Do Mutual Funds Exhibit a Smart Money Effect?

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Based on a sample of equity funds, we examine mutual fund performance as it relates to cash flows into and out of funds. Controlling for both size and style, we estimate the major determinants of fund flows cross-sectionally and show that positive cash flow mutual fund portfolios have significant risk-adjusted returns in the subsequent period. Our causality tests demonstrate a predominantly one-way causal relationship between fund performance and net cash flows for several groups of funds, however. Specifically, our finding that fund performance causes cash flows is not consistent with a smart money effect.

Introduction

The relationship between mutual fund performance and fund flow (the cash flow into the fund versus the cash flow from the fund) has been examined in a series of studies over the last decade. One reason why this question generates significant interest is that fund flows may offer evidence about an investor's stock-picking skill. For example, Gruber (1996) shows that risk-adjusted returns on new cash flows into mutual funds are higher than the average return for all investors in the funds. He calls this phenomenon the *smart money effect*, meaning that investors are able to predict mutual fund performance and invest accordingly. One possible explanation for this effect is that investors use fund-specific information in making decisions and have the ability to identify superior managers and invest accordingly. Gruber claims that selection provides an explanation for why investors put money in actively managed funds even when the average funds' performance is inferior to passive benchmarks.

Zheng's (1999) follow-up study examines a sample of 1,826 domestic equity funds over the period 1970 to 1993 and finds that funds that receive net inflows subsequently perform significantly better than those with net outflows. Using conditional methods and style variations, Zheng concludes that the smart money

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effect is due not to macroeconomic information or to a style effect, but more likely to fund-specific information and that superior returns are earned principally on small funds rather than large funds. Zheng's (1999) evidence on a size effect is consistent with Gruber's notion of sophisticated investors using information embedded in past performance to identify superior funds. In addition, Zheng finds that the smart money effect is short-lived and is explained largely, but not completely, by a strategy of betting winners. The bottom line of both of these studies is that investors may possess superior fund selection ability

Given the popularity of momentum as a strategy among fund investors, a natural question to ask is whether the smart money effect is due to fund-specific information or to exposure to momentum. To evaluate the impact of return momentum, Sapp and Tiwari (2004) account for the well-known Jegadeesh and Titman (1993) stock return momentum factor and show that the smart money effect is actually a byproduct of stock return momentum. Based on a four-factor benchmark that includes a momentum factor, they find that the adjusted excess return (alpha) on the flow of money is essentially zero and that the return earned by the abnormal flow of money is unable to outperform the return on the average dollar invested in the fund universe. Sapp and Tiwari (2004) also demonstrate that investors do not follow a deliberate strategy of selectively investing in momentum funds, but appear instead to naïvely chase funds that are recent winners and benefit from the momentum effect in the short term.

Another potential factor in the performance-flow relationship is the age effect. Chevalier and Ellison (1997) investigate manager risk-taking behavior in response to the performance-flow relationship. They measure the performance-flow relationship by allowing sensitivity coefficients to vary across age regions and find that flows into young funds are more sensitive to performance than flows into older funds. Particularly, younger funds have higher flows on average and a greater sensitivity to lagged period returns. Putting size and age together, Sawicki and Finn (2002) find that investors respond more strongly to recent performance of small (young) funds than to recent performance of large (old) funds. Their tests are designed to discriminate between size and age and support a size rather than an age effect. Their results show that investors do not appear to distinguish on the basis of age when isolating large funds only. In addition, small funds comprise a disproportionate proportion of top performers and are underrepresented among bottom performers, suggesting that the performance of small funds is not random and that investors should be chasing their performance.

The impact of advertising on fund flows is also an issue in the performance and money flow relationship. Sirri and Tufano (1998) find that search costs seem to be an important determinant of equity mutual fund flows. Using different measures of search costs, they find that the performance and money flow relationship is most pronounced among funds with higher marketing efforts, which in turn lowers the

consumers' search costs. Jain and Wu (2000) find that fund flows to the advertised funds are significantly larger than fund flows to other funds with the same investment objective. Even if the advertisements do not signal future superior performance, the mutual fund operators may advertise funds to attract more fund flows. The authors find that the cash inflows to the advertised funds are about 20 percent larger than those for the nonadvertised funds with similar characteristics.

This paper contributes to the study of performance-flow relationship in three aspects. First, we pay particular attention to database issues that potentially can distort test results. For example, Gruber's relatively small sample (less than 300 funds) excluded small funds from the database, which could introduce survivorship bias. The fund sample of Zheng (1999) is a merged fund database from different sources, and this practice can introduce the problem of data inconsistency. Sapp and Tiwari (2004) used the CRSP mutual fund database. Although free from survivorship bias, the CRSP mutual fund database suffers from backfilling bias caused by fund incubation. When a fund begins reporting to a database, historical results are added to provide a more comprehensive view of performance. Backfilled returns tend to be substantially higher than the contemporaneously reported ones because funds tend to begin reporting only after a strong run. Fund incubation is the practice of privately running multiple funds, but publicly opening only those funds with superior returns. Both incubated and non-incubated funds receive seed money from their family. This allows the funds to operate unfettered from the issues of redemption and liquidity provisions that plague established funds. Because incubated funds receive money from their family in response of to the previous period's return, we might expect to find a size effect in the data; that is, to show that money flows into small companies do a better job predicting subsequent performance versus flows into larger more established companies.

To correct for these potential problems we use Morningstar Principia as the only data source, thus removing the potential problem of data inconsistency. Our data are constructed to minimize the impact of both survivorship bias and backfilling bias by including all of the funds available to investors in each quarter, thus better capturing investors' response to fund performance.

Second, the smart money effect indicates that fund flows can be used as predictors of fund performance. Thus, the causal relationship between performance and fund flow is a key point in understanding the smart money effect, yet previous researchers did not examine the issue in this context. Risk-adjusted returns tell only whether we can get abnormal returns from a trading strategy, not whether fund flow can predict performance. Controlling for size and fund investment style, this paper studies the relation between performance and cash flows both cross-sectionally and over time, with a particular emphasis on the potential for a causal relationship. We also examine the effect of marketing efforts on fund flows based on funds' 12b-1 fee.

Third, the domestic mutual fund market has gone though a period with dramatic change since the mid-1990s, not only in the number of funds and capital under management, but also in terms of how the funds are managed. Our time period of 1998 through 2005 is particularly rich and well positioned for such a study.

Data and Methodology

Our sample period spans from October 1998 to December 2005, a time period that includes significant market movements. Our methodology is designed to remove the backfilling bias caused by fund incubation, a potential problem in previous investigations. Because we use Morningstar Principia as our data source and because these data only include funds that are available to the investors in each quarter, the impact of fund incubation on the performance and cash flow relationship has been minimized.

Table 1 presents descriptive statistics by year for the mutual fund sample. From the mean and median values we see that the average quarterly new cash flow into funds dropped sharply from 2000 to 2002. In addition, with the exception of 2003, the number of domestic equity funds has been increasing steadily. The average fund size rose from about $577 million in 1998 to about $619 million in 2000, then decreased to about $334 million in 2003, and then rose to about $415 million in 2005. The average expense ratio and 12b-1 fees are relatively stable throughout our sample period, although both show a slightly upward trend. It is interesting to see that the turnover ratio peaked in the years 2001 and 2002, a time period that corresponds to the burst of the technology bubble.

Performance and fund flows are evaluated based on new money portfolios formed on the basis of previous net cash flow. Specifically, at the beginning of each quarter, mutual funds are divided into two groups: a positive net cash flow portfolio and a negative net cash flow portfolio. The former includes all funds that realized positive net cash flow during the previous quarter, and the latter includes all funds that realized negative net cash flow during the previous quarter. We define the net cash flow to fund i during quarter t as follows:

$$NCF_{i,t} = TNA_{i,t} - TNA_{i,t-1} \times (1+r_{i,t}) = MGTNA_{i,t} \quad (1)$$

where:

$TNA_{i,t}$ = Total assets at the end of quarter t;

$r_{i,t}$ = The fund's return for quarter t; and

$MGTNA_{i,t}$ = T the increase in the total net assets due to mergers during quarter t.

From equation (1) we see that the net cash flow measure assumes that existing investors reinvest their dividends and that new money is invested at the end of each

Table 1—Descriptive Statistics for Mutual Fund Sample

Table 1 presents summary statistics on the mutual fund sample. The sample includes all US equity funds available in the market each quarter from July 1998 to December 2005. The quarterly net cash flow ($NCF_{i,t}$) for fund i during quarter t is measured as $NCF_{i,t} = TNA_{i,t}-TNA_{i,t-1}(1+r_{i,t}) - MGTNA_{i,t}$. In this equation, the terms $TNA_{i,t-1}$ and $TNA_{i,t}$ represent the total net assets for the fund at the end of quarter t-1 and t, respectively, $r_{i,t}$ represents the fund's return in month t, and $MGTNA_{i,t}$ represents the increase in the fund's total net assets due to mergers during quarter t. Fund size is the quarter-end net assets of the mutual fund, recorded in millions of dollars. The expense ratio is the percentage of total investment that shareholders pay for the fund's operating expenses. The turnover ratio represents the percentage of the portfolio's holdings that have changed over the past year. 12b-1 fee is the annual charge deducted from fund assets to pay for distribution and marketing costs

Average Quarterly		1998	1999	2000	2001	2002	2003	2004	2005
Observations		2778	4265	5412	6321	7528	5797	9425	11025
Quarterly NCF	Mean	36.75	26.81	-30.37	7.57	-5.34	-2.09	12.02	2.39
	Median	5.56	1.17	-0.87	2.30	0.07	0.51	0.95	0.35
Fund Size	Mean	577.00	602.40	619.35	422.06	360.24	334.02	380.19	415.37
	Median	63.73	59.24	61.39	41.85	30.35	29.68	31.53	33.65
Expense Ratio	Mean	1.41	1.43	1.43	1.43	1.44	1.49	1.50	1.51
	Median	1.30	1.32	1.34	1.35	1.36	1.40	1.44	1.46
Turnover Ratio	Mean	84.00	91.92	101.65	120.37	112.35	109.93	107.10	101.23
	Median	65.00	69.25	71.25	77.75	76.25	70.25	64.00	70.31
12b-1 Fee	Mean	0.37	0.33	0.38	0.30	0.41	0.41	0.42	0.43
	Median	0.25	0.25	0.25	0.19	0.25	0.25	0.25	0.25

quarter. We also assume that investors in merged funds place their money in the surviving funds and continue to earn a return on the surviving funds.[1]

To get a clear understanding of the cross-sectional relationship between fund performance and fund flows, it is necessary to examine the determinants of cash flow based on fund-specific information. Because larger funds have more existing assets and greater visibility to potential investors, we would expect that these funds experience larger absolute cash flows than smaller funds. In addition, funds that advertise more heavily would be expected to have higher expense ratios on average, because these costs frequently are deducted from fund assets in the form of 12-1 fees. We introduce three models to address this issue.[2] Net cash flows (NCF) as the dependent variable will be compared to normalized net cash flows (NNCF) in the second model. The normalized quarterly cash flow for a fund during a quarter is computed as the dollar quarterly cash flow for the fund divided by fund size at the beginning of the quarter. In this way cash flow is measured not in dollar terms, but in percentage terms. The third model is based on a binary logistic regression where the dependent variable is assigned a value of one for mutual funds with positive cash flows in the quarter and zero for those with negative cash flows in the quarter, modeling net cash flow as an all or nothing proposition. Because prior returns are assumed to be a major cash flow determinant, we include as potential explanatory variables the prior three-month return as well as the prior twelve-month return. Because fees and

[1]This is based on Gruber's (1996) follow-the-money approach.
[2]Sapp and Tiwari(2004) use OLS regression to find the major cash flow determinants.

expenses are deducted from the fund assets, we include in our model the expense ratio, 12b-1 fees, and turnover ratio as the independent variables. These variables, plus size, define our three models given as follows:

$$\text{Model 1: } NCF_t = \alpha + \text{Ret3} + \text{Ret12} + \text{Turnover} + \text{Expense} + \text{Size} + \text{12b-1} + \varepsilon_t \quad (2)$$

$$\text{Model 2: } NNCF_t = \alpha + \text{Ret3} + \text{Ret12} + \text{Turnover} + \text{Expense} + \text{Size} + \text{12b-1} + \varepsilon_t \quad (3)$$

$$\text{Model 3: } Y = \alpha + \text{Ret3} + \text{Ret12} + \text{Turnover} + \text{Expense} + \text{Size} + \text{12b-1} + \varepsilon_t \quad (4)$$

where:

NCFt = The quarterly net cash flow;
NNCFt = The normalized quarterly net cash flow;
Y = A binary logistic variable; and
Ret3 = The prior 3-month return;
Ret12 = The prior 12 month return;
Turnover = Turnover ratio;
Expense = Expense ratio;
Size = Fund net assets; and
12b-1 fee = 12b-1 fee.

To further address the issue of fund size and scale we divide the fund sample into deciles as a control effect. To address the issue of investment styles we pick six fund groups to investigate: large growth funds, large value funds, mid-cap growth funds, mid-cap value funds, small growth funds, and small value funds. In this way we can examine whether there is a difference in the performance-flow relationship across fund sizes and investment styles.

We evaluate the performance of the positive and the negative net cash flow portfolios using a four-factor model used in Carhart (1997). Specifically, the benchmarking model is given by:

$$R_{p,t} = \alpha_p + \beta_{1,p}\text{RMRF} + \beta_{2,p}\text{SMB} + \beta_{3,p}\text{HML} + \beta_{4,p}\text{UMD} + e_{pt} \quad (5)$$

where:

$r_{p,t}$ = The quarterly return on a portfolio of funds in excess of the quarterly T-bill return;
RMRF = The excess return of market portfolio; and
SMB, HML, and UMD = Returns on zero-investment factor-mimicking portfolios for size, book-to-market, and quarterly momentum in stock returns.

In equation (5), α_p represents the alpha of a portfolio of funds, defined as the risk-adjusted return in excess of the four-factor benchmark model. We will test the risk-adjusted performance of positive and negative cash flow portfolios by examining the difference between their alphas.

Because regressions reflect mere correlations between variables and do not reveal anything about causality between the variables, we use Granger causality as a technique for determining whether one time series is useful in forecasting another. For example, X is said to Granger-cause Y if it can be shown, usually through a series of F-tests on lagged values of X (and with lagged values of Y also known), that those X values provide statistically significant information on future values of Y. The test works by first performing a regression of ΔY on lagged values of ΔY. Once the appropriate lag interval for Y is found, subsequent regressions for lagged levels of ΔX are performed and added to the regression provided that they are significant and add explanatory power to the model. In addition, more than one lagged level of a variable can be included in the final regression model, provided it is statistically significant and provides explanatory power.

We argue that Granger causality tests can play an important role in such studies. Specifically, we can conduct a causality effect between fund performance and net cash flow by addressing two issues:

- Does prior fund performance Granger-cause net cash flow in the current period?
- Does current net cash flow Granger-cause fund performance in the following period?

If only the former is proved, we conclude that cash flows are attracted by fund performance and that money is not smart. If only the latter is confirmed, we conclude that money is indeed smart. A significant two-way causality would indicate the existence of a dynamic relation between fund performance and net cash flow.

Determinants of Fund Flows

Table 2 presents the results of the three specifications. From Model 1 we can see that when quarterly net cash flows is the dependent variable, prior three-month return, prior twelve-month return, and fund size are significant, and prior returns are the dominating factor. Specifically, higher prior returns attract more cash inflows, and, on average, larger funds attract more cash flows. Furthermore, the importance of prior three-month returns is higher than that of prior twelve-month returns. Model 2 uses normalized quarterly net cash flows as the dependent variable and finds that prior returns are still the most important determinant even when net cash flows are measured in percentage form. In the normalized model the turnover ratio now becomes a significant and positive factor. Fund size exhibits a negative sign, indicating that large funds attract fewer funds in terms of normalized net cash flows, though it is no longer a significant factor. Model 3, based on a logistic regression, shows that all of the independent variables except 12b-1 fees are significant. Prior three-month return, prior twelve-month return, turnover ratio, expense ratio, and fund size are all related positively to the likelihood of subsequent cash inflows. It is not unexpected that 12b-1 fees are statistically insignificant. These fees often are

Table 2—Determinants of Fund Net Cash Flows

Table 2 presents the coefficients from three models. Model 1 is based on weighted least square (WLS) regression where quarterly net cash flow (NCF) is the dependent variable. Model 2 represents an ordinary least square regression with normalized quarterly net cash flows (NNCF) as the dependent variable. The normalized quarterly cash flow for a fund during a quarter is computed as the dollar quarterly cash flow for the fund divided by fund size at the beginning of the quarter. The Newey-West covariance matrix is used to adjust for autocorrelation and heteroscedasticity. Model 3 is a logistic model where the dependent variable is assigned a value of one for funds with positive net cash flows and zero for those with negative net cash flows in the quarter. The sample period spans from July 1998 to December 2005. t-values are reported in parentheses for Model 1 and 2, and chi-squares are reported in the parentheses for Model 3. Max-rescaled R-sq applies to Model 3

	Model 1	Model 2	Model 3
Intercept	2.6430	39.6344	-0.1384
	(0.93)	(2.62)**	(60.20)**
Ret3	5.0565	0.10984	0.1253
	(41.51)**	(0.17)	(16285.81)**
Ret12	0.4827	0.1859	0.0143
	(7.84)**	(0.57)	(1244.69)**
Turnover Ratio	0.0009	0.1606	0.0001
	(0.14)	(4.88)**	(3.90)*
Expense Ratio	0.3429	14.3010	0.0218
	(0.20)	(1.58)	(3.94)*
12b-1 Fee	0.0107	0.1632	0.0006
	(0.03)	(0.08)	(0.10)
Fund Size	0.0018	-0.0020	0.0002
	(3.91)**	(-0.83)	(4.12)*
R-Sq/Max-rescaled R-Sq	0.02045	0.0003	0.3256

* Statistically significant at the 5 percent level

** Statistical significant at the 1 percent level

used by funds to cover expenses other than market expenses, and the 12b-1 fees do not fund some marketing efforts.

In summary, test results of the three models are consistent. The evidence in Table 2 shows that cash flows to funds are related consistently and positively to the fund's nearer-term performance, i.e., the prior three-month return, indicating that investors are most sensitive to a fund's near-term performance. In addition, fund size is an important determinant of net cash flows; larger funds on average attract higher net cash inflows. Based on logistic regression, the expense ratio and turnover ratio can help fund attract cash inflows. Finally, we note that the marginal impact of marketing efforts on net cash flow is insignificant.

Performance of New Money Portfolios Controlling for Size Effect

There are two issues related to the smart money effect. First, Sapp and Tiwari (2004) argue that the effect is explained by stock return momentum so that smart money is a result of investors responding to large recent returns. We use the Carhart (1997) four-factor model (including momentum) to address this effect. Second, both Gruber (1996) and Zheng (1999) find that there seems to be a size component in

smart money, in other words, smart money is strongest for the smallest funds. In order to model this effect we first divide funds into deciles so that we can study the aggregated effect of fund size on new cash flow. Decile 1 represents the smallest fund category, while decile 10 represents largest funds. We then divide new money portfolios into two groups: positive cash flow portfolios and negative cash flow portfolios. Positive cash flow portfolios are funds experiencing positive net cash inflows in the prior quarter, and negative cash flow portfolios are those experiencing net cash outflows in the prior quarter.

Panels A and B of Table 3 presents results using the Carhart (1997) four-factor model for the positive cash flow and negative cash flow portfolios, respectively. According to Panel A, all of the deciles in the positive cash flow portfolio have statistically significant alphas[3] at the 1 percent level, ranging from 1.395 percent to 2.765 percent per quarter. In addition, there is an upward trend in the value of alpha from decile 1 to decile 8 that then reverses. From Panel B we see that all of the alphas based on the Carhart (1997) model are negative, and eight are significant at the 10 percent level.

Comparing the results of Panel A and Panel B we see that positive net cash flows earn significant positive alphas, while negative cash flows generally have negative alphas. In addition, the analysis by deciles reports that the levels of alpha increase monotonically from decile 1 to decile 5 and decrease in succession from decile 8 to decile 10. This finding suggests that fund size also plays a significant role in funds' risk-adjusted returns. In other words, there exists an optimal range of fund size where positive net cash flow portfolios are rewarded with higher risk-adjusted returns. This finding also confirms the documented size effect of smart money. Small funds do not enjoy economies of scale, while very large funds find it difficult to invest efficiently. Negative net cash flow portfolios do not exhibit such a pattern. Furthermore, we find that positive net cash flows portfolios are growth-oriented, while negative net cash portfolios are characterized by value style funds.

Performance of New Money Portfolios Controlling for Style Effect

The investment style of the underlying assets of mutual funds may influence money flow and performance. In Table 4, we examine style issues based on the six fund categories given by large growth funds, large value funds, mid-cap growth funds, mid-cap value funds, small growth funds, and small value funds. We repeat the same procedure as that reported in Table 3.

[3] Alpha is the intercept of the regression model, or risk-adjusted return, and it also is used to indicate fund selection ability.

Table 3—Performance of New Money Portfolios by Fund Size

Each quarter, from July 1998 to December 2005, domestic funds are grouped into either a positive net cash flow or a negative net cash flow portfolio based on the sign of the net cash flow experienced by each fund during the previous quarter. Funds are divided into ten groups based on total net assets, and the performance of the new money portfolio is evaluated based on the estimated portfolio alpha. Decile 1 represents the smallest fund category while decile 10 represents largest funds. The Carhart four-factor portfolio alpha is calculated as the intercept from the quarterly time series regression of portfolio excess returns on the market excess return (RMRF) and mimicking portfolios for size (SMB), book-to-market (HML), and momentum (UMD) factors. Panel A of the Table reports estimates of portfolio alphas and factor loadings for the positive new money portfolios formed using equally weighted fund returns. Panel B reports estimates of portfolio alphas and factor loadings for the negative new money portfolios formed using equally weighted fund returns. The estimation is based on the Newey-West covariance matrix. t-values are reported in parentheses

	Alpha	RMRF	SMB	HML	UMD	Adj. R-sq
Panel A: Positive Net Cash Flow Portfolios						
Decile 1	1.395**	0.931***	0.083	0.102**	-0.091***	0.949
	(2.46)	(22.67)	(1.01)	(2.56)	(-3.229)	
Decile 2	2.126***	0.863***	0.085	0.049	-0.082**	0.943
	(3.71)	(22.31)	(0.88)	(1.17)	(-2.71)	
Decile 3	2.298***	0.856***	0.125	0.032	-0.083**	0.935
	(3.46)	(24.49)	(1.19)	(0.62)	(-2.65)	
Decile 4	2.463***	0.835***	0.120	-0.0002	-0.081**	0.918
	(3.48)	(20.89)	(1.01)	(-0.004)	(-2.33)	
Decile 5	2.783***	0.839***	0.107	-0.025	-0.077**	0.926
	(4.04)	(18.18)	(0.95)	(-0.49)	(-2.19)	
Decile 6	2.628***	0.842***	0.092	-0.005	-0.071**	0.927
	(3.79)	(20.37)	(0.82)	(-0.10)	(-2.08)	
Decile 7	2.734***	0.832***	0.081	-0.027	-0.066**	0.919
	(4.51)	(19.26)	(0.77)	(-0.61)	(-2.19)	
Decile 8	2.765***	0.845***	0.058	-0.029	-0.075**	0.927
	(4.63)	(20.63)	(0.58)	(-0.66)	(-2.46)	
Decile 9	2.667***	0.846***	0.061	-1.053	-0.052	0.918
	(4.18)	(19.23)	(0.56)	(-1.08)	(-1.62)	
Decile 10	2.513***	0.869***	0.046	-0.089	-0.055	0.932
	(4.07)	(18.01)	(0.46)	(-1.79)	(-1.65)	
Panel B: Negative Net Cash Flow Portfolios						
Decile 1	-0.271	0.955***	0.106	0.119***	-0.021	0.964
	(-0.499)	(25.89)	(1.44)	(2.88)	(-0.77)	
Decile 2	-0.455	0.965***	0.115	0.157***	-0.049	0.953
	(-0.86)	(18.86)	(1.71)	(3.70)	(-1.35)	
Decile 3	-1.325***	0.882***	0.172***	0.171***	0.004	0.960
	(-3.01)	(22.56)	(3.13)	(4.77)	(0.15)	
Decile 4	-2.004***	0.781***	0.252***	0.160***	0.035	0.952
	(-3.62)	(15.73)	(3.12)	(4.79)	(0.95)	
Decile 5	-1.432***	0.836***	0.110	0.144***	0.003	0.949
	(-2.94)	(25.96)	(1.16)	(4.69)	(0.12)	
Decile 6	-0.818***	0.769***	0.141	0.139***	0.018	0.932
	(-3.82)	(17.52)	(1.71)	(3.78)	(0.59)	
Decile 7	-1.575***	0.832***	0.129*	0.151***	-0.018	0.931
	(-3.55)	(14.45)	(2.04)	(2.58)	(-0.57)	
Decile 8	-1.48***	0.819***	0.079	0.076**	0.022	0.942
	(-3.19)	(20.25)	(0.85)	(2.65)	(0.832)	
Decile 9	-1.096***	0.876***	-0.024	0.062*	-0.018	0.924
	(-2.46)	(18.26)	(-0.21)	(1.78)	(-0.57)	
Decile 10	-0.934**	0.838***	-0.005	0.120***	-0.015	0.953
	(-2.75)	(22.57)	(-0.09)	(3.37)	(-0.65)	

* Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistical significant at the 1 percent level

Table 4—Performance of New Money Portfolios by Investment Styles

Each quarter, from July 1998 to December 2005, domestic funds are grouped into either the positive net cash flow or the negative net cash flow portfolios based on the sign of the net cash flow experienced by each fund during the previous quarter. Funds are divided into six groups according to investment styles, and the performance of the new money portfolio is evaluated based on the estimated portfolio alpha. The four-factor portfolio alpha is calculated as the intercept from the quarterly time series regression of portfolio excess returns on the market excess return (RMRF) and mimicking portfolios for size (SMB), book-to-market (HML) and momentum (UMD) factors. Panel A of the Table reports estimates of portfolio alphas and factor loadings for the positive new money portfolios formed using equally weighted fund returns. Panel B reports estimates of portfolio alphas and factor loadings for the negative new money portfolios formed using equally weighted fund returns. The t-statistics based on the Newey-West covariance matrix are reported in parentheses

	Alpha	RMRF	SMB	HML	UMD	Adj. R-sq
Panel A: Positive Net Cash Flow Portfolios						
Large-cap Growth	1.85***	0.996***	-0.106	-0.255***	-0.055**	0.973
	(5.16)	(24.72)	(-1.53)	(-9.66)	(-2.67)	
Large-cap Value	1.246**	0.875***	-0.107	0.348***	-0.075**	0.938
	(2.28)	(40.83)	(-1.68)	(6.79)	(2.60)	
Mid-cap Growth	-1.325***	0.882***	0.172**	0.171***	0.004	0.960
	(-3.01)	(22.56)	(3.13)	(4.77)	(0.15)	
Mid-cap Value	2.041**	0.778***	0.139	0.358***	-0.067*	0.864
	(2.49)	(19.83)	(1.29)	(4.83)	(-1.78)	
Small-cap Growth	0.819**	0.989***	0.571***	-0.299***	-0.095	0.948
	(2.64)	(12.38)	(4.22)	(-3.06)	(-1.61)	
Small-cap Value	1.432	0.707***	0.609***	0.439***	-0.052	0.869
	(1.40)	(16.01)	(4.17)	(5.39)	(-1.11)	
Panel B: Negative Net Cash Flow Portfolios						
Large-cap Growth	-0.405	1.005***	-0.069	-0.221***	0.004	0.975
	(-1.07)	(27.26)	(-1.60)	(10.20)	(0.21)	
Large-cap Value	0.067	0.878***	-0.087**	0.363***	-0.036	0.960
	(0.17)	(58.57)	(-1.79)	(11.78)	(-1.69)	
Mid-cap Growth	0.509	1.111***	0.293***	-0.403***	-0.006	0.963
	(0.61)	(21.79)	(3.11)	(-5.98)	(-0.14)	
Mid-cap Value	0.322	0.829***	0.153	0.443***	-0.029	0.902
	(0.45)	(24.21)	(1.49)	(8.05)	(-0.95)	
Small-cap Growth	-0.138	1.084***	0.598***	-0.108***	-0.089**	0.958
	(-0.21)	(16.94)	(5.51)	(-2.21)	(-2.19)	
Small-cap Value	-0.336	0.710***	0.606***	0.489***	0.002	0.907
	(-0.41)	(17.55)	(4.81)	(8.97)	(0.05)	

* Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistical significant at the 1 percent level

Panel A of Table 4 reports test results for positive net cash flow portfolios. We can see that all but the mid-cap growth funds have positive alphas, all of which are significant with the exception of small-cap value funds. In contrast, Panel B for negative net cash flow portfolios reports that none of the six fund categories have significant alphas. Regardless of investment style, negative net cash flow portfolios do not exhibit abnormal risk-adjusted returns.

In summary, we find that most of the positive net cash flow portfolios have positive and significant alphas, while none of the alphas of the negative net cash flow portfolios are significant. Not only does this pattern hold for deciles based on fund size, it is also true across different fund investment styles. We therefore conclude that there is a positive relationship between a fund's new cash flow in one quarter and its performance in the next quarter.

Causal Relationship between Fund Performance and Cash Flows

While our previous results indicate a significant relationship between positive cash flows and alpha, the finding of significance is not the entire story. We can expand our thinking to include other aspects of potential importance when investigating the relationship between performance and cash flow. For example, does fund performance determine fund flows or do fund flows determine performance? A significant alpha only confirms the existence of a correlation between variables. Given a causal relationship, how long does it last? Is the casual relationship related to fund size and investment style.

Based on Granger causality tests, Table 5 examines the causal relationship between the prior three-month return (Ret3) and quarterly net cash flows, and between the quarterly net cash flows and the following quarter's performance (FRet3). We use both absolute quarterly net cash flow (designated as NCF) and normalized quarterly net cash flow (designated as NNCF) as the measures for money flows. Once again we divide the fund sample into deciles to test the effect of fund size. Further, if a relationship between performance and cash flows exists, we want to examine how long it lasts. Grinblatt and Titman (1989) estimated that mutual fund performance persists between one to four quarters. Thus, we control the number of lags in the Granger causality test from one to four, where each lag is measured by quarter years.

From Table 5 we can see that when absolute fund flow is used, the prior three-month return (Ret3) Granger-causes absolute quarterly net cash flow (NCF) in seven of ten deciles for one lag; this becomes six of ten, five of ten, and four of ten for two, three, and four lags, respectively. On the other hand, NCF Granger-causes the following quarter's return (FRet3) only for decile 1 based on one lag, implying that new cash flows into very small funds can boost the funds' subsequent performance quickly. For two and three lags, our results show that NCF does not Granger-cause FRet3. There are four of ten deciles where absolute net cash flow Granger-causes FRet3 with four lags, indicating that it takes a longer time for the effect of cash inflows to be reflected in fund performance; this relationship is weak, given the number of lags. If we use normalized quarterly net cash flows (NNCF), the test results show that only in three of ten deciles can we conclude that prior three-month return Granger-causes normalized fund flow with one lag, and this relation disap-

Table 5—Granger Causality Test by Fund Size

Each quarter, from July 1998 to December 2005, domestic funds are grouped into deciles according to funds' net assets. Decile 1 represents the smallest fund category while decile 10 represents largest funds. In order to investigate the significance of performance and cash flow relationship over time, Granger causality tests are conducted based on lags from one quarter to four quarters. P-values are listed in Panel A through D

Null Hypothesis	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
Panel A: Granger Causality Test with One Lag										
Ret3 does not Gran-cause NCF	.4228	.4141	**.0996**	**.0085**	**.0024**	**.0127**	**.0919**	.7016	**.0908**	**.0091**
NCF does not Gran-cause FRet3	**.0531**	.1112	.6776	.97701	.9032	.5934	.6489	.6738	.8093	.9353
Ret3 does not Gran-cause NNCF	**.0879**	.7766	.4945	**.0889**	.3922	.5278	.3256	.2829	.7507	**.0718**
NNCF does not Gran-cause FRet3	.3163	.2283	.4277	.5724	.5239	.1448	.4767	.1646	.6482	.4869
Panel B: Granger Causality Test with Two Lags										
Ret3 does not Gran-cause NCF	.6752	.4152	**.0804**	**.0841**	**.0218**	**.0489**	.6706	**.0905**	.4744	**.0579**
NCF does not Gran-cause FRet3	.1687	.2423	.9872	.51743	.7271	.3331	.6430	.6276	.6270	.3985
Ret3 does not Gran-cause NNCF	.2273	.8000	.6249	.2213	.4183	.6481	.2859	.3718	.4751	**.0863**
NNCF does not Gran-cause FRet3	.7908	.5392	.8782	.8673	.7305	.3492	.7635	.2167	.4559	.0692
Panel C: Granger Causality Test with Three Lags										
Ret3 does not Gran-cause NCF	.9250	.2777	**.0793**	**.0212**	**.0224**	**.0234**	.4987	.1413	.3250	**.0156**
NCF does not Gran-cause FRet3	.3216	.4059	.5350	.0608	.3410	.0116	.0716	.7255	.0677	.0776
Ret3 does not Gran-cause NNCF	.2229	.3088	.6578	.2568	.8493	.5639	.6518	.7044	.4578	.4251
NNCF does not Gran-cause FRet3	.2343	.6591	.9589	.9773	.5074	.5475	.6595	.3711	.6018	.1724
Panel D: Granger Causality Test with Four Lags										
Ret3 does not Gran-cause NCF	.9667	.5141	.2664	**.08956**	**.1006**	**.0949**	.1505	.3640	.1244	**.0590**
NCF does not Gran-cause FRet3	.0832	.2072	.6225	**.0935**	.4837	**.0364**	**.0406**	.7744	**.0340**	.1272
Ret3 does not Gran-cause NNCF	.4009	.4329	.5931	.1719	.9671	.5553	.2002	.4977	.5694	.6792
NNCF does not Gran-cause FRet3	.2994	.1276	.6155	.3387	.3882	.6607	.1173	.5687	.6811	.1475

* Boldfaced p-values indicate statistically significance at 10 percent level

** Two measures of fund cash flows, including quarterly net cash flow (NCF) and normalized quarterly net cash flow (NNCF), are used to examine the relationship between the prior three-month return Ret3, cash flows, and the following three-month fund return FRet3. The normalized quarterly net cash flow for a fund during a quarter is computed as the dollar quarterly cash flow for the fund divided by fund size at the beginning of the quarter. The quarterly net cash flow ($NCF_{i,t}$) for fund i during quarter t is measured as $NCF_{i,t} = TNA_{i,t}-TNA_{i,t-1}(1+r_{i,t}) - MGTNA_{i,t}$. In this equation, the terms $TNA_{i,t-1}$ and $TNA_{i,t}$ represent the total net assets for the fund at the end of quarter t-1 and t, respectively, $r_{i,t}$ represents the fund's return in month t, and $MGTNA_{i,t}$ represents the increase in the fund's total net assets due to mergers during quarter t

pears for two, three, and four lags. There is no evidence that normalized quarterly net cash flows (NNCF) Granger-causes funds' return (Fret3) in the following quarter.

In Table 6 we repeat the same procedure controlling for fund investment styles. Here we find that the prior three-month return (Ret3) Granger-causes absolute net cash flows for large growth funds and mid-cap growth funds with one lag. This causality holds for large value funds up to two lags, and the causal relationship between the prior three-month return and large value funds exists after two quarters. In the growth fund category, including large-cap growth funds, mid-cap growth funds, and small-cap growth funds, we see that net cash flows (NCF) Granger-causes the following quarter's fund performance (FRet3). This result suggests that for growth-oriented mutual funds, money is smart and, to some extent, cash flows into and out of funds contain useful information about funds' future performance. This relation, however, disappears if we use normalized cash flows.

Our results show that prior quarter return Granger-causes absolute net cash flows for several groups of funds based on fund size, and we also find weak evidence that net cash flow Granger-causes subsequent fund performance with longer lags in several cases. If we examine the causal relationship based on investment style, then according to our test results, fund performance Granger-causes net cash flows in the near future for large-cap growth funds, mid-cap growth funds, and large-cap value funds. If we use normalized fund flows to examine the performance-flow relationship, the causal effect based on absolute cash flow largely disappears. Although there is weak evidence that fund flow does predict future performance to an extent, we see that the opposite dominates the performance-flow relationship. In summary, we conclude that the smart money effect is largely a result of investors naïvely pursuing recent large returns. There is no definitive evidence that money is smart (i.e., that money flows contain useful information about fund future performance). This pattern is particularly strong if we categorize funds based on size. We conclude that money is actually naïve—flows respond promptly to recent large returns. Evidence of a smart money effect is not definitive.

Conclusion

Gruber (1996) and Zheng (1999) examine whether mutual fund investors have the ability to predict future fund performance and invest accordingly. Both studies find evidence of a smart money effect, meaning that investors appear to invest in funds that subsequently perform better. These studies suggest that investors as a group possess fund selection ability. Neither the Gruber nor the Zheng study adopt a momentum factor for benchmarking returns or specifically investigate the link between the smart money effect and momentum. Sapp and Tiwari (2004) address this omission and show that the smart money effect is an artifact of stock return momentum. Their evidence on fund net cash flows from both a cross-sectional

Table 6—Granger Causality Test by Investment Styles

Each quarter, from July 1998 to December 2005, domestic funds are grouped into deciles according to total net assets. In order to investigate the significance of performance and cash flow relationship over time, Granger causality tests are conducted based on lags from one quarter to four quarters. Test results are listed in Panel A through D

Null Hypothesis	Large-cap Growth	Mid-cap Growth	Small-cap Growth	Large Value	Mid-cap Value	Small-cap Value
Panel A: Granger Causality Test with One Lag						
Ret3 does not Gran-cause NCF	**.0754**	**.0621**	.9849	**.0337**	.7775	.4309
NCF does not Gran-cause FRet3	.9995	.9458	.7528	.4907	.6070	.8718
Ret3 does not Gran-cause NNCF	.4900	**.0712**	.4177	.7228	.5589	.6691
NNCF does not Gran-cause FRet3	.9129	.4622	.6963	.7253	.5647	.6293
Panel B: Granger Causality Test with Two Lags						
Ret3 does not Gran-cause NCF	.9553	.1487	.2630	**.0473**	.4025	.5256
NCF does not Gran-cause FRet3	.1932	.1746	.3604	.8674	.4609	.6083
Ret3 does not Gran-cause NNCF	.5956	**.0389**	.4391	.3683	.4061	.8603
NNCF does not Gran-cause FRet3	.4221	.4846	.3318	.5308	.6821	.9469
Panel C: Granger Causality Test with Three Lags						
Ret3 does not Gran-cause NCF	.5488	.2336	.2319	.1243	**.0799**	.5910
NCF does not Gran-cause FRet3	**.0401**	**.05292**	**.0447**	.7371	.7472	.7267
Ret3 does not Gran-cause NNCF	.7587	.1119	.1293	.4959	.7411	.7233
NNCF does not Gran-cause FRet3	.6832	.2338	.4559	.6869	.5085	.9606
Panel D: Granger Causality Test with Four Lags						
Ret3 does not Gran-cause NCF	.15453	.53306	**.02186**	.35949	**.05186**	.77322
NCF does not Gran-cause FRet3	**.02208**	**.02169**	**.0551**	.7486	.5645	.3663
Ret3 does not Gran-cause NNCF	.95703	.24709	.27643	.22180	.88105	.84621
NNCF does not Gran-cause FRet3	.8664	**.0617**	.5161	.6879	.5850	.9874

* Boldfaced p-values indicate statistically significance at 10 percent level.

** Two measures of fund flows, including quarterly net cash flow (NCF) and normalized quarterly net cash flow (NNCF), are used to examine the relation between prior 3-month return Ret3, net cash flows, and the following three-month fund return FRet3. The normalized quarterly net cash flow for a fund during a quarter is computed as the dollar quarterly cash flow for the fund divided by fund size at the beginning of the quarter. The quarterly net cash flow ($NCF_{i,t}$) for fund i during quarter t is measured as $NCF_{i,t} = TNA_{i,t}-TNA_{i,t-1}(1+r_{i,t}) - MGTNA_{i,t}$. In this equation, the terms $TNA_{i,t-1}$ and $TNA_{i,t}$ represent the total net assets for the fund at the end of quarter t-1 and t, respectively, $r_{i,t}$ represents the fund's return in month t, and $MGTNA_{i,t}$ represents the increase in the fund's total net assets due to mergers during quarter t

regression analysis and an examination of investment patterns over time indicate that investors are simply responding to large recent returns.

Controlling for the previously documented small company effect and the potential style effect, we assess performance with a four-factor benchmark model that controls for momentum exposure. First, we find that a strategy of investing in the positive cash flow portfolio appears to yield significant alpha gains. After conducting a Granger causality test controlling for fund size, investment styles and number of lags, however, we find that the relationship between performance and new cash flow is characterized mainly by a one-way casual relationship that finds that fund performance Granger-causes new cash flows. We conclude that there is no definitive evidence to support the smart money effect.

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