Earnings Volatility, Cash Flow Volatility, and Informed Trading

Sudarshan Jayaraman
Olin School of Business
Washington University in St. Louis
Campus Box 1133
One Brookings Drive
St. Louis, MO 63130
jayaraman@olin.wustl.edu

August 2007

Abstract

I examine whether earnings that are smoother or more volatile than cash flows provide or garble information. Consistent with theories that predict more informed trading when public information is less informative, I find that bid-ask spreads and the probability of informed trading are higher both when earnings are smoother than cash flows and also when earnings are more volatile than cash flows. Additional tests suggest that managers' discretionary choices that lead to smoother or more volatile earnings than cash flows garble information, on average. However, I find that informed trading is attenuated in settings in which theory suggests that discretionary smoothing or volatizing of earnings is likely to be informative.

This paper is based on my doctoral dissertation at the University of North Carolina at Chapel Hill. I am indebted to my committee members Robert Bushman, Wayne Landsman, Mark Lang, and Gunter Strobl, and especially to my dissertation chairman, Jeffery Abarbanell. I also appreciate helpful comments from Phil Berger (editor), an anonymous referee, Donal Byard, Hemang Desai, Scott Dyreng, Richard Frankel, John Hand, Doug Hanna, Chris Petrovits, Jana Raedy, Kartik Raman, Steve Stubben, Anjan Thakor, Kumar Venkataraman, S. Viswanathan, Wendy Wilson, and workshop participants at Baruch College, Southern Methodist University, the University of North Carolina at Chapel Hill, and Washington University in St. Louis. I am grateful to Joel Hasbrouck and Soeren Hvidkjaer for sharing their data with me.

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1. Introduction

In this paper I investigate whether earnings that are smoother or more volatile than cash flows provide or garble information for market participants. It is well understood that accounting rules such as the required matching of expenses and revenues are designed to smooth out fluctuations in cash flows and present a smooth stream of earnings (e.g., Dechow [1994]). Other accounting conventions, such as conservatism, and the inherent difficulty in predicting future cash flows can result in earnings that are more volatile than cash flows (e.g., Basu [1997], Dechow and Dichev [2002]). On the other hand, it is possible that earnings that are smoother than cash flows result from managers' proactive discretionary choices, such as income smoothing (e.g., Leuz et al. [2003], Levitt [1998], Kirschenheiter and Melumad [2002], Arya et al. [2003]), while earnings that are more volatile than cash flows may result from discretionary choices such as "big baths" and timely loss recognition (e.g., Kirschenheiter and Melumad [2002], Givoly and Hayn [2000], Ball and Shivakumar [2006], Turner [2001], Riedl [2004]). Thus, earnings that are either smoother or more volatile than cash flows may be due to either the neutral application of accounting rules and conventions or to proactive discretionary choices, or both. Regardless of the underlying reason for smoother or more volatile earnings, an empirical question arises whether these outcomes either provide or garble information.

I refer to the difference between the volatility of earnings and the volatility of cash flows as the *accrual component of earnings volatility* (*ACEV*). Using bid-ask spreads and the probability of informed trading as proxies for informed trading, I find that when earnings are smoother than cash flows (i.e., for negative values of the accrual component), there is, on average, more informed trading. Similarly, when earnings are more volatile than cash flows (i.e.,

for positive values of the accrual component), there is, on average, more informed trading. These results suggest that earnings that are smoother or more volatile than cash flows garble information and thus attract informed traders. Because earnings volatility can differ from cash flow volatility either because of accounting conventions or due to proactive period-by-period managerial discretion, I perform additional tests to parse out the individual effects of neutral application and proactive discretion.

To establish my hypotheses, I rely on theories from information economics that link the informativeness of public information to informed trading (e.g., Grossman and Stiglitz [1980], Verrecchia [1982], Diamond [1985], Easley and O'Hara [2004], Baiman and Verrecchia [1996]). These theories predict that the informational advantage of informed traders, and therefore the level of informed trading, is inversely related to the informativeness of public disclosure.[1] Following prior research in market microstructure, I use bid-ask spreads and the probability of informed trading as proxies for the level of informed trading. According to the above theories, if earnings that are smoother or more volatile than cash flows provide information, then these reporting outcomes would be associated with lower bid-ask spreads and lower probabilities of informed trading. On the other hand, if earnings that are smoother or more volatile than cash flows garble information, then these reporting outcomes would be associated with higher bid-ask spreads and higher probabilities of informed trading.[2] Alternatively, it is possible that these reporting outcomes are unrelated to informed trading.[3]

[1] I use the term *public disclosure* to correspond to the notion of disclosure in the analytical literature. Following Kim and Verrecchia [1994, pp. 43], I use the phrase *provide information* to indicate "public disclosure that ameliorates the adverse selection problem by partially or fully revealing to market makers information known by informed traders." Similarly, I use *garble information* to indicate public disclosures that "stimulate informed judgments among traders who process public disclosure into private information. The ability of information processors to produce superior assessments of a firm's performance on the basis of an earnings announcement provides them with a comparative information advantage over market makers (pp, 44)."

[2] It is possible that earnings that are smoother or more volatile than cash flows provide information but are associated with more informed trading because public and private information are complements. Lundholm [1998]

Volatility of earnings is defined in this paper as the variance of five years' earnings before extraordinary items, scaled by assets, and the volatility of cash flows as the variance of five years' annual cash flow from operations, scaled by assets. I use the difference between these two volatility measures, which is the accrual component or *ACEV*, to classify earnings as to whether they are smoother or more volatile than cash flows. Negative (positive) values of the accrual component indicate earnings that are smoother (more volatile) than cash flows.[4]

The empirical results indicate that higher levels of informed trading are associated with more negative values of the accrual component (i.e., earnings smoother than cash flows). Further, higher informed trading is also associated with more positive values of the accrual component (i.e., earnings more volatile than cash flows). Informed trading is the lowest when the accrual component is close to zero (i.e., earnings volatility similar to cash flow volatility). The relation between the accrual component and informed trading is robust in a multivariate regression that includes controls for firm size, turnover, illiquidity, and the inverse of stock price.

Having established the overall relation between informed trading and the accrual component of earnings volatility, I next examine the role of proactive discretion in the relation

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and Manzano [1999] consider correlated public and private signals, while Indjejikian [1991] considers correlated private signals. Alles and Lundholm [1993] present a general representation of the asset payoff and information structures and derive predictions based on modifications to the underlying structures. Substitutability versus complementarity of public and private signals also depends on whether the private signal is about the asset payoff or the public signal (Verrecchia [2001]). Although I perform additional tests to investigate the possibility of complementarity, I cannot conclusively rule out this interpretation.

[3] Prior studies have generally used associations with contemporaneous or future stock prices/returns (value-relevance) to assess informativeness of reporting outcomes. While contemporaneous association-based studies might be intuitively appealing, they face the problem of correlated omitted variables, because these studies do not account directly for the mechanism through which information is impounded in stock prices. That is, do earnings that are smoother or more volatile than cash flows provide information and directly impound information into stock prices, or do they garble information and thus attract informed traders who impound the private information into stock prices through informed trading? A related limitation of future stock price/returns–based associations is that they do not address the reasons that the ability of current earnings to predict future stock prices/returns is not arbitraged away. Informed trading, on the other hand, is based on informativeness of public information and does not rely on associations with future realizations.

[4] The characterization of earnings that are either smoother or more volatile than cash flows as the difference between earnings volatility and cash flow volatility (i.e., the second moment) is in the spirit of prior studies that characterize accruals as the difference between earnings and cash flows (i.e., the first moment). In subsequent sections, I discuss the robustness of my results to alternate measures currently used in the literature.

between informed trading and the accrual component. Studies in the accounting literature have allowed for the possibility that proactive discretion in the reporting process is aimed at either providing or garbling information. In a recent survey of more than 400 corporate executives, Graham et al. [2005] find that an overwhelming majority of CFOs (97%) prefer to report smooth earnings, holding cash flows constant. The main reasons offered by survey participants for their preference for smooth earnings are the perception of lower risk, the lower cost of equity and debt, and improved earnings predictability by analysts. Prior research has not reached a consensus on whether income smoothing either provides or garbles information for equity market participants. While some researchers (e.g., Arya et al. [2003], Sankar and Subramanyam [2001], and Demski [1998]) argue that income smoothing is informative, other studies, regulators, and anecdotal evidence (e.g., Leuz et al. [2003], Levitt [1998], Lang et al. [2003], Bhattacharya et al. [2003], LaFond et al. [2007], and Barth et al. [2006]) suggest that income smoothing is an act of earnings management that garbles information.

There is also no consensus in the literature on whether proactive discretionary choices that make earnings more volatile than cash flows reveal or garble information. While some researchers argue that big baths and timely loss recognition can be informative (Kirschenheiter and Melumad [2002], Basu [1997], Givoly and Hayn [2000], Ball and Shivakumar [2006]), other studies and regulators contend that such reporting choices reflect opportunistic behavior and can distort the information in earnings (Turner [2001], Riedl [2004]).

I perform three tests to examine the role of proactive discretion in the relation between informed trading and the accrual component. First, I control for the effect of neutral application by including industry fixed effects to capture constant accounting rules and by incorporating additional controls such as leverage, market-to-book ratio, firm age, institutional ownership,

analyst following, and cash flow volatility. As prior research (e.g., Dechow and Dichev [2002]) has shown that the accrual component is more likely to occur due to neutral application in firms with high cash flow volatility, I also include an interaction term of the accrual component with cash flow volatility. I find that the relation between the (stand-alone) accrual component and informed trading persists, consistent with the argument that proactive discretion contributes, on average, to the garbling of information and an increase in the level of informed trading.

Second, I use standard discretionary accrual models (Dechow et al. [1995]) to decompose the accrual component of earnings volatility into nondiscretionary and discretionary components. I find that the discretionary component is associated with higher informed trading. In contrast, the nondiscretionary component is generally insignificant.

Third, I examine a situation in which theory suggests that proactive discretionary choices are likely to be informative. Exploiting the analysis of Kirschenheiter and Melumad [2002], in which big baths taken during periods of extremely poor performance and income smoothing during periods of extremely good performance perfectly reveal underlying cash flows, I investigate the relation between the accrual component and informed trading during periods of extreme performance. Consistent with their theory, I find that the relation between the magnitude of the accrual component and informed trading is attenuated during these periods, suggesting that proactive discretion does not always garble information and may in fact be informative when performance is extremely good or bad.

Because some theories argue that characteristics of the reporting environment and private information markets evolve endogenously as part of an overall equilibrium and are expected to be stable, I conduct additional tests to determine whether realization of the accrual component in every period affects informed trading. Results show that the most recent accrual component is

positively associated with the following year's informed trading after contemporaneous (i.e., this year's) informed trading is controlled for. This suggests that realizations of the accrual component in a given year can affect the level of informed trading in future years.[5]

Two additional tests explore how changes in the accrual component affect changes in bid-ask spreads. I compute changes from small magnitudes to more negative values of the accrual component (smoother earnings) and to more positive values of the accrual component (more volatile earnings) and examine the relation between these changes and (i) future annual bid-ask spreads and (ii) earnings announcement (short-window) bid-ask spreads with controls for contemporaneous bid-ask spreads. Results indicate that changes in the accrual component from small magnitudes to more negative values and to more positive values are associated with higher incremental future annual spreads. In the case of the short-window test, changes from small magnitudes to more positive values are associated with larger incremental announcement spreads, whereas the relation between changes from small magnitudes to more negative values is insignificantly associated with incremental announcement spreads. On balance, these results suggest that the increase in informed trading for these firms occurs subsequent to the earnings announcement period. I also find that when the accrual component does not change, there is no change in bid-ask spreads.

While the higher level of informed trading is consistent with a greater informational advantage for *all* informed traders, there is one group that deserves special attention—insiders. Insiders are a subset of the group of informed traders who are endowed with private information due to their strategic association with the firm. In order to assess whether the relation between the accrual component and informed trading is driven by insider trading, I include the level of

[5] The implicit inference is that changes in the accrual component are associated with changes in bid-ask spreads. In subsequent tests, I explicitly explore changes in the accrual component and in bid-ask spreads.

insider sales and purchases as an additional explanatory variable. Results show that the higher level of informed trading is due to informed traders external to the firm and not merely insiders.[6]

This paper provides three contributions to the earnings informativeness literature. First, it uses theories from information economics to investigate whether earnings that are smoother or more volatile than cash flows either provide or garble information. Second, by examining the relation between informed trading and managerial discretion, it provides evidence regarding whether reporting choices such as income smoothing and big baths are informative or whether they garble information. Finally, this study also contributes to the market microstructure literature by elucidating the mechanism through which reporting outcomes impound information into stock prices.

The rest of the paper is organized as follows. Section 2 presents the hypothesis development, followed by the research design in section 3. In section 4 I describe the primary results, and in section 5 I report the results of tests exploring the individual effects of proactive managerial discretion and the influence of accounting rules. Section 6 investigates a number of extensions and robustness tests, and section 7 concludes.

2. Hypothesis development

Theories of endogenous information acquisition hold that the incentives to acquire private information are inversely related to the informativeness of public information (Grossman and Stiglitz [1980], Verrecchia [1982], Diamond [1985]). Further, theories argue that incentives to exploit existing private information are also inversely related to the informativeness of public

[6] Aboody et al. [2005] find that firms with low earnings quality have high levels of insider trading. Similarly, Frankel and Li [2004] find more insider trading in firms whose financial statements are less value-relevant. To the extent that more informed trading is associated with the accrual component, earnings affected by the accrual component can be considered, on average, to be of "low quality."

information (Baiman and Verrecchia [1996], Easley and O'Hara [2004]). The relation between informed trading and earnings that are smoother or more volatile than cash flows depends on the extent to which the reporting outcomes either provide or garble information.

2.1. Earnings that are smoother than cash flows

The preference of financial markets for smooth earnings is evident from a recent survey of corporate executives by Graham et al. [2005], who find that approximately 97% of respondents prefer to report smooth earnings, holding cash flows constant. The results of this study are suggestive, but they do not directly address the empirical question of how investors interpret smoother earnings.[7]

Prior academic research has not reached a theoretical or empirical consensus on whether earnings that are smoother than cash flows provide or, rather, garble information. For example, Arya et al. [2003] argue that by smoothing earnings, managers remove the transient portion of earnings and communicate the permanent portion, thereby enabling equity markets to arrive at an efficient estimate of the firm's stock price. Chaney and Lewis [1995] argue that income smoothing plays an informational role, as it is high-valued, rather than low-valued, firms that smooth income. In Sankar and Subramanyam [2001], a risk-averse manager smooths reported earnings to smooth his consumption, revealing his private information about future earnings in doing so. A similar idea is developed in Demski [1998], who suggests that a hard-working manager is able to better predict future earnings, which will enable her to smooth reported earnings. On the other hand, other studies find that choices such as income smoothing are acts of

[7] Some prior studies (e.g., Dechow [1994]) have emphasized how the neutral application of accounting rules such as the matching of expenses and revenues naturally leads to accruals smoothing out fluctuations in cash flows. Similarly, earnings can be smoother than cash flows due to the exercise of proactive discretion in the form of income smoothing, where managers purposefully make reported earnings smoother than cash flows in every period.

earnings management that garble information. For example, Leuz et al. [2003] find that managers in economies with more private benefits of control use income smoothing to conceal firm performance from outsiders. Other studies find that firms that cross-list in better investor-protection regimes or adopt international accounting standards indulge in less income smoothing (Lang et al. [2003], Barth et al. [2006]).

2.2. Earnings that are more volatile than cash flows

There is also no consensus in the literature regarding whether earnings that are more volatile than cash flows either provide or garble information. These reporting outcomes could be due to neutral application of accounting rules and conventions such as conservatism (Basu [1997]) and the inherent difficulty of predicting future cash flows (Dechow and Dichev [2002]) or to proactive discretion such as big baths (Kirschenheiter and Melumad [2002]), timely loss recognition (Givoly and Hayn [2000], Ball and Shivakumar [2006]), and choices that entail increasing and then reversing earnings without a corresponding change in cash flows. While some studies argue that earnings that are more volatile than cash flows reveal private information (Kirschenheiter and Melumad [2002], Basu [1997], Givoly and Hayn [2000], Ball and Shivakumar [2006]), other studies find that these more volatile earnings do not reveal private information, but rather reflect opportunistic behavior (Turner [2001], Riedl [2004]).

2.3. Hypothesis

If earnings that are smoother than cash flows provide information, they will be associated with less informed trading, because private information has been publicly revealed. Similarly, if earnings that are more volatile than cash flows provide information, they will also be associated

with less informed trading. Thus, in this case, I expect an inverted-U-shaped relation to obtain between earnings that are smoother or more volatile than cash flows and informed trading.

On the other hand, if earnings that are smoother or more volatile than cash flows garble information, they will be associated with more informed trading. In such a case, I expect a U-shaped relation to obtain between earnings that are smoother or more volatile than cash flows and informed trading. My two-sided hypothesis therefore is as follows:

H1 (a): *There is an inverted-U-shaped relation between earnings that are smoother or more volatile than cash flows and informed trading.*

H1 (b): *There is a U-shaped relation between earnings that are smoother or more volatile than cash flows and informed trading.*

3. Research design

3.1. Accrual component of earnings volatility (ACEV)

To measure the degree to which earnings are smoother or more volatile than cash flows, I use the difference between earnings volatility and cash flow volatility. I begin with the standard definition of earnings:

$$E_{i,t} = CF_{i,t} + AC_{i,t}$$

where $E_{i,t}$ is earnings for firm *i* in year *t;* $CF_{i,t}$ is cash flows for firm *i* in year *t;* and $AC_{i,t}$ is accruals for firm *i* in year *t.* The variance of earnings is given by

$$Var(E_{i,t}) = Var(CF_{i,t}) + Var(AC_{i,t}) + 2Cov(CF_{i,t}, AC_{i,t}) \quad \cdots \quad (1)$$

I define the accrual component of earnings volatility (*ACEV*) as

$$ACEV_{i,t} = Var(AC_{i,t}) + 2Cov(CF_{i,t}, AC_{i,t}) \quad \cdots \quad (2)$$

Replacing in (1),

$$ACEV_{i,t} = Var(E_{i,t}) - Var(CF_{i,t}) \quad \cdots \quad (3)$$

ACEV captures the difference between earnings volatility and cash flow volatility. This characterization (i.e., the second moment) is in the spirit of prior studies that represent accruals as the difference between earnings and cash flows (i.e., the first moment).

The advantage of *ACEV* is that it captures the combined effect of the cash flow–accrual covariance (*Cov (CF,AC)*) and the variance of accruals (*Var (AC)*) to represent a comprehensive measure of income smoothing (Gu [2005] also makes a similar argument). It is clear from equation (1) that neither *Cov (CF,AC)* nor *Var (AC)* in isolation can determine whether earnings are smoother or more volatile than cash flows. In additional tests reported in section 6.3, I illustrate how the use of existing proxies of income smoothing such as the ratio of earnings volatility to cash flow volatility might lead to problematic inferences.

The variance of five years' annual earnings before extraordinary items, scaled by assets (*EARNINGS_VOL*) is the proxy for earnings volatility, or *Var(E)*. The proxy for the volatility of cash flows, *Var (CF),* is the variance of five years' operating cash flows, scaled by assets (*CFO_VOL*).[8] Equation (3) shows that when *ACEV* = 0, earnings volatility equals cash flow volatility [i.e., *Var (E) = Var (CF)*]. When *ACEV* < 0, earnings are smoother than cash flows. When *ACEV* > 0, earnings are more volatile than cash flows. These scenarios are depicted in figure 1.

<< Insert figure 1 about here >>

The *SMOOTH* regime comprises earnings that are smoother than cash flows. The *VOLATILE* regime comprises earnings that are more volatile than cash flows. The horizontal line (*ACEV* = 0) represents the instances in which earnings volatility equals cash flow volatility.

[8] Results based on standard deviations of these variables are similar.

3.2. Proxies for informed trading

The proxies I use to measure informed trading are the bid-ask spread (*SPREAD*) and the probability of informed trading (*PIN*).

3.2.1. Bid-ask spread (SPREAD)

The relation between the extent of informed trading and bid-ask spreads was first discussed in Bagehot [1971]. Bagehot argues that market makers trade with two kinds of traders—informed and uninformed. While the market maker loses to informed traders, he recoups these losses from uninformed traders by increasing the bid-ask spread. Thus, a high level of informed trading leads to higher bid-ask spreads. Bagehot's intuition has been subsequently modeled by Copeland and Galai [1983], Kyle [1985], and Glosten and Milgrom [1985].

There are many measures of bid-ask spreads commonly used in the literature. However, Hasbrouck [2005] finds a high degree of correlation (above 0.9) among these alternate measures. Since CRSP-based measures are available for a large sample of firms and over a long time period, I use them for my primary results. However, my results are robust to the alternate bid-ask spread measure of Hasbrouck [2005]. Following Amihud and Mendelson [1986], I define *SPREAD* as the annual relative bid-ask spread using daily closing bids and asks.[9] Specifically,

$$SPREAD_{i,t} = \frac{1}{D_{i,t}} \sum_{1}^{D_{i,t}} \frac{(ASK_i - BID_i)}{(ASK_i + BID_i)/2} \qquad (4)$$

where $D_{i,t}$ is the number of days in year t for firm i for which closing daily bids (BID_i) and closing daily asks (ASK_i) are available.

[9] Results are identical when I use the effective spread, defined by Stoll [2000] as the bid-ask spread scaled by price.

3.2.2. Probability of informed trading (PIN)

Easley and O'Hara [1992] and Easley et al. [1996, 1997], use a market-microstructure framework to construct a measure of the probability of informed trading (*PIN*) using trade data. The underlying parameters—the arrival rates of informed and uninformed traders and the probability of an information event—determine the likelihood that the market maker will transact with an informed investor. The higher the ratio of informed to uninformed investors, the higher the *PIN*. Easley et al. [2002] and Easley and O'Hara [2004] argue that *PIN* captures information risk (the market maker's probability of trading with an informed trader) and depends on the mix of public versus private information. I use the probability of informed trading as a second proxy for the level of informed trading. *PIN* is more comprehensive than the extent of insider trading, because it incorporates trading by all kinds of informed traders, both insiders endowed with private information and private-information arbitrageurs who acquire private information at a cost. Because theories state that anyone who has expended resources and gathered private information (or who is endowed with private information due to his/her association with the firm) is an informed trader, the definition of an informed trader is not necessarily restricted to either large institutions or to information intermediaries.

3.3. Sample

As bid-ask spreads are available for a large number of firms and for a longer time period than *PIN*, I employ two distinct samples in the study, the *SPREAD* sample and the *PIN* sample.[10] The *SPREAD* sample is obtained from the combined CRSP and Compustat tapes and consists of 69,218 firm-year observations from 10,245 firms in the nonregulated and nonfinancial services industries for the period 1988–2005. The year 1988 was selected as the first year for the sample

[10] Results are robust to a common sample containing both *SPREAD* and *PIN* data.

because cash flow variables are available beginning only in 1987.[11] The *PIN* sample is obtained from Easley et al. [2002][12] and comprises 18,625 firm-year observations for 2,817 firms for the period 1988–2001.[13]

For each fiscal year-end *t*, *ACEV* is defined as of the end of year *t*, while informed trading (*SPREAD* and *PIN*) is measured as of year *t + 1*. The control variables employed in the multivariate regressions are measured as of the end of year *t*. For example, in the year 2000, for a firm with a December year-end, *ACEV* and the control variables are measured as of December 31, 2000, while *SPREAD* and *PIN* are measured as of December 31, 2001. For firms with a non-December fiscal year-end, for instance, June 30, 2000, *ACEV* and the control variables are measured as of June 30, 2000, and *SPREAD* and *PIN* are measured as of Dec 31, 2001.[14] In appendix 1 I present a timeline for the measurement of the variables.

The primary variables are *ACEV*, *SPREAD*, and *PIN*. The mean *ACEV* is 0.01, while the median is −0.0001. Computing *ACEV* based on standard deviations (instead of variances) and imposing similar restrictions on the data as in Gu [2005] yields a median *ACEV* of −0.005, which compares closely with Gu's median value of −0.007 (not tabulated). The mean (median) *SPREAD* is 4% (2%), which is similar to that reported in prior studies.[15] When the sample is restricted to 1983–1998, the (unwinsorized) mean *PIN* is 0.19, which is similar to the 0.191

[11] Although *ACEV* is based on the variance of five annual observations, those based on two observations or more (equivalent to earnings changes) are retained. None of my inferences is altered when the sample is restricted to *ACEV* based on five historical observations.

[12] http://www.smith.umd.edu/faculty/hvidkjaer/

[13] The last year for the *PIN* sample is 2001 because of the difficulty of estimating the parameters of the estimation model when trading intensity is very high. See Easley et al. [2004, n. 5, p. 7].

[14] The *PIN* parameters in Easley et al. [2002] are estimated using the calendar year. I use the calendar year for *SPREAD* to maintain consistency across the informed trading proxies. Although December year-end firms comprise the majority of my sample (about 60%), I perform some sensitivity checks to ensure robustness of my results. In Section 6.1, I use bid-ask spreads around earnings announcement dates and find consistent results. My results for both *SPREAD* and *PIN* are also robust to a sample of December year-end firms.

[15] Hasbrouck [2005], for instance, reports a mean Trade and Quote (TAQ)–based spread of approximately 4% for his sample of randomly selected firms from 1993–2003, while Wahal [1997] reports a mean spread of 5.79% for a sample of NASDAQ firms for the period 1982–1993. The mean spread of my sample for the Wahal time period is 6%, and the mean *PIN* is 0.20.

reported by Easley et al. [2002]. See table 1 for detailed descriptive statistics for the samples. Approximately 33% of the *SPREAD* sample is centered around zero (figure 2, panel A), indicating that earnings volatility is similar to cash flow volatility for these firms. For about 45% of the *PIN* sample, earnings volatility is similar to cash flow volatility (figure 2, panel B).

<< Insert table 1 and figure 2 about here >>

To provide better intuitions about *ACEV*, I identify accounting items that cause a mismatch between earnings before extraordinary items and cash flow from operations, thereby possibly leading to large absolute values of *ACEV* (in the extreme *SMOOTH* and *VOLATILE* deciles). In appendix 2, I present a characterization of the accounting items underlying *ACEV* in the most *SMOOTH* and in the most *VOLATILE* deciles. I find that *ACEV* in the most *SMOOTH* decile is associated with periods of capital expenditures (14% of the time); increases in accounts receivable (14%); changes in accounts payable (11%); and increases in inventory (10%). *ACEV* in the most *VOLATILE* decile is associated with capital expenditures (16% of the time); changes in accounts payable (15%); increases in accounts receivable (8%); increases in other special items (8%); profit/loss on sale of property, plant, and equipment (7%); and decreases in accounts receivable accompanied by a special item (7%). The values of *ACEV* in both of these extreme deciles are associated with periods of growth, as evidenced by capital expenditures and changes in accounts payable. However, increases in accounts receivable are more common among most *SMOOTH* firms (14%) than among the most *VOLATILE* firms (8%). Increases in inventory are also more common for companies in the most *SMOOTH* decile (10%), compared to those in the most *VOLATILE* decile (4%). Finally, decreases in accounts receivable accompanied by a special item (7%) are more prevalent among firms with more volatile earnings than among those with smoother earnings (1%). In appendix 3 I provide a 1-year and 5-year transition matrix of *ACEV*.

4. Empirical results

4.1. Preliminary evidence

Results indicate a U-shaped relation between earnings that are smoother or more volatile than cash flows and informed trading (fig. 3, panel A). Earnings that are smoother than cash flows appear to be associated with larger bid-ask spreads. *SPREAD* is the lowest at the center of the distribution, where *ACEV* is close to zero (i.e., where earnings volatility is equal to cash flow volatility).[16] As earnings become more volatile than cash flows, *SPREAD* increases. Thus, earnings that are more volatile than cash flows also appear to be associated with larger bid-ask spreads. A similar pattern obtains for *PIN* (figure 3, panel B).

<< Insert figure 3 about here >>

4.2. Correlations

Correlations between *ACEV* and *SPREAD* and between *ACEV* and *PIN* are statistically significant (table 2).[17] There is a negative and significant correlation between *SPREAD* and *ACEV* (–0.18) and also between *PIN* and *ACEV* (–0.20) in the *SMOOTH* regime. Further, there is a positive and significant correlation between *SPREAD* and *ACEV* (0.11) and between *PIN* and *ACEV* (0.14) for firms in the *VOLATILE* regime. The accrual component of earnings volatility thus appears to be significantly associated with informed trading in both of these regimes, consistent with the U-shaped relation between *ACEV* and informed trading.

<< Insert table 2 about here >>

[16] Empirical results show that informed trading is the lowest around zero values of the accrual component. There was no reason, ex ante, to expect zero values of the accrual component to be the point at which informed trading was lowest or highest, nor was it necessarily expected that zero values of the accrual component would lead to the lowest or highest level of informed trading for all firms.

[17] All correlations are statistically significant at the 1% level, except as otherwise stated.

As correlations do not control for differences in innate characteristics between firms and over time, they should be interpreted cautiously. Nevertheless, an association between *SPREAD* and *ACEV* and between *PIN* and *ACEV* in univariate correlations suggests a first-order relation between informed trading and the accrual component of earnings volatility.

4.3. Multivariate regressions

In this section, I discuss variables related to *SPREAD* and *PIN* used in prior literature and incorporate them in a multivariate regression to ascertain whether the explanatory power of *ACEV* with respect to *SPREAD* and *PIN* is incremental to that of these firm-level characteristics.

4.3.1. Firm-level determinants

Following prior research, I include market value of equity ($SIZE_{i,t}$), because larger firms have less information asymmetry (Atiase [1985], Bamber [1987]).[18] I also include proxies for the inventory component of spreads so that the cross-sectional variation in spreads that remains can be interpreted as capturing the adverse selection component (Glosten and Harris [1988]). I use turnover, $TURN_{i,t}$, as the proxy for liquidity. I include the Amihud [2002] measure of illiquidity, $AMIHUD_{i,t}$, defined as daily unsigned movements in stock returns divided by dollar trading volume. *AMIHUD* is a price impact measure and is highly related to the inventory component (Amihud [2002], Hasbrouck [2005]).[19] Finally, I include the inverse of the stock price, *PRC_INV*, in the regression, as firms with lower stock prices have larger bid-ask spreads (Stoll [2000]).[20]

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[18] Defining *SIZE* as the book value of assets yields similar results.

[19] As trading volume is measured differently between NYSE/AMEX and NASDAQ, in unreported robustness tests I split both *TURN* and *AMIHUD* into two variables—one for NYSE/AMEX and the other for NASDAQ (following Brennan et al. [1998])—and find similar results.

[20] I do not include stock return volatility as an additional control because the *AMIHUD* measure already contains the volatility of stock returns in the numerator. Although both *AMIHUD* and stock return volatility are highly correlated, I use the *AMIHUD* measure, as it explains a greater proportion of spreads than does stock return volatility. Further,

Following Petersen [2005], I estimate the OLS regressions with year indicators and standard errors clustered at the firm level (table 3, panel A). The year indicators control for common shocks, which could cause cross-sectional correlation in the errors. The firm-level clustering of standard errors corrects for the possibility of serial correlation attributable to unobserved firm effects that cause serial correlation in the errors, as well as for serial correlation potentially arising from the fact that *ACEV* is based on five annual observations, with each earnings observation influencing both current and future *ACEV*. I also use robust regressions (table 3, panel B) as an additional specification to mitigate the effects of outliers.[21]

<< Insert table 3 about here >>

4.3.2. Regression specification and results

The multivariate regressions of informed trading (*SPREAD* and *PIN*) on *ACEV* in the *SMOOTH* and *VOLATILE* regimes are as follows:

$$SPREAD_{i,t+1} / PIN_{i,t+1} = \alpha_0 + \alpha_1 ACEV_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 TURN_{i,t} + \alpha_4 AMIHUD_{i,t} + \alpha_5 PRC\_INV_{i,t} + \sum \alpha_k YEAR + \varepsilon \quad (5)$$

In the *SMOOTH* regime (table 3, panel A), the coefficient of *ACEV* is negative (-0.21) and significant (*t*-statistic –8.20). More negative values of *ACEV* are associated with larger spreads, suggesting that earnings that are smoother than cash flows are associated with more informed trading. A one-standard-deviation (0.01) decrease in *ACEV* is associated with a 21-basis-point increase in bid-ask spreads. In the *VOLATILE* regime, there is a positive (0.04) and significant (*t*-statistic 7.62) relation between *SPREAD* and *ACEV*, suggesting that earnings that

I do not include the number of trades as an additional control in the main specification because it is available only on the TAQ database, which would drastically reduce the sample size. However, in unreported robustness tests I include the number of trades for this smaller TAQ-based sample and find similar results.

[21] A robust regression uses iteratively reweighted least squares and assigns higher weights to better-behaved observations. See Baker and Hall [2004] for a description of robust regressions and their use.

are more volatile than cash flows are associated with larger bid-ask spreads. A one-standard-deviation (0.07) increase in *ACEV* is associated with a 28-basis-point increase in bid-ask spreads.

The relations between *SPREAD* and *ACEV* in the *SMOOTH* and *VOLATILE* regimes are robust to outliers (table 3, panel B). The coefficients of *ACEV* are –0.08 and 0.02 and significant (*t*-statistics -15.76 and 9.16) in the robust regression for the *SMOOTH* and *VOLATILE* regimes, respectively. The control variables have been scaled for exposition (*SIZE* by 10^6; *AMIHUD* by 10^4; *MB*, *AGE*, *ANALYSTS*, and *TURN* by 10^2; and *INST* by 10^1) and are in the direction consistent with prior research. *SPREAD* is larger for smaller firms, less-liquid firms, and firms with lower stock prices.

I also conduct OLS and robust regressions of *PIN* on *ACEV* and controls (table 4, panels A and B). Consistent with the intuition from the *SPREAD* results, there is a negative and significant relation between *PIN* and *ACEV* in the *SMOOTH* regime. The coefficients of *ACEV* are -1.05 and -1.14 and the associated *t*-statistics are -7.15 and -16.10 in the OLS and robust regressions, respectively.[22] These results indicate that earnings that are smoother than cash flows are associated with higher probabilities of informed trading. A positive relation similarly obtains between *PIN* and *ACEV* in the *VOLATILE* regime. The coefficients of *ACEV* in the OLS and robust regressions (0.11 and 0.13, *t*-statistics 3.48 and 5.84, respectively) indicate that earnings that are more volatile than cash flows are associated with higher probabilities of informed trading. Results of the multivariate regressions confirm that the explanatory power of *ACEV* with respect to informed trading is incremental to underlying economic characteristics of the firm.

<< Insert table 4 about here >>

[22] Although the coefficients are greater than 1, the confidence intervals vary from 0.76 to 1.34.

5. Proactive discretion versus neutral application of accounting rules

Having established the overall relation between earnings that are either smoother or more volatile than cash flows and informed trading, I now investigate the roles of proactive managerial discretion versus neutral or conventional application of accounting rules in the relation between *ACEV* and informed trading. To disentangle these individual effects, I perform three tests. First, I attempt to control for the influence of accounting rules and evaluate whether the relation between *ACEV* and informed trading persists, thus providing evidence of either a dominant or incremental role for proactive discretion. Second, I use the discretionary accrual model of Dechow et al. [1995] to decompose *ACEV* into nondiscretionary and discretionary components. I then examine the relation between informed trading and the individual components. Third, I examine a situation in which managerial reporting discretion is hypothesized to be informative and test whether the overall relation between *ACEV* and informed trading is attenuated, strengthened, or of no incremental importance.

5.1. Controlling for the influence of accounting rules

I include additional controls in the regressions to capture the influence of longstanding accounting rules and choices on the relation between *ACEV* and informed trading.[23] My modified two-sided hypothesis is as follows:

H2 (a): When the influence of accounting rules is controlled for, managerial discretion is associated with less informed trading.

[23] This is not to suggest that accounting rules and choices are completely exogenous and can never be changed, but that they are costly and/or hard to change from period to period. In this I follow the views of Francis et al. [2004, p. 985] on "innate" factors who state "… (innate factors) capture the notion that they are predetermined with respect to each period's reporting and implementation decisions. We do not characterize them as exogenous because they can be changed, albeit slowly and at perhaps considerable cost by management…Our identification of these factors as innate is merely intended to capture the fact that these variables are difficult to change in the short-run." See also footnote 27.

H2 (b): When the influence of accounting rules is controlled for, managerial discretion is associated with more informed trading.

I include industry fixed effects using two-digit SIC codes to capture constant accounting rules, and I incorporate additional firm factors to capture the interaction between accounting rules and the underlying economic characteristics of the firm. These factors capture differences in managers' accounting choices and/or differences in underlying risk/uncertainty in the operating environment. I include leverage ($LEV_{i,t}$), as it influences managers' preferences for alternative accounting standards (Holthausen and Leftwich [1983], Watts and Zimmerman [1990]) and managers' incentives to take on risky projects (Jensen and Meckling [1976]).

As prior research (Dechow and Dichev [2002], Francis et al. [2004]) has found that the quality of accruals depends on the uncertainty of the firm's operating environment, I use firm age ($AGE_{i,t}$), defined as the number of years the firm has been listed on Compustat; the market-to-book ratio ($MB_{i,t}$); and reported cash flow volatility ($CFO\_VOL_{i,t}$) to capture the uncertainty of the operating environment. I hypothesize that the presence of analysts and institutional investors is likely to reduce the flexibility of managers to choose accounting methods to manipulate earnings. Thus, I include analyst following ($ANALYSTS_{i,t}$), defined as the number of analysts following the firm, obtained from I/B/E/S; and institutional holding ($INST_{i,t}$), defined as the percentage of the firm's shares held by institutions based on data from the 13-F filings, as additional controls.[24]

Prior studies argue that accruals naturally smooth out fluctuations in cash flows and present a smooth stream of earnings (see, e.g., Dechow [1994]). Thus, earnings that are smoother

[24] It is possible that analyst following and institutional ownership in fact capture the ability of managers to exercise discretion in the reporting process. In this case, including these variables as controls would bias against finding an association between *ACEV* and informed trading. I estimate all the regressions excluding analyst following and institutional ownership (together as well as sequentially) and find similar results.

than cash flows are expected to arise naturally (i.e., due to accounting rules) in firms with high cash flow volatility. Further, studies show that difficulty in estimating future cash flows in highly volatile environments leads to greater estimation errors in accruals (Dechow and Dichev [2002]). One consequence of greater estimation errors is that earnings become more volatile than cash flows due to the reversing nature of accruals. As larger values of *ACEV* are more likely to occur due to accounting rules in firms with high cash flow volatility, I interact *ACEV* with *CFO_VOL* (*ACEV*CFO_VOL*) and include this interaction term as an additional control. The stand-alone coefficient of *ACEV* can now be interpreted as the role of managerial discretion. The extended regression specification is

$$\begin{aligned} SPREAD_{i,t+1} / PIN_{i,t+1} = {} & \alpha_0 + \alpha_1 ACEV_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 TURN_{i,t} + \alpha_4 AMIHUD_{i,t} + \alpha_5 PRC\_INV_{i,t} \\ & + \alpha_6 LEV_{i,t} + \alpha_7 MB_{i,t} + \alpha_8 AGE_{i,t} + \alpha_9 INST_{i,t} + \alpha_{10} ANALYSTS_{i,t} + \alpha_{11} CFO\_VOL_{i,t} \\ & + \alpha_{12} ACEV * CFO\_VOL_{i,t} + \sum \alpha_j SIC + \sum \alpha_k YEAR + \varepsilon \end{aligned} \quad (6)$$

Results of the relation between *ACEV* and *SPREAD* (*PIN*) with controls for the influence of accounting rules are presented in table 5, panel A (panel B). In the *SMOOTH* regime, the stand-alone coefficients of *ACEV* are negative (-0.45 and -0.16) and significant (*t*-statistics -8.60 and -13.54) for the *SPREAD* sample in both the OLS and robust regressions. The coefficients of *ACEV* in the *PIN* sample are also negative (-1.19 and -1.32) and significant (*t*-statistics -4.02 and -7.37) in both regressions. Similarly, *ACEV* is positive and significant in the regressions for both the *SPREAD* and the *PIN* samples in the *VOLATILE* regime. Because *ACEV* is related to informed trading in the presence of controls for accounting rules, I interpret these results as evidence that proactive discretionary reporting choices, on average, contribute to rather than mitigate the overall relation between *ACEV* and informed trading, consistent with hypothesis *H2*

(b). This evidence is consistent with cross-country studies like those of Bhattacharya et al. [2003] and LaFond et al. [2007].[25]

<< Insert table 5 about here >>

5.2. Decomposing ACEV into nondiscretionary and discretionary components

I now examine whether the relation between informed trading and the accrual component is pronounced or attenuated by the discretionary component of accruals. The percentage of smoothest-decile firms that narrowly beat analyst forecasts is higher (14%) than the corresponding percentage in the most *VOLATILE* decile (7%) (see appendix 2). This result, in conjunction with studies such as that of Abarbanell and Lehavy [2003], who find that firms use discretionary accruals to increase the incidence of small positive forecast errors—suggests a role for managerial discretion.

Following previous studies in the earnings management literature (e.g., Jones [1991], Dechow et al. [1995]), I decompose *ACEV* into two components, nondiscretionary (*ACEV_NDA*) and discretionary (*ACEV_DA*), and examine the relation between informed trading and these individual components. I first decompose earnings into cash flows, nondiscretionary accruals, and discretionary accruals.

$$E_{i,t} = CF_{i,t} + NDA_{i,t} + DA_{i,t} \qquad \cdots \qquad (7)$$

[25] Bhattacharya et al. [2003] and LaFond et al. [2007] find that income smoothing is associated with lower liquidity in the equity market. LaFond et al. [2007] decompose income smoothing into nondiscretionary and discretionary components and find that the discretionary component lowers liquidity. This paper finds evidence consistent with this in a single-country (i.e., U.S.) setting, where economy-wide and institutional variables are held constant. Moreover, in subsequent tests, I explore specific situations in which theory predicts that managerial discretion is informative. Results indicate that the relation between informed trading and income smoothing is attenuated in these settings. Thus, this paper also provides evidence that there are situations where managers use discretion in the reporting process to provide information to market participants.

where $E_{i,t}$ is earnings for firm *i* in year *t;* $CF_{i,t}$ is cash flows for firm *i* in year *t;* $NDA_{i,t}$ is nondiscretionary accruals for firm *i* in year *t;* and $DA_{i,t}$ is discretionary accruals for firm *i* in year *t.* The variance of earnings is given by the following equation:

$$Var(E) = Var(CF) + Var(NDA) + Var(DA) + 2Cov(CF, NDA) + 2Cov(CF, DA) \quad \cdots \quad (8)$$ [26]

I define the nondiscretionary accrual component of earnings volatility (*ACEV_NDA*) as

$$ACEV\_NDA_{i,t} = Var(NDA_{i,t}) + 2Cov(CF_{i,t}, NDA_{i,t}) \quad \cdots \quad (9)$$

and the discretionary accrual component of earnings volatility (*ACEV_DA*) as

$$ACEV\_DA_{i,t} = Var(DA_{i,t}) + 2Cov(CF_{i,t}, DA_{i,t}) \quad \cdots \quad (10)$$

Replacing in (8),

$$ACEV\_NDA_{i,t} + ACEV\_DA_{i,t} = Var(E_{i,t}) - Var(CF_{i,t}) \quad \cdots \quad (11)$$

As the nondiscretionary and discretionary components can each either provide or garble information, the relations between informed trading and *ACEV_NDA* and *ACEV_DA* are empirical questions. In the *SPREAD* sample, *ACEV_DA* is negative (-0.46 and -0.16) and significant (*t*-stats -6.54 and -9.70) in both the OLS and robust regressions in the *SMOOTH* regime (table 6, panel A). Further, it is positive (0.04 and 0.01) and significant (*t*-stats 4.68 and 6.09) in both regressions in the *VOLATILE* regime. *ACEV_DA* is significant in both regimes and for both regressions in the *PIN* sample (table 6, panel B). Overall, *ACEV_DA* appears to garble information and is associated with more informed trading. *ACEV_NDA* is generally insignificant. This is not surprising, as the regression includes firm-level factors that also capture the influence of neutral application of accounting rules.[27]

[26] *Cov (NDA, DA)* is zero (by construction) and hence excluded.

[27] In their examination of the relation between cost of equity and earnings attributes, Francis et al. [2004, p. 991] find that inclusion of the "innate controls" in the multivariate regression renders book-to-market ratio insignificant and also reduces the economic and statistical significance of beta. My results are consistent with the notion that the

<< Insert table 6 about here >>

5.3. Situations in which managerial discretion is informative

I next exploit the analysis in Kirschenheiter and Melumad [2002] to investigate settings in which theory suggests that managerial discretion plays a role and, in particular, is informative. Specifically, I explore the relation between *ACEV* and informed trading during periods of extreme performance. According to Kirschenheiter and Melumad [2002], investors infer the precision of reported earnings and managers take a big bath when the firm experiences a sufficiently negative outcome, while managers smooth income when the firm experiences a positive (or a less negative) outcome. Kirschenheiter and Melumad's model predicts a pooling equilibrium for periods of moderate performance and a separating equilibrium for big baths (income smoothing) during periods of extremely bad (good) performance. Thus, big baths (i.e., *ACEV* in the *VOLATILE* regime) during extremely bad performance and income smoothing (i.e., *ACEV* in the *SMOOTH* regime) during extremely good performance are both expected to reveal information about underlying cash flows.

I measure firm performance using the current year's annual stock returns (*RET*). I denote extreme performance by setting the indicator variable *EXTREME* to 1 for firms in the *SMOOTH* regime with returns in the tenth decile (extremely good performance). Similarly, I set *EXTREME* to 1 for firms in the *VOLATILE* regime with returns in the first decile to denote extremely bad performance (inferences based on quartiles are similar but slightly weaker in statistical significance). To capture the impact of extreme performance on the relation between *ACEV* and informed trading, I interact *ACEV* with *EXTREME* and define this term as *ACEV*EXTREME*. As

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nondiscretionary component (or "innate factors") and firm-level controls such as leverage, market-to-book ratio, etc., capture (in part) the same underlying constructs.

income smoothing and big baths are expected to be informative during periods of extremely good and poor performance, respectively, I expect the relation between *ACEV* and *SPREAD* (and *ACEV* and *PIN*) to be attenuated during these periods; that is, I expect *ACEV*EXTREME* to be positive (negative) in the *SMOOTH* (*VOLATILE*) regime.

As predicted, in the *SMOOTH* regime, the coefficients of *ACEV*EXTREME* are positive and significant (0.21 and 0.10, *t*-statistics 4.52 and 8.89, respectively) in the *SPREAD* sample in the OLS and robust regressions (table 7, panel A). The coefficient of *ACEV*EXTREME* is positive and insignificant in the OLS regression but positive and significant in the robust regression for the *PIN* sample (table 7, panel B). This indicates that income smoothing during periods of extremely good performance is associated with relatively less informed trading. In the *VOLATILE* regime, the coefficient of *ACEV*EXTREME* is insignificant in the OLS regression but negative and significant in the robust regression (−0.01, *t*-statistic −2.20). Further, the coefficient of *ACEV*EXTREME* in the *VOLATILE* regime is negative and significant in both the OLS and robust regressions in the *PIN* sample. This indicates that earnings that are more volatile than cash flows during extremely poor performance are associated with less informed trading. These results suggest that the relation between informed trading and the accrual component is attenuated in situations in which managerial discretion is expected to be informative. Thus, while the overall relation between *ACEV* associated with proactive discretion and informed trading suggests that earnings that are smoother or more volatile than cash flows tend, on average, to garble information, it appears that proactive discretion can in certain contexts be informative.

<< Insert table 7 about here >>

6. Extensions and robustness tests

6.1. Effect of realization of ACEV on informed trading

Some theories argue that characteristics of the information environment and private information markets evolve endogenously and remain stable in equilibrium. In such an equilibrium, one would not expect realization of the accrual component to have any effect on informed trading. However, it is an empirical question whether the realization of *ACEV* in a given period alters the level of informed trading. I conduct two tests relevant to this question.

First, I examine whether the accrual component is associated with next year's informed trading after controlling for this year's level of informed trading. If the accrual component has no relation to future informed trading incremental to contemporaneous informed trading (measured as of the same period as the most recent *ACEV*), this would suggest that new realizations of the accrual component have very little effect on the level of informed trading in any given year. I find that, after controlling for *SPREAD* and *PIN* as of year *t*, *ACEV* as of year *t* is significantly associated with *SPREAD* and *PIN* as of year $t + 1$ (table 8, panel A). The OLS coefficient of *ACEV* in the *SMOOTH* (*VOLATILE*) regime is -0.08 (0.03) and the *t*-statistic is -5.19 (6.78).

<< Insert table 8 about here >>

Second, I examine whether changes in *ACEV* are related to changes in bid-ask spreads. I do not expect a monotonic relation between changes in *ACEV* and short-window spreads. This is because an increase in *ACEV* could be associated with smaller or larger spreads depending on whether it makes earnings less smooth or more volatile than cash flows. I partition the sample into quintiles of *ACEV*, where quintile 1 denotes the most negative *ACEV* and quintile 5 denotes the most positive *ACEV*. I compute changes in *ACEV* between quintiles 3 and 2 (change in earnings smoother than cash flows), between quintiles 3 and 4 (change in earnings more volatile

than cash flows) as well as between quintile 3 and quintile 3 (no change).[28] I then explore the relation between changes in *ACEV* and (i) future annual bid-ask spreads and (ii) earnings announcement bid-ask spreads, with controls for contemporaneous bid-ask spreads.[29]

Results show that changes in *ACEV* from small magnitudes to more negative values (*ACEV_CHNG* is -0.95 and *t*-statistic is -1.66) and from small magnitudes to more positive values (coefficient is 0.84 and *t*-statistic is 1.68) are associated with changes in future annual bid-ask spreads (table 8, panel B). I also find that changes in *ACEV* from small magnitudes to more positive values are associated with changes in earnings announcement spreads (coefficient is 0.70 and *t*-statistic is 1.78). The relation between changes in *ACEV* from small values to more negative values is negative but insignificant for short-window bid-ask spreads. Finally, in unreported tests, I find that when *ACEV* does not change, there is no change in bid-ask spreads. The above results are significant only at the 10% level. It is not clear whether the lower significance is due to the weakness in the relation, to the nature of the test, or to the substantial reduction in power because of the reduced sample size (about 2,000 observations, compared to approximately 30,000 observations for the main tests).

[28] I exclude observations in the extreme quintiles for two reasons. First, there are very few observations that move from quintile 3 to the extreme quintiles. Second, observations in the extremes might have a differential relation with informed trading, as seen in the prior section. However, including these observations does not alter the inferences.

[29] There are certain caveats. First, the accrual component is based on five annual earnings observations, and so the notion of an earnings expectation and an earnings realization, and hence the appropriateness of an event-study, is unclear. Second, it is not clear that the announcement/10-K filing period is the only time when informed traders acquire and/or trade on their private information. Further, there is ambiguity about the announcement period. As studies state that cash flow information is publicly available only after the 10-K has been filed, I define the short window from the date of the release of the earnings announcement until five days after the date of the filing of the 10-K with the SEC. Based on a random sample of one hundred firm-year observations, the average difference between the earnings announcement date and the filing date is thirty-five days. Hence, the short window for the entire sample is taken as forty days. Defining the end date as three days after the filing date yields similar results.

6.2. Role of insiders

While the hypotheses are based on the behavior of *all* informed traders, I explore in unreported tests whether the relation between the accrual component and informed trading is driven by insider trading (as suggested in Baiman and Verrecchia [1996]). I include the level of insider trading (defined as the total of insider sales and purchases) as an explanatory variable. I find that higher levels of informed trading are due to informed traders external to the firms as well as to insiders. For example, in the *SMOOTH* regime, the coefficient of *ACEV* in the *PIN* regression declines from 1.05 to 1.03 with controls for insider trading (the coefficient for insider trading is 0.01 and the *t*-statistic is 5.29).

6.3. Existing proxies for income smoothing

I also explore the relation between informed trading and an existing proxy for income smoothing—the ratio of earnings volatility to cash flow volatility (*RATIO*). In unreported tests, I find a positive relation between informed trading and *RATIO*; that is, firms with smaller values of *RATIO* have less informed trading. This might lead one to inadvertently conclude that income smoothing is associated with less informed trading for two important reasons.

First, *RATIO* is generally interpreted in the literature as a proxy for the extent of income smoothing, wherein smaller values of *RATIO* indicate more income smoothing and larger values indicate less income smoothing. However, prior studies do not take into account that larger values of *RATIO* might indicate choices such as big baths, which do not necessarily reflect a lesser degree of income smoothing. *ACEV*, on the other hand, distinguishes between the two regimes in which negative values of *ACEV* denote earnings that are smoother than cash flows and positive values of *ACEV* indicate earnings that are more volatile than cash flows.

Second, *RATIO* mathematically represents *ACEV* divided by cash flow volatility (*CFO_VOL*). Low values of *RATIO* can arise due to either low values of *ACEV* (holding *CFO_VOL* constant) or high values of *CFO_VOL* (holding *ACEV* constant). Thus, the relation between *RATIO* and informed trading combines the relations between *ACEV* and informed trading and between *CFO_VOL* and informed trading. Results presented in figure 3 indicate that lower values of *ACEV* are associated with less informed trading. Further, prior studies as well as results from my own (unreported) tests have shown that firms with higher cash flow volatility have more informed trading (Kyle [1985], Brennan and Subrahmanyam [1998], Copeland and Galai [1983]). Thus, the relation between *RATIO* and informed trading is potentially confounded by the positive relations between *ACEV* and informed trading (in the numerator) and between *CFO_VOL* and informed trading (in the denominator). Studies that are interested in examining earnings that are smoother or more volatile than cash flows are therefore better served by the use of *ACEV* rather than *RATIO*.

6.4. Alternate measure of bid-ask spread

Hasbrouck [2005] develops a Gibbs estimate of bid-ask spreads based on Roll [1984]. I find that my results are insensitive to this measure. The coefficients of *ACEV* are significant in the *SMOOTH* and *VOLATILE* regimes for the OLS and robust regressions.

6.5. Addressing the possibility of serial correlation

Although the standard errors are clustered by firm, I employ a cross-sectional regression to ensure that my results are unaffected by serial correlation. The cross-sectional regression uses the firm-level mean of each variable across all years in the sample and contains only one

observation per firm. The coefficients of *ACEV* are significant in the *SPREAD* and *PIN* samples, in the *SMOOTH* and *VOLATILE* regimes, and for the OLS and robust regressions.

6.6. Other robustness tests

The main results are robust to the use of standard deviations instead of variances to compute *ACEV*; the calculation of variances based on ten observations instead of five; the definition of earnings as operating income or net income; the use of effective spreads; the computation of *ACEV* for the pre-1987 period using the balance sheet; the estimation of *ACEV* as the residual of a regression of earnings volatility on cash flow volatility; and the inclusion of the level of accruals as an additional control.

7. Conclusion

This paper investigates whether earnings that are smoother or more volatile than cash flows—and, specifically, reporting choices such as income smoothing and big baths—provide or garble information. Consistent with theories that predict more informed trading when public information is less informative, I find that the difference between earnings and cash flow volatility is associated with a larger bid-ask spread and a higher probability of informed trading. More informed trading occurs when earnings are smoother than cash flows as well as when earnings are more volatile than cash flows. Further, I find evidence consistent with this in a changes specification, where changes in earnings that are smoother than cash flows and in earnings that are more volatile than cash flows are significantly associated with changes in informed trading.

I also explore the extent to which the relation between the accrual component and informed trading is due to individual effects of proactive managerial discretion and/or application of conventional accounting rules. I find that the above-mentioned relations with informed trading persist when additional controls intended to capture the influence of accounting rules are included. Further, when the accrual component is decomposed into nondiscretionary and discretionary components, I find that the discretionary component is associated with more informed trading. This suggests that managers' exercise of proactive discretion in the form of income smoothing and big baths contributes on average to the garbling of information and reinforces the relation between the accrual component and informed trading. However, in a setting in which theory suggests that managerial discretion is informative (i.e., extreme performance), the relation between the accrual component and informed trading is attenuated. This suggests that proactive discretion can be informative in certain contexts.

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Table 1: Descriptive statistics

ACEV represents the accrual component of earnings volatility, defined as the difference between the variance of earnings and the variance of cash flows. Earnings is defined as earnings before extraordinary items (Compustat data item 18), scaled by assets (data item 6), while cash flow represents cash flow from operations (data item 308) scaled by assets. *SPREAD* is the relative bid-ask spread (defined as the closing ask minus the closing bid divided by the average of closing ask and bid). *PIN* stands for the probability of informed trading. *SIZE* denotes the market value of equity (data item 199 multiplied by data item 25) in $ millions. *TURN* is annual turnover, defined as the ratio of shares traded divided by shares outstanding (data item 25). *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of total debt (data item 9 plus data item 34) scaled by total assets. *MB* stands for the market-to-book ratio, defined as the ratio of the market value of assets (data item 199 times data item 25 plus data item 6 less data item 60) divided by the book value of assets (data item 6). *AGE* is the number of years the firm has been listed on Compustat. The percentage of institutional ownership is denoted by *INST*. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* denotes variance of cash flows (data item 308).

	Mean	Min.	Q1	Median	Q3	Max.	Std. Dev.
Primary variables							
ACEV	0.01	-0.22	-0.002	-0.0001	0.004	0.40	0.05
SPREAD	0.04	0.00	0.01	0.02	0.05	0.34	0.06
PIN	0.20	0.07	0.14	0.19	0.25	0.46	0.08
Firm-level characteristics							
SIZE	1475.90	1.90	28.48	117.63	594.54	36977.81	4935.00
TURN	1.17	0.03	0.36	0.74	1.46	7.20	1.28
AMIHUD	6.45	0.00	0.01	0.20	2.39	152.82	20.90
PRC_INV	0.23	0.01	0.04	0.10	0.25	2.35	0.37
LEV	0.23	0.00	0.00	0.19	0.36	0.94	0.21
MB	2.07	0.56	1.08	1.46	2.26	11.79	1.82
AGE	12.62	2.00	4.00	9.00	18.00	50.00	11.07
INST	0.27	0.00	0.02	0.19	0.47	0.95	0.27
ANALYSTS	6.20	0.00	0.00	2.00	9.00	44.00	9.04
CFO_VOL	0.01	0.00	0.001	0.003	0.01	0.22	0.03

Table 2: Correlations

ACEV is the accrual component of earnings volatility. *SPREAD* is the relative bid-ask spread. *PIN* is the probability of informed trading. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is debt scaled by total assets. *MB* is the market-to-book ratio. *AGE* is the number of years the firm exists on Compustat. *INST* is the percentage of institutional ownership. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. All correlations are significant at the 1% level. Correlations marked with an asterisk (*) are not significant. See table 1 for detailed definitions of the variables.

Panel A: Correlations between *ACEV, SPREAD,* and *PIN*

	ACEV (*SMOOTH*)	*ACEV* (*VOLATILE*)	*SPREAD*	*PIN*
ACEV (*SMOOTH*)	1.00			
ACEV (*VOLATILE*)	–	1.00		
SPREAD	–0.18	0.11	1.00	
PIN	–0.20	0.14	0.45	1.00

Panel B: Correlations between *ACEV* and firm-level determinants

	ACEV (*SMOOTH*)	*ACEV* (*VOLATILE*)	*SPREAD*	*PIN*	*SIZE*	*TURN*	*AMIHUD*	*PRC_INV*	*LEV*	*MB*	*AGE*	*INST*	*ANALYSTS*	*CFO_VOL*
ACEV (*SMOOTH*)	1.00													
ACEV (*VOLATILE*)	–	1.00												
SPREAD	-0.18	0.11	1.00											
PIN	-0.20	0.14	0.45	1.00										
SIZE	0.10	-0.10	-0.19	-0.40	1.00									
TURN	-0.06	0.12	-0.25	-0.34	0.05	1.00								
AMIHUD	-0.11	0.08	0.59	0.33	-0.09	-0.18	1.00							
PRC_INV	-0.23	0.23	0.57	0.37	-0.16	-0.15	0.60	1.00						
LEV	0.06	-0.03	0.13	0.06	0.01	-0.13	0.07	0.07	1.00					
MB	-0.15	0.17	-0.13	-0.22	0.11	0.26	-0.11	-0.06	-0.18	1.00				
AGE	0.15	-0.16	-0.15	-0.21	0.28	-0.17	-0.06	-0.14	0.04	-0.13	1.00			
INST	0.18	-0.15	-0.40	-0.39	0.13	0.21	-0.24	-0.36	-0.05	0.01*	0.25	1.00		
ANALYSTS	0.15	-0.09	-0.34	-0.49	0.49	0.24	-0.20	-0.29	-0.01	0.07	0.24	0.58	1.00	
CFO_VOL	-0.81	0.36	0.12	0.16	-0.10	0.11	0.06	0.22	-0.10	0.33	-0.16	-0.18	-0.15	1.00

Table 3: Multivariate regression of *SPREAD* on *ACEV*

The dependent variable is the bid-ask spread (*SPREAD*). *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. The regressions include year indicators and robust standard errors clustered by firm in the OLS regression. Although the relation between *SPREAD* and *ACEV* is based on a two-sided hypothesis, the negative (positive) prediction for *ACEV* in the *SMOOTH* (*VOLATILE*) regime is based on the preliminary evidence in figure 3, panel A. See table 1 for detailed definitions of the variables.

Panel A: OLS regression

		ACEV regime			
	Predicted sign	*SMOOTH* (n = 37,249)		*VOLATILE* (n = 30,676)	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.03	13.08	0.04	11.35
ACEV	+/–	-0.21	-8.20	0.04	7.62
SIZE	–	-0.73	-23.47	-0.86	-19.58
TURN	–	-0.48	-28.14	-0.49	-25.91
AMIHUD	+	0.10	24.54	0.09	28.39
PRC_INV	+	0.05	23.09	0.05	30.20
Adjusted R^2		0.53		0.52	

Panel B: Robust regression

		ACEV regime			
	Predicted sign	*SMOOTH* (n = 37,249)		*VOLATILE* (n = 30,676)	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.02	14.11	0.03	14.09
ACEV	+/–	-0.08	-15.76	0.02	9.16
SIZE	–	-0.40	-26.77	-0.55	-22.92
TURN	–	-0.21	-31.50	-0.24	-27.86
AMIHUD	+	0.18	344.84	0.15	264.41
PRC_INV	+	0.05	142.18	0.03	94.25

Table 4: Multivariate regression of *PIN* on *ACEV*

The dependent variable is the probability of informed trading (*PIN*). *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. The regressions include year indicators and robust standard errors clustered by firm in the OLS regression. Although the relation between *PIN* and *ACEV* is based on a two-sided hypothesis, the negative (positive) prediction for *ACEV* in the *SMOOTH* (*VOLATILE*) regime is based on the preliminary evidence in figure 3, panel B. See table 1 for detailed definitions of the variables.

Panel A: OLS regression

		ACEV regime			
	Predicted sign	*SMOOTH* (*n* = 11,392)		*VOLATILE* (*n* = 7,111)	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.23	33.40	0.22	42.07
ACEV	+/–	-1.05	-7.15	0.11	3.48
SIZE	–	-5.33	-22.47	-5.13	-19.38
TURN	–	-4.38	-19.99	-3.68	-17.82
AMIHUD	+	0.06	2.79	0.08	5.98
PRC_INV	+	0.08	6.60	0.04	6.30
Adjusted R^2		0.36		0.35	

Panel B: Robust regression

		ACEV regime			
	Predicted sign	*SMOOTH* (*n* = 11,392)		*VOLATILE* (*n* = 7,111)	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.22	33.91	0.21	37.01
ACEV	+/–	-1.14	-16.10	0.13	5.84
SIZE	–	-4.71	-42.38	-4.61	-33.62
TURN	–	-3.36	-31.70	-2.88	-22.22
AMIHUD	+	0.04	4.23	0.09	11.13
PRC_INV	+	0.11	22.24	0.05	13.21

Table 5: Relation between *SPREAD* and *ACEV* with controls for the influence of accounting rules (Panel A)

The dependent variable is *SPREAD*, the bid-ask spread. *ACEV* is accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage, scaled by total assets. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. The percentage of institutional ownership is denoted by *INST*. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV*CFO_VOL* is the interaction of *ACEV* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The predicted sign for *ACEV* is indeterminate, because the relation between *SPREAD* and the stand-alone coefficient of *ACEV* with controls for the influence of accounting rules is based on a two-sided hypothesis [*H2 (a)* and *H2 (b)*]. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (*n* = 37,249)				*VOLATILE* (*n* = 30,676)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.04	6.08	0.03	15.19	0.05	7.53	0.04	13.94
ACEV	?	-0.45	-8.60	-0.16	-13.54	0.05	6.94	0.02	7.87
SIZE	–	-0.06	-1.30	-0.09	-4.80	-0.14	-2.42	-0.17	-6.24
TURN	–	-0.35	-19.49	-0.16	-23.10	-0.34	-17.12	-0.16	-18.37
AMIHUD	+	0.10	24.66	0.18	351.38	0.09	28.48	0.16	289.93
PRC_INV	+	0.04	18.53	0.03	89.88	0.04	23.52	0.02	65.72
LEV	+	0.01	6.96	0.01	4.02	0.02	12.71	0.01	11.54
MB	–	-0.20	-12.04	-0.12	-24.59	-0.20	-13.49	-0.11	-18.02
AGE	–	-0.02	-10.20	-0.01	-16.86	-0.02	-7.30	-0.01	-12.60
INST	–	-0.15	-14.73	-0.06	-16.12	-0.18	-13.58	-0.10	-17.21
ANALYSTS	–	-0.04	-13.62	-0.02	-18.60	-0.04	-11.34	-0.02	-13.32
CFO_VOL	+	0.06	2.74	0.04	8.85	0.12	7.40	0.06	11.33
*ACEV*CFO_VOL*	?	2.27	7.64	0.95	14.56	-0.60	-4.75	-0.25	-6.34
Adjusted R^2		0.56		–		0.55		–	

Table 5: Relation between *PIN* and *ACEV* with controls for the influence of accounting rules (Panel B)

The dependent variable is the probability of informed trading (*PIN*). *ACEV* is accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage, scaled by total assets. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listesd on Compustat. The percentage of institutional ownership is denoted by *INST*. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV*CFO_VOL* is the interaction of *ACEV* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The predicted sign for *ACEV* is indeterminate, because the relation between *PIN* and the stand-alone coefficient of *ACEV* with controls for the influence of accounting rules is based on a two-sided hypothesis [*H2 (a)* and *H2 (b)*]. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (n = 11,392)				*VOLATILE* (n = 7,111)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.25	17.24	0.24	21.32	0.23	30.91	0.22	9.79
ACEV	?	-1.19	-4.02	-1.32	-7.37	0.11	2.76	0.12	4.35
SIZE	–	-2.66	-10.60	-2.37	-17.60	-2.78	-10.02	-2.47	-14.78
TURN	–	-3.59	-18.48	-2.88	-25.93	-3.05	-16.70	-2.40	-18.56
AMIHUD	+	0.09	4.79	0.09	8.85	0.09	6.99	0.10	13.00
PRC_INV	+	0.03	3.09	0.05	10.25	0.01	1.42	0.02	5.75
LEV	+	-0.01	-2.26	-0.01	-3.24	-0.01	-1.07	-0.01	-0.56
MB	–	-0.81	-9.19	-0.66	-11.95	-0.69	-7.65	-0.55	-8.27
AGE	–	-0.06	-7.02	-0.07	-16.38	-0.04	-4.16	-0.05	-8.43
INST	–	-0.30	-6.12	-0.17	-6.41	-0.27	-5.20	-0.17	-4.79
ANALYSTS	–	-0.13	-12.25	-0.12	-16.60	-0.13	-11.58	-0.12	-13.22
CFO_VOL	+	0.44	2.72	0.33	3.00	0.71	4.31	0.63	6.31
*ACEV*CFO_VOL*	?	16.46	4.26	15.27	7.04	-4.84	-2.84	-4.69	-4.32
Adjusted R^2		0.45		–		0.43			–

Table 6: Multivariate regression of *SPREAD* on *ACEV_NDA* and *ACEV_DA* (Panel A)

The dependent variable is *SPREAD*, the bid-ask spread. *ACEV_NDA* (*ACEV_DA*) is the nondiscretionary (discretionary) component of *ACEV*. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage, scaled by total assets. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. The percentage of institutional ownership is denoted by *INST*. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV_DA*CFO_VOL* is the interaction of *ACEV_DA* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The predicted signs for *ACEV_NDA* and *ACEV_DA* are indeterminate, because the relation between *SPREAD* and the stand-alone coefficient of *ACEV* with controls for the influence of accounting rules is based on a two-sided hypothesis [*H2 (a)* and *H2 (b)*]. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (n = 23,657)				*VOLATILE* (n = 18,077)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.03	11.56	0.02	12.59	0.04	10.53	0.03	13.05
ACEV_NDA	?	-0.91	-2.27	-0.35	-1.46	0.45	1.27	0.34	1.36
ACEV_DA	?	-0.46	-6.54	-0.16	-9.70	0.04	4.68	0.01	6.09
SIZE	–	-0.20	-3.37	-0.14	-6.48	-0.24	-3.06	-0.23	-6.44
TURN	–	-0.35	-16.27	-0.16	-18.92	-0.32	-12.39	-0.15	-13.55
AMIHUD	+	0.10	19.75	0.18	286.77	0.09	21.79	0.16	237.86
PRC_INV	+	0.04	13.24	0.03	76.71	0.04	17.97	0.02	48.11
LEV	+	0.01	4.91	0.01	0.24	0.02	11.27	0.01	8.76
MB	–	-0.22	-10.83	-0.12	-18.50	-0.20	-9.93	-0.11	-13.37
AGE	–	-0.02	-7.29	-0.01	-12.44	-0.02	-4.33	-0.01	-8.52
INST	–	-0.14	-11.55	-0.05	-10.67	-0.15	-9.73	-0.08	-12.20
ANALYSTS	–	-0.03	-10.95	-0.02	-15.02	-0.04	-10.13	-0.02	-11.69
CFO_VOL	+	0.04	1.34	0.04	5.33	0.13	5.30	0.07	10.11
*ACEV_DA*CFO_VOL*	?	2.33	5.66	1.05	10.77	-0.70	-4.01	-0.39	-7.04
Adjusted R^2		0.56		–		0.55		–	

Table 6: Multivariate regression of *PIN* on *ACEV_NDA* and *ACEV_DA* (Panel B)

The dependent variable is the probability of informed trading (*PIN*). *ACEV_NDA* (*ACEV_DA*) is the nondiscretionary (discretionary) component of *ACEV*. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage, scaled by total assets. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. The percentage of institutional ownership is denoted by *INST*. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV_DA*CFO_VOL* is the interaction of *ACEV_DA* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The predicted signs for *ACEV_NDA* and *ACEV_DA* are indeterminate, because the relation between *PIN* and the stand-alone coefficient of *ACEV* with controls for the influence of accounting rules is based on a two-sided hypothesis [*H2 (a)* and *H2 (b)*]. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (n = 7,702)				*VOLATILE* (n = 4,693)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.28	26.97	0.26	32.75	0.27	34.45	0.25	35.13
ACEV_NDA	?	-196.56	-2.22	-198.15	-3.57	-159.56	-2.34	-158.62	-3.08
ACEV_DA	?	-1.25	-3.09	-1.54	-6.61	0.10	1.92	0.13	3.78
SIZE	–	-2.89	-8.48	-2.59	-14.41	-2.88	-8.37	-2.50	-10.88
TURN	–	-3.53	-14.77	-2.82	-20.92	-2.88	-12.56	-2.23	-14.61
AMIHUD	+	0.10	4.12	0.09	6.76	0.08	5.27	0.08	8.70
PRC_INV	+	0.03	2.10	0.05	8.00	0.01	1.66	0.03	5.69
LEV	+	-0.02	-3.07	-0.01	-4.40	-0.01	-0.85	0.01	0.20
MB	–	-0.92	-8.57	-0.76	-11.16	-0.78	-6.87	-0.66	-7.76
AGE	–	-0.05	-4.55	-0.06	-11.22	-0.03	-2.97	-0.04	-6.00
INST	–	-0.32	-5.42	-0.17	-5.17	-0.30	-4.67	-0.17	-3.90
ANALYSTS	–	-0.15	-11.08	-0.13	-14.56	-0.14	-10.78	-0.14	-12.10
CFO_VOL	+	0.73	3.53	0.57	3.92	0.83	3.55	0.92	6.69
*ACEV_DA*CFO_VOL*	?	21.51	4.58	22.18	7.83	-7.10	-3.18	-8.34	-5.69
Adjusted R^2		0.43		–		0.42		–	

Table 7: Relation between *SPREAD* and *ACEV* during periods of extreme performance (Panel A)

The dependent variable is *SPREAD*, the bid-ask spread. *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *EXTREME* is an indicator variable set to 1 for firms with a current-year annual stock return in the tenth (first) decile of the annual stock return distribution in the *SMOOTH* (*VOLATILE*) regime. *ACEV*EXTREME* is the interaction of *ACEV* with *EXTREME*. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. *INST* is the percentage of institutional ownership. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV*CFO_VOL* is the interaction of *ACEV* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The positive (negative) predicted sign for *ACEV*EXTREME* in the *SMOOTH* (*VOLATILE*) regime is based on the predictions in section 5.3. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (n = 37,249)				*VOLATILE* (n = 30,676)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.03	6.05	0.03	15.05	0.05	7.49	0.04	13.80
ACEV	+/–	-0.49	-9.52	-0.18	-15.58	0.03	4.69	0.01	5.77
*ACEV*EXTREME*	+/–	0.21	4.52	0.10	8.89	0.01	0.13	-0.01	-2.20
EXTREME	?	-0.01	-13.51	-0.01	-13.65	0.03	24.54	0.02	37.83
SIZE	–	-0.08	-1.66	-0.09	-5.01	-0.11	-1.91	-0.16	-5.76
TURN	–	-0.30	-16.62	-0.14	-19.88	-0.40	-20.24	-0.18	-21.31
AMIHUD	+	0.10	25.08	0.18	355.76	0.09	28.92	0.16	292.77
PRC_INV	+	0.04	18.87	0.03	95.48	0.04	22.65	0.02	62.80
LEV	+	0.01	7.26	0.01	4.67	0.02	11.16	0.01	10.65
MB	–	-0.15	-9.08	-0.10	-20.19	-0.13	-8.50	-0.08	-13.27
AGE	–	-0.02	-10.10	-0.01	-16.73	-0.02	-5.68	-0.01	-11.30
INST	–	-0.16	-15.36	-0.06	-16.60	-0.15	-12.11	-0.09	-16.03
ANALYSTS	–	-0.04	-14.69	-0.02	-19.73	-0.04	-12.60	-0.03	-14.78
CFO_VOL	+	0.05	2.70	0.04	8.79	0.07	5.02	0.04	8.32
*ACEV*CFO_VOL*	?	2.27	7.64	0.96	14.67	-0.44	-3.68	-0.18	-4.77
Adjusted R^2		0.57		–		0.57		–	

Table 7: Relation between *PIN* and *ACEV* during periods of extreme performance (Panel B)

The dependent variable is the probability of informed trading (*PIN*). *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *EXTREME* is an indicator variable set to 1 for firms with a current-year annual stock return in the tenth (first) decile of the annual stock return distribution in the *SMOOTH* (*VOLATILE*) regime. *ACEV*EXTREME* is the interaction of *ACEV* with *EXTREME*. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. *INST* is the percentage of institutional ownership. *ANALYSTS* is the number of analysts covering the firm. *CFO_VOL* represents cash flow volatility. *ACEV*CFO_VOL* is the interaction of *ACEV* with *CFO_VOL*. The regressions include two-digit SIC code indicators, year indicators, and robust standard errors clustered by firm in the OLS regression. The positive (negative) predicted sign for *ACEV*EXTREME* in the *SMOOTH* (*VOLATILE*) regime is based on the predictions in section 5.3. See table 1 for detailed definitions of the variables.

		ACEV regime							
	Predicted sign	*SMOOTH* (n = 11,392)				*VOLATILE* (n = 7,111)			
		OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.25	17.42	0.24	21.32	0.23	30.62	0.22	9.70
ACEV	+/–	-1.22	-4.02	-1.41	-7.81	0.12	2.83	0.13	4.35
*ACEV*EXTREME*	+/–	0.35	1.35	0.62	3.63	-0.11	-1.87	-0.11	-2.47
EXTREME	?	0.01	3.18	0.01	4.34	0.02	6.45	0.02	7.16
SIZE	–	-2.66	-10.64	-2.36	-17.56	-2.78	-10.13	-2.46	-14.76
TURN	–	-3.65	-18.70	-2.94	-26.03	-3.13	-16.99	-2.48	-19.21
AMIHUD	+	0.09	4.83	0.09	8.76	0.09	7.33	0.10	13.54
PRC_INV	+	0.03	3.00	0.05	10.04	0.01	0.70	0.02	4.70
LEV	+	-0.13	-2.31	-0.01	-3.35	-0.01	-1.51	-0.01	-1.20
MB	–	-0.83	-9.32	-0.69	-12.33	-0.63	-7.02	-0.50	-7.50
AGE	–	-0.06	-6.97	-0.07	-16.20	-0.04	-3.91	-0.04	-8.14
INST	–	-0.30	-6.13	-0.17	-6.42	-0.26	-5.01	-0.15	-4.41
ANALYSTS	–	-0.13	-12.11	-0.12	-16.37	-0.13	-11.65	-0.12	-13.27
CFO_VOL	+	0.44	2.71	0.34	3.06	0.68	4.22	0.60	6.06
*ACEV*CFO_VOL*	?	16.02	4.25	15.19	7.00	-4.74	-2.84	-4.55	-4.20
Adjusted R^2		0.45		–		0.43		–	

Table 8: Multivariate regression of *SPREAD* on *ACEV* controlling for *LAG_SPREAD* (Panel A)

The dependent variable is the bid-ask spread (*SPREAD*). *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LAG_SPREAD* is the lagged value of the bid-ask spread. The regressions include year indicators and robust standard errors clustered by firm in the OLS regression. The predicted sign for *ACEV* is indeterminate, because the relation between *SPREAD* and *ACEV* with controls for *LAG_SPREAD* is an empirical question. See table 1 for detailed definitions of the variables.

		SMOOTH regime (n = 35,932)				*VOLATILE* regime (n = 29,640)			
	Predicted sign	OLS regression		Robust regression		OLS regression		Robust regression	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		-0.01	-2.91	0.01	1.59	0.01	2.23	0.01	3.26
ACEV	?	-0.08	-5.19	-0.01	-4.02	0.03	6.78	0.01	6.29
SIZE	–	-0.05	-4.98	-0.04	-4.02	-0.09	-5.70	-0.06	-3.99
TURN	–	-0.03	-2.62	-0.01	-2.25	-0.01	-0.71	-0.01	-0.61
AMIHUD	+	0.01	0.15	0.01	31.21	-0.01	-2.58	-0.02	-35.45
PRC_INV	+	0.01	4.24	0.01	10.31	0.01	3.84	0.01	10.07
LAG_SPREAD	+	0.87	78.17	0.78	426.23	0.93	70.03	0.81	316.64
Adjusted R^2		0.74		–		0.71		–	

Table 8: Multivariate regression of changes in *SPREAD* on changes in *ACEV* (Panel B)

Columns 1 and 2 represent those firm-year observations where the value of *ACEV* has moved from the third quintile to the second quintile (i.e., earnings have become smoother than cash flows). Columns 3 and 4 represent those firm-year observations for which the value of *ACEV* has moved from the third quintile to the fourth quintile (i.e., earnings have become more volatile than cash flows). The dependent variable in columns 1 and 3 is the annual bid-ask spread (Annual *SPREAD*) and that in columns 2 and 4 is the earnings announcement bid-ask spread (Short-Window *SPREAD*). *ACEV_CHNG* is the change in the accrual component of earnings volatility (*ACEV*) defined as this year's value of *ACEV* minus last year's value of *ACEV*. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LAG_SPREAD* is the lagged value of the bid-ask spread. The regressions include year indicators and robust standard errors clustered by firm in the OLS regression. The predicted sign for *ACEV_CHNG* is indeterminate, because the relation between changes in *SPREAD* and changes in *ACEV* is an empirical question. See table 1 for detailed definitions of the variables.

		Change in *ACEV* between quintiles 3 and 2				Change in *ACEV* between quintiles 3 and 4			
		Col. 1		Col.2		Col. 3		Col.4	
	Predicted sign	Annual *SPREAD* (n = 2,138)		Short-Window *SPREAD* (n = 1,856)		Annual *SPREAD* (n = 1,523)		Short-Window *SPREAD* (n = 1,279)	
		Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept		0.01	1.72	0.01	1.55	0.01	1.17	0.01	3.15
ACEV_CHNG	?	-0.95	-1.66	-0.33	-0.68	0.84	1.68	0.70	1.78
SIZE	–	-0.01	-0.22	0.01	0.11	-0.08	-1.40	-0.09	-1.99
TURN	–	-0.04	-1.16	-0.04	-1.43	-0.02	-0.37	-0.10	-2.69
AMIHUD	+	-0.03	-2.07	-0.03	-1.54	-0.01	-0.15	-0.02	-1.76
PRC_INV	+	0.01	1.33	-0.01	-0.26	0.01	0.73	0.01	0.32
LAG_SPREAD	+	0.89	16.70	0.95	21.61	0.91	12.23	0.90	13.06
Adjusted R^2		0.77		0.78		0.73		0.75	

Figure 1: *ACEV* and the *SMOOTH* and *VOLATILE* regimes

ACEV denotes the accrual component of earnings volatility. *Var (E)* represents the variance of annual earnings before extraordinary items, scaled by assets. *Var (CF)* is the variance of cash flow from operations over five years, scaled by assets. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. See table 1 for detailed definitions of the variables.

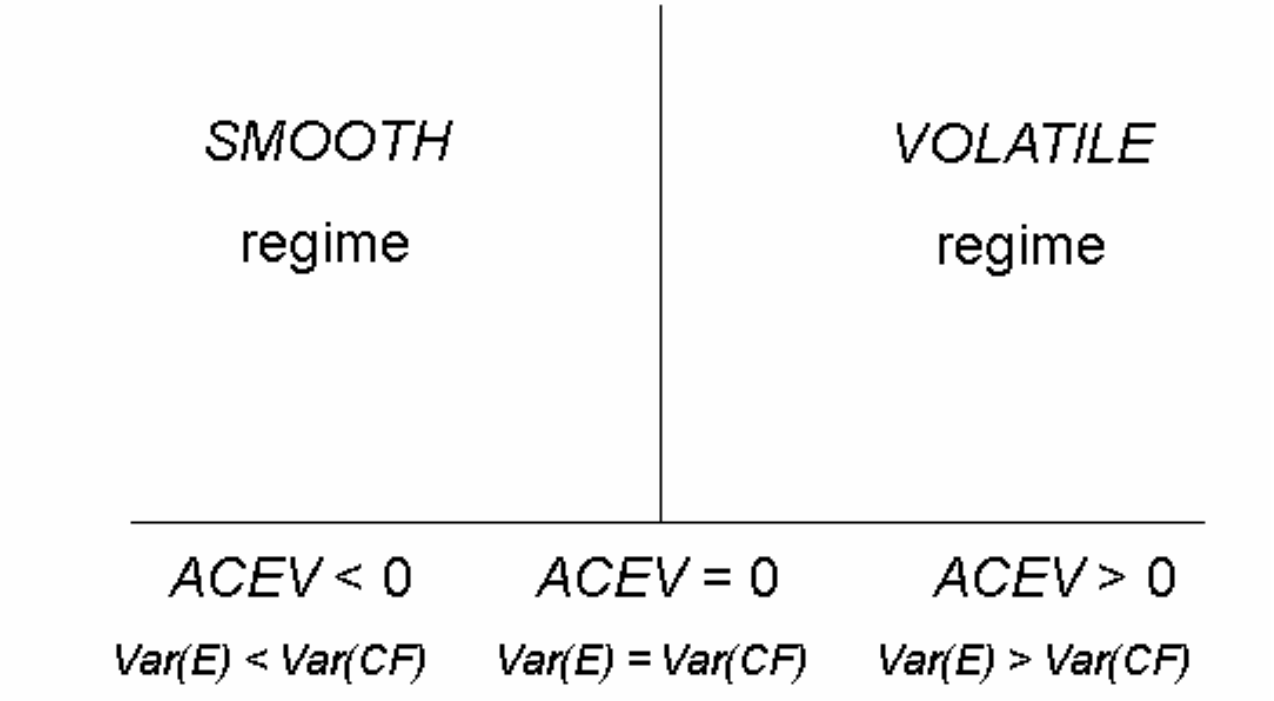


Figure 2: Distribution of *ACEV*

SPREAD denotes the relative bid-ask spread. *PIN* is the probability of informed trading. *ACEV* is the accrual component of earnings volatility. *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. See table 1 for detailed definitions of the variables.

Panel A: *SPREAD* sample

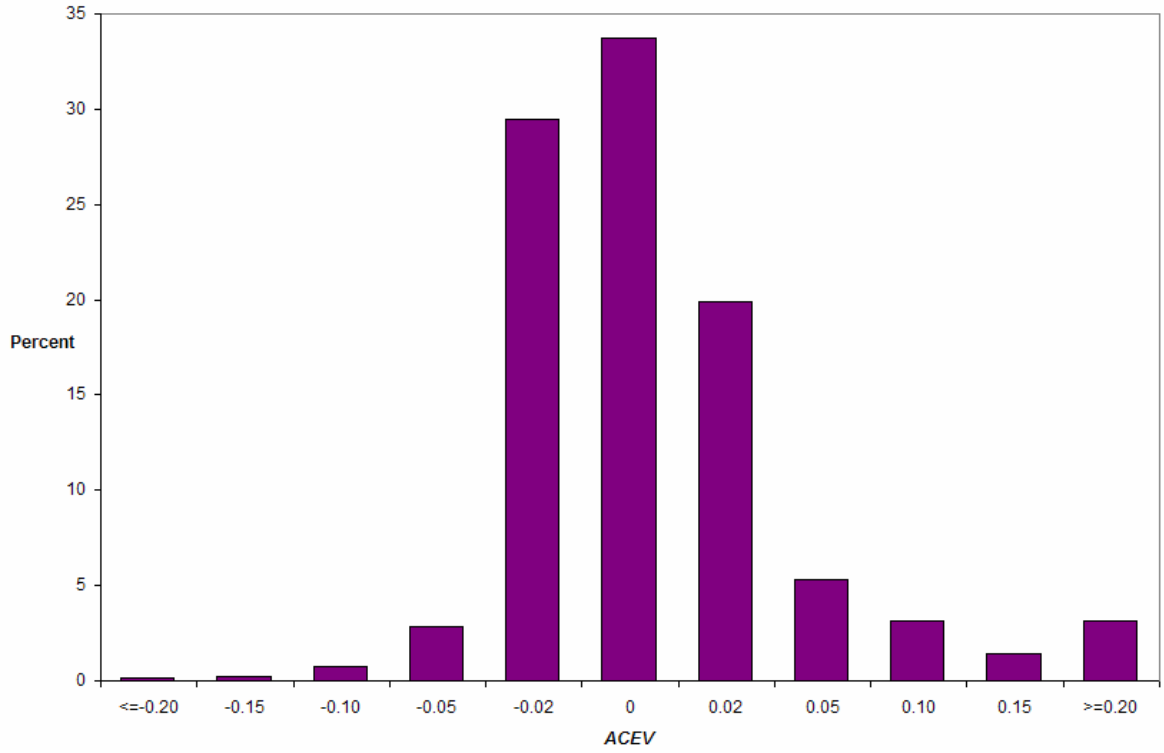


Figure 2: Distribution of *ACEV* (cont'd.)

Panel B: *PIN* sample

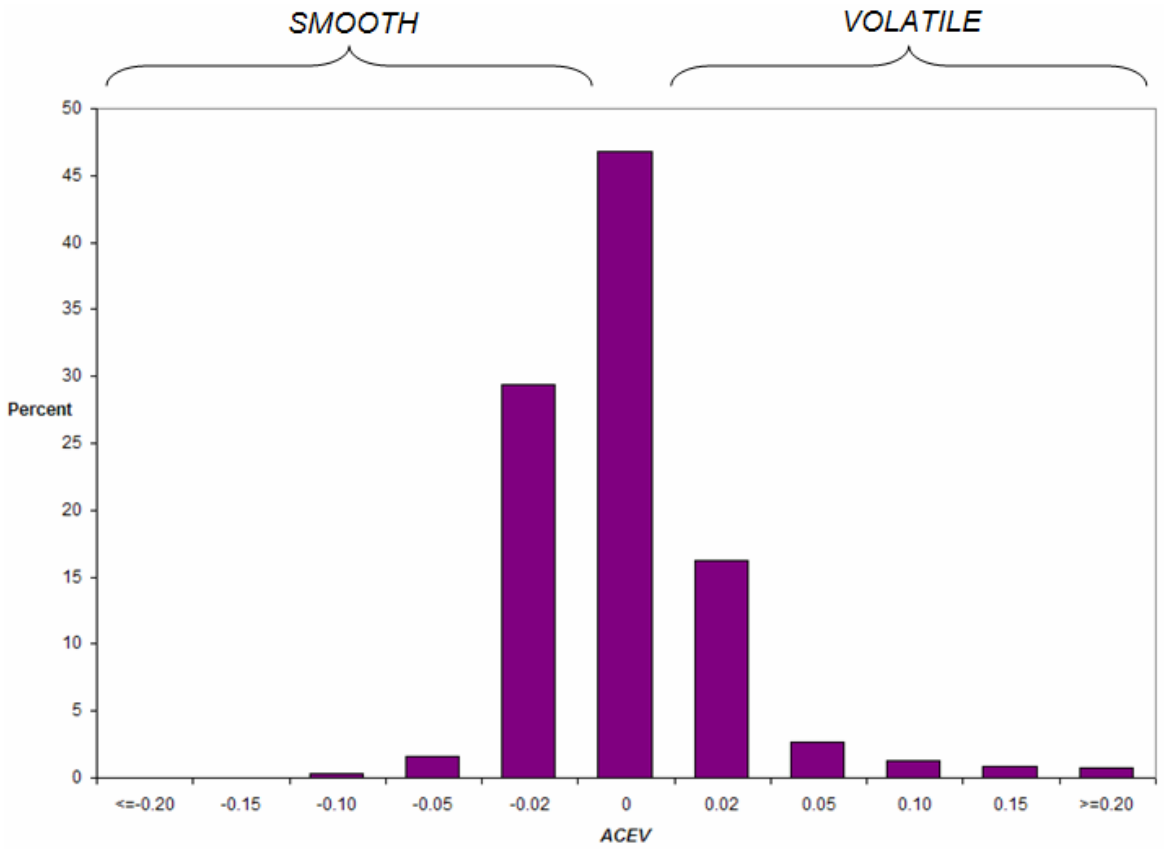


Figure 3: Relation between informed trading (*SPREAD* and *PIN*) and *ACEV*

SPREAD is the relative bid-ask spread. *PIN* is the probability of informed trading. *ACEV* is the accrual component of earnings volatility. The horizontal axes plot *ACEV* deciles and the vertical axes plot deciles of *SPREAD* (panel A) and *PIN* (panel B). *SMOOTH* (*VOLATILE*) is the regime in which earnings are smoother (more volatile) than cash flows. See table 1 for detailed definitions of the variables.

Panel A: *SPREAD* and *ACEV*

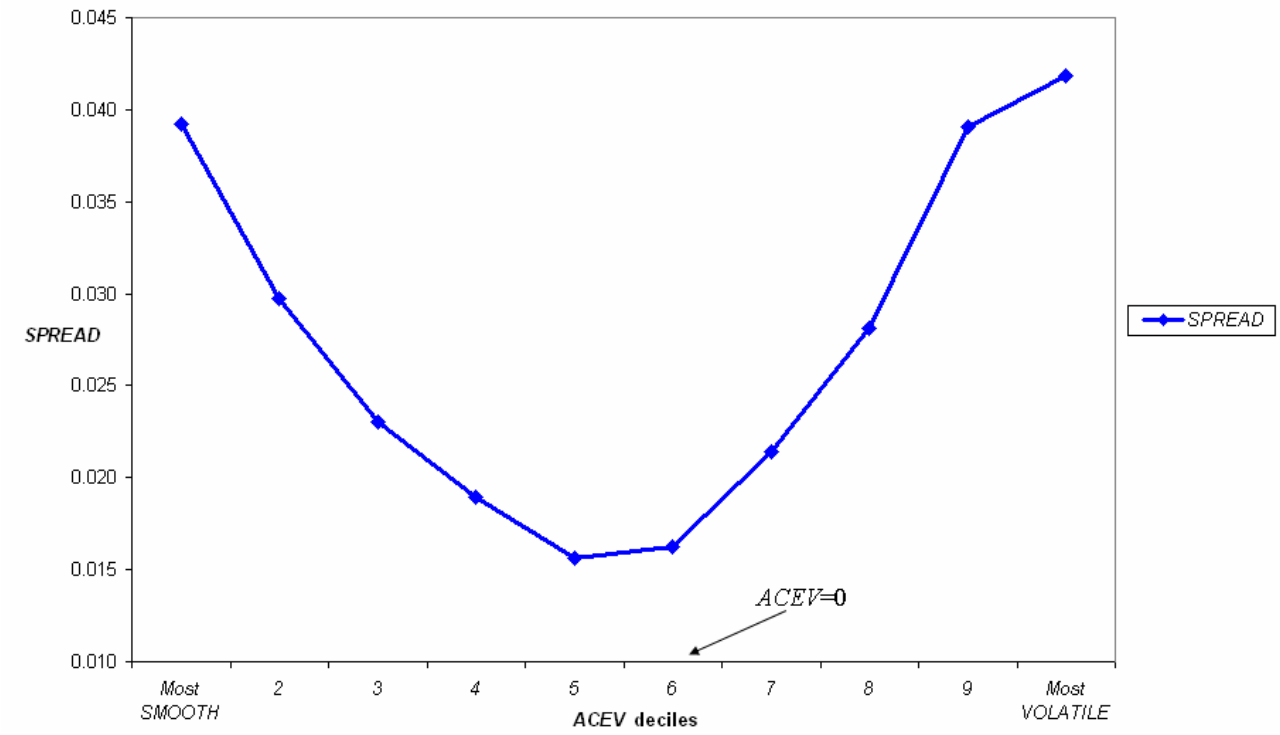
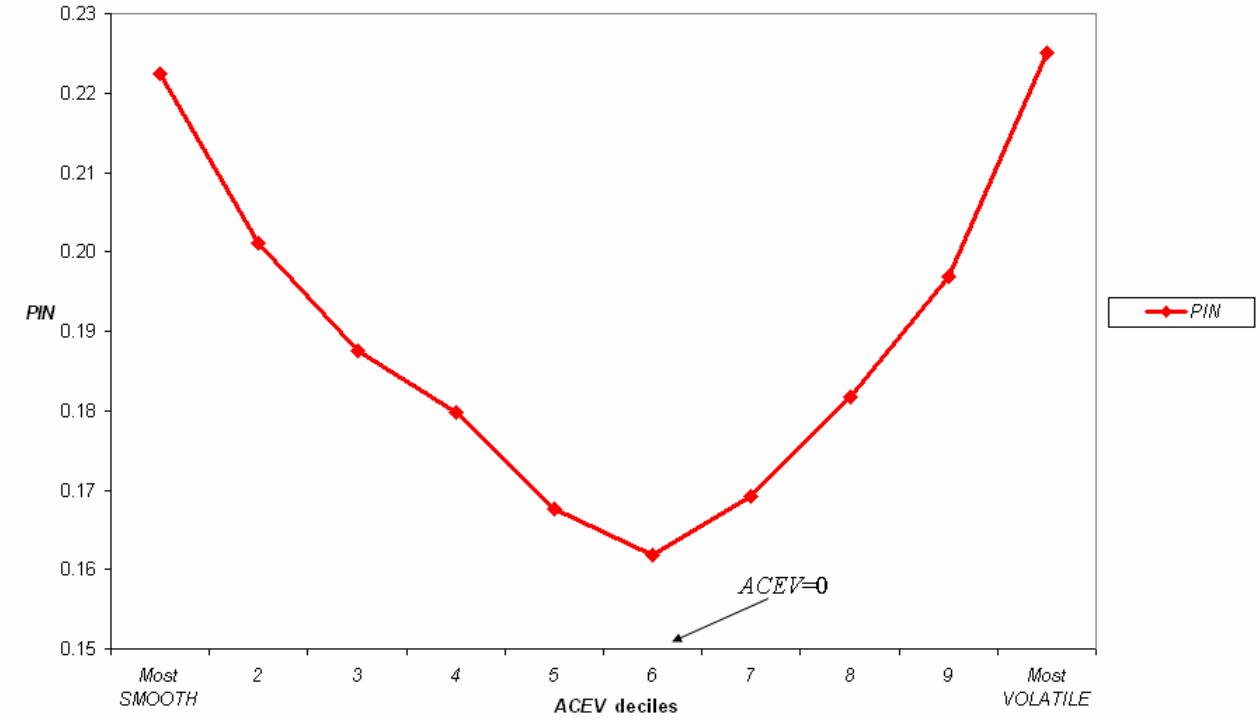


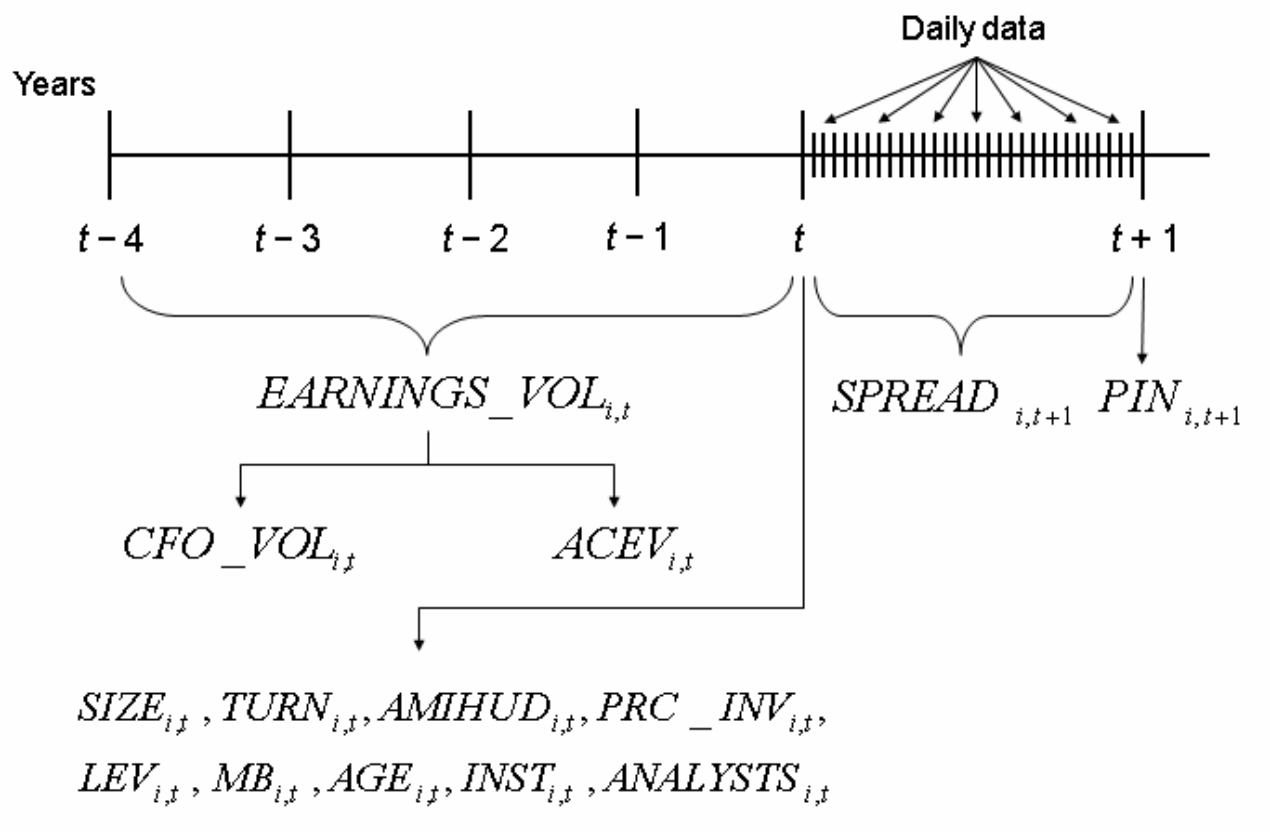
Figure 3: Relation between informed trading (*SPREAD* and *PIN*) and *ACEV* (cont'd.)

Panel B: *PIN* and *ACEV*



Appendix 1: Timeline of variable definitions

ACEV denotes the accrual component of earnings volatility. *EARNINGS_VOL* measures the variance of five years' annual earnings before extraordinary items, scaled by assets. *CFO_VOL* is the variance of cash flow from operations over five years, scaled by assets. *SIZE* denotes the market value of equity. *TURN* is annual turnover. *AMIHUD* is the Amihud [2002] measure of illiquidity. *PRC_INV* is the inverse of the stock price. *LEV* is the amount of leverage. *MB* stands for the market-to-book ratio. *AGE* is the number of years the firm has been listed on Compustat. *INST* is the percentage of institutional ownership. *ANALYSTS* is the number of analysts covering the firm. *SPREAD* is the relative bid-ask spread. *PIN* stands for the probability of informed trading. See table 1 for detailed definitions of the variables.



Appendix 2: Accounting items associated with *ACEV* in the most *SMOOTH* and most *VOLATILE* deciles

To provide better intuitions about *ACEV*, I identify accounting items that cause a mismatch between earnings before extraordinary items and cash flow from operations, thereby possibly leading to large absolute values of *ACEV* (in the extreme *SMOOTH* and *VOLATILE* deciles). One example of a mismatch is profit/loss on sale of property, plant and equipment, which affects earnings before extraordinary items but does not affect cash flow from operations.

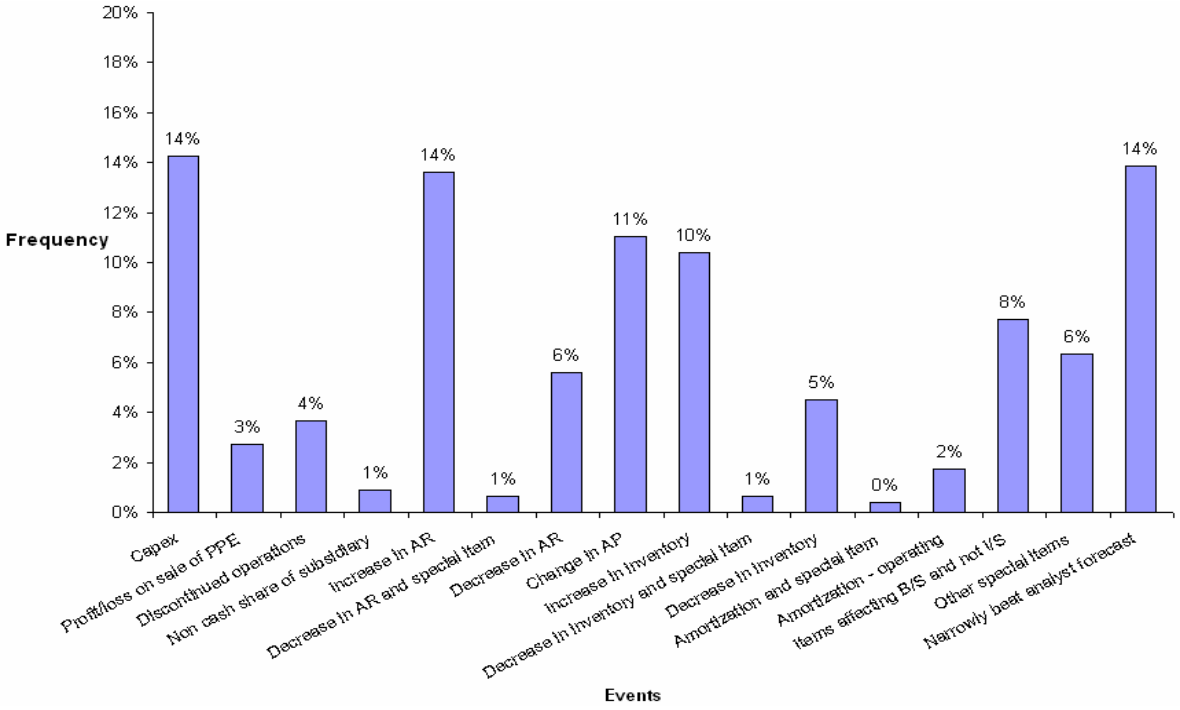
In categorizing the accounting items associated with *ACEV* in the most *SMOOTH* and most *VOLATILE* deciles, I make the following assumptions. (i) Items that affect the balance sheet (income statement) and represent more than 10% (5%) of total assets are considered. (ii) "Capex" refers to capital expenditures incurred during the year. (iii) Profit or loss on sale of property, plant, and equipment is classified as "Profit/loss on sale of PPE." (iv) Income from discontinued operations and extraordinary income are classified under "Discontinued operations." (v) Unrealized income or losses from unconsolidated subsidiaries are reported as "Noncash share of subsidiary." (vi) Changes in accounts receivables (AR) and changes in inventory are classified into increases, decreases, and decreases with an accompanying charge to special items. The rationale is that if accounts receivable or inventory reductions are accompanied by a charge to special items, they might indicate write-offs. (vii) Changes in accounts payable (AP) are classified under a single category. (viii) Amortizations classified as special items are categorized separately. (ix) Other amortizations (such as customer acquisition expenditures) that are considered operating expenses are shown as "Amortization—operating." (x) Items affecting the balance sheet (B/S) but not the income statement (I/S) (such as cumulative translation adjustments, deferred compensation, etc.) are classified under "Items affecting B/S and not I/S." This category includes changes in current deferred assets. (xi) "Other

special items" indicates charges to special items that have not been considered in (iii), (vi), or (viii) above. (xii) The category "Narrowly beat analyst forecast" includes instances in which the firm beats the median analyst forecast by less than one cent. Although meeting or missing analyst forecasts would not by itself lead to larger absolute values of *ACEV*, this category captures incentives to smooth earnings or to take earnings baths.

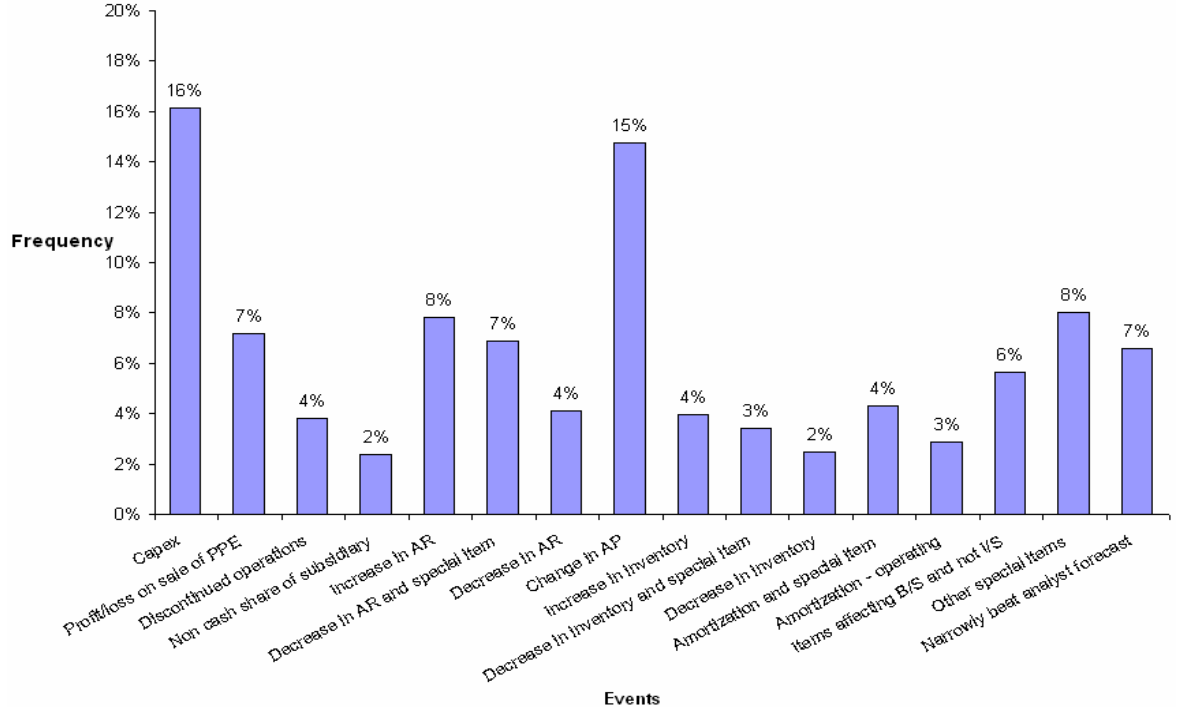
In panels A and B below I present the frequency of the above items for the most *SMOOTH* and most *VOLATILE* deciles respectively. Earnings that are smoother than cash flows are associated with the following: periods of capital expenditures (14% of the time); increases in accounts receivable (14%), presumably due to increases in sales; periods of beating the median analyst forecast by less than one cent (14%); changes in accounts payable (11%); and increases in inventory (10%). Accrual components that make earnings more volatile than cash flows are associated with capital expenditures (16% of the time); changes in accounts payable (15%); increases in accounts receivable (8%); increases in other special items (8%); profit/loss on sale of property, plant and equipment (7%); decreases in accounts receivable accompanied by a special item (7%); and beating analyst forecasts (7% of the time). The values of *ACEV* in both the deciles are associated with periods of growth, as evidenced by capital expenditures and changes in accounts payable. However, increases in accounts receivable are more common among firms with earnings that are smoother than cash flows (14%) than among firms with earnings that are more volatile than cash flows (8%). Increases in inventory are also more common for the most *SMOOTH* decile (10%) compared to the most *VOLATILE* decile (4%). The percentage of firms that smooth earnings and narrowly beat analyst forecasts is higher (14%) than the percentage that make earnings more volatile than cash flows and narrowly beat analyst forecasts (7%). Finally,

decreases in accounts receivable accompanied by a special item (7%) are more prevalent among firms with more volatile earnings than among those with smoother earnings (1%).

Panel A: Most *SMOOTH* decile



Panel B: Most *VOLATILE* decile



Appendix 3: Transition matrix of *ACEV*

ACEV denotes the accrual component of earnings volatility. The quintiles are formed on the basis of the values of *ACEV:* the first quintile (*MOST SMOOTH*) comprises observations with earnings that are the smoothest relative to cash flows, while the fifth quintile (*MOST VOLATILE*) consists of observations with earnings that are the most volatile relative to cash flows.

Panel A: One year later

		***ACEV* quintiles in year *t* + 1**						
		Most *SMOOTH*	2	3	4	Most *VOLATILE*	Missing	Total
ACEV* quintiles in year *t	Most *SMOOTH*	0.60	0.16	0.04	0.03	0.04	0.13	1.00
	2	0.13	0.46	0.18	0.07	0.04	0.12	1.00
	3	0.04	0.17	0.45	0.17	0.04	0.13	1.00
	4	0.03	0.07	0.17	0.46	0.12	0.15	1.00
	Most *VOLATILE*	0.02	0.02	0.03	0.11	0.60	0.22	1.00

Panel B: Five years later

		***ACEV* quintiles in year *t* + 5**						
		Most *SMOOTH*	2	3	4	Most *VOLATILE*	Missing	Total
ACEV* quintiles in year *t	Most *SMOOTH*	0.13	0.10	0.07	0.07	0.07	0.56	1.00
	2	0.08	0.12	0.12	0.08	0.05	0.55	1.00
	3	0.05	0.10	0.14	0.10	0.05	0.56	1.00
	4	0.05	0.08	0.09	0.11	0.07	0.60	1.00
	Most *VOLATILE*	0.04	0.04	0.04	0.06	0.10	0.72	1.00

In panel A I report the quintiles that *ACEV* moves to in the following year, while in panel B I present the quintiles that *ACEV* moves to after 5 years. 60% of the observations in the extreme *ACEV* quintiles remain in that quintile one year later (panel A). Firms with persistently smoother earnings do differ from those with more volatile earnings. However, the percentage of observations in the *MOST VOLATILE* quintile that drop out of the sample (22%) is larger than in the *MOST SMOOTH* quintile (13%). There is a high level of attrition in the sample (panel B): almost half of the sample drops out over five years. The percentage of drop-outs is higher for the *MOST VOLATILE* quintile (72%) than for all the other quintiles. Firms with persistently smooth earnings (13%) are more frequent than those having more volatile earnings (10%).