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Investor Sophistication and the Mispricing of Accruals

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Abstract. This paper examines the role of institutional investors in the pricing of accruals. Using Bushee's (1998) classification of institutional investors, we show that firms with a high level of institutional ownership and a minimum threshold level of active institutional traders have stock prices that more accurately reflect the persistence of accruals. This result holds after controlling for differences in the persistence of accruals between firms with high and low institutional ownership, and after controlling for other characteristics that are correlated with institutional ownership and future returns. Additionally, firms with low institutional ownership are smaller, less profitable, and have lower share turnover, suggesting that limits to arbitrage impede institutional investors from exploiting the seemingly large abnormal returns for these firms.

Keywords: accruals, mispricing, institutional investors

JEL Classification: G14, M41

This paper addresses the question of whether share prices differentially reflect the valuation implications of accruals depending on investor sophistication. Prior research finds that investors tend to overestimate the persistence of accruals and, therefore, tend to overprice accruals (Sloan, 1996). This paper seeks to provide insight on one factor that may contribute to the observed accrual mispricing by examining the role of investor sophistication in assessing the valuation implications of accruals. We focus on the mispricing of accruals because accruals are fundamental to earnings measurement and because understanding accruals' future earnings implications requires that investors possess a reasonably high level of sophistication. Additionally, prior research examining the pricing of accruals has shown that seemingly sophisticated intermediaries do not incorporate the information contained in accruals into earnings forecasts, audit opinions, auditor changes, and short sales (e.g., Bradshaw et al., 2001; Richardson, 2002; Jegadeesh et al., 2002). Thus, there is currently little evidence that even the most sophisticated financial statement users exhibit an understanding of the implications of accruals.

Hand (1990) provides evidence consistent with the extended functional fixation hypothesis (EFFH), which posits that a firm's stock price is sometimes set by

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marginal investors who are relatively sophisticated in their understanding and interpretation of accounting data, while at other times prices are set by unsophisticated marginal investors who are less knowledgeable about the properties of accrual accounting. Thus, the EFFH suggests that when investors respond to earnings signals comprised of cash flow and accrual components, there is a greater likelihood that a security can be temporarily mispriced when prices are set by unsophisticated marginal investors. Likewise, the EFFH predicts less mispricing with respect to earnings and its components when prices are set by sophisticated marginal investors. As in Hand (1990), we conjecture that stock price will be set by either sophisticated or unsophisticated marginal investors, and this in turn will impact the degree of market mispricing with respect to accruals. Compared to individuals, institutional investors have greater resources for gathering and processing information contained in financial reports. This should lead to more in-depth analysis and better understanding of the differential persistence properties of the accrual and cash flow components of earnings, which should lead to more accurate pricing of earnings components.

Following prior literature (e.g., Hand, 1990; Walther, 1997; Ali et al., 2000; Bartov et al., 2000), we consider institutional investors as sophisticated investors and construct our empirical proxy for investor sophistication based on the proportion of common shares held by institutional investors. However, our classification of sophisticated investors differs from earlier research in that we also incorporate knowledge about the trading behavior of the institutions holding the stock. Bushee (1998) classifies institutions into three groups based on factors such as portfolio turnover, diversification, and momentum trading. Utilizing Bushee's classification, we examine firms with a high amount of institutional ownership comprised of a minimum threshold level of transient institutional investors—defined as institutions that hold stakes in numerous firms and trade frequently in and out of stocks. This departure from earlier research is crucial, because trading on the accrual anomaly is a relatively short-term strategy that requires active portfolio management and significant turnover. Since it is the transient institutions that are most likely to trade on the information contained in a signal such as accruals, we expect that accruals will be more accurately priced in firms that have substantive transient institutional ownership.[1]

Following Sloan (1996), we conduct both non-linear regression-based tests (i.e., Mishkin, 1983) and hedge portfolio tests to address our research questions. The regression-based test uses a non-linear system of equations that provides a statistical comparison between: (1) the market's assessment of accruals persistence imbedded in share prices (i.e., the market's valuation coefficient on accruals) and (2) the accruals persistence with respect to future earnings (i.e., the forecasting coefficient of accruals with respect to future earnings). Results from estimating the system of equations reveal that the degree of accruals mispricing is substantially less for firms with high institutional ownership relative to firms with low institutional ownership. Moreover, this result holds after matching high and low institutional ownership firms on the basis of their accruals persistence.

The hedge portfolio tests further quantify the economic significance of the accruals mispricing phenomena. We perform the tests by forming an accrual-based hedge

portfolio that invests long in firms in the largest income-decreasing accruals portfolio and short in firms in the largest income-increasing accruals portfolio. Separate hedge portfolios are formed for firms with high versus low institutional ownership. Consistent with findings from the Mishkin (1983) test, our accrual-based hedge portfolio tests show that the one-year-ahead hedge returns are significantly smaller for firms with high institutional ownership relative to firms with low institutional ownership. However, the hedge returns for the high institutional ownership firms are still significantly positive, indicating that there is some accruals mispricing even for those firms primarily held by sophisticated investors.

Because there are systematic differences in the firms that attract a large amount of institutional investors, we conduct additional regression tests that control for factors correlated with institutional investors' investment preferences and long-term return predictability (Gompers and Metrick, 2001; Fama and French, 1992). Specifically, we use cross-sectional regressions to examine the relation between future returns and the scaled portfolio rank of accruals for firms with different levels of institutional ownership, controlling for market value of equity, book-to-market ratio, earnings-to-price ratio and contemporaneous returns (Fama and French, 1992; Basu, 1977; Jegadeesh and Titman, 1993). Results from this analysis support the important role of institutional investors in mitigating accruals mispricing.

In addition to the returns-based tests, we also examine changes in institutional ownership in response to the accruals signal, among the actively trading institutions. This provides an additional check that any mitigated mispricing within the high institutional ownership subsample is due to informed trading. Results from this analysis show that for actively trading (transient) institutions, changes in share-holdings are negatively related to accruals consistent with informed trading by these institutional investors.

Finally, we discuss the role of limits to arbitrage in the differential mispricing across the high and low institutional ownership groups. Examining the characteristics of these two subsamples reveals that the low institutional ownership group contains firms that are smaller, less profitable, and trade less frequently, and there is also a much higher concentration of american depository receipts (ADRs). Thus, it appears that a likely reason why these seemingly large abnormal returns exists among this group of firms is because institutional investors are unable to trade in these firms either explicitly because of internal restrictions or charter provisions,[2] or implicitly because of the perceived riskiness and/or costliness of the arbitrage opportunity.

Taken together, our findings show that there is less accruals mispricing exhibited by firms with high institutional ownership relative to firms with low institutional ownership. These findings are robust across several alternative specification tests. We attribute the differential accrual mispricing to the sophistication of institutional investors, combined with their ability to trade on the signal provided by accruals.

The remainder of the paper is organized as follows. The next section reviews relevant literature and develops hypotheses. Section 2 presents the sample and descriptive statistics. Section 3 describes our research design and discusses our findings. The final section summarizes the main results and acknowledges limitations of this paper.

1. Prior Literature and Hypotheses Development

In practice, the different persistence of accruals and cash flows is difficult to correctly identify due to estimation errors and possible management of accounting numbers by the firm. Sloan (1996) finds that earnings expectations embedded in stock prices do not fully reflect the low persistence of accruals. Investors appear to overweight the future earnings implications of current accruals. Hence, a trading strategy that takes a long position in firms with the largest income-decreasing accruals and an offsetting short position in firms with the largest income-increasing accruals yields economically significant abnormal returns in the subsequent years.

Previous research suggests that institutional investors, on average, have superior ability to interpret financial information relative to individual investors (e.g., Walther, 1997; Bartov et al., 2000). There is also evidence that institutional investors may mitigate market mispricing through informed trading activities (Bartov et al., 2000; Cohen et al., 2002). For example, Bartov et al. (2000) document a negative correlation between institutional holdings and post-earnings-announcement abnormal returns, suggesting that the trading activity of institutional investors mitigates the post-earnings-announcement drift anomaly.

Yet several recent studies provide conflicting evidence on whether sophisticated investors and users of financial statements incorporate the differential persistence properties of accruals and cash flows when forecasting future earnings and forming prices. Bradshaw et al. (2001) show that analysts' earnings forecasts fail to incorporate predictable future earnings declines associated with high accruals. They also show that neither audit opinions nor auditor changes appear to signal the future earnings declines that are associated with high accruals. Moreover, Richardson (2002) shows that, on average, short sellers do not appear to trade on the predictable earnings declines associated with high accruals firms.

Using a sample of firms for which there is *ex-post* evidence of earnings management, Balsam et al. (2002) investigate whether investors reassess the integrity of recently announced quarterly earnings using information provided in quarterly financial statements (SEC 10-Q filings) as they become available. More germane to our analysis, they also investigate whether investor sophistication (as proxied by institutional ownership) affects the timing of market reaction to accruals management. Balsam et al. (2002) hypothesize that due to superior analytical skills and/or better access to information, sophisticated investors will be better able to recognize earnings management and correct accruals mispricing more quickly. Consistent with their predictions, they find that investors reassess reported quarterly earnings figures using other financial statement information released in 10-Q filings. Moreover, they find that the valuation implications of 10-Q's vary with the level of investor sophistication as measured by institutional ownership. Specifically, they find that sophisticated investors are able to infer accruals management in a more timely manner by drawing on sources of information such as conference calls and private conversations with management. Thus, these results suggest that investor sophistication plays an important role in correcting mispricing due to accruals-based earnings management.

In a study most closely related to the present study, Ali et al. (2000) investigate whether the association between accruals and future returns documented in Sloan (1996) is due to fixation by naïve (i.e., individual) investors. Contrary to predictions of the naïve investor hypothesis, they find the negative association between current accruals and future stock returns is stronger for firms with greater institutional ownership compared to stocks held primarily by individual investors. Moreover, they find that a hedge portfolio strategy of taking a long position in low accrual stocks and a short position in high accrual stocks produces larger size-adjusted returns for firms with high institutional ownership. Thus, the Ali et al. (2000) results are inconsistent with investor sophistication mitigating accruals mispricing.

Our study differs from the Ali et al. (2000) study in two important respects. First, we use accruals taken directly from the cash flow statement. The Ali et al. (2000) study estimates accruals using successive changes in balance sheet accounts. This can introduce substantial measurement error into the accruals estimates due to mergers, acquisitions, divestitures, and foreign currency translation (Hribar and Collins, 2002). We find that the measurement error in balance sheet accruals estimates is greater for firms held by individual investors compared to institutional investors. This differential measurement error in accruals estimates confounds the results in the Ali et al. (2000) study and biases against finding significant hedge portfolio returns for low institutional ownership firms.

A second important difference between our study and the Ali et al. (2000) study is that the earlier study ignores the fact that some institutional traders follow passive (index) investment strategies and, therefore, are unlikely to trade on information contained in accruals signals. The present study utilizes Bushee's (1998) three categories of institutions classified by trading behavior to focus on institutions that are most likely to base their trades on value proxies such as current earnings or its components. Specifically, we impose a minimum level of "transient" ownership (see discussion below) when selecting our high institutional ownership subsample. Both of these refinements in the research design remove potentially large sources of measurement error and/or confounding in the Ali et al. (2000) study and enhance the power of our tests.

We begin by examining the accruals persistence properties of firms with different levels of institutional ownership. Prior research has demonstrated that institutional investors can influence management decision-making (e.g., Bushee, 1998; Rajgopal et al. 1999). For example, Bushee (1998) finds that institutional investors reduce managers' incentives to under-invest in research and development (R&D) to meet short-term earnings goals, which is consistent with institutional investors serving an important monitoring role and mitigating myopic managerial behavior. Rajgopal et al. (1999) document that the absolute value of discretionary accruals declines with institutional holdings. The results of these studies suggest there is a feedback effect of institutional ownership that, under certain conditions, can potentially mitigate earnings management, and therefore increase the persistence of accruals. This reasoning leads to our first hypothesis:

H1: *Earnings and accruals are more persistent for firms with high institutional ownership relative to firms with low institutional ownership.*

It is important to recognize that persistent earnings and accruals are neither sufficient nor necessary for more accurate pricing of accruals. Since, however, this effect has already been documented in the literature, it is necessary to control for differences in accruals persistence when testing for the ability of institutions to more accurately impound the information contained in accruals.

Our second set of hypotheses explicitly predicts that share prices differentially reflect value-relevant information in accruals depending on investor sophistication. Since institutional investors are expected to have a better understanding of the valuation implications of accruals than do individual investors, we predict that earnings expectations embedded in share prices will more accurately reflect the persistence of accruals for firms with high institutional ownership relative to firms with low institutional ownership. This reasoning leads to the following hypothesis:

H2a: *Earnings expectations embedded in share prices more accurately reflect the differential persistence of accrual components of earnings for firms with high institutional ownership relative to firms with low institutional ownership.*

More accurate pricing of current accruals implies less opportunity for exploiting the value-relevant information in accruals. Hence, we expect that an accrual-based trading strategy will be less profitable for firms with high institutional ownership relative to firms with low institutional ownership. This reasoning leads to the following hypothesis:

H2b: *An accruals-based hedge portfolio yields smaller future abnormal returns for firms with high institutional ownership relative to firms with low institutional ownership.*

Finally, we examine the actual holdings of the institutions to determine whether there appears to be a change in holdings related to the accruals signal. If the differential accrual mispricing between the two subsets of firms is due to informed trading by institutions based on the accruals signal, then we should see a relation between changes in holdings and accruals. We expect this relation to hold among the transient institutions, as they represent the institutional investors that are most likely to trade on earnings-related signals. This leads to our third hypothesis:

H3: *Among transient institutions, changes in the holdings of a firm are negatively related to that firm's accruals.*

2. Sample and Descriptive Statistics

2.1. Sample

Financial statement data are collected from the Compustat Annual Industrial and Research files. Returns data are collected from CRSP daily and monthly stock return

files for NYSE, AMEX, and NASDAQ firms. Institutional holdings data are obtained from 13-f filings to the SEC, provided by CDA Spectrum database. Our sample spans a ten-year period from 1988 to 1997. We begin in 1988 because this is the first year accruals can be calculated from the cash flow statement, and end in 1997 because this is the last year for which we have Bushee's (1998) institutional classifications.[3]

Firms from the financial service industry (SIC code 6000–6999) and utility industry (SIC code 4900–4949) are excluded from the analysis because disclosure requirements and accounting rules are significantly different for these industries. We also impose minimum size restrictions. Firms with sales less than $25 million, or total assets less than $50 million, or a share price less than $1 or greater than $250 are excluded from the analysis. The final sample has 18,893 firm-year observations with required financial statement variables and returns data.

2.2. 13-f Filings and Investor Sophistication

A 1978 amendment to the Securities and Exchange Act of 1934 requires all institutions with greater than $100 million of securities under discretionary management to report their holdings to the SEC.[4] Holdings are reported quarterly on the 13-f form for all common stock positions greater than 10,000 shares or $200,000. We use the proportion of common shares held by institutional investors—hereafter referred to as institutional ownership or institutional holdings—to proxy for the degree of investor sophistication of a firm's investor base. Firms with larger institutional ownership are deemed to be held by more sophisticated investors.

Because some institutions required to file form 13-f follow passive (index) investment strategies, they are unlikely to trade on information contained in the accruals signal. To address this issue, we utilize Bushee's (1998) three categories of institutions, classified by trading behavior. Transient institutional investors typically hold small stakes in numerous firms and trade frequently, generally basing their trades on a value proxy such as current earnings or its components. Dedicated institutional investors typically hold large, long-term stakes in a limited number of firms, which suggests that these investors rely on information other than current earnings and its components to assess the firms' performance (Porter, 1992). Quasi-indexers are institutions that generally follow indexing and buy-and-hold strategies, and are characterized by high diversification. The short-term focus of transient institutions makes them the most likely group to mitigate and exploit the accruals mispricing phenomena. Consequently, we impose a minimum level of transient ownership when selecting our high institutional ownership subsample.

We use a categorical classification for investor sophistication, instead of using a continuous measure, to enhance the power of our tests. Firms that are never present in the 13-f filings (3180 firm-years) or are present but show zero institutional ownership (1685 firm-years) are referred to as the low institutional ownership subsample (hereafter "LIO"). To be included in the high institutional ownership subsample (hereafter "HIO"), a firm-year must satisfy two criteria. First, the firm-

year must be ranked in the top third of the full sample based on the average institutional holdings for that year. We then set a minimum cutoff level of transient ownership, which results in approximately equal number of firms in the HIO and LIO subsamples. This leads to a hurdle of at least 5% transient institutional holdings to be included in the HIO sample. Our categorization results in 4865 firm-years in the LIO subsample and 4783 firm-years in the HIO subsample.

2.3. *Descriptive Statistics*

Tables 1(a) and 1(b) provides descriptive statistics for the variables used in our analysis. We present statistics for the full sample in Table 1(a), and statistics for the HIO and LIO subsamples in Table 1(b). Firms in the HIO subsample are more profitable (6.8% of average assets) and have higher cash flows (11.2% of average assets) compared to the LIO subsample (4.2% and 8.8%, respectively). The magnitude of scaled total accruals, however, does not differ significantly across the two subsamples (−4.3% versus −4.6% of average assets). Other statistics show

Table 1(a). Descriptive statistics for selected variables for a sample of 18,893 firm-years from 1988–1997, full sample.

Panel A: Full Sample[a]

Variable[b]	Mean	Standard Deviation	Min.	First Quartile	Median	Third Quartile	Max.
Earn	0.052	0.082	−1.956	0.019	0.053	0.089	0.900
Accruals	−0.044	0.088	−1.759	−0.083	−0.045	−0.003	0.712
CashFlows	0.096	0.091	−0.610	0.045	0.094	0.144	0.780
LnMV	5.995	1.753	1.529	4.699	5.796	7.127	12.386
LnBM	−0.684	0.708	−6.535	−1.103	−0.648	−0.217	2.987
EP	0.023	0.211	−13.472	0.026	0.052	0.075	2.846
R	0.017	0.455	−1.491	−0.235	−0.036	0.185	8.707
VOL	0.984	1.148	0.000	0.340	0.634	1.153	18.206
%IS	0.368	0.239	0.000	0.174	0.376	0.559	1.000
$*IS*	781	2,799	0	17	85	417	92,039
TRA	0.070	0.073	0.000	0.013	0.049	0.102	0.617
DED	0.108	0.096	0.000	0.033	0.088	0.162	0.873

[a] Full sample consists of 18,893 firm-years from 1988 to 1997.

[b]Variable definitions: *Earn*: Net income before extraordinary items (COMPUSTAT #123), scaled by average total assets; *CashFlows*: Net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets; *Accruals*: *Earn* − *CashFlows*. (*Earn* and *CashFlows* are as defined above); *LnMV*: Natural logarithm of the market value of equity at fiscal year end; *LnBM*: Natural logarithm of the book-to-market ratio at fiscal year end; *EP*: The earnings-to-price ratio at fiscal year end; *R*: Contemporaneous returns, measured as annual size-adjusted buy-and-hold returns for the year prior to the abnormal return accumulation period; *VOL*: Annual trading volume divided by shares outstanding; $*IS*: Annual average market value of shares held by institutions, in millions; *%IS*: Annual average percentage of common shares held by institutions; *TRA*: Annual average percentage of common shares held by "transient" institutions; *DED*: Annual average percentage of common shares held by "dedicated" institutions. ("Transient" and "dedicated" institutions are as defined in Bushee, 1998.)

Table 1(b). Descriptive statistics for selected variables for a sample of 18,893 firm-years from 1988–1997, firms having high and low institutional ownership.

Panel B: HIO (LIO) Subsample

	Mean		Standard Deviation		Minimum		First Quartile		Median		Third Quartile		Maximum	
Variable[b]	HIO	LIO	HIO	LIO	HIO	LIO	HIO	LIO	HIO	LIO	HIO	LIO	HIO	LIO
Earn	0.068	0.042	0.073	0.093	−0.733	−1.956	0.033	0.010	0.065	0.045	0.103	0.081	0.422	0.583
Accruals	−0.043	−0.046	0.076	0.097	−0.787	−1.759	−0.080	−0.088	−0.044	−0.045	−0.007	−0.003	0.319	0.712
CashFlows	0.112	0.088	0.086	0.096	−0.367	−0.592	0.063	0.036	0.107	0.084	0.156	0.137	0.735	0.780
LnMV	6.816	5.990	1.450	1.825	2.609	1.529	5.745	4.639	6.761	5.780	7.792	7.123	11.585	11.933
LnBM	−0.846	−0.693	0.668	0.728	−6.535	−6.312	−1.234	−1.130	−0.794	−0.677	−0.413	−0.203	2.068	2.987
EP	0.042	0.003	0.117	0.307	−4.116	−13.472	0.034	0.015	0.054	0.047	0.074	0.069	0.818	2.846
R	0.007	0.038	0.513	0.395	−1.491	−0.995	−0.271	−0.193	−0.048	−0.014	0.182	0.197	8.423	2.602
VOL	1.328	1.044	1.322	1.215	0.068	0.000	0.585	0.351	0.879	0.675	1.468	1.266	18.206	13.870
%IS	0.636	0.000	0.099	0.000	0.433	0.000	0.561	0.000	0.626	0.000	0.703	0.000	1.000	0.000
$IS	1,585	0	3,217	0	8	0	195	0	531	0	1,521	0	46,800	0
TRA	0.137	0.000	0.080	0.000	0.016	0.000	0.078	0.000	0.118	0.000	0.177	0.000	0.617	0.000
DED	0.168	0.000	0.093	0.000	0.000	0.000	0.096	0.000	0.156	0.000	0.222	0.000	0.788	0.000

All firm-years are ranked annually based on *%IS*. HIO subsample includes 4783 firm-years from 1988 to 1997 ranked in the top third of the rankings and having "transient" institutional holdings larger than 5% of the total institutional holdings. ("Transient" institutions are as defined in Bushee, 1998.) LIO subsample includes 4865 firm-years from 1988 to 1997 with missing institutional holding data or zero institutional holdings.

that the overall distribution of accruals deflated by average assets is fairly similar in the two subsamples, with a 25-th and 75-th percentile of −8.0% and −0.7% for the HIO subsample, and −8.8% and −0.3% for the LIO subsample. Institutional investors, on average, hold 63.6% of the outstanding stocks of firms in the HIO subsample, of which 13.7% belongs to transient institutional investors. Consistent with prior research, firms in the HIO subsample have larger market value of equity, higher earnings-to-price ratio, smaller book-to-market ratio, and greater trading volume compared to firms largely held by individual investors (i.e., the LIO subsample). Based on the results in Table 1(b), we include controls for size, earnings-to-price, and book-to-market in the empirical tests.

Table 2 presents Pearson and Spearman correlation coefficients for variables used in our analysis. Consistent with prior studies (e.g., Gompers and Metrick, 2001; Dennis and Weston, 2001), institutional ownership is highly correlated with earnings, market value of equity, and book-to-market ratio. There is no significant association between institutional ownership (*%IS*) and scaled accruals, which reduces the concern that any differences between the HIO and LIO subsamples is simply capturing differences in the magnitude of accruals in the two subsamples.

Table 2. Pearson (upper diagonal) and Spearman (lower diagonal) correlation coefficients for selected variables for a sample of 18,893 firm-years from 1988–1997.

Variable[a]	*Earn*	*Accruals*	*CashFlows*	*%IS*	*LnMV*	*LnBM*	*EP*	*R*
Earn		0.422	0.498	0.126	0.276	−0.385	0.468	0.137
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Accrual	0.267		−0.576	−0.004	−0.015	−0.014	0.280	−0.001
	(0.001)		(0.001)	(0.618)	(0.030)	(0.022)	(0.001)	(0.894)
CashFlow	0.536	−0.58		0.117	0.264	−0.333	0.149	0.127
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
%IS	0.163	−0.002	0.123		0.251	−0.163	0.052	0.020
	(0.001)	(0.818)	(0.001)		(0.001)	(0.001)	(0.001)	(0.036)
LnMV	0.334	−0.018	0.289	0.303		−0.513	0.135	0.067
	(0.001)	(0.005)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
LnBM	−0.517	−0.032	−0.35	−0.174	−0.542		−0.086	−0.185
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.001)	(0.001)
EP	0.563	0.252	0.233	0.007	0.008	0.118		0.102
	(0.001)	(0.001)	(0.001)	(0.001)	(0.254)	(0.001)		(0.001)
R	0.175	−0.002	0.148	0.049	0.122	−0.214	0.072	
	(0.001)	(0.825)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	

p-values are given in parentheses.

[a]Variable definitions: *Earn*: Net income before extraordinary items (COMPUSTAT #123), scaled by average total assets; *CashFlows*: Net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets; *Accruals*: *Earn* − *CashFlows*. (*Earn* and *CashFlows* are as defined above); *%IS*: Annual average percentage of common shares held by institutions; *LnMV*: Natural logarithm of the market value of equity at fiscal year end; *LnBM*: Natural logarithm of the book-to-market ratio at fiscal year end; *EP*: The earnings-to-price ratio at fiscal year end; *R*: Contemporaneous returns, measured as annual size-adjusted buy-and-hold returns for the year prior to the abnormal return accumulation period.

3. Empirical Tests and Results

3.1. Persistence of Earnings and Accruals

To test hypothesis H1 that earnings and accruals are more persistent for firms with high institutional ownership, we first estimate the persistence of earnings in the following equation:

$$Earn_{t+1} = a_0 + \alpha_{0H}H + \alpha_1 Earn_t + \alpha_{1H}H\_Earn_t + v_{t+1}, \quad (1)$$

where *Earn* is net income before extraordinary items (COMPUSTAT #123), scaled by average total assets; H is an indicator variable that equals one for firms in the HIO subsample and zero for firms in the LIO subsample. *H_Earn* is an interaction term used to test whether earnings persistence differs between firms in the HIO and LIO subsamples. We expect α_{1H} to be positive.

To test for differences in persistence of accruals, we partition earnings into accruals and cash flows, and estimate the following equation:

$$\begin{aligned} Earn_{t+1} = {} & \gamma_0 + \gamma_{0H}H + \gamma_1 Accruals_t + \gamma_{1H}H\_Accruals_t + \gamma_2 CashFlows_t \\ & + \gamma_{2H}H\_CashFlows_t + v_{t+1}, \end{aligned} \quad (2)$$

where *CashFlows* equals cash flow from continuing operations (COMPUSTAT #308 – COMPUSTAT #124), scaled by average total assets. *Accruals* equals *Earn* minus *CashFlows*, where *Earn* and *CashFlows* are as defined above. *H_Accruals* and *H_CashFlows* are interaction terms used to test whether the persistence properties of accrual and cash flow components of earnings differ between HIO and LIO subsamples. Based on evidence in Dechow (1994) and Sloan (1996), we expect cash flows to be more persistent than accruals. γ_1 and γ_2 reflect the persistence of accruals and cash flows, respectively, for the LIO subsample. γ_{1H} indicates whether accruals' persistence differs between HIO and LIO subsamples. We expect γ_{1H} to be positive.

Table 3 presents summary statistics from estimating equation (1) and (2) relating to the persistence of earnings and its cash flow and accrual components. Consistent with previous research, Panel A shows that the persistence of earnings for the full sample is 0.577, which is significantly different from zero. As predicted in hypothesis H1, earnings persistence is significantly higher for firms in the HIO subsample ($0.670 = 0.497 + 0.173$) relative to firms in the LIO subsample (0.497).

Also consistent with prior research, Panel B reveals that accruals are significantly less persistent than cash flows for the full sample (i.e., 0.471 for accruals persistence compared with 0.659 for cash flows persistence). This result holds for both subsamples. As predicted in hypothesis H1, accruals are more persistent for firms with high institutional ownership. The persistence of accruals is 0.382 for firms in the LIO subsample, and 0.576 ($= 0.382 + 0.194$) for firms in the HIO subsample. Panel B also reveals that firms in the HIO subsample have more persistent cash flows (i.e., $0.620 + 0.098 = 0.718$ for HIO sample versus 0.620 for LIO sample).

Table 3. Coefficient estimates (*t*-statistics) from regression of future earnings on lagged earnings and the accrual and cash flow components of lagged earnings.

Panel A[a]:

$$Earn_{t+1} = a_0 + \alpha_{0H}H + \alpha_1 Earn_t + \alpha_{1H}H\_Earn_t + V_{t+1}$$

Obs.	Intercept	*H*	*Earn*	*H_Earn*	Adj. R^2
14,989[a]	0.019		0.577		0.319
	(28.57)		(83.72)		
7,360[b]	0.015	0.002	0.497	0.173	0.330
	(11.05)	(1.22)	(37.58)	(8.57)	

Panel B[b]:

$$Earn_{t+1} = \gamma_0 + \gamma_{0H}H + \gamma_1 Accruals_t + \gamma_{1H}H\_Accruals_t + \gamma_2 CashFlows_t + \gamma_{2H}H\_CashFlows_t + v_{t+1}$$

Obs.	Intercept	*H*	*Accruals*	*H_Accruals*	*CashFlows*	*H_CashFlows*	Adj. R^2
14,989[a]	0.006		0.471		0.659		0.351
	(7.96)		(60.77)		(85.49)		
7,360[b]	−0.002	0.01	0.382	0.194	0.62	0.098	0.360
	(−0.95)	(3.89)	(25.99)	(8.33)	(41.55)	(4.51)	

[a]The sample consists all firm-years with available earnings and its component variables.
[b]The sample consists firm-years in the HIO and LIO subsamples with available earnings and its component variables.
[c]Variable definitions: *Earn*: Net income before extraordinary items (COMPUSTAT #123), scaled by average total assets; *CashFlows*: Net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets; *Accruals*: *Earn*−*CashFlows*. (*Earn* and *CashFlows* are as defined above); *H*: An indicator variable that equals one for firms in the HIO subsample and zero for firms in the LIO subsample. HIO and LIO subsamples are as defined in Table 1; *H_Earn*: $H \times Earn$; *H_Accruals*: $H \times Accruals$; *H_CashFlows*: $H \times CashFlows$.

3.2. Tests of Market Pricing of Accruals and Cash Flows

We use the Mishkin (1983) test to address hypothesis H2a that earnings expectations embedded in share prices more accurately reflect the differential persistence of accruals for firms with high institutional ownership. The Mishkin (1983) framework is a recursive system of two equations that tests the null hypothesis that the market rationally anticipates and prices the persistence of current accruals and cash flows with respect to future earnings. Specifically, the test compares the coefficients in the following equations, which are estimated simultaneously using a generalized nonlinear least squares estimation procedure:

$$Earn_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_{1H}H\_Accruals_t + \gamma_2 CashFlows_t + \gamma_{2H}H\_CashFlows_t + v_{t+1}. \quad (3)$$

$$R_{t+1} = \delta_0 + \delta_1[Earn_{t+1} - \gamma_0 - \gamma_1^* Accruals_t - \gamma_{1H}^* H\_Accruals - \gamma_2^* CashFlows_t - \gamma_{2H}^* CashFlows] + z_{t+1}. \quad (4)$$

Table 4. Ratios of market perceptions of persistence parameters to forecasting parameters and *p*-values from Mishkin tests of equality of perceived and forecasting parameters.

$$Earn_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_{1H} H\_Accruals_t + \gamma_2 CashFlows_t + \gamma_{2H} H\_CashFlows_t + v_{t+1} \quad (3)$$

$$R_{t+1} = \delta_0 + \delta_1[Earn_{t+1} - \gamma_0 - \gamma_1^* Accruals_t - \gamma_{1H}^* H\_Accruals_t - \gamma_2^* CashFlows_t - \gamma_{2H}^* H\_CashFlows_t] + z_{t+1} \quad (4)$$

	Full Sample		HIO vs LIO	
	Coeff. Est	(*t*-stat)	Coeff. Est	(*t*-stat)
γ_1	0.471	(41.26)	0.382	(25.96)
γ_{1H}			0.208	(8.99)
γ_1^*	0.677	(14.19)	0.696	(11.11)
γ_{1H}^*			−0.037	(−0.39)
γ_1/γ_1^*	0.70		0.55	
$(\gamma_1 + \gamma_{1H})/(\gamma_1^* + \gamma_{1H}^*)$			0.90	

Market efficiency tests for full sample:
Equality of accruals parameters across equations (i.e., 0.70 different from 1?):

reject $\gamma_1 = \gamma_1^*$: $p < 0.001$

Market efficiency tests for HIO vs LIO sample:
Equality of accruals parameters across equations for LIO (i.e., 0.55 different from 1?):

reject $\gamma_1 = \gamma_1^*$: $p < 0.001$

Equality of accruals parameters across equations for HIO (i.e., 0.90 different from 1?):

cannot reject $(\gamma_1 + \gamma_{1H}) = (\gamma_1^* + \gamma_{1H}^*)$: $p = 0.362$

Difference in market efficiency ratios LIO vs. HIO (i.e., 0.55 different from 0.90?):

reject $(\gamma_1 + \gamma_{1H})/(\gamma_1^* + \gamma_{1H}^*) = \gamma_1/\gamma_1^*$ $p = 0.001$

[a]Full sample consists 14,986 firm-years with available returns and financial statement variables data.
[b]HIO vs LIO sample consists of 7354 firm-years in either the HIO or LIO subsample with available returns and financial statement variables data. HIO and LIO subsamples are as defined in Table 1.
[c]Variable definitions: R_{t+1}: one-year-ahead size-adjusted returns, measured as annual size-adjusted buy-and-hold returns from the beginning of the fourth month after the firm's fiscal year end; *Earn*: Net income before extraordinary items (COMPUSTAT #123), scaled by average total assets.; *CashFlows*: Net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets; *Accruals*: *Earn* − *CashFlows*. (*Earn* and *CashFlows* are as defined above); *H*: An indicator variable that equals one for firms in the HIO subsample and zero for firms in the LIO subsample. HIO and LIO subsamples are as defined in Table 1; *H_Accruals*:$H \times Accruals$; *H_CashFlows*: $H \times CashFlows$.

Equation (3) is a forecasting equation in which γ_1 and γ_2 capture the persistence of accruals and cash flows for predicting one-year-ahead earnings, while γ_{1H} and γ_{2H} capture the incremental persistence in the HIO subsample. Equation (4) is a pricing equation that uses returns to infer the persistence that investors implicitly assign to accruals and cash flows. γ_1^* and γ_2^* are estimates of investors' implied persistence for accruals and cash flows in the LIO subsample, while γ_{1H}^* and γ_{2H}^* are estimates of the incremental implied persistence for accruals and cash flows in the HIO subsample. Mispricing is indicated if the weights the market assigns to accruals and cash flows in the pricing equation are significantly different from the weights that these items receive in the forecasting equation. A likelihood ratio statistic is developed to test the null hypothesis that the market rationally prices accruals and cash flows.[5] Hypothesis H2a predicts that the ratio of γ_1 and γ_1^* is significantly less than the ratio of $(\gamma_1 + \gamma_{1H})$ to $(\gamma_1^* + \gamma_{1H}^*)$.

Table 4 presents the results from jointly estimating (3) and (4) for the full sample and the HIO and LIO subsamples. Results for the full sample indicate that, in general, the market overestimates the persistence of accruals $(\gamma_1/\gamma_1^* = 0.70)$, which is consistent with Sloan (1996). When we decompose the full sample into the HIO and LIO subsamples, an interesting pattern emerges. The ratio of γ_1 to $\gamma_1^*(= 0.55)$ is significantly less than one (p-*value* < 0.001), which indicates that the market overestimates the persistence of accruals in the LIO subsample. However, the ratio of $(\gamma_1 + \gamma_{1H})$ to $(\gamma_1^* + \gamma_{1H}^*)(= 0.90)$ is not significantly different from 1 (p-*value* $= 0.362$), indicating that there is no statistically significant overpricing in the HIO subsample. Moreover, the ratio of $(\gamma_1 + \gamma_{1H})$ to $(\gamma_1^* + \gamma_{1H}^*)$ is significantly greater than the ratio of γ_1 to γ_1^* (p-*value* < 0.001), indicating that there are significant differences in the efficient pricing of accruals across the HIO and LIO subsamples.

The results in Table 4 are consistent with investors better understanding the persistence of accruals in the HIO sample, but they are also confounded by the fact that the persistence of accruals is correlated with institutional ownership as shown in Tables 3 and 4. Thus, it could be the case that investors fixate on earnings to the same extent in both the HIO and LIO samples, but the LIO sample is more mispriced simply because the accruals are less persistent. To address this concern, we reestimate equations (3) and (4), using a matched sample design that equates the persistence of accruals across the two subsamples. In particular, we run firm-specific time series regressions of earnings on lagged accruals and cash flows, requiring a minimum of eight annual observations. We then use the firm-specific estimates of accruals persistence to form a matched sample, where the accruals persistence of each firm in the LIO sample is matched within ± 0.03 of the accruals persistence of a firm in the HIO sample. This results in a matched sample with 2788 observations, or 1394 observations in each of the LIO and HIO subsamples.

Table 5 presents the results of reestimating equations (3) and (4) using the sample matched on persistence. Unlike Table 4, where the persistence of accruals in the LIO sample was significantly lower than the persistence of accruals in the HIO sample, the matching procedure has effectively removed that difference. $\gamma_{1\mathrm{H}}$ is not significantly different from zero (0.029, t-statistic $= 0.82$), indicating that the persistence is not significantly different between the HIO and LIO samples. More

Table 5. Ratios of market perceptions of persistence parameters to forecasting parameters controlling for difference in persistence of accruals in HIO vs. LIO.

$$Earn_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_{1H} H\_Accruals_t + \gamma_2 CashFlows_t + \gamma_{2H} H\_CashFlows_t + v_{t+1} \quad (3)$$

$$R_{t+1} = \delta_0 + \delta_1 [Earn_{t+1} - \gamma_0 - \gamma_1^* Accruals_t - \gamma_{1H}^* H\_Accruals - \gamma_2^* CashFlows_t - \gamma_{2H}^* H\_CashFlows] + z_{t+1} \quad (4)$$

	Matched Sample		HIO vs LIO	
	Coeff. Est	(*t*-stat)	Coeff. Est	(*t*-stat)
γ_1	0.622	(36.22)	0.601	(27.11)
γ_{1H}			0.029	(0.82)
γ_1^*	0.801	(14.56)	0.883	(12.11)
γ_{1H}^*			−0.186	(−1.98)
γ_1/γ_1^*	0.775		0.68	
$(\gamma_1 + \gamma_{1H})/(\gamma_1^* + \gamma_{1H}^*)$			0.90	

Market efficiency tests for full sample:
Equality of accruals parameters across equations (i.e., 0.77 different from 1?):

reject $\gamma_1 = \gamma_1^*$: $p = 0.002$

Market efficiency tests for HIO vs LIO sample:
Equality of accruals parameters across equations for LIO (i.e., 0.68 different from 1?):

reject $\gamma_1 = \gamma_1^*$: $p < 0.001$

Equality of accruals parameters across equations for HIO (i.e., 0.90 different from 1?):

cannot reject $(\gamma_1 + \gamma_{1H}) = (\gamma_1^* + \gamma_{1H}^*) : p = 0.504$

Difference in market efficiency ratios LIO vs. HIO (i.e., 0.68 different from 0.90?):

reject $(\gamma_1 + \gamma_{1H})/(\gamma_1^* + \gamma_{1H}^*) = \gamma_1/\gamma_1^* \; p = 0.047$

[a]Matched sample consists 2788 firm-years with available returns and financial statement variables data. Time series regressions are used to compute firm specific persistence parameters for accruals. These estimates are then used to form a matched sample, where each firm in the LIO sample is matched to a firm with persistence within ±0.03. Firms without a match are eliminated from this test, as are firms without at least 8 annual observations needed to estimate the firm specific regressions.
[b]HIO vs LIO sample contains the same firms as the overall matched sample.
[c]Variable definitions: R_{t+1}: one-year-ahead size-adjusted returns, measured as annual size-adjusted buy-and-hold returns from the beginning of the fourth month after the firm's fiscal year end; *Earn*: Net income before extraordinary items (COMPUSTAT #123), scaled by average total assets; *CashFlows*: Net cash flow

importantly, however, the ratio of γ_1 to γ_1^* (= 0.68) remains significantly less than one (*p-value* < 0.001), while the ratio of $(\gamma_1 + \gamma_{1H})$ to $(\gamma_1^* + \gamma_{1H}^*)$ (= 0.90) is not significantly different from 1 (*p-value* = 0.504), indicating that there is statistically significant overpricing only in the LIO subsample. Once again, the ratio of $(\gamma_1 + \gamma_{1H})$

to $(\gamma_1^* + \gamma_{1H}^*)$ is significantly greater than the ratio of γ_1 to γ_1^*(p-value $= 0.047$), indicating significant differences in the efficient pricing of accruals across the HIO and LIO subsamples even after controlling for accruals persistence.

3.3. Accrual-based Hedge Portfolio Abnormal Returns

We utilize a hedge portfolio test and Fama and MacBeth (1973) cross-sectional regressions to address hypothesis H2b that an accruals-based trading strategy yields smaller future abnormal returns for firms with high institutional ownership relative to firms with low institutional ownership. The hedge portfolio test examines future returns to an accrual-based trading strategy that invests long in firms in the lowest accruals portfolio and short in firms in the highest accrual portfolio for the HIO and LIO subsamples. The regression test examines the relation between future returns and the scaled portfolio rank of accruals, controlling for factors that relate to institutions' investment preferences and future returns.

Future returns are annual buy-and-hold size-adjusted returns for the twelve-month period beginning four months after a firm's fiscal year end, measured as the difference between a firm's buy-and-hold return and the buy-and-hold return to its size-matched portfolio. We use the NYSE/AMEX size decile breakpoints to assign each sample firm according to its market value of equity at the beginning of the calendar year.

To implement the hedge portfolio test, we sort firms into deciles based on their realization of *Accruals* for that year. We group the accrual deciles into three portfolios. The lowest (highest) accrual portfolio is comprised of firms in the lowest (highest) two accrual-deciles and the remaining firms in deciles 3 through 8 are grouped into the middle accrual portfolio. We then calculate future returns for each accrual portfolio for the year following portfolio formation dates. We present results for the full sample, as well as the HIO and LIO subsamples. Future returns for the full sample serve as a benchmark to facilitate comparison with prior findings. Hypothesis H2b conjectures that hedge returns from an accruals-based trading strategy are significantly smaller for the HIO subsample than for the LIO subsample.

Table 6 summarizes the results. Consistent with Sloan (1996), for the full sample, the one-year-ahead returns are monotonically decreasing in the rank of accruals, ranging from 0.059 for firms in the lowest accruals portfolio to -0.048 for firms in the highest accruals portfolio, leading to a significant positive hedge return of 0.107. For the HIO and LIO subsamples, one-year-ahead abnormal returns are also monotonically decreasing in the rank of accruals. Consistent with hypothesis H2b, Table 6 reveals that the one-year-ahead hedge return is smaller for the HIO subsample (0.052) than that for the LIO subsample (0.166). A t-test on the annual hedge returns ($N = 11$ years) shows that the one-year-ahead hedge return of 0.052 for the HIO subsample is significantly smaller than the hedge return of 0.166 for the LIO subsample (p-*value* < 0.001).[7] However, the hedge return for the HIO subsample is still significantly different from zero, indicating a modest amount of accruals mispricing even for stocks primarily held by sophisticated investors.

Table 6. One-year-ahead abnormal returns (R_{t+1}[a]) for portfolios based upon annual rankings of accruals and institutional holdings. Sample firms: 1988–1997.

			Institutional Ownership				
	Full Sample		HIO		LIO		
	Mean	(*t*-stat)	Mean	(*t*-stat)	Mean	(*t*-stat)	*p*-value[c]
ACC[b] = 1−2	0.059	(6.45)	0.037	(2.60)	0.066	(3.27)	0.252
ACC = 3−8	0.007	(1.77)	0.018	(2.60)	−0.019	(−2.19)	0.001
ACC = 9−10	−0.048	(−6.13)	−0.015	(−1.02)	−0.100	(−5.99)	0.000
Hedge ret.	0.107	(8.89)	0.052	(2.55)	0.166	(6.35)	0.000

[a] R_{t+1} is one-year-ahead size-adjusted returns, measured as annual size-adjusted buy-and-hold returns from the beginning of the fourth month after the firm's fiscal year end.
[b] ACC are rankings based on *Accruals*, which equals the difference between net income before extraordinary items (COMPUSTAT #123) and net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets.
[c] *p*-values for accrual portfolios are based on two-tailed *t*-tests for differences of abnormal returns between HIO and LIO subsamples (HIO and LIO subsamples are as defined in Table 1). *p*-values for hedge returns are based on a two-tailed *t*-test on the differences between time-series means of hedge returns for the HIO versus the LIO subsamples.

We also conduct cross sectional regressions that allow us to incorporate other control variables correlated with institutional ownership that have been shown to be related with subsequent returns. We begin by estimating the following relation between future abnormal returns and the scaled portfolio rank of accruals:

$$R_{t+1} = \delta_0 + \delta_{0H} H + \delta_1 Racc_t + \delta_{1H} H\_Racc_t + \delta_2 Pacc_t + \xi_{t+1}, \quad (5)$$

where *Racc* equals the portfolio decile rank of accruals, scaled to range between zero and one. This scaling facilitates our interpretation of the coefficient of *Racc* as the hedge return to a zero investment strategy with a long position in the highest accruals portfolio and a short position in the lowest accruals portfolio. $Pacc_t$ represents the scaled decile rank of the firm-specific estimate of persistence as described in the previous section, to control for differences in accruals persistence between the HIO and LIO subsamples. As in Fama and MacBeth (1973), regressions are run annually and *t*-statistics are based on the time-series average and standard deviation of the annual coefficients. *H_Racc* is an interaction term between investor sophistication classification and the scaled portfolio decile rank of accruals. $|\delta_1 + \delta_{1H}|(|\delta_1|)$ can be interpreted as the hedge return from the zero investment strategy for the HIO (LIO) subsample. We expect δ_1 to be negative since the LIO subsample likely experiences overpricing of accruals. Hypothesis H2b predicts that the hedge return for the HIO subsample would be smaller relative to that for the LIO subsample. Therefore, we expect δ_{1H} to be positive, or equivalently, $|\delta_1 + \delta_{1H}| < |\delta_1|$.

To ensure that any significant relation between accruals and future abnormal returns is incremental to factors correlated with institutions' investment preferences

and future returns, we also estimate the following equation:

$$R_{t+1} = \delta_0 + \delta_{0H}H + \delta_1 Racc_t + \delta_{1H}H\_Racc_t + \delta_2 Pacc + \delta_3 LnMV_t + \delta_4 LnBM_t + \delta_5 EP_t + \delta_6 R_t + \delta_7 IndustryDummy_t + \xi_{t+1}, \quad (6)$$

where *LnMV* is the scaled ranking for the natural logarithm of the market value of equity, *LnBM* is the scaled ranking for the natural logarithm of the book-to-market ratio, *EP* is the scaled ranking for the earnings-to-price ratio, and R_t is the contemporaneous size-adjusted returns to control for returns momentum (e.g., Fama and French, 1992; Basu, 1977; Jegadeesh and Titman, 1993).

Table 7 presents the results of estimating equations (5) and (6). The first column provides a benchmark to facilitate comparison with prior research. Consistent with Sloan (1996), the coefficient on *Racc* is significantly negative at -0.117, suggesting significant arbitrage profits from an accrual-based trading strategy for the full sample. The second column relates to equation (5) and reveals that the coefficients on *Racc* and *H_Racc* are negative (-0.110) and positive (0.058), respectively, and both are significantly different from zero at the 5% level using a one-tailed test. Hence, the hedge portfolio return of $0.052 = (|-0.110 + 0.058|)$ for the HIO subsample is smaller than the hedge return of $0.110\ (= |-0.110|)$ for the LIO subsample (*p-value* < 0.001). Notice also that the inclusion of persistence reduces the hedge portfolio returns in the LIO sample, relative to the results reported in Table 6 (11.0% versus 16.6%), indicating that some of the difference between the HIO and LIO hedge portfolios reported in Table 6 is due to differences in accruals persistence. Consistent with Table 6, the 5.2% annual abnormal return for the HIO subsample indicates a modest amount of accruals mispricing (the null hypothesis of $\delta_1 + \delta_{1H} = 0$ is rejected with t-stat $= 2.46$) before transaction costs.

The third column tests the incremental contribution of institutional ownership in mitigating accrual mispricing controlling for accruals persistence, size, book-to-market ratio, earnings-to-price ratio and contemporaneous returns. As shown, results are qualitatively similar to those in column (2). In particular, the accrual-based hedge return of $0.053(= |-0.112 + 0.059|)$ for the HIO subsample is still significantly smaller than the hedge return of $0.112(= |-0.112|)$ for the LIO subsample using a one-tailed test. The relations between future returns and control variables are generally consistent with prior research (e.g., Fama and French, 1992).

Since institutions' investment preferences differ from those of individuals (e.g., Gompers and Metrick, 2001), the level of institutional ownership is likely correlated with factors reflecting the firms' overall information environment. Such factors may also impact the pricing of accruals and, hence, may represent correlated omitted variables in our analysis. One such confounding factor is sell-side financial analysts' forecast revisions. A recent study by Barth and Hutton (2001) examines the role of analysts in the accruals mispricing phenomena. They document that share prices reflect the persistence property of accruals differently depending on whether and how analysts revise their forecasts of future earnings in anticipation of the accrual reversals. On average, investors seem to ignore the information contained in analyst forecast revisions. A trading strategy that combines information in accruals with

Table 7. Coefficient estimates (*t*-statistics) from Fama-MacBeth (1973) regressions of one-year ahead size-adjusted buy-and-hold returns on the portfolio ranks of accruals and other predictors of returns.

$$R_{t+1} = \delta_0 + \delta_{0H}H + \delta_{0C}C + \delta_1 Racc_t + \delta_{1H}H\_Racc_t + \delta_{1C}C\_Racc_t + \delta_2 Pacc + \delta_3 LnMV_t + \delta_4 LnBM_t + \delta_5 EP_t + \delta_6 R_t + \delta_7 IndustryDummy_t + \xi_{t+1}$$

Variables	Pred.	(1)	(2)	(3)	(4)
		Estimate (*t*-stat)	Estimate (*t*-stat)	Estimate (*t*-stat)	Estimate (*t*-stat)
Intercept	?	0.006 (1.45)	−0.008 (−0.97)	0.006 (1.39)	0.005 (0.34)
H	?		−0.006 (−1.34)	−0.008 (−1.44)	−0.005 (−1.21)
C	?				−0.077 (−1.08)
Racc	−	−0.117 (−5.97)	−0.110 (−3.99)	−0.112 (−3.74)	−0.096 (−2.43)
H_Racc	+		0.058 (1.91)	0.059 (1.85)	0.048 (1.71)
C_Racc	−				−0.016 (0.96)
Pacc			0.011 (2.06)	−0.010 (1.97)	−0.001 (0.66)
LnMV	−			−0.002 (−0.29)	−0.005 (−1.35)
LnBM	+			−0.007 (−1.12)	−0.001 (−0.39)
EP	+			0.000 (−0.04)	0.007 (1.71)
R	?			0.000 (−0.02)	0.002 (0.56)
Industry Dummy	?	Excluded	Included	Included	Included
Avg. Adj. R^2		0.053	0.103	0.170	0.085
t-stats for $H_0 : d_1 + d_{1H} = 0$			2.46	2.26	2.01

[a]Variable definitions: R_{t+1}: One-year-ahead size-adjusted returns, measured as annual size-adjusted buy-and-hold returns from the beginning of the fourth month after the firm's fiscal year end; *Accruals*: Net income before extraordinary items (COMPUSTAT #123) minus net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets; *Racc*: The decile rank of the *Accruals* in year *t*, scaled to be between zero and one; *H*: An indicator variable that equals one for firms in the HIO subsample and zero for firms in the LIO subsample. (HIO and LIO subsamples are as defined in Table 1.); *H_Racc*: $H \times Racc$; *C*: An indicator variable that equals one for firm-years with consistent signals and zero otherwise. A firm-year has consistent signals if the mean consensus analyst forecast for year $t+1$ is revised upward (downward) in the month of the year *t* earnings announcement and year *t* accruals are negative (positive); Otherwise it has inconsistent signals; *C_Racc*: $C \times Racc$; *Pacc*: Scaled decile ranking of the coefficient estimate on *Accruals* from firm-specific time-series regressions running of *Earn* on lagged *Accruals* and lagged *CashFlows*; *LnMV*: The scaled-decile ranking of the natural logarithm of the market value of equity at fiscal year end; *LnBM*: The scaled-decile ranking of the natural logarithm of the B/M ratio at fiscal year end; *R*: The scaled-decile ranking of contemporaneous returns, measured as annual size-adjusted buy-and-hold returns for the year prior to the abnormal return accumulation period; *EP*: The scaled-decile ranking of the earnings-to-price ratio at fiscal year end; *Industry Dummy*: 48 binary variables based on Fama-French 48 industry classification.

information in analyst forecast revisions earns a significant hedge return of 29% in the year following the portfolio formation dates.

To ascertain whether our results are robust to analysts' activities, we augment equation (6) by adding two more terms, *C* and *C_Racc*. *C* is a binary variable that equals one for firms with analyst forecast revisions that are consistent with the accruals signal and zero otherwise.[8] *C_Racc* is the interaction term between *C* and *Racc*. Results in Barth and Hutton (2001) indicate that analysts' forecast revisions contain useful information for interpreting accruals.

The fourth column of Table 7 presents the results for this augmented regression. Including analysts' activities in our analysis does not change our results qualitatively. Institutional ownership still appears to mitigate accruals mispricing, as reflected in the significantly positive coefficient on *H_Racc*. The robustness of the coefficient on *H_Racc* indicates that the role of institutional ownership in mitigating accruals mispricing is not an artifact of the correlation between institutional ownership and whether analysts' forecast revisions are consistent with accruals reversals. Moreover, in our sample, the coefficient on *C_Racc* is statistically insignificant. This implies that for our sample firms, investors do incorporate analysts' forecast behavior into their investment decisions. Hence, the arbitrage opportunity from exploiting whether analysts' forecast revisions are consistent or inconsistent with accruals reversals appears to be limited for our sample of firms.

One additional issue that arises from the preceding series of tests relates to the consistency of our results across the different methodologies. In Tables 4 and 5 the Mishkin tests show an insignificant market overpricing of accruals for the HIO subsample. In contrast, the hedge portfolio results in Tables 6 and 7 indicate a muted but significantly positive hedge return from an accrual-based trading strategy for the HIO subsample. These seemingly contradictory results are likely due to the non-linear nature of the returns to an accrual strategy where mispricing is more pronounced in the extreme quintiles. Thus, the hedge portfolio analysis that considers only the extreme realizations of accruals (or more heavily weights extreme realizations of accruals) will exhibit significant mispricing while the Mishkin test, which equally weights the entire distribution of accruals, shows insignificant mispricing.

3.4. Trading Behavior of Institutions in Relation to Accruals

To further examine whether institutional investors exhibit sophisticated trading behavior, we shift our focus from stock returns to examining the change in institutional holdings in response to the accruals signal. If sophisticated investors are able to anticipate the future reversal of extreme accruals and exploit the market overreaction to accruals, then they should buy (sell) stocks upon observing large income-decreasing (income-increasing) accruals. Hence, if institutional ownership is a reasonable proxy for investor sophistication, we expect a negative relation between accruals at $t-1$ and changes in the institutional ownership from $t-1$ to t.[9]

Table 8. Coefficient estimates (*t*-statistics) from pooled regressions of changes in institutional ownership on accruals.

$$ChgHldg_t = \alpha_0 + \alpha_1 Accruals_{t-1} + \sum_{k=2}^{K} \alpha_k ControlVariable_k + \varepsilon$$

Dependent Variable	$Accruals_{t-1}$	*t*-stat	Size, B/M, Momentum Controls	Industry Dummies
$ChgHldg_t$	−0.105	−3.69*	Excluded	Excluded
$ChgHldg_t$	−0.078	−2.80*	Included	Excluded
$ChgHldg_t$	−0.074	−2.57*	Included	Included

*Significant at 0.01 one-tailed

Variable definitions: *ChgHldg:* Represents the change in the average holdings of transient institutions from the year preceding the annual report (*t*-1) to the year following the annual report (*t*); *Accruals:* Net income before extraordinary items (COMPUSTAT #123) minus net cash flow from operating activities (COMPUSTAT #308), scaled by average total assets.

Table 8 provides results from running a regression of the change in institutional ownership on accruals, including various controls. Rather than examining aggregate changes in institutional holdings, we focus only on the transient institutional investors, as this is the subset of institutions that would be expected to trade on an earnings-based signal. Using the individual institutional classifications, we identify the subset of institutions defined as transient in year $t-1$. We then measure the changes in shareholdings for each firm held by the transient institution, and aggregate the change in holdings across all transient institutions for each firm. We then regress the aggregate change in holdings for each firm, on the level of accruals and other control variables, using the following model:

$$ChgHldg_t = \alpha_0 + \alpha_1 Accruals_{t-1} + \sum_{k=2}^{K} \alpha_k ControlVariable_k + \varepsilon, \quad (7)$$

where *ChgHldg* represents the aggregate change in holdings from year $t-1$ to t of all transient institutions holding an individual stock, $Accruals_{t-1}$ is as defined previously, and the control variables include size, book-to-market, returns momentum, and industry dummies.

Results in Table 8 are consistent with *H*3, and show that changes in institutional ownership are negatively related to accruals. The coefficient on accruals (α_1) is significantly negative in all three regression specifications, indicating that institutions decrease (increase) their ownership in response to large income-increasing (income-decreasing) accruals, and that this effect is not subsumed by other predictors of future performance. Additional untabulated results show that, on average, the increase in shareholdings by transient institutions is 2.1% of total shares outstanding when the firm is in the lowest accrual quintile and only 0.8% of shares outstanding when the firm is in the highest accruals quintile, for a difference of 1.2% of total shares outstanding.[10]

3.5. Institutional Ownership and Speed of Adjustment Process

Prior research documents that institutions, on average, execute more frequent and informed trading (e.g., Gompers and Metrick, 2001; Dennis and Weston, 2001). Since more frequent informed trading tends to accelerate the speed of adjustment to pricing errors, we expect that the accrual-based hedge returns will stabilize within a shorter period of time for firms in the HIO subsample. Although we do not have a formal statistical test of this hypothesis, we plot daily cumulative market-adjusted returns over the 250-day period following the portfolio formation dates to examine the return behavior in the HIO and LIO subsamples.

Figure 1 presents the time-series behavior of the hedge returns for the full sample and the two subsamples. As shown, the accrual-based hedge returns for the HIO subsample are consistently smaller than those for the LIO subsample over the 250-day period following the portfolio formation dates. During the first 60 days, the hedge returns for both subsamples are relatively small (less than 2%). However, after 80 days, the hedge returns for the HIO subsample and the LIO subsample begin to diverge rather dramatically. For the HIO subsample, the hedge returns vacillate around 2% for the first 120 days, then climb gradually until stabilizing around 4% after approximately 10 months (200 trading days) from the portfolio formation dates. For the LIO subsample, the hedge returns drift upward quickly, reaching nearly 14% after one year from the portfolio formation dates. There is no evidence that the hedge returns for the LIO subsample stabilize after one year.

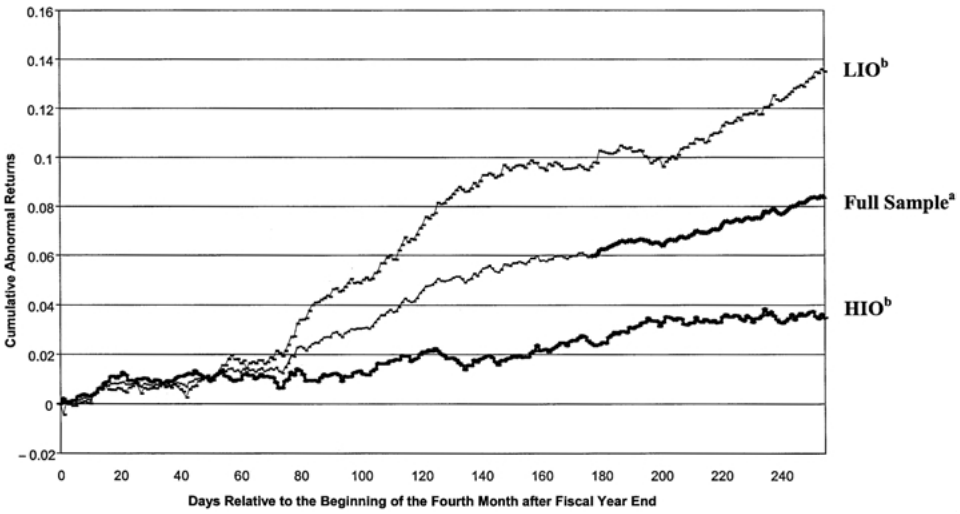

Figure 1. Cumulative daily market-adjusted returns from an accrual-based trading strategy.
[a]Full sample consists 14,986 firm-years with available returns and financial statement variables data.
[b]HIO (LIO) sample consists 4,140 (3,214) firm-years with available returns and financial statement variables data. HIO and LIO subsamples are as defined in Table 1.

3.6. Limits to Arbitrage in Relation to HIO and LIO Subsamples

Our analysis suggests that significantly larger abnormal returns can be generated in the LIO subsample. Accordingly, an important issue that arises is why sophisticated investors do not trade in these firms and attempt to exploit this mispricing. The descriptive statistics in Table 1 show that the LIO sample consists of smaller, less profitable companies with lower share turnover. Additional untabulated findings show that the LIO group also has lower average share prices, higher return volatility, and a greater proportion of ADRs. These differences are consistent with the theory that limits to arbitrage play an important role in equilibrium prices and the predictability of returns (e.g., Shleifer and Vishny, 1997; Chen et al., 2002; Ali et al., 2003; Mendenhall, 2002). Collectively, these papers suggest that firm-specific factors and capital market constraints combine to limit the ability of investors to arbitrage the apparent systematic mispricing of a group of stocks. Thus, factors that increase the riskiness or costliness of an arbitrage opportunity or otherwise limit large, sophisticated investors from trading in a subset of firms provide a rationale for why these systematic mispricings persist.

Similar to findings with respect to the book-to-market anomaly, returns momentum, and post-earnings announcement drift, our findings show that the accruals mispricing is greater among the LIO subsample, which is comprised of smaller firms with lower turnover and greater return volatility, suggesting that there are greater impediments to information-based arbitrage among this subset of firms. Thus, although there appears to be the possibility of earning significant abnormal returns among this subset of firms, these characteristics (and others) preclude institutions from trading in these stocks and exploiting the systematic mispricing. However, further research is needed to evaluate the relative importance of the different firm characteristics in limiting institutional ownership and, hence, limiting arbitrage.

4. Concluding Remarks

This paper seeks to enhance our understanding of the accrual mispricing phenomena by examining the role of investor sophistication in evaluating the valuation implications of accruals. If the mispricing of accruals is due to investors' limited ability to assess the persistence properties of accruals and their future earnings implications, then we expect to observe less accruals mispricing for firms primarily held by investors who are more sophisticated in the interpretation of accounting information. Using institutional ownership as a proxy for investor sophistication, we find that firms with high institutional ownership and a minimum threshold level of actively trading institutions exhibit less accruals mispricing relative to firms with low institutional ownership.

First, the Mishkin (1983) test shows that the market perception of accruals persistence embedded in stock prices is more accurate for firms with high institutional ownership relative to firms with low institutional ownership. Second,

an accrual-based hedge portfolio generates significantly smaller one-year-ahead hedge returns for firms with high institutional ownership relative to firms with low institutional ownership. Controlling for other variables relating to institutional investors' investment preferences and future returns (firm size, book-to-market ratio, earnings-to-price ratio and contemporaneous returns) has no qualitative effect on the results with respect to institutional ownership. Third, changes in transient institutional ownership appear to respond to the accruals signal. This suggests that when institutions are sophisticated and are able to trade on a signal, their trading behavior reduces the amount of mispricing.

Taken together, our findings are consistent with investor sophistication mitigating the accruals mispricing phenomena. However, it is not clear from our results whether the more accurate assessment of accruals persistence results from institutional investors' superior ability to interpret information contained in published financial statements or from an informational advantage such as greater access to management. The interplay between institutional investors and financial analysts in accruals mispricing phenomena also warrants further examination. These relevant questions are left for future research.

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Notes

1. This is in contrast to institutions that buy and hold for lengthy periods of time or institutions that follow indexing strategies. Although both of these types of institutions are likely to be sophisticated, their trading behavior is more constrained, and less likely to reflect arbitrage based trading on information in accruals.
2. For example, Alzman et al. (2002) examine several explicit restrictions placed on the trading behavior of mutual funds that are reported in form N-SAR with the SEC.
3. We thank Brian Bushee for making the detailed institutional investor classifications available to us.
4. SEC assigns five manager types to the included institutions: (1) bank, (2) insurance company, (3) investment company (mutual fund), (4) investment advisor, and (5) other. The "investment advisor" category includes most of the large brokerage firms. The "other" category includes pension funds and university endowments.
5. Details of the estimation procedure are provided in Mishkin (1983) and Sloan (1996).
6. Sloan (1996) uses extreme deciles to perform the hedge portfolio test. To increase sample size, we group the highest (lowest) *two* deciles into one portfolio. Using the extreme two deciles does not change our results qualitatively.

7. The smaller hedge returns for the HIO subsample comes mainly from the short side of the hedge portfolio. This may seem inconsistent with the presence of short-selling constraints. However, in practice, the stock price of firms that are widely held by institutions may decrease simply by investors selling their positions upon observing extreme positive accruals. In Table 8 we provide evidence of the change in institutional ownership in response to extreme accrual realizations.
8. A forecast revision is consistent with respect to the reversal of accruals if the mean consensus analyst forecast for year $t+1$ is revised upward (downward) in the month of the year t earnings announcement when year t accruals are negative (positive).
9. Ideally, we would test this conjecture by examining institutions' trading activities around earnings announcement dates or the release date of the annual report. Since we are using annual institutional holdings data, results from this section should be interpreted cautiously.
10. Because we do not adjust the changes in shareholdings for overall trends and other factors, only the difference of 1.2% between the accrual quintiles should be used to judge economic significance.

References

Ali, A., L. Hwang and M. Trombley. (2000). "Accruals and Future Stock Returns: Tests of Naïve Investor Hypothesis." *Journal of Accounting, Auditing, and Finance* 15, 161–181.

Ali, A., L. Hwang and M. Trombley. (2003). "Arbitrage Risk and the Book-To-Market Anomaly." *Journal of Financial Economics*, forthcoming.

Alzman, A., K. Brown, M. Carlson and D. Chapman. (2002). "Why Constrain Your Mutual Fund Manager?" Working Paper, University of Texas at Austin.

Balsam, S., E. Bartov and C. Marquardt. (2002). "Accruals Management, Investor Sophistication, and Equity Valuation: Evidence from 10-Q Filings." *Journal of Accounting Research* 40, 987–1012.

Barth, M. and A. Hutton. (2001). "Financial Analysts and the Pricing of Accruals." Working Paper, Stanford University.

Bartov, E., S. Radhakrishnan and I. Krinsky. (2000). "Investor Sophistication and Patterns in Stock Returns after Earnings Announcements." *The Accounting Review* 75, 43–63.

Bradshaw, M., S. Richardson and R. Sloan. (2001). "Do Analysts and Auditors Use Information in Accruals?" *Journal of Accounting Research* 39, 45–74.

Bushee, B. (1998). "The Influence of Institutional Investors on Myopic R&D Investment Behavior." *The Accounting Review* 73, 305–333.

Bushee, B. and C. Noe. (2000). "Corporate Disclosure Practices, Institutional Investors, and Stock Return Volatility." *Journal of Accounting Research* 38, 171–207.

Chen, J., H. Hong and J. Stein. (2002). "Breadth of Ownership and Stock Returns." *Journal of Financial Economics*, forthcoming.

Cohen, R., P. Gompers and T. Vuolteenaho. (2002). "Who Underreacts to Cash-Flow News? Evidence from Trading Between Individuals and Institutions." Working Paper, National Bureau of Economic Research, Cambridge, MA.

Collins, D. and P. Hribar. (2000). "Earnings-Based and Accrual-Based Market Anomalies: One Effect or Two?" *Journal of Accounting and Economics* 29, 101–123.

Dennis, P. and J. Weston. (2001). "Who's Informed? An Analysis of Stock Ownership and Informed Trading." Working paper, University of Virginia.

Fama, E. and K. French. (1992). "The Cross-Section of Expected Stock Returns." *Journal of Finance* 47, 427–465.

Fama E. and J. MacBeth. (1973). "Risk, Return, and Equilibrium: Empirical Tests." *Journal of Political Economy* 81, 607–636.

Gompers, P. and A. Metrick. (2001). "Institutional Investors and Equity Prices." *Quarterly Journal of Economics* 116, 229–259.

Hand, J. (1990). "A Test of the Extended Functional Fixation Hypothesis." *The Accounting Review* 65, 740–763.

Hribar, P. and D. Collins. (2002). ''Errors in Estimating Accruals: Implications for Empirical Research.'' *Journal of Accounting Research* 40, 105–134.

Jegadeesh N., J. Kim, S. Krische and C. Lee. (2002). ''Analyzing the Analysts: When Do Recommendations Add Value?'' Working Paper, Cornell University.

Jegadeesh N. and S. Titman. (1993). ''Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency.'' *Journal of Finance* 48, 65–91.

Mendenhall, R. (2002). ''Arbitrage Risk and Post-Earnings-Announcement Drift.'' Working Paper, University of Notre Dame.

Mishkin, F. (1983). *A Rational Expectations Approach to Macroeconomics*. Chicago: The University of Chicago Press.

Porter, M. (1992). *Capital Choices: Change in the Way America Invests in Industry*. Boston, MA: Council on Competitiveness/Harvard Business School.

Rajgopal, S., M.Venkatachalam and J. Jiambalvo. (2002). ''Is Institutional Ownership Associated with Earnings Management and the Extent to Which Stock Prices Reflect Future Earnings?'' *Contemporary Accounting Research* 19, 117–145.

Richardson, S. (2002). ''Accruals and Short Selling. An Opportunity Forgone?'' Working Paper, University of Pennsylvania.

Shleifer, A. and R. Vishny. (1997). ''The Limits of Arbitrage.'' *Journal of Finance* 52, 35–55.

Sloan, R. (1996). ''Do Stock Prices Fully Reflect Informaiton in Accruals and Cash Flows about Future Earnings?'' *The Accounting Review* 71, 289–315.

Walther, B. (1997). ''Investor Sophistication and Market Earnings Expectations.'' *Journal of Accounting Research* 35, 157–192.