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Who Blinks in Volatile Markets, Individuals or Institutions?

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ABSTRACT

We investigate the relationship between the ownership structure and returns of firms on days when the absolute value of the market's return is two percent or more. We find that a firm's abnormal return on these days is related to the percentage of institutional ownership, that there is abnormally high turnover in the firm's shares on these days, and that this abnormal turnover is significantly related to the percentage of institutional ownership in the firm. Taken together, these results are consistent with positive feedback herding behavior on the part of some institutions, particularly mutual and pension funds.

WHO SELLS WHEN THERE IS A LARGE DROP in the stock market, institutional or individual investors? The answer is not clear. One could argue that individual investors are less sophisticated and more risk averse than institutions, so the individual investor is the one who reacts and sells during a sharp market drop. Alternatively, one could argue that institutional investors, although they are more sophisticated, have short horizons. Because of this, they herd together with their peers and sell during a market decline, since "an unprofitable decision is not as bad for reputation when others make the same mistake" (Scharfstein and Stein (1990) and Froot, Scharfstein, and Stein (1992)). Individuals, who may make decisions based on longer-term criteria (Markowitz (1991)), would be less likely to react during short-term market swings. The answer to the question of who sells during large market swings is important since it helps us to understand the dynamics associated with large swings in stock prices and the sources of market volatility.

We address this question by examining the returns of stocks on days when the absolute value of the market's return is large, defined as two percent or more. We have four main findings. First, if institutional investors are selling

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more than individuals when there is a large market drop, then we would expect to observe more negative returns for stocks that have larger institutional ownership. We find that, after controlling for risk, this is exactly the case—the percentage of institutional ownership in a firm is inversely related to that firm's return on days when there is a market drop of more than two percent. This evidence is consistent with the notion that institutions sell more than individuals when there is a large stock market drop. We find similar results on days when the market rises by two percent or more. Specifically, stocks that have a greater percentage of institutional ownership have a higher return than those that have lower levels of institutional ownership. This is what we would expect to see if institutional owners are purchasing more than individuals on these days. This effect is present even after controlling for liquidity. Hence, this result is not due to the faster price adjustment of more liquid stocks that have higher institutional ownership.

Second, different types of institutional ownership have different effects on the firm's abnormal return. Ownership by mutual funds, investment advisors, pension funds, and endowments is positively (negatively) related to the abnormal return on up (down) days, while ownership by banks has the opposite effect. Since the performance of managers at institutions like mutual funds is subject to much more scrutiny than that of managers of bank trust funds, our evidence is consistent with theoretical explanations such as managerial labor market reputation (Scharfstein and Stein (1990)).

Third, we find that abnormal share turnover, defined as daily turnover minus median turnover from a prior period, is positively related to the level of institutional ownership on the event-days when the absolute value of the market's return exceeds two percent. This evidence is consistent with the notion that institutions buy (sell) more than individuals when there is a large market increase (decline).

Fourth, we find that the abnormal returns following the event of a large market drop are positive for stocks that have high levels of institutional ownership and negative for stocks that have low levels of institutional ownership. This is relevant since the event-day large negative returns that are associated with higher levels of institutional ownership could simply be the result of the prices of these stocks being driven to their fundamental levels more quickly. If this were the case, institutions would not be contributing to market volatility. On the contrary, they would be making the market more efficient. The fact that we observe positive abnormal returns subsequent to the event-day indicates that institutions are driving prices below their fundamental values on the event-day.

Taken together, these findings are consistent with the idea that institutions herd together and trade with the momentum of the market on days when there are large moves in the stock market. The fact that institutions trade in this fashion implies that, at least in the short term, they contribute to market volatility.

Section I provides a brief review of the theoretical basis and empirical evidence for institutional herding. Section II describes how the data set was constructed. Section III discusses the empirical findings regarding large market price changes and institutional ownership. Section IV discusses the findings that relate turnover to institutional ownership. Section V discusses the abnormal returns subsequent to the event-day, and Section VI concludes the paper.

I. Herding Theory and Evidence

Our basic premise is that institutional shareholders react strongly to large market price changes by herding together and moving prices. The herding literature does not assume irrationality on the part of the institution, but rather assumes that the manager follows a rational decision-making process. Though this is not a new direction in the theoretical or empirical literature, we test this premise in a very different way from prior studies.

A. Institutional Herding—Theory

There are several models in the literature that provide motives for the herding behavior of institutional managers. In all of these models, the herding results in an inefficient equilibrium, where the private information that the managers have is not fully impounded in the observable market prices. First, managers may rationally choose to focus only on information that pays off in the short term and to ignore valuable information that may take a long time to be impounded into the price (Froot et al. (1992)). Second, managers are concerned about their reputations in the labor market. A manager's reputation is hurt less if everyone makes the same bad decision than if only the manager makes the bad decision. A risk-averse manager will run with the herd instead of going out on a limb and following a contrarian strategy, even if the manager has information that the contrarian strategy has the higher probability of being correct (Scharfstein and Stein (1990)). Third, if the information that managers have is revealed sequentially, herding could occur (Banerjee (1992)). Finally, if there are positive feedback traders in the market, then rational speculation can cause asset prices to deviate from their fundamental values (De Long et al. (1990)). A rational agent will purchase more stock than he would if the positive feedback traders were not present, knowing that the positive feedback traders will buy when the price starts to rise. As the positive feedback traders purchase more of the firm's stock, the price rises even further, enabling the rational speculator to capture additional profits. This type of rational destabilizing speculation can create speculative bubbles, drive prices away from their fundamental values, and contribute to market volatility.

B. Institutional Herding—Evidence

Prior empirical research on institutional herding does not consistently find evidence of the existence of herding. This could be due to the fact that most prior empirical studies of institutional herding behavior have focused on the institution's changes in quarterly holdings of equity. For example, Klemkosky (1977) studied quarterly buying imbalances (dollar purchases less dollar sales) and quarterly selling imbalances (dollar sales less dollar purchases) of mutual funds between the first quarter of 1963 and the fourth quarter of 1972. He found that large buying imbalances were preceded by at least two months of abnormally positive stock returns, indicating that institutions engaged in positive feedback trading when the market was rising. Klemkosky also found that large selling imbalances were preceded by at least one month of abnormally negative stock returns, indicating that institutions engaged in positive feedback trading when the market was falling. Kraus and Stoll (1972) studied the presence of herding in 229 bank trust departments, mutual funds, and closed-end companies for the 21-month period from January 1968 to September 1969. They conclude that any observed herding by institutions can simply be attributed to chance. Lakonishok, Shleifer, and Vishny (1992) use quarterly holdings from 341 money managers from the first quarter of 1985 to the fourth quarter of 1990 to test for herding by pension fund managers. In general, they find that pension fund managers do not herd except in smaller stocks, where there is a slight degree of herding. Wermers (1999) uses data provided by CDA Investment Technologies that provide quarterly holdings of almost all mutual fund companies from the fourth quarter of 1974 to the fourth quarter of 1994. Using the same measure of herding that Lakonishok et al. use, Wermers reaches the same conclusion for mutual funds that Lakonishok et al. reached for pension funds: that institutional herding is, in general, not present in most stocks. A study by Nofsinger and Sias (1999) examines annual changes in institutional holdings and finds evidence of herding among institutional investors for the period from 1977 to 1996.

Two other recent studies also reach somewhat different conclusions regarding the causes of institutional trading. Cai, Kaul, and Zheng (2000) find that market returns Granger cause institutional trading, but that institutional trading does not Granger cause returns. This evidence is consistent with positive feedback trading and herding, but inconsistent with the hypothesis that trading by institutions puts pressure on prices. In contrast, Sias, Starks, and Titman (2001) distinguish between the hypothesis that institutions buy stocks and then their prices increase (price pressure/informed institutions) and the hypothesis that a stock's price increases and then institutions buy it (positive feedback trading). They reject the positive feedback trading hypothesis in favor of the hypothesis that institutions trade because they possess superior information. The problem with using quarterly or annual data on holdings is that these data may not reveal herding if it occurs over a shorter time interval. We attempt to circumvent

this problem by examining price reactions and trading for a cross section of stocks on event-days when the absolute value of the market's return exceeds two percent.

II. Data

We examine all days between January 1, 1988 and December 31, 1996[1] when the absolute value of the Center for Research in Security Prices (CRSP) equal or value-weighted NYSE/AMEX/Nasdaq return is greater than two percent.[2] These days are referred to as "event-days." Table I contains the dates and returns of the CRSP equal-weighted and value-weighted index for the event-days when the absolute value of the return was greater than two percent. There are 6 days when the equal-weighted return is greater than two percent and 10 days when the equal-weighted return is less than negative two percent, meaning that a significant market move was observed about once every six months. Extreme value-weighted days are more frequent. There are 13 days when the CRSP value-weighted return is greater than two percent and 17 days when the CRSP value-weighted return is less than negative two percent. There is a significant overlap between the sets of event-dates conditioned on both the equal- and value-weighted returns. Four (eight) of the days when the equally weighted index went up (down) by more than two percent are also days when the value-weighted index went up (down) by more than two percent. Hence, the results for the two weighting schemes are not independent of one another and we should not draw a stronger inference from any similarities in the results for the two samples than is warranted.

A potential issue for the value-weighted days is outliers. As the reported CRSP NYSE/AMEX/Nasdaq portfolio is a value-weighted average, very large positive or negative returns for several large firms could generate a large portfolio return. As a result, the selected days may contain days when the market price change does not reflect a broad market shift. To ascertain if this occurs in our sample, we calculate the percentage of firms with positive returns, negative returns, and zero returns. In addition, we calculate the ratio of firms with positive returns to firms with negative returns for days when the market return exceeds two percent and the ratio of firms with negative returns to firms with positive returns when the market return is less than two percent. Table I contains these results. For value-weighted up days, the smallest percentage of firms with positive returns is 43.3 percent

[1] We began with the most recent institutional ownership data that were available at the commencement of the study and acquired as much as was financially feasible.

[2] The two percent cutoff is not arbitrary. We calculate the mean and standard deviation of daily returns for the CRSP equal- and value-weighted NYSE/AMEX/Nasdaq portfolios from 1988 to 1996 and select days that are roughly three standard deviations above or below the mean. While the choice of what constitutes an extreme market price change day is somewhat arbitrary, the results obtain for days when the return is two standard deviations above or below the 1988 to 1996 daily mean.

Table I

Market Returns

This table presents dates, market returns, and the fraction of returns that are positive, zero, and negative when the absolute value of the return of the market portfolio exceeds two percent. Percent positive is the percentage of firms with returns above zero. Percent zero is the percentage of firms with returns equal to zero. Percent negative is the percentage of firms with returns less than zero. Ratio is the ratio of percent positive to percent negative when the market return is positive and the ratio of percent negative to percent positive when the market return is negative. The market portfolio is defined as the CRSP equal-weighted or value-weighted NYSE/AMEX/Nasdaq portfolio.

Date	Mean Return (%)	Percent Positive	Percent Zero	Percent Negative	Ratio
		Panel A: Equal-Weighted Up Market			
01/04/88	3.21	63.17	22.73	14.10	4.48
01/05/88	2.25	58.57	24.46	16.97	2.93
08/27/90	2.45	57.39	26.71	15.91	3.60
01/17/91	2.50	58.25	26.53	15.22	3.82
04/05/94	2.33	64.93	18.41	16.66	2.88
07/17/96	2.32	58.48	19.01	22.51	2.60
		Panel B: Equal-Weighted Down Market			
10/13/89	−2.66	9.63	23.97	66.40	6.89
08/06/90	−2.55	13.33	21.61	65.06	4.88
08/23/90	−3.31	8.96	22.29	68.75	7.67
09/24/90	−2.04	14.01	26.90	59.09	4.21
08/19/91	−2.43	11.09	20.97	67.94	6.12
02/16/93	−2.30	15.81	17.51	66.68	4.21
04/04/94	−2.03	17.31	16.78	65.91	3.80
03/08/96	−2.03	12.91	15.09	71.99	5.57
07/11/96	−2.14	16.44	18.01	65.55	3.98
07/15/96	−2.49	16.07	17.93	66.00	4.10
		Panel C: Value-Weighted Up Market			
01/04/88	3.35	63.14	22.75	14.11	4.47
01/15/88	2.29	54.08	28.16	17.76	3.05
04/06/88	2.15	46.42	32.59	20.98	2.21
05/31/88	2.67	44.20	34.11	21.69	2.11
08/27/90	3.05	57.37	26.72	15.91	3.60
10/01/90	2.60	45.79	30.36	23.85	1.92
10/18/90	2.16	43.33	33.98	22.69	1.91
01/17/91	3.30	58.23	26.55	15.22	3.83
02/11/91	2.34	51.01	28.37	20.62	2.47
08/21/91	2.71	57.62	27.73	14.66	3.93
12/23/91	2.22	45.26	30.28	24.46	1.85
12/30/91	2.03	49.33	26.87	23.80	2.07
04/05/94	2.36	64.99	18.43	16.57	3.92

Table I—*Continued*

Date	Mean Return (%)	Percent Positive	Percent Zero	Percent Negative	Ratio
		Panel D: Value-Weighted Down Market			
01/08/88	−5.55	14.60	25.56	59.85	4.10
01/20/88	−2.33	15.52	30.64	53.84	3.47
04/14/88	−3.65	12.75	25.34	61.91	4.85
10/13/89	−5.35	9.62	24.01	66.37	6.90
01/12/90	−2.31	12.35	26.71	60.94	4.93
01/22/90	−2.22	16.32	30.85	52.83	3.24
08/06/90	−3.15	13.34	21.65	65.01	4.87
08/16/90	−2.03	17.63	30.77	51.59	2.93
08/23/90	−3.14	8.99	22.34	68.67	7.66
09/24/90	−2.05	14.04	26.88	59.09	4.21
10/09/90	−2.42	15.63	32.94	51.42	3.29
08/19/91	−2.30	11.10	20.91	67.99	6.12
11/15/91	−3.40	15.70	27.04	57.26	3.65
02/16/93	−2.58	15.74	17.53	66.73	4.24
02/04/94	−2.22	16.09	19.65	64.26	3.99
03/08/96	−2.84	12.86	15.10	72.04	5.60
07/15/96	−2.60	16.02	17.97	66.01	4.12

on October 18, 1990 and the largest percentage of firms with positive returns is 65.0 percent on April 5, 1994 with a sample mean percent positive of 52.3 percent. The ratio of the percentage of firms with positive returns to the percentage of firms with negative returns for these days is 1.9 and 3.9 with a sample mean of 2.8. The percent positive and ratio statistics imply that for our sample of value-weighted positive days, there are, on average, twice as many winners as losers. This result indicates that our sample consists of days when the market movement is not outlier driven. The results for the value-weighted down days are similar to those for the value-weighted up days.

Outliers may also be an issue for the equal-weighted sample. Large positive or negative returns for several small firms could produce an extreme portfolio return when the majority of firms have returns of the opposite sign. This is not the case, however. On equal-weighted up days, the average number of firms with a positive return is 60.1 percent and the ratio of percent positive to percent negative is 3.4. This implies that, on average, there are three times as many winners as losers on equal-weighted up days. This indicates that the market price change for equal-weighted up days is broad based. The results for the equal-weighted down days are similar to the results for equal-weighted up days. In sum, the sample days represent large market portfolio price changes in which winners greatly outnumber losers on up days and losers greatly outnumber winners on down days.

For all firms on each of these days, we determine the percentage of institutional ownership. The institutional ownership data for this study are drawn from quarterly 13(f) filings. The Securities Act Amendment of 1975 requires that institutional investors report their portfolio holdings to the SEC on a quarterly basis. The amendment specifies that all institutional investors with investment discretion over portfolios exceeding $100 million in equity securities report the content of their holdings to the SEC. We obtain these data from the CDA/Spectrum database, which reports the name of the institutional holder, most recent trade, and the number of shares held by each institution for all publicly traded companies. The CDA/Spectrum database also allows us to decompose the institutional ownership structure into four types of institutions: (1) mutual funds and investment advisors, (2) pension funds and endowments, (3) insurance companies, and (4) banks. Data on the total number of outstanding shares are also obtained from CDA/Spectrum. For all firms on each of these days, we also collect the firm's return, shares traded, and stock price from CRSP.

III. Empirical Findings: Returns

Simply stated, our hypothesis is that institutional investors react to large market price swings. One potential effect of such a reaction is larger price movements for stocks with significant institutional ownership. This implies that the cross-sectional distribution of the returns of individual firms on event-days will be a function of the level of institutional ownership. We discuss the univariate results first and then discuss the regression results.

A. Univariate Comparisons

Descriptive statistics for the variables are presented in Table II. Throughout the paper t will refer to the event-day when the absolute value of the market's return is greater than two percent. The independent variables that we will use as controls in the regression analysis are *size*, defined as the natural logarithm of the market value of equity for firm i 50 days prior to day t; *turnover*, defined as the ratio of shares traded to total shares outstanding for firm i on day t; *variance*, defined as the variance of the market model residual for firm i on day t for the period from $t - 250$ to $t - 50$ days; *beta*, defined as the beta of the firm's daily returns with the CRSP value-weighted index for the period from $t - 250$ to $t - 50$ days; and *io*, defined as the percentage of a firm's outstanding shares held by 13(f) institutions for firm i on day t. For each of our independent variables, the minimum, first quartile, median, mean, third quartile, maximum, and standard deviation are calculated. We also calculate these statistics for subsamples partitioned by the median level of institutional ownership. Gompers and Metrick (2001) demonstrate that the overall level of institutional ownership is increasing during the sample period. As a result, we partition firms into high and low institutional ownership subsamples within each extreme day.

The size statistics are consistent with the size finding of Lakonishok et al. (1992). The high institutional ownership firms are significantly larger than the low institutional ownership firms. The statistics for variance and beta suggest that firms within the high institutional ownership portfolio have lower idiosyncratic volatility and higher systematic risk.[3]

Though this result seems to be at odds with Falkenstein (1996), this is probably not the case, since the univariate analysis does not control for size and liquidity.

The mean (median) level of institutional ownership is 24.3 (17.7) percent for the equal-weighted up day portfolio. This level of institutional ownership is consistent with that reported in Gompers and Metrick (2001) and Wahal (1996). While the reported level of institutional ownership suggests extensive institutional holdings, there is substantial cross-sectional variation. For equal-weighted up days the 25th percentile of holdings is 4.9 percent and the 75th percentile is 39.1 percent. The substantial cross-sectional variation in institutional holdings suggests that a differential reaction for institutional investors could produce considerable cross-sectional variation in returns.

In addition to the aggregate institutional ownership in a firm, we also segregate ownership into ownership by mutual funds and investment advisors, pension funds and endowments, insurance companies, and banks. The time series of these four components from the first quarter of 1988 to the fourth quarter of 1996 is shown in Figure 1. As the figure shows, overall institutional ownership has grown by almost 10 percent over this period, from 21 percent in 1988 to just over 30 percent in 1996. Almost all of this growth has been driven by the increase in ownership by mutual funds, from 12 percent in 1988 to 22 percent in 1996.

Rather than calculate the descriptive statistics in Table II for market-adjusted returns, we calculate descriptive statistics for raw returns. While we employ market-adjusted returns in the regressions, the pattern in extreme day returns is more transparent in the raw returns. For the equal-weighted up days, the mean (median) return is 2.5 (1.6) percent. The mean (median) return for the low institutional ownership portfolio is 2.2 (0.0) percent while the mean (median) return for the high institutional ownership portfolio is 2.8 (2.1) percent. We perform a t-test and a simple sign test to determine if the means and medians for the high and low institutional ownership portfolios are equal. The equality of the means and medians is rejected at the one percent level. Moreover, the difference is approximately 60 basis points. Given the magnitude of the market returns on these days, a 60 basis-point difference is economically significant.

A second interesting pattern in the return statistics is the standard deviations of the returns for the high and low institutional ownership portfolios. The high institutional ownership portfolio that has a larger return also has a lower standard deviation. This suggests a tighter clustering of returns for

[3] The average beta is not one since we compute the equal-weighted average, not the value-weighted average.

Table II

Descriptive Statistics for High and Low Institutional Ownership

This table presents event-day sample descriptive statistics. The event-day is defined as a trading day when the absolute value of the return of the market portfolio exceeds two percent. The market portfolio is defined as the CRSP value-weighted or equal-weighted NYSE/AMEX/Nasdaq portfolio. The variables are *size*, which is the natural logarithm of the market value of equity 50 days prior to the event-day; *turnover*, which is daily volume expressed as a percentage of shares outstanding on the event-day; *variance*, which is the market model residual variance for days [−250, −50]; *beta*, which is computed using returns for days [−250, −50] for the CRSP value-weighted index; *io*, which is the percentage of a firm's outstanding shares held by 13(f) institutions; and *return*, which is the firm's return on the event-day. Bold represents a rejection at the one percent level of equality of the statistic for the subsamples.

Variable	Partition	Min	25th	Median	Mean	75th	Max	Standard Deviation	*N*
				Panel A: Equal-Weighted Up Market					
size	Whole sample	9.077	16.772	18.009	18.154	19.382	25.566	1.943	37,292
	io < Median	9.077	16.091	**17.034**	**17.138**	18.109	24.421	**1.561**	18,333
	io ≥ Median	13.071	17.885	18.996	19.137	20.299	25.566	1.763	18,959
turnover	Whole sample	0.000	0.023	0.105	0.260	0.287	80.040	1.589	37,292
	io < Median	0.000	0.007	**0.052**	**0.169**	0.163	80.040	**2.109**	18,333
	io ≥ Median	0.000	0.061	0.178	0.347	0.401	46.425	0.808	18,959
variance	Whole sample	0.000	0.000	0.001	0.002	0.002	0.248	0.004	37,292
	io < Median	0.000	0.001	**0.001**	**0.003**	0.003	0.248	**0.005**	18,333
	io ≥ Median	0.000	0.000	0.001	0.001	0.001	0.079	0.002	18,959
beta	Whole sample	−7.372	0.225	0.565	0.637	1.000	10.267	0.688	37,292
	io < Median	−7.372	0.083	**0.379**	**0.470**	0.810	10.267	**0.732**	18,333
	io ≥ Median	−3.263	0.383	0.710	0.788	1.112	4.805	0.608	18,959
io	Whole sample	0.000	0.049	0.177	0.243	0.391	0.999	0.224	37,292
	io < Median	0.000	0.012	**0.048**	**0.061**	0.101	0.234	**0.054**	18,333
	io ≥ Median	0.149	0.265	0.388	0.419	0.554	0.999	0.182	18,959
return	Whole sample	−0.773	0.000	0.016	0.025	0.046	1.400	0.061	37,292
	io < Median	−0.500	0.000	**0.000**	**0.022**	0.046	1.400	**0.073**	18,333
	io ≥ Median	−0.773	0.000	0.021	0.028	0.046	0.571	0.046	18,959
				Panel B: Equal-Weighted Down Market					
size	Whole sample	8.854	16.915	18.197	18.313	19.557	25.582	1.960	64,010
	io < Median	8.854	16.201	**17.173**	**17.274**	18.281	24.412	**1.580**	31,561
	io ≥ Median	12.783	18.098	19.200	19.324	20.466	25.582	1.754	32,449
turnover	Whole sample	0.000	0.034	0.127	0.279	0.321	26.553	0.543	64,010
	io < Median	0.000	0.012	**0.072**	**0.193**	0.213	26.553	**0.444**	31,561
	io ≥ Median	0.000	0.075	0.195	0.362	0.425	17.254	0.611	32,449
variance	Whole sample	0.000	0.000	0.001	0.002	0.002	0.302	0.005	64,010
	io < Median	0.000	0.001	**0.001**	**0.003**	0.003	0.302	**0.006**	31,561
	io ≥ Median	0.000	0.000	0.001	0.001	0.001	0.076	0.002	32,449
beta	Whole sample	−6.849	0.243	0.589	0.674	1.030	8.582	0.705	64,010
	io < Median	−6.849	0.082	**0.390**	**0.494**	0.836	8.582	**0.744**	31,561
	io ≥ Median	−4.135	0.385	0.719	0.809	1.133	7.785	0.642	32,449
io	Whole sample	0.000	0.056	0.197	0.263	0.429	0.999	0.236	64,010
	io < Median	0.000	0.014	**0.054**	**0.069**	0.114	0.234	**0.061**	31,561
	io ≥ Median	0.158	0.295	0.425	0.452	0.591	0.999	0.185	32,449
return	Whole sample	−0.760	−0.046	−0.019	−0.024	0.000	1.500	0.052	64,010
	io < Median	−0.760	−0.046	**−0.011**	**−0.021**	0.000	1.500	**0.062**	31,561
	io ≥ Median	−0.594	−0.045	−0.023	−0.028	−0.005	1.000	0.039	32,449

Table II—*Continued*

Variable	Partition	Min	25th	Median	Mean	75th	Max	Standard Deviation	*N*
				Panel C: Value-Weighted Up Market					
size	Whole sample	11.524	16.518	17.773	17.939	19.205	25.246	1.993	75,515
	io < Median	11.524	15.816	**16.744**	**16.873**	17.840	23.678	**1.581**	37,270
	io ≥ Median	12.435	17.691	18.817	18.978	20.174	25.246	1.794	38,245
turnover	Whole sample	0.000	0.016	0.087	0.221	0.252	36.528	0.467	75,515
	io < Median	0.000	0.003	**0.040**	**0.134**	0.142	15.416	**0.323**	37,270
	io ≥ Median	0.000	0.047	0.154	0.305	0.358	36.528	0.561	38,245
variance	Whole sample	0.000	0.000	0.001	0.002	0.002	0.247	0.004	75,515
	io < Median	0.000	0.001	**0.002**	**0.003**	0.003	0.247	**0.006**	37,270
	io ≥ Median	0.000	0.000	0.001	0.001	0.001	0.089	0.002	38,245
beta	Whole sample	−5.841	0.255	0.603	0.660	1.023	10.267	0.620	75,515
	io < Median	−5.841	−4.250	**0.398**	**0.482**	0.815	10.267	**0.656**	37,270
	io ≥ Median	−3.336	−2.595	0.747	0.800	1.131	5.692	0.550	38,245
io	Whole sample	0.000	0.045	0.165	0.232	0.374	0.993	0.217	75,515
	io < Median	0.000	0.012	**0.044**	**0.057**	0.094	0.209	**0.049**	37,270
	io ≥ Median	0.149	0.250	0.371	0.403	0.534	0.993	0.178	38,245
return	Whole sample	−0.667	0.000	0.007	0.017	0.036	3.000	0.062	75,515
	io < Median	−0.667	0.000	**0.000**	**0.013**	0.030	3.000	**0.077**	37,270
	io ≥ Median	−0.541	0.000	0.016	0.021	0.039	1.000	0.044	38,245
				Panel D: Value-Weighted Down Market					
size	Whole sample	9.077	16.675	17.939	18.093	19.351	25.582	1.978	102,013
	io < Median	9.077	15.982	**16.907**	**17.036**	18.003	24.412	**1.574**	50,248
	io ≥ Median	12.435	17.847	18.975	19.119	20.292	25.582	1.780	51,765
turnover	Whole sample	0.000	0.023	0.101	0.242	0.268	63.785	0.551	102,013
	io < Median	0.000	0.006	**0.053**	**0.165**	0.167	26.437	**0.453**	50,248
	io ≥ Median	0.000	0.057	0.161	0.316	0.361	63.785	0.623	51,765
variance	Whole sample	0.000	0.000	0.001	0.002	0.002	0.301	0.004	102,013
	io < Median	0.000	0.001	**0.001**	**0.003**	0.003	0.301	**0.005**	50,248
	io ≥ Median	0.000	0.000	0.001	0.001	0.001	0.076	0.002	51,765
beta	Whole sample	−6.848	0.274	0.612	0.676	1.027	8.594	0.632	102,013
	io < Median	−6.848	0.111	**0.417**	**0.504**	0.841	8.594	**0.670**	50,248
	io ≥ Median	−3.108	0.410	0.738	0.801	1.118	6.447	0.572	51,765
io	Whole sample	0.000	0.049	0.177	0.243	0.391	0.999	0.224	102,013
	io < Median	0.000	0.012	**0.048**	**0.061**	0.101	0.234	**0.054**	50,248
	io ≥ Median	0.149	0.265	0.388	0.419	0.554	0.999	0.182	51,765
return	Whole sample	−0.833	−0.041	−0.016	−0.021	0.000	2.000	0.052	102,013
	io < Median	−0.750	−0.039	**0.000**	**−0.016**	0.000	1.500	**0.062**	50,248
	io ≥ Median	−0.833	−0.042	−0.022	−0.025	0.000	2.000	0.040	51,765

the high institutional ownership portfolio. The results for the equal-weighted down days and value-weighted days are quantitatively and qualitatively similar to those for the equal-weighted up days. While the return difference and clustering of returns for portfolios with high institutional ownership are supportive of our hypothesis, they are not conclusive. It is possible that the observed pattern in the returns is the result of a concentration of larger, liquid firms in the high institutional ownership portfolio. To control for these effects, we test our hypothesis in a regression framework.

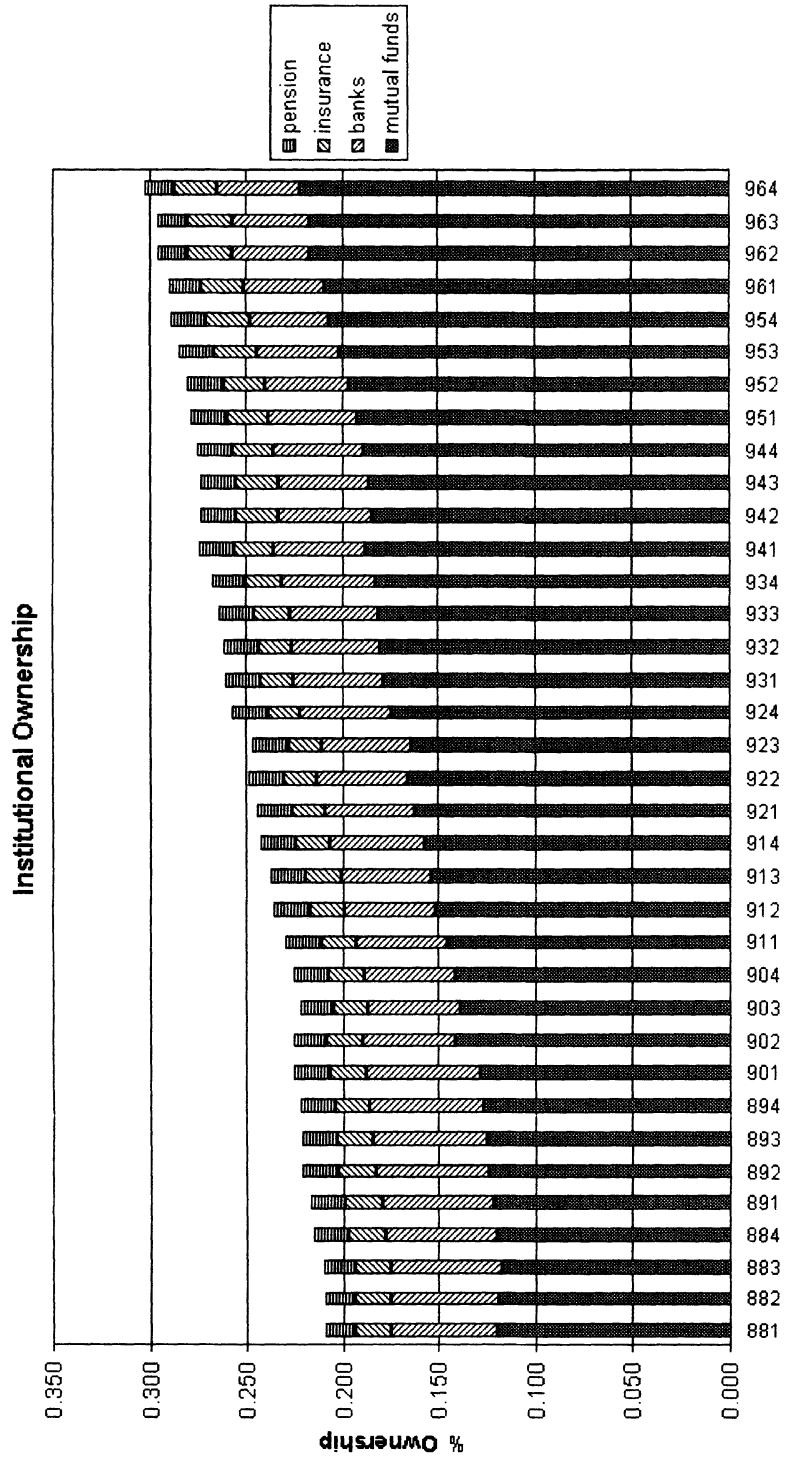

Figure 1. Growth of institutional ownership from 1988 to 1996.

B. Regression Evidence

We model the market-adjusted return on the event-day as a function of the independent variables outlined in Section III.A. Though we would like to use all the observations to estimate a pooled time-series cross-sectional regression, the clustering of the events within certain days creates a problem. Specifically, the residual for firm i on day t may be contemporaneously correlated with the residual for firm j on day t, and this correlation of residuals could understate the true standard errors for the coefficient estimates. We cannot estimate the variance–covariance matrix of residuals since we have many more firms in our sample than we have event-days; hence, Generalized Least Squares is not feasible in this case. Our approach is to use the technique of Fama and MacBeth (1973). We estimate the following cross-sectional regression for each event-day:

$$ar_i = \gamma_0 + \gamma_1 size_i + \gamma_2 turnover_i + \gamma_3 variance_i + \gamma_4 beta_i + \gamma_5 io_i + \epsilon_i, \quad (1)$$

where ar_i is the market-adjusted return for firm i on the event-day. We then use the time-series average of the estimated cross-sectional coefficients to make our inferences. Model (1) is estimated with both total institutional ownership (*io*), and institutional ownership segregated into four different categories: (1) mutual funds and investment advisors, (2) pension funds and endowments, (3) insurance companies, and (4) banks.

There are two empirical bases for the inclusion of size in the regression model. First, institutional investors prefer to invest in larger firms (Lakonishok et al. (1992)). The inclusion of size ensures that the measured relationship between the level of institutional ownership and abnormal returns is not acting as an empirical proxy for size. Second, we include size as an empirical risk factor. Banz (1981) provides evidence that small firms outperform large stocks on a risk-adjusted basis. In addition, Fama and French (1992) find that this performance differential has significant return explanatory potential. Whether size is an empirical risk factor or an institutional ownership preference factor is not central to our core hypothesis; size is included to ensure that the measured relationship for institutional ownership is robust to pricing and proxy effects.

Falkenstein (1996) finds that institutions prefer liquid stocks. He employs monthly turnover as a measure of liquidity and provides evidence that suggests that mutual funds tilt their portfolios toward more liquid stocks. Gompers and Metrick (2001) provide similar evidence for a larger class of institutional investors. The liquidity preference of institutional investors is rational because altering their large equity positions requires substantial trade volume. Thus, we include turnover as a dependent variable to control for the liquidity preference of institutional investors.

Like size, variance is included for both theoretical and empirical reasons. First, Dierkens (1991) conjectures that idiosyncratic volatility is a useful measure of informational asymmetry. Several researchers have argued that

institutional investors are informed investors. This implies a negative correlation between the level of informational asymmetry and the level of institutional ownership. If stocks with larger levels of informational asymmetry have greater reactions to market news, failure to include variance could mask the relationship between institutional ownership and returns. We also include variance to control for an institutional preference for more volatile stocks. Falkenstein (1996) finds that mutual funds are averse to stocks with low idiosyncratic volatility. Thus, if one excludes variance, the institutional ownership variables may proxy for an informational effect or an institutional investor volatility preference. We also include beta since, like size, it is a proxy for the risk of the firm. If institutions do have a preference for stocks with larger betas, then omitting beta from the model could bias the results.

The essential independent variable of interest is the level of institutional ownership. We include this variable to ascertain if the cross-sectional distribution of market-adjusted returns is related to the level of institutional ownership. If the institutional ownership variable is significant, this would suggest that institutional investors react to large market price changes. In addition to the aggregate institutional ownership, we also decompose institutional ownership (*io*) into four different types: (1) mutual funds and investment advisors (*mhold*), (2) pension funds and endowments (*phold*), (3) insurance companies (*ihold*), and (4) banks (*bhold*). This allows us to determine how different types of institutions react on the event-days. For example, prior research suggests that mutual funds are the most active institutional investors in terms of trading and have a higher percentage of ownership than the other three classes combined. Thus, it is possible that firms whose institutional ownership is heavily weighted with mutual funds experience larger price movements. Overall, our results are consistent with our prediction that the cross-sectional distribution of returns on these extreme days is related to the level and composition of a firm's institutional shareholder base. Our evidence suggests that institutions, especially mutual funds and investment advisors, herd together and trade with the momentum of the market on days when there are large stock market price changes.

The results from the estimation of model (1) are presented in Table III. Conditioning on the value-weighted return will tend to pick days when large stocks move more than small ones, ceteris paribus. Because institutional ownership is highly correlated with size, conditioning on the value-weighted index could induce a sample-selection bias. Though our results for both the value-weighted and equal-weighted samples are quantitatively and qualitatively similar, we will focus our discussion on equal-weighted days since they are free of this bias. There is no statistically significant relationship between size and the equal-weighted event-day market-adjusted returns on up or down days. Not surprisingly, size is significantly related to the market-adjusted return when we condition on value-weighted returns for both up and down days. Turnover is significantly related to the event-day market-adjusted return, with higher turnover associated with more positive (nega-

tive) returns on up (down) days. The turnover result suggests that more liquid firms experience larger percentage price changes on event-days. The variance of the market model residual is not significantly related to the abnormal return, and the beta of a firm is significantly related to the market-adjusted return in the direction that we would expect: High beta firms have larger returns on up days and smaller returns on down days.

The core variable of interest is institutional ownership. We first estimate the model using aggregate institutional ownership (*io*) and report the results in Panels A and C. Aggregate institutional ownership is significantly related to the market-adjusted return for the value-weighted days, but not for the equal-weighted days. For value-weighted days, the impact of institutional ownership is consistent with institutions trading together in the direction of the market, buying (selling) on days when the return on the market is sharply positive (negative). While the level of aggregate institutional ownership does not appear to be significant for the equal-weighted days, this may be due to different types of institutions behaving in different ways. This is exactly what we find when we estimate the model with institutional ownership decomposed into the four different categories. In Panels B and D, ownership by mutual funds (*mhold*) and pension funds and investment advisors (*phold*) is positively (negatively) related to market-adjusted returns on up (down) event-days. The estimated coefficients of *mhold* and *phold* in the regressions for both equal-weighted and value-weighted days are, in general, statistically significant and of the same order of magnitude. These results are consistent with the notion that managers at these types of institutions trade in the same direction, namely they sell (buy) when the market goes down (up). In contrast, holdings by bank trust funds behave in the opposite way: They are negatively (positively) associated with the market-adjusted returns on up (down) event-days. It also important to note that since the sign of the estimated coefficient for bank ownership is opposite that of mutual and pension fund ownership, the magnitude of the estimated coefficient of *aggregate* institutional ownership is smaller than that of the *segregated* components of ownership. The different effects of the various classes of institutional ownership on event-day returns are consistent with the managerial monitoring and incentives at the different types of institutions. Mutual and pension fund managers come under more frequent scrutiny than do managers of bank trust funds; thus they may have a labor market incentive to run with the herd (Scharfstein and Stein (1990)).

While the coefficients on the different classes of institutional ownership are statistically significant, they are also economically significant. For example, the estimated coefficient of 0.009 for *mhold* on equal-weighted up days corresponds to an increase of approximately nine basis points in the predicted abnormal return for a 10 percent increase in the level of institutional ownership. This suggests that the different levels of institutional ownership lead to a large economic wealth effect. For example, the difference in predicted abnormal return for a firm with institutional ownership in the

Table III

Event-Day Abnormal Return Regressions on Institutional Ownership and Control Variables

This table contains coefficient estimates from Fama–MacBeth regressions using the following model:

$$ar_i = \gamma_0 + \gamma_1 size_i + \gamma_2 turnover_i + \gamma_3 variance_i + \gamma_4 beta_i + \gamma_5 io_i + \epsilon_i.$$

The dependent variable is the event-day market-adjusted abnormal return. The event-day is defined as a day when the absolute value of the return of the CRSP equal-weighted or value-weighted NYSE/AMEX/Nasdaq portfolio exceeds two percent. The independent variables are *size*, which is the natural logarithm of the market value of equity 50 days prior to the event-day; *turnover*, which is daily volume expressed as a percentage of shares outstanding on the event-day; *variance*, which is the market model residual variance for days [−250, −50], *beta* which is the beta of the firm using returns for days [−250, −50]; and *io*, which is the percentage of a firm's outstanding shares held by 13(f) institutions. Results are reported with *io* both aggregated and segregated into banks (*bhold*), insurance companies (*ihold*), pension funds and endowments (*phold*), and mutual funds and investment advisors (*mhold*). Subsamples are formed by partitioning the data into value-weighted and equal-weighted up and down days. The table also reports the *t*-statistic corresponding to a test of the mean being different from zero, the minimum coefficient estimate, and the maximum coefficient estimate. There are 6, 10, 13 and 17 days in the equal-weighted up, equal-weighted down, value-weighted up, and value-weighted down subsamples, respectively.

	Up Days				Down Days			
	Mean	*t*-stat	Min	Max	Mean	*t*-stat	Min	Max
	Panel A: Equal-Weighted Days, Aggregated Institutional Ownership							
size	−0.001	−1.17	−0.002	0.001	0.000	0.32	−0.004	0.002
turnover	0.010	2.34	0.000	0.031	−0.012	−6.83	−0.019	−0.003
variance	1.591	1.31	−0.120	7.497	0.292	0.80	−1.031	3.066
beta	0.013	5.44	0.006	0.021	−0.011	−6.59	−0.018	−0.002
io	0.001	0.46	−0.008	0.009	−0.001	−0.82	−0.012	0.006
	Panel B: Equal-Weighted Days, Segregated Institutional Ownership							
size	0.000	−0.60	−0.002	0.001	0.000	−0.04	−0.004	0.002
turnover	0.010	2.37	0.000	0.030	−0.011	−6.71	−0.019	−0.003
variance	1.608	1.34	−0.101	7.459	0.273	0.75	−1.041	3.050
beta	0.012	5.32	0.006	0.021	−0.010	−6.50	−0.017	−0.002
bhold	−0.022	−2.11	−0.059	0.019	0.020	4.12	−0.007	0.047
ihold	−0.001	−0.16	−0.025	0.029	−0.002	−0.29	−0.032	0.036
phold	0.008	1.05	−0.025	0.023	−0.009	−4.43	−0.017	0.002
mhold	0.009	2.25	0.000	0.023	−0.008	−2.78	−0.026	0.003
	Panel C: Value-Weighted Days, Aggregated Institutional Ownership							
size	0.001	2.49	−0.002	0.003	−0.001	−1.76	−0.004	0.002
turnover	0.013	6.42	0.003	0.030	−0.010	−5.00	−0.027	0.001
variance	0.981	1.71	−0.468	7.529	0.501	1.92	−1.085	3.048
beta	0.009	6.62	0.000	0.021	−0.012	−7.32	−0.028	−0.002
io	0.005	2.70	−0.006	0.012	−0.005	−2.62	−0.020	0.006

Table III—*Continued*

	Up Days				Down Days			
	Mean	*t*-stat	Min	Max	Mean	*t*-stat	Min	Max
	Panel D: Value-Weighted Days, Segregated Institutional Ownership							
size	0.001	2.42	−0.002	0.003	−0.001	−2.10	−0.004	0.002
turnover	0.013	6.59	0.003	0.029	−0.010	−4.90	−0.027	0.002
variance	0.976	1.71	−0.469	7.476	0.488	1.87	−1.095	3.032
beta	0.009	6.58	0.000	0.021	−0.012	−7.20	−0.028	−0.001
bhold	0.001	0.15	−0.031	0.022	0.011	2.87	−0.012	0.045
ihold	0.003	0.92	−0.018	0.024	0.004	1.30	−0.017	0.023
phold	0.015	2.22	−0.028	0.062	−0.010	−2.15	−0.033	0.037
mhold	0.005	2.02	−0.009	0.023	−0.010	−4.50	−0.026	0.002

25th percentile and a firm in the 75th percentile is roughly 45 basis points. This indicates that the level of institutional ownership can have a major effect on the magnitude of a firm's event-day return.

Though we find that mutual fund ownership is positively associated with the abnormal return on the event day, there are two possible interpretations of this result. As discussed before, it could be the result of herding on the part of mutual fund managers. Alternatively, this result could be driven by individual investors using mutual funds as liquidity vehicles and redeeming (buying) shares in mutual funds on down (up) days. If this were the case, the decision to sell would not be a discretionary one on the part of the mutual fund manager, but rather one forced on the manager by the individuals who own the fund.

There is some evidence against this. Using the results from Edelen and Warner (2001), we find that mutual fund flows on our event-days are not economically significant.[4] We are, however, cautious about drawing too strong a conclusion from the results of Edelen and Warner for several reasons. First, though economically significant flows probably do not occur on our event-days, this does not preclude managers from selling (buying) assets on days when the market is down (up) in anticipation of fund flows on subsequent days. Second, when the square of the market return, with the same sign as the market return, is included in the Edelen and Warner model, it is much more significant than the linear term.[5] This indicates that economically significant fund flows may only occur when there are large market movements. Last, the data used by Edelen and Warner come from a differ-

[4] The mean market return for equal-weighted down days in our sample is −2.4 percent. Using estimates from Table 2 on page 202 of Edelen and Warner (2001), we estimate that the fund flow on these days would be (0.024)(0.017) = 4.1 basis points of the prior day's asset base. This number is not economically significant when compared to the daily standard deviation of fund flows of 13.4 basis points reported in Table 1 of their paper.

[5] We thank the anonymous referee for providing this result.

ent time period than the data in our sample. However, given the advances in information technology, it is more likely that fund flows would be driven by returns in a sample of data from 1998 to 1999 than in our sample from 1988 to 1996.

More convincing evidence against our results being driven by individual investors using institutions as liquidity vehicles can be found in the regressions where we segregate institutional ownership. In particular, we find that other types of institutional ownership, such as that by pension funds and endowments, have the same effect as mutual fund ownership. Managers of pension funds and endowments can buy and sell equity at their discretion and are not subject to daily inflows and redemptions like mutual fund managers.

Overall, our regression results are consistent with our prediction that the cross-sectional distribution of returns on the event-days is related to the level and composition of a firm's institutional shareholder base. Our evidence suggests that institutional managers, especially those of mutual funds, pension funds, and endowments, herd together and trade with the momentum of the market on days when there are large stock market price changes.

C. Robustness Tests

Though the results in Table III are statistically significant, they could be due to the correlation between the independent variables or the proxies used for the independent variables. To make certain that our results are robust, we address these issues in turn.

One potential issue in model (1) is the correlation between the independent variables. Lakonishok et al. (1992), among others, provide evidence that institutional investors prefer large firms. Falkenstein (1996) demonstrates that mutual funds are averse to stocks with low idiosyncratic volatility. Thus it is possible that the institutional ownership results obtained from model (1) are contaminated with proxy effects. To ascertain the validity of the contamination issue, we orthogonalize the independent variables using a modified Gram–Schmidt (Golub and Van Loan (1989)) procedure. We orthogonalize the variables in the following order: constant, size, variance, beta, and institutional ownership. The ordering of the variables is important as the full effect of each variable is extracted from the following variable. For example, the procedure removes the effect of the constant from size and then removes the effects of the constant and size from variance. The procedure continues until the effects of the constant, size, variance, and beta are removed from institutional ownership. Cross-sectional results for model (1) are estimated using the orthogonalized variables. The Fama–MacBeth time-series statistics are then computed from the cross-sectional estimates. In the interest of brevity, the results are not tabulated.

The results obtained from the reestimation do not markedly differ from those in Table III. For example, on equal-weighted days, larger firms experience larger abnormal returns. The point of the orthogonalization proce-

dure, however, is to verify that the aggregated and segregated institutional ownership variables are robust to the proxy critique. The reestimated institutional ownership coefficients confirm that institutional ownership variables are related to the event-day abnormal return. The results obtained from the reestimation suggest that the relationship between the event-day abnormal return and institutional ownership is not the result of size or variance proxy effects. The results for the value-weighted days are quantitatively and qualitatively similar to the equal-weighted days.

We also examine the robustness of the regression specification by estimating model (1) with alternate specifications of the dependent variables. We replace the market value of equity with the book value of total assets and the variance with the total return variance. Finally, we include two-digit SIC dummies. For brevity, the results are not reported. The results from the alternate specifications are quantitatively and qualitatively similar to those obtained from the original specification.

IV. Empirical Findings: Turnover

The return analysis results are supportive of our hypothesis that institutional investors react strongly to large market price changes. One possible source of the relationship between the event-day abnormal returns and institutional ownership is the volume of trade. If institutional investors panic on event-days and initiate more sells than buys, this could lead to the observed larger price movements for institutional-investor-dominated stocks. Here we investigate the relationship between turnover and ownership structure on the event-days.

A. Univariate Comparisons

As shown in Table II, the turnover for firms with high institutional ownership is larger than the turnover for firms with low institutional ownership. We know, however, that stocks with greater institutional ownership are more liquid. Consequently, a comparison of the turnover of high and low institutional ownership stocks provides little insight, so we compare the *abnormal* turnover of firms with high and low institutional ownership. We define abnormal turnover as event-day turnover minus median turnover for days $[-250, -50]$. For value-weighted days, mean (median) abnormal turnover is 0.1447 (0.0087) percent. This indicates that event-days are associated with increased trade volume. As with the return univariate analysis, we also calculate these statistics for subsamples partitioned by the median level of institutional ownership. For value-weighted days, mean (median) abnormal turnover for the low institutional ownership portfolio is 0.1066 (0.0000) percent while the mean (median) abnormal turnover for the high institutional ownership portfolio is 0.1817 (0.0247) percent. We perform a t-test and a simple sign test to determine if the means and medians for the high and low institutional ownership portfolios are equal. Equality of the means and medians is rejected at the one percent level.

The reported values are somewhat difficult to interpret, since firms with high institutional ownership already have high turnover. This means that an x percent increase in turnover on the event-day for all firms would manifest itself in a higher abnormal turnover for those firms with higher institutional ownership. To address this issue, we scale abnormal turnover by dividing it by median turnover for days $[-250, -50]$. For value-weighted days, median scaled abnormal turnover is approximately 16 percent. Median scaled abnormal turnover is 6 percent for the low institutional ownership portfolio and 22 percent for the high institutional ownership portfolio. We perform a simple sign test to determine if median scaled abnormal turnovers for the high and low institutional ownership portfolios are equal. Equality of the medians is rejected at the one percent level. The results for the value-weighted days and equal-weighted days are quantitatively and qualitatively similar. While the difference in abnormal turnover is supportive of our hypothesis, it is not conclusive. It is possible that the observed pattern in abnormal turnover is the result of a concentration of larger firms in the high institutional ownership portfolio. We address this possibility next.

B. Regression Evidence

The estimation of a model relating abnormal turnover to the variables *size*, *variance*, and *io* faces the same problem as the estimation of model (1). Namely, if we estimate a pooled time-series cross-sectional regression, the contemporaneous correlation between residuals could understate the true standard errors for the coefficient estimates. Furthermore, due to the fact that we have many more firms than days, Generalized Least Squares is not feasible. Again, our approach is to use the technique of Fama and MacBeth (1973). We estimate the following cross-sectional regression for each event-day:

$$aturn_i = \gamma_0 + \gamma_1 size_i + \gamma_2 variance_i + \gamma_3 io_i + \epsilon_i, \tag{2}$$

and use the time-series average of the estimated cross-sectional coefficients to make our inferences. The dependent variable is event-day abnormal turnover for firm i. Turnover is defined as the ratio of shares traded to total shares outstanding, and abnormal turnover is defined as the turnover for firm i less the median turnover for days $[-250, -50]$.[6] Using abnormal turnover as the dependent variable controls for the fact that stocks that normally have a high turnover would have a high turnover on the event-day. The independent variables *size*, *variance*, and *io* have the same definitions as in model (1) in Section III. The rationale for including size and variance in the turnover regression is due to the institutional preference for large firms with high idiosyncratic volatility discussed in Section III.

[6] The Nasdaq daily shares traded (volume) is halved to more closely reflect investor to investor trade. There is no market-wide algorithm to obtain an exact transformation of Nasdaq volume. Atkins and Dyl (1997) find, however, that halving the reported volume is a good approximation.

The essential independent variable of interest is the level of institutional ownership. We include this variable to ascertain if the cross-sectional distribution of abnormal turnover is related to the level of institutional ownership. If the institutional ownership variable is significant, this would suggest that institutional investors react to large market price changes. As with the return regressions, we estimate model (2) with both total institutional ownership (*io*), and institutional ownership decomposed in four different categories: (1) mutual funds and investment advisors, (2) pension funds and endowments, (3) insurance companies, and (4) banks. Mutual funds are the most active institutional investors in terms of trading. Thus, it is possible that firms whose institutional ownership is heavily weighted with mutual funds experience larger abnormal turnover.

The results from the estimation of model (2) are presented in Table IV. To parallel the discussion of the return regression, we will discuss the equal-weighted up days' results. The results for the equal-weighted down days and value-weighted days are quantitatively and qualitatively similar. In general, size and variance are not related to abnormal turnover. In results not reported, we also estimate the model using the firm's turnover as the dependent variable, and control for median turnover on the right-hand side of the equation. In this specification, all three variables, size, variance, and institutional ownership, are statistically significant. Hence, while using abnormal turnover rather than turnover as the dependent variable creates orthogonality between both size and variance; the dependent variable, institutional ownership, is statistically significant in both cases.

In Table IV, the institutional ownership coefficient is positive and highly significant for both equal-weighted up and down days. This suggests that firms with greater institutional ownership have larger abnormal turnover on the event-days. This is supportive of our hypothesis that institutions react to a large market price change. While the coefficient is highly statistically significant, it also has a substantive economic effect. For equal-weighted up days, the average predicted abnormal turnover has a mean of 10.9 basis points and a standard deviation of 5.6 basis points. Holding all else constant, the difference in predicted abnormal turnover for a firm with institutional ownership in the 25th percentile and a firm in the 75th percentile is $0.00232(0.287 - 0.023) = 6.1$ basis points, or over one standard deviation of abnormal turnover. This indicates that the level of institutional ownership has a large effect on the magnitude of a firm's turnover on event-days.

When institutional ownership is segregated into the four subcategories, we find that the estimated coefficient of the percentage of mutual fund ownership is positive and significant for both equal-weighted up and down days. In contrast, the estimated coefficient of the percentage of bank ownership is negative and significant. In addition to being statistically significant, the estimated coefficient of the mutual fund ownership variable is also two to six times as large as the coefficient of the other classes of institutional ownership. This suggests that different types of institutions exhibit different

Table IV

Event-Day Abnormal Turnover Regressions on Institutional Ownership and Control Variables

This table contains coefficient estimates from Fama–MacBeth regressions using the following model:

$$aturn_i = \gamma_0 + \gamma_1 size_i + \gamma_2 variance_i + \gamma_3 io_i + \epsilon_i.$$

The dependent variable is the event-day abnormal turnover, defined as the turnover for firm i on day t less the median turnover for days $[-250, -50]$. The event-day is defined as a day when the absolute value of the return of the CRSP equal-weighted or value-weighted NYSE/AMEX/Nasdaq portfolio exceeds two percent. The independent variables are *size*, which is the natural logarithm of the market value of equity 50 days prior to the event-day; *variance*, which is the market model residual variance for days $[-250, -50]$; and *io*, which is the percentage of a firm's outstanding shares held by 13(f) institutions. Results are reported with *io* both aggregated and segregated into banks (*bhold*), insurance companies (*ihold*), pension funds and endowments (*phold*), and mutual funds (*mhold*). Subsamples are formed by partitioning the data into value-weighted and equal-weighted up and down days. The table also reports the t-statistic corresponding to a test of the mean being different from zero, the minimum coefficient estimate, and the maximum coefficient estimate. There are 6, 10, 13, and 17 days in the equal-weighted up, equal-weighted down, value-weighted up, and value-weighted down subsamples, respectively. Coefficient estimates are multiplied by 100.

	Up Days				Down Days			
	Mean	t-stat	Min	Max	Mean	t-stat	Min	Max
	Panel A: Equal-Weighted Days, Aggregated Institutional Ownership							
size	−0.007	−0.87	−0.031	0.015	0.000	0.06	−0.014	0.010
variance	1.267	0.36	−13.343	13.051	−0.016	−0.03	−2.342	2.637
io	0.232	4.52	0.047	0.423	0.171	6.68	0.083	0.334
	Panel B: Equal-Weighted Days, Segregated Institutional Ownership							
size	−0.003	−0.34	−0.029	0.021	0.004	2.02	−0.007	0.014
variance	1.672	0.47	−12.782	13.155	0.361	0.69	−2.083	3.224
bhold	−0.053	−1.97	−0.165	0.007	−0.148	−2.98	−0.446	0.063
ihold	−0.002	−0.03	−0.333	0.294	−0.041	−0.53	−0.230	0.598
phold	0.012	0.21	−0.184	0.201	0.126	2.77	−0.121	0.396
mhold	0.364	4.47	0.108	0.714	0.302	6.49	0.118	0.571
	Panel C: Value-Weighted Days, Aggregated Institutional Ownership							
size	−0.001	−0.59	−0.015	0.015	−0.003	−1.56	−0.019	0.010
variance	−0.252	−0.39	−3.220	3.813	−0.366	−0.85	−3.137	3.793
io	0.210	6.52	0.030	0.423	0.158	7.93	0.052	0.361
	Panel D: Value-Weighted Days, Segregated Institutional Ownership							
size	0.001	0.50	−0.011	0.021	−0.001	−0.32	−0.017	0.014
variance	−0.030	−0.05	−2.955	4.113	−0.153	−0.36	−2.894	3.734
bhold	−0.029	−0.72	−0.344	0.170	−0.094	−2.11	−0.532	0.152
ihold	−0.004	−0.13	−0.185	0.243	0.027	0.29	−0.398	1.329
phold	0.078	1.24	−0.425	0.435	0.092	1.29	−0.227	0.752
mhold	0.322	5.87	0.065	0.712	0.251	6.81	−0.006	0.573

trading behavior on volatile days: Mutual fund managers trade more than normal while managers of bank trust funds trade less than normal. This is consistent with the notion that mutual fund managers herd, while bank trust fund managers, who are not subject to the same amount of public scrutiny as mutual fund managers, do not necessarily herd.

Overall, the regression results are consistent with our prediction that the cross-sectional distribution of abnormal turnover on the event-days is related to both the *level* and *composition* of a firm's institutional shareholder base. Our evidence suggests that institutions, especially mutual funds, herd together and trade with the momentum of the market on days when there are large stock market price changes.

C. Robustness Tests

The estimated coefficients for model (2) are subject to the same empirical issues as model (1). Specifically, they could be driven by the correlation between independent variables or the proxies used for the independent variables. In this section, we subject the model for the event-day abnormal turnover to the same robustness tests that we used for the model for the event-day abnormal return.

The turnover results are also subject to the same possible proxy effects as the abnormal return regressions. To establish the robustness of our results, we repeat the orthogonalization process outlined in Section III for the turnover model. Again, in the interest of brevity the results are not tabulated. The results obtained from the reestimation do not markedly differ from those in Table IV. The purpose of the orthogonalization procedure is to verify that the institutional ownership variables are robust to the proxy critique. The reestimated institutional ownership coefficients confirm that institutional ownership is related to the event-day abnormal turnover. The results obtained from the reestimation suggest that the relationship between the event-day turnover and institutional ownership is not the result of size or variance proxy effects. The results for the value-weighted days are quantitatively and qualitatively similar to the equal-weighted days.

As we did with model (1), we also examine the robustness of the regression specification by estimating model (2) with alternate specifications of the independent variables. We replace market value of equity with the book value of total assets and variance with total return variance. Finally, we include two-digit SIC dummies. For brevity the results are not reported. The results from the alternate specifications are quantitatively and qualitatively similar to those obtained from the original specification.

Finally, as discussed in Section IV.A, it is possible that our results stem from the fact that firms with high institutional ownership already have high turnover; thus, we would expect them to have high abnormal turnover as well. As another check, we use abnormal turnover divided by median turnover for days $[-250, -50]$ as the dependent variable and reestimate model (2). The results do not change sign or significance.

V. Postevent Performance

Although the absolute value of the returns of firms with higher amounts of institutional ownership exceed those with lower amounts of institutional ownership on event-days, it does not necessarily imply that institutional herding increases volatility and causes prices to deviate from their fundamental values (Lakonishok et al. (1992)). The returns on stocks with high institutional ownership could be more negative (positive) than those with low institutional ownership on down (up) days because institutions are more informed than individuals and react to a signal by driving prices to their fundamental values faster than individuals. If this is the case, then we should observe no significant abnormal return for stocks primarily owned by institutions during the period immediately following the event-day. To examine this issue, we compute postevent cumulative returns for six months (125 trading days) starting the day after the event-day for each stock.

The results for the equal-weighted days are shown in Table V. The results for value-weighted days are qualitatively similar to the equal-weighted days and are not presented. Panel A presents the results from the up days, and Panel B presents the results from the down days. We will discuss the results in Panel B first. Firms are divided into quintiles based on their percentage of institutional ownership, *io*. The first two rows of each panel contain the average percentage of institutional ownership and the mean event-day return for firms in each quintile. The third row contains the post-event-day return, defined as the equally weighted mean return from day $t + 1$ to day $t + 125$ for firms in each ownership quintile for all event-days. As before, we see that the firms in the highest quintile of institutional ownership have an event-day average return of -2.88 percent, the most negative of all the quintiles. While the event-day return is the most negative, the postevent cumulative return for these firms is 12.94 percent, the highest of all the quintiles. This suggests that institutions may have oversold on the event-day, driving prices below their fundamental values.

Institutions, however, own firms with the largest capitalizations, so the postevent superior returns of firms with large institutional ownership could simply be driven by the superior performance of large firms relative to small firms. To control for this, we examine postevent abnormal returns, which are constructed as follows. Let t denote the event date and r_{it} be the postevent six-month return for firm i. A postevent abnormal return for firm i at time t is computed by subtracting the postevent median six-month return for all firms in the same size-quintile as firm i from r_{it}. Next, the mean of the abnormal returns for all firms in the same institutional ownership quintile at time t is computed. Since there are five quintiles, this results in five observations for each event-day t. Finally, for each institutional ownership quintile, a mean and standard error are computed from each of these time-series observations. Since size appears to be a priced risk factor (Fama and French (1992)) and institutional ownership is highly correlated with size, this procedure should remove any size bias from the results. The mean size-

Table V

Postevent Performance of Firms by Institutional Ownership

This table contains post-event-day returns for firms in quintiles ranked by institutional ownership for the period from January 1, 1988, to December 31, 1996. An "event" is a day when the absolute value of the return on the CRSP value-weighted index is more than two percent. The event-day return is the equally weighted mean return in each ownership quintile for all event-days. The postevent six-month return is the mean cumulative return for all firms in each ownership quintile over the 125 trading days following each event. The postevent abnormal return for firm i is the six-month return for firm i less the median six-month return for all firms that fall in the same size quintile as firm i on the event-day. The abnormal return is also presented for observations that are separated by at least six months and therefore are independent. The t-statistics correspond to a test of a null hypothesis that the mean is zero.

Institutional Ownership Quintile:	1	2	3	4	5
Panel A: Equal-Weighted Up Market					
Average institutional ownership (%)	1.00	6.50	16.70	32.80	59.50
Event-day return (%)	1.08	1.47	1.48	1.89	2.52
Postevent return (%)	15.03	17.27	17.20	16.67	15.67
Postevent abnormal return (%)	−3.78	−0.55	1.15	1.55	2.05
t-statistic	−4.57	−0.81	5.51	3.93	2.34
Postevent abnormal return, indep (%)	−2.88	−0.23	0.84	1.16	1.28
t-statistic	−3.38	−0.21	1.74	2.33	1.43
Panel B: Equal-Weighted Down Market					
Average institutional ownership (%)	1.10	7.10	17.90	34.60	61.40
Event-day return (%)	−1.19	−1.76	−2.11	−2.48	−2.88
Postevent return (%)	4.70	6.58	8.92	10.95	12.94
Postevent abnormal return (%)	−3.13	−1.32	0.34	1.59	2.86
t-statistic	−4.00	−3.54	0.97	4.05	5.38
Postevent abnormal return, indep (%)	−1.69	−1.00	0.66	0.51	1.45
t-statistic	−2.12	−1.75	1.45	0.99	2.74

adjusted abnormal return for the quintile with the largest amount of institutional ownership is 2.86 percent and is statistically significant. Hence, even after adjusting for size, the postevent returns of firms that have high institutional ownership appear to be abnormally high, suggesting that these firms were oversold on the event-day.

Since we are looking at six-month postevent returns, it is possible that the overlapping time periods induce correlated abnormal returns and that the t-statistics are overstated. In Table V, we repeat the analysis using only observations that are at least six months apart and therefore are nonoverlapping and independent. To select this subsample, we order the event-dates chronologically and include the first event-day in the subsample. We then select the next event-day that is at least six months in the future and include that one in the sample. Starting from the date just selected, we choose the next event-day at least six months in the future and include it in the sample. We repeat this procedure until the end of the sample period is reached. The results in Table V indicate that there is still a significantly positive

(negative) postevent abnormal return for the firms with the highest (lowest) amounts of institutional ownership. Since there are many combinations of dates that are at least six months apart, we form subsamples using all possible combinations of dates and the results are similar to those in Table V.

As another robustness check, we compute abnormal returns by sorting firms by beta instead of size and compute beta-adjusted abnormal returns using the same procedure as we did for size. The betas were computed using daily returns for the firm and the value-weighted market for days [−250, −50]. Our results do not change: The portfolio with the highest concentration of institutional ownership has an abnormal return of 3.1 percent and the abnormal return is statistically significantly different from zero at the one percent level (p-value of 0.012). Also, our results using beta-adjusted instead of size-adjusted abnormal returns are still significant when we use nonoverlapping observations.

The results presented for the equal-weighted up market in Panel A tell a different story. If institutions herded and pushed prices above their fundamental values on days when the market went up by a large amount, we would expect to see subsequent negative abnormal returns as the prices adjusted downward to their true values. The evidence in Panel A suggests the opposite. The quintile with the highest institutional ownership has a statistically significant postevent abnormal return of 2.05 percent. This suggests that institutions may underreact when the market rises sharply. Since the stocks that are in the highest quintile of institutional ownership are also the most liquid, this effect is not due to lack of liquidity and nonsynchronous prices. However, when we repeat the analysis using nonoverlapping observations of the abnormal return, the postevent abnormal return for the highest quintile of institutional ownership loses statistical significance. Therefore, the results for the up market are somewhat inconclusive in that the statistical significance of the postevent abnormal return may be an artifact of the correlation between postevent returns.

VI. Conclusion

We present evidence that supports the notion that institutions react more strongly than individuals when the absolute value of the return on the market is large on any given day. The magnitude of a firm's market-adjusted returns and abnormal turnover is related to the percentage of shares held by institutions. Furthermore, the type of institutional owner seems to matter. Ownership by mutual funds, investment advisors, pension funds, and endowments is positively related to turnover on event-days, and is positively related to abnormal returns on up-market days, and negatively related to abnormal returns on down-market days. This evidence is consistent with our conjecture that since fund managers are evaluated more frequently than other types of managers and the focus is on short-term performance, they have a larger incentive to "run with the herd" than do other types of institutional managers. In contrast to ownership by mutual and pension funds,

ownership by banks is negatively (positively) related to abnormal returns on up (down)-market days. Finally, we find that on event-days when the market's return is negative, subsequent abnormal returns for portfolios with high institutional ownership are positive, which suggests that event-day selling by institutions drives prices below their true values.

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