THE JOURNAL OF FINANCE • VOL. LXVI, NO. 2 • APRIL 2011

The Interim Trading Skills of Institutional Investors

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ABSTRACT

Using a large proprietary database of institutional trades, this paper examines the interim (intraquarter) trading skills of institutional investors. We find strong evidence that institutional investors earn significant abnormal returns on their trades within the trading quarter and that interim trading performance is persistent. After transactions costs, our estimates suggest that interim trading skills contribute between 20 and 26 basis points per year to the average fund's abnormal performance. Our findings also indicate that any trading skills documented by previous studies that use quarterly data are biased downwards because of their inability to account for interim trades.

FINANCIAL ECONOMISTS OFTEN refer to institutional investors as "informed" traders, and individuals attempting to trade in the same markets as institutions are likened to "tourists playing poker with professionals in the smoky backroom of a Las Vegas casino."[1] In spite of this conventional wisdom, empirical evidence on institutional investors' ability to generate positive abnormal returns is mixed. On the one hand, Jensen (1968), Gruber (1996), Carhart (1997), Wermers (2000), and Fama and French (2010) find that actively managed mutual funds underperform passive benchmarks after fees. On the other hand, a number of studies provide evidence that a subset of mutual funds seems to possess superior skill.[2] Furthermore, while the presence of skilled institutions suggests that past winners should continue to outperform, the literature is ambiguous about whether superior performance persists over adjacent periods.[3]

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[1] Excerpt taken from "Individual Investors See Red, Prof. Terry Odean Finds," June 5, 2007, Hass Newsroom.

[2] Studies that show at least some fund managers are skilled include Cohen, Coval, and Pástor (2005), Kacperczyk, Sialm, and Zheng (2005), Mamaysky, Spiegel, and Zhang (2008), Kacperczyk and Seru (2007), and Cremers and Petajisto (2009).

[3] Studies that find persistence in relative performance include Grinblatt and Titman (1992), Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann

Prior findings that institutional investors possess little, if any, investment skill are economically troubling, since portfolio managers are highly compensated by the market.

A number of recent studies investigate institutional investors' stock-picking skills more directly by examining the performance of their trades.[4] Chen, Jegadeesh, and Wermers (CJW, 2000), Kacperczyk, Sialm, and Zheng (KSZ, 2005), and Alexander, Cici, and Gibson (2007) find that the stocks that mutual funds purchase earn significantly higher returns than the stocks they sell, although subsequent studies (e.g., Duan, Hu, and McLean (2009)) find that this trading performance has declined or even reversed during more recent time periods. Alternatively, Bennett, Sias, and Starks (2003), Cai and Zheng (2004), and Yan and Zhang (2009) find conflicting results on whether institutional trading predicts future stock returns. Because institutional trading data are not publicly available, previous studies that examine trading performance have used changes in quarterly institutional holdings to proxy for trading activity,[5] and there are at least two important limitations of this proxy. First, changes in quarterly holdings data do not capture intraquarter transactions where funds purchase and sell or sell and repurchase the same stock (hereafter, round-trip trades). Second, quarterly holdings do not identify the exact timing or execution price of trades. Studies that use quarterly data commonly assume that all trades occur at the end of the quarter, but in fact they could occur at any time within the quarter. Imprecision in the identification and estimated timing (and therefore execution price) of trades might limit researchers' ability to identify superior trading skills if trades are motivated by short-lived private information and profitable trading opportunities dissipate quickly (Kothari and Warner (2001)).[6]

Our study contributes to the current trading skill debate by using actual institutional trades to examine the trading performance of institutions. We overcome the limitations of quarterly institutional holdings data by using a proprietary database of institutional trades provided by ANcerno Ltd. (formerly the Abel Noser Corporation). The ANcerno data are uniquely suited for answering questions related to trading skill, since they identify the exact date

(1995), Elton, Gruber and Blake (1996), Bollen and Busse (2005), Busse and Irvine (2006), and Kosowski et al. (2006). However, Carhart (1997), Busse, Goyal, and Wahal (2010), and a previous version of Fama and French (2010) find that performance persistence is weak to nonexistent after controlling for momentum and is sensitive to the methodology employed.

[4] Kothari and Warner (2001) use simulation procedures to show that analyzing mutual funds' stock trades substantially improves power to detect abnormal performance.

[5] Several studies use high-frequency data to examine whether institutional trading predicts future stock returns. Griffin, Harris, and Topaloglu (2003) identify institutional trades by using the brokerage firm involved, whereas Campbell, Ramadorai, and Schwartz (2009) use a complex algorithm to infer institutional trades in TAQ. However, both of these studies measure institutional trades with noise and neither is able to distinguish the trades of different institutions either in the cross section or over time.

[6] To quantify the magnitude of the potential measurement error in the execution price of trades, we investigate the difference between the intraquarter high and low price for all CRSP stocks during the 1999 to 2005 sample period. On average, the intraquarter price range is 41.42%.

and execution price of each transaction and allow us to distinguish the trades of each institution (and funds within these institutions) both in the cross-section and over time.

The primary objective of our paper is to examine the performance of funds' trades during the quarter in which they occur. Our analysis of interim trades is important since, by definition, the within-quarter performance of these trades cannot be captured using quarterly data. Our investigation is inspired by KSZ (2008), who show that unobserved mutual fund actions within the quarter (including interim trades) are important, persistently create value for some funds, and predict future abnormal fund performance. Although it is not possible for KSZ (2008) to fully disentangle the benefits and costs of all unobserved actions, they argue that interim trades "create sufficient value to offset trading costs and other hidden costs of fund management" (p. 2380). Our study builds on the findings of KSZ (2008) by directly analyzing the performance of interim trades. Our analysis is also motivated by Elton et al. (2010) and Elton, Gruber, and Blake (2010), who show that when higher-frequency (i.e., monthly) holdings are used to investigate window dressing, tax-loss selling, tournament behavior, and timing ability, conclusions are very different from those obtained using quarterly data. In a similar spirit, we provide evidence on the existence, persistence, and sources of interim trading skill, and we show that these results change rather dramatically when quarterly data are used.

If institutional trades are motivated by short-lived private information, we might expect funds to reverse their trades in order to lock in gains (Hirshleifer, Subrahmanyam, and Titman (1994)). As such, we begin our empirical analysis by investigating trades that are reversed within the trading quarter (i.e., intraquarter round-trip trades). We find that round-trip trades account for nearly a quarter of all trades in our sample, and, more importantly, we find strong evidence of round-trip trading skill. For the average fund in our sample, the abnormal holding-period return for round-trip trades is 1.80% (t-statistic = 3.27). We also investigate the persistence of round-trip trading performance and find that the quintile of funds with the best past trading performance significantly outperforms the quintile of funds with the worst past trading performance in the four quarters following portfolio formation.

While round-trip trades are an important component of trading performance, our round-trip analysis does not consider all trades that occur within the quarter. Moreover, if institutional investors are influenced by the disposition effect (Odean (1998)) or if their portfolios are subject to rebalancing requirements, the abnormal performance of round-trip trades might be biased upwards. To provide a more comprehensive measure of interim trading skill, we track the abnormal performance of all stocks that a fund buys and sells from the execution date (using the execution price) until the end of the quarter, and we refer to the performance difference between buys and sells as *interim trading performance*. For the average fund in our sample, the stocks that a fund buys outperform the stocks that it sells by 0.74% (0.57%) using equal- (principal-) weighted averages, suggesting that institutional investors in our sample have superior interim trading skills. To examine whether this performance is

persistent, each quarter we sort funds into quintiles based on their interim trading performance. Subsequent quarter interim trading performance is 1.56% (t-statistic = 5.69) for high-performance funds, compared to −0.33% (t-statistic = −1.49) for low-performance funds. Our results that trading skill persistence is significant and almost entirely driven by high-performance funds contrast with CJW (2000) and Carhart (1997), who show that persistence, when it exists, is driven by past underperforming funds that charge high fees.

High-frequency trading data are necessary to investigate interim trading performance; however, it is not clear whether our results and inferences differ from those that would obtain if we were to use coarser proxies for institutional trading (i.e., changes in quarterly holdings). This question is particularly relevant for future research that relies on low-frequency quarterly ownership data to investigate institutional trading activities. To highlight the importance of using high-frequency data in our investigation, we reconstruct our analysis using "implied" quarterly trades. Specifically, for each fund and stock we aggregate all trades within the quarter and calculate net trading positions as of the quarter-end. We then track the abnormal performance of these implied quarterly trades over the subsequent quarter in a manner similar to CJW (2000). We find that the equal- (principal-) weighted implied quarterly trading performance is −0.33% (−0.24%), and implied quarterly trading performance is not persistent. These results contrast starkly with our interim trading performance results and suggest that had we conducted our analysis at the quarterly frequency (i.e., ignoring round-trip trades and the timing of each trade), we would conclude that the funds in our sample have no (or even negative) trading skills.

To better understand the sources of superior interim trading skills, we explore whether interim trading performance varies systematically across firm characteristics such as size, book-to-market, turnover, idiosyncratic volatility, and liquidity. To the extent that superior interim trading performance results from private information, we conjecture that profitable trading opportunities are more likely to arise in stocks where the public information environment is more limited, greater information asymmetries exist, or limits to arbitrage are higher. On the other hand, we also recognize that funds will be able to trade profitably only if the value of their private information is large enough to overcome the higher liquidity costs that are associated with these types of stocks. We find that interim trading performance is significantly more positive in stocks with high idiosyncratic volatility and in illiquid stocks. We further show that superior interim trading performance does not result from compensation for liquidity provision. In fact, consistent with Campbell, Ramadorai, and Schwartz (2009), we find that high-skill funds experience higher implicit trading costs than low-skill funds, suggesting that high-skill funds are more likely to demand (rather than provide) liquidity in their trades. Taken together, our results are most consistent with institutions being able to exploit temporary mispricing in situations in which information asymmetry and limits to arbitrage are high.

Overall, our study contributes to the investment skill debate by showing that institutional investors have significant interim trading skills, these trading skills are persistent, and this persistence is driven by high-skill funds. Our interim trading performance results are significantly different from quarterly studies that examine trading skill (e.g., CJW (2000)). Because interim trading performance is orthogonal to quarterly trading performance measures, our results suggest that prior studies understate the trading skills of institutional investors.

One limitation of the ANcerno database is that it does not contain information on management fees or fund returns. Thus, we cannot ascertain whether interim trading performance accrues to underlying investors or is captured as rents by portfolio managers. To provide some insight concerning the implications of our results for overall fund performance, we make a back-of-the-envelope calculation. We document (in Table III) that the stocks institutions buy outperform the stocks institutions sell by 27 to 34 basis points after commissions. Assuming this outperformance accrues to the fund and assuming an average turnover rate of 75% per year, we show that interim trading performance contributes between 20 and 26 basis points to the annual abnormal returns of the portfolio. This amount is roughly a quarter of the average management fee for equity mutual funds, which we assume to be about 1%. As such, our results are consistent with Grossman and Stiglitz (1980), who show that informed traders earn abnormal returns from their trading when information acquisition is costly.

The remainder of the paper proceeds as follows. Section I discusses our data, Section II presents the methodology, Section III reports our empirical results, and Section IV concludes.

I. Data

A. Data, Sample, and Summary Statistics

We obtain institutional trading data for the period from January 1, 1999 to December 31, 2005 from ANcerno Ltd. ANcerno is a widely recognized consulting firm that works with institutional investors to monitor their equity trading costs. ANcerno clients include pension plan sponsors such as CalPERS, the Commonwealth of Virginia, and the YMCA retirement fund, as well as money managers such as Massachusetts Financial Services (MFS), Putman Investments, and Lazard Asset Management.[7]

The ANcerno data offer significant advantages over other high-frequency trading data that make them uniquely suited for investigating institutional investor trading skill and trading skill persistence. Conversations with ANcerno confirm that the database captures the complete transaction history for institutions in the sample; data available for each transaction include an identity

[7] Previous academic studies that use ANcerno data include Goldstein et al. (2009), Chemmanur, He, and Hu (2009), Goldstein, Irvine, and Puckett (2010), Jame (2010), Puckett and Yan (2010), and Busse, Green, and Jegadeesh (2010).

code for the institution, an identity code for the fund within each institution, the date of execution, the stock traded, the number of shares executed, the execution price, commissions paid, and whether the execution is a buy or sell. Identity codes for both the institution and fund provide unique identification in the cross section and time series, which is not available in other high-frequency data such as TAQ or Plexus.[8] We provide a more detailed description of the ANcerno database, how the data are delivered from institutions to ANcerno, and the variables contained in the database in the Appendix at the end of the paper.

Institutional coverage in the ANcerno database is quite broad. The database contains a total of 840 different institutions during our sample period and allows us to reliably track 3,816 different funds within those institutions. Institutions in the ANcerno database are responsible for approximately 87 million trades involving more than $22.9 trillion (755 billion shares) in trading volume. On average, this trading activity accounts for approximately 8% of the dollar value of CRSP trading volume during the 1999 to 2005 sample period.[9] Assuming that institutional investors, in aggregate, are responsible for 80% of CRSP trading volume, we estimate that ANcerno institutions account for 10% of all institutional trading volume. Thus, while the ANcerno data capture the activities of a subset of pension and money managers, the subset represents a significant fraction of total institutional trading volume.

Summary statistics for the ANcerno trading data are presented in Panel A of Table I. Of the 3,816 funds that we can reliably track in the database, 227 are money manager funds and 3,589 are pension funds. While the number of money manager funds is small relative to pension funds, money manager funds are responsible for more than half of the trading volume in the database. The total number of different stocks traded by ANcerno funds ranges from 4,692 in 2002 to 6,150 in 1999, while the average dollar volume per trade varies from $423,726 in 2000 to $206,902 in 2005. The median dollar volume per trade is almost an order of magnitude smaller than the mean, ranging from $60,030 in 1999 to $14,232 in 2005, and, consistent with Campbell, Ramadorai, and Schwartz (2009), suggests that institutional trade sizes are likely to be either very large or very small.

We collect stock and market data from CRSP, Compustat, and TAQ to complement our analysis of ANcerno trade data. We obtain stock returns, share price, trading volume, and shares outstanding from CRSP and book value of equity from Compustat, and we estimate quoted spreads from TAQ. Summary

[8] TAQ data, for example, do not provide any type of investor identification, while the Plexus database (a competitor of ANcerno) changes anonymous institutional identifiers each month, making it impossible to track the performance of particular institutions over time. Studies using the Plexus database include Chan and Lakonishok (1995) and Jones and Lipson (2001).

[9] We calculate the ratio of ANcerno trading volume to CRSP trading volume during each day of the sample period. We include only stocks with sharecode equal to 10 or 11 in our calculation. In addition, we divide all ANcerno trading volume by two, since each individual ANcerno client constitutes only one side of a trade. We believe this estimate represents an approximate lower bound for the size of the ANcerno database.

Table I

Descriptive Statistics for ANcerno Institutional Trading Data and Stock Characteristics

Institutional trading data are obtained from ANcerno Ltd., and the trades in the sample are placed by 840 institutions during the period from January 1, 1999 to December 31, 2005. Panel A presents descriptive statistics for the ANcerno institutional trading data for each year of our sample period. Panel B reports descriptive statistics for stocks traded by ANcerno institutions. We obtain share price, total shares outstanding, stock returns, and trading volume from the CRSP stock database. Our sample includes only common stocks (those with a sharecode of 10 or 11 in CRSP). We obtain book value of equity from Compustat. Quoted spreads are from the TAQ database. Idiosyncratic volatility is the standard deviation of residuals for regressions of daily stock returns on market returns. Amihud illiquidity measure is constructed as the average of daily ratios between absolute return and dollar trading volume. We compute stock characteristics each quarter. Market capitalization and book-to-market ratio are as of the end of the previous quarter. All other stock characteristics are measured based on the 12-month period until the end of the previous quarter. We report the time-series mean, median, standard deviation, maximum, and minimum of quarterly cross-sectional averages for all stock characteristics.

Panel A: ANcerno Data

	1999	2000	2001	2002	2003	2004	2005
Total number of funds	1,846	1,699	1,733	1,717	1,600	1,545	1,241
Total number of institutions	382	376	404	430	405	406	376
Median number of funds per inst.	4	4	4	4	4	3	3
Total number of stocks	6,150	5,906	5,082	4,692	4,736	4,927	4,763
Total number of trades (millions)	5.64	7.56	9.05	12.32	12.35	21.43	19.10
Total share volume (billion)	50.69	73.44	100.99	135.04	112.30	155.92	127.40
Total dollar volume ($trillion)	2.25	3.20	3.06	3.23	2.76	4.46	3.95
Average share volume per trade	8,988	9,714	11,159	10,961	9,093	7,276	6,669
Median share volume per trade	1,700	1,500	1,400	1,300	1,050	700	453
Average dollar volume per trade	398,803	423,726	337,633	262,359	223,126	208,027	206,902
Median dollar volume per trade	60,030	54,970	39,200	30,300	27,297	20,568	14,232

Panel B: Stock Characteristics

	Mean	Median	*SD*	Maximum	Minimum
Market capitalization ($billion)	2.67	2.76	0.34	3.28	2.03
Book-to-market ratio	0.51	0.49	0.06	0.63	0.43
Lagged 12-month return (%)	4.31	2.38	19.11	57.78	−24.83
Turnover (%)	163.42	158.39	15.84	195.98	143.13
Idiosyncratic volatility (%)	47.93	49.71	11.28	65.30	31.09
Amihud illiquidity measure ($\times 10^4$)	0.22	0.15	0.14	0.58	0.09
Quoted spread (%)	0.06	0.04	0.04	0.14	0.02

statistics for the sample of stocks traded by ANcerno institutions are reported in Panel B of Table I. The mean market capitalization of securities traded by ANcerno institutions is $2.67 billion, while the average book-to-market ratio is 0.51. In addition, we find that our sample stocks have a mean turnover of 163% per year and an average quoted spread of 0.06%.

B. Database Integrity

Issues of survivorship and selection bias are of primary concern with any proprietary database, and we investigate both of these potential biases as they relate to the ANcerno trading data. We believe that survivorship bias is not a concern in the ANcerno database for at least three reasons. First, ANcerno representatives have told us directly that the database is free of survivorship bias. Second, if the ANcerno data contain only surviving institutions, we would expect all sample institutions to be present at the end of our sample period. However, we observe many institutions that are present during a portion of the sample period but no longer present in the data set in December 2005. Finally, the method by which the data were delivered to us prevents survivorship bias for most of the sample period. Specifically, in May 2003 we were provided with data for the 1999 to 2002 sample period. ANcerno provided subsequent annual updates every year thereafter, and since we already had the earlier data, ANcerno did not have the ability to retroactively delete nonsurviving institutions.

The first form of potential selection bias that we investigate relates to whether institutions that choose to become ANcerno clients might differ systematically from the typical institution. Because the ANcerno database contains neither the actual names (i.e., institutions are identified by unique *client-codes*) nor the portfolio holdings of client institutions, a full sample comparison of institutions in the ANcerno database to institutions in the 13F universe is not possible. We circumvent this problem in two ways. First, we use a list of 64 client institution names that ANcerno separately provided to us to facilitate a comparison between the holdings of ANcerno and 13F institutions. Second, we compare changes in quarterly holdings for all ANcerno institutions to changes in quarterly holdings for all 13F institutions. The results for both of these analyses are presented in the Internet Appendix.[10] We find that the characteristics of stocks held and traded by ANcerno institutions are not significantly different from the characteristics of stocks held and traded by the average 13F institution. We also compare the return characteristics of holdings and trades and find that they are almost identical between the two groups of institutions. It appears that ANcerno institutions differ from the average 13F institution primarily in one dimension: institution size. ANcerno institutions are larger than the average 13F institution with respect to the number of different stock

[10] The Internet Appendix is located on the *Journal of Finance* website at http://www.afajof.org/supplements.asp.

holdings (603 vs. 264), total net assets ($22.04 billion vs. $4.34 billion), and dollar value of trades ($1,285 million vs. $842 million).[11]

Given that ANcerno institutions are larger than the typical institution in the 13F universe, our primary concern is whether a relationship exists between fund size and trading skill. Although Berk and Green (2004) show that fund size is positively associated with skill, many empirical studies actually find evidence of a negative relation between fund size and performance (Chen et al. (2004), Yan (2008), KSZ (2008), Lewellen (2009), and Edelen, Evans, and Kadlec (2009)). Since the ANcerno sample is biased toward larger funds, we believe that evidence from these studies suggests that this type of selection bias actually works against finding significant interim trading skill in our sample.[12]

Another form of potential selection bias that we explore relates to whether ANcerno clients submit a nonrandom selection of either ex post profitable or difficult-to-execute trades to ANcerno. Our detailed analysis of evaluation reports that ANcerno provides its clients suggests that these behaviors would be suboptimal. First, ANcerno consults exclusively on execution costs and provides no analysis on the investment performance of client trades; thus, it is unclear why institutions would have any incentive to submit only their most profitable trades. Second, institutions that are concerned about evaluating the execution cost of trades that are particularly difficult (i.e., expensive) have the ability to do so ex post, and limiting the trades sent to ANcerno only reduces the value of the execution cost analysis service that clients are paying for. In addition, we compare cumulative quarterly ANcerno trades to changes in quarterly 13F holdings for a subsample of matched institutions. Matching scores reported in the Internet Appendix show that more than 80% of quarterly trades between these two databases match with respect to the stock traded and the trading direction.[13] Although we cannot completely rule out the possibility that institutions send only a subset of their trades to ANcerno, the magnitude of our matching scores suggests it is unlikely that institutions are submitting a nonrandom selection of trades to ANcerno.

II. Methodology

A. Round-Trip Trades

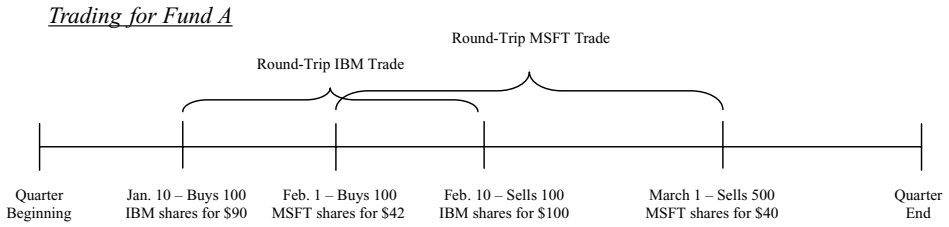
Our first interim trading skill measure focuses on intraquarter round-trip trades. We proceed as follows. For each fund, we select all trades within a

[11] In the Internet Appendix, we also compare a subsample of ANcerno funds to the CRSP equity mutual fund database. Fund characteristics for expense ratios, turnover, and average monthly return are not significantly different between the two samples. Consistent with our other comparisons based on 13F data, we find that ANcerno funds are larger than the average CRSP equity mutual fund.

[12] We test for differences in interim trading skill between large and small ANcerno funds and present results in the Internet Appendix. Our results provide no evidence that larger funds have better interim trading skill than smaller funds.

[13] In the Internet Appendix, we present four reasons we would not expect matching statistics between these two databases to be perfect. The reasons include differences in "institution" definitions, short sales, confidential 13F filings, and small trades.

quarter in which the fund both buys and sells a particular stock.[14] We use execution prices to calculate the holding-period return for each round-trip trade and subtract the DGTW benchmark return over the same holding period to calculate abnormal returns. DGTW benchmark returns are constructed based on size, book-to-market, and past performance, as described in Daniel et al. (DGTW, 1997). We refer the reader to DGTW (1997) for further details. For funds that execute multiple buy or multiple sell trades (as part of the round-trip transaction), we use the volume-weighted average execution price of buys or sells in our analysis. We then compute the average principal-weighted raw and abnormal return, both before and after commissions, of all round-trip trades for each fund during each quarter. The method used for calculating round-trip trading performance is illustrated below:



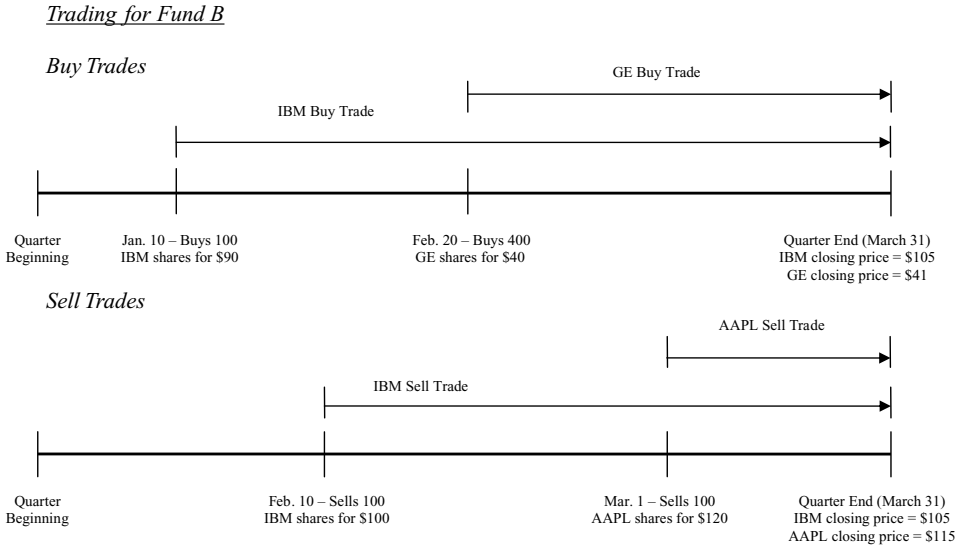
In the above illustration, Fund A executes two round-trip trades within the quarter. We calculate the raw holding-period return for both trades. For IBM, the holding-period return is 11.11% (=($100–$90)/$90), and for MSFT the return is −4.76% (=($40–$42)/$42). To compute abnormal returns, we subtract the DGTW benchmark return over the identical holding period for each round-trip trade. For IBM, the holding-period DGTW benchmark return is calculated from January 10 to February 10. Finally, we calculate the raw (and abnormal) trading performance for Fund A by taking the principal-weighted average of all round-trip trades within the quarter. The principal-weighted raw round-trip trading performance for Fund A is 6.06%, where the weight for the IBM trade is 0.6818 (=$9,000/$13,200) and that for the MSFT trade is 0.3182 (=$4,200/$13,200).

B. All Trades

Our second interim trading skill measure applies to all trades. We proceed as follows. For each fund, we separate all trades within the quarter into buys and sells. Then, for each buy or sell trade, we track its performance from the execution date (using the execution price) until the end of the quarter. Our holding-period return calculations account for both stock splits and dividend

[14] We capture trades where the fund buys first and later sells and those where the fund sells first and later buys. Our primary purpose in this analysis is to capture the performance of trades that prior literature has been unable to observe.

distributions. We subtract the DGTW benchmark return over the same holding period to compute abnormal returns. Next, for each fund we compute the equal- and principal-weighted average abnormal returns for buys and sells separately. Finally, we calculate the difference between DGTW adjusted returns for buys and sells, both before and after commissions. We again use an illustration to clarify our methodology:



In the above illustration, Fund B executes two buy trades and two sell trades within the quarter. For buy trades, the raw holding-period return for the IBM trade is 16.67% (=($105–$90)/$90), and for GE the return is 2.5% (=($41–$40)/$40). For sell trades, the raw holding-period return for the IBM trade is 5.0% (=($105–$100)/$100), and for AAPL the return is −4.17% (= ($115–$120)/$120). We subtract the DGTW benchmark return over the identical holding period; for simplicity, we assume that DGTW benchmark returns are 0% in this illustration. The equal- (principal-) weighted average return for buy trades is 9.59% (7.60%), and for sell trades the return average is 0.42% (−0.04%).[15] Finally, we compute the difference in buy and sell average returns (hereafter *interim trading performance*). The equal-weighted interim trading performance is 9.17% (=9.59% − 0.42%), and the principal-weighted interim trading performance is 7.64% (=7.60% + 0.04%).

Our measures of round-trip and interim trading performance might be correlated over time and/or across funds. To account for possible dependencies both in the cross section and over time, we compute *t*-statistics in all of our

[15] The weights used in calculating the principal-weighted averages are as follows. For the buy trade portfolio, the IBM trade weight is 0.36 (=$9,000/$25,000) and the GE trade weight is 0.64 (=$16,000/$25,000). For the sell trade portfolio, the IBM trade weight is 0.45 (=$10,000/$22,000) and the AAPL trade weight is 0.55 (=$12,000/$22,000).

analyses based on two-way clustered standard errors (see Moulton (1986) and Thompson (2011)).

III. Empirical Results

A. Round-Trip Trades

If institutional trades are motivated by value-relevant private information and profitable trading opportunities dissipate quickly, we might expect funds to reverse their trading to lock in gains. Furthermore, if funds reverse their trades within the quarter, these trades are not observed by studies that use quarterly holdings data (e.g., CJW (2000)). As such, we begin our empirical analysis by investigating trades that are reversed within the trading quarter (i.e., intraquarter round-trip trades). This type of trading pattern is consistent with Hirshleifer, Subrahmanyam, and Titman (1994), who model the trading behavior of investors who receive private information. In the period before information is publicly revealed, informed investors trade in order to exploit their information advantage. When information is publicly revealed, early informed investors partially reverse their trading in order to lock in gains. We hypothesize that if funds possess trading skill, their abnormal round-trip trading performance will be positive.

We present raw and abnormal holding-period returns for round-trip trades across all funds in Panel A of Table II. Consistent with estimates by Elton et al. (2010) that intraquarter round-trip trades account for approximately 20% of a typical mutual fund's trades, we find that 22.89% of all trades in our sample are intraquarter round-trip trades. Performance results show that the average raw and abnormal returns for round-trip trades are significantly positive. For the average fund in our sample, raw returns are 2.99% (t-statistic = 4.79), and DGTW abnormal returns are 2.09% (t-statistic = 3.81). Even after commissions, abnormal returns are 1.80% (t-statistic = 3.27). We further note that since we use actual execution prices to compute returns, our measures of performance account for implicit trading costs (e.g., price impact). We find that abnormal returns from round-trip trading activity are larger for pension funds (2.17%) than for money manager funds (1.17%).[16]

Although abnormal round-trip trading performance, on average, is positive, a more demanding test of investment skill is whether certain funds persistently outperform. We sort funds into quintiles based on abnormal round-trip trading performance during each quarter. Funds with the lowest abnormal round-trip trading performance are assigned to quintile 1, while those with the highest

[16] This result is somewhat puzzling because money manager funds trade more actively, and hence if they are skilled, we would expect the money manager funds to exhibit better round-trip trading performance. However, later in this section we argue that our interim trading performance measure is a more appropriate measure to use when comparing the trading performance of pension and money manager funds, since round-trip trading performance might be influenced by several potential biases. Consistent with this conjecture, we find (in Section III.B) some evidence of money manager fund outperformance using the interim trading performance measure.

Table II

Performance of Intraquarter Round-Trip Trades

Institutional trading data are obtained from ANcerno Ltd., and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. Of these funds, 227 are money manager funds and 3,589 are pension funds. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). We calculate the holding-period return for each round-trip trade as the percentage difference between the sell price and buy price. DGTW-adjusted return is the raw holding-period return less the DGTW benchmark return over the identical holding period. We calculate principal-weighted average returns across all intra-quarter round-trip trades for each fund and each quarter. We then take a simple average across all funds and quarters and report raw and DGTW abnormal returns both before and after commissions in Panel A. In Panel B, we divide all funds into five quintiles at the end of each quarter based on the DGTW adjusted returns for their round-trip trades. We then report the average DGTW adjusted returns for these quintiles during the quarter of portfolio formation and the subsequent four quarters. All returns are expressed in percent. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

Panel A: Performance of Round-Trip Trades

	All	Pension Funds	Money Manager Funds
Raw return	2.99	3.07	2.00
	(4.79)	(4.70)	(4.23)
Raw return (after commissions)	2.71	2.79	1.69
	(4.30)	(4.24)	(3.64)
DGTW adj. return	2.09	2.17	1.17
	(3.81)	(3.84)	(2.28)
DGTW adj. return (after commissions)	1.80	1.88	0.87
	(3.27)	(3.32)	(1.71)
% of intra-quarter round-trip trades	22.89	18.30	33.65

Panel B: Performance Persistence of Round-Trip Trades

Current Quarter DGTW adj. Return Quintiles	Quarters				
	Q+0	Q+1	Q+2	Q+3	Q+4
q1	−13.16	−2.67	−2.54	−2.05	−1.82
	(−20.11)	(−4.79)	(−3.63)	(−2.75)	(−2.00)
q2	−2.98	−0.20	−0.23	−0.32	−0.21
	(−8.77)	(−0.38)	(−0.46)	(−0.50)	(−0.34)
q3	0.94	1.28	1.40	1.29	1.32
	(2.31)	(2.43)	(2.36)	(2.48)	(2.19)
q4	5.48	3.74	3.51	2.96	3.02
	(9.00)	(5.02)	(4.33)	(3.89)	(4.66)
q5	20.15	6.85	6.89	6.10	6.09
	(12.60)	(7.91)	(8.13)	(9.24)	(6.47)
q5–q1	33.31	9.53	9.43	8.15	7.91
	(17.08)	(11.37)	(11.99)	(10.23)	(7.10)

are assigned to quintile 5. We then track the abnormal round-trip trading performance for each quintile during the subsequent four quarters. We note that, by definition, abnormal round-trip trading performance in a particular quarter depends only on round-trip trades executed within that quarter. Therefore, the momentum of prior holdings is not a concern in our sample (Carhart (1997)).

Round-trip trading persistence results are presented in Panel B of Table II. By construction, the best performing funds significantly outperform the worst performing funds (20.15% compared to −13.16%) in the quarter of portfolio formation. The central test of trading skill is whether relative performance persists in subsequent quarters. We find that it does. In particular, funds with the best past trading performance continue to have positive abnormal round-trip trading performance during the subsequent four quarters, while abnormal performance for the worst past performers continues to be negative. The difference in abnormal round-trip trading performance between extreme quintiles is 9.53%, 9.43%, 8.15%, and 7.91% in quarters Q+1, Q+2, Q+3, and Q+4, respectively.

Our analysis of round-trip trades quantifies the performance of trading activities that were previously unobserved. However, this analysis is limited since round-trip trading decisions might result from mechanical factors or behavioral biases that are unrelated to investment skill. Mechanical factors include explicit or implicit rebalancing requirements. For instance, if a fund buys a stock and the stock price increases significantly over a short period of time, the fund might sell some of the position in order to rebalance its portfolio. Thus, our round-trip trading measure might suffer from a selection bias such that a disproportionate number of successful trades are reversed prior to the end of the quarter. Behavioral biases may also play a role. If institutional investors are subject to the same disposition effect that Odean (1998) documents for individual investors—selling winners too quickly and holding on to losers too long—then our selection of round-trip trades might pick up a disproportionate amount of successful trades ex post. Specifically, the disposition effect would suggest that for a given stock purchase, the fund is more likely to realize gains (with a subsequent sale) if prices go up and is more likely to keep holding the stock (no sale) if prices go down. In the next section, we examine a more comprehensive measure of interim trading skill that is not influenced by the above selection biases.

B. All Trades

To provide a comprehensive measure of interim trading skill, we analyze the performance of all trades within the quarter in which they are executed. Consistent with our previous discussion, we hypothesize that if funds have trading skills, then the stocks a fund buys will outperform the stocks it sells. We note that some trades by funds might be motivated by fund flows and/or rebalancing requirements. As such, these trades will likely contain little information and should bias our study against finding evidence of trading skill (Alexander, Cici, and Gibson (2007)).

Table III

Interim Trading Performance of Institutional Investors

Institutional trading data are obtained from ANcerno Ltd. and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. Of these funds, 227 are money manager funds and 3,589 are pension funds. Money manager funds are responsible for more than half of the dollar value of trading volume in the sample. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). For each trade, we calculate the raw cumulative stock return from the execution price until the end of the quarter. We adjust the raw cumulative return by the DGTW benchmark return over the same period. For each fund in each quarter, we then compute the equal-weighted or principal-weighted DGTW adjusted returns separately for buys and sells. We take the difference in DGTW adjusted returns between buys and sells. We report a simple average across all funds and quarters. Panel A presents equal-weighted DGTW adjusted returns, and Panel B presents principal-weighted DGTW adjusted returns. All returns are expressed in percent. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

	All	Pension Funds	Money Manager Funds
Panel A: Equal-Weighted DGTW Adjusted Return			
Buy	0.67	0.68	0.50
	(4.04)	(3.96)	(4.38)
Sell	−0.06	−0.06	−0.13
	(−0.43)	(−0.40)	(−1.06)
Buy−Sell	0.74	0.74	0.63
	(7.73)	(7.51)	(6.28)
Buy−Sell (after commissions)	0.34	0.34	0.27
	(3.26)	(3.16)	(2.87)
Panel B: Principal-Weighted DGTW Adjusted Return			
Buy	0.54	0.55	0.45
	(3.57)	(3.48)	(4.22)
Sell	−0.03	−0.01	−0.26
	(−0.18)	(−0.08)	(−1.73)
Buy−Sell	0.57	0.56	0.72
	(5.73)	(5.52)	(4.75)
Buy−Sell (after commissions)	0.27	0.26	0.40
	(2.67)	(2.52)	(2.74)

We present interim trading performance for all funds in Table III. Using equal-weighted averages, we find that the stocks that funds buy significantly outperform DGTW benchmarks by 0.67%, while the stocks that funds sell underperform the benchmarks by 0.06%. Principal-weighted averages produce qualitatively similar results, where the abnormal return of stocks that funds buy (sell) is 0.54% (−0.03%). Moreover, the stocks that funds buy significantly outperform the stocks they sell by 0.74% (0.57%) when using equal- (principal-) weighted averages.[17] After accounting for brokerage commissions, these differences are lower (0.34% and 0.27%, respectively) but still significantly positive.

[17] In the Internet Appendix, we construct a measure of interim trading performance that standardizes the return horizon to a quarter. Specifically, we multiply the abnormal holding-period

Our results suggest that funds possess superior skills in timing their trades within the quarter.

The asymmetry between the relative abnormal performance of buy and sell trades is consistent with many studies in the literature. In particular, Chan and Lakonishok (1993, 1995) argue that when institutional investors purchase securities, their choice of which security to buy is likely to be unconstrained. As such, the decision to buy a particular security, out of the numerous possibilities that exist, is likely to convey positive firm-specific information. Alternatively, an institutional investor holds a finite number of securities in its portfolio and, when short sales are constrained, faces a limited number of alternatives when deciding to sell. As a result, there are many reasons why institutional sales might not necessarily convey negative firm-specific information.

Table III also presents interim trading performance results separately for money manager funds and pension funds. Because money manager funds trade more actively, we expect them to display higher interim trading performance (Yan and Zhang (2009)). For both institution types, buy trades significantly outperform DGTW benchmarks. Although sell trades uniformly underperform their DGTW benchmarks, only principal-weighted money manager sells significantly underperform (-0.26%, t-statistic $= -1.73$). The equal- (principal-) weighted interim trading performance is 0.74% (0.56%) for pension funds and 0.63% (0.72%) for money manager funds. Focusing on principal-weighted interim trading performance, which more accurately reflects trading returns that accrue to the fund, the performance of money manager funds is about 16 basis points higher than pension funds (0.72% vs. 0.56%). The fact that we do not observe an even larger performance difference between these two groups is somewhat puzzling.

If some funds in our database are truly skilled, we should expect relative interim trading performance to persist. To test for persistence, we sort funds into quintiles based on their principal-weighted interim trading performance. We then track the principal-weighted interim trading performance for funds in each quintile over the subsequent four quarters. By construction, trade executions and trade performance evaluation do not overlap across the time series of quarterly observations.

Our results are presented in Table IV. We find strong evidence that past interim trading performance is related to future interim trading performance. Quintile 1 funds have the worst interim trading performance in the quarter of portfolio formation (-8.67%) and continue to have negative interim trading performance of -0.33%, -0.24%, -0.23%, and -0.16% during the subsequent four quarters. Quintile 5 funds have the best interim trading performance during the portfolio formation quarter (9.60%) and continue to display positive interim trading performance of 1.56%, 1.16%, 1.33%, and 1.10% during the following four quarters. The difference between extreme quintiles is 1.89%

return for each trade by the number of trading days in the quarter divided by the number of trading days between the transaction date and the last day of the quarter. Quarterized equal- (principal-) weighted interim trading performance is 2.98% (2.08%).

Table IV

Persistence of Interim Trading Performance

Institutional trading data are obtained from ANcerno Ltd. and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). For each trade, we calculate the raw cumulative stock return from the execution price until the end of the quarter. We adjust this cumulative return by the DGTW benchmark return over the same period. For each fund in each quarter, we then compute the principal-weighted DGTW adjusted returns separately for buys and sells. We take the difference in DGTW adjusted returns between buys and sells. At the end of the each quarter, we divide all funds into five quintiles based on the principal-weighted DGTW adjusted returns for buys minus sells. We then report the average DGTW adjusted returns for these quintiles during the quarter of portfolio formation and for the subsequent four quarters. All returns are expressed in percent. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

Current Quarter Performance Quintiles		Quarters				
		Q+0	Q+1	Q+2	Q+3	Q+4
q1	Buy	−3.88	0.15	0.13	0.21	0.11
		(−14.12)	(0.95)	(0.63)	(1.23)	(0.57)
	Sell	4.79	0.48	0.38	0.44	0.27
		(10.70)	(2.38)	(1.81)	(2.48)	(1.26)
	Buy–Sell	−8.67	−0.33	−0.24	−0.23	−0.16
		(*−15.11*)	(*−1.49*)	(*−1.38*)	(*−1.14*)	(*−0.66*)
q2	Buy	−0.78	0.36	0.29	0.21	0.30
		(−8.16)	(3.73)	(2.73)	(1.36)	(2.35)
	Sell	1.05	0.05	−0.08	−0.01	0.11
		(6.98)	(0.33)	(−0.61)	(−0.07)	(0.64)
	Buy−Sell	−1.84	0.31	0.37	0.22	0.18
		(*−11.59*)	(*2.50*)	(*3.01*)	(*1.75*)	(*1.12*)
q3	Buy	0.37	0.36	0.50	0.46	0.36
		(3.60)	(2.63)	(4.04)	(2.54)	(3.93)
	Sell	−0.25	−0.14	−0.15	0.02	−0.16
		(−2.45)	(−1.11)	(−1.08)	(0.10)	(−1.06)
	Buy−Sell	0.62	0.50	0.65	0.44	0.52
		(*10.06*)	(*5.04*)	(*4.97*)	(*3.76*)	(*3.69*)
q4	Buy	1.72	0.59	0.54	0.64	0.59
		(12.58)	(3.44)	(3.38)	(3.82)	(3.73)
	Sell	−1.41	−0.15	−0.17	−0.30	−0.36
		(−14.18)	(−0.70)	(−0.86)	(−1.40)	(−2.64)
	Buy−Sell	3.13	0.74	0.70	0.93	0.96
		(*20.29*)	(*5.18*)	(*4.82*)	(*6.42*)	(*7.41*)
q5	Buy	5.29	1.13	0.96	1.13	0.63
		(10.35)	(3.55)	(3.45)	(3.44)	(2.56)
	Sell	−4.31	−0.44	−0.20	−0.20	−0.46
		(−15.80)	(−2.18)	(−0.95)	(−0.88)	(−2.61)
	Buy−Sell	9.60	1.56	1.16	1.33	1.10
		(*16.19*)	(*5.69*)	(*5.73*)	(*6.40*)	(*6.12*)
q5–q1	Buy	9.17	0.97	0.82	0.91	0.52
		(15.21)	(3.74)	(4.18)	(2.87)	(2.49)
	Sell	−9.11	−0.92	−0.58	−0.64	−0.74
		(−16.02)	(−4.86)	(−3.19)	(−3.53)	(−3.39)
	Buy−Sell	18.27	1.89	1.41	1.56	1.26
		(*16.26*)	(*5.16*)	(*5.55*)	(*5.47*)	(*5.19*)

(t-statistic = 5.16) during quarter Q+1 and declines to 1.26% (t-statistic = 5.19) in quarter Q+4, although differences in all quarters are significant at the 1% level. Further, our results show that persistence is primarily driven by skilled funds, which contrasts with results found by Carhart (1997), who shows that performance persistence is driven by past underperforming funds that tend to charge higher fees.

C. Abnormal Trading Performance of Implied Quarterly Trades

The results in the previous section support the hypothesis that institutions possess significant interim trading skills. In this section, we ask whether we would still find significant trading skills for our sample of funds if we were to ignore round-trip trades and the timing of interim trades within the quarter. Our investigation not only helps facilitate comparisons to previous quarterly studies but, more importantly, could help highlight the importance of using high-frequency trading data when investigating institutional trading skill.

We proceed as follows. For each fund and each stock, we aggregate all trades within a quarter and calculate the cumulative net trading position as of the quarter-end. Our net trading positions correspond to net changes in holdings from the previous quarter (identical to CJW (2000) and KSZ (2005)). We then calculate the DGTW equal- and principal-weighted abnormal return performance for buys (positive net trading positions) and sells (negative net trading positions) separately over the subsequent quarter and compute the difference between buys and sells. We refer to this difference as *implied quarterly* trading performance (to differentiate it from our previous *interim* trading performance measures). Our methodology is consistent with CJW (2000) and implicitly assumes that all trades occur at the closing price on the last day of the quarter.

We present implied quarterly trading performance results in Panel A of Table V. The equal- (principal-) weighted average is −0.33% (−0.24%) and both are marginally significant. Implied quarterly trading results suggest that the stocks funds buy *underperform* the stocks funds sell during the *subsequent* quarter. These conclusions are opposite to our interim trading results and underscore the importance of using high-frequency trading data in the investigation of trading skill.

Our implied trading measurement period is identical to the measurement period that is used by previous quarterly studies, yet our findings appear to be inconsistent with CJW (2000) and KSZ (2005). In particular, CJW (2000) find that mutual fund buys outperform sells by 0.59% over the subsequent quarter, and KSZ (2005) find outperformance of 1.06% during the subsequent quarter. However, our results are consistent with a more recent study by Duan, Hu, and McLean (2009), who follow the methodology of CJW (2000) and KSZ (2005) and find that subsequent quarter trading performance has declined dramatically over time. Specifically, Duan, Hu, and McLean (2009) find outperformance of 0.76% in the 1980 to 1994 sample period but find that the stocks that mutual funds buy underperform the stocks they sell by −0.16% during the more recent 1995 to 2003 sample period. We again note that our sample period is 1999

Table V

Implied Quarterly Trading Performance of Institutional Investors

Institutional trading data are obtained from ANcerno Ltd., and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. Of these funds, 227 are money manager funds and 3,589 are pension funds. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). For each fund, we track all trades within the quarter and calculate the net trading position for each stock as of the quarter-end. We then calculate the DGTW equal- and principal-weighted abnormal performance for buys (positive net trading imbalance) and sells (negative trading imbalance) over the subsequent quarter. Finally, we take the difference in DGTW adjusted returns between buys and sells. We report a simple average across all funds and quarters in Panel A. In Panel B, we divide all funds into five quintiles at the end of each quarter based on their principal-weighted implied quarterly trading performance. We then report the average implied quarterly trading performance for these quintiles during the quarter of portfolio formation and the subsequent four quarters. All returns are expressed in percent. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

Panel A: Implied Quarterly Trading Performance

	All	Pension Funds	Money Manager Funds
Equal-weighted DGTW adj. Return			
Buy	−0.05	−0.06	0.20
	(−0.14)	(−0.17)	(0.70)
Sell	0.28	0.28	0.27
	(0.79)	(0.79)	(0.73)
Buy−Sell	−0.33	−0.34	−0.08
	(−2.14)	(−2.20)	(−0.38)
Principal-weighted DGTW adj. Return			
Buy	−0.05	−0.05	−0.10
	(−0.17)	(−0.15)	(−0.84)
Sell	0.19	0.20	0.10
	(0.78)	(0.81)	(0.74)
Buy−Sell	−0.24	−0.24	−0.20
	(−1.70)	(−1.66)	(−1.21)

Panel B: Persistence of Implied Quarterly Trading Performance

Performance	Quarters				
Quintiles	Q+0	Q+1	Q+2	Q+3	Q+4
q1 (low)					
Buy	−7.23	−0.03	0.04	0.01	−0.03
	(−10.74)	(−0.07)	(0.07)	(0.02)	(−0.08)
Sell	7.02	0.45	0.21	−0.01	0.42
	(11.76)	(1.17)	(0.53)	(−0.04)	(0.99)
Buy−Sell	*−14.24*	*−0.48*	*−0.18*	*0.03*	*−0.46*
	(−15.37)	(−1.71)	(−0.61)	(0.07)	(−1.19)

(*continued*)

Table V—*Continued*

Panel B: Persistence of Implied Quarterly Trading Performance

Performance Quintiles	Quarters				
	Q+0	Q+1	Q+2	Q+3	Q+4
q2					
Buy	−2.25	−0.17	−0.40	0.04	0.16
	(−7.75)	(−0.50)	(−1.00)	(0.10)	(0.42)
Sell	1.94	−0.04	0.02	0.35	0.15
	(7.56)	(−0.11)	(0.09)	(1.02)	(0.48)
Buy−Sell	−4.19	−0.13	−0.43	−0.03	0.01
	(−15.72)	(−0.66)	(−1.63)	(−1.33)	(0.03)
q3					
Buy	−0.08	−0.07	0.11	0.11	−0.09
	(−0.32)	(−0.23)	(0.47)	(0.35)	(−0.28)
Sell	0.12	0.19	0.31	0.19	0.25
	(0.52)	(0.84)	(1.22)	(0.82)	(0.79)
Buy−Sell	−0.20	−0.25	−0.20	−0.08	−0.34
	(−1.90)	(−1.48)	(−0.99)	(−0.35)	(−1.72)
q4					
Buy	1.97	−0.03	0.05	0.07	0.11
	(6.45)	(−0.13)	(0.20)	(0.22)	(0.33)
Sell	−1.90	0.11	0.33	0.23	0.29
	(−7.05)	(0.54)	(1.60)	(0.81)	(1.18)
Buy−Sell	3.87	−0.14	−0.28	−0.16	−0.17
	(12.94)	(−0.81)	(−1.18)	(−0.69)	(−0.74)
q5 (high)					
Buy	7.33	0.04	0.37	0.04	0.16
	(10.79)	(0.11)	(0.88)	(0.13)	(0.35)
Sell	−6.21	0.03	0.19	0.43	−0.13
	(−13.06)	(0.08)	(0.47)	(1.38)	(−0.37)
Buy−Sell	13.54	0.01	0.18	−0.38	0.29
	(15.77)	(0.04)	(0.47)	(−1.49)	(0.95)
q5–q1					
Buy	14.56	0.07	0.33	0.03	0.20
	(14.24)	(0.17)	(0.57)	(0.08)	(0.51)
Sell	−13.23	−0.42	−0.02	0.44	−0.55
	(−15.96)	(−1.27)	(−0.08)	(1.13)	(−1.37)
Buy−Sell	27.78	0.49	0.36	−0.41	0.75
	(16.07)	(1.05)	(0.68)	(−1.00)	(1.72)

to 2005.[18] Our implied quarterly trading results are also consistent with Cai and Zheng (2004), who find that stock returns are negatively related to lagged institutional trading, and with several studies that focus on more recent time

[18] We note that CJW (2000) analyze the sample period from 1975 to 1995 and KSZ (2005) analyze the sample period from 1984 to 1999. We also present results in the Internet Appendix showing that the equal- (principal-) weighted implied quarterly trading performance of 13F institutions is −0.24% (−0.17%) during our 1999 to 2005 sample period.

periods. In particular, Brown, Wei, and Wermers (2009) and Dasgupta, Prat, and Verardo (2011) document evidence of return reversals following institutional trading or herding.

We also investigate the persistence of implied quarterly trading performance to see whether the results differ from those obtained using high-frequency trading data. We sort funds into quintiles based on their principal-weighted implied quarterly trading performance and track the implied trading performance of each quintile over the subsequent four quarters. Results presented in Panel B of Table V show almost no evidence of performance persistence, and any persistence is only evident for quintile 1 (poor performing) funds. Quintile 1 funds have implied quarterly trading performance of −0.48% in the subsequent quarter, whereas the subsequent performance of quintile 5 funds is 0.01%. The difference between quintiles 5 and 1 is insignificant in all four subsequent quarters. This result differs from earlier interim trading persistence results but is consistent with CJW (2000), who also find no evidence of performance persistence.

D. Sources of Interim Trading Skill

Given that we find evidence of superior interim trading skill in Tables II through IV, one important follow-up question is: What is the source of this trading skill? We argue that profitable trading opportunities are more likely to occur in stocks where the public information environment is more limited, greater information asymmetries exist, or arbitrage costs are large. Mispricing is more likely to arise and persist in these stocks and therefore provide institutional investors with greater incentive to gather and process private information. On the other hand, we also recognize that funds will be able to capture abnormal trading profits only if the value of their private information is large enough to overcome the higher liquidity costs associated with these stocks.

The stock characteristics that we use to proxy for a more limited public information environment or greater information asymmetries are firm size and book-to-market ratio. We expect that smaller firms are more likely to operate in an environment of more limited publicly available information (Fang and Peress (2009)). In addition, greater information asymmetries are likely to exist in growth firms because their values are derived more from growth options than assets in place. We proxy for limits to arbitrage using idiosyncratic volatility. Pontiff (1996, 2006) and Shleifer and Vishny (1997) contend that arbitrageurs are less willing to take large positions in high idiosyncratic volatility stocks, which results in larger potential mispricing.

Both information asymmetry and limits to arbitrage are likely to be positively correlated with stock illiquidity, which we measure using turnover, Amihud's (2002) illiquidity measure, and quoted spreads. As such, we might expect interim trading performance to be higher among illiquid stocks. However, the relationship between stock liquidity and interim trading performance is not clear-cut; while higher illiquidity enables mispricing and potentially creates

profitable trading opportunities for informed investors, it also makes trades less profitable after implementation costs. Finally, we investigate the relation between trading performance and lagged returns, since some institutions might profit by following momentum trading strategies.

We begin our analysis by assigning a decile-rank value to each stock based on NYSE breakpoints for each of the above-listed stock characteristics. The highest decile for each stock characteristic category has a decile-rank value of 10 and the lowest a decile-rank value of 1. We report average decile ranks for buy and sell trades separately in Panel A of Table VI. The average market capitalization decile rank for buys (sells) is 7.98 (8.09), and the average book-to-market decile rank is 3.60 (3.67). Our lagged return variable is measured over the prior 12 months, where we find average decile values between 5.87 and 6.07, slightly higher than the median. Turnover, illiquidity, and quoted spread statistics all suggest that institutions prefer to trade liquid stocks. Our result that institutional investors typically trade large, growth, and liquid stocks is consistent with findings by CJW (2000) and Gompers and Metrick (2001). Our results do not indicate meaningful differences between the characteristics of stocks bought or sold or systematic differences between the type of stocks traded by pension funds and money manager funds.

For each stock characteristic listed in Panel A of Table VI, we divide all buy and sell trades into two portfolios based on the median NYSE stock characteristic breakpoint. Following our previous methodology, we calculate principal-weighted interim trading performance for each stock characteristic category and present our results in Panel B of Table VI. Interim trading performance is higher in small stocks (0.82%) when compared to large stocks (0.59%), although the difference is not statistically significant (t-statistic = 1.22). We find higher interim trading performance for value stocks and past winners (0.84% and 0.71%, respectively) than for growth stocks and past losers (0.58% and 0.50%, respectively), but neither difference is statistically significant. Our results do show significantly higher interim trading performance for high idiosyncratic volatility and illiquid stocks. The difference in interim trading performance between high and low idiosyncratic volatility stocks is 0.43% (t-statistic = 2.52), and the performance differential is also higher for stocks with higher illiquidity (0.80%, t-statistic = 2.41) and higher quoted spreads (0.48%, t-statistic = 2.79). Overall, our results provide some support for the hypothesis that interim trading gains are driven by trades in stocks where potential information asymmetries and limits to arbitrage are greater.

Our result that interim trading performance is significantly higher in low-liquidity stocks raises the possibility that some funds exhibit superior trading performance because they systematically provide liquidity (and are compensated for doing so). To explore the possibility that interim trading performance is driven by liquidity provision rather than investment skill, we investigate the relationship between funds' implicit trading costs and their interim trading performance. We calculate implicit trading costs for each buy trade as the execution price minus the volume-weighted average price (VWAP) of the same trading day, and for sell trades we take the VWAP minus the execution price.

Table VI

Stock Characteristics and Interim Trading Performance

Institutional trading data are obtained from ANcerno Ltd., and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. Of these funds, 227 are money manager funds and 3,589 are pension funds. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). We assign stocks to size, book-to-market, lagged return, turnover, idiosyncratic volatility, illiquidity, and quoted spread deciles based on NYSE breakpoints. All of these variables are based on data available at the end of the previous quarter. Lagged return, turnover, idiosyncratic volatility, Amihud's illiquidity, and quoted spread are calculated using 12 months of data ending at the previous quarter's end. The decile portfolio with the smallest value of the sorting variable is assigned to decile 1; the decile portfolio with the largest value of the sorting variable is assigned to decile 10. In Panel A, we report the average decile values for buys and sells separately and also for pension funds and money manager funds separately. For each stock characteristic, we group all stocks into two categories, those below the NYSE median and those above the NYSE median. We calculate the abnormal trading performance for each stock characteristic category as follows. We calculate the raw cumulative stock return for each trade from the execution price until the end of the quarter. We adjust this raw cumulative return by the DGTW benchmark return over the same period. For each fund in each quarter, we then compute the principal-weighted DGTW adjusted returns separately for buys and sells. Finally, we take the difference in DGTW adjusted returns between buys and sells. In Panel B, we report the simple average abnormal trading performance measure for each stock characteristic category across all funds and quarters. All returns are expressed in percent. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

Panel A: Stock Characteristics

		All	Pension Funds	Money Manager Funds
Size Deciles	Buy	7.98	7.99	7.82
	Sell	8.09	8.10	7.91
Book-to-Market Deciles	Buy	3.60	3.59	3.83
	Sell	3.67	3.65	3.92
Lagged Return Deciles	Buy	5.87	5.89	5.56
	Sell	6.07	6.09	5.72
Turnover Deciles	Buy	7.04	7.05	6.87
	Sell	6.97	6.98	6.83
Idiosyncratic Volatility Deciles	Buy	5.60	5.61	5.39
	Sell	5.43	5.44	5.31
Illiquidity Deciles	Buy	2.80	2.79	2.92
	Sell	2.72	2.71	2.87
Quoted Spread Deciles	Buy	3.46	3.45	3.65
	Sell	3.54	3.53	3.73

Panel B: Abnormal Trading Performance by Stock Characteristics

	Average Decile	Buy	Sell	Buy–Sell
Small stocks	1.88	1.17	0.35	0.82
		(3.45)	(1.23)	(5.07)
Large stocks	7.83	0.35	−0.24	0.59
		(2.02)	(−1.55)	(5.45)
Small−Large				0.23
				(1.22)

(*continued*)

Table VI—*Continued*

Panel B: Abnormal Trading Performance by Stock Characteristics				
	Average Decile	Buy	Sell	Buy–Sell
Growth stocks	2.75	0.43	−0.15	0.58
		(2.51)	(−0.97)	(5.88)
Value Stocks	8.29	1.34	0.50	0.84
		(3.56)	(1.50)	(5.02)
Growth−Value				−0.26
				(−1.42)
Past losers	2.55	0.35	−0.15	0.50
		(1.68)	(−0.64)	(3.19)
Past winners	8.34	0.61	−0.11	0.71
		(3.55)	(−0.57)	(6.94)
Losers−Winners				−0.21
				(−1.09)
Low turnover stocks	2.38	0.80	0.06	0.74
		(2.56)	(0.19)	(6.93)
High turnover stocks	8.54	0.55	−0.08	0.63
		(2.08)	(−0.35)	(5.01)
Low−High				0.11
				(0.66)
Low IVOL stocks	3.08	0.56	0.11	0.45
		(2.43)	(0.47)	(5.06)
High IVOL stocks	9.03	0.79	−0.09	0.88
		(2.16)	(−0.24)	(5.58)
Low−High				−0.43
				(−2.52)
Low illiquidity stocks	3.16	0.35	−0.15	0.49
		(2.31)	(−1.05)	(4.65)
High illiquidity stocks	9.07	1.82	0.53	1.29
		(4.92)	(1.83)	(4.26)
Low−High				−0.80
				(−2.41)
Low quoted spread stocks	2.62	0.36	−0.21	0.56
		(2.43)	(−1.27)	(5.22)
High quoted spread stocks	8.61	1.59	0.55	1.05
		(5.39)	(2.14)	(6.10)
Low−High				−0.48
				(−2.79)

For each fund, we calculate the principal-weighted average implicit trading cost across all trades within the quarter. We then sort all funds into quintiles based on their principal-weighted interim trading performance and report the contemporaneous implicit trading cost for each quintile in Table VII.

If compensation for liquidity provision drives interim trading performance, we should find that funds with higher interim trading performance experience lower (or perhaps negative) implicit trading costs. Our results presented in Table VII show the opposite: high-skill funds incur higher implicit trading costs

Table VII
Interim Trading Performance and Implicit Trading Costs

Institutional trading data are obtained from ANcerno Ltd., and the trades in the sample are placed by 3,816 funds during the period from January 1, 1999 to December 31, 2005. The sample includes only common stocks (those with a sharecode of 10 or 11 in the CRSP database). We divide all funds into five quintiles at the end of each quarter based on their principal-weighted interim trading performance measure. We then calculate the average implicit trading costs for each fund as follows. For each buy trade, we calculate the implicit trading cost as execution price less the volume-weighted average price (VWAP) of the same trading day. For each sell trade, we calculate the implicit trading cost as the VWAP of the same trading day less the execution price. The implicit trading costs are then scaled by the execution price and expressed in percentage terms. For each fund in each quarter, we then compute the principal-weighted average implicit trading cost. We then report the average implicit trading costs for each abnormal trading performance quintile. Numbers in parentheses are *t*-statistics, which are computed based on two-way clustered standard errors.

Interim Trading Performance Quintiles	Average Interim Trading Performance (%)	Implicit Trading Costs (%)
Q1 (low)	−8.67	0.051 (5.87)
Q2	−1.84	0.058 (8.21)
Q3	0.62	0.056 (9.32)
Q4	3.13	0.070 (8.71)
Q5 (high)	9.60	0.090 (7.42)
Q5–Q1	18.27	0.039 (3.82)

when compared to low-skill funds (0.09% vs. 0.051%). The difference (0.039%) is statistically significant at the 1% level and indicates that high-skill funds are more likely to demand rather than provide liquidity in their trades. Our finding suggests that superior interim trading performance in high-idiosyncratic volatility and low-liquidity stocks likely results from funds exploiting mispricing in situations in which limits to arbitrage or asymmetric information are high.

E. Robustness

In this section, we conduct several robustness tests that relate to our round-trip trading performance and interim trading performance results. For brevity, the results of these robustness tests are not reported in the paper but are available in the Internet Appendix.

E.1. Round-Trip Trading Performance: Trade Duration

An interesting question related to our round-trip trade analysis is whether round-trip trading performance is systematically related to the duration of these trades. Intuitively, one might expect a positive relation since a longer duration allows for the possibility of greater gains. Alternatively, if skilled funds have access to very short-lived private information, trading skills might be evident only for trades with very short durations. We assign all

round-trip trades in our sample to one of four mutually exclusive categories: holding period less than or equal to 1 week, holding period between 1 week and 1 month, holding period between 1 month and 2 months, and holding period greater than 2 months. Abnormal holding-period returns are roughly equivalent for the first three holding period categories (1.86%, 2.11%, and 2.06%, respectively), and slightly lower for round-trip trades held more than 2 months (1.43%). Our results do not support the hypothesis that trading performance and trading horizon are correlated but are consistent with the idea that the holding period is endogenous.

E.2. Round-Trip Trading Performance: FIFO and LIFO

Our analysis of round-trip trades relies on specific choices in how we define and calculate round-trip trading performance. In particular, for funds that execute multiple buy or multiple sell trades (as part of a round-trip transaction) we use the volume-weighted average execution price of buys or sells in our analysis. To check the robustness of our results to alternative methods, we reconstruct our round-trip trading results using the intraquarter first-in first-out (FIFO) and last-in first-out (LIFO) methods. After-commission abnormal round-trip trading performance is 1.76% (t-statistic = 3.38) using FIFO and 1.92% (t-statistic = 3.12) using LIFO. Both methods produce very similar results to those reported in Table II.

E.3. Interim Trading Performance: Subperiod Analysis

Our sample of institutional trades spans an interesting time period of both economic expansion and contraction. We investigate whether interim trading performance differs across different market environments by splitting the sample into bubble (1999 to 2000) and post-bubble (2001 to 2005) periods. Several recent studies document that mutual funds perform significantly better during economic contractions than during economic expansions (Kacperczyk, Van Nieuwerburg, and Veldkamp (2009), Kosowski (2006), Lynch and Wachter (2007), Moskowitz (2000), and Glode (2010)), which suggests that we should expect higher trading performance during the post-bubble period. On the other hand, we might expect funds to deliver greater abnormal trading profits during the bubble period, which is characterized by elevated volatility and trading volumes, large stock mispricing (ex post), and greater market participation by individual investors. The magnitude and significance of interim trading performance during both bubble and post-bubble sample periods (0.55% and 0.58%) are similar to full sample results. However, the excess interim trading performance for high-idiosyncratic volatility and low-liquidity stocks declines significantly from the bubble to the post-bubble period.

E.4. Interim Trading Performance: Money Manager Funds versus Pension Funds

Because money manager funds trade more actively than pension funds, we might expect to observe differences in the sources of interim trading

performance between these two groups. We examine interim trading performance across various stock characteristics (listed in Table VI) and find that both pension funds and money manager funds have higher interim trading performance in small, high idiosyncratic volatility, and illiquid stocks. There appear to be some differences between the two types of institutions; in particular, money manager funds appear to be more skilled in their sells.

E.5. Interim Trading Performance: Institution-Level Evidence

It is possible that private information used to generate abnormal interim trading performance is common to all funds within a particular institution (e.g., Fidelity). Indeed, Pomorski (2009) finds that common trades from funds within the same investment management company exhibit significant outperformance. To investigate this possibility, we replicate our analysis of performance persistence at the institution level and find that the interim trading performance difference between quintile 5 and quintile 1 is 1.10% (t-statistic = 3.81) in the quarter following portfolio formation. Our results suggest that at least a portion of the interim trading performance we document is attributable to institution-level factors.

E.6. Does Interim Trading Performance Predict Fund Returns?

If superior interim trading performance benefits fund investors, then a relationship should exist between interim trading skill and fund returns. Since fund returns are unavailable in our data, we construct a proxy of fund returns based on trades and also match a subset of ANcerno funds to the CRSP mutual fund database. In both of our analyses, funds with the highest interim trading performance have higher monthly fund alphas during the quarter following portfolio formation than funds with the lowest interim trading performance. Although there is significant noise in each of these tests, our results are consistent with the hypothesis that interim trading performance is correlated with subsequent quarter fund alphas.

F. Discussion

Our analysis reveals that institutional investors possess significant interim trading skills. In particular, we find that the average after-commission interim trading performance is 0.27% to 0.34% for funds in our sample. If we assume a 75% turnover rate, these figures would suggest that interim trades contribute 20 to 26 basis points to abnormal annual fund performance. An obvious follow-up question is: Where or to whom does this outperformance go?

One limitation of the ANcerno database is that it does not contain information on management fees or fund returns; therefore, we cannot determine whether interim trading performance goes to investors or is captured by portfolio managers. However, we can compare our abnormal fund performance estimate to the average management fee charged by institutions. French (2008) estimates

the average management fee for mutual funds to be approximately 1% per year.[19] We conclude that the fund outperformance due to interim trading skills does not exceed the management fee on average. Our results are consistent with Grossman and Stiglitz (1980), who show that informed traders earn abnormal returns from their trading when information acquisition is costly.

We note that interim trading performance is persistent and for the top quintile of funds is 1.56%. Using a similar calibration, we estimate that interim trading contributes 1.17% annually to abnormal portfolio returns for high-skill funds. This estimate is large enough to overcome an average management fee; however, we stress that we do not have information on the cross section of fund management fees. These excess returns might accrue to underlying investors, or as in Berk and Green (2004), these high-skill funds might capture their skill by charging higher management fees.

We also acknowledge that our study captures only one dimension of institutional investors' skills, namely, interim trading skills. Our analysis does not address whether institutional investors possess other investment skills such as long-term (i.e., holdings-based) skills or market-timing skills. We choose to focus on interim trading skills in part because of data availability but more importantly because these skills have not been previously examined, whereas long-term skills and market-timing skills have already received substantial attention.

IV. Conclusions

The question of whether institutional investors have superior investment skills is essential to our understanding of efficient capital markets. Our study contributes uniquely to the current investment skill debate by directly examining the performance of fund trades within the quarter in which they occur. We find that interim trading performance is significantly positive and persistent and that persistence is driven by high-skill funds. Our results contrast with much of the prior literature and suggest that prior studies using quarterly data have understated the trading skill of institutional investors because of their inability to capture interim trades.

To highlight the importance of using high-frequency data in our investigation, we reconstruct our analysis to mimic the sampling frequency of studies that employ quarterly holdings data to investigate trading skill (e.g., CJW (2000)). We find that this "implied" quarterly trading performance is actually negative and therefore suggests that if we had conducted our analysis at the

[19] We provide two alternative estimates for the average annual management fee that is charged by our sample of funds. Since our data contain both money manager funds and pension funds, the first alternative that we provide aggregates French's (2008) management fee estimates for five groups of institutional investors: mutual funds, defined benefit plans, defined contribution plans, public funds, and nonprofits. The asset-weighted average management fee across all institution groups is 0.6%. The second alternative is the average expense ratio for a subsample of ANcerno mutual funds that we discuss in the Internet Appendix. The average expense ratio for this subsample of funds is 1.41%.

quarterly frequency (i.e., ignoring round-trip trades and the timing of interim trades), we would conclude that funds in our sample have negative trading skills. Our findings highlight the necessity of using high-frequency trading data when investigating short-term institutional trading activities. Specifically, future research investigating institutional trading activities around events, such as earnings announcements, analyst recommendations, and merger announcements using high-frequency data is likely to yield fresh insights.

We also believe that our research is relevant for policy debates involving the frequency of disclosure for institutional investors. In the past, the Securities and Exchange Commission (SEC) has considered petitions that would require more frequent disclosure for mutual funds and other institutional investors (see Wermers (2001)). Our findings suggest that institutional investors exploit short-term information advantages through their trading activity, and therefore any requirement that increases the frequency of portfolio disclosures might erode some of this short-term information advantage.

Appendix: ANcerno Database of Institutional Trades

In this appendix, we present a detailed description of the ANcerno Ltd. institutional trading database. ANcerno is a widely recognized consulting firm that works with institutional investors to monitor their equity trading costs. Our understanding of the database results from dozens of conversations with ANcerno over a period of more than 5 years. In the following description, we detail some of the key insights to understanding the data. Where appropriate, we include samples taken directly from the ANcerno database. For each client execution, the ANcerno database contains 107 different variables. For brevity, we do not list all 107 variables in this appendix, but, rather, concentrate our discussion on what we believe are some of the most important variables.

Trades are sent to ANcerno in "batches" by institutional clients. Trading data for money manager clients are received directly from these clients' Order Delivery System, while the method of data delivery for pension plan sponsors is more heterogeneous. Batches can be identified by the variable *lognumber*, and institutional clients are given a unique numerical code (*clientcode*). Each observation in the ANcerno database represents an execution. Several of the key variables of interest are *clientcode*, *clientmgrcode*, *clientbkrcode, ticker, cusip, side*, *price*, and *volume*. The *clientmgrcode* refers to the fund within each institution that is responsible for the trade (e.g., Fidelity Magellan vs. Fidelity Contrafund). The *clientbkrcode* allows the researcher to identify the broker executing the trade. *Ticker* and *cusip* identify the stock traded. *Side, price*, and *volume* identify whether the trade is a buy or sell, the execution price, and the number of shares executed.

Executions are often part of larger ticket orders submitted by an institution. The variables *xv* and *xp* correspond to the executed volume and volume-weighted execution price of the ticket order. Each observation (execution) corresponds to a ticket order. The following illustration represents a ticket order from an institution to buy (identified by *side*) 600 shares of a

particular stock (identified by *ticker*). The ticket is executed in two pieces, first for 200 shares and then 400 shares. *Price* is the execution price of the particular trade, whereas *xp* is the volume-weighted execution price for the entire ticket order. Because of space restrictions, we do not include all variables in this ticket order.

Ticket Order Example

Tradedate	Clientcode	Clientmgrcode	Ticker	Side	Volume	xv	Price	xp
15707	32	379,047	AZN	1	200	600	34.7620	34.8227
15707	32	379,047	AZN	1	400	600	34.8530	34.8227

ANcerno also provides us several additional data files, which contain the following two variables that can be mapped into the original data set:

Variables added (with permission from ANcerno)	
Clienttype	1 = pension plan sponsor, 2 = money manager
Managercode	Unique identifier: allows us to track funds over time

As stated previously, each client is assigned a unique *clientcode* that allows for identification both cross-sectionally and over time. Although *clientcodes* are unique, *clientmgrcodes* are not. As discussed, clients submit trades to ANcerno in "batches" (identified by *lognumber*). Within a batch, each fund within the institution corresponds to a unique *clientmgrcode*. However, the next batch might contain different *clientmgrcodes* for the same funds. ANcerno is able to track these code changes for many *clientmgrcodes*; however, for some, it cannot. For those *clientmgrcodes* that cannot be reliably tracked, ANcerno assigns a *managercode* value of either –1 or 0. For the 1999 to 2005 sample period, ANcerno provides 3,816 unique *managercodes*.

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