Managerial Discretion in Accruals and Informational Efficiency

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Abstract

In this paper we examine the relation between discretionary accruals and informational efficiency. Assuming that efficient prices follow a random walk, we measure informational efficiency by using stock return variance ratios. Our analysis concentrates on a large sample of US non-financial firms between 1988 and 2007. We find that the absolute value of discretionary accruals is positively associated with informational efficiency. The results are consistent with the view that managerial discretion is informative for market participants; discretionary accruals convey useful information to investors and facilitate the price convergence to its fundamental value.

Keywords: Managerial discretion; Discretionary accruals; Informational efficiency; Stock return variance ratios

I. INTRODUCTION

The informative role of managerial discretion in accounting earnings is at the center of a long-standing debate within the academic literature, and among practitioners and regulators. The debate arises from the question whether managers use the flexibility in accrual-based accounting to convey private information or to conceal the firm's true underlying economic performance (e.g., Watts and Zimmermann, 1986; 1990; Holthausen and Leftwich, 1983; Healy and Palepu, 1993; Healy and Wahlen, 1999; Dechow, Ge and Schrand, 2010).

The topic has important practical relevance within the current trend in accounting regulation. Some of the major issues addressed by the standard setters in recent years involve accrual-based managerial discretion. For instance, FASB's notable revisions concern the accounting standards on financial instruments, employee stock options, fixed assets and goodwill impairment, and valuation of acquired intangibles (e.g., Lev, Li and Sougiannis, 2010). Current joint projects of the FASB and the IASB deal with revenue recognition, financial instruments and leases. Particularly with the proposed convergence to the international financial reporting standards (IFRS), characterized by a shift from a rules-based towards a principles-based accounting framework, the need for managers to apply their professional judgment over accounting numbers is expected to increase (e.g., Alexander and Jermakovics, 2006).[1] These regulatory changes are likely to substantially influence the extent to which managers exercise discretion in accrual reporting.

[1] See, for example, the special issues, *Accounting Horizons* (March, 2003) and *Abacus* (June, 2006) dedicated to the principles-based vs. rules-based debate.

In this paper we investigate whether managerial discretion in accruals is informative for investors. To address this question we examine the relation between discretionary accruals and stock price informational efficiency. Our tests of informational efficiency are based on the assumption that informational efficient prices follow a random walk. Specifically, following the standard approach in the informational efficiency literature (e.g., Campell, Lo and MacKinley, 1997), we focus on stock return variance ratios to investigate the extent to which prices deviate from their fundamental value. We consider a large sample of US firms between 1988 and 2007 and find that the deviation of the price pattern from a random walk process decreases as the absolute value of discretionary accruals increases; thus, informational efficiency increases with the absolute value of discretionary accruals. These results support the interpretation that managerial discretion is - on average - informative for investors; discretionary accruals convey useful information to market participants and facilitate the price convergence to its fundamental value.

The results are stable using alternative specifications of a model which controls for the cross-sectional determinants of informational efficiency (size, liquidity, trading volume, analysts' coverage, growth opportunities, and financial distress). Inference is unchanged when estimating discretionary accruals using a number of different accrual expectation models. The results hold over different time sub-samples, and when segmenting the sample by profit vs. loss firms and by income-increasing vs. income-decreasing discretionary accruals. In additional analyses, we examine the relation between informational efficiency and a measure of general managerial discretion (Hambrick and Abrahamson, 1995); furthermore, we investigate how our findings are related to the pattern of idiosyncratic return volatility and to the accrual anomaly.

Our analysis extends prior evidence on the informativeness of discretionary accruals. Extant research has investigated the informative role of managerial discretion in accruals by examining the ability of discretionary accruals to predict future economic prospects (Wahlen, 1994; Subramanyam, 1996; Ahmed, Takeda and Thomas, 1999; Kanagaretnam, Lobo and Yang, 2004; Bowen, Rajgopal and Venkatachalam, 2008; Lev, Li and Sougiannis, 2010; Badertscher, Collins and Lys, 2012). The results tend to indicate that discretionary accruals are significantly associated with future operating profitability, suggesting that managerial discretion conveys useful information.[2] We differ from this field of works as we concentrate on price informativeness rather than on future performance; the difference is substantial as the former is determined by investors' expectations conditional on accrual reporting and the latter represents ex-post realizations.

Our findings also contribute to explaining the determinants of informational efficiency and, hence, have relevant implications for market regulation. Stock price informational efficiency is a fundamental aspect of market quality. The extent to which prices reflect available information affects financing and investment decisions; it influences how issuers, investors and analysts interpret and use financial statements information. Prior research highlights the role of the informativeness of prices in capital allocation and in real investment decisions (Wurgler, 2000; Subrahmanyam and Titman, 2001; Chen, Goldstein and Jiang, 2007). On a related note, more research on how accounting affects informational efficiency has been called for by Kothari (2001) in his survey on accounting-based capital market research; by Lee (2001) in his

[2] Despite the results of this group of works, there exists a strong tendency in the accounting literature to treat the purposeful intervention of managers on earnings numbers as undesirable (Schwartz and Young, 2012). This becomes particularly apparent in the large number of studies adopting the notion that the discretionary component of accruals represents "a distortion that is of low quality" (Dechow, Ge and Schrand, 2010).

commentary;[3] and by Richardson, Tuna, and Wysocki (2010) in their review of the literature on accounting anomalies.

The remainder of the paper is organized as follows. Section II reviews the related literature and introduces the motivation; Section III presents the research design; Section IV describes the sample selection and reports descriptive statistics; Section V and VI comment on the results of the univariate analysis and of the multivariate analysis, respectively; Section VII presents the sensitivity analysis; Section VIII reports additional analyses; Section IX concludes.

II. MOTIVATION AND RELATED LITERATURE

Conflicting views on managerial discretion in accruals

Two main views exist regarding the way managers make use of the flexibility allowed by GAAP. As suggested, for example, by Dye and Verrecchia (1995) and Hann, Lu and Subramanyam (2007), understanding which is the prevailing motivation underlying managerial discretion is an empirical issue.

One view is that discretionary accruals are used by managers as a signal to communicate private information to investors ('signaling view'). A large group of normative and analytical works supports this view (e.g., Holthausen and Leftwich, 1983; Healy and Palepu, 1993; Demski, 1998; Arya, Glover and Sunder, 2003; Stocken and Verrecchia, 2004); relatively little research examines this perspective from the empirical side (e.g., Louis and Robinson, 2005; Hann, Lu and Subramanyam, 2007).

3 "Rather than remaining agnostic about the role of market prices, I advocate a more proactive approach. Rather than assuming market efficiency, we should study how, when, and why price becomes efficient (and why at other times it fails to do so). Rather than ignoring the current market price, we should seek to improve it." (Lee, 2001, p. 251).

The second view is that discretionary accrual reporting is contracting-motivated (e.g., Watts and Zimmermann, 1986; 1990). Contracting motivations can be opportunistic ('opportunistic-contracting view'); for example, it has been documented that managers manipulate earnings to maximize bonus payouts (Healy, 1985) or to avoid violations of debt contracts (DeFond and Jiambalvo, 1994). A wide body of research investigates opportunistic motivations of managerial discretion.[4] Alternatively, it has also been suggested that contracting-motivated choices are aimed at improving the efficiency of contracts ('efficient-contracting view'); these choices can have the objective of reducing agency costs among stakeholders (e.g., Watts, 1977; Watts and Zimmermann, 1978; 1986).

The different views have conflicting implications for the informative role of discretionary accruals. According to the signaling view, discretionary accruals communicate useful information to market participants. The opportunistic-contracting view predicts that discretionary accruals do not convey useful information, unless investors are able to recognize the opportunistic motivation of the reporting choices (Dechow, Ge and Schrand, 2010). The efficient-contracting view does not provide a clear-cut prediction on the effect of managerial discretion on the informativeness of discretionary accruals.[5]

The informativeness of managerial discretion in accruals

Prior literature has already investigated whether managerial discretion in accruals provides useful information to market participants. The approach taken by this research is to

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4 See reviews of the earnings management literature by Healy and Wahlen (1999) and Ronen and Yaari (2007).

5 See Badertscher, Collins and Lys (2012) for a discussion of the efficient-contracting view implications for accrual informativeness.

examine the ability of discretionary accruals to predict future economic prospects.[6] The results generally indicate that discretionary accruals are associated with future operating profitability, thus suggesting that managerial discretion in accruals conveys useful information.

Subramanyam (1996) finds that discretionary accruals are positively associated with future stock returns; he explains this result by the ability of discretionary accruals to predict future profitability and argues that this evidence supports the signaling view on accounting discretion. Guay, Kothari and Watts (1996) analytically show that a positive correlation between discretionary accruals and future stock returns can also be consistent with opportunistically motivated accrual accounting. Xie (2001) extends Subramanyam's (1996) analysis, finding that the market overprices discretionary accruals. Wahlen (1994) and Kanagaretnam, Lobo and Yang (2004) document that the discretionary part of the bank loan loss provision increases as future cash flow prospects improve; by contrast, Ahmed, Takeda and Thomas (1999) find a negative association between discretionary loss provisions and future earnings changes. Bowen, Rajgopal and Venkatachalam (2008) document that accounting discretion due to poor corporate governance is positively associated with future cash flows and return on assets. Lev, Li and Sougiannis (2010) find that accruals based on estimates have limited predicting ability for future cash flows and earnings. Badertscher, Collins and Lys (2012) examine a sample of restatement firms; they find that, if the restatements are not opportunistically motivated, originally reported earnings and accruals have lower forecasting power than restated numbers.

[6] Relatedly, an extensive literature deals with the ability of accruals to predict future performance. The results of these groups of studies are mixed and are highly dependent on whether the in-sample or the out-of-sample prediction is considered. With an in-sample approach, most studies (e.g., Dechow, Kothari and Watts, 1998; Kim and Kross, 2005) find that earnings better predict future cash flows than current cash flows. Furthermore, Barth, Cram and Nelson (2001) find that each accrual component is associated with future cash flows. By contrast, research designs based on an out-of-sample approach (e.g., Finger, 1994; Nam, Brochet and Ronen, 2012) question the predictive ability of accruals with respect to future cash flows.

Managerial discretion in accruals and informational efficiency

We contribute to the debate on whether managerial discretion in accounting conveys useful information to market participants by examining the relation between stock price informational efficiency and discretionary accruals.

Consistent with a large field of research (e.g., Solnik, 1974; Campbell, Lo and MacKinley, 1997; Boehmer and Kelley, 2009; Griffin, Kelly and Nardari, 2010; He, Shivakumar, Sidhu and Simmonds, 2011), we measure informational efficiency by the price deviation from a random walk pattern; assuming that informational efficient prices follow a random walk, a higher deviation from the random walk pattern implies a wider divergence from the fundamental value and, thus, lower informational efficiency.

To illustrate the reasoning underlying our measures of informational efficiency and the link with discretionary accruals, assume that a set of value-relevant information is privately known by managers. If no information is released to the market, this information is likely to be gradually impounded into prices, thus causing non-zero stock return autocorrelation and a deviation of the price pattern from the random walk benchmark. If the set of information is released to the market through discretionary accruals, part of the information is immediately incorporated into prices, thus reducing subsequent return autocorrelation (negative or positive) and the deviation from random walk pricing. Furthermore, the set of information in discretionary accruals can help investors to better interpret the additional information conveyed to the market through other channels, thus facilitating the incorporation of the additional information into prices.

Our work complements the results of the research on the predictive ability of discretionary accruals. We differ from this stream of literature as we examine the consequence of managerial discretion on price informativeness rather than on future performance. Given the absence of consensus in the theoretical and in the empirical literature regarding the informative role of managerial discretion in accruals, we do not formulate directional hypotheses.

III. RESEARCH DESIGN AND VARIABLE MEASUREMENT

Measuring the extent of discretion in accruals

To measure discretionary accruals, we use a performance-adjusted version of the modified Jones model, as proposed by Kothari, Leone and Wasley (2005).[7] The model is meant to capture management's discretionary financial reporting decisions in accruals by splitting a firm's total accruals into normal and discretionary accruals, where the normal part of accruals is assumed to be economically driven by the firm's underlying business activities.

Using the Fama-French 48 industries classification,[8] our measure of discretionary accruals is the prediction error obtained from the following regression model estimated by industry-year (firm subscript *i* is suppressed for notational convenience):[9]

$$\mathrm{TA_t} = \beta_0 + \beta_1(1/\mathrm{AT_t}) + \beta_2(\Delta\mathrm{REV_t} - \Delta\mathrm{AR_t}) + \beta_3\mathrm{PPE_t} + \beta_4\mathrm{ROA_{t-1}} + \varepsilon_t \qquad (1)$$

7 Following Kothari, Leone and Wasley (2005), we control for a potential misspecification of prior accrual models for firms with extreme performance by including the lagged return on assets (ROA_{t-1}). We additionally use several alternative measures used in previous literature to estimate discretionary accruals (i.e., Jones, 1991; Dechow, Sloan and Sweeney, 1995; Dechow and Dichev, 2002; McNichols, 2002). Our results are robust to the choice of the discretionary accruals model.

8 Using two-digit SIC code as an industry identification criterion instead of the Fama-French 48 industries classification does not affect our results.

9 Although the original Jones (1991) model and other discretionary accrual models suppress an unscaled intercept, we are following Kothari, Leone and Wasley (2005), who argue that an intercept is a further control for heteroskedasticity and helps to omit scale effects. As a result, the mean discretionary accruals for every industry-year are zero. Excluding either the unscaled or the scaled intercept has virtually no effect on our results.

where TA is total accruals, calculated as: change in current assets (Compustat *ACT*) minus change in cash and short-term investments (Compustat *CHE*) minus change in current liabilities (Compustat *LCT*) plus change in debt included in current liabilities (Compustat *DLC*) plus depreciation and amortization expense (Compustat *DP*); ΔREV is change in revenues (Compustat *REVT*); ΔAR is change in total accounts receivables (Compustat *RECT*); PPE is gross property, plant & equipment (Compustat *PPEGT*); ROA is net income before extraordinary items (Compustat *IB*) divided by total assets (Compustat *AT*).

All variables (except lagged ROA) are deflated by beginning of year total assets to mitigate heteroskedasticity. As we do not impose any directional sign on management's financial reporting decisions, we use the absolute value of the prediction error as our firm-year specific measure of discretionary accruals (ABSDA).

Measuring informational efficiency

Our main measure of informational efficiency is the return variance ratio. Variance ratios reflect the deviation of the price pattern from a random walk process, which has traditionally been interpreted as a proxy for weak form informational efficiency and for the extent to which prices diverge from the fundamental value.[10] The analysis is based on daily returns, as obtained from CRSP. We compute the variance ratio, VR(n,m), as n/m times the ratio of the m-day return variance to the n-day return variance. We use continuously compounded returns. A random walk implies that the ratio of long-term to short-term variances, per unit of time, is equal to one.

[10] Contributions on testing the deviation from random walk pricing are provided by Solnik (1974) and Campbell, Lo and MacKinley (1997); more recently, these tests have been used in different research fields: for example, Boehmer and Kelley (2009) (the role of institutional investors), Griffin, Kelly and Nardari (2010) (international comparison of market efficiency) and He, Shivakumar, Sidhu and Simmonds (2010) (information dissemination by exchanged-sponsored analysts). Surveys of the empirical literature on informational efficiency are contained in Charles and Darné (2009) and Lim and Brooks (2010).

Variance ratios less than one are consistent with negative return autocorrelation; variance ratios greater than one are consistent with positive return autocorrelation.[11] Because we are interested in any departure from the random walk, we examine the quantity |VR-1|. A smaller deviation from random walk pricing implies a smaller divergence of prices from the fundamental value; thus, a lower level of |VR-1| indicates higher informational efficiency. We present results concerning VR(1,5) and VR(1,10). For ease of interpretation, we denote |VR(1,5)-1| multiplied by -1 as IE1 and |VR(1,10)-1| multiplied by -1 as IE2, so that a higher level of IE1 and IE2 indicate higher informational efficiency.

As a second approach to study the deviation from random walk pricing we examine the autocorrelation of returns. We consider the first-order autocorrelation in 5-day and 10-day continuously compounded returns. If prices follow a random walk, the autocorrelation at all frequencies should be equal to zero. Because both a positive and a negative autocorrelation of returns indicate a departure from random walk pricing, we focus on the absolute value of autocorrelation. The results obtained using stock return autocorrelation are untabulated; they are qualitatively similar to those obtained using return variance ratios.

Following, for example, Campbell, Lo and MacKinley (1997), in the computation of our measures of deviation from random walk pricing we use overlapping observations to improve the power of the tests. We examine return frequencies longer than daily to abstract from microstructure frictions. We do not consider long return frequencies to avoid the possibility that the results might be affected by time varying expectations on the returns.

[11] See Campell, Lo and MacKinley (1997) for a formal treatment of the properties of variance ratios.

We compute our informational efficiency measures over the 12-month period beginning three months after the end of the fiscal year. We use this time adjustment to ensure that financial statements are available to the public.

Relating managerial discretion in accruals and informational efficiency

In our main analysis, we examine the association between managerial discretion in accruals and informational efficiency by estimating following regression model:

$$\mathrm{IE}_t = \beta_0 + \beta_1 \mathrm{ABSDA}_{t-1} + \beta_2 \mathrm{SIZE}_{t-1} + \beta_3 \mathrm{ILLIQ}_{t-1} + \beta_4 \mathrm{TURN}_{t-1} + \beta_5 \mathrm{NASDAQ}_t + \varepsilon_t \qquad (2)$$

where:

IE = Measures of stock price informational efficiency, computed as |VR(*n*,*m*)-1| multiplied by -1; where VR(*n*,*m*) is the return variance ratio, i.e. *n*/*m* times the ratio of the *m*-day return variance to the *n*-day return variance. IE1 is computed using VR(1,5) and IE2 using VR(1,10). Both measures are calculated over the 12-month period beginning three months after the end of the previous fiscal year.

ABSDA = Measure of discretionary accruals; computed as the absolute value of discretionary accruals resulting from the Dechow, Sloan and Sweeney (1995) model as modified by Kothari, Leone and Wasley (2005).

SIZE = Natural logarithm of market capitalization; market capitalization is computed as the market price of shares at the end of the fiscal year times the number of common shares outstanding.

ILLIQ = Amihud (2002) illiquidity ratio; computed as the average of daily absolute stock return per dollar trading volume. The measure is calculated over the 12-month period corresponding to the fiscal year.

TURN = Natural logarithm of share turnover; where share turnover is computed as the number of shares traded divided by the number of shares outstanding. The measure is calculated over the 12-month period corresponding to the fiscal year.

NASDAQ = Dummy variable coded 1 for stocks traded on NASDAQ and 0 otherwise.

In addition to our proxies for informational efficiency (IE1, IE2) and for discretionary accruals (ABSDA), we added a set of control variables identified by prior literature to be associated with our informational efficiency measures. SIZE is the natural logarithm of market capitalization, computed as the market price at the end of the fiscal year (Compustat *PRCC_F*) times the number of common shares outstanding (Compustat *CSHO*); size has been consistently documented to influence the price deviation from a random walk (French and Roll, 1986; Keim and Stambaugh, 1986; Griffin, Kelly and Nardari, 2010). Previous literature often uses size as a proxy for a firm's information environment (Atiase, 1985; Collins, Kothari and Rayburn, 1987), finding a positive association with informational efficiency (Griffin, Kelly and Nardari, 2010). ILLIQ is the Amihud (2002) Illiquidity ratio, computed as the annual average of daily absolute stock return per dollar trading volume; illiquidity affects the price pattern and can cause deviations of prices from the fundamental value (Griffin, Kelly and Nardari, 2010). TURN is the natural logarithm of share turnover, defined as the annual number of shares traded (Compustat *CSHTR_F*) divided by the number of shares outstanding (Compustat *CSHO*); higher trading activity, implied by greater turnover, might accelerate the price convergence to the fundamental value (Hou and Moskowitz, 2005; Griffin, Kelly and Nardari, 2010).[12] NASDAQ is a dummy variable for stocks traded on NASDAQ; the variable is added to control for the potential effect on the results of cross-market differences in trading structure.

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[12] Following previous literature (for example, Boehmer and Kelley, 2009), we use the lagged value of the market variables (turnover and illiquidity ratio) to avoid endogeneity issues. Using the contemporaneous values does not change the results.

We estimate the model with OLS and present two-way (firm and year) clustered standard errors (Petersen, 2009). The results obtained including year and industry fixed effects are qualitatively the same.

IV. SAMPLE AND DESCRIPTIVE STATISTICS

Our main sample is obtained from Compustat and the Center for Research in Securities Prices (CRSP) covering a 20-year period from 1988-2007. To compute our primary measure of discretionary accruals, we require at least 20 observations with sufficient accounting data in CRSP/Compustat Merged for each industry-year, using the Fama-French 48 industries classification. Consistent with previous literature, we exclude financial firms. Stock price data from CRSP is used to calculate our informational efficiency measures.

Table 1 describes the sample selection procedures and reports the distribution of the sample firms across industries and years. Data on our main control variables is also obtained from Compustat and CRSP. After excluding firm-years with insufficient data, we are left with a final sample of 10,301 firms from 38 Fama-French industries representing 77,451 firm-year observations. The number of observations is fairly well distributed throughout the sample period and across industry groupings, although some industries have more observations than others.[13]

[Table 1]

[13] Excluding the only industry group representing more than 10% of the final sample (Business Services, 12.21%) does not affect our results.

For further tests, we also require data on the number of analysts following (NAF) from I/B/E/S. Due to limited data availability, this requirement restricts our analyses using NAF to a sample of 67,586 firm-year observations.

Table 2 reports descriptive statistics for the variables used in later analyses. Descriptive statistics for informational efficiency and discretionary accruals measures as well as for our other variables are consistent with prior literature examining US stocks. The mean values of IE1 (-0.236) and IE2 (-0.303) are significantly different from zero at the 1% level, indicating that stock prices deviate from the pattern of a random walk on average. Mean and median values of ABSDA are 0.066 and 0.042, respectively.

[Table 2]

V. UNIVARIATE ANALYSIS

The Pearson (upper triangle) and Spearman (lower triangle) correlation coefficients between the variables are shown in Table 3. The univariate correlations indicate a negative relation between informational efficiency (IE1, IE2) and ABSDA.

[Table 3]

Previous research shows that informational efficiency and the absolute value of discretionary accruals are significantly associated with firm size (Boehmer and Kelley, 2009; Kothari, Leone and Wasley, 2005); this can lead to spurious associations between IE and ABSDA in the univariate analysis. To examine the relation between discretionary accruals and informational efficiency after partialling out the effect of size, we take a double sorting approach. Specifically, we firstly rank firms into three equally weighted portfolios based on size; then, within each size portfolio, we rank firms into three equally weighted portfolios based on the absolute value of discretionary accruals. Table 4 presents the results: for each size portfolio, firms in the portfolio with the highest level of ABSDA show the highest level of IE. The results indicate a positive association between informational efficiency and the absolute value of discretionary accruals. These findings show that the observed negative correlation between IE and ABSDA is likely to be determined by firm size.

[Table 4]

This is also confirmed by replicating the correlation analysis after orthogonalzing our measures of informational efficiency (IE1, IE2) and ABSDA with respect to SIZE. The results (untabulated) show that the Pearson (Spearman) correlation between IE and ABSDA is significantly positive at the 1% level.

VI. MULTIVARIATE ANALYSIS

For our main analysis, we use a multivariate regression model that controls for the cross-sectional determinants of informational efficiency. We estimate equation (2), where we relate informational efficiency to the absolute value of discretionary accruals and to a set of variables potentially affecting the price deviation from a random walk process. The results, presented in Table 5 (Model 1), show a positive and highly significant association between both measures of price deviation from a random walk (IE1, IE2) and ABSDA. Thus, informational efficiency increases as the absolute value of discretionary accruals increases.

[Table 5]

The coefficients of the control variables have the expected sign. SIZE is positively associated with IE; thus, the larger the market capitalization, the greater the informational efficiency. Furthermore, IE is negatively associated with ILLIQ (Amihud's illiquidity ratio) and positively associated with TURN (turnover by volume); hence, the most liquid stocks and the most traded stocks exhibit the lowest price deviation from a random walk. NASDAQ (the dummy variable for stocks listed on NASDAQ) has a negative and significant coefficient.

In an alternative specification of our main model, we consider additional control variables potentially affecting the relation between informational efficiency and the absolute value of discretionary accruals.

As a further proxy for the richness of the information environment we add the number of analysts following at the end of the fiscal year (NAF; Rajgopal and Venkatachalam, 2011). We obtain analyst data from I/B/E/S; this leads to a loss of 9,865 firm-year observations with respect to the main analysis.

We control for the effects of long term growth opportunities by including the book-to-market ratio (BM). The ratio can be interpreted as the extent to which expected future cash flows are incorporated in current stock prices. A low value of BM indicates higher future cash flows, which in turn adds to the uncertainty in firm value and might affect our measures of deviation from random walk pricing (Chae, Lee and Wang, 2011). The book-to-market ratio is measured as the book value of equity (Compustat *CEQ*) divided by the market capitalization.

We consider financial distress as a further possible driver of uncertainty and, thus, of informational efficiency. We add Altman's Z-Score (ALTZ) as a proxy for financial distress.[14]

As our informational efficiency measures - through the return variance - might be affected by non-trading periods, we add the number of non-trading days (NTDAYS); these are identified, following, for example, Griffin, Kelly and Nardari (2010), as the days with zero returns in CRSP. We compute NTDAYS in the 12-month period used for the estimation of the informational efficiency measures.

The results of the alternative specification with additional control variables are presented in Table 5 (Model 2). The coefficient of ABSDA is positive and highly significant; hence, the positive association between informational efficiency and the absolute value of discretionary accruals is confirmed.

VII. SENSITIVITY ANALYSIS

Time sub-samples – To examine the stability of the results over time, we split the sample in two periods of ten years (1988-1997 and 1998-2007) and four periods of five years (1988-1992, 1993-1997, 1998-2002, 2003-2007); the coefficient of ABSDA is positive and significant at the 1% level in all sub-periods. The findings (Table 6 reports the results for the two ten-year sub-periods) show that the positive association between informational efficiency and discretionary

[14] Altman's (1968) Z-Score is an indicator for the firm's economic viability computed as Z = 1.2·WC/TA + 1.4·RE/TA + 3.3·NIBE + 0.6·MVE/TL + REV/TA; where WC is working capital (Compustat *WCAP*); RE is retained earnings (Compustat *RE*); NIBE is net income before extraordinary items (Compustat *IB*); MVE is the market value of equity (Compustat *PRCC_F* * Compustat *CSHO*); TL is total liabilities (Compustat *LT*); REV is revenues (Compustat *REVT*) and AT is total assets (Compustat *AT*).

accruals holds over the entire time period considered. We also note that the association is stronger in the first ten-year period.

[Table 6]

The effect of SOX – A potential reason for the decline in the magnitude of the association between discretionary accruals and informational efficiency over time is the change of the institutional and regulatory environment for US firms during our sample period (e.g., Reg. FD, SOX). In particular, the passage of the Sarbanes-Oxley act (SOX), which was enacted in 2002 as a reaction to the several accounting scandals that happened soon after the turn of the millennium (e.g., Enron, WorldCom), can affect the association between IE and ABSDA. Previous literature finds that the extent of reported discretionary accruals decreases after SOX (Cohen, Dye and Lys, 2008). Cohen, Dey and Lys (2008) argue that adverse publicity and increased legal costs imposed on managers for purposeful intervention on earnings numbers might be possible reasons for the decline. This increase in cost can reduce the willingness of managers to use accruals as a signal to convey private information. Therefore, we test the effect of SOX on the association between IE and ABSDA by including a dummy variable for the period after the passage of SOX (2002 to 2007) and interaction terms to our main model.[15] The results show a significantly negative interaction term between ABSDA and SOX (-0.090, t-value -3.97 for IE1 and -0.077, t-value -2.50 for IE2, respectively) indicating that the positive association between

[15] We measure the effect of SOX on the association between IE and ABSDA by including a dummy variable for SOX (SOX is a dummy variable equal to one in the period after the passage of SOX, i.e. 2002-2007, and zero otherwise) and interaction terms to our main model in equation (2): $\mathrm{IE}_t = \beta_0 + \beta_1\mathrm{SOX}_{t-1} + \beta_2\mathrm{ABSDA}_{t-1} + \beta_3\mathrm{ABSDA}_{t-1}\cdot\mathrm{SOX}_{t-1} + \beta_4\mathrm{SIZE}_{t-1} + \beta_5\mathrm{SIZE}_{t-1}\cdot\mathrm{SOX}_{t-1} + \beta_6\mathrm{ILLIQ}_{t-1} + \beta_7\mathrm{ILLIQ}_{t-1}\cdot\mathrm{SOX}_{t-1} + \beta_8\mathrm{TURN}_{t-1} + \beta_9\mathrm{TURN}_{t-1}\cdot\mathrm{SOX}_{t-1} + \beta_{10}\mathrm{NASDAQ}_t\cdot\mathrm{SOX}_{t-1} + \varepsilon_t$.

informational efficiency and discretionary accruals is weaker in the post-SOX period relative to the pre-SOX period.

Positive vs. negative discretionary accruals – Different reporting motivations might affect the information conveyed by positive and negative discretionary accruals. For example, Dechow and Ge (2006) argue that large positive accruals are likely to be driven by firms smoothing transitory negative fluctuations; conversely, large negative accruals are indicative of fair value adjustments. Segmenting the analysis by income-increasing and income-decreasing discretionary accruals does not change the inference regarding the association between informational efficiency and the extent of discretionary accruals (the results are reported in Table 6). These findings suggest that both income-increasing and income-decreasing discretionary accruals convey useful information to the market.

Profit vs. loss firms – We repeat our main analysis on loss firms and profit firms, separately (the results are untabulated).[16] Loss firms represent 32.53% of our main sample. The association between informational efficiency and discretionary accruals is weaker for loss firms, but the coefficient of ABSDA (0.062, t-value 2.87, using IE1 and 0.063, t-value 2.93, using IE2) is still positive and significant at the 1% level.[17] Prior research (starting from Kormendi and Lipe, 1987) documents that value relevance of earnings increases with their persistence. The lower persistence of negative earnings relative to positive earnings might also determine a lower informativeness of discretion and a weaker association between informational efficiency and discretionary accruals.

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[16] A firm is considered a loss firm if current year's net income before extraordinary items is less than zero.

[17] In firms with positive earnings the coefficient of ABSDA is 0.133 (t-value 7.07) for IE1 and 0.149 (t-value 6.90) for IE2, respectively.

Discretionary vs. non-discretionary accruals – As a further sensitivity test, we examine the association between informational efficiency and the non-discretionary portion of accruals. We follow the design used in the main analysis but focus on the absolute value of non-discretionary accruals (ABSNDA). The results are reported in Table 7. The coefficient of non-discretionary accruals is positive but insignificantly different from zero. The results indicate that the observed pattern in informational efficiency is not attributable to non-discretionary accruals.

[Table 7]

Informational efficiency and managerial discretion in accruals: intra-year variation – In the main analysis we concentrate on informational efficiency in the 12-month period beginning three months after the end of the fiscal year. Here, we also divide this period into quarters and examine the relation between our informational efficiency measures and discretionary accruals. The results (untabulated) are qualitatively the same in all the quarters.[18] The magnitude of the ABSDA coefficient is highest in the second quarter, i.e. between the seventh and the ninth month after the end of the fiscal year. In the third and in the fourth quarter, the association between informational efficiency and discretionary accruals is weaker but still highly significant. These findings suggest a decrease in the informativeness of discretionary accruals over time. The high significance of the ABSDA coefficient in the whole year also indicates that the association between informational efficiency and discretionary accruals goes beyond the period affected by the post-earnings announcement drift. Specifically, most studies document

[18] When using IE1, the coefficient of ABSDA is: 0.103 (t-value 5.76) in the first quarter; 0.115 (t-value 7.02) in the second quarter; 0.067 (t-value 3.81) in the third quarter; 0.087 (t-value 5.52) in the fourth quarter. When using IE2, the coefficient of ABSDA is: 0.104 (t-value 5.69) in the first quarter; 0.131 (t-value 7.37) in the second quarter; 0.056 (t-value 3.07) in the third quarter; 0.086 (t-value 3.40) in the fourth quarter.

that the drift is concentrated between the first quarter and the end of the second quarter after earnings announcements (see, for a survey, Richardson, Tuna and Wysocki, 2010).

Informational efficiency and managerial discretion in quarterly accruals – In addition, we investigate the association between the absolute value of quarterly discretionary accruals and informational efficiency. We measure quarterly discretionary accruals following Louis and Robinson (2005).[19] Using our main model in equation (2), we relate the absolute value of quarterly discretionary accruals (ABSDAQ) to informational efficiency in the period between the corresponding earnings announcement and the following earnings announcement. In the model we add dummy variables for the quarters. The dates of the earnings announcements are obtained from Compustat; we remove observations for which the quarterly announcement date is at least 90 days later than quarter end (for the fourth quarter) or those for which the announcement date is at least 60 days later than quarter end (for the first three quarters). Consistent with the analysis of annual data, the results (untabulated) show that the coefficient on ABSDAQ is positive and significantly different from zero with a t-value of 3.17 (3.29) for IE1 (IE2). The significance of the tests is weaker than in the main analysis, suggesting that quarterly discretionary accruals carry less information than annual discretionary accruals.

The role of analysts following – Previous literature suggests that managers' incentives to use discretionary accruals as a mechanism to convey private information also depend on the richness of a firm's information environment; managers of firms in richer information environments are expected to have less need to use discretion in accounting numbers to

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[19] Quarterly discretionary accruals are represented by the residual ε_q of the following model: $TA_q = \sum_{q=1}^{4} \alpha_q Q_q + \beta_1(1/AT_q) + \beta_2(\Delta REV_q - \Delta AR_q) + \beta_3 PPE_q + \beta_4 ROA_{q-1} + \varepsilon_q$, where Q is a dummy variable taking the value 1 in quarter q and 0 otherwise. All other variables are quarterly observations of the variables as defined in equation (2).

communicate their private information (Arya, Glover and Sunder, 2003; Louis and Robinson, 2005). To test whether the information environment of a firm affects our findings on the association between informational efficiency and discretionary accruals, we follow Louis and Robinson (2005) and use the number of analysts following (NAF) as a proxy for the richness of a firm's information environment. A higher number of analysts following represents a richer information environment.[20] The results (untabulated) show a negative coefficient for the interaction term $ABSDA_{t-1} \cdot NAF_{t-1}$, indicating that discretionary accruals of firms with a higher number of analysts following contain less private information and therefore have a smaller effect on the informational efficiency of stock prices.[21] We note that the significance of the association is at the 5% level for IE1 and only at the 10% for IE2.

Further alternative control variables - As an alternative measure of liquidity we use the annual average of the daily percentage bid-ask spread, which is measured as the difference between the closing ask and bid price divided by the midquote (the average of the closing ask and bid price). Because of missing observations in CRSP, the bid-ask spread can be computed only for 70,942 firm-year observations. We use leverage as an alternative control variable for financial distress since highly leveraged firms are more likely to go bankrupt (Rajgopal and Venkatachalam, 2011). The results obtained using these alternative specifications are untabulated and are qualitatively the same with respect to the main analysis.

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[20] We measure the effect of the richness of the information environment on the association between IE and ABSDA by adding the level of NAF and interaction terms with NAF to our main model in equation (2): $IE_t = \beta_0 + \beta_1 ABSDA_{t-1} + \beta_2 NAF_{t-1} + \beta_3 ABSDA_{t-1} \cdot NAF_{t-1} + \beta_4 SIZE_{t-1} + \beta_5 SIZE_{t-1} \cdot NAF_{t-1} + \beta_6 ILLIQ_{t-1} + \beta_7 ILLIQ_{t-1} \cdot NAF_{t-1} + \beta_8 TURN_{t-1} + \beta_9 TURN_{t-1} \cdot NAF_{t-1} + \beta_{10} NASDAQ_t \cdot \beta_{11} NAF_{t-1} + \varepsilon_t$.

[21] The coefficient on the interaction term ABSDA·NAF is -0.029 (t-value -2.39) using IE1 and -0.026 (t-value -1.84) using IE2, respectively.

Penny stocks - Penny stocks (with a price lower than one dollar) have often been documented as being related to extreme illiquidity and pricing anomalies. Accordingly, we also replicate the analysis excluding penny stocks; untabulated findings are qualitatively analogous.

VIII. ADDITIONAL ANALYSES

General managerial discretion and informational efficiency

For an alternative proxy of managerial discretion, we consider a widely used industry discretion index (MDSCORE) developed by Hambrick and Abrahamson (1995). This index measures the effect of executives on the organizational outcome within an industry. It is based on ratings of the overall managerial discretion in 17 industries; the ratings are given by a panel of securities analysts specialized in these industries and by academic experts. Using industry determinants of discretion theoretically proposed by Hambrick and Finkelstein (1987), Hambrick and Abrahamson (1995) extend the 17-industry index by 53 additional industries, resulting in a final index encompassing 70 four-digit-SIC code industries.[22] The index uses a seven-point scale, where higher levels of MDSCORE indicate greater managerial discretion.

As the index is available only for 70 four-digit-SIC code industries, our sample is limited to 37,539 observations from these industries.[23] Using a model with the same set of control variables as in our main analysis, the coefficient of MDSCORE is positive and highly significant (the results are presented in Table 8). These findings are consistent with our main results: the extent of managerial discretion is positively associated with stock price informational efficiency.

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22 The extended index is presented in Finkelstein, Hambrick and Cannella (2009).

23 Higher levels of MDSCORE indicate greater managerial discretion.

[Table 8]

Informational efficiency, idiosyncratic volatility, and managerial discretion in accruals

Idiosyncratic stock return volatility has been proposed as a measure of price informativeness. Hence, our analysis is related to prior research investigating the relation between idiosyncratic return volatility and discretionary accruals; the findings of these studies are mixed. Rajgopal and Venkatachalam (2011) measure idiosyncratic return volatility as the residual volatility in a Fama-French three factor model; they find that idiosyncratic volatility increases with the absolute value of discretionary accruals. Chen, Huang and Jha (2012) measure idiosyncratic return volatility in a similar way and find that it is positively associated with the volatility and with the absolute value of discretionary accruals. Hutton, Marcus and Tehranian (2009) use the R^2 of the market model augmented with lagged and forward returns as a proxy for idiosyncratic volatility; in contrast with the aforementioned contributions, they find that idiosyncratic volatility decreases with the absolute value of discretionary accruals.[24]

The interpretation of the results of this field of literature is controversial. One group of works argues that greater idiosyncratic volatility implies greater firm specific information conveyed to the market (Morck, Yeung and Yu, 2000; Durnev, Morck, Yeung and Zarowin, 2003; Jin and Myers, 2006). A second stream of studies contends that greater idiosyncratic volatility indicates a poorer information environment (West, 1988; Krishnaswami and Subramaniam, 1999; Brown and Kapadia, 2007; Dasgupta, Gan and Gao, 2010); consistent with this view, it has been suggested that idiosyncratic volatility reflects noise trading (Roll, 1988;

[24] A related contribution is provided by Callen, Khan and Lu (2012); they document that price delay - defined as the delay with which market-information is incorporated into prices - decreases with accruals quality.

Kelly, 2007) or limits to arbitrage (Pontiff, 1996, Wurgler and Zhuravskaya, 2002, and Mashruwala, Rajgopal and Shevlin, 2006).[25] Lee and Liu (2012) try to reconcile the different views on idiosyncratic volatility and price informativeness; they develop a model showing that idiosyncratic volatility has either a U-shaped or negative relation with price informativeness; using six widely used price informativeness measures, they also document a U-shaped relation between idiosyncratic volatility and price informativeness.

The deviation of prices from a random walk pattern is different than idiosyncratic volatility (see, for example, Chae, Lee and Wang, 2011 for a formal comparison of idiosyncratic volatility and variance ratios). Furthermore, contrary to idiosyncratic volatility, the deviation of prices from a random walk pattern is an uncontested measure of stock price informativeness.

We examine the relation between idiosyncratic volatility, discretionary accruals and informational efficiency in our sample. Following the standard approach in previous literature (Ang, Hodrick, Xing and Zhang, 2006; Rajgopal and Venkatachalam, 2011), we measure idiosyncratic volatility (IVOL) as the standard deviation of residuals of the Fama-French three factor model.[26]

We relate idiosyncratic volatility to discretionary accruals and to the cross-sectional determinants of informational efficiency. The results are presented in Panel A of Table 9; idiosyncratic volatility is positively associated with the absolute value of discretionary accruals.

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25 Pantzalis and Park (2011) present a review of the different views on idiosyncratic volatility.

26 Specifically, we use daily returns and for each firm we estimate the following equation: $R_{i,t} = \beta_{0i} + \beta_i^{M} R_{M,t} + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \varepsilon_{i,t}$; where R_i is the actual return of firm i, R_M is the market return, SMB is the return of the book-to-market factor mimicking portfolio, and HML is the return of the size factor mimicking portfolio. R_M, SMB, HML are obtained from Kenneth French's website. The model is estimated using a one-year estimation window (we consider all the trading days included in the period beginning three months after the end of the fiscal year). Idiosyncratic volatility (IVOL) is defined as the in-sample standard deviation of the estimated residuals.

The results are consistent with those found by Rajgopal and Venkatachalam (2011) and by Chen, Huang and Jha (2012).

[Table 9]

To investigate the difference between idiosyncratic volatility and the price deviation from a random walk pattern as a measure of price informativeness, we examine the correlation between IVOL and IE for different quartiles of IE – obtained by sorting firms in each year separately. Because IE and IVOL are likely to be influenced by the same determinants, we also consider a residual form measure of informational efficiency (IE_{RES}); this is obtained as the residual of equation (2). Table 9 (Panel B) reports the results. Firstly, notice that the correlation between IVOL and IE is negative although IVOL and IE are both positively associated with ABSDA. Moreover, both raw form and residual form measures of informational efficiency exhibit a U-shaped relation with idiosyncratic volatility. In the lowest three quartiles of IE the correlation between IE and IVOL is negative; in the highest quartile of IE the correlation between IE and IVOL is positive. In all quartiles and for all the measures – except the top two quartiles of IE1 - the correlations are highly significant. The results are in line with those found by Lee and Liu (2012), who also show that for low (high) levels of price informativeness, idiosyncratic volatility and price informativeness are negatively (positively) associated. The results support the view that idiosyncratic volatility and the price deviation from a random walk pattern are substantially different.

The role of the accrual anomaly

The accrual anomaly – the negative relation between accruals and future stock returns - is one of the most pervasive market anomalies based on financial accounting information. The anomaly has also been documented for discretionary accruals (Xie, 2001) – 'discretionary accrual anomaly'. We examine whether the discretionary accrual anomaly is related to the association between the absolute value of discretionary accruals and the price deviation from a random walk pattern.

We investigate the discretionary accrual anomaly in our sample by performing the hedge return test. We compute discretionary accruals (DA) as the (signed) residuals of equation (1); every year we then rank firms in ten decile portfolios based on DA. Hedge returns are defined as the mean abnormal size-adjusted returns in the firms with low (the most negative) discretionary accruals minus the mean abnormal size-adjusted returns in the firms with high (the most positive) discretionary accruals.[27]

Panel A of Table 10 reports the results. Consistent with Xie (2001), we find that a hedge portfolio that takes a long position in the lowest DA decile and a short position in the highest DA decile yields positive abnormal returns (significantly different from zero at the 1% level). To examine whether the discretionary accrual anomaly is related to the association between IE and ABSDA, we use yearly observations of hedge returns. We regress yearly hedge returns on: (1) the yearly average IE in the extreme DA deciles; (2) the difference in IE between the lowest and

[27] We base our analysis on monthly returns. Abnormal size-adjusted returns are obtained as the difference between the actual return and the value-weighted return on a portfolio of firms belonging to the same size decile (as provided by CRSP). Membership to a size decile is determined by the calendar year in which the accumulation period begins. We focus on annual buy-and-hold abnormal returns and we start the accumulation period three months after fiscal year end. We exclude penny stocks as they are often documented to be strongly related to mispricing. As a robustness check, we also estimated abnormal returns resulting from a three-factor model augmented with momentum (following the approach used, for example, by Landsman, Miller, Peasnell and Ye (2010); the results, untabulated, are similar.

highest DA decile; (3) the yearly coefficient of ABSDA in equation (2) obtained using the observations in the extreme DA deciles. The results are reported in Panel B of Table 10. In none of the models is the slope coefficient significantly different from zero. We interpret the findings as evidence that hedge returns are not associated with: the average IE in the extreme deciles; the difference in IE between the highest and lowest DA decile; the strength of the association between ABSDA and IE. Overall, the results indicate that the discretionary accrual anomaly cannot be explained by the association between the price deviation from a random walk pattern and the absolute value of discretionary accruals.

[Table 10]

IX. CONCLUSIONS

Do discretionary accruals convey useful information to investors? Or does managerial discretion simply mislead market participants? A long-standing debate among academics, regulators and practitioners is centered around these questions. One view is that discretionary accruals are used by managers as a signal to communicate private information. The other view is that discretion is contracting motivated and this can lead to accrual reporting choices deviating from the most accurate representation of the financial position.

In this paper we contribute to the debate on the informativeness of managerial discretion in accruals by examining the relation between discretionary accruals and informational efficiency. Assuming that efficient prices follow a random walk, we measure informational efficiency by using stock return variance ratios. Our analysis considers a large sample of US non-financial firms between 1988 and 2007. We find that the absolute value of discretionary accruals is negatively associated with the price deviation from a random walk pattern. Hence, informational efficiency increases with the absolute value of discretionary accruals. These results are consistent with the view that discretionary accruals do, indeed, convey useful information to investors.

Our findings have implications for the interpretation and regulation of managerial discretion in accrual reporting. The analysis is related to the major issues addressed by the FASB in recent years (e.g., financial instruments, employee stock options, fixed assets and goodwill impairment and valuation of acquired intangibles); it is also closely linked to the current debate on rules-based vs. principles-based accounting – the latter model (which characterizes the international financial reporting standards) relying to a greater extent on managerial discretion. Furthermore, the results contribute to the understanding of the determinants of informational efficiency; this is a crucial aspect of market quality, of the consequences of financial reporting information and of the investment decisions process.

APPENDIX: VARIABLES DEFINITION

Variable	*Definition*
ABSDA, ABSNDA	ABSDA is the absolute value of discretionary accruals resulting from the Dechow, Sloan, and Sweeney (1995) model as modified by Kothari, Leone, and Wasley (2005). ABSNDA is the absolute value of non-discretionary accruals resulting from the same model. See Section III.
ALTZ	Altman's Z-Score, computed following Altman (1968).
BM	Book-to-market ratio, computed as the book value of equity divided by the market value of equity at the end of the fiscal year.
IE1,2	Measures of stock price informational efficiency, computed as $\lvert VR(n,m)-1 \rvert$ multiplied by -1; where $VR(n,m)$ is the return variance ratio, i.e. n/m times the ratio of the m-day return variance to the n-day return variance. IE1 is computed using VR(1,5) and IE2 using VR(1,10). Both measures are calculated over the 12-month period beginning three months after the end of the previous fiscal year. See Section III.
ILLIQ	Amihud (2002) illiquidity ratio; where the Amihud illiquidity ratio is computed as the average of daily absolute stock return per dollar trading volume. The measure is calculated over the 12-month period corresponding to the fiscal year.
IVOL	Measure of idiosyncratic volatility, computed as the in-sample standard deviation of the residuals of the Fama-French three factor model. The measure is calculated over the 12-month period beginning three months after the end of the previous fiscal year. See Section VIII.
MDSCORE	Industry index of managerial discretion developed by Hambrick and Abrahamson (1995). See Section VIII.
NAF	Natural logarithm of (1 + number of analysts following at the end of the fiscal year).
NASDAQ	Dummy variable coded 1 for stocks traded on NASDAQ and 0 otherwise.
NTDAYS	Number of non-trading days, computed as the number of days with zero returns in CRSP. The measure is calculated over the 12-month period beginning three months after the end of the previous fiscal year.
SIZE	Natural logarithm of market capitalization; where market capitalization is computed as the market price of shares at the end of the fiscal year times the number of common shares outstanding.
TURN	Natural logarithm of share turnover; where share turnover is computed as the number of shares traded divided by the number of shares outstanding. The measure is calculated over the 12-month period corresponding to the fiscal year.

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Table 1: Sample composition

Panel A: Sample selection procedures

	Firm-years
All non-financial firm fiscal years 1988-2007 in CRSP/Compustat Merged	103,246
- insufficient stock return data to compute variance ratios	-12,400
- missing or insufficient data to compute discretionary accruals	-13,145
- insufficient data to compute control variables	-250
Final sample	77,451

Panel B: Industry distribution

Industry	Firm-years	Pct.%	Industry	Firm-years	Pct.%
Agriculture	124	0.16	Electrical Equipment	1,518	1.96
Food Products	1,505	1.94	Automobiles and Trucks	1,263	1.63
Beer & Liquor	193	0.25	Aircraft	414	0.53
Recreation	808	1.04	Precious Metals	781	1.01
Entertainment	1,237	1.6	Non-Metallic/Ind. Metal Mining	519	0.67
Printing and Publishing	786	1.01	Petroleum and Natural Gas	3,960	5.11
Consumer Goods	1,583	2.04	Utilities	3,134	4.05
Apparel	1,295	1.67	Communication	2,970	3.83
Healthcare	1,600	2.07	Personal Services	889	1.15
Medical Equipment	3,097	4	Business Services	9,457	12.21
Pharmaceutical Products	5,077	6.56	Computers	3,866	4.99
Chemicals	1,792	2.31	Electronic Equipment	5,619	7.25
Rubber and Plastic Products	890	1.15	Measuring and Control Eq.	2,130	2.75
Textiles	451	0.58	Business Supplies	1,299	1.68
Construction Materials	1,711	2.21	Shipping Containers	34	0.04
Construction	613	0.79	Transportation	2,286	2.95
Steel Works Etc	1,364	1.76	Wholesale	3,440	4.44
Fabricated Products	311	0.4	Retail	4,604	5.94
Machinery	3,144	4.06	Restaraunts, Hotels, Motels	1,687	2.18

Panel C: Fiscal year distribution

Year	Firm-years	Pct.%	Year	Firm-years	Pct.%
1988	3,537	4.57	1998	4,509	5.82
1989	3,503	4.52	1999	4,218	5.45
1990	3,509	4.53	2000	4,077	5.26
1991	3,482	4.5	2001	4,091	5.28
1992	3,638	4.7	2002	3,758	4.85
1993	3,917	5.06	2003	3,743	4.83
1994	4,194	5.42	2004	3,562	4.6
1995	4,430	5.72	2005	3,491	4.51
1996	4,518	5.83	2006	3,352	4.33
1997	4,621	5.97	2007	3,301	4.26

Table 2: Descriptive statistics

Variable	Mean	Median	Q1	Q3	SD	N
IE1	-0.236	-0.187	-0.345	-0.087	0.189	77,451
IE2	-0.303	-0.261	-0.440	-0.126	0.219	77,451
ABSDA	0.066	0.042	0.018	0.086	0.073	77,451
ABSNDA	0.054	0.045	0.026	0.073	0.041	77,451
SIZE	5.216	5.086	3.584	6.735	2.244	77,451
ILLIQx100,000	0.952	0.010	0.001	0.167	11.000	77,451
TURN	13.434	13.548	12.765	14.272	1.268	77,451
NASDAQ	0.580	1.000	0.000	1.000	0.493	77,451
NAF	1.257	1.099	0.000	2.079	1.043	67,586
BM	0.575	0.482	0.267	0.783	3.683	67,586
NTDAYS	36.180	26.000	7.000	56.000	36.013	67,586
ALTZ	5.388	3.196	1.735	5.472	16.953	67,586
IVOL	0.039	0.032	0.021	0.049	0.029	77,451
MDSCORE	4.841	5.170	4.050	5.700	1.371	37,539

Notes: The sample for our main analysis consists of 77,451 firm-year observations from 1988-2007. Descriptive statistics for variables used in additional analyses are based on smaller sample sizes due to limited data availability for some of the variables. The variables are defined in the Appendix.

Table 3: Correlation matrix

	IE1	IE2	ABSDA	ABSNDA	SIZE	ILLIQ	TURN	NASDAQ	NAF	BM	NTDAYS	ALTZ	IVOL	MDSCORE
IE1	1	0.910*	-0.043*	-0.031*	0.438*	-0.141*	0.261*	-0.247*	0.370*	-0.031*	-0.428*	0.039*	-0.359*	0.026*
IE2	0.855*	1	-0.039*	-0.028*	0.402*	-0.131*	0.242*	-0.228*	0.342*	-0.031*	-0.394*	0.031*	-0.332*	0.021*
ABSDA	-0.057*	-0.052*	1	0.107*	-0.223*	0.024*	0.079*	0.167*	-0.179*	-0.012*	0.110*	0.009	0.219*	0.182*
ABSNDA	-0.019*	-0.019*	0.067*	1	-0.087*	0.030*	-0.041*	0.021*	-0.082*	-0.001	0.041*	-0.055*	0.136*	-0.229*
SIZE	0.423*	0.395*	-0.247*	-0.067*	1	-0.131*	0.160*	-0.415*	0.743*	-0.044*	-0.614*	0.049*	-0.527*	-0.158*
ILLIQ	-0.509*	-0.476*	0.204*	0.084*	-0.887*	1	-0.097*	0.045*	-0.087*	0.005	0.129*	-0.005	0.328*	-0.017*
TURN	0.268*	0.248*	0.070*	-0.058*	0.263*	-0.468*	1	0.170*	0.354*	-0.029*	-0.363*	0.083*	0.014*	0.254*
NASDAQ	-0.217*	-0.213*	0.180*	0.001	-0.413*	0.353*	0.193*	1	-0.269*	0.011*	0.103*	0.084*	0.356*	0.345*
NAF	0.341*	0.319*	-0.184*	-0.064*	0.755*	-0.756*	0.387*	-0.263*	1	-0.027*	-0.437*	0.005	-0.398*	-0.115*
BM	-0.199*	-0.181*	-0.080*	0.023*	-0.332*	0.340*	-0.268*	-0.028*	-0.209*	1	0.034*	0.009	0.007	-0.072*
NTDAYS	-0.405*	-0.379*	0.131*	0.022*	-0.663*	0.716*	-0.433*	0.102*	-0.468*	0.282*	1	-0.045*	0.263*	-0.043*
ALTZ	0.071*	0.061*	0.040*	-0.220*	0.136*	-0.159*	0.187*	0.151*	0.118*	-0.248*	-0.145*	1	-0.011*	0.083*
IVOL	-0.297*	-0.283*	0.291*	0.115*	-0.636*	0.623*	0.084*	0.494*	-0.457*	0.022*	0.303*	-0.084*	1	0.183*
MDSCORE	0.008	0.008	0.197*	-0.229*	-0.178*	0.097*	0.278*	0.350*	-0.112*	-0.211*	-0.014	0.270*	0.306*	1

Notes: The sample for our main analysis consists of 77,451 firm-year observations from 1988-2007. Correlation results for NAF, BM, NTDAYS and ALTZ (MDSCORE) are based on a smaller sample size of 67,586 (37,539) firm-year observations due to limited data availability. All the variables are defined in the Appendix. * indicates statistical significance at the 1% level.

Table 4: Discretionary accruals and informational efficiency – double sorting by size and discretionary accruals

Number of firms in each SIZE/ABSDA portfolio:

	ABSDA (low to high)			
SIZE (small to large)	1	2	3	
1	6,295	7,914	11,608	25,817
2	8,134	8,730	8,953	25,817
3	11,388	9,173	5,256	25,817
Total	25,817	25,817	25,817	77,451

Average ABSDA in each SIZE/ABSDA portfolio:

	ABSDA (low to high)		
SIZE (small to large)	1	2	3
1	0.012	0.045	0.151
2	0.012	0.044	0.143
3	0.012	0.042	0.127

Average IE1 in each SIZE/ABSDA portfolio:

	ABSDA (low to high)		
SIZE (small to large)	1	2	3
1	-0.362	-0.359	-0.345
2	-0.214	-0.208	-0.198
3	-0.152	-0.151	-0.141

Average IE2 in each SIZE/ABSDA portfolio:

	ABSDA (low to high)		
SIZE (small to large)	1	2	3
1	-0.438	-0.435	-0.419
2	-0.279	-0.271	-0.261
3	-0.214	-0.212	-0.200

Notes: Firms are sorted by size (SIZE) and by the absolute value of discretionary accruals (ABSDA). For each portfolio the table reports the number of firms, the average level of ABSDA, and of the informational efficiency measures (IE). All the variables are defined in the Appendix.

Table 5: Discretionary accruals and informational efficiency – multivariate analysis

Model 1: $IE_t = \beta_0 + \beta_1 ABSDA_{t-1} + \beta_2 SIZE_{t-1} + \beta_3 ILLIQ_{t-1} + \beta_4 TURN_{t-1} + \beta_5 NASDAQ_t + \varepsilon_t$

Model 2: $IE_t = \beta_0 + \beta_1 ABSDA_{t-1} + \beta_2 SIZE_{t-1} + \beta_3 ILLIQ_{t-1} + \beta_4 TURN_{t-1} + \beta_5 NASDAQ_t + \beta_6 NAF_{t-1} + \beta_7 BM_{t-1} + \beta_8 NTDAYS_t + \beta_9 ALTZ_{t-1} + \varepsilon_t$

	Model 1		**Model 2**	
	IE1:∣VR(1,5)-1∣*(-1)	IE2:∣VR(1,10)-1∣*(-1)	IE1:∣VR(1,5)-1∣*(-1)	IE2:∣VR(1,10)-1∣*(-1)
ABSDA	**0.107*****	**0.116*****	**0.111*****	**0.122*****
	[5.92]	**[6.09]**	**[7.88]**	**[7.69]**
SIZE	0.029***	0.030***	0.015***	0.015***
	[10.93]	[10.78]	[4.81]	[4.47]
ILLIQ	-117.777***	-128.643***	-139.259*	-152.451*
	[-3.63]	[-3.61]	[-1.70]	[-1.68]
TURN	0.033***	0.035***	0.025***	0.026***
	[12.29]	[13.01]	[9.16]	[10.03]
NASDAQ	-0.056***	-0.061***	-0.064***	-0.070***
	[-5.19]	[-5.28]	[-5.78]	[-5.74]
NAF	-	-	0.006**	0.009***
		-	[2.23]	[2.94]
BM	-	-	-0.000*	-0.001***
	-	-	[-1.94]	[-2.94]
NTDAYS	-	-	-0.001***	-0.001***
	-	-	[-2.71]	[-2.78]
ALTZ	-	-	0.000***	0.000***
	-	-	[3.56]	[3.00]
Constant	-0.803***	-0.909***	-0.581***	-0.657***
	[-16.30]	[-18.05]	[-9.81]	[-11.07]
Observations	77,451	77,451	67,586	67,586
Adjusted R^2	0.252	0.213	0.277	0.234

Notes: All the variables are defined in the Appendix. Reported t-values are calculated using two-way clustered standard errors, clustered by firm and year. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 6: Results by sub-samples

$$IE_t = \beta_0 + \beta_1 ABSDA_{t-1} + \beta_2 SIZE_{t-1} + \beta_3 ILLIQ_{t-1} + \beta_4 TURN_{t-1} + \beta_5 NASDAQ_t + \varepsilon_t$$

	IE1: ∣VR(1,5)-1∣*(-1)		IE2: ∣VR(1,10)-1∣*(-1)		IE1: ∣VR(1,5)-1∣*(-1)		IE2: ∣VR(1,10)-1∣*(-1)	
	1988 – 1997	1998 – 2007	1988 – 1997	1998 - 2007	Positive DA	Negative DA	Positive DA	Negative DA
ABSDA	**0.171*** **	**0.061*** **	**0.175*** **	**0.079*** **	**0.094*** **	**0.118*** **	**0.101*** **	**0.130*** **
	[10.81]	**[4.12]**	**[9.62]**	**[3.89]**	**[4.16]**	**[6.39]**	**[4.26]**	**[6.50]**
SIZE	0.031***	0.022***	0.033***	0.023***	0.028***	0.029***	0.030***	0.031***
	[6.69]	[8.43]	[6.96]	[7.77]	[11.39]	[10.42]	[11.04]	[10.43]
ILLIQ	-93.894***	-149.475**	-102.798***	-166.596**	-136.688***	-101.727**	-151.398***	-109.362**
	[-3.01]	[-2.04]	[-2.95]	[-2.06]	[-2.87]	[-2.40]	[-2.95]	[-2.37]
TURN	0.035***	0.026***	0.037***	0.029***	0.034***	0.032***	0.036***	0.035***
	[6.97]	[11.85]	[7.08]	[11.68]	[11.05]	[13.18]	[12.11]	[13.31]
NASDAQ	-0.093***	-0.023***	-0.099***	-0.027***	-0.056***	-0.056***	-0.061***	-0.061***
	[-6.37]	[-4.21]	[-6.19]	[-4.40]	[-4.93]	[-5.32]	[-5.07]	[-5.33]
Constant	-0.846***	-0.662***	-0.936***	-0.783***	-0.812***	-0.795***	-0.919***	-0.901***
	[-9.31]	[-14.66]	[-10.15]	[-15.32]	[-15.26]	[-17.12]	[-17.22]	[-18.49]
Observations	39,349	38,102	39,349	38,102	37,496	39,955	37,496	39,955
Adjusted R^2	0.267	0.183	0.231	0.148	0.258	0.246	0.221	0.207

Notes: In the first four columns, the main sample is segmented into two sub-periods: 1988-1997 and 1998-2007. In the last four columns, the main sample is segmented into two sub-samples based on the sign of discretionary accruals. All the variables are defined in the Appendix. Reported t-values are calculated using two-way clustered standard errors, clustered by firm and year. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 7: Discretionary accruals, non-discretionary accruals and informational efficiency

$$IE_t = \beta_0 + \beta_1 ABSDA_{t-1} + \beta_2 ABSNDA_{t-1} + \beta_3 SIZE_{t-1} + \beta_4 ILLIQ_{t-1} + \beta_5 TURN_{t-1} + \beta_6 NASDAQ_t + \varepsilon_t$$

	IE1:∣VR(1,5)-1∣*(-1)	IE2:∣VR(1,10)-1∣*(-1)
ABSDA	**0.105*** **	**0.114*** **
	[5.87]	**[6.13]**
ABSNDA	**0.041**	**0.047**
	[1.11]	**[1.07]**
SIZE	0.029***	0.030***
	[11.00]	[10.85]
ILLIQ	-118.036***	-128.939***
	[-3.62]	[-3.61]
TURN	0.033***	0.036***
	[12.40]	[13.15]
NASDAQ	-0.056***	-0.061***
	[-5.18]	[-5.27]
Constant	-0.806***	-0.913***
	[-16.74]	[-18.64]
Observations	77,451	77,451
Adjusted R^2	0.252	0.213

Notes: All the variables are defined in the Appendix. Reported t-values are calculated using two-way clustered standard errors, clustered by firm and year. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8: Managerial discretion industry score and informational efficiency

$$IE_t = \beta_0 + \beta_1 MDSCORE_{t-1} + \beta_2 SIZE_{t-1} + \beta_3 ILLIQ_{t-1} + \beta_4 TURN_{t-1} + \beta_5 NASDAQ_t + \varepsilon_t$$

	IE1: ∣VR(1,5)-1∣*(-1)	IE2: ∣VR(1,10)-1∣*(-1)
MDSCORE	**0.009*** **	**0.009*** **
	[4.78]	**[4.14]**
SIZE	0.028***	0.029***
	[10.16]	[9.96]
ILLIQ	-84.889***	-93.938***
	[-3.07]	[-3.04]
TURN	0.032***	0.035***
	[12.10]	[12.57]
NASDAQ	-0.053***	-0.057***
	[-5.00]	[-4.82]
Constant	-0.825***	-0.935***
	[-15.28]	[-16.77]
Observations	37,539	37,539
Adjusted R^2	0.249	0.210

Notes: All the variables are defined in the Appendix. Reported t-values are calculated using two-way clustered standard errors, clustered by firm and year. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 9: Discretionary accruals, idiosyncratic volatility and informational efficiency

Panel A: Discretionary accruals and idiosyncratic volatility

$$IVOL_{i,t} = \beta_0 + \beta_1 ABSDA_{i,t-1} + \beta_2 SIZE_{i,t-1} + \beta_3 ILLIQ_{i,t-1} + \beta_4 TURN_{i,t-1} + \beta_5 NASDAQ_{i,t} + \varepsilon_{i,t}$$

	IVOL
ABSDA	**0.035*** **
	[8.96]
SIZE	-0.006***
	[-17.62]
ILLIQ	71.464***
	[4.44]
TURN	0.002***
	[3.38]
NASDAQ	0.008***
	[7.64]
Constant	0.037***
	[4.66]
Observations	77,451
Adjusted R^2	0.384

Panel B: Correlation between idiosyncratic volatility and informational efficiency by informational efficiency quartile

	IE1	IE2	$IE1_{RES}$	$IE2_{RES}$
Whole sample	-0.359***	-0.332***	-0.244***	-0.223***
Q1 (LOW)	-0.310***	-0.270***	-0.282***	-0.201***
Q2	-0.180***	-0.180***	-0.171***	-0.164***
Q3	-0.012	-0.017**	-0.034***	-0.043***
Q4 (HIGH)	0.008	0.020***	0.140***	0.149***

Notes: Panel A reports the results of the regression of idiosyncratic volatility on the absolute value of discretionary accruals. Reported t-values are calculated using two-way clustered standard errors, clustered by firm and year. Panel B presents Pearson correlation coefficients between IVOL and IE by IE quartile. IE_{RES} refers to residual form informational efficiency, as defined in section VIII. All the other variables are defined in the Appendix. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 10: The role of the accrual anomaly

Panel A: Mean size-adjusted abnormal returns by discretionary accrual portfolio

PF1	PF2	PF3	PF4	PF5	PF6	PF7	PF8	PF9	PF10	HR	t-value
0.057	0.051	0.048	0.032	0.027	0.010	0.013	0.018	-0.009	-0.050	0.107	3.13 [***]

Panel B: Hedge returns based on discretionary accruals and informational efficiency

	(1)	(2)	(3)	(4)	(5)	(6)
IE1(PF1,PF10)	-0.519					
	[-0.82]					
IE2(PF1,PF10)		-0.569				
		[-0.98]				
IE1(PF1)-IE1(PF10)			1.241			
			[-0.38]			
IE2(PF1)-IE2(PF10)				-2.230		
				[-0.68]		
$\beta(IE1_{ABSDA})$					0.239	
					[-0.55]	
$\beta(IE2_{ABSDA})$						0.059
						[-0.17]
Constant	-0.017	-0.066	0.1259*	0.071	0.082	0.1007*
	[-0.11]	[-0.37]	[-2.07]	[-1.11]	[-1.43]	[-1.99]
Observations	20	20	20	20	20	20
Adjusted R^2	-0.018	-0.002	-0.047	-0.029	-0.038	-0.054

Notes: Abnormal size-adjusted returns are defined in Section VIII. All the other variables are defined in the Appendix. Panel A reports mean abnormal size-adjusted returns by discretionary accrual decile. PF1 refers to the lowest accrual decile and PF10 refers to the highest accrual decile. HR (the hedge return) is the difference in mean abnormal returns between PF1 and PF10. The statistics are obtained by treating the mean abnormal returns on the different portfolios in each year as a single observation. Panel B presents the results of the regression of annual hedge returns on: the yearly average IE in the extreme DA deciles (models 1 and 2); the difference in IE between the lowest and highest DA decile (models 3 and 4); the yearly coefficient of ABSDA in equation (2) obtained using the observations in the extreme DA deciles (models 5 and 6). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.