Institutional investors and the limits of arbitrage

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Abstract

This paper studies the performance and equity holdings of institutional investors from 1980–2005, providing a pessimistic assessment of their stock-picking abilities. Institutions overall essentially hold the market portfolio: their aggregate portfolio has nearly perfect correlation with the value-weighted index, a market beta of 1.00, and a small, precisely estimated CAPM alpha of 0.11% quarterly. Institutions also show little tendency to bet, in aggregate, on any of the main characteristics known to predict stock returns, like B/M, momentum, and accruals. Some groups of institutions have modest stock-picking ability relative to the CAPM but their performance is almost entirely explained by the B/M and momentum effects in returns. Finally, Shleifer and Vishny's (1997) theory of limited arbitrage does not describe the returns and portfolio decisions of institutions, either in aggregate or when they're grouped by type.

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1. Introduction

Institutional investors play a growing role in the U.S. equity market. The share of equity held by mutual funds, hedge funds, pensions, university endowments, and other institutions has increased from 27% of total market value in the early 1980s to over 62% at the end of 2005, according to quarterly 13F filings compiled by Thomson Financial.

The performance of institutional investors has been the subject of much research. A growing literature finds that institutions have stock-picking ability even though their returns, after costs and fees, are known to be mediocre or poor (the latter result dates to at least Jensen, 1968; more recent studies include Malkiel, 1995, Gruber, 1996, and Carhart, 1997). Daniel, Grinblatt, Titman, and Wermers (1997) show that stocks held by mutual funds outperform, on average, various benchmarks, building on the results of Grinblatt and Titman (1989, 1993) and Grinblatt, Titman, and Wermers (1995). More broadly, Gompers and Metrick (2001) find that institutional ownership – the fraction of a firm's shares held by all institutions – predicts returns cross-sectionally after controlling for a variety of firm characteristics, and Cohen, Gompers, and Vuolteenaho (2002) show that institutions, as a group, exploit price momentum at the expense of individuals.[1]

This paper offers new perspective on the performance of institutional investors. Results in prior studies can be difficult to evaluate and compare because of the use of different return benchmarks and weighting schemes (equal weights vs. value weights vs. cross-sectional regressions). I argue that the best way to evaluate institutions' overall performance, given stock ownership data, is to sum their holdings and study their collective, or aggregate, portfolio. This aggregate portfolio gives the clearest picture of performance in the same way that a value-weighted index best measures stock returns. It also allows me to test whether institutions' returns and investment behavior are constrained by the type of 'limits of arbitrage' studied by Shleifer and Vishny (1997), as I explain below.[2]

My results provide a surprisingly simple view of institutions' overall performance: institutions in aggregate essentially hold the market portfolio. From 1980–2005, the aggregate institutional portfolio had a return correlation of 99.8% with the CRSP value-weighted index and a market beta of 1.00 (see also

[1] Nofsinger and Sias (1999) and Bennett, Sias, and Starks (2003) provide additional evidence on institutions' stock-picking ability; Wermers (1999, 2000), Chen, Jegadeesh, and Wermers (2000), Chen, Hong, and Stein (2002) and Brunnermeier and Nagel (2004) provide additional evidence for mutual funds and hedge funds.

[2] My focus on institutions' aggregate portfolio isn't entirely new. Gompers and Metrick (2001) and Cohen, Gompers, and Vuolteenaho (2002) consider institutions' aggregate returns but neither uses these returns to test whether institutions outperform on a risk-adjusted basis (or considers the other tests in this paper).

Cohen, Gompers, and Vuolteenaho, 2002). Given these facts, it should come as little surprise that institutions have alphas, however measured, that are economically close to zero (before costs and fees): their CAPM and Fama-French (1993) three-factor alphas are 0.11% per quarter and their Carhart (1997) four-factor alpha is 0.09% per quarter, all of which are estimated precisely with standard errors of 0.05–0.06%. I show, moreover, that any factor model that includes the market portfolio should produce similar alphas since the unexplained portion of institutions' returns is so small.

Statistically, my results are weakly consistent with studies that find evidence of stock-picking ability: institutions' CAPM and Fama-French alphas are marginally significant, with OLS t-statistics of 2.08 and 1.88, while the Carhart alpha is not, with a t-statistic of 1.32. But debating which model is appropriate and whether the alphas are statistically significant misses the more important point that institutions' returns very closely mimic the market portfolio, and any abnormal performance, significant or not, is economically small. It is also clear that even small trading costs and management fees would wipe out performance, economically and statistically.

The aggregate holdings of institutions also provide the clearest picture of their investment choices. In particular, I sort stocks into quintiles based on a variety of characteristics and compare how much institutions invest in each quintile with the quintile's weight in the market portfolio. Gompers and Metrick (2001) estimate cross-sectional regressions of institutional ownership on stock characteristics and find that institutions tend to prefer larger, older stocks with higher prices, B/M ratios, volatility, and turnover, and, controlling for the other characteristics, lower past returns.[3] My results provide a much different picture: institutions, in aggregate, show little tendency to tilt toward high or low values of any of the characteristics I consider. From 1980–2005, institutions tilt a bit toward large stocks (the top size quintile represents 77% of the institutional portfolio and 72% of market value) and away from low-turnover (7% institutional vs. 13% market weight) and low-beta (14% institutional vs. 16% market weight) stocks. But for sorts based on eight other characteristics – B/M, momentum, long-term returns, volatility, stock issuance, accruals, asset growth, and profitability – not a single quintile has a weight in the institutional portfolio that differs from its value weight by more than 2%, and most differ by less than 1%. In short, institutions don't bet, to a significant degree, on any of the main characteristics that research has found to be associated with expected stock returns.

These findings have several implications. Most clearly, they show that institutions in aggregate do little more than hold the market portfolio (likely generating significant costs and fees in the process). The

[3] See, also, Del Guercio (1996), Falkenstein (1996), and Bennett, Sias, and Starks (2003).

results also suggest that institutional herding (e.g., Sias, 2004) doesn't substantially affect returns, in the sense than an investor who actively mimics institutional trades or passively holds the market portfolio would earn almost identical pre-cost returns. Finally, as I explain in a moment, the results suggest that limits of arbitrage can't explain institutions' investment decisions.

My tests also explore the stock-picking ability of different types of institutions, grouped by size, past performance, legal type (banks, insurance companies, and other[4]), and by the type of stocks they hold. Except for the last classification, different types of institutions all hold portfolios that, in aggregate, closely mimic the market portfolio, though not quite as closely as institutions' overall portfolio. The equity portfolios of banks, insurance companies, and other institutions have return correlations of 99.3%, 99.7%, and 99.8%, respectively, with the market index, and their pre-cost risk-adjusted returns are economically close to zero: banks exhibit the best performance with a CAPM alpha of 0.21% quarterly and a four-factor alpha of 0.15% quarterly (t-statistics of 2.16 and 1.59, respectively), compared with alphas of 0.04–0.09% for insurance companies and other institutions.

Ranked by equity under management, the largest institutions (top quartile) hold the portfolio that has the highest correlation with the market (99.8%) and the smallest alphas (CAPM alpha of 0.10% quarterly and four-factor alpha of 0.08% quarterly). Small and medium-sized institutions also hold portfolios that have greater than 99% return correlation with the market index, but with somewhat better returns. Medium-sized institutions (middle two quartiles) have the highest CAPM alphas of 0.27% and 0.28% quarterly (t-statistics of 3.14 and 3.15), while the smallest institutions have the highest four-factor alpha of 0.25% quarterly (t-statistic of 2.35).

Ranked by past annual returns and growth, the best performing and fastest growing institutions have the highest CAPM alphas, largely a consequence of momentum in returns (consistent with Carhart, 1997). The top performers hold, in aggregate, a portfolio that has a return correlation of 97.7% with the market, a CAPM alpha of 0.46% quarterly (t-statistic of 2.37), and a four-factor alpha of 0.15% quarterly (t-statistic of 0.82). The fastest growing institutions hold, in aggregate, a portfolio that has a return correlation of 99.3% with the market, a CAPM alpha of 0.20% quarterly (t-statistic of 1.83), and a four-factor alpha of 0.07% quarterly (t-statistic of 0.74).

Last, I group institutions by the types of stocks they hold: I rank institutions into quartiles by the average

[4] The current draft of the paper relies on Thomson Financial's type code, which doesn't permit a finer classification. The 'other' category includes mutual funds, hedge funds, investment advisors, pensions, university endowments, and all other institutions.

size, B/M ratio, and 12-month momentum of stocks in their portfolios. Institutions that tilt the most toward small, high-B/M, or high-momentum stocks have the highest CAPM alphas, with quarterly estimates of 0.27%, 0.69%, and 0.34%, respectively, for their aggregate portfolios (only the second of these is significant, with a t-statistic of 2.50). But no group has a significant four-factor alpha; the largest point estimate is 0.14% quarterly for these three groups and 0.19% quarterly across all 12 size-, B/M-, and momentum-ownership quartiles.

In sum, institutions don't earn significant pre-cost abnormal returns in aggregate, but, if we search for the best types of institutions, it appears that smaller, faster growing, and better performing institutions, and those most willing to tilt their portfolios to small, value, and high-momentum stocks, have at least moderate stock-picking ability relative to the CAPM. The only type of institution that has a statistically significant four-factor alpha (taking its t-statistic in isolation) is smaller institutions, with a point estimate of 0.25% quarterly.

My final tests exploit an important advantage of looking at institutions' aggregate portfolio (or the aggregate portfolio of a group of institutions): we can study whether their returns and investment decisions are constrained by the type of limits of arbitrage posited by Shleifer and Vishny (1997). SV argue that institutions (i.e., professional traders) may be reluctant to bet heavily on an anomaly because mispricing might widen in the short run, leading to poor returns and withdrawals by investors. A testable feature of the argument is that, regardless of such concerns, institutions still have an incentive to hold either the tangency portfolio or, if relative performance is important, a portfolio that has the highest alpha per unit of idiosyncratic risk. The latter portfolio produces the tangency portfolio when combined with the market (see Gibbons, Ross, and Shanken, GRS 1989; MacKinlay, 1995). Thus, testing whether institutions' portfolio is mean-variance efficient when combined with the market portfolio provides a simple test of the joint hypothesis that an anomaly (i) reflects mispricing and (ii) isn't eliminated because institutions only take limited offsetting bets. This test is also consistent with Fama and French's (2007) version of Shleifer and Vishny's argument.

Statistically, the test takes a simple form: I just use the institutional portfolio, together with the market portfolio, as an asset-pricing factor in time-series regressions (the logic follows GRS's general analysis of mean-variance tests). Specifically, I test whether alphas are zero when excess returns of size, B/M, and momentum portfolios are regressed on excess returns of the market portfolio and either the aggregate institutional portfolio or the portfolio held by a particular type of institution. The test basically reverses our earlier tests of performance; it asks whether institutions' returns explains the size, B/M, and momentum effects, rather than the other way around.

The answer for institutions taken as a whole, grouped by legal type and past annual growth, or grouped by the size and momentum of stocks they hold is a clear ‘no.’ For each of these classifications, adding the aggregate portfolio held by each group to CAPM regressions has little effect on the B/M and momentum effects (alphas for size portfolios are somewhat variable as different institutional portfolios are added to the regression, but the size effect isn’t significant with or without institutional portfolios in the regressions). The implication is that none of these groups, or institutions overall, tilt toward the tangency portfolio in the way suggested by SV’s limits-of-arbitrage view.

The same conclusion holds when institutions are grouped by size, past annual return, or their holding of value stocks, but the results are more nuanced. Portfolios held by most groups within these classifications explain neither the B/M nor momentum effects. The exceptions are: (i) portfolios held by medium-sized institutions and institutions that tilt most toward value stocks partially explain the B/M effect; and (ii) the portfolio held by the top-performing institutions partially explains momentum. I find the largest effect for institutions that hold value stocks: adding their aggregate portfolio to CAPM regressions pushes up the quarterly alpha for low-B/M stocks (bottom quintile) from -0.30% to 0.09% and pushes down the quarterly alpha for high-B/M stocks (top quintile) from 1.35% to 0.53%; the t-statistic for the difference between the high- and low-B/M alphas drops from 2.51 to 0.95. Put differently, we can’t reject that value-oriented institutions as a group tilt optimally toward the tangency portfolio that is achievable from B/M quintiles (though not from momentum portfolios).

The paper is organized as follows. Section 2 describes the data. Section 3 explores the performance and portfolio choices of institutions as a whole. Section 4 explores the performance of institutions by type. Section 5 explains the tests of mean-variance efficiency and relates them to Shleifer and Vishny’s (1997) limits-of-arbitrage arguments. Section 6 concludes.

2. The data

The data for the study come from four sources. Stock returns, market values, trading volume, and one-month Tbill rates come from the Center for Research in Security Prices (CRSP) monthly files. Returns on Fama and French’s size, B/M, and momentum factors, SMB, HML, and UMD, come from Ken French’s website at Dartmouth College. Accounting data, including the book value of common equity, operating accruals, and return on assets (defined later), come from the Compustat annual file, supplemented with Davis, Fama, and French’s (2000) hand-collected book equity data from Moody’s, also available on French's website. Finally, institutional stock holdings come from the CDA/Spectrum files maintained by Thomson Financial.

The CDA/Spectrum database is compiled from institutions' 13F filings with the SEC. In particular, the SEC requires large institutional investors – those that 'exercise investment discretion over $100 million or more' in so-called 13(f) securities – to report their quarter-end holdings of U.S. stocks, closed-end funds, and other exchange-traded securities within 45 days after the end of the calendar quarter (except for small holdings below 10,000 shares and $200,000, or in special circumstances in which the SEC grants a confidentiality waiver). Securities are listed by CUSIP number, allowing an easy merge with CRSP data. Institutions can be tracked through time, and Thomson identifies each as being one of five types: (1) banks (trust departments), (2) insurance companies, (3) investment companies, (4) investment advisors, and (5) other, where the last three types include mutual funds, hedge funds, brokerage firms, pensions, university endowments, and all other institutions.

Two issues complicate the use of Thomson's institutional types: (i) the breakdown into investment companies, investment advisors, and other institutions is somewhat arbitrary, and (ii) Thomson mistakenly reclassified many institutions as 'other' beginning in the 4th quarter of 1998 (see Wharton Research Data Services' User Guide for details), a change that seems to affect the last three categories the most, though not exclusively. As a partial solution to these problems, I merge types 3, 4, and 5 into a single group for any test that uses legal type. I also use Thomson's coding at the end of 1997 for any institution that is in the database at that time, rather than updating it if the classification changes.

The main other issue that arises in using the 13F database relates to late filers who miss the SEC's 45-day deadline. The WRDS User Guide explains that share holdings for late filers are (or may be?) adjusted for stock splits that occur after the quarter. Fortunately, fewer than 0.02% of the records in the 13F database (after WRDS eliminates duplicate entries) seem to be affected, i.e., the filing date and report date are different, signaling a late filer, and a stock split was recorded on CRSP between the two dates. In these cases, I reverse Thomson's split adjustment using CRSP's share-price adjustment factors.

The nearby charts illustrate a few features of the data. The sample extends from 1980Q1–2005Q4. At the beginning of the sample, just under 500 institutions owned shares in 3,436 stocks for which I could find returns and market values on CRSP (stocks that represent 71% of firms and 85% of market cap on CRSP; the latter figure rises rapidly to 98% by December 1981). As group, institutions in the 13F database held 27% of total market cap on March 31, 1980. The number of institutions in the database steadily increases

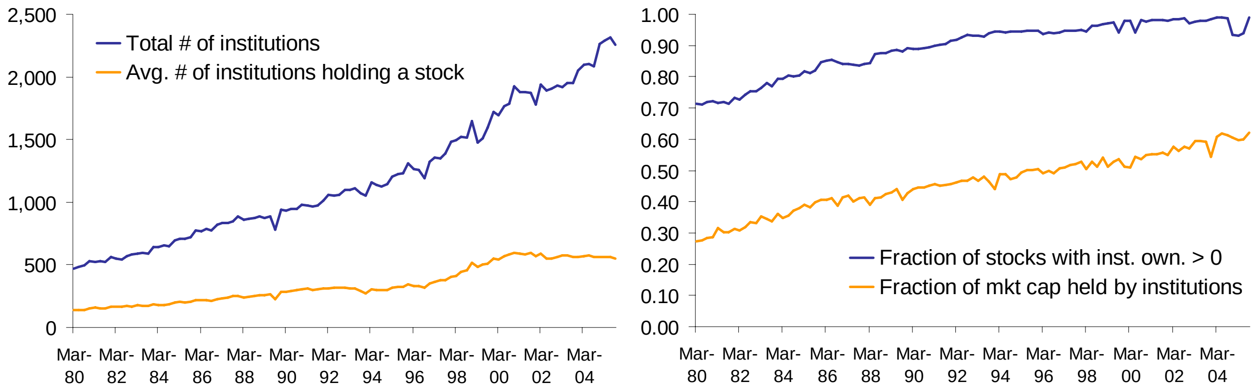

Fig. 1. Institutional ownership, 1980–2005

The figure plots quarterly statistics from our merged CRSP/institutional ownership database. The left panel shows (i) the number of institutions in the CDA/Spectrum files, and (ii) the average number of institutions holding each stock, value-weighting across stocks on CRSP. The right panel shows (i) the fraction of stocks with positive institution ownership, and (ii) the share of total market capitalization held, in aggregate, by institutions.

to 2,256 by the end of 2005, at which time they hold 62% of total market cap. Nearly all stocks on CRSP, representing close to 100% of market cap, are held by at least one institution at the end of the sample. The average number of institutions holding shares in a given stock (including stocks with zero institutional ownership) rises from 137 to 552 on a value-weighted basis and from 16 to 89 on an equal-weighted basis during the sample.

As a data check, I flag observations for which institutions, in aggregate, hold more than 100% of the shares outstanding on CRSP. These observations represent less than 1% of firms and less than 0.5% of market cap in an average quarter. In about half of those cases, the number of shares held by institutions exceeds shares outstanding by less than 5%, a scenario that is plausibly attributable to short selling rather than data error (shares owned and lent out are included in an institution's holdings but shares borrowed and sold short are not). The issue, overall, appears to be minor and my solution is just to set the maximum ownership of institutions at 100%.

3. Performance of institutional investors

My analysis of returns and portfolio decisions focuses on the aggregate portfolio that is held, collectively, by all institutions (or by a particular type of institution). This portfolio simply sums their holdings, treating institutions as one giant investor, and provides the best overall measure of performance. Returns on the portfolio are the same as the institutions' size-weighted average returns (size, here, being the

Table 1
Institutions' returns and alphas, quarterly, 1980–2005
Panel A reports average quarterly excess returns (%), standard deviations, and t-statistics (do average excess returns differ from zero?) for the aggregate portfolios held by institutions and individuals, and for the CRSP value-weighted index, MKT, and the Fama-French factors, SMB, HML, and UMD. Panel B reports quarterly CAPM, three-factor, and four-factor regressions for institutions' and individuals' returns (R): R = a + b MKT + s SMB + h HML + m UMD + e. se(a) is the standard error of a, t(a) is the OLS t-statistic testing whether a is zero, R^2 is the regression adjusted R^2, and GRS F is the Gibbons, Ross, Shanken (1989) F-statistic (p-value in parentheses) testing whether the intercepts for institutions and individuals are jointly significant. The columns labeled MKT, SMB, HML, and UMD report the slope estimates on each factor. Returns come from CRSP, institutional ownership comes from Thomson Financial, and SMB, HML, and UMD come from Ken French's website.

Panel A: Excess returns (quarterly, %)

	Avg	Std	t-stat
Institutions	2.23	8.55	2.65
Individuals	2.03	8.48	2.43
MKT	2.11	8.51	2.52
SMB	0.57	5.19	1.12
HML	1.24	6.44	1.95
UMD	2.51	7.26	3.50

Panel B: Regressions

	a	se(a)	t(a)	MKT	SMB	HML	UMD	R^2	GRS F
Institutions	0.11	0.05	2.08	1.00	.	.	.	1.00	2.35
Individuals	-0.07	0.08	-0.85	0.99	.	.	.	0.99	(0.10)
Institutions	0.11	0.06	1.88	1.01	-0.02	0.00	.	1.00	2.21
Individuals	-0.04	0.08	-0.52	0.98	0.03	-0.01	.	0.99	(0.12)
Institutions	0.09	0.06	1.32	1.01	-0.02	0.01	0.01	1.00	1.16
Individuals	-0.03	0.09	-0.30	0.98	0.03	-0.01	0.00	0.99	(0.32)

institution's equity under management).[5] I also consider the portfolio held by everyone else, who I refer to as 'individuals' or 'other investors.'

Table 1 reports quarterly excess returns over Tbills for institutions, individuals, the CRSP value-weighted index (the 'market portfolio,' MKT), and the Fama-French size, B/M, and momentum factors. Quarterly returns are compounded from monthly data; I compound each side of the strategy and then difference for long-short portfolios. The table also reports CAPM, Fama-French (1993) three-factor, and Carhart (1997) four-factor regressions for institutions and individuals.

The main message from Table 1 is that institutions as a group have returns that are slightly higher than, but almost perfectly correlated with, the value-weighted index. From 1980–2005, institutions outperform

[5] Strictly speaking, this assertion isn't exactly true because I truncate institutions' overall ownership of a stock at 100%, a consistency check that isn't possible if we average institutions' returns. The actual difference is quite small, however.

the market by 0.12% per quarter and individuals by 0.20% per quarter, without adjusting for risk. Institutions' returns have a CAPM beta and an adjusted R^2 both equal to 1.00 rounded to two decimals (1.004 and 0.996, respectively, rounded to three). And their alphas, however measured, are economically small: their CAPM and three-factor alphas are both 0.11% quarterly and their four-factor alpha is 0.09% quarterly. Institutions' returns load a bit negatively on SMB and a bit positively on HML and UMD but none of the coefficients is large or statistically significant (the largest t-statistic in absolute value is for the three-factor slope on SMB, -1.84).

Statistically, Table 1 provides weak evidence of institutional stock-picking ability. Their CAPM and three-factor alphas have t-statistics of 2.08 and 1.88, respectively, while their four-factor alpha has a t-statistic of 1.32. But we can't reject, for any of the three regressions, that institutions significantly outperform individuals or that alphas for the two groups are jointly significant (the GRS F-statistics in the table aren't significant, nor are untabulated t-statistics testing for a difference between the groups' alphas, the highest being 1.47 for CAPM regressions). More importantly, regardless of statistical significance, institutions' alphas are economically small and would be wiped by even small trading costs (not to mention management fees). The low standard errors of the estimates also means that the range of statistically likely true alphas is quite narrow, roughly from zero to a best-case value of 0.20% quarterly for any of the factor models.

It is useful to note that, given the near-perfect correlation with the market portfolio, any risk model that includes the market is likely to produce similar results. The impact on alpha of adding a factor portfolio to the CAPM regression is the product of (i) the Sharpe ratio of the portion of the factor that is uncorrelated with the market (an 'orthogonalized factor'), and (ii) the standard deviation of the part of returns explained by the orthogonalized factor. The second term is bounded above by the residual standard deviation of returns missed by the market, 0.53% quarterly for institutions. Thus, if we add an orthogonalized factor with, say, the same Sharpe ratio as the market, 0.25, institutions' alpha could go up or down by at most 0.13% quarterly (0.25×0.53). The actual impact seems likely to be much smaller, as illustrated by the three-factor and four-factor regressions.

The near-perfect correlation between institutional and market returns also suggests that institutions' aggregate holdings must not deviate too much from the value-weighted portfolio – if they do, institutions must bet primarily on idiosyncratic returns. Table 2 provides relevant evidence. I sort stocks into quintiles (NYSE breakpoints) based on a variety of characteristics and compare the quintiles' market weights (the market cap of each divided by the total market cap of all five portfolios) with their institutional weights (the fraction of institutions' holdings invested in each). The weights are found each quarter, using all stocks with data for the characteristic, and the table reports the time-series averages from 1980–2005. The 11 characteristics are:

(a) size – market cap at the beginning of the quarter
(b) B/M – book value of common equity for the prior fiscal year (with a 4-month delay) divided by size
(c) momentum – returns from months -12 to -2 relative to the sort date,
(d) reversals – returns from months -36 to -13 relative to the sort date,
(e) volatility – daily return volatility from month -12 to -1 relative to the sort date,
(f) beta – market beta estimated from at least 24 months and up to 60 months of past monthly returns,
(g) turnover – trading volume divided by shares outstanding over the past 12 months,
(h) share issuance – percent change in split-adjusted shares outstanding, equal to the growth in market cap minus without-dividend returns over the past 12 months,
(i) accruals – operating accruals, as per Sloan (1996),
(j) asset growth – percent change in total assets (book values) during the last fiscal year,
(k) ROA – return on assets, equal to EPS before extraordinary items divided by lagged assets per share.

These characteristics have all been used by prior studies to predict the cross section of stock returns, for the most part successfully (except for beta). My focus isn't on their predictive power per se but, rather, on whether institutions underweight or overweight the various quintiles relative to the market portfolio. That is, do institutions tilt their holdings, relative to the market portfolio, toward or away from stocks that have high or low values of each variable?

Table 2 shows that the answer is almost uniformly negative: institutions' average holdings from 1980–2005 line up very closely with value weights. Institutions somewhat overweight large stocks (the top size quintile has an institutional weight of 77% vs. a value weight of 72%) and underweight low-turnover and low-beta stocks (institutional weights of 7% and 14% vs. value weights of 13% and 16%, respectively, for the bottom quintiles of the two variables). But for the eight other characteristics, not a single quintile has an institutional weight that differs from its value weight by more than two percentage points and most differ by less than one (looking closely, institutions take tiny bets on growth, momentum, and profitability, and against share issuers).[6] These results suggest that the institutional preferences found by

[6] I don't report statistical tests in Table 2 for two reasons. First, it isn't clear what the right notion of statistical randomness would be, since the results are essentially population values (interpreting the population as all institutions on CDA/Spectrum). In return tests, randomness comes from returns themselves – i.e., we are interested in expected returns but the tests use realized returns – but there is no corresponding notion of such randomness here. Second, even if the differences were 'statistically significant,' it wouldn't change the conclusions about their economic magnitudes.

Table 2
The institutional portfolio vs. the market portfolio, 1980–2005
The table compares the weight invested by institutions in each group of stocks with its weight in the market portfolio (weights are relative to the total investment in, or market cap of, stocks included in the five portfolios in each row). The weights are found quarterly, and the table reports their time-series averages. Stock portfolios are based on NYSE quintile breakpoints for each of the 11 variables listed in the table and described more thoroughly in the text. Market values come from CRSP, accounting data come from Compustat (supplemented with Davis, Fama, and French's, 2000, equity data), and institutional holdings come from Thomson Financial.

		Portfolio				
		Low	2	3	4	High
Size portfolios	Institutions	0.01	0.03	0.06	0.14	0.77
(market cap)	Market	0.03	0.04	0.07	0.13	0.72
	Difference	-0.02	-0.01	-0.01	0.00	0.04
B/M portfolios	Institutions	0.44	0.23	0.16	0.12	0.06
(book-to-market equity)	Market	0.42	0.22	0.17	0.12	0.06
	Difference	0.02	0.00	-0.01	-0.01	-0.01
Momentum portfolios	Institutions	0.11	0.18	0.20	0.24	0.26
(returns for months -12 to -2)	Market	0.12	0.19	0.20	0.24	0.25
	Difference	-0.01	0.00	0.00	0.00	0.01
Reversal portfolios	Institutions	0.10	0.17	0.20	0.24	0.28
(returns for months -36 to -13)	Market	0.11	0.17	0.20	0.24	0.28
	Difference	-0.01	0.00	0.00	0.00	0.00
Volatility portfolios	Institutions	0.21	0.31	0.24	0.15	0.10
(daily, past 12 months)	Market	0.23	0.29	0.22	0.14	0.11
	Difference	-0.02	0.02	0.01	0.00	-0.02
Beta portfolios	Institutions	0.14	0.24	0.22	0.21	0.19
(past 24- to 60-month estimate)	Market	0.16	0.24	0.21	0.20	0.18
	Difference	-0.03	0.00	0.01	0.01	0.00
Turnover portfolios	Institutions	0.07	0.22	0.25	0.23	0.24
(past 12 months)	Market	0.13	0.24	0.23	0.20	0.21
	Difference	-0.05	-0.02	0.02	0.03	0.03
Share issuance	Institutions	0.24	0.18	0.19	0.19	0.19
(past 12 months)	Market	0.24	0.19	0.18	0.19	0.20
	Difference	0.01	-0.01	0.00	0.00	-0.01
Accruals	Institutions	0.18	0.24	0.22	0.21	0.15
(as per Sloan, 1996)	Market	0.18	0.25	0.22	0.20	0.14
	Difference	-0.01	0.00	0.00	0.00	0.00
Asset growth	Institutions	0.10	0.19	0.23	0.25	0.23
(prior year)	Market	0.10	0.19	0.23	0.24	0.23
	Difference	0.00	0.00	0.00	0.01	0.00
ROA	Institutions	0.10	0.17	0.16	0.22	0.35
(prior year)	Market	0.11	0.18	0.17	0.22	0.33
	Difference	0.00	0.00	-0.01	0.00	0.02

Del Guercio (1996), Falkenstein (1996), Gompers and Metrick (2001), and Bennett, Sias, and Starks (2003) have only a modest aggregate effect (those studies focus on cross-sectional regressions of institutional ownership on firm characteristics).

The patterns in Table 2 are stable throughout the sample period. The key exception is that institutions tilt less toward large stocks through time: they begin with a 10 percentage point overweight of the largest quintile in the early 1980s, which steadily drops to zero by the end of the sample. Part of this effect could be due to reporting requirements since the minimum holding that must be disclosed (10,000 shares or $200,000) hasn't changed over time as institutions have grown larger, likely increasing the reported holdings of smaller stocks. Figure 2, on the next page, plots average institutional and market weights for several of the characteristic-sorted portfolios in each of the 1980s, 1990s, and 2000s.

In sum, institutions as a group do little more than hold the market portfolio: they don't bet to a significant degree on any of the most important characteristics known to predict stock returns, and their aggregate returns are almost perfectly correlated with market returns. The close correspondence with market returns and the small, precisely estimated alphas provide strong evidence that institutions don't earn significant abnormal returns, even before costs and fees.

4. Institutional performance by type

A natural follow-up question to ask is whether some institutions have stock-picking ability, even if institutions overall do not. I explore the performance of institutions grouped by size, legal type, past performance, and the characteristics of stocks they hold.

In particular, Table 3 reports CAPM, three-factor, and four-factor regressions for institutions grouped in seven different ways: by legal type (banks vs. insurance companies vs. all others), size (equity under management at the beginning of the quarter), past annual returns of their equity portfolios, past annual growth in equity under management, and by the holding-weighted average of the log market cap, log B/M ratio, and 12-month momentum of stocks in the institution's portfolio. All classifications, except legal type, sort institutions into quartiles. I focus, as before, on the aggregate portfolio held by each group, treating institutions within the group as one big investor.

The basic conclusion from Table 3 is that some groups have stock-picking ability relative to the CAPM and Fama-French three-factor model – typically only a small amount – but there's little evidence any group does so as measured by the four-factor model. The majority of groups hold portfolios that, in

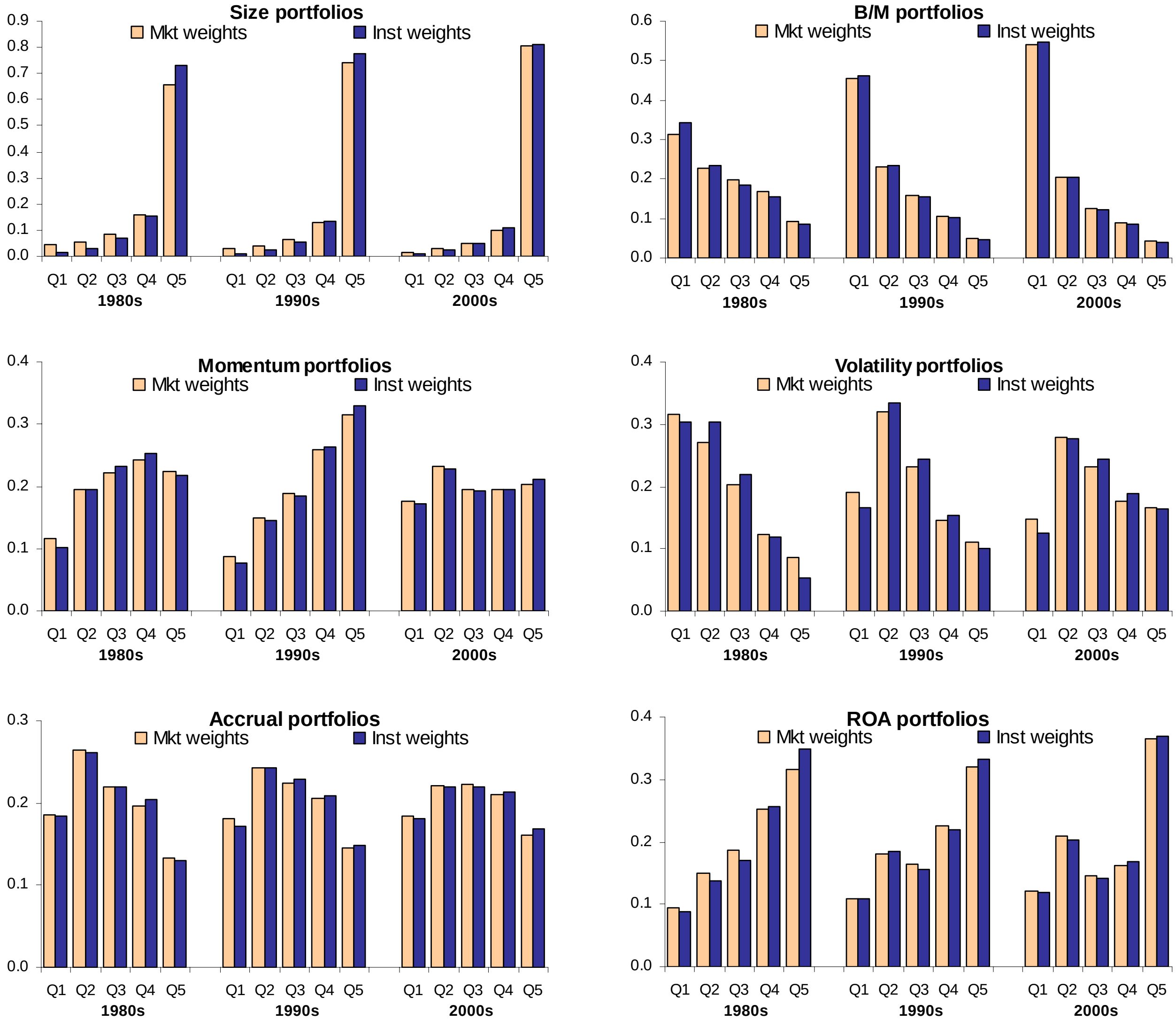

Fig. 2. Institutional vs. market cap weights, by decade, 1980–2005
Average institutional and market cap weights during the 1980s, 1990s, and 2000s for stock portfolios sorted by size, B/M, momentum (returns from month -12 to -2), volatility (daily for past 12 months), accruals (as per Sloan, 1996), and ROA (EPS before extraordinary items divided by lagged assets per share). Market values come from CRSP, accounting data come from Compustat, and institutional holdings come from Thomson Financial.

aggregate, closely mimic returns on the market index: 17 out of 27 have return correlations with the market index of 99% or higher, including 12 out of 15 of the groups sorted by legal type, size, past returns, and past growth (the other categories sort by the type of stocks held by the institution, so it's not surprising that they have somewhat lower correlations).

In Panel A, the portfolios held by banks, insurance companies, and other institutions have return correlations with the market index of 99.3%, 99.7%, and 99.8%, respectively. Banks appear, weakly, to have the

Table 3
Institutional performance by type, quarterly, 1980–2005

The table reports quarterly CAPM, three-factor, and four-factor regressions for institutional investors grouped by legal type, size (equity under management at the start of the quarter), past annual returns, past annual growth in size, or by the average market cap, B/M ratio, or momentum of stocks in the institution's portfolio (groups are quartiles except for legal type). The latter three are holding-weighted averages of the log market cap, log B/M ratio, or return from month -12 to -2 of stocks in the institution's portfolio. The regression is: R = a + b MKT + s SMB + h HML + m UMD + e, where R is the excess return on the aggregate portfolio held by a group. se(a) is the standard error of a, t(a) is the OLS t-statistic testing whether a is zero, R^2 is the regression adjusted R^2, and GRS F is the Gibbons, Ross, and Shanken (1989) F-statistic (p-value below) testing whether alphas are jointly significant for groups in each panel. The columns labeled MKT, SMB, HML, and UMD report the slope estimates on each factor; bold denotes slopes greater than 1.96 standard errors from zero. Returns come from CRSP, accounting data come from Compustat, institutional ownership comes from Thomson Financial, and SMB, HML, and UMD come from Ken French's website.

	a	se(a)	t(a)	MKT	SMB	HML	UMD	R^2	GRS F
Panel A: Institutions grouped by LEGAL TYPE									
Banks	0.21	0.10	2.16	0.93	.	.	.	0.99	1.61
Insurance	0.08	0.06	1.34	0.99	.	.	.	1.00	0.19
All others	0.07	0.06	1.13	1.03	.	.	.	1.00	
Banks	0.13	0.08	1.54	0.98	**-0.12**	**0.04**	.	0.99	0.96
Insurance	0.08	0.06	1.29	1.00	**-0.04**	0.00	.	1.00	0.41
All others	0.09	0.07	1.28	1.03	0.02	-0.01	.	1.00	
Banks	0.15	0.09	1.59	0.98	**-0.12**	**0.04**	-0.01	0.99	0.99
Insurance	0.09	0.07	1.19	1.00	**-0.04**	0.00	0.00	1.00	0.40
All others	0.04	0.07	0.47	1.03	0.03	0.00	0.02	1.00	
Panel B: Institutions grouped by SIZE									
Smallest	0.21	0.12	1.80	1.01	.	.	.	0.98	2.73
2	0.27	0.09	3.14	1.01	.	.	.	0.99	0.03
3	0.28	0.09	3.15	1.00	.	.	.	0.99	
Largest	0.10	0.06	1.66	1.00	.	.	.	1.00	
Smallest	0.10	0.10	0.95	1.00	**0.13**	**0.05**	.	0.99	1.85
2	0.20	0.08	2.54	1.00	**0.09**	**0.03**	.	0.99	0.13
3	0.19	0.09	2.26	1.00	**0.07**	**0.04**	.	0.99	
Largest	0.10	0.06	1.62	1.01	**-0.03**	0.00	.	1.00	
Smallest	0.25	0.11	2.35	0.99	**0.12**	0.03	**-0.04**	0.99	1.56
2	0.18	0.09	2.04	1.00	**0.09**	**0.03**	0.01	0.99	0.19
3	0.16	0.10	1.64	1.00	**0.07**	**0.04**	0.01	0.99	
Largest	0.08	0.07	1.14	1.01	**-0.03**	0.00	0.01	1.00	
Panel C: Institutions grouped by PAST RETURNS									
Lowest	-0.24	0.22	-1.11	1.02	.	.	.	0.94	3.12
2	0.08	0.11	0.72	0.98	.	.	.	0.98	0.02
3	0.25	0.08	3.26	0.98	.	.	.	0.99	
Highest	0.46	0.20	2.37	1.02	.	.	.	0.95	
Lowest	-0.54	0.23	-2.34	1.07	0.02	**0.13**	.	0.95	2.96
2	-0.11	0.11	-1.00	1.02	-0.02	**0.08**	.	0.99	0.02
3	0.16	0.08	2.13	1.00	**-0.05**	**0.04**	.	0.99	
Highest	0.70	0.21	3.38	0.97	0.04	**-0.10**	.	0.96	
Lowest	0.01	0.21	0.04	1.05	-0.04	0.07	**-0.17**	0.96	0.29
2	0.04	0.11	0.35	1.02	-0.04	**0.07**	**-0.05**	0.99	0.88
3	0.06	0.08	0.76	1.01	**-0.04**	**0.05**	**0.03**	0.99	
Highest	0.15	0.18	0.82	1.00	**0.10**	-0.04	**0.17**	0.97	

table continues on next page

	a	se(a)	t(a)	MKT	SMB	HML	UMD	R^2	GRS F
Panel D: Institutions grouped by PAST GROWTH									
Lowest	0.03	0.17	0.16	1.02	.	.	.	0.96	1.67
2	0.09	0.10	0.90	0.98	.	.	.	0.99	0.16
3	0.14	0.07	2.10	1.00	.	.	.	0.99	
Highest	0.20	0.11	1.83	1.03	.	.	.	0.99	
Lowest	-0.23	0.18	-1.29	1.06	0.02	**0.11**	.	0.97	2.65
2	-0.06	0.10	-0.56	1.02	-0.03	**0.06**	.	0.99	0.04
3	0.10	0.07	1.41	1.02	**-0.05**	0.02	.	1.00	
Highest	0.37	0.11	3.28	1.00	0.03	**-0.07**	.	0.99	
Lowest	0.16	0.17	0.97	1.04	-0.02	**0.07**	**-0.12**	0.98	0.56
2	0.09	0.10	0.83	1.01	**-0.05**	**0.05**	**-0.04**	0.99	0.69
3	0.06	0.08	0.75	1.02	**-0.04**	0.02	0.01	1.00	
Highest	0.07	0.10	0.74	1.01	**0.06**	**-0.04**	**0.09**	0.99	
Panel E: Institutions grouped by the MARKET CAP OF HOLDINGS									
Small cap	0.27	0.26	1.04	1.11	.	.	.	0.93	1.45
2	0.17	0.12	1.51	1.04	.	.	.	0.98	0.22
3	0.08	0.06	1.31	1.00	.	.	.	1.00	
Large cap	0.11	0.13	0.89	0.94	.	.	.	0.98	
Small cap	0.09	0.15	0.63	1.02	**0.46**	**0.08**	.	0.98	2.28
2	0.01	0.11	0.13	1.04	**0.11**	**0.08**	.	0.99	0.07
3	0.11	0.06	1.74	1.01	**-0.06**	-0.01	.	1.00	
Large cap	0.19	0.09	2.11	0.97	**-0.19**	**-0.04**	.	0.99	
Small cap	0.01	0.17	0.04	1.02	**0.47**	**0.09**	0.02	0.98	1.04
2	0.02	0.12	0.14	1.04	**0.11**	**0.07**	0.00	0.99	0.39
3	0.08	0.07	1.22	1.01	**-0.06**	-0.01	0.01	1.00	
Large cap	0.19	0.10	1.88	0.97	**-0.19**	**-0.04**	0.00	0.99	
Panel F: Institutions grouped by the B/M RATIO OF HOLDINGS									
Low B/M	-0.15	0.23	-0.67	1.13	.	.	.	0.95	2.96
2	0.04	0.08	0.47	0.99	.	.	.	0.99	0.02
3	0.30	0.11	2.63	0.95	.	.	.	0.98	
High B/M	0.69	0.28	2.50	0.91	.	.	.	0.89	
Low B/M	0.54	0.15	3.53	1.00	-0.06	**-0.32**	.	0.98	3.53
2	0.09	0.08	1.16	1.00	**-0.08**	-0.02	.	0.99	0.01
3	0.04	0.10	0.42	1.01	-0.01	**0.12**	.	0.99	
High B/M	-0.15	0.17	-0.89	1.03	**0.16**	**0.39**	.	0.96	
Low B/M	0.13	0.14	0.89	1.02	-0.02	**-0.27**	**0.12**	0.99	1.96
2	0.09	0.09	0.97	1.00	**-0.08**	-0.02	0.00	0.99	0.11
3	0.19	0.11	1.71	1.00	-0.02	**0.10**	**-0.04**	0.99	
High B/M	0.06	0.19	0.31	1.02	**0.14**	**0.37**	**-0.06**	0.96	
Panel G: Institutions grouped by the MOMENTUM OF HOLDINGS									
Low returns	0.00	0.28	0.01	0.95	.	.	.	0.90	1.98
2	0.16	0.13	1.24	0.94	.	.	.	0.98	0.10
3	0.17	0.08	2.18	0.99	.	.	.	0.99	
High returns	0.34	0.21	1.60	1.12	.	.	.	0.95	
Low returns	-0.59	0.25	-2.32	1.05	0.06	**0.28**	.	0.93	5.32
2	-0.11	0.11	-1.00	1.01	**-0.06**	**0.13**	.	0.98	0.00
3	0.16	0.08	2.03	1.01	**-0.06**	0.01	.	0.99	
High returns	0.79	0.19	4.19	1.01	0.06	**-0.21**	.	0.97	
Low returns	0.19	0.22	0.85	1.02	-0.02	**0.18**	**-0.22**	0.96	1.01
2	0.06	0.12	0.50	1.00	**-0.07**	**0.10**	**-0.05**	0.99	0.41
3	0.11	0.09	1.22	1.01	**-0.05**	0.01	0.02	0.99	
High returns	0.14	0.15	0.96	1.04	**0.12**	**-0.13**	**0.18**	0.99	

best performance, with a CAPM alpha of 0.21% quarterly (t-statistic of 2.16) and a four-factor alpha of 0.15% quarterly (t-statistic of 1.59). Insurance companies and other institutions have consistently small alphas, regardless of the risk model, with estimates of 0.04–0.09% quarterly. None of the alphas for insurance companies or other institutions is individually significant, nor are any of the GRS F statistics testing whether alphas for the three groups are jointly significant.

In Panel B, different-sized institutions again hold portfolios that are highly correlated with the market index. The portfolio held by large institutions (top quartile) has the strongest correlation with the market (99.8%) and the smallest alphas (0.08–0.10% quarterly, with t-statistics between 0.47 and 1.28). Small and medium-sized institutions also hold portfolios that have greater than 99% correlation with the market but with slightly better returns. Medium-sized institutions (quartiles 2 and 3) have the best CAPM and three-factor adjusted performance, with CAPM alphas of 0.27% and 0.28% quarterly and three-factor alphas of 0.20% and 0.19%, respectively, all of which are individually statistically significant. Small institutions (bottom quartile) have insignificant CAPM and three-factor alphas but the highest four-factor alpha, 0.25% quarterly (t-statistic of 2.35). The GRS F statistic, testing the joint significance of the groups' alphas, has a p-value less than 0.05 only for the CAPM. Loadings on the Fama-French factors suggest that the bottom three quartiles tilt a bit toward small, value stocks, and the smallest institutions tilt slightly toward loser stocks.

In Panels C and D, institutions with the best past annual returns and growth have the highest CAPM and three-factor alphas, largely a consequence of momentum in returns. The spread between the best and worst performing institutions is greatest for alphas measured relative to the three-factor model: Institutions with the highest past returns have a big positive three-factor alpha of 0.70% quarterly (t-statistic of 3.38), while institutions with the lowest past returns have an alpha that is almost as big, but negative, -0.54% quarterly (t-statistic of -2.34). Likewise, though the estimates aren't as extreme, the fastest growing institutions have a three-factor alpha of 0.37% quarterly (t-statistic of 3.28), while the slowest growing institutions have an alpha of -0.23% quarterly (t-statistic of -1.29). Alphas all but vanish once we control for momentum via the four-factor model: alphas of the two top quartiles shrink to 0.15% and 0.07% quarterly, alphas of the two bottom quartiles jump 0.01% and 0.16% quarterly, and none of the estimates (or GRS F statistics) is statistically significant.

Finally, in Panels E, F, and G, institutions grouped by the characteristics of stocks they hold (small vs. large stocks, growth vs. value stocks, losers vs. winners) also show evidence of stock-picking ability relative to the CAPM and three-factor model but not relative to the four-factor model. As one might expect, institutions that tilt the most toward smaller, higher-B/M, or higher-momentum stocks have the highest CAPM alphas within each panel, with estimates of 0.27%, 0.69%, and 0.34% quarterly for the extreme quartiles, respectively (only the middle number is individually significant, with a t-statistic of 2.50). Those compare with CAPM alphas of 0.11%, -0.15%, and 0.00% quarterly for institutions at the opposites ends of the spectrum (all insignificant). Again, alphas all but vanish when we control for the size, B/M, and momentum effects via the four-factor model: the point estimates all become slightly positive and insignificant, with an average of 0.10% quarterly and a range of 0.01–0.19% quarterly across the 12 groups in Panels E, F, and G. Loadings on the Fama-French factors exhibit the expected patterns as institutions invest in progressively smaller, higher-B/M, or higher-momentum stocks. None of the four-factor GRS F statistics is statistically significant.

In sum, a number of institutional groups appear to have stock-picking ability as measured by the CAPM, but abnormal performance is almost fully explained by those groups modest tilts toward small, value, and high-momentum stocks. Across all 27 groups we consider, only one (small institutions, with an alpha of 0.25%) has a four-factor alpha that is greater than 0.20% quarterly and only two have four-factor alphas that are individually statistically significant (none of the seven classifications has a significant four-factor GRS F statistic). Returns earned by most groups closely mimic market returns.

5. Limits of arbitrage

The tests above ask whether institutions have stock-picking ability, i.e., do their equity holdings have positive alphas? I answered 'yes' for some types of institutions when performance is measured by the CAPM. The implication is that portfolios held by those groups, when combined appropriately with the market portfolio, achieve a higher Sharpe ratio than the market alone.

My final tests ask a stronger question: do institutions (or particular groups of institutions) hold portfolios that are either mean-variance efficient or, somewhat less strongly, tilt optimally away from the market portfolio toward the mean-variance frontier? These tests are stronger because, as I explain further below, they ask whether institutions hold portfolios with the highest alphas per unit of idiosyncratic risk, not just portfolios with positive alphas.

One motivation for the tests is to explore the 'limits of arbitrage' view of Shleifer and Vishny (1997). Shleifer and Vishny argue that mispricing may exist in equilibrium, rather than being arbitraged away, because most arbitrage is undertaken by professional traders – i.e., institutions – who may be reluctant to bet heavily on an anomaly, fearing short-term loses and withdrawals by their investors. A testable feature of the argument is that, despite such concerns, professional traders should still hold portfolios with the best risk-return trade-off, either the tangency portfolio, if absolute performance is important, or a portfolio with the highest alpha per unit of idiosyncratic risk, if relative performance is important. The latter type of portfolio produces the tangency portfolio when combined with the market (assuming that 'relative performance' means relative to the CAPM or market index). Thus, asking whether institutions hold portfolios that are mean-variance efficient when combined with the market portfolio provides a basic test of the limits-of-arbitrage view.[7]

Statistically, the mean-variance test takes a simple form: I just use the institutional portfolio, along with the market portfolio, as an asset-pricing factor in time-series regressions, i.e., I test whether alphas are zero when B/M and momentum portfolios are regressed on the market portfolio and either the aggregate institutional portfolio or the portfolio held by a particular type of institution. The logic here follows from Gibbons, Ross, and Shanken's (1989) general analysis of mean-variance tests: alphas for B/M and momentum portfolios will be zero if and only if the market and institutional portfolios combine to form the tangency portfolio that is achievable from each set of assets (or, equivalently, only if institutions hold a portfolio with the highest CAPM alpha per unit of idiosyncratic risk). I focus on B/M and momentum portfolios because the value and momentum anomalies (relative to the CAPM) are significant during the sample, while the size effect is not.

Table 4 reports basic time-series statistics for the B/M and momentum portfolios. Both sets of portfolios are value-weighted quintiles and include all stocks on CRSP, with breakpoints determined by NYSE percentiles. The B/M quintiles come from Ken French's website; they are formed each year in June using stocks with positive B/M ratios as of the prior December (to allow for a lag in reporting). The momentum quintiles are the same that I used earlier for comparing institutional vs. market weights; they are formed monthly based on returns from months -12 to -2 relative to the sort date. (I use French's data for the B/M quintiles because their returns exhibit a more consistent pattern across portfolios than my own and should be closer to the Fama-French HML factor.)

The table shows that the B/M and momentum effects are significant during the sample. Focusing on CAPM alphas for the extreme quintiles, high-B/M stocks outperform low-B/M stocks by 1.65% per quarter (t-statistic of 2.51), while high-momentum stocks outperform low-momentum stocks by 2.72%

[7] I use the phrase 'limits of arbitrage' to refer exclusively to the issue above, which focuses on problems caused by delegated portfolio management. The literature sometimes uses the phrase more generally to refer to any trading friction, including, for example, trading costs and segmented markets. My tests don't address whether anomalies might persist because of these other frictions.

Table 4
B/M and momentum portfolios, quarterly, 1980–2005
Panel A reports average quarterly excess returns (%), standard deviations, and t-statistics for B/M and momentum quintiles, Q1 though Q5. Panel B reports quarterly CAPM regressions: R = a + b MKT + e, where R is a quintile's excess return and MKT is the excess return on CRSP value-weighted index. The portfolio Q5-Q1 goes long quintile 5 and short quintile 1. a is in percent; t(a) is the OLS t-statistic testing whether a is zero; MKT is the slope on MKT; R^2 is the regression adjusted R^2; GRS F is the Gibbons, Ross, and Shanken (1989) F-statistic (with p-values immediately below) testing whether intercepts for the five quintiles are jointly significant. B/M quintiles come from Ken French's website and other returns come from CRSP. Momentum quintiles (NYSE breakpoints) are re-formed monthly based on returns from months -12 to -2 relative to the sort date.

B/M quintiles						Momentum quintiles					
Panel A: Excess returns (quarterly, %)											
Portfolio	Avg	Std	t-stat			Portfolio	Avg	Std	t-stat		
Q1	2.05	9.85	2.11			Q1	0.72	11.62	0.63		
Q2	2.40	8.67	2.81			Q2	1.90	8.20	2.35		
Q3	2.35	7.85	3.04			Q3	1.43	7.40	1.96		
Q4	2.62	7.57	3.52			Q4	2.37	7.68	3.13		
Q5	3.03	8.14	3.78			Q5	3.27	9.91	3.35		
Q5–Q1	0.98	7.01	1.42			Q5–Q1	2.55	8.60	3.01		
Panel B: CAPM regressions											
Portfolio	a	t(a)	MKT	R^2	GRS F	Portfolio	a	t(a)	MKT	R^2	GRS F
Q1	-0.30	-1.10	1.11	0.92	1.91	Q1	-1.76	-2.88	1.17	0.73	4.72
Q2	0.35	1.27	0.97	0.90	0.10	Q2	0.09	0.23	0.86	0.79	0.00
Q3	0.57	1.75	0.84	0.83		Q3	-0.28	-1.01	0.81	0.86	
Q4	1.01	2.54	0.76	0.73		Q4	0.56	2.21	0.85	0.89	
Q5	1.35	2.92	0.80	0.69		Q5	0.96	2.74	1.09	0.88	
Q5–Q1	1.65	2.51	-0.32	0.14		Q5–Q1	2.72	3.10	-0.08	0.00	

per quarter (t-statistic of 3.10). The GRS F statistic, testing whether alphas are jointly significant, is marginal for the B/M quintiles, with a p-value of 0.10, but strong for the momentum quintiles, with a p-value of 0.00. These results provide a benchmark for my subsequent tests.

Table 5 explores the mean-variance efficiency of institutions' portfolios. Panel A repeats, for ease of reference, the CAPM regressions for B/M and momentum portfolios from Table 4. The remaining panels report two-factor regressions that add either the aggregate institutional portfolio (Panel B) or the portfolio held by a particular group of institutions (Panels C–I) as a second factor: $R_i = a_i + b_i$ MKT + g_i INST + e_i, where R_i is the excess return on a B/M or momentum portfolio and INST is the excess return on the institutional portfolio. Again, testing whether the B/M and momentum portfolios' alphas are zero in this regression is equivalent to testing whether the institutional portfolio has the highest alpha per unit of idiosyncratic risk. For brevity, I only report estimates of a_i and g_i for the long-short portfolios, quintiles 5 minus quintiles 1, along with the GRS F statistics for all five quintiles. Rows that are shaded indicate institutional groups that I found had statistically significant stock-picking ability relative to the CAPM (see Tables 1 and 3).

Table 5
Testing the efficiency of institutional portfolios, quarterly, 1980–2005
The table reports quarterly CAPM and two-factor regressions for B/M and momentum quintiles. Intercepts are in percent. V-G is B/M quintile 5 minus B/M quintile 1. W-L is momentum quintile 5 minus momentum quintile 1. Panel A reports CAPM regressions: R = a + b MKT + e, where R is either V-G's or W-L's excess return and MKT is the excess return on CRSP value-weighted index. Panels B–I report regressions that include the portfolio held by the specified group of institutions (or, in the second row of Panel B, individuals) as a second factor: R = a + b MKT + g INST + e. MKT is included in the regressions but its slope isn't reported. t(a) is the OLS t-statistic testing whether a is zero; INST is the slope on INST, with t-statistic t(INST); R^2 is the regression adjusted R^2; GRS F is the Gibbons, Ross, and Shanken (1989) F-statistic testing whether intercepts for all five B/M or momentum quintiles (not just V-G and W-L) are jointly significant; F pval is the p-value for the GRS F. B/M quintiles come from Ken French's website, other returns come from CRSP, and institutional ownership comes from Thomson Financial. Momentum portfolios are re-formed monthly based on returns from months -12 to -2 relative to the sort date. Shaded rows indicate institutional groups that have statistically significant CAPM alphas in Tables 1 or 3.

Portfolio	Institutional group used as INST	a	t(a)	INST	t(INST)	R2	GRS F	F pval
Panel A: CAPM benchmark								
V-G	--	1.65	2.51	.	.	0.14	1.91	0.10
W-L	--	2.72	3.10	.	.	0.00	4.72	0.00
Panel B: All institutions and individuals								
V-G	All institutions	1.75	2.60	-0.87	-0.72	0.14	1.60	0.17
	Individuals	1.66	2.49	0.07	0.08	0.13	1.82	0.12
W-L	All institutions	2.56	2.86	1.37	0.85	-0.01	4.01	0.00
	Individuals	2.66	3.02	-0.79	-0.71	-0.01	4.61	0.00
Panel C: Institutions grouped by LEGAL TYPE								
V-G	Banks	1.69	2.49	-0.17	-0.25	0.13	1.44	0.22
	Insurance	1.73	2.59	-0.89	-0.84	0.14	1.70	0.14
	All others	1.70	2.56	-0.67	-0.64	0.14	1.74	0.13
W-L	Banks	2.61	2.91	0.48	0.54	-0.01	4.18	0.00
	Insurance	2.64	2.98	0.91	0.65	-0.01	4.52	0.00
	All others	2.65	3.00	0.91	0.66	-0.01	4.43	0.00
Panel D: Institutions grouped by SIZE								
V-G	Smallest	1.26	1.99	1.91	3.51	0.23	1.31	0.27
	2	1.14	1.70	1.92	2.54	0.19	0.89	0.49
	3	1.14	1.69	1.87	2.56	0.19	0.95	0.45
	Largest	1.77	2.66	-1.26	-1.10	0.14	1.67	0.15
W-L	Smallest	3.47	4.43	-3.66	-5.47	0.22	6.38	0.00
	2	3.27	3.63	-2.10	-2.08	0.03	4.35	0.00
	3	3.12	3.42	-1.45	-1.47	0.01	4.23	0.00
	Largest	2.55	2.88	1.77	1.17	0.00	4.11	0.00
Panel E: Institutions grouped by PAST RETURNS								
V-G	Low returns	1.99	3.11	0.80	2.74	0.19	3.63	0.01
	2	1.66	2.61	1.64	2.77	0.19	2.17	0.07
	3	1.65	2.38	0.57	0.65	0.13	1.70	0.14
	High returns	2.20	3.35	-0.88	-2.65	0.19	3.25	0.01
W-L	Low returns	1.97	2.80	-2.50	-7.76	0.38	4.15	0.00
	2	2.82	3.43	-3.15	-4.13	0.14	4.57	0.00
	3	1.69	1.90	3.58	3.16	0.08	2.59	0.03
	High returns	1.26	1.77	2.84	7.92	0.39	3.22	0.01

table continues on next page

Portfolio	Institutional group used as INST	a	t(a)	INST	t(INST)	R2	GRS F	F pval
Panel F: Institutions grouped by PAST GROWTH								
V-G	Low growth	1.76	2.80	1.20	3.24	0.21	2.63	0.03
	2	1.69	2.59	1.21	1.79	0.15	1.94	0.10
	3	1.83	2.72	-0.29	-0.29	0.13	1.77	0.13
	High growth	2.15	3.36	-1.77	-3.08	0.20	3.12	0.01
W-L	Low growth	2.66	3.61	-2.91	-6.69	0.31	5.08	0.00
	2	2.85	3.40	-3.14	-3.61	0.11	4.72	0.00
	3	2.25	2.51	2.27	1.74	0.02	3.52	0.01
	High growth	1.68	2.23	4.43	6.55	0.30	3.65	0.01
Panel G: Institutions grouped by the MARKET CAP OF HOLDINGS								
V-G	Small stocks	1.43	2.27	0.83	3.50	0.23	1.68	0.15
	2	1.25	2.04	2.30	4.41	0.27	1.44	0.22
	3	1.84	2.81	-2.22	-2.15	0.17	1.83	0.12
	Large stocks	1.88	3.06	-2.03	-4.15	0.26	2.15	0.07
W-L	Small stocks	2.95	3.46	-0.87	-2.70	0.06	5.06	0.00
	2	3.08	3.60	-2.09	-2.87	0.06	4.75	0.00
	3	2.48	2.86	2.84	2.08	0.03	4.29	0.00
	Large stocks	2.52	2.95	1.81	2.67	0.05	4.50	0.00
Panel H: Institutions grouped by the B/M RATIO OF HOLDINGS								
V-G	Low B/M stocks	1.32	3.10	-2.26	-12.06	0.65	2.56	0.03
	2	1.75	2.76	-2.41	-3.16	0.21	1.88	0.11
	3	0.82	1.37	2.81	5.49	0.33	0.71	0.62
	High B/M stocks	0.44	0.95	1.76	10.78	0.60	0.71	0.62
W-L	Low B/M stocks	3.03	4.11	2.13	6.54	0.29	5.91	0.00
	2	2.63	3.05	2.08	2.00	0.03	4.84	0.00
	3	3.61	4.31	-3.01	-4.23	0.14	6.49	0.00
	High B/M stocks	3.72	4.62	-1.46	-5.16	0.20	6.70	0.00
Panel I: Institutions grouped by the MOMENTUM OF HOLDINGS								
V-G	Low ret stocks	1.65	2.90	1.22	5.98	0.36	3.60	0.01
	2	1.34	2.17	2.00	4.14	0.26	1.76	0.13
	3	1.84	2.74	-1.09	-1.30	0.15	1.69	0.15
	High ret stocks	2.18	3.74	-1.55	-5.74	0.35	3.80	0.00
W-L	Low ret stocks	2.72	4.29	-2.18	-9.63	0.47	5.85	0.00
	2	3.11	3.77	-2.53	-3.91	0.12	5.24	0.00
	3	2.28	2.60	2.52	2.33	0.04	3.75	0.00
	High ret stocks	1.80	2.67	2.72	8.68	0.42	4.18	0.00

The overall conclusion from Table 5 is that no group of institutions tilts optimally toward the tangency portfolio achievable from B/M and momentum portfolios. The portfolios held by a few groups help explain either the B/M or momentum effects – never both – but the improvements are generally modest, with a couple of exceptions.

Specifically, Panel B shows that the aggregate return for all institutions explains almost none of the B/M and momentum effects, as measured by alphas for the long-short B/M and momentum quintiles (labeled

V-G and W-L, respectively). The B/M effect increases slightly, from 1.65% to 1.75% quarterly, and the momentum effect decreases slightly, from 2.72% to 2.56% quarterly, when the aggregate institutional portfolio is added as a factor. Both alphas remain significant, and we can't reject that the aggregate institutional portfolio has no explanatory power. (The conclusions are the same if, instead, we use the aggregate portfolio held by individuals as a factor.) These results are consistent with my finding that, even though institutions overall have some stock-picking ability relative to the CAPM, the magnitude is economically small and institutions add little beyond the market index.

Portfolios held by most groups of institutions also explain only a small part of the B/M and momentum effects. For classifications based on legal type (Panel C) and the market cap of the institution's holdings (Panel G), no group of institutions has a meaningful effect on the alphas of V-G and W-L when the groups' portfolio is added to the regressions. Among those groups, the largest effect is for institutions that hold moderately small stocks (group 2 in Panel G); adding their aggregate portfolio to the regressions decreases the B/M effect from 1.65% to 1.25% quarterly but increases the momentum effect from 2.72% to 3.08% quarterly. Both alphas remain significant.

Institutions grouped by past growth (Panel F) and the momentum of their stock holdings (Panel I) have a somewhat larger impact on alphas, but still no group within those classifications explains either the B/M or momentum effect. Portfolios held by the fastest growing institutions and by institutions that invest the most in past winners substantially decrease W-L's alpha, to 1.68% quarterly in the first case and 1.80% quarterly in the second (down from a CAPM alpha of 2.72%), but t-statistics for both remain greater than 2.20. Thus, even institutions that invest most strongly in winners don't tilt optimally toward the tangency portfolio that is achievable from momentum portfolios (let alone from B/M portfolios). And short-sales constraints don't seem to be the cause: when that groups' portfolio is included as a factor, both the long and short sides of the W-L portfolio continue to have significant alphas (not shown in the table): quintile 1 has an alpha of -1.28% quarterly, with a t-statistic of -2.37, and quintile 5 has an alpha of 0.52% quarterly, with a t-statistic of 2.37.

The groups that best take advantage of the B/M or momentum effects (no group exploits both) are medium-sized institutions (in Panel D), the best-performing institutions (in Panel E), and institutions that invest most in value stocks (in Panel H). In particular, portfolios held by medium-sized and value-oriented institutions, when used as factors, accentuate the momentum effect but decrease V-G's alpha to 1.14% and 0.44% quarterly, respectively, down from the CAPM alpha of 1.65%. Neither estimate is statistically different from zero (t-statistics of 1.70 and 0.95), though the first remains economically large.

In contrast, the portfolio held by the top-performing institutions accentuates the B/M effect but decreases W-L's alpha to 1.26% quarterly (t-statistic of 1.77), down from the CAPM alpha of 2.72%. These results imply that, on a statistical basis, we can't reject that medium-sized, value-oriented, or top-performing institutions optimally exploit the opportunities available from either B/M portfolios or momentum portfolios, though not from both.[8]

Overall, the results provide little support for the limits-of-arbitrage view that (1) the B/M and momentum effects reflect mispricing, and (2) the anomalies persist because professional traders are reluctant to bet too heavily on them. In practice, institutions overall or grouped by type barely exploit the anomalies and certainly not in a way that maximizes alpha (per unit of idiosyncratic risk). Remarkably, no group that we considered simultaneously takes advantage of both the B/M and momentum effects: when we use groups' portfolios as factors, *not once* do the alphas of V-G and W-L both decrease. The results suggest that the anomalies persist either because institutions don't take advantage of them for reasons other than Shleifer and Vishny's (1997) limited-arbitrage arguments or because institutions themselves have the same biases that create the anomalies in the first place.

6. Summary

The performance and trading decisions of institutional investors have become more important in recent years as their assets have grown. A fair summary of the literature suggests that institutions have stock-picking ability even though returns ultimately delivered to their investors are mediocre at best. That view has important effects on how we think about institutions' role in capital markets, the economics of the money management industry, and market efficiency more generally. For example, it supports Berk and Green's (2004) contention that many stylized facts about mutual fund performance and flows are perfectly consistent with a rational, competitive mutual fund industry.

This study provides a more pessimistic view of the value added by institutional investors. Quite simply, institutions overall seem to do little more than hold the market portfolio, at least from the standpoint of their pre-cost and pre-fee returns. The aggregate equity portfolio held by institutions is almost perfectly correlated with the value-weighted index, has a market beta of 1.00, and has an economically small, precisely estimated CAPM alpha of 0.11% quarterly. Institutions overall take essentially no bet on any of

[8] In the case of top-performing institutions, it's more accurate to say that they exploit the opportunites available from momentum quintiles 1 and 5, not from all five quintiles, since the GRS F statistic in Table 5 is significantly different from zero. Also, I find that none of the groups' portfolios explain the returns on HML or UMD, which give greater weight to small stocks than the long-short portfolios considered in Table 5. Thus, none of the groups really fully exploits the B/M or momentum effects.

the most important stock characteristics that research has found to be associated with expected returns, like B/M, momentum, or accruals. The implication is that, to the extent that institutions' holdings deviate from the market portfolio, they seem to bet primarily on idiosyncratic returns and their bets aren't particularly successful. Another implication is that institutions, in aggregate, don't exploit anomalies in the way they should if they rationally tried to maximize the (pre-cost) risk-return trade-off of their portfolios – either relative or absolute.

The same conclusions apply, for the most part, to the different types of institutions that we considered. I found modest stock-picking ability, as measured by the CAPM, for banks, medium-sized institutions, institutions with strong past performance, and institutions that invest in high-B/M or high-momentum stocks, but their performance is almost entirely explained by the B/M and momentum effects in returns – only one group out of 27 total has a four-factor alpha that is greater than 0.20% quarterly. And, like institutions overall, even groups that have some stock-picking ability (relative to the CAPM) don't take advantage of the risk-return opportunities presented by B/M and momentum portfolios. Put differently, the B/M and momentum effects explain the groups' returns, but the groups' returns do not explain (in a statistical sense) the B/M and momentum effects.

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