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Measuring investor sentiment with mutual fund flows ☆, ☆☆

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ABSTRACT

We investigate a proxy for monthly shifts between bond funds and equity funds in the USA: aggregate net exchanges of equity funds. This measure (which is negatively related to changes in VIX) is positively contemporaneously correlated with aggregate stock market excess returns: One standard deviation of net exchanges is related to 1.95% of market excess return. Our main new finding is that 85% (all) of the contemporaneous relation is reversed within four (ten) months. The effect is stronger in smaller stocks and in growth stocks. These findings support the notion of "noise" in aggregate market prices induced by investor sentiment.

1. Introduction

In this paper, we focus on a subset of the aggregate flows in the USA: shifts between bond funds and equity funds. Defining a measure for this shift, we find a significant, positive contemporaneous relation between this measure and stock market excess returns. Our main finding is that about 85% of these price changes are reversed within four months, and the remainder is reversed within ten months. We interpret this reversal pattern as evidence of price "noise" at the aggregate market level.

Our paper relates to the studies of Warther (1995), Edwards and Zhang (1998), and Fant (1999), who investigate the Investment Company Institute (ICI) data of monthly aggregate flows to US mutual funds. They show a significant, positive contemporaneous relation between monthly US aggregate net equity fund flows and equity market returns. These studies do not find a relation

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☆☆ Former title: "Flows between Bond and Stock Funds and Stock Returns".

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between aggregate net monthly flows and subsequent market returns.[2]

As in Warther (1995), Edwards and Zhang (1998), and Fant (1999), we use ICI data: monthly data of flows and asset values of aggregate US mutual fund categories (for example, "Growth" and "Income Equity"). The data are published on a monthly basis, reporting the previous month's data at the end of each month. For example, ICI data for December 2008 are publicly available at the end of January 2009. Our sample covers the period of 1984–2008, which is twice as long as the period covered in previous research; in Warther (1995), Edwards and Zhang (1998), and Fant's (1999) studies, the sample periods end in 1992, 1996, and 1995, respectively.

In our paper, as opposed to those of Warther (1995), Edwards and Zhang (1998), and Fant (1999), we find a negative relation between flows and subsequent market returns. The main difference between these papers and ours is not the sample period, but rather the flow variables. ICI flow data are divided into four categories: "exchanges in," "exchanges out," "sales," and "redemptions," which sum to net fund flows. Sales and redemptions are actual cash flows that enter or exit a fund family, while "exchanges in" and "exchanges out" are transfers between different funds in the same fund family—for example, money transfers from Fidelity equity Fund A to Fidelity equity Fund B, or between Fidelity equity Fund C to Fidelity bond Fund D. In order to have a proxy for the flows between the equity funds and the bond funds only, we proceed as follows. First, we divide the fund population into two groups: the *equity group*, which includes domestic equity, international equity, and mixed funds, and *the bond group*, which includes bonds and money market funds. Second, we define the "net exchanges" of each fund group as "exchanges in" minus "exchanges out." The "net exchanges" sum to zero by definition over the all-fund population. Therefore, the "net exchanges" of the equity funds are the "net exchanges" of the bond funds with the opposite sign. As opposed to Warther (1995) and Edwards and Zhang (1998), who investigate the relation between net flows (net exchanges plus sales minus redemptions) and market returns, we focus on the relation between "net exchanges" and returns. In other words, we exclude "sales minus redemptions" from our main analysis. The reason is that net exchanges reflect asset allocation decisions of mutual fund investors on shifting between bonds to equity, while net sales and redemptions are influenced more by long-term savings and withdrawals. Therefore, net exchanges are more likely to reflect investor sentiment than net sales and redemptions. We next normalize the net exchanges by fund assets and find that one standard deviation of the normalized net exchanges (denoted *NEIO*) is related to 1.95% of excess market returns. Our main new finding is that there is a negative relation between net exchanges and subsequent excess market return; about 85% of the contemporaneous effect is reversed within four months, while after ten months there is a full reversal. This pattern is analyzed with multivariate regressions (of excess market returns on lagged variables), and by using the VAR (vector autoregression) approach. The relation between flows that are not exchanges (that is, sales minus redemptions), and concurrent and subsequent excess market returns, is much weaker (the relation with subsequent excess market returns is insignificant).[3]

To demonstrate the economic significance of the relation between our measure and market returns, we look at simple feasible trading strategies by observing the net exchanges, which are published by ICI with a lag of one month. First, we look at a strategy of investing in the stock market or in the risk-free rate, based on the sign of the sum of the second to the fourth lag of *NEIO* (normalized net exchanges), which are publicly available at the time of the decision. The average excess return in the stock investing months is 1.10%, while in the other months it is −0.19%—the differences are statistically significant. In contrast, the differences between the standard deviations of the excess return series are insignificant and not large: 4.60% vs. 4.26%, respectively. In addition to this "in-sample" strategy, we also examine a strategy based on an out-of-sample analysis in a rolling window of 36 months. The results are qualitatively the same as with the "in-sample" strategy.

Net exchanges are small, relative to the market volume and it seems implausible that they cause the large price changes reported in the paper. Since net exchanges reflect asset allocation decisions about shifts between bonds and equity, it seems that they are related to other demand/supply shocks driven by economic factors or investor sentiment. The strongest relation of *NEIO* is with *VIX* (the implied standard deviation of the S&P 500). The *NEIO-VIX* relation is negative and significant for both the level and the difference.[4] We find that *NEIO* is weakly negatively related to the level of the short interest rate and weakly positively related to the "Consumer Sentiment Index" of the University of Michigan Survey Center, which is based on surveys. Furthermore, we find that *NEIO* is not related to Baker and Wurgler's (2006) sentiment measure, which is based on six known measures: trading volume, as measured by the NYSE turnover; the dividend premium; the closed-end fund discount; the number of and first-day returns on initial public offerings (IPOs); and the equity share in new issues.

[2] Edelen and Warner (2001) find a positive correlation between daily flows and market returns and a weak and marginally significant reversal at a one-day lag. Goetzmann and Massa (2003), who investigate daily flows to three S&P 500 index funds, also find a positive correlation between daily flows and market returns. Ben-Rephael, Kandel, and Wohl (2008), based on complete records of daily flows, find that daily flows to equity mutual funds in Israel are positively contemporaneously correlated with aggregate stock market returns, and approximately one-half of the contemporaneous relationship is reversed within ten trading days.

[3] Fant (1999) finds that the contemporaneous relation between flows and returns is mainly due to "exchanges in" and "exchanges out." Fant does not look at "net exchanges" (which is a measure for a shift from bond funds to equity funds) and he does not find a relation between flows and subsequent returns.

[4] This is consistent with Ederington and Golubeva (2009), who investigate the determinants of aggregate mutual fund flows. They find a negative relation between VIX and net flows.

Although *NEIO* is negatively related to *VIX*, we show that the price reversal pattern we find cannot be attributed to time-varying risk premiums. In other words, net exchanges are related to changes in stock market risk; however, the associated price changes are too big to be justified as risk premium changes. A more reasonable interpretation is that "net exchanges" is a proxy for the investor sentiment effect on the aggregate stock market.[5] Our sentiment measure – "net exchanges" – is different than the University of Michigan Survey Center and Baker and Wurgler's measures. Moreover, our measure predicts the aggregate excess market return, while the other measures predict the cross-section of returns (see Lemmon and Portniaguina, 2006; Baker and Wurgler, 2006). Consistent with the interpretation of "net exchanges" as a sentiment measure, we find that its effect is stronger in smaller stocks and in growth stocks.

De Long, Shleifer, Summers, and Waldmann (1990) and Shleifer and Vishny (1997) show that irrational investors can induce price noises that do not quickly vanish if they cannot be corrected by riskless arbitrage. In our case, indeed, we find price noises which cannot be corrected using arbitrage (note that the trading strategies we investigate in Section 4.4 are very profitable, but nevertheless risky) and they take ten months to correct. A possible reason for net exchanges reflecting sentiment is the fact that mutual fund investors are small and uninformed. The ICI Fact Book 2008 (www.ici.org) reports that in 2007, 86% of mutual fund assets in the USA were held by households. The median annual income of these households before taxes was $74,000. The assumption that investors are uninformed is reasonable, since investors who perceive themselves as "informed" presumably invest directly in the market. Frazzini and Lamont (2008) find that over the long run, mutual fund investors earn lower returns as a result of reallocating across funds. In the same spirit, Friesen and Sapp (2007) find that, at the individual fund level, the dollar-weighted average return is lower than the geometric average return.[6,7] A possible explanation for these findings is that as inflows and outflows create price pressure (see Coval and Stafford, 2007; Wermers, 2003), funds tend to "buy high and sell low." While Frazzini and Lamont (2008) and Friesen and Sapp (2007) focus on the investors' inability to allocate money across mutual funds, our focus is on the effect of mutual fund investments on the market as a whole.

The rest of the paper is organized as follows: Section 2 describes the data and variables. Section 3 presents the summary statistics. Section 4 presents the relation between flows, and especially net exchanges and excess market returns. Section 5 investigates the relations between net exchanges and some economic variables (*VIX* and short-term interest rates) and sentiment measures. Section 6 presents the relation between the net exchanges and "small-minus-big" and "high-minus-low" portfolios. Section 7 provides an interpretation for our results and Section 8 concludes the paper.

[5] See Baker and Wurgler (2007) for a survey on investment sentiment.

[6] Bullard, Friesen, and Sapp (2007) relate the difference between the dollar-weighted returns and the geometric returns to the type of the fund (load vs. no-load and active vs. index funds).

[7] Dichev (2007) finds that the annual dollar-weighted historical returns of the stock market in many countries, including the USA, are lower than the return of the buy-and-hold strategy.

2. Data

2.1. Main variables

Data of aggregate mutual fund flows from January 1984 through December 2008 were obtained from the Investment Company Institute (ICI). The aggregate data contain 33 categories over our sample period: five categories for domestic equity funds, four categories for international equity funds, four categories for mixed funds (both equity and bonds), and 20 categories for bond funds. The aggregate data are published on a monthly basis, reporting at the end of each month the data of the previous month. For example, ICI data for December 2008 are publicly available at the end of January 2009. The population of the funds covered by ICI was changed in January 1991 to include TIAA-CREF funds. We focus on equity funds that, according to our definition, include domestic equity, international equity, and mixed funds.[8] The main category in terms of asset values and flows is domestic equity, which includes: Growth, Aggressive Growth, Growth and Income, Income Equity and Sector.[9,10] Similarly to Warther (1995), we calculate the monthly net flows as the sum of the components: "new sales" plus "exchanges in" minus "redemptions" and "exchanges out." Due to the increase in the volume of flows during the sample period, we normalize the monthly flow components by the fund assets at the beginning of the month.[11] In our analysis we partition the net flows into two variables, *NEIO* and *NSR*. *NEIO* is the normalized aggregate net exchanges ("exchanges in" minus "exchanges out") of the equity funds and *NSR* is the normalized aggregate net sales ("new sales" minus "redemptions") of the equity funds. The next section describes the data structure and the "net exchanges" calculations in more detail. *ExRET* is the equity market return minus the 30-day T-bill return. As the

[8] We include the mixed funds in the "equity" group and not in the "bond" group because we find that the normalized net exchanges of the mixed funds are positively correlated with the normalized net exchanges of the equity funds, and negatively correlated with the normalized net exchanges of the bond funds. In addition, using fund assets and flows, we estimated their returns and betas. The beta of the mixed funds (0.53) is closer to the beta of the equity funds (0.93) than to the beta of the bond funds (0.02). The "mixed" funds contain the following categories: flexible portfolio, balanced, asset allocation, and income mixed.

[9] The domestic equity assets are about 76%, on average, of our total sample assets. The international equity and mixed equity assets are each about 12% of our total sample assets.

[10] Warther (1995) includes international and global equity categories. Fant (1999) does not include the international, global, and sector categories in his study.

[11] Since the population of the funds covered by ICI was enlarged in 1991, we normalized fund flows by fund assets and not by total market value. Normalization by total market value does not qualitatively change our results (see Section 4.5).

Table 1
Mutual fund flows in January 2003.
The table presents the monthly flows of mutual funds in January 2003 (in millions of dollars). ICI data include four flow categories: new sales, redemptions, "exchanges in," and "exchanges out." The funds are classified into four major investment types: bonds, domestic equity (with five sub-investment categories), international equity, and mixed funds (funds that contain both equity and bonds). New sales and redemptions are actual cash flows that enter or exit the fund family. "Exchanges in" and "exchanges out" are transfers between categories in the same fund family. Net flows are the fund flows from the sum of the four categories: "new sales" minus "redemptions" plus "exchanges in" minus "exchanges out."

Fund categories	Exchanges in	Exchanges out	Net exchanges	New sales	Redemptions	Net sales	Net flows
Bonds	36,839	32,814	4,025	1,075,466	1,067,709	7,758	11,783
Aggressive growth	6,421	7,485	−1,064	12,109	13,052	−943	−2,007
Growth	5,027	6,607	−1,580	18,335	17,344	991	−589
Growth and income	3,956	4,754	−798	17,501	15,554	1,946	1,148
Income equity	769	759	10	2,474	1,745	730	739
Sector	2,622	2,943	−321	3,057	3,346	−289	−610
Total domestic equity	18,794	22,547	−3,754	53,477	51,042	2,435	−1,319
International equity	4,325	4,642	−318	18,623	17,249	1,374	1,057
Mixed	1,376	1,333	43	7,150	6,100	1,050	1,093
Total categories	61,333	61,336	−3	1,154,716	1,142,099	12,617	12,613

equity market return, we use the Center for Research in Security Prices (CRSP) value-weighted index composed of NYSE, Amex and Nasdaq stocks. Other variables obtained from the CRSP are the equity market total value, as the total value of NYSE, Amex and Nasdaq stocks, CPI data (all urban consumers), and 30-day T-bill returns (denoted *RF*). In addition to market returns, we look at the returns of Fama-French portfolios ("small stocks," "big stocks," "high book-to-market stocks," and "low book-to-market stocks") and at the total returns of the Russell 1000 and Russell 2000 indexes. The data of Baker and Wurgler's measure of sentiment are obtained from Jeffrey Wurgler's website at www.stern.nyu.edu/~jwurgler. The data end at December 2005. The data of the University of Michigan sentiment measure are obtained from Reuters website and the University of Michigan Surveys of Consumers at www.sca.isr.umich.edu. Data of *VIX* values (implied standard deviation of S&P 500 options) are obtained from finance.yahoo.com.

2.2. Exchanges in, exchanges out, new sales, and redemptions

ICI data include four categories of flows: sales, redemptions, "exchanges in," and "exchanges out," which sum to net fund flows. Sales and redemptions are actual cash flows that enter or exit a fund family. On the other hand, exchanges in and out are transfers of existing cash flows between different funds in the same fund family.[12] Because we are interested in the flows between the equity funds and the bond funds, we look at the net exchanges. This ensures that the inter-equity movements are washed out.

Table 1 presents an example of monthly flows (in millions of $) in January 2003. The funds are classified into four major investment types: bonds, domestic equity, international equity, and mixed (funds that invest in both equity and bonds). By definition, the aggregate net exchanges across all fund categories should sum to zero (any deviation from zero is due to rounding of numbers or reporting errors). Indeed, in the example for January 2003 given in Table 1, the aggregate net exchanges are $3 million, which is a very small number relative to the total "exchanges in" ($61,333 million) and "exchanges out" ($61,336 million).[13] In this month, the "net exchanges" of the bond funds were $4,025 million while the "net exchanges" of the equity funds (domestic and international) were –$4,028 million (domestic: –$3,754 million, international: –$318 million, and mixed: $43 million). That is, in this month about $4 billion was shifted through the "exchanges" mechanism from equity funds to bond funds. We can also see that the "international equity" and "mixed" net exchanges are much smaller in magnitude than the "domestic equity." The correlation between "net exchanges" of equity and the "net exchanges" of bond funds, over the entire sample period, is -0.98. The correlation is not -1 because of number rounding and reporting errors.

3. Summary statistics

Table 2 presents the summary statistics of the equity fund flows, asset values, and equity market returns. The monthly average net flows over the period are $7.89 billion. Fig. 1A depicts the monthly net fund inflows in real terms over the sample period. Similarly, Fig. 1B and C depict the "net exchanges" and "net sales" in real terms over the sample period. It can be seen that while net sales are, on average, positive and increasing over the sample period, "net exchanges" are not increasing.

The average of the monthly normalized (by fund assets at the beginning of the month) net flows (*NFLOWS*) is 0.61%. The *NFLOWS* average is composed of 0.65% due to the *NSR* (normalized net sales and redemptions) average and -0.04% due to the *NEIO* (normalized net exchanges) average.

[12] It is important to note that transfer of cash between different funds that are not in the same fund family is not recorded as "exchanges in" and "exchanges out," but as new sales and redemptions.

[13] The average of the absolute net exchanges divided by the absolute sum of the exchanges in the whole sample is 1.5%.

Table 2
Summary statistics.
The table presents the summary statistics of the equity fund flows, asset values, and equity market returns. The sample period ranges from February 1984 to December 2008, covering a total of 299 months. Fund flows and net asset values were obtained from the Investment Company Institute (ICI) and include the following fund categories: domestic equity, international equity, and mixed funds. The total value of the equity market and returns were obtained from the Center for Research in Security Prices (CRSP) as the total value and value-weighted return of NYSE, Amex, and Nasdaq stocks. *NET_FLOWS* is the net flows (in billion $) into and out of the funds from four components: "new sales" plus "exchanges in" minus "redemptions" minus "exchanges out." Assets are the end-of-period net assets of the equity funds (in billions $). The net flows of the equity funds and their components are normalized each month by the previous month's fund assets value: *NFLOWS* is the normalized net flows (in %). *NS* is the normalized "new sales" (in %). *NR* is the normalized "redemptions" (in %). *NI* is the normalized "exchanges in" (in %). *NO* is the normalized "exchanges out" (in %). *NSR* is the normalized net sales ("new sales" minus "redemptions") in %. *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. *RET* is the monthly market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks (in %). *ExRET* is the excess market return (over 30-day T-bill return) in %.

Variables	Mean	Median	Std	Min	Max
NET_FLOWS ($ billions)	7.89	7.94	14.34	−86.25	50.35
ASSETS ($ billions)	2,405.4	1,737.1	2,201.4	79.0	7,675.9
NFLOWS (%)	0.61	0.51	0.87	−2.94	3.85
NS (%)	2.29	2.21	0.59	0.98	5.16
NR (%)	1.63	1.57	0.40	0.96	3.27
NI (%)	1.09	1.07	0.62	0.21	3.82
NO (%)	1.14	1.08	0.67	0.24	5.04
NSR (%)	0.65	0.56	0.69	−1.17	3.61
NEIO (%)	−0.04	−0.01	0.33	−2.41	2.23
RET (%)	0.86	1.36	4.49	−22.53	12.85
ExRET (%)	0.47	1.01	4.48	−23.14	12.43

Looking at *NEIO*'s minimum and maximum values, we can see that the distance between these values and the average is larger than six standard deviation units. In the empirical analysis *NEIO* is winsorized around the 1% tails of the distribution. After the winsorizing the average is still −0.04% and the standard deviation decreases from 0.33% to 0.28%. As a robustness check, we repeat our main empirical analysis with *NEIO* that is not winsorized and the results are not changed qualitatively (see Section 4.5).

To obtain an idea of the relation between fund flows and market dollar volume, we sum the absolute values of all four flow components (each component is given its absolute value). The ratio between this sum and the market monthly dollar volume ranges from 2.29% to 19.19% and has no time trend. The correlation between the monthly percentage changes of the market dollar volume and absolute flow volume is 0.69. This indicates that the changes in fund flow volumes are positively correlated with the changes in market volume. To obtain an idea of the relation of "exchanges in" and "exchanges out" with market volume, we sum the absolute value of exchanges in and exchanges out. The average ratio between this sum and market volume is 3.49%. The average ratio of the absolute value of net exchanges to the market volume is only 0.26%.

The average of the market return (*RET*) is 0.86%. The average excess return over the risk-free rate (*ExRET*) is 0.47%. The minimum return of −22.53% is the market

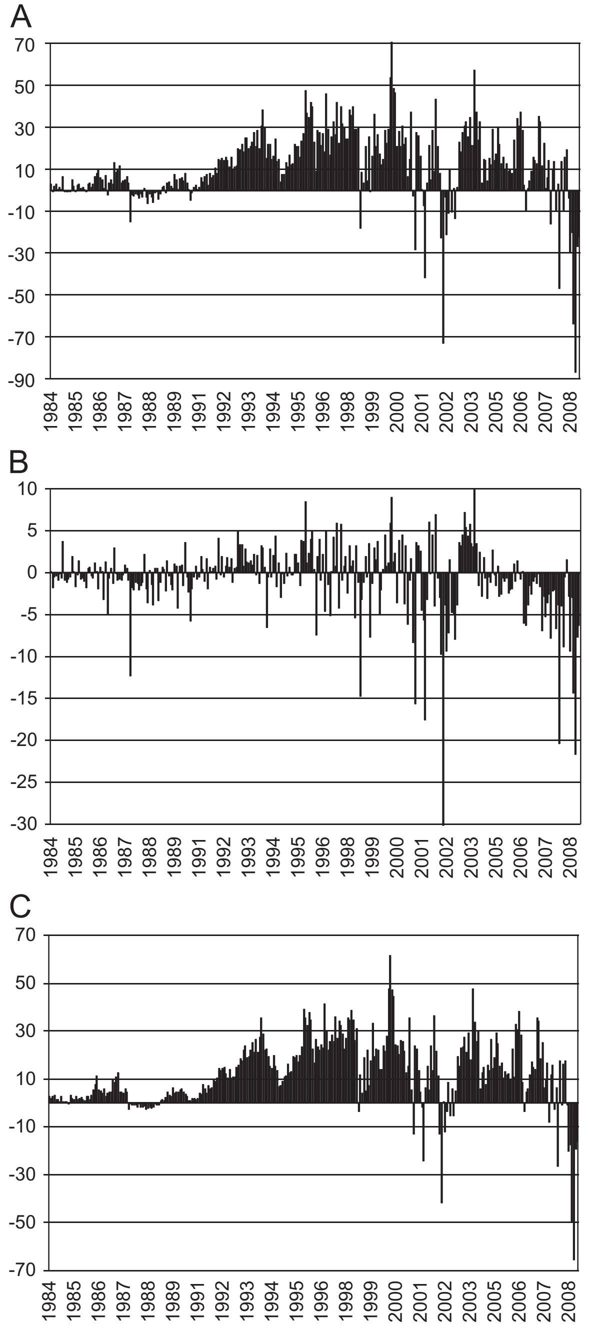

Fig. 1. Flows to equity funds. (A) Depicts the real net flows (adjusted for inflation and presented in December 2008 prices) to the equity funds from February 1984 to December 2008, a period of 299 months. The real net flows (in billions $) are composed of "new sales" plus "exchanges in" minus "redemptions" and "exchanges out." (B) Depicts the real net exchanges (adjusted for inflation and presented in December 2008 prices) to the equity funds from February 1984 to December 2008, a period of 299 months. The real net exchanges (in billions $) are composed of "exchanges in" minus "exchanges out." (C) Depicts the real net sales (adjusted for inflation and presented in December 2008 prices) to the equity funds from February 1984 to December 2008, a period of 299 months. The real net sales (in billions $) are composed of "new sales" minus "redemptions.".

return in October 1987. The standard deviation is 4.49%, which reflects a yearly standard deviation of 15.6%.

4. The relations between flows and excess market returns

4.1. The contemporaneous relation between flows and excess market returns

The innovation in our analysis is the separation of the *NFLOWS* into two components: *NEIO* (normalized net exchanges) and *NSR* (normalized net sales). The correlation between *NEIO* and *NSR* is positive and significant with a value of 0.388. As mentioned in Section 2.2, we aim to capture the flows between equity funds and bond funds. Using the net exchanges washes out the flows between the equity funds. Therefore, the "net exchanges" is the best proxy for flows from bond funds to equity funds. Fant (1999) uses all four components of the fund flows ("new sales," "redemptions," "exchanges in," and "exchanges out") separately in his analysis. The use of "exchanges in" and "exchanges out" separately, as in Fant (1999), also captures the flows between the equity funds.

We start with the contemporaneous relation between *ExRET* and the *NFLOWS* components. Table 3 presents the coefficients from the time-series regressions of excess market return (*ExRET*) as the dependent variable on contemporaneous variables. In specification (1), the adjusted-R^2 between *ExRET* and *NFLOWS* is 0.223. Specifications (2) and (3) separate *NFLOWS* into *NEIO* and *NSR*. The adjusted-R^2 between *ExRET* and *NEIO* is 0.373. The adjusted-R^2 between *ExRET* and *NSR* is only 0.086. Specification (4) uses both *NEIO* and *NSR* in the regression. As we can see, each of the variables separately is significant, but together *NEIO* is significant with a *t*-statistic of 10.67 while the relation with *NSR* is weak and insignificant with a *t*-statistic of 1.37. This indicates that the positive relation between *ExRET* and *NFLOWS* is mainly due to *NEIO*. Moreover, *NEIO* and *NSR* are positively and significantly correlated, with a correlation value of 0.388. One explanation for the relation between *NSR* and *ExRET* in specification (3) is the positive relation between *NEIO* and *NSR*.

Based on Warther's (1995) separation of flows into expected and unexpected components, we create the expected and unexpected *NEIO* components by running a regression of *NEIO* on four lags of *NEIO*, *ExRET*, and *NSR* from period $t-1$ to $t-4$. *ENEIO* is the expected part and *UENEIO* is the unexpected part. Consistent with Warther (1995), we find that the unexpected part of *NEIO* is correlated with *ExRET* (Table 3, specification (5)). Adding the expected part of *NEIO* as an additional explanatory variable (Table 3, specification (6)) reveals that is it not correlated with *ExRET*. Since *NEIO* is very unpredictable (the adjusted-R^2 in specification (3) of the Appendix is 0.035), the explanatory powers of *NEIO* and *UENEIO* for *ExRET* are very similar. That is, the adjusted-R^2 of specifications (2) and (5) of Table 3 are very similar: 0.373 and 0.385.

To summarize the main finding in Section 4.1: Normalized net exchanges (*NEIO*) are positively correlated with the excess market return *(ExRET)*.

4.2. The relation between flows and subsequent excess market returns

In this subsection we analyze the relation between the excess market return and the lagged flow components. In an unreported result, the Wald statistic of using four lags of *NFLOWS* as explanatory variables has a *p*-value of 0.648. That is, by using *NFLOWS* we do not get predictability of

Table 3
Regressions of excess market returns (*ExRET*) on contemporaneous variables.

The table presents the coefficients from the time-series regressions of excess market returns (*ExRET*) on the respective variables. The sample period ranges from February 1984 to December 2008, covering a total of 299 months. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill (in %). The net flows of the equity funds and their components are normalized each month by the previous month's fund assets value. *NFLOWS* is the normalized net flows (in %). *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. *NEIO* is winsorized around the 1% tails of the distribution. *NSR* is the normalized "net sales" ("new sales" minus "redemptions") in %. *ENEIO* is *NEIO*'s expected value using a regression of *NEIO* on four lags of *NEIO, ExRET,* and *NSR* from period $t-1$ to $t-4$. *UENEIO* is *NEIO*'s unexpected part from that regression. The table presents the *p*-values of the Wald statistic, for the significance of the regressions. The *t*-statistics are reported below the coefficients. Both the Wald statistics and the *t*-statistics are corrected for heteroskedasticity using the White (1980) correction.

	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	−1.02	0.91	−0.80	0.59	0.50	0.53
	[2.73]	[4.76]	[1.79]	[1.61]	[2.42]	[2.45]
NFLOWS	2.46					
	[6.51]					
NEIO		9.85		9.40		
		[10.42]		[10.67]		
NSR			1.94	0.47		
			[4.17]	[1.37]		
ENEIO						0.85
						[0.33]
UENEIO					10.88	10.87
					[10.09]	[10.07]
Adjusted-R^2	0.223	0.373	0.086	0.375	0.385	0.384
p-Values of Wald statistic for						
Regression	0.000	0.000	0.000	0.000	0.000	0.000

Table 4
Regressions of excess market returns (*ExRET*) on lagged variables.

The table presents the coefficients from the time-series regressions of excess market returns (*ExRET*) on the respective variables. The sample period ranges from February 1984 to December 2008, covering a total of 299 months. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill return (in %). The flow components of the equity funds are normalized each month by the previous month's fund assets value. *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. *NEIO* is winsorized around the 1% tails of the distribution. *NSR* is the normalized "net sales" ("new sales" minus "redemptions") in %. $SumNEIO_{2\_4}$ is the sum of *NEIO* lags from period $t-2$ to $t-4$. $SumNEIO_{1\_4}$ is the sum of *NEIO* lags from period $t-1$ to $t-4$. *UENEIO* is *NEIO*'s unexpected part from a regression of *NEIO* on four lags of *NEIO, ExRET,* and *NSR* from period $t-1$ to $t-4$. $SumUENEIO_{2\_4}$ is the sum of *UENEIO* lags from period $t-2$ to $t-4$.The table presents the *p*-values of the Wald statistic for the significance of the regressions and the variables. For example, the *p*-value for *NEIO* lags is the *p*-value of the Wald statistic for the significance of the *NEIO* lags as a group. The *t*-statistics are reported below the coefficients. Both the Wald statistics and the *t*-statistics are corrected for heteroskedasticity using the White (1980) correction.

	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	0.332	0.343	0.333	0.395	−0.426	0.498
	[1.29]	[1.31]	[1.30]	[0.99]	[0.92]	[1.92]
NEIO($t-1$)	−0.338				−1.768	
	[0.39]				[2.05]	
NEIO($t-2$)	−0.949				−1.506	
	[1.10]				[1.52]	
NEIO($t-3$)	−1.289				−1.254	
	[1.48]				[1.10]	
NEIO($t-4$)	−1.844				−2.455	
	[2.21]				[2.68]	
SumNEIO2_4		−1.392				
		[3.10]				
SumUENEIO2_4						−1.695
						[3.27]
SumNEIO1_4			−1.113			
			[3.07]			
NSR($t-1$)				1.035	1.695	
				[1.50]	[2.28]	
NSR($t-2$)				−0.353	−0.026	
				[0.44]	[0.03]	
NSR($t-3$)				−1.162	−1.454	
				[1.66]	[1.62]	
NSR($t-4$)				0.673	0.806	
				[1.06]	[1.23]	
Adjusted-R^2	0.013	0.021	0.019	0.000	0.031	0.027
p-Values of Wald statistic for						
Regression	0.026	0.002	0.002	0.274	0.003	0.001
NEIO lags	0.026				0.001	
NSR lags				0.274	0.021	

the excess returns. This result is consistent with previous studies (Warther, 1995; Edwards and Zhang, 1998; Fant, 1999). Table 4 presents the coefficients from the time-series regressions of *ExRET* as a dependent variable on lagged *NEIO* and *NSR*. Specifications (1)–(3) are based on *NEIO* lags. We start in specification (1) by looking at the four lags of *NEIO* from period $t-1$ to $t-4$.[14] It can be seen that each of the coefficients is negative and the *p*-value of the Wald statistic is 0.026. It is apparent that the coefficient of the first lag is not significant, with a value that is much smaller than the other coefficients. This is possibly because the information about the flows is released by ICI at a one-month lag, which may delay the reversal by one month. If each lag of *NEIO* has a similar effect on *ExRET*, we might want to reduce noise in the estimation and estimate *ExRET* with the sum of *NEIO* lags. In specification (2), the explanatory variable is the sum of lags 2–4 ($SumNEIO_{2\_4}$). The *t*-statistic of this variable is -3.10. The adjusted-R^2 is also higher than for specification (1), with a value of 0.021. Omitting the first lag from the sum of the lagged variables can be justified by the fact that this variable is unknown in the return month (due to the one-month lag in ICI's reporting). Nevertheless, for a robustness check, in specification (3) the explanatory variable is the sum of lags 1–4 (denoted $SumNEIO_{1\_4}$). The *t*-statistic of this variable is -3.07. $SumNEIO_{2\_4}$ and $SumNEIO_{1\_4}$ are persistent by construction. Thus, the *t*-statistics in specifications (2) and (3) may be biased, as explained in Stambaugh (1999). Therefore, we check that the residuals of these regressions are not correlated with the residuals of the AR(1) model of the explanatory variables. The correlations are 0.012 and not significant. Therefore, there is no need to correct the *t*-statistic estimation. To be on the safe side, we use the correction of Amihud and Hurvich (2004) and get very similar *t*-statistics and coefficient values. Specification (4) shows that the lags of *NSR* alone are not related to *ExRET*, but specification (5) shows that adding the lags of

[14] The number of lags is set to four as in the VAR equations (see Section 4.3). To determine the number of lags, we employed the next lag test of the three-variable VAR system: $(T-k)(\ln Det_R - \ln Det_{ur}) \sim \chi^2(q)$.

Table 5
Impulse response simulation of *ExRET*, *NEIO*, and *NSR*.

The table presents the impulse response function results of a one-standard-deviation shock to *NEIO* (normalized net exchanges) on *ExRET* (the excess market return) based on two alternative estimations: "Full VAR" is the impulse response estimation based on a three-variable VAR system of *NEIO*, *NSR*, and *ExRET* with four lags of each variable (see Eq. (1)). "Restricted VAR" is the impulse response estimation based on a three-variable VAR system of *NEIO, NSR*, and *ExRET* without the lags of *ExRET* (see Eq. (2)). Period t is the contemporaneous period of the shock. The accumulated response column presents the accumulated periodic effect. The table presents the t-statistics of the impulse response estimation for the accumulated response from period $t+1$ to $t+10$. The t-statistics are calculated based on simulated standard deviations.

Period	Accumulated response	
	Full VAR	Restricted VAR
t	1.95%	1.95%
$t+1$	1.52%	1.54%
$t+2$	1.14%	1.16%
$t+3$	0.90%	0.90%
$t+4$	0.31%	0.28%
$t+5$	0.16%	0.12%
$t+6$	0.17%	0.13%
$t+7$	0.08%	0.03%
$t+8$	0.03%	−0.01%
$t+9$	0.03%	−0.01%
$t+10$	−0.01%	−0.04%
t-Statistic	3.03	3.46
% of reversal	101	102

NSR to the lags of *NEIO* increases the explanatory power of the regression. Specification (6) uses *NEIO*'s unexpected part (*UENEIO*). As in specification (2), we sum lags 2–4 of *UENEIO* ($SumUENEIO_{2\_4}$). As with the contemporaneous relations, we get only slight improvements in the estimation over using *NEIO*. Therefore, for simplicity we use *NEIO* in our next analyses.

To summarize the main result of Section 4.2: Normalized net exchanges (*NEIO*) are negatively correlated with subsequent market returns.

4.3. The dynamic relation between flows and market returns

We estimate the accumulated dynamic effect of *NEIO* on *ExRET* using the VAR (vector autoregression) approach. In Table 5 we present the results of the accumulated impulse response simulation of a one-standard-deviation shock to *NEIO* on *ExRET* in three equation systems.[15] The Cholesky order is set to be *NSR*, *NEIO*, *ExRET*.[16] Changing the order does not affect the results qualitatively.

The first system of equations is the "Full VAR" between *NSR*, *NEIO* and *RET*[17]

$$NSR_t = \alpha_1 + \sum_{i=1}^{4}\gamma_{1i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{1i}NEIO_{t-i} + \sum_{i=1}^{4}\delta_{1i}ExRET_{t-i} + \varepsilon_{1t} \quad (1.1)$$

$$NEIO_t = \alpha_2 + \sum_{i=1}^{4}\gamma_{2i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{2i}NEIO_{t-i} + \sum_{i=1}^{4}\delta_{2i}ExRET_{t-i} + \varepsilon_{2t} \quad (1.2)$$

$$ExRET_t = \alpha_3 + \sum_{i=1}^{4}\gamma_{3i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{3i}NEIO_{t-i} + \sum_{i=1}^{4}\delta_{3i}ExRET_{t-i} + \varepsilon_{3t} \quad (1.3)$$

Although the lags of *ExRET* are not significant in these equations, we estimate the full system as the unconstrained starting point. The result of the simulation is presented in the "Full VAR" column. The contemporaneous effect in period t is 1.95%. The total reversal effect from $t+1$ to $t+10$ is 1.97%, which is approximately the full contemporaneous effect. The t-statistic of the accumulated reversal is 3.03.[18] The main part of the reversal occurs between period $t+1$ and period $t+4$ and accounts for 85% of the reversal.

The second estimation is of the "Restricted VAR" system, which does not include the insignificant *ExRET* lags

$$NSR_t = \alpha_1 + \sum_{i=1}^{4}\gamma_{1i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{1i}NEIO_{t-i} + \varepsilon_{1t} \quad (2.1)$$

$$NEIO_t = \alpha_2 + \sum_{i=1}^{4}\gamma_{2i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{2i}NEIO_{t-i} + \varepsilon_{2t} \quad (2.2)$$

$$ExRET_t = \alpha_3 + \sum_{i=1}^{4}\gamma_{3i}NSR_{t-i} + \sum_{i=1}^{4}\beta_{3i}NEIO_{t-i} + \varepsilon_{3t} \quad (2.3)$$

The results are presented in the "Restricted VAR" column. Clearly, the results are not different from the "Full VAR" system, as the lags of *ExRET* do not have much influence on the forecasting: the accumulated reversal is −2.00%, which is approximately all the contemporaneous effect. The t-statistic of the accumulated reversal is 3.46. Fig. 2 depicts the accumulated responses in one graph.

To summarize the main findings in Section 4.3: A shock of one standard deviation to *NEIO* (normalized net exchanges) is related to a contemporaneous market return of 1.95%; most of this effect is reversed within four months and all of it is reversed within ten months.

4.4. Trading strategies based on normalized net exchanges

In order to demonstrate the economic significance of the reversal relation between net exchanges and market

[15] In order to verify that there is no structural break in the three equations, we estimated the Andrews (1993) test for structural break for unknown change points. The chosen search range was the inner segment of 70% of the data. The test indicates that there is no structural break in any of the three equations.

[16] This order is justified by the regression analysis reported in the Appendix which, based on the Granger causality test, finds that *NSR* is not affected by *NEIO* lags, *NEIO* is affected by *NSR* lags, and finally *ExRET* is affected by both *NEIO* and *NSR* lags.

[17] To determine the number of lags in the VAR equations, we employed the next lag test of the three-variable VAR system: $(T-k)(\ln Det_R - \ln Det_{ur}) \sim \chi^2(q)$.

[18] The t-statistic was estimated numerically by a Monte Carlo simulation [for Monte Carlo standard errors, see Hamilton (1994, pp. 336–337)].

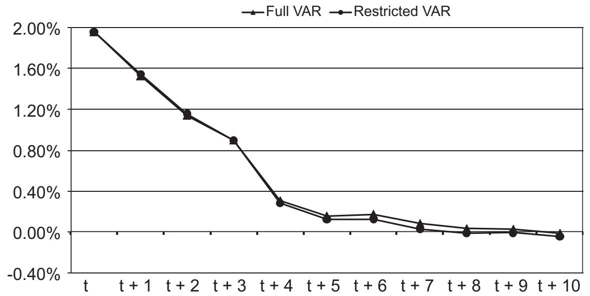

Fig. 2. Accumulated impulse response function. Fig. 2 presents the accumulated impulse response simulation of a one-standard-deviation shock to *NEIO* (normalized net exchanges) on *ExRET* (excess market return) based on two alternative estimations: "Full VAR" is the impulse response estimation based on a three-variable VAR system of *NEIO, NSR,* and *ExRET* with four lags of each variable (see Eq. (1)); "Restricted VAR" is the impulse response estimation based on a three-variable VAR system of *NEIO, NSR,* and *ExRET* without the lags of *ExRET* (see Eq. (2)). Period *t* is the contemporaneous period of the shock.

Table 6

A trading strategy based on normalized net exchanges.

The table presents the results of a strategy based on the normalized net exchanges (*NEIO*). For each month *t*, we sum the lags of *NEIO* from month $t-2$ to $t-4$ ($SumNEIO_{2\_4}$), to produce an indicator for month *t* return (recall that ICI data for month $t-1$ are available only at the end of month *t*). If the indicator is negative, the investment decision for month *t* is to invest in the stock market. If the indicator is positive, the investment decision is to invest in a risk-free asset (30-day T-bills). The table presents, for each series of months ("in the stock market," "out of the stock market"), the average and standard deviation of market return (*RET*) and market excess return over the risk-free rate (*ExRET*).

Decision proportions			Average		Std	
Decision	Obs	%	*RET* (%)	*ExRET* (%)	*RET* (%)	*ExRET* (%)
In	161	54.6	1.50	1.10	4.63	4.60
Out	134	45.4	0.17	−0.19	4.24	4.26

excess returns (*ExRET*), we examine the following strategy: For each month *t*, we sum the lags of *NEIO* (normalized net exchanges) from period $t-2$ to $t-4$, to produce an indicator for asset holdings at month *t*. This variable is denoted $SumNEIO_{2\_4}$. The reason we do not use the lag of the net exchanges in period $t-1$ is that flow information is released with a one-month lag. The strategy is based on taking a position opposite to that indicated by the exchanges. If the indicator is negative, the investment decision for month *t* is to invest 100% in the market. If the indicator is positive, the investment decision is to invest 100% in the risk-free asset (30-day T-bills). Table 6 summarizes the return series statistics for the months "in the market" vs. the months "out of the market." The number of months "in the market" is 161 out of 295 (54.6%). The average return in these months is 1.50% (the excess return over the risk-free rate is 1.10%) and the standard deviation is 4.63%. The number of months "out of the market" is 134 out of 295 (45.4%). The average return in these months is 0.17% (the excess return over the risk-free rate is −0.19%) and the standard deviation is 4.24%. The *p*-value of the difference between the two subgroups' average returns is 0.011. The *p*-value of the *F*-test for the difference of variances is 0.30. Fig. 3 depicts accumulated returns of three investment strategies. The strategy examined (denoted "Strategy") is based on the indicator $SumNEIO_{2\_4}$, which indicates investing 100% in the market or in the risk-free rate, depending on the sign of the indicator. This strategy shifts between the equity market and the risk-free rate. Benchmark 1 holds constant weights of 54.6% in the market and 45.4% in the risk-free asset, based on the averages of Table 6. Benchmark 2 invests 100% in the market. The accumulated return on Strategy for the 295 months is 1,396% (0.92% monthly and 11.6% annually), while the accumulated return on Benchmark 1 is 538% (0.63% monthly and 7.8% annually), and the accumulated return on Benchmark 2 is 918% (0.79% monthly and 9.9% annually). It is striking to see that Strategy yields a higher return than the stock market, even though it invests in the stock market during only about half of the months. Furthermore, Fig. 3 reveals that Strategy's accumulated return is above the market accumulated return throughout the investment period. We employ the Treynor and Mazuy (1966) and Henriksson and Merton (1981) tests for timing the excess return series of Strategy. In both tests, the *p*-value is less than 0.01.

The strategies above are based on in-sample analysis. Next, we examine the following out-of-sample strategy: First, based on Table 4 specification (2), we sum the lags of *NEIO* (the normalized net exchanges) from period $t-2$ to $t-4$, denoted $SumNEIO_{2\_4}$. Again, the reason we do not use the first lag of *NEIO* in period $t-1$ is that flow information is released with a one-month lag. The strategy basically exploits the relation between this indicator and excess market returns. For each month *t*, we look at a window of 36 months ($t-1-t_{-36}$) and calculate the correlation between $SumNEIO_{2\_4}$ and the excess return in that window. After calculating the correlation, we employ the following very simple trading rule: If the correlation between $SumNEIO_{2\_4}$ and *ExRET* is negative (positive), the

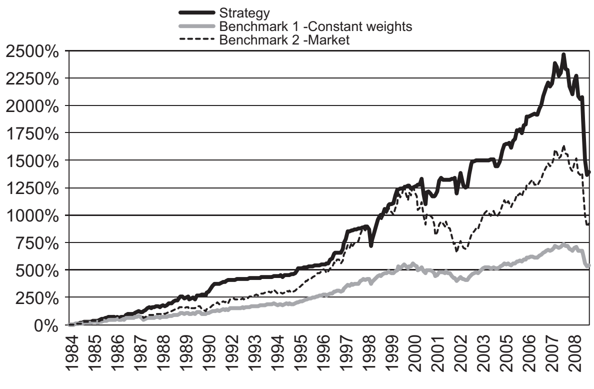

Fig. 3. Accumulated return of the in-sample trading strategy. Fig. 3 depicts the accumulated returns (from June 1984 to December 2008) of three investments: Strategy—investment based on the indicator decision (the solid black line); Benchmark 1—investment in constant weights based on the indicator percentage of months in (54.6%) and out (45.4%) of the market (the solid gray line); Benchmark 2—investment 100% in the market portfolio (the dashed black line).

investment decision for month t if $SumNEIO_{2\_4}$ is negative is to invest 100% (0%) in the stock market and 0% (100%) in the risk-free asset (30-day T-bills). If $SumNEIO_{2\_4}$ is positive, the opposite decision is made. Table 7 summarizes the return series statistics for the months "in the market" vs. the months "out of the market." There are 263 months in the rolling strategy period (the sample of 299 months minus the 36 months of the rolling window). The number of months "in the market" is 133 out of 263 (50.6%). The average market return in these months is 1.37% (the excess return over the risk-free rate is 0.99%) and the standard deviation is 4.55%. The number of months "out of the market" is 130 out of 263 (49.4%). The average return in these months is 0.08% (the excess return over the risk-free rate is −0.24%) and the standard deviation is 4.31%. The p-value of the difference between the two subgroups' average returns is 0.019. The p-value of the F-test for the difference of variances is 0.53. In Figs. 3 and 4 the accumulated returns of three investment strategies are depicted. The strategy examined (denoted "Strategy") is based on the indicator described above, which indicates investing 100% in the market or in the risk-free rate, Benchmark 1 holds constant weights of 50.6% in the market and 49.4% in the risk-free asset, based on the averages in Table 7, and Benchmark 2 invests 100% in the stock market. The accumulated return on Strategy for the 263 months is 712% (0.80% monthly and 10.0% annually), while the accumulated return on Benchmark 1 is 293% (0.52% monthly and 6.4% annually), and the accumulated return on Benchmark 2 is 426% (0.63% monthly and 7.9% annually). As in the in-sample examination, it is striking to see that Strategy yields a higher return than the stock market, even though it invests in the stock market about half of the months. Furthermore, Fig. 4 reveals that Strategy's accumulated return is above the market accumulated return throughout the investment period. We employ the Treynor-Mazuy (1966) and Henriksson-Merton (1981) tests for timing the excess return series of Strategy. In both tests the p-value is less than 0.03.

Table 7
An out-of-sample trading strategy based on *NEIO*.

The table presents the results of an out-of-sample strategy based on the normalized net exchanges (*NEIO*). For each month t, we look at the previous 36 months and sum the lags of *NEIO* from month $t-2$ to $t-4$ ($SumNEIO_{2\_4}$), to produce an indicator for the month t return (recall that ICI data for month $t-1$ are available only at the end of month t). If the correlation of the indicator with *ExRET* (the excess market return over the 30-day T-bill return) is negative and the indicator at month t is positive (negative), the investment decision for month t is to invest in the risk-free rate asset (stock market). If the correlation of the indicator with *ExRET* is positive and the indicator at month t is positive (negative), the investment decision for month t is to invest in the stock market (risk-free rate). The table presents, for each series of months ("in the stock market," "out of the stock market"), the average and standard deviation of market return (*RET*) and market excess return over the risk-free rate (*ExRET*).

Decision proportions			Average		Std	
Decision	Obs	%	*RET* (%)	*ExRET* (%)	*RET* (%)	*ExRET* (%)
In	133	50.6	1.37	0.99	4.55	4.53
Out	130	49.4	0.08	−0.24	4.31	4.32

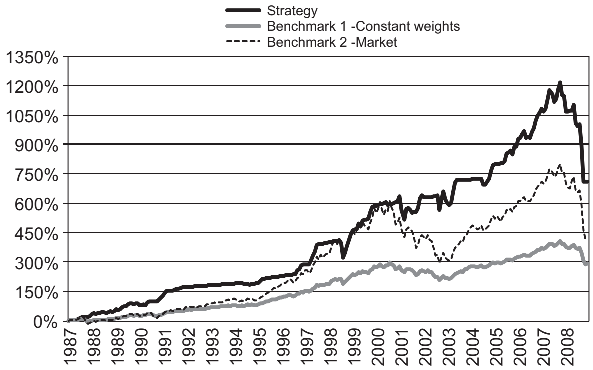

Fig. 4. Accumulated return of the out-of-sample trading strategy. Depicts the accumulated returns (from February 1987 to December 2008) of three investments: Strategy—investment based on the indicator decision (the solid black line); Benchmark 1—investment in constant weights based on the indicator percentage of months in (50.6%) and out (49.4%) of the market (the solid gray line); Benchmark 2—investment 100% in the market portfolio (the dashed black line).

To summarize Section 4.4: The return reversal related to net exchanges is economically significant and it can be used for trading strategies.

4.5. Robustness checks

We check the robustness of our results by the following specifications.

(A) We divide the sample into two equal subperiods, the first from February 1984 to June 1996 and the second from July 1996 to December 2008. The results for the two subperiods are qualitatively similar to the results for the entire sample period presented in Table 4. The coefficients of $SumNEIO_{2\_4}$ in specification (2) are −1.33 and −1.27 in the first and second subperiods, respectively, compared to −1.39 for the total sample period. Fig. 5 presents the impulse response function for the two sub-periods. In the first subperiod, the contemporaneous price impact of one standard deviation (std.) shock to *NEIO* on *ExRET* is 2.54%, followed by a reversal of 1.57% for the period $t+1$ – $t+10$, with a t-statistic of 2.75. In the second subperiod, the contemporaneous price impact of one std. shock to *NEIO* on *ExRET* is 1.55%, followed by a reversal of 3.06% for the period $t+1$ – $t+10$, with a t-statistic of 2.45.
Next we look at 1984–1992 (as in Warther, 1995), and the following 1993–2000 and 2001–2008 sub-periods. As in the two subperiod analyses, the results are in the same direction of our main results. The coefficients of $SumNEIO_{2\_4}$ are −1.78, −2.28, −0.69 in the first, second, and third subperiods, respectively.[19] The VAR analysis f or all periods indicates a similar reversal pattern. The

[19] After omitting the crisis year 2008, the coefficient of $SumNEIO_{2\_4}$ in 2000–2007 is −1.71.

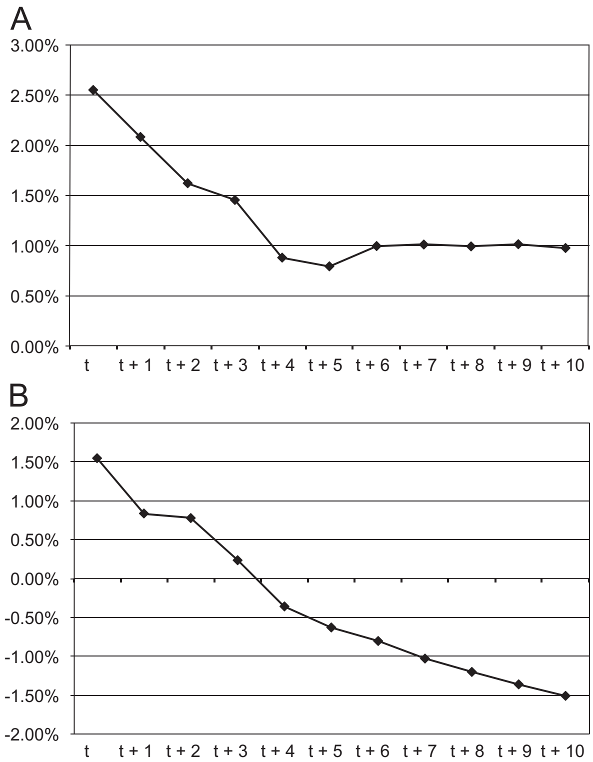

Fig. 5. Accumulated impulse response function—two subperiods. (A) and (B) depict the accumulated impulse response simulation of a one-standard-deviation shock to *NEIO* (normalized net exchanges) on *ExRET* (excess market return) for the two subperiods. The impulse response estimation is based on a three-variable VAR system of *NEIO, NSR,* and *ExRET* with four lags of each variable (see Eq. (1)). (A) The impulse response function for the period from February 1984 to June 1996 and (B) the impulse response function for the period from July 1996 to December 2008. Period *t* is the contemporaneous period of the shock.

t-statistics of the VAR reversal for the three periods are −2.93, −1.95, and −2.16, respectively.[20]

In order to check that there is no structural break for an unknown change point in the sample period, we estimated the Andrews (1993) test. The chosen search range was the inner segment of 70% of the data. The test indicates that there is no structural break in any of the estimated VAR equations.

(B) In order to verify that our results are not driven by the "January effect," we add a January dummy to specification (2) in Table 4. The *t*-statistic of $SumNEIO_{2\_4}$ in this specification is −3.10 (it is the same in the original specification) and the January dummy is not significant. Adding the rest of the monthly dummies, the *t*-statistic of $SumNEIO_{2\_4}$ is 3.09 and none of the dummies is significant.

(C) In order to verify that our results are not driven by extreme return values, we reestimate specification (2) in Table 4. Winsorizing the bottom 1% and the top 1% of the explained variable (*ExRET*) does not affect the significance of the regression: the *t*-statistic is −3.08.

(D) Un-winsorizing the explanatory variable *NEIO* (recall that *NEIO* is winsorized in the analysis) does not affect the significance of the regression: the *t*-statistic increases to −3.64 from −3.10.

(E) In order to verify that our results are not driven by using excess returns, we reestimate specification (2) in Table 4, using *RET* (market return) as a dependent variable. The coefficient changes from −1.39 to −1.48 and the *t*-statistic changes from −3.10 to −3.32.

(F) In order to verify that there is no "mixed" fund influence, we reestimate specification (2) in Table 4, without the mixed fund group. The coefficient changes from −1.39 to −1.16 and the *t*-statistic changes from −3.10 to −3.61.

(G) In our analysis, we look at transfers between equity and bond funds via the exchanges. In the same manner, we can build a proxy for allocation between equity and bonds through sales and redemptions.

Denote $X = \text{EquitySales} - \text{EquityRedemptions}$

$Y = \text{BondRedemptions} - \text{BondSales}$

If $X > 0$ and $Y > 0$, then the proxy is $\min(X, Y)$

If $X < 0$ and $Y < 0$, then the proxy is $-1 \times \min(|X|, |Y|)$

If X and Y are not with the same sign, the proxy is zero.

The intuition behind the measure can be explained by the next example. Assuming that in a certain month, the net sales of the equity funds are 300, and the net redemptions of the bond funds are 700. In this case, the possible overlap part is 300. So 300 is the proxy for the shift from bonds to equity. Out of the 299 months of our sample, only 113 have values different than zero. The measure is very noisy and thus yields weak results, but in the same direction as *NEIO*'s results. The contemporaneous effect is positive and significant, and the lags are negative but not significant. These results support our conclusion that the shifts between equity and bond funds are the driver of our results.

5. Economic variables and sentiment measures related to net exchanges

The main finding in Section 4 is the relation between normalized net exchanges (*NEIO*) and excess market returns: a contemporaneous positive relation followed by a reversal. As discussed in Section 3, the net exchanges are small relative to the market volume and it seems implausible that they cause the large price changes reported in the paper. It seems that these demand/supply shocks of mutual fund investors are related to other demand/supply shocks driven by economic factors or investor sentiment.[21] This hypothesis is

[20] The results of the sub-period analysis are also interesting when compared with the performance of the mutual funds. Barras, Scaillet, and Wermers (2010) find a significant proportion of skilled (positive alpha) funds prior to 1996, but almost none by 2006. In our subperiod analysis, we do not find a similar pattern in *NEIO*. Therefore, *NEIO* does not seem to be related to the change over time of fund performance.

[21] Indro (2004) finds a relation between investor sentiment indicators and a proxy for net aggregate equity fund flows. Kamstra, Kramer, Levi, and Wermers (2008) relate fund flows to sentiment driven by daylight length. Consistent with Kamstra, Kramer, Levi, and Wermers (2008), we find that *NEIO* is significantly lower in September and October, when the days become shorter.

supported by the relation between the exchanges and market volume: the correlation between the monthly change in the sum of "exchanges in" and "exchanges out" and the monthly change in the market dollar volume is 0.51 (for each variable, the monthly change is calculated as the value at month *m* in year *t*, minus the average value of year $t-1$).

Our next question is what factors are related to *NEIO*? As can be seen in the Appendix, *NEIO* is not autocorrelated and it is not related to lagged excess market returns. In this section we try to explain *NEIO* using a set of economic variables and sentiment measures. More specifically, we start with the analysis of the relation between *NEIO* and each of these variables in turn. Next, we analyze the relation between excess market return and each of these variables in turn. Finally, we analyze the relation between excess market return and these variables together with *NEIO* in multivariate regressions.

5.1. The relation between NEIO and selected explanatory variables

Table 8 reports relations between *NEIO* and several variables: *VIX* – the implied standard deviation of the S&P 500, *RF* – the short interest rate (actually the 30-day T-bill return), and two measures of "investor sentiment." One sentiment measure is the survey-based "Consumer Sentiment Index" of the University of Michigan Survey Center. Lemmon and Portniaguina (2006) find that this measure predicts the subsequent returns of small vs. big stocks. We denote this measure at month *t* as *CSI*. The second is Baker and Wurgler's (2006) measure, which is based on six indirect measures of investor sentiment: trading volume as measured by NYSE turnover; the dividend premium; the closed-end fund discount; the number of and first-day returns on IPOs; and the equity share in new issues. Baker and Wurgler (2006) find that their proxy is negatively related to the subsequent returns of smaller stocks, high volatility stocks, unprofitable stocks, non-dividend-paying stocks, extreme-growth stocks, and distressed stocks.[22] We denote this measure at month *t* as *BW*.

Table 8 reports the univariate regressions of the relation between *NEIO* at month *t* and each of the variables in the previous month ($t-1$), and the univariate regressions of the relation between *NEIO* and the contemporaneous change of each of these variables during month *t*. The contemporaneous change, denoted with the suffix *diff*, is the variable in month *t* minus the variable in month $t-1$. All these variables are very persistent; therefore, in Tables 8 and 9 we use the Amihud-Hurvich (2004) correction (denoted A–H), and in addition estimate the *p*-value by a simulation as in Table 2 of Boudoukh, Michaely, Richardson, and Roberts (2007). The sample periods of these series vary due to data availability.

As can be seen from specifications (1) and (2), the relation with *VIX* is negative and significant for both the level and the difference. The R^2 of the level regression is 0.054 and for the difference regression it is 0.157. It appears that risk increase (decrease) is related to shifts from (to) stocks to (from) bonds. This result is plausible. If investors' relative risk aversion is decreasing with wealth, it can be shown that risk increase leads to selling of risky assets to the wealthier investors. If mutual fund investors are the less wealthy investors in the capital market, risk increase can lead them to sell some of their risky assets to other investors.[23]

The other relations are quite weak, and much weaker than the relation with *VIX*. The relation with the level of *RF* (specification (3)) is negative and significant but the R^2 is only 0.039. The relation with the difference in interest rates (specification (4)) is not significant. The relation with the level of the *CSI* (Consumer Sentiment Index), reported in specification (5), is negative and the R^2 is only 0.009. The relation with the difference in the *CSI* (specification (6)) is positive and significant, but the R^2 is only 0.03. As can be seen from specifications (7) and (8), *NEIO* is not related to Baker and Wurgler's measure.

5.2. Excess returns and NEIO's explanatory variables

As *NEIO* is contemporaneously correlated with market excess returns, we investigate the relations between these variables and market excess returns. As can be seen from Table 9, all these relations are insignificant or weak except the relation with the difference in *VIX* (specification (2)). The difference in *VIX* is negatively correlated with market excess return and the relation is very strong: the R^2 is 0.47 and the *t*-statistic is -11.0. This relation is expected, since risk is supposed to be negatively correlated with stock prices and positively correlated with expected returns. This implies that the difference in *VIX* should be positively correlated with subsequent returns. However, realistically the changes in expected monthly returns are very small relative to the price change and probably too small to be detected empirically.[24] Indeed, in Table 10 (see Section 5.3) we report a regression of excess market returns on lags of differences in *VIX*.

The relations between *ExRET* and the sentiment measures are as expected. Specification (6) indicates that the changes in *CSI* are positively correlated with *ExRET*. That is, consumer confidence increase is related to positive excess market returns. Specification (7) indicates that the relation with BW_{t-1} is negative, as expected. That is, high levels of Baker-Wurgler measures at $t-1$ are related to lower future returns. The statistical significance of this relation is modest (a *t*-statistic of 1.91 using the Amihud-Hurvich correction).[25]

[22] Baker, Wurgler, and Yuan (2009) create sentiment indices, as in Baker and Wurgler (2006), in each of six countries and form a global index based on these six indices. They find a negative relation between the global and local indices and the subsequent annual returns. The results for the USA are not reported.

[23] The ICI Fact Book 2008 (www.ici.org) reports that in 2007, 86% of mutual fund assets in the USA were held by households. The median annual income of these households before taxes was $74,000.

[24] Look at the simple example of a Gordon model with a firm that pays monthly dividends: the expected dividend D=$1, the expected monthly return is 0.75%, and the expected dividend growth rate is 0.25%. In this case, the price of the stock is 200=1/(0.0075–0.0025). A decrease of 0.01% in the expected return to 0.74% increases the price by about 2% to 204.1=1/(0.0074 − 0.0025).

[25] This is consistent with Baker and Wurgler (2007), who find this relation, but state that the statistical significance is modest and do not report it.

Table 8
Regressions of *NEIO* on selected explanatory variables.

The table presents the coefficients from the time-series regressions of *NEIO* as a dependent variable. For each explanatory variable: the "Sample year begin" is the first year for which we have data about the explanatory variable; the "Sample year end" is the last year for which we have data about the explanatory variable; *N* is the number of available monthly observations. *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. The measure is winsorized around the 1% tails of the distribution. *RF* $(t-1)$ is the risk-free rate for 30 days based on the 30-day T-bill return from CRSP at the end of the month (assuming the return in month *t* reflects the 30-day interest rate known to investors at the end of the previous month). *RFdiff* is the contemporaneous change in *RF* (the return difference of $RF_{t+1} - RF_t$). *VIX*$(t-1)$ is the volatility index of Chicago Board Options Exchange (CBOE) retrieved from finance.yahoo.com (symbol ^vix) at the end of the previous month. For convenience, the measure, which is in percentage terms, is divided by 100 (for example, 20 is converted into 0.2). *VIXdiff* is the contemporaneous change in *VIX*. *CSI*$(t-1)$ is the University of Michigan "Consumer Sentiment Index" at the end of the previous month. *CSIdiff* is the contemporaneous change in *CSI*. *BW*$(t-1)$ is the Baker and Wurgler (2006) orthogonal sentiment measure ($SENT^{\perp}$) at the end of the previous month. *BWdiff* is the contemporaneous change in *BW*. The *t*-statistics are reported below the coefficients and corrected for heteroskedasticity using the White (1980) correction. Due to the persistence of the explanatory variables, the table also presents the Amihud and Hurvich (2004) correction for a single persistent regressor (A–H). Simulated *p*-values (one-sided sim *p*-value) are computed as in Boudoukh, Michaely, Richardson, and Roberts (2007, Table II), via 10,000 simulations under the null of zero predictability, but accounting for the regressor's autocorrelation and the cross-correlation of the errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INTERCEPT	0.110	0.003	0.075	−0.043	0.236	−0.040	−0.039	−0.041
	[4.55]	[0.24]	[2.18]	[0.04]	[1.88]	[2.37]	[2.20]	[2.25]
VIX$(t-1)$	−0.554							
	[4.82]							
VIXdiff		−1.708						
		[4.71]						
RF$(t-1)$			−0.308					
			[2.88]					
RFdiff				0.463				
				[1.06]				
CSI$(t-1)$					−0.003			
					[2.20]			
CSIdiff						0.013		
						[2.91]		
BW$(t-1)$							−0.019	
							[0.69]	
BWdiff								0.027
								[0.51]
R^2	0.054	0.157	0.039	0.008	0.009	0.030	0.002	0.001
Sample year begin	1990	1990	1984	1984	1984	1984	1984	1984
Sample year end	2008	2008	2008	2008	2007	2007	2005	2005
N	227	227	299	299	280	280	264	264
A–H correction								
Regressor persistence	0.86		0.96		0.91		0.84	
Residual correlation	−0.48		0.06		0.16		0.02	
New coefficient	−0.59		−0.303		0.00		−0.02	
New *t*-statistic	−4.33		−2.87		−2.08		−0.68	
One-sided sim *p*-value	0.000		0.003		0.023		0.245	

5.3. *Excess returns, NEIO, and NEIO's explanatory variables in a multivariate setting*

Tables 10 and 11 analyze the relations presented in Table 9 together with *NEIO* in a multivariate setting. The sample periods are based on the overlapping sample periods of the explanatory variables. In this analysis, some of the specifications include more than one persistent explanatory variable. For this reason, we use the Amihud, Hurvich, and Wang (2008) correction (denoted A–H–W) for multiple persistent regressors.

Table 10 reports regressions of excess market returns on *NEIO* and *VIX*. Specification (1) reports the contemporaneous relation between *NEIO* and *VIXdiff* and excess returns. We can see that both measures have explanatory power and the adjusted-R^2 increases to 0.61 from 0.37 (0.47) for *NEIO* (*VIXdiff*) alone (see Table 3, specification (2) and Table 9, specification (2)). Specifications (2) and (3) analyze the relation with the lags of *VIX* differences (*VIXdiff*). In specification (2) the coefficient of the first lag is unexpectedly negative (but not significant). The coefficients of the next three lags are positive, as expected, but not significant. It can be seen that the sum of the four coefficients is roughly zero. Specification (3) sums all four coefficients together. The coefficient is close to zero with a *t*-statistic of 0.19, that is, we do not detect a relation between changes in *VIX* and future returns. Specification (4) looks at the sum of *NEIO*'s lags (note that the sample period here is different than in Table 4 due to the availability of *VIX*) with *NSR* and *ExRET* lag variables. $SumNEIO_{1\_4}$ is negative and significant. Specification (5) adds *VIXdiff* lags. We can see that adding *VIXdiff* lags to specification (5) does not have an effect on *NEIO*'s coefficient. The *t*-statistic of *NEIO* is 2.07 while the *t*-statistic of *VIXdiff* is 0.44. These findings are supported by an unreported VAR (vector autoregression) analysis

Table 9
Regressions of excess market return on *NEIO*'s explanatory variables.

The table presents the coefficients from the time-series regressions of the excess market return (*ExRET*) as the dependent variable. Due to data limitations, the regression sample period depends on the explanatory variables. For each explanatory variable: the "Sample year begin" is the first year for which we have data about the explanatory variable; the "Sample year end" is the last year for which we have data about the explanatory variable; *N* is the number of available monthly observations. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill (in %). *RF* $(t-1)$ is the risk-free rate for 30 days based on the 30-day T-bill return from CRSP at the end of the month (assuming the return in month *t* reflects the 30-day interest rate known to investors at the end of the previous month). *RFdiff* is the contemporaneous change in *RF* (the return difference of $RF_{t+1}-RF_t$). *VIX* $(t-1)$ is the volatility index of CBOE retrieved from finance.yahoo.com (symbol ˆvix) at the end of the previous month. For convenience, the measure, which is in percentage terms, is divided by 100 (for example, 20 is transformed to 0.2). *VIXdiff* is the contemporaneous change in *VIX*. *CSI* $(t-1)$ is the University of Michigan "Consumer Sentiment Index" at the end of the previous month. *CSIdiff* is the contemporaneous change in *CSI*. *BW* $(t-1)$ is the Baker and Wurgler (2006) orthogonal sentiment measure ($SENT^{\perp}$) at the end of the previous month. *BWdiff* is the contemporaneous change in *BW*. The *t*-statistics are reported below the coefficients and corrected for heteroskedasticity using the White (1980) correction. Due to the persistence of the explanatory variables, the table also presents the Amihud and Hurvich (2004) correction for a single persistent regressor (A–H). Simulated *p*-values (one-sided sim *p*-value) are computed, as in Boudoukh, Michaely, Richardson, and Roberts (2007, Table II), via 10,000 simulations under the null of zero predictability, but accounting for the regressor's autocorrelation and the cross-correlation of the errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INTERCEPT	0.947	0.447	0.117	0.496	4.130	0.684	0.739	0.656
	[0.99]	[2.14]	[0.18]	[1.97]	[1.59]	[2.70]	[2.83]	[2.43]
VIX$(t-1)$	−2.800							
	[0.51]							
VIXdiff		−72.887						
		[11.01]						
RF$(t-1)$			0.897					
			[0.58]					
RFdiff				13.101				
				[1.70]				
CSI$(t-1)$					−0.037			
					[1.31]			
CSIdiff						0.222		
						[3.43]		
BW$(t-1)$							−0.829	
							[1.84]	
BWdiff								−0.296
								[0.28]
R^2	0.002	0.472	0.001	0.024	0.006	0.038	0.017	0.001
Sample year begin	1990	1990	1984	1984	1984	1984	1984	1984
Sample year end	2008	2008	2008	2008	2007	2007	2005	2005
N	227	227	299	299	280	280	264	264
A–H correction								
Regressor persistence	0.86		0.96		0.91		0.84	
Residual correlation	−0.72		0.16		0.18		−0.07	
New coefficient	−4.07		1.08		−0.03		−0.83	
New *t*-statistic	−0.87		0.72		−1.16		−1.91	
One-sided sim *p*-value	0.224		0.255		0.117		0.036	

that includes *VIXdiff* in the system. These results confirm that the reversal pattern of the relation between excess returns and *NEIO* is not due to their relation with *VIX*.

Table 11 reports regressions of excess market returns on *NEIO* together with the other sentiment measures. The contemporaneous relations are reported in specifications (1)–(4). We start with *NEIO* (specification (1)) and verify that changing the sample period does not qualitatively affect the result of Table 3, specification (2): a very significant positive relation. Specification (2) adds *CSIdiff* to *NEIO*, specification (3) adds *BWdiff* to *NEIO*, and specification (4) adds all the three measures together. We can see that *CSIdiff* is marginally significant with a very small contribution to the adjusted-R^2 and that *BWdiff* is not significant. Specifications (5)–(7) analyze the relation between *ExRET* and the lags of these variables. The specifications include the four lags of *ExRET* and *NSR* from period $t-1$ to $t-4$ as controls. Again we start with $SumNEIO_{1\_4}$ and verify that the results are similar to the results presented in Table 4. As in the contemporaneous analysis, adding the lags of *CSIdiff*, or *BWdiff*, or $BW_{(t-1)}$ does not improve the adjusted-R^2, and none of the added variables is significant. Using different lags of *CSIdiff* and *BWdiff* or excluding the lags of *ExRET* and *NSR* does not change the results qualitatively.

6. The relation between NEIO and SMB and HML

If sentiment effect is stronger in stocks that are difficult to arbitrage, our measure should have a stronger effect on these stocks. In this section we follow Neal and Wheatley (1998), Baker and Wurgler (2006), and Lemmon and Portniaguina (2006). These papers find a relation

Table 10
Regressions of excess market return on *NEIO* and *VIX*.

The table presents the coefficients from the time-series regressions of the excess market return (*ExRET*) as the dependent variable. The sample period ranges from June 1990 to December 2008. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill (in %). *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. *NEIO* is winsorized around the 1% level of the distribution. *NSR* is the normalized "net sales" ("new sales" minus "redemptions") in %. $SumNEIO_{1\_4}$ is the sum of *NEIO* lags from period $t-1$ to $t-4$. *VIX* is the volatility index of CBOE retrieved from finance.yahoo.com (symbol ˆvix). For convenience, the measure, which is in percentage terms, is divided by 100 (for example, 20 is transformed to 0.2). *VIXdiff* is the contemporaneous change in *VIX* at period *t*. $SumVIXdiff_{1\_4}$ is the sum of *VIXdiff* lags from period $t-1$ to $t-4$. "YES" in "*ExRET* and *NSR* lags" indicates that the regression contains four lags of *ExRET* and *NSR* from period $t-1$ to $t-4$. The *t*-statistics are reported below the coefficients and corrected for heteroskedasticity using the White (1980) correction. Due to the persistence of the explanatory variables, the table also presents the Amihud and Hurvich (2004) correction for a single persistent regressor (A–H) and the Amihud, Hurvich, and Wang (2008) correction for multiple persistent regressors (A–H–W). Simulated *p*-values (one-sided sim *p*-value) are computed, as in Boudoukh, Michaely, Richardson, and Roberts (2007, Table II), via 10,000 simulations under the null of zero predictability, but accounting for the regressors' auto-correlation and cross-correlations and the cross-correlation of the errors.

	(1)	(2)	(3)	(4)	(5)
INTERCEPT	0.45	0.39	0.38	−0.57	−0.60
	[2.51]	[1.40]	[1.33]	[0.88]	[0.93]
NEIO	10.26				
	[6.21]				
VIXdiff	−55.84				
	[9.41]				
VIXdiff($t-1$)		−18.94			
		[1.47]			
VIXdiff($t-2$)		6.09			
		[0.80]			
VIXdiff($t-3$)		6.21			
		[0.80]			
VIXdiff($t-4$)		8.69			
		[0.92]			
SumVIXdiff1_4			−0.23		3.45
			[0.03]		[0.42]
SumNEIO1_4				−2.55	−2.51
				[2.19]	[2.13]
ExRET and *NSR* lags		No	No	Yes	Yes
Adjusted-R^2	0.606	0.028	−0.005	0.012	0.009
A–H and A–H–W corrections					
New *VIX* coefficient			−0.96		3.10
New *t*-statistic			−0.19		0.44
One-sided sim *p*-value			0.445		0.315
New *NEIO* coefficient				−2.35	−2.43
New *t*-statistic				−1.98	−2.07
One-sided sim *p*-value				0.023	0.019

between investor sentiment measures and returns of small stocks vs. big stocks.[26] The findings concerning growth (low book-to-market) and value (high book-to-market) stocks are mixed. Baker and Wurgler find a relation between their sentiment measure and extreme low book-to-market (extreme-growth) and distressed stocks. They argue that both extreme-growth and distressed firms have relatively subjective valuations and are relatively hard to arbitrage. Contrary to Baker and Wurgler, Lemmon and Portniaguina (in unreported results) do not find predictability for the low and high portfolios, and find some predictability in the value stocks. In Tables 12 and 13, we repeat our main analysis with small-minus-big (hereafter SMB) and high-minus-low (hereafter HML) Fama-French factors as explained variables and find support for stronger responses in both small and growth stocks.

Table 12 reports the analysis of the size cap portfolios. In Panel A, we use the Fama-French SMB factor with its size cap portfolios, and in Panel B we use the Russell 1000 and Russell 2000 total return indexes. The Russell 1000 index includes roughly the 1,000 stocks with the highest market capitalization in the USA, and the Russell 2000 includes roughly the next 2,000 stocks according to market capitalization. In each panel, the *NEIO* columns (specifications (1), (3), and (5)) are the results for specification (2) in Table 3 (regression of *ExRET* on *NEIO*). In Panel A, the contemporaneous price impact of *NEIO* in the small (large) portfolio is 11.03 (9.42). The difference (specification (5)) is significant with a *t*-statistic of 2.58. Panel B shows similar results with a *t*-statistic of 2.73 for the difference. The $SumNEIO_{2\_4}$ columns (specifications (2), (4), and (6)) are the results for specification (2) in Table 4 (regression of *ExRET* on $SumNEIO_{2\_4}$). We can see a significant negative coefficient of $SumNEIO_{2\_4}$ for both small and large portfolios in both panels. As with the *NEIO* results, the coefficient seems to be bigger for the small portfolio, the difference being negative as expected but

[26] Neal and Wheatley (1998) use net mutual fund redemptions as one of their investment sentiment measures.

Table 11
Regressions of excess market return on *NEIO* and sentiment measures.

The table presents the coefficients from the time-series regressions of the excess market return (*ExRET*) as the dependent variable. The sample period ranges from June 1986 to December 2005. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill (in %). *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. *NEIO* is winsorized around the 1% level of the distribution. $SumNEIO_{1\_4}$ is the sum of *NEIO* lags from period $t-1$ to $t-4$. *CSI* is the University of Michigan "Consumer Sentiment Index" at the end of the month. *CSIdiff* is the contemporaneous change in *CSI*. $SumCSIdiff_{1\_4}$ is the sum of *CSIdiff* lags from period $t-1$ to $t-4$. $BW(t-1)$ is the Baker and Wurgler (2006) orthogonal sentiment measure ($SENT^{\perp}$) at the end of the previous month. *BWdiff* is the contemporaneous change in *BW*. $SumBWdiff_{1\_4}$ is the sum of *BWdiff* lags from period $t-1$ to $t-4$. Specifications (5)–(7) include as controls the four lags of *ExRET* and *NSR* from period $t-1$ to $t-4$. The *t*-statistics are reported below the coefficients and corrected for heteroskedasticity using the White (1980) correction. Due to the persistence of the explanatory variables, the table also presents the Amihud and Hurvich (2004) correction for a single persistent regressor (A–H), and the Amihud, Hurvich, and Wang (2008) correction for multiple persistent regressors (A–H–W). Simulated *p*-values (one-sided sim *p*-values) are computed, as in Boudoukh, Michaely, Richardson, and Roberts (2007, Table II), via 10,000 simulations under the null of zero predictability, but accounting for the regressors' auto-correlation and cross-correlations and the cross-correlation of the errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INTERCEPT	1.04	1.03	1.03	1.03	0.12	0.11	0.09
	[5.08]	[5.06]	[5.09]	[5.06]	[0.22]	[0.21]	[0.16]
NEIO	9.58	9.37	9.61	9.39			
	[9.95]	[9.87]	[9.99]	[9.97]			
CSIdiff		0.09		0.09			
		[1.77]		[1.71]			
BWdiff			−0.51	−0.45			
			[0.67]	[0.59]			
SumNEIO1_4					−1.41	−1.27	−1.30
					[2.77]	[2.55]	[2.50]
SumCSIdiff1_4						−0.03	−0.03
						[0.68]	[0.61]
$BW(t-1)$						−0.62	
						[1.20]	
SumBWdiff1_4							−0.46
							[0.76]
Adjusted-R^2	0.390	0.394	0.390	0.392	0.027	0.028	0.023
A–H and A–H–W corrections							
New *NEIO* coefficient					−1.32	−1.17	−1.22
New *t*-statistic					−2.44	−2.29	−2.30
One-sided sim *p*-value					0.004	0.029	0.021
New *CSI* coefficient						−0.03	−0.03
New *t*-statistic						−0.72	−0.64
One-sided sim *p*-value						0.288	0.307
New *BW* coefficient						−0.63	−0.47
New *t*-statistic						−1.35	−0.79
One-sided sim *p*-value						0.094	0.203

not significant. It seems that the effects (a contemporaneous relation between *NEIO* and returns followed by a reversal) are stronger for smaller stocks.

Table 13 reports the analysis regarding the Fama-French book-to-market portfolios (HML), which have a long position in high book-to-market stocks (denoted High in Table 13 and called "value") and a short position in the low book-to-market stocks (denoted Low in Table 13 and called "growth"). In this table, the *NEIO* columns (specifications (1), (3), and (5)) are similar to specification (2) in Table 3, where the explanatory variable is *NEIO*. The difference is that the explained variables are H, L, and HML returns. The contemporaneous relation of *NEIO* with the H (L) return is 9.28 (11.65). The relation of *NEIO* with HML (specification (5)) is negative and significant with a *t*-statistic of 5.02. That is, it seems that *NEIO* has a larger effect on low book-to-market (growth) stocks than on high book-to-market (value) stocks. The $SumNEIO_{2\_4}$ columns (specifications (2), (4), and (6)) are similar to specification (2) in Table 4 (regression of *ExRET* on $SumNEIO_{2\_4}$). We can see a significant negative coefficient of $SumNEIO_{2\_4}$ for both H and L portfolios. As with the *NEIO* results, the coefficient is larger for the L portfolio, and the difference is significant with a *t*-statistic of 3.17. It seems that the effects (a contemporaneous relation between *NEIO* and returns followed by a reversal) are stronger for the growth stocks than for the value stocks.

As mentioned in Section 2, ICI's data detail the flow components (sales, redemptions, exchanges in, and exchanges out) and net asset values of each fund category. Over the sample period, the domestic equity accounts on average for 76% of the total equity fund asset values. The average asset proportions of the domestic equity categories over the sample periods are: Aggressive Growth—17%, Growth—33%, Growth and Income—39%, Income Equity—6%, and Sector—5%. We find that the information about net exchanges to each of these categories contributes very modestly to the explanation of excess market return beyond *NEIO*. The difference between the normalized net exchanges of "Aggressive Growth" and "Income Equity"

Table 12
Regressions of size portfolio returns.

The table presents the coefficients from the time-series regressions of small and big size cap portfolios. Panel A reports the results of Fama-French SMB portfolios on *NEIO* and *SumNEIO*$_{2\_4}$. Panel B reports the results of Russell 1000 and Russell 2000 total return indexes on *NEIO* and *SumNEIO*$_{2\_4}$. The sample period ranges from February 1984 to December 2008, covering a total of 299 months. In each panel, specifications (1) and (2) are for the small portfolio, specifications (3) and (4) are for the big size portfolio, and specifications (5) and (6) are for the ''small-minus-big'' (SMB) portfolio. *NEIO* is the normalized ''net exchanges'' (''exchanges in'' minus ''exchanges out'') in %. *NEIO* is winsorized around the 1% tails of the distribution. *SumNEIO*$_{2\_4}$ is the sum of *NEIO* lags from period $t-2$ to $t-4$. The t-statistics are reported below the coefficients and are corrected for heteroskedasticity using the White (1980) correction.

	Small		Big		SMB	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A—FF's SMB factor						
INTERCEPT	1.46	0.82	1.36	0.80	0.10	0.01
	[5.95]	[2.49]	[7.41]	[3.23]	[0.52]	[0.07]
NEIO	11.03		9.42		1.61	
	[8.80]		[10.31]		[2.58]	
SumNEIO2_4		−1.57		−1.37		−0.20
		[2.91]		[3.12]		[0.63]
Adjusted-R^2	0.314	0.017	0.374	0.022	0.015	0.000

	Russell 2000		Russell 1000		Rus2–Rus1	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B—Russel 1000 and Russel 2000						
INTERCEPT	1.30	0.62	1.30	0.72	0.00	-0.10
	[5.31]	[1.88]	[6.76]	[2.82]	[0.03]	[0.54]
NEIO	11.41		9.61		1.80	
	[8.85]		[10.31]		[2.73]	
SumNEIO2_4		−1.79		−1.48		−0.31
		[3.11]		[3.29]		[0.96]
Adjusted-R^2	0.326	0.022	0.362	0.024	0.023	0.000

Table 13
Regressions of value and growth portfolio returns.

The table presents the coefficients from the time-series regressions of Fama-French HML portfolios. The sample period ranges from February 1984 to December 2008, covering a total of 299 months. Specifications (1) and (2) are for the high book-to-market (value) portfolio, specifications (3) and (4) are for the low book-to-market (growth) portfolio, and specifications (5) and (6) are for the ''high-minus-low'' portfolio. *NEIO* is the normalized ''net exchanges'' (''exchanges in'' minus ''exchanges out'') in %. *NEIO* is winsorized around the 1% tails of the distribution. *SumNEIO*$_{2\_4}$ is the sum of *NEIO* lags from period $t-2$ to $t-4$. The t-statistics are reported below the coefficients and are corrected for heteroskedasticity using the White (1980) correction.

	High		Low		HML	
	(1)	(2)	(3)	(4)	(5)	(6)
FF's HML factor						
INTERCEPT	1.50	0.98	1.27	0.55	0.22	0.43
	[7.93]	[3.74]	[5.15]	[1.68]	[1,27]	[2.35]
NEIO	9.28		11.65		−2.37	
	[8.71]		[10.21]		[5.02]	
SumNEIO2_4		−1.06		−2.04		0.98
		[2.44]		[3.67]		[3.17]
Adjusted-R^2	0.340	0.011	0.340	0.030	0.044	0.022

(the normalization of each category is by its previous month's asset values) is negatively correlated with the HML factor. That is, exchanges to Aggressive Growth funds measured relatively to exchanges to Income Equity funds are positively related to returns of the low book-to-market stocks (growth) vs. high book-to-market stocks (value). The adjusted-R^2 of this regression is 0.086 which is roughly double the adjusted-R^2 of a regression of HML on *NEIO* (Table 13, specification (5)). The relation between the SMB and the difference between the normalized net exchanges of ''Aggressive Growth'' and ''Income Equity'' is in the same direction but much weaker.

7. Interpretation of the findings

In Section 4, we find a contemporaneous positive relation between normalized net exchanges (*NEIO*) and excess market returns, followed by a reversal. In Section 5, we find that *NEIO* is negatively and contemporaneously correlated with changes in *VIX*, and that changes in *VIX* are negatively and contemporaneously correlated with excess market returns. These findings suggest two possible explanations for the relation between normalized net exchanges (*NEIO*) and excess market returns. The first explanation is that *NEIO* is correlated with changes in *VIX*, and that these changes lead to the reversal pattern of stock prices. This explanation seems very reasonable; however, the changes in future expected returns, due to *VIX*'s changes, should be very small, relative to the price changes (see footnote 23) and hence, cannot explain a reversal pattern within four months. Indeed, in Section 5, we do not find that excess market returns are related to lagged changes in *VIX*. In the trading strategy (in-sample) reported in Table 6, we find that the difference in average excess returns of the two series is very large (1.10% vs. −0.19%), while the difference in realized standard deviations is relatively small (4.60% vs. 4.26%) and cannot explain such large difference in average returns. Therefore, the reversal pattern cannot be attributed to time-varying risk premia. Thus, we are left with a second potential explanation: this pattern is an indication of price "noises" that are subsequently corrected. These price "noises" are due to investor demand/supply shock stemming from "sentiment"; in other words, normalized net exchanges (*NEIO*) may be interpreted as a sentiment measure. In Section 5, we find that *NEIO* is weakly correlated with changes in the "Consumer Sentiment Index" of the Michigan University Survey Center and is not correlated with Baker and Wurgler's (2006) measure. Therefore, it seems that *NEIO* captures other dimensions of investor sentiment. We find (Table 8, specification (2)) that *NEIO* is negatively correlated with changes in *VIX;* hence, it seems that *VIX* is related to "investor sentiment" effects on the aggregate stock market. Since we detect a price reversal in *NEIO* and not in *VIX*, it seems that *NEIO* is a more accurate indicator of "investor sentiment" than *VIX*. The interpretation of *NEIO* as an "investor sentiment" measure is supported in Section 6 by the analysis of its relations with "small" vs. "big" stocks and "growth" vs. "value" stocks. We find that the contemporaneous relation between *NEIO* and the returns and its reversal are stronger for "small" stocks than for "big" stocks. This finding is consistent with prior research showing that investor sentiment measures are related to returns of small stocks vs. big stocks (see references in Section 6). We also find that the contemporaneous and reversal relations are stronger for growth stocks.

As can be seen from the survey by Subrahmanyam (2007), the evidence for investor sentiment inducing "noise" in the stock markets relates mainly to individual stocks or to asset classes, such as small stocks.[27] In this paper, we use a variable, *NEIO* (normalized net exchanges in equity mutual funds), which is related to aggregate market returns, of which 85% are reversed within four months. We interpret these results as evidence of "noise" in the aggregate market prices. The magnitude of this "noise" is quite significant and, of course, this is probably an underestimation of the "noise" in the market for three reasons

(A) We examine only one measure of investor sentiment.
(B) Investigating monthly data does not enable the detection of price "noises" that are corrected within a few days. Ben-Rephael, Kandel, and Wohl (2008) investigate aggregate **daily** flows to mutual funds in Israel and find evidence of price "noises" that are quickly corrected. In addition, they find that flows are correlated with market returns (R^2 of 20%), and approximately one-half of the price change is reversed within ten trading days.
(C) The strength of our measure is probably its focus on shifts between bond funds and equity funds. However, it is a noisy measure of flows between bond funds and equity funds, since (1) shifts that are not between fund families are not counted, and (2) our definition of equity funds includes mixed funds.

8. Conclusion

Aggregate net exchanges to equity funds in the USA are a proxy for shifts between bond funds and equity funds. We find that monthly aggregate net exchanges are related to contemporaneous prices changes in the stock market. One standard deviation of net exchanges is related to 1.95% of market returns, while about 85% of the contemporaneous relation is reversed within four months, and the remainder is reversed within ten months.

The net exchanges are negatively related to contemporaneous changes in *VIX*, but realistically the price reversal is too large to be explained by time-varying risk premia. Therefore, we interpret the net exchanges as an "investor sentiment" indicator. Consistent with the interpretation of "net exchanges" as a sentiment measure, we find that the effect is stronger in smaller stocks and in growth stocks. This indicator is weakly correlated with the sentiment measures used by Lemmon and Portniaguina (2006) and Baker and Wurgler (2006) for cross-section predictions. Thus, it seems that our measure captures a different dimension of investor sentiment than these other measures. We interpret these results as evidence of "noise" in the aggregate market prices.

Appendix A. Main flow relations for the VAR analysis

Table A1 presents the coefficients from the time-series regressions of *NFLOWS*, *NEIO*, and *NSR*, on the respective variables. The sample period ranges from February 1984 to December 2008, a period of 299 months. *ExRET* is the monthly excess market return from the CRSP value-weighted index composed of NYSE, Amex, and Nasdaq stocks minus the 30-day T-bill return (in %). The flow components of the equity funds are normalized each

[27] The exception in this survey is the evidence on the relation between investor mood (related to weather, holidays, sports, etc.) and aggregate stock returns (see Section 2.3 in Subrahmanyam, 2007) In addition, Fisher and Statman (2000) find in 1987–1998 a negative relation between individual investor sentiment (measured by a survey) and subsequent monthly S&P 500 returns.

Table A1

	(1)	(2)	(3)	(4)	(5)
Dependent	*NFLOWS*	*NEIO*	*NEIO*	*NSR*	*NSR*
INTERCEPT	−0.039	−0.074	−0.070	0.040	0.037
	[0.67]	[3.24]	[3.02]	[0.91]	[0.82]
ExRET(*t*−1)			−0.002		0.006
			[0.58]		[0.97]
ExRET(*t*−2)			0.003		−0.003
			[0.71]		[0.62]
ExRET(*t*−3)			−0.005		0.004
			[1.24]		[0.60]
ExRET(*t*−4)			−0.002		0.000
			[0.46]		[0.04]
NEIO(*t*−1)	−0.124	0.002	0.022	−0.119	−0.171
	[0.62]	[0.02]	[0.25]	[0.72]	[1.03]
NEIO(*t*−2)	0.074	−0.054	−0.089	0.101	0.143
	[0.39]	[0.55]	[0.80]	[1.02]	[1.32]
NEIO(*t*−3)	0.049	0.191	0.234	−0.103	−0.134
	[0.24]	[1.64]	[1.87]	[1.02]	[1.10]
NEIO(*t*−4)	−0.180	−0.037	−0.027	−0.118	−0.100
	[0.90]	[0.40]	[0.26]	[0.96]	[0.75]
NSR(*t*−1)	0.740	0.086	0.092	0.662	0.649
	[5.02]	[1.77]	[1.77]	[4.80]	[4.51]
NSR(*t*−2)	0.105	−0.016	−0.021	0.143	0.153
	[0.77]	[0.23]	[0.29]	[1.81]	[1.77]
NSR(*t*−3)	0.059	−0.091	−0.077	0.154	0.143
	[0.34]	[1.06]	[0.85]	[1.67]	[1.47]
NSR(*t*−4)	0.074	0.081	0.068	−0.046	−0.034
	[0.47]	[1.30]	[1.04]	[0.47]	[0.33]
Adjusted-R^2	0.504	0.043	0.035	0.713	0.710
p-Values of Wald statistic for					
Regression	0.000	0.137	0.352	0.000	0.000
NEIO lags	0.815	0.590	0.449	0.439	0.361
ExRET lags			0.704		0.835
NSR lags	0.000	0.091	0.138	0.000	0.000

month by the previous month's fund assets value. *NEIO* is the normalized "net exchanges" ("exchanges in" minus "exchanges out") in %. The measure is winsorized around the 1% tails of the distribution. *NSR* is the normalized "net sales" ("new sales" minus "redemptions") in %. *NFLOWS* is the normalized net flows (in %). The table presents the *p*-values of the Wald statistic for the significance of the regressions and the variables. For example, the *p*-value for *NEIO* lags is the *p*-value of the Wald statistic for the significance of the *NEIO* lags as a group. The *t*-statistics are reported below the coefficients. Both the Wald statistic and the *t*-statistics are corrected for heteroskedasticity using the White (1980) correction.

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