresponding firm over the daily return on the value weighted market portfolio.

Dev = Standard deviation of net income before extraordinary items, divided by the standard deviation of cash flows from operations, both calculated over a three-year period. The inverse of this (*iDev*) is used in most specifications.

Corr = The correlation between change in accruals and change in cash flows from operations, calculated over a three-year period. The inverted sign of this (*iCorr*) is used in most specifications.

Control Variables:

LogMktVal = logarithm of the market value of equity.

ROA = net income before extraordinary items divided by total assets.

MB = market value of equity divided by the book value.

Leverage = long term debt over total assets.

Institution = percentage of shares held by institutional investors.

DevCFO = standard deviation of cash flow from operations, calculated using quarterly data over a period of 12 quarters.

Table 2: Sample Selection

CRSP daily data to calculate *Volat*	128,963
Intersection with	
Compustat data to calculate income smoothing	113,903
Base sample	88,577
Subsamples for various analyses:	
Sample with robust set of controls	
(Including data from CDA Spectrum)	72,469
Sample with CEO turnover	21,246
Sample with *governance* data	12,951
Sample with compensation data	17,963

Table 3: Descriptive Statistics of Select Variables (1990-2006)

This table reports descriptive statistics of the main variables for the common sample of observations for which we can calculate our income smoothing measures and all the control variables included in Model (1) of Table 4. The sample comprises more than 65,000 observations and 10,000 individual firms. The number of firms per year ranges from a minimum of 536 in 1990 to a maximum of 4,962 in 2001. *Volat* is the idiosyncratic volatility, estimated as the average of monthly variances of daily market adjusted returns. *Corr* is the correlation between change in accruals and change in cash flows from operations, calculated over a three-year period. *Dev* is the standard deviation of net income before extraordinary items, divided by the standard deviation of cash flow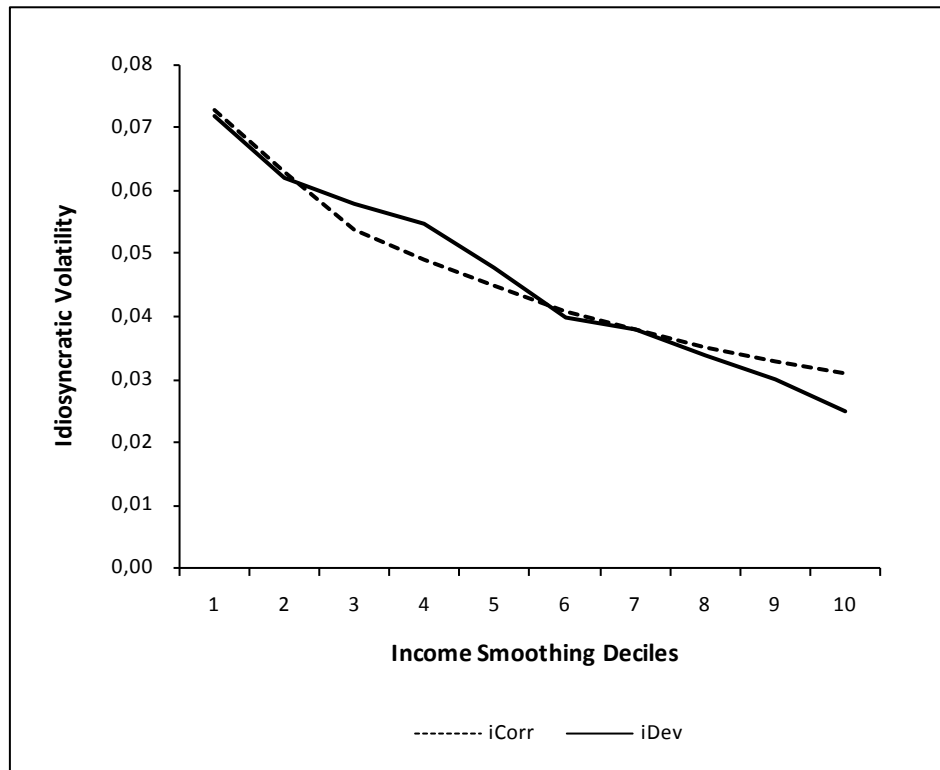s from operations, both calculated over a three-year period. *Mktval* is the market value of equity. *ROA* is the net income before extraordinary items divided by total assets. *MB* is the market value of equity divided by the book value of equity. *Institution* is the percentage of shares held by institutional investors. *Leverage* is the long term debt over total assets. *DevCFO* is the standard deviation of cash flow from operations, calculated quarterly over a period of 12 quarters.

Variable	N	Mean	p50	St.Dev.	p5	p25	p75	p95
Volat	65,090	0.046	0.023	0.067	0.003	0.010	0.052	0.172
Corr	65,090	-0.547	-0.891	0.630	-1.000	-0.987	-0.315	0.919
Dev	65,090	1.472	0.818	2.149	0.108	0.387	1.575	5.124
MktVal	65,090	1,474.6	174.6	4,187.1	7.0	40.5	814.4	7,362.2
ROA	65,090	-0.037	0.030	0.248	-0.508	-0.028	0.070	0.152
MB	65,090	2.714	1.767	4.018	0.063	1.003	3.159	8.895
Institution	65,090	0.383	0.350	0.286	0.007	0.119	0.617	0.879
Leverage	64,798	0.234	0.194	0.220	0.000	0.031	0.369	0.657
DevCFO	65,090	0.072	0.042	0.095	0.006	0.020	0.083	0.234

Table 4: Relationship between Income Smoothing and Idiosyncratic Volatility

Column (1) shows the coefficients from the OLS regression of firm idiosyncratic volatility (*Volat*) on income smoothing (*iDev*) and control variables. Column (2) shows the same using *iCorr*. Column (3) shows the coefficients of regression in column (1), but utilizes firm fixed effects. Column (4) shows the coefficients from an OLS regression of changes in idiosyncratic volatility (*Ch_Volat)* on changes in income smoothing (*Ch_iDev*) and control variables (*Ch_Controls*), where changes in all variables are calculated from t-3 to t to precede the time period related to income smoothing. Finally, column (5) shows the coefficients from the second equation, in a three-stage least squares regression where the second equation is *Volat = iDev + Controls*, and the first equation is *iDev* = lagged *Volat* + lagged *Controls*, where all independent variables are lagged by three years to precede the time period related to income smoothing. Control variables are: *LogMktVal* is the natural logarithm of the market value of equity; *ROA* is the net income before extraordinary items divided by total assets; *MB* is the market value of equity divided by the book value; *Institution* is the percentage of shares held by institutional investors; and *DevCFO* is the standard deviation of cash flow from operations, calculated over a period of 12 quarters. All variables are winsorized at 1% and 99%. In parenthesis we report t-statistics that are robust to heteroskedasticity, autocorrelation, and firm-level clustering in the OLS regressions. Statistical levels are indicated by *** for $p<0.01$, ** for $p<0.05$, and * for $p<0.1$.

	Model 1 Volat	Model 2 Volat	Model 3 Volat	Model 4 Ch_Volat	Model 5 Volat
Constant	0.0971*** [12.61]	0.1042*** [12.04]	0.1045*** [50.57]	-0.0130** [-2.52]	0.2307 *** [10.36]
iDev	-0.0011*** [-18.42]		-0.0006*** [-11.63]		-0.0663 *** [-35.38]
iCorr		-0.0060*** [-12.24]			
LogMktVal	-0.0121*** [-42.61]	-0.0121*** [-41.32]	-0.0166*** [-77.32]		-0.0085*** [-16.78]
ROA	-0.0638*** [-33.17]	-0.0619*** [-30.24]	-0.0448*** [-45.17]		0.0216*** [3.84]
MB	0.0005*** [7.01]	0.0007*** [8.11]	0.0004*** [9.10]		-0.0008*** [-6.40]
Institution	-0.0111*** [-9.13]	-0.0113*** [-8.96]	-0.0051*** [-3.94]		-0.0038*** [-2.94]
DevCFO	0.0531*** [12.11]	0.0518*** [10.43]	0.0472*** [19.80]		0.2862*** [15.71]
Ch_iDev				-0.0004 *** [-8.03]	
Ch_LogMktVal				-0.0149*** [-22.66]	
Ch_ROA				-0.0396*** [-13.14]	
Ch_MB				0.0004*** [5.06]	
Ch_Institution				-0.0042** [-1.96]	
Ch_DevCFO				0.0349*** [5.81]	
Year Dummies	Yes	Yes	Yes	Yes	Yes
Ind. Dummies	Yes	Yes	No	Yes	Yes
Firm dummies	No	No	Yes	No	No
Observations	72,469	65,090	72,469	40,539	51,091
R-squared	39.76%	39.73%		16.01%	

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Table 5: The role of CEO Career Concerns on the Relationship between Income Smoothing and Idiosyncratic Volatility

Panel A: Effect of Income Smoothing on the Probability of CEO Forced Turnover

Panel A shows the coefficients and marginal effects from a probit regression of firm CEO forced turnover on idiosyncratic volatility (*Volat*), income smoothing (*iDev* or *iCorr*) and other explanatory variables. The time period is 1992-2006. All the right-hand-side variables are winsorized at 1% and 99%. Z-values are below each estimated coefficient, calculated using robust standard errors controlling for firm level clustering. Column (1) does not include income smoothing, while columns (2) and (3) include income smoothing measured using *iDev* and *iCorr* respectively. Statistical levels are indicated by *** for p<0.01, ** for p<0.05, and * for p<0.1. The dependent variable is CEO forced turnover (*Forced*) which is defined as 1 if there is a forced turnover, 0 otherwise. *Size* is the natural logarithm of total assets. *ROA* is the net income before extraordinary items divided by total assets. *DevNI* is the standard deviation of net income before extraordinary items, calculated quarterly over a period of 12 quarters. *CEO_tenure* indicates the number of years the CEO has held that position in the company.

	Model 1 Forced Turnover		Model 2 Forced Turnover		Model 3 Forced Turnover	
	Estimate	**Marginal**	**Estimate**	**Marginal**	**Estimate**	**Marginal**
Constant	-1.916*** [-8.75]		-1.868*** [-8.45]		-2.375*** [-9.12]	
Volat	2.719*** [4.92]	0.373	2.587*** [4.73]	0.352	2.839*** [5.06]	0.391
iDev			-0.021*** [-5.03]	-0.003		
iCorr					0.029 [1.14]	0.004
Size	0.042*** [4.54]	0.006	0.040*** [4.38]	0.006	0.042*** [4.52]	0.006
ROA	-0.823*** [-7.42]	-0.113	-0.837*** [-7.45]	-0.114	-0.819*** [-7.28]	-0.113
DevNI	-0.242 [-1.37]	-0.033	-0.366** [-1.99]	-0.050	-0.196 [-1.08]	-0.027
CEO_tenure	-0.008*** [-4.32]	-0.001	-0.008*** [-4.15]	-0.001	-0.009*** [-4.54]	-0.001
Year Dummies	Yes		Yes		Yes	
Industry Dummies	Yes		Yes		Yes	
Observations	19,462		19,462		19,231	
Pseudo R²	3.12%		3.38%		3.13%	
# Forced = 1	1,504		1,504		1,494	

Panel B: Relationship between income smoothing and idiosyncratic volatility by levels of ex ante CEO firing probability (CFP)

Panel B shows the coefficient of the income smoothing variable (*iDev* or *iCorr*) when estimating our main model (Columns 1 and 2 of Table 4) in the lowest and highest quartiles of our *ex ante* CEO firing probability (*CFP*) measures. *Ex ante* CEO firing probability measures are estimated in two steps: first, in the subsample where CEO turnover data is available, we estimate a logistic regression to model forced CEO turnover using four alternative specifications; second, for the whole sample where data on the regressors is available, we obtain the predicted values from the logistic regression (the log of the odds ratios), which are subsequently transformed into probabilities. We also report the Wald statistic to test whether the relationship between income smoothing (*iDev* or *iCorr*) and idiosyncratic volatility (*Volat*) are statistically different in low versus high *CFP* levels.

	iDev			*iCorr*		
	Low *CFP*	**High *CFP***	**Wald test low *vs* high**	**Low *CFP***	**High *CFP***	**Wald test low *vs* high**
CFP1	-0.0005***	-0.0019***	25.59***	-0.0031***	-0.0095***	22.85***
t-statistic	[-9.71]	[-6.92]		[-5.96]	[-7.28]	
N	*7,300*	*7,299*		*7,300*	*7,299*	
CFP2	-0.0006***	-0.0018***	27.51***	-0.0039***	-0.0097***	16.81***
t-statistic	[-9.43]	[-7.76]		[-6.70]	[-7.45]	
N	*7,288*	*7,287*		*7,288*	*7,287*	
CFP3	-0.0003***	-0.0015***	7.04***	-0.0021***	-0.0083***	25.19**
t-statistic	[-14.68]	[-4.56]		[-10.23]	[-7.53]	
N	*14,790*	*14,789*		*14,790*	*14,789*	
CFP4	-0.0005***	-0.0021**	21.40***	-0.0034***	-0.0111***	20.26**
t-statistic	[-15.02]	[-8.49]		[-10.40]	[-9.55]	
N	*14,743*	*14,743*		*14,743*	*14,743*	

Table 6: Factors affecting the effect of Income Smoothing on Idiosyncratic Volatility

This table shows the coefficients of the income smoothing variables (*iCorr* or *iDev*) from OLS regressions of firm idiosyncratic volatility (*Volat*) on income smoothing and other explanatory variables, examining partitions of our sample based on selected variables. Control variables and year and industry controls are included but not reported. All variables are winsorized at 1% and 99%. In parenthesis we report t-statistics that are robust to heteroskedasticity, autocorrelation, and firm-level clustering. Statistical levels are indicated by *** for p<0.01, ** for p<0.05, and * for p<0.1. Panels A, B, C, D, and E split our sample firms according to the lowest/highest quartiles of *Institution* (percentage of shares held by institutional investors), *Inst_herf* (ownership concentration of top 5 institutional investors), *Analysts* (the log of the number of analysts covering the firm), *DevCFO* (the standard deviation of cash flow from operations, calculated over a period of 12 quarters), and *VIX* (Volatility Index that proxies for exogenous risk). The last column of the table shows the Wald statistic that compares the estimated coefficient of the corresponding income smoothing variable in the two samples, where the null is that the two coefficients are equal.

Panel A: Sample partition by Institutional Investors Ownership (Institution)

	Lowest quartile *Institution* (16,273 Obs)	**Highest quartile *Institution*** (16,272 Obs)	**Low *vs* high**
iCorr	-0.0093*** [-7.15]	-0.0027*** [-8.47]	27.83***
iDev	-0.0023*** [-10.09]	-0.0005*** [-11.58]	59,79***

Panel B: Sample partition by Ownership Concentration on Institutional Investors (Inst_herf)

	Lowest quartile *Inst_herf* (16,273 Obs)	**Highest quartile *Inst_herf*** (16,272 Obs)	**Low *vs* high**
iCorr	-0.0089*** [-7.01]	-0.0046*** [-7.31]	7.53***
iDev	-0.0021*** [-10.26]	-0.0008*** [-10.47]	31.16***

Panel C: Sample partition by Analysts Coverage (Analysts)

	Lowest quartile *Analysts* (10,100 Obs)	**Highest quartile *Analysts*** (6,923 Obs)	**Low *vs* high**
iCorr	-0.0066*** [-7,07]	-0.0016*** [-4.17]	28.34***
iDev	-0.0014*** [-12,04]	-0.0002*** [-4.39]	101.76***

Panel D: Sample partition by Cash Flow volatility (DevCFO)

	Lowest quartile *DevCFO* (16,273 Obs)	**Highest quartile *DevCFO*** (16,272 Obs)	**Low *vs* high**
iCorr	-0.0024*** [-4.02]	-0.0100*** [-9.45]	38.80***
iDev	-0.0007*** [-8.89]	-0.0018*** [-13.06]	28.56***

Panel E: Sample partition by Volatility Index (VIX)

	Lowest quartile *VIX* (18,378 Obs)	**Highest quartile *VIX*** (13,945 Obs)	**Low *vs* high**
iCorr	-0.0037*** [-5.49]	-0.0064*** [-7.53]	12.79***
iDev	-0.0009*** [-10.72]	-0.0013*** [-12.30]	19.29***

Table 7: Relationship between Income Smoothing and Idiosyncratic Volatility, Including Additional Controls for Discretionary Smoothing.

Column (1) shows the coefficients from the OLS regression included in model 1 of table 4, where the income smoothing measure has been substituted with the residuals of the regression of *iDev* on the innate determinants of accruals as per Francis et al. (2004) (*Res_iDev*). Column (2) shows the coefficients of the OLS regression of firm idiosyncratic volatility on explanatory variables, included income smoothing measured as per Tucker and Zarowin (2006) (*iCorrz*). Column (3) shows the coefficients of the OLS regression included in model 1 of table 4, where we additionally control for the Dechow and Dichev (2002) measure of earnings quality (*DD*) and for the absolute value of the modified Jones (Dechow et al. 1995) measure of abnormal accruals (*AbsAcc*). Control variables in all the models include: *LogMktVal* is the natural logarithm of the market value of equity; *ROA* is the net income before extraordinary items divided by total assets; *MB* is the market value of equity divided by the book value; *Institution* is the percentage of shares held by institutional investors; and *DevCFO* is the standard deviation of cash flow from operations, calculated over a period of 12 quarters. All variables are winsorized at 1% and 99%. In parenthesis we report t-statistics that are robust to heteroskedasticity, autocorrelation, and firm-level clustering. Statistical levels are indicated by *** for $p<0.01$, ** for $p<0.05$, and * for $p<0.1$.

	Model 1 Volat	Model 2 Volat	Model 3 Volat
Constant	0.0681***	0.0870***	0.0752***
	[12.61]	[7.27]	[14.36]
Res_iDev	-0.0008***		
	[-10.02]		
iCorrz		-0.0056***	
		[-9.76]	
iDev			-0.0013***
			[-17.48]
LogMktVal	-0.0097***	-0.0116***	-0.0114***
	[-27.13]	[-37.52]	[-32.52]
ROA	-0.0700***	-0.0601***	-0.0558***
	[-19.12]	[-25.97]	[-20.40]
MB	0.0007***	0.0007***	0.0006***
	[5.89]	[8.00]	[5.80]
Institution	-0.0143***	-0.0133***	-0.0164***
	[-8.82]	[-9.69]	[-10.08]
DevCFO	0.0478***	0.0549***	0.0557***
	[5.52]	[9.45]	[8.23]
DD			0.0108***
			[4.07]
AbsAcc			0.0002
			[0.22]
Year Dummies	Yes	Yes	Yes
Ind. Dummies	Yes	Yes	Yes
Observations	31,584	52,689	42,656
R-squared	37.40%	39.44%	37.67%

Table 8: Consequences of Smoothing

Columns (1) to (6) in this table show the coefficients from OLS regressions of several variables on income smoothing (*iDev*) and control variables. Dependent variables include: standard deviation of the revision in analysts' forecasts (*Deviation_Forecasts*); dispersion in analysts' forecasts (*Dispersion*); future earnings surprises (*Surprise$_{t+1}$*); institutional holdings (*Institution*); institutional trading (*Institution_Trading*); share turnover (*Turnover*). Control variables include: idiosyncratic volatility (*Volat*); size (*LogMktVal*); profitability (*ROA*); market to book ratio (*MB*); institutional holdings (*Institution*); cash flow volatility (*DevCFO*); and bid ask spread (*Bidask*). Column (7) shows the coefficients from the OLS regression included in column (1) of table 4, where the dependent variables in models (1) to (6) are included as additional controls. Additional information is per Table 4.

	Model 1 Deviation Forecasts	Model 2 Surprise$_{t+1}$	Model 3 Turnover	Model 4 Dispersion	Model 5 Institution	Model 6 Institution Trading	Model 7 Volat
Constant	0.0428***	0.0299***	-0.1692	0.0684***	-0.0711**	-2.259 ***	0.0264
	[7.62]	[10.32]	[-1.47]	[4.31]	[-2.33]	[-10.37]	[0.00]
iDev	-0.0006***	-0.0003***	-0.0168***	-0.0020***	0.0008**	0.0089***	-0.0002***
	[-14.04]	[-8.19]	[-11.73]	[-13.34]	[2.39]	[3.86]	[-5.67]
Volat	0.3801***		7.4344***	0.1389**		-5.934***	
	[15.92]		[35.18]	[2.35]		[-18.16]	
LogMktVal	-0.0030***	-0.0031***	0.0499***	-0.0001	0.0873***	0.1478***	-0.0034***
	[-13.11]	[-20.59]	[6.48]	[-0.17]	[84.00]	[17.56]	[-24.81]
ROA	-0.0724***	-0.0178***	0.2311***	-0.1102***	0.0463***	-0.1414***	-0.0290***
	[-18.17]	[-11.57]	[6.34]	[-10.18]	[9.18]	[-2.67]	[-10.54]
MB	-0.0007***	-0.0002***	0.0213***	-0.0020***	-0.0041***	-0.0327***	0.0002***
	[-7.32]	[-3.24]	[11.31]	[-6.73]	[-12.70]	[-16.06]	[3.55]
Leverage	0.0226***	0.0169***	-0.1622***	0.0583***	0.0128	0.0745	
	[11.01]	[12.99]	[-4.19]	[7.99]	[1.58]	[1.44]	
DevCFO	-0.0112*	0.0079**	1.2512***	0.0501**	-0.1228***	-0.6948***	0.0276***
	[-1.67]	[2.45]	[14.51]	[2.46]	[-10.83]	[-5.35]	[4.32]
Institution		-0.0077***	1.4655***	-0.0518***		1.7064***	-0.0108***
		[-8.81]	[33.01]	[-7.70]		[42.38]	[-7.44]
Bidask			-8.5037***	-0.0478		-3.4996***	
			[-21.20]	[-0.59]		[-5.50]	
Deviation_ Forecasts							0.1222***
							[8.20]
Dispersion							-0.0169***
							[-5.43]
Surprise$_{t+1}$							0.0276**
							[2.48]
Institution_Trading							-0.0043***
							[-5.84]
Turnover							0.0047***
							[15.94]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	No	Yes	Yes	Yes	Yes	Yes
Observations	32,620	36,892	66,486	23,514	73,893	66,241	15,880
R-squared	31.62%	9.05%	33.87%	13.92%	49.63%	32.82%	56.50%