The (Bad?) Timing of Mutual Fund Investors

by

Oded Braverman,* Shmuel Kandel,** and Avi Wohl***

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* Doctoral Program, The Leon Recanati Graduate School of Business Administration, Tel Aviv University

** The Leon Recanati Graduate School of Business Administration, Tel Aviv University, Wharton School, University of Pennsylvania, and CEPR

*** The Leon Recanati Graduate School of Business Administration, Tel Aviv University
The (Bad?) Timing of Mutual Fund Investors

Abstract

This paper provides a new look at the timing of mutual fund investors. We re-examine the relationship between investors' aggregate net flows into and out of the funds and the returns of the funds in subsequent periods. The negative relationship that we find (using monthly data of aggregate US equity mutual funds in the years 1984-2003 and a statistical test based on bootstrapping of returns) causes mutual fund investors, as a group, to realize a lower long-term accumulated return than the long-term accumulated return on a "buy and hold" position in these funds.

The "bad" performance of mutual fund investors can be explained either by "behavioral explanations" such as investor sentiment or by "rational market explanations" that are based on time-varying risk premiums. We present a simple overlapping-generation model which predicts a negative relationship between flows and subsequent returns. It is assumed that flows into and out of funds are not related to information about future cash flows (dividends), but are caused by changes in other factors affecting the demand for stocks. Hence, a positive (negative) net flow in a given month implies a positive (negative) price change in the same month, but also lower (higher) expected future returns. We show that in each month the change in the expected future returns may be relatively small (relative to the return variance), but the accumulated effect of these changes may be significant. This result may explain why previous studies, using monthly data of flows and returns in either simple regression models or VAR, could not have significantly detected the monthly change in the expected future returns even in a 15-year sample.
**Introduction**

Can flows into and out of equity mutual funds predict stock returns? Several studies in the last decade have investigated the relationship between aggregate monthly mutual funds flows and stock returns, concluding that there is no effect of lagged flows on future returns. In this paper we provide a new look at this issue and argue that there is a negative relationship between net flows into equity funds and the long-run returns following them.

Unlike the lack of evidence for the lagged flows-lead returns relationship, researchers have documented a significant positive contemporaneous relationship between monthly fund flows and the equity returns in those months. This contemporaneous relation is consistent with two main hypotheses. The first is the information hypothesis: Good (bad) news regarding the equity market leads both to positive (negative) returns and to flows into (out of) equity funds. This hypothesis implies no relationship between lagged flows and future returns. The second hypothesis is the short-term price pressure hypothesis: If demand for equity is not fully elastic, a large flow into (out of) equity funds will push security prices up (down), and this will be reversed in the following periods, namely lagged positive flows should predict negative returns and vice-versa. As no empirical evidence has been found of the negative lagged flows-future returns relationship, Warther (1995) and Fant (1999) reject the price pressure hypothesis.

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2. Warther (1995) is the first article to document a strong positive relationship between unexpected monthly flows and concurrent monthly stock returns. This finding was later confirmed by many other studies (e.g. Santini and Aber (1998), Mosebach and Najand (1999) and Fant (1999)). Fant (1999) relates the finding only to exchanges in and out of the domestic equity funds. Edelen and Warner (2001) find similar results using daily flow data, and also conclude that aggregate flows follow market returns with a one-day lag. Goetzmann and Massa (2003) confirm these results, documenting a strong correlation between net daily cash flows to index funds and contemporaneous equity returns.
In this paper we suggest a third explanation regarding the contemporaneous relationship between flows and returns, which has other predictions for the relationship between lagged flows and lead returns. We hypothesize a long-term price pressure that is associated with a time-varying mean-reverting process of equity premiums. To formally derive and illustrate this hypothesis, we employ a simple overlapping-generation model. The model's basic assumptions are similar to those in De Long, Shleifer, Summers and Waldman (1990, hereafter DSSW), namely, two separate groups of investors who differ in their demand for the risky asset (equity). In our model, the first group is always in the equity market while the second group may enter and leave the equity market for relatively long periods. Unlike DSSW, we do not make behavioral assumptions such as misperception. The model implies a contemporaneous positive relationship between flows of the second group and the market price of the risky asset. More importantly, the equity risk premium expected for future periods is negatively related to the presence of the second group's investors in the equity market. In other words, when the investors of the second group enter the market, the equity price increases but there is also a long-term (but mean reverting) effect of a decline of the price of risk – and the investors of the second group earn a lower equity premium when they hold the equity. The equity price decreases and the equity premium increases when these investors leave the market.

We apply the predictions of our simple model to mutual fund investors. These predictions are similar in spirit to those made by Bekaert, Harvey, and Lumsdaine (2002) with respect to flows into emerging markets. They argue that unexpected flows to emerging markets are associated with price increases that are not temporary and not reversed (as predicted by the "pure price pressure hypothesis") and that this permanent change is the result of an additional risk sharing and a reduced cost of
capital ("the permanent change in the cost of capital hypothesis"). In our model (and hypotheses) the effect is not permanent, but it is slowly mean reverting and may exist for a very long time. As we show in the model's examples, the change in the cost of equity may be small relative to the actual change in price.

In our empirical study we use monthly data of flows and asset values of aggregate US equity mutual funds in the years 1984-2003. Due to a significant change in the fund population included in the data base in 1991, we study separately two sub-periods: 1984-90, and 1991-2003.

As the model implies, we first infer a significant positive contemporaneous relationship between the funds' monthly flows and returns. We then test and significantly reject the null hypothesis that future returns are not related to lagged flows, favoring the hypothesis that the relationship is negative. The formal statistical tests are based on bootstrapping of accumulated monthly returns. It is shown that this result holds even when we control for the persistence of the flows and the contemporaneous relation between flows and returns. We also directly test and infer that the negative relationship is due to time-varying equity premiums and not the riskfree rates. This negative relationship causes mutual fund investors, as a group, to realize a lower long-term accumulated return than the long-term accumulated return on a "buy and hold" position in these funds.

The "bad" performance of mutual funds investors, documented in this paper, can be explained either by "rational market explanations" that are based on rational time-varying risk premiums or "behavioral explanations" such as investor sentiment. Assuming investors are rational and markets are efficient, our results can be explained by equilibrium models with heterogeneous agents having heterogeneous constraints, income or preferences [see Campbell (2000)]. However, assuming that individual
investors try to “time” the markets by channeling their money in and out of mutual funds, our results indicate that they are bad performers. The bad performance of mutual fund investors is called in a concurrent paper by Lamont and Frazzini (2005) “the dumb money effect”. While their focus is not on the timing of mutual fund investors but on investors’ ability to allocate money across mutual funds, they find that over the long run investors earn lower returns as a result of their reallocation across funds.

Our results also shed new light on the performance of individuals vs. institutions reported in recent studies. The empirical evidence on this issue is mixed. Several studies examine the performance of individuals based on unique datasets of brokerage houses. Odean (1999) and Barber and Odean (2000) find that individuals’ buying portfolios under-perform their selling portfolios over the following two years. The results of Coval, Hirshleifer and Shumway (2002) suggest, however, that skillful individual investors exploit market inefficiencies to earn abnormal profits, above and beyond any profits available from well-known strategies. Several other articles use more comprehensive datasets of individual trading. Grinblatt and Keloharju (2000) use a dataset that consists of portfolio holdings for all Finnish investors. They document that individual investors perform poorly while institutions – particularly foreigners – perform well. Barber, Lee, Liu and Odean (2005) use a complete trading history of all investors in Taiwan. They document that, due to trading, the aggregate portfolio of individuals suffers an annual performance penalty of 3.8% while institutions enjoy an annual performance boost of 1.5%. Kaniel, Saar and Titman (2004) use classification code of NYSE to identify individuals’ transactions. They document that stocks that individuals buy exhibit positive excess returns in the following month. San (2005) employs data on institutional holdings, insider
transactions and trading volume for all NYSE and NASDAQ-NM stocks, and concludes that institutions gain less than individuals. Our study contributes to understanding the relative performance of individuals and institutions by emphasizing that the performance of institutional investors is affected by the investors’ flows into and out of the funds as well as management skills (if any). When analyzing the performance of institutional investors such as mutual funds one has to consider the two effects and their mutual relations.

We use our methodology to re-examine Dichev’s (2004) results which indicate a negative relationship between lagged flows and future returns for the equity market as a whole. We find such a significant negative relationship only in the sub-period 1991-2003, but the relation is not significant once the flows into and out of equity funds are excluded. Finally, we apply our statistical tests to another category of funds, bonds and money market funds, and find a similar negative relation between future returns and lagged flows into and out of these funds.

In order to assess the economic significance of our results, we calculate the average value weighted returns of equity fund investors (weights according to total equity funds’ NAV at the beginning of each month) and the internal rate of return (IRR) based on the monthly flows into and out of these funds, and compare them to the arithmetic and geometric means of the returns. This comparison is similar to that in Dichev (2004) for the whole equity market in the USA. Like Dichev, we find that the monthly value weighted average returns of investors in equity funds are considerably lower than the arithmetic average monthly returns. In real terms: 0.45% and 0.37% vs. 0.72% and 0.75% for the two sub-periods, respectively. The IRR is

3 Regarding individual funds, Wermers (2003) reviews the literature and provides new evidence on the relation between flows, manager behavior and performance persistence.
also lower than the geometric mean monthly return by 0.1% and 0.21%, in real terms, for the two sub-periods, respectively. The results are similar in nominal terms.

The paper is organized as follows. Section 1 introduces our simple overlapping-generations model and derives its hypotheses. Section 2 describes the data and summary statistics. In section 3 we present the main results of the empirical study. Section 4 concludes the paper.

1. The Model

The model is a simple overlapping-generations model with two-period-lived agents and two financial assets. The first asset is a riskless asset which pays an interest payment \( r \) at the end of each period. There exists a perfectly elastic supply of this asset at the price of 1. The second asset is risky and there are \( X \) outstanding shares of this asset. An owner of shares may get a dividend at the end of each period. The dividend’s possible values are 0 and 1 per share with equal probabilities. The dividends are identically and independently distributed across periods.

As in DSSW (1990), the model assumes two groups of investors who differ in their total demand for the risky asset (equity). There is no consumption in the first period, no labor supply decision, and no bequest. The only decision an agent makes is choosing a portfolio when young. The young agents arrive at the financial market with their endowments at discrete points of time \( (t=1,2,3, \ldots) \), and buy financial assets from the old agents. The old agents sell the financial assets, and then consume and die. The number of young agents who arrive at the market at time \( t \) is a random variable. Denote this variable by \( N_t \), and assume that it has two possible values, either a low value \( L \) or a high value \( H \). \( N_t \) depends on \( N_{t-1} \): \( N_t = N_{t-1} \) with probability \( q \). One way to interpret this assumption is that there exist two groups of investors:
one group of investors ("G1") is always present in the stock market and a second

group ("G2") is present only part of the time.

Every agent has utility only from the total wealth at the end of the period, W.

We assume an exponential utility function:

$$U(W) = -e^{\rho W}$$

where $\rho$ is a coefficient of risk aversion.

The equilibrium

At the beginning of each period, each stock may be evaluated as a combination of two components:

A – the dividend payment at the end of the period

B – the following dividends (after the end of the period)

Two observations are useful in calculating equilibrium prices:

1. Because dividend payments are independent across time, the price of component B is independent of the dividend paid at the end of the previous period.

2. Because of the investors’ exponential utility function and the independence of future payoffs of components A and B, the market values of A and B can be calculated separately. Both of them depend on the only time-varying state variable $N_t$ (the number of young agents at the beginning of the period).

3. Hence, the price of the stock is simply the sum of the two values of A and B. As $N_t$ can get one of two values, L and H, the price of the stock can also get one of two values, $P_L$ or $P_H$, respectively.
Using Lemma A1 (in the Appendix), the equilibrium prices $P_H$ and $P_L$ are shown to be the solution of the following set of equations:

\[
P_H = \left\{ \frac{1}{1 + e^{\frac{\rho}{N_H}}} + \frac{qP_H + (1 - q)P_L e^{\frac{\rho(P_H - P_L)X}{N_H}}}{q + (1 - q) e^{\frac{\rho(P_H - P_L)X}{N_H}}} \right\} (1 + r) \tag{1}
\]

\[
P_L = \left\{ \frac{1}{1 + e^{\frac{\rho}{N_L}}} + \frac{(1 - q)P_H + qP_L e^{\frac{\rho(P_H - P_L)X}{N_L}}}{q + (1 - q) e^{\frac{\rho(P_H - P_L)X}{N_L}}} \right\} (1 + r) \tag{2}
\]

### A numerical example

<table>
<thead>
<tr>
<th>Variable</th>
<th>Notation</th>
<th>Value in Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of shares</td>
<td>$X$</td>
<td>3,000</td>
</tr>
<tr>
<td>Coefficient of risk aversion</td>
<td>$\rho$</td>
<td>1</td>
</tr>
<tr>
<td>Number of young agents when “low”</td>
<td>$L$</td>
<td>2000</td>
</tr>
<tr>
<td>Number of young agents when “high”</td>
<td>$H$</td>
<td>3000</td>
</tr>
<tr>
<td>Probability of persistence of number of agents</td>
<td>$q$</td>
<td>0.99</td>
</tr>
<tr>
<td>Riskless rate</td>
<td>$r$</td>
<td>0.04</td>
</tr>
</tbody>
</table>

In this example $P_L = 4.58$ and $P_H = 5.43$. The difference between the prices is 18.5% of $P_L$.

The expected dividend yield is \[
\frac{0.5 \times 1 + 0.5 \times 0}{price} = \frac{0.5}{price}.
\]

Therefore, in the “L” state the expected dividend yield is $0.5/4.58 = 10.92\%$ and in the “H” state it is $9.20\%$.

The expected return due to capital gain in the “L” state is $0.01 \times (5.43/4.58 - 1) = 0.19\%$ and in the “H” state it is $-0.16\%$. Overall the expected return in the “L” state is higher by roughly 2\% than the average return in the “H” state (11.10\% vs. 9.04\%).
The actual rate of return for each period depends on the state (price) at the beginning of the period, the actual dividend, and the actual state (capital gain) of the following period. Hence, for each state (H or L), there are four possible values for the rate of return. For example, the return in the “H” state if the dividend is 1 and there is no price change is \( \frac{1}{5.43} = 18.4\% \), and the return in the “L” state if the dividend is 0 and there is a price increase is \( \frac{5.43}{4.58} - 1 = 18.6\% \).

The table below presents the distribution of returns for each state:

<table>
<thead>
<tr>
<th></th>
<th>State L</th>
<th></th>
<th>State H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>probability</td>
<td>Return</td>
<td>probability</td>
</tr>
<tr>
<td>40.4%</td>
<td>0.005</td>
<td>18.4%</td>
<td>0.495</td>
</tr>
<tr>
<td>21.8%</td>
<td>0.495</td>
<td>2.7%</td>
<td>0.005</td>
</tr>
<tr>
<td>18.6%</td>
<td>0.005</td>
<td>0.0%</td>
<td>0.495</td>
</tr>
<tr>
<td>0.0%</td>
<td>0.495</td>
<td>-15.7%</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Note that it not easy to detect price level changes by looking only at the returns. Also note that the differences in average returns are relatively small relative to return variances.

Model’s empirical predictions for G2’s investors

1. There is a positive relationship between net flows into and out of the equity market (of G2’s investors) and contemporaneous returns.

2. There is a negative relationship between net flows into and out of the equity market (of G2’s investors) and subsequent returns.
3. *Value weighted expected return on equity (held by G2’s investors)* < *expected equity return*

The model’s predictions for G1’s investors are the mirror images of those for G2’s investors. In addition, the model implies that the equity risk premium is positive in every period.

In our empirical study that follows, we identify the flows of G2’s investors with the net flows into and out of equity mutual funds.

2. Data

2.1 Data sources

Aggregate equity fund data for the months 1984:01 through 2003:12 were obtained from the Investment Company Institute (ICI). Similarly to Fant (1999), we focus on US domestic equity funds, aggregating the flows and market values of the following categories: Growth, Aggressive Growth, Growth and Income, Income Equity and Sector. We did not include the International Equity and Global Equity categories. Similarly to Warther (1995), we calculate the monthly net flow as aggregated “new sales” plus “exchanges in” minus “redemptions and exchanges out”.

The nominal monthly return of the equity funds is calculated as:

\[
R_t = \frac{NAV_t - 0.5 \cdot \text{Net~Flow}_t}{NAV_{t-1} + 0.5 \cdot \text{Net~Flow}_t} - 1
\]

(2.1)

where NAV represents the total value of the equity funds at the end of the month and Net_Flow represents the net flow within a given month. This calculation implicitly assumes that half of the reported monthly flow occurs at the beginning of the month and half of the flow occurs at the end of the month.

4 Fant (1999) does not include the Sector category in his study. Warther (1995) also includes international and global equity categories.
In January 1991, TIAA-CREF funds were added to the population of funds covered by ICI. We therefore consider in our empirical study two sub-periods: January 1984 to December 1990, and January 1991 to December 2003.

The total value of the equity market was obtained from the Center for Research in Security Prices (CRSP) as the total value of NYSE, AMEX and NASDAQ stocks. CPI data (All Urban Consumers) and 30-day t-bill returns are also obtained from CRSP.

2.2 Summary statistics

Table 1 presents summary statistics of the various variables. Figure 1 depicts two series of accumulated returns: equity mutual fund returns vs. the whole US equity market returns (including reinvested dividends, the starting point in 1984:01 normalized to 100). It can be seen that the returns are highly correlated – the correlation coefficient between the two series is 0.9925. For the full sample, the average market monthly return is 1.066% and exceeds the average mutual funds return which is 0.984%. The difference between them is economically significant (sums to around 1% annually) and it is statistically significant (p-value of t-test smaller than 0.001), but the standard deviation of the funds’ return is slightly smaller than the standard deviation of the market return: 4.35% vs. 4.58%. After controlling for these differences in the standard deviations by forming a portfolio of the equity market and investment in short t-bills, the funds underperform this portfolio by 0.6% roughly annually and the difference is significant.

January 1991 is excluded for the correlation calculation. For the calculation of accumulated returns, the monthly return for the whole US market in January 1991 is also used for the equity funds.
Figure 2 depicts net flows into the equity funds (in January 1984 real terms). It can be seen that over time there is a trend of net flow increase and also an increase in the variability of the net flows. The 2002 flows are examples of both high positive and negative net flows.

A result of the increase in the net flows over time is an increase in the ratio of the value of equity funds to the value of the whole US equity market (hereafter denoted by FR – Funds Ratio). FR increased from around 4% in 1984 to around 22% at the end of 2003. The monthly average net inflow over the period was more than $6.5B, leading to an annual growth of 21.1% of the net asset value of the equity funds relative to an 11% annual growth of the total equity market value. Figure 3 depicts the values of the equity funds, the whole US equity market, and the resulting FR.

4. Empirical Results

Our model’s first prediction is about the contemporaneous positive relationship between monthly flows into and out of equity funds and the funds’ returns. As discussed in the Introduction, this relationship is well documented in the literature. We also find a significant positive correlation between net flows and the contemporaneous returns. For the first sub-period (1984-1990), the correlation coefficient is 0.67, for returns and flows either in nominal or real terms. When flows are normalized (the flow is divided by market value of equity), the coefficient is 0.70. For the second sub-period (1991-2003), the correlation coefficient is 0.46 for returns and flows in both nominal and real terms, and 0.49 when flows are normalized. In all cases the p-value is smaller than 0.0001. The correlation matrix of the returns, flows and their lagged values is presented in Table 2.
Our model makes the simplifying assumption that net flows are slowly mean reverting. In the model, this assumption implies that, over time, there is a positive relationship between contemporaneous expected flows and expected returns. As documented in the literature (see, for example, Warther (1995) and Fant (1999)), net flows are persistent in the short run. Therefore, one should not expect to find in the data a positive contemporaneous relationship between expected flows and expected returns. However, the predicted contemporaneous positive relationship between unexpected flows and unexpected returns is independent of our simplifying assumptions. To estimate expected and unexpected flows, we consider the following variables in a regression model:

- $F_t/M_{t-1}$ = the ratio (in percentage terms) between the net flow into and out of equity funds in month $t$ and the previous month’s total value of the equity market, and
- $A_t/M_t$ = the ratio (in percentage terms) between the end-of-month total value of the equity funds and the end-of-month total value of the equity market.

The estimated regression relation is (t-statistics in parentheses):

$$\frac{F_t}{M_{t-1}} = 0.0122 + 0.6209 \cdot \frac{F_{t-1}}{M_{t-2}} + 0.0014 \cdot \frac{A_{t-1}}{M_{t-1}} + \epsilon_t \quad R^2 = 0.42$$

(1.17) (12.05) (1.88)

We then regress the monthly real returns on the expected and unexpected flows. The estimated relation is (t-statistics in parentheses):

$$R_t = 0.853 + -1.48 \cdot EXPECTED\_FLOW + 40.05 \cdot UNEXPECTED\_FLOW + \epsilon_t \quad R^2 = 0.42$$

(2.40) (−0.41) (13.09)
The results are consistent with those of Warther (1995) that the source of the contemporaneous relationship between flows and returns is the correlation between unexpected flows and unexpected returns.

Our second prediction is regarding a negative relationship between monthly flows and subsequent returns. In section 1 we note that, even in our simplifying model, the decrease (increase) in the equity premium following a flow into (out of) equity funds seems to be small relative to the standard deviation of the returns. Hence, a very long sample might be needed to detect a negative relationship in a simple regression model. Indeed, like previous studies, we too do not find the correlation between monthly returns and lagged flows to be significantly negative. But, if the effect exists, and is persistent, we may detect it using longer term returns and non-linear techniques.

We employ a bootstrapping technique to test the relation between lagged flows and future returns. In all the tests that follow, the null hypothesis is that there is no such relationship, and under the alternative hypothesis (as derived from our simple model) the relationship is negative.

In our first test, denoted by TEST-1, we simply interpret the null hypothesis as a hypothesis of statistical independence between flows and returns. This independence is consistent with the “no price pressure hypothesis”, neither a short-term price pressure nor a long-term price pressure. A “simulation” is run where the flows into and out of equity funds are equal to the realized real flows, but in each round of the simulation the real monthly returns are “shuffled” over the period. We then apply the simulated (or shuffled) returns, together with the real flows, to calculate the simulated value of the funds at the end of the period (“terminal funds’ value”). We repeat this procedure 10,000 times. Under the independence hypothesis,
one should expect that the actual terminal funds’ value would not be significantly different from the simulated average terminal funds’ value. Under a price pressure hypothesis, where there is a negative relationship between lagged flows and future returns, the actual total terminal funds’ value should be significantly smaller than the simulated average. Table 3 presents the results of all simulation tests. The results of TEST-1 indicate that, for each sub-period, the actual terminal value is indeed at the left tail of the simulated distribution: only 10.53% and 5.66% of the simulated values are lower than the actual values in the first and second sub-periods, respectively. The distributions of the results are presented in Figure 4-A and Figure 4-B. Taking the two figures together, and approximating the simulated distributions with normal distributions, the null hypothesis of independence is rejected at the 5% significance level. The results (not presented) are similar when flows and returns are expressed in nominal terms and when we assume a zero value for the starting value of the funds in each sub period.

In the second test, TEST-2, we check whether the result of the first test, namely the relatively low actual terminal funds’ value, is solely the outcome of the contemporaneous price impact of the unexpected flows into and out of equity funds (as we and others have documented). To do so, we first estimate the expected return conditioned on the unexpected contemporaneous flow.

A “simulation” is then run where, like the simulation of the first test, the flows into and out of equity funds are equal to the realized real flows, but in each round of the simulation the unexpected (residual) returns of the regression are “shuffled” over the period. We then apply the realized real flows and their contemporaneous expected real returns together with the simulated (or shuffled) unexpected returns to calculate the terminal funds’ value. Again, under the null hypothesis the actual terminal funds’
value should not be significantly different from the simulated average terminal funds’ value, and under the alternative hypothesis the actual total terminal funds’ value should be significantly smaller than the simulated average.

Similarly to the results of the first test, for each sub-period the actual terminal funds’ value is at the left end of the simulated distribution: Only 3.0% and 7.8% of the simulated values are lower than the actual values in the first and second sub-periods, respectively. Taking the two figures together, and approximating the simulated distributions with normal distributions, the null hypothesis of independence is rejected at the 5% significance level. Here again the results (not presented) are robust to expressing the flows and returns in nominal terms instead of real terms.

TEST-3 is similar to TEST-1, but the hypothesis focuses directly on the equity risk premium: the null hypothesis is that the equity premium is independent of past flows, while this relationship is negative in the alternative hypothesis. In each round of the simulation the equity premiums are “shuffled” over the period. 16.2% and 5.5% of the simulated values are lower than the actual values in the first and second sub-periods, respectively. The null is rejected at the 5% significance level (in a one-sided test; in a two-sided test, the p-value is 6.8%).

Based on the three tests, we infer that there is a negative relationship between lagged flows and future returns. Moreover, the equity risk premium is time-varying and is negatively related to lagged flows.

In order to demonstrate the economic significance of the inferred negative relationship, we compare the Value weighted average return to the arithmetic mean return in each sub-period. The values presented in Table 4 indicate that in both sub-periods the Value weighted average return is lower than the arithmetic mean return. For the monthly real returns: 0.45% vs. 0.72% and 0.36% vs. 0.75%, for the two sub-
periods, respectively. Similar differences hold for the nominal returns. Another way to assess the economic significance of the results is to compare the IRR (calculated using the flows) to the geometric mean return. In our sample there is a unique IRR for each sub-period, and it is indeed lower than the geometric mean (for monthly real returns 0.53% vs. 0.63% and 0.46% vs. 0.67%).

Our results are similar in spirit to those of Dichev (2004) regarding the negative relationship between return and net flows into and out of the whole equity market in the period 1926-2002. We apply our methodology to reproduce Dichev’s results for our sample period. Our TEST-4 is similar to TEST-1, but with flows into and out of the whole equity market replacing the flows of the equity funds and returns of the market replacing the equity funds returns. For the first sub-period, 68.8% of the simulated terminal values are smaller than the actual terminal value. For the second sub-period, only 1.3% of the simulated terminal values are smaller than the actual terminal value. Based on these results the null hypothesis of independence can not be rejected at the 5% significance level for the whole equity market and for the two sub-periods.

Next, we check whether Dichev’s (2004) and the above results regarding the whole equity market (especially for the second sub-period) can be explained by flows into and out of equity funds. In TEST-5 we replicate TEST-4 but with the equity market net flows replaced by “equity’s non-funds net flows”, calculated as

\[ \text{equity's non-funds net flows} = \text{equity market net flows} - \text{equity funds net flows}. \]

As can be seen in Table 3, the results are not significant at the 5% significance level. Hence, we infer that the negative relationship between lagged flows and future equity

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6 Dichev (2004) holds the returns constant and shuffles normalized flows.
7 The correlation of the monthly flows into the equity funds to the estimated monthly flows to the whole US market – estimated as in Dichev 2004 – are around 0.25, in each sub-period.
returns, if it exists in the whole US equity market, is mostly linked to net flows into and out of equity funds.

Is the poor timing of mutual fund investors unique to equity funds? TEST-6 examines the hypothesized negative relationship between lagged real flows to bonds and money market funds and the real returns following them. TEST-7 examines this relation for flows to all equity, bonds, and money market funds. Not surprisingly, we find that the results are very similar to those related to equity funds only. Namely, once the returns are “shuffled” over the period, the terminal funds’ value is significantly higher than the actual terminal value.

4. Conclusions

This paper provides a new look at the performance of mutual fund investors. We re-examine the relationship between investors' aggregate net flows into and out of the funds and the returns of the funds in subsequent periods and find this relationship to be significantly negative. This negative relationship causes mutual fund investors, as a group, to realize a lower long-term accumulated return than the long-term accumulated return on a "buy and hold" position in these funds.

The "bad" performance of mutual fund investors can be explained either by "rational market explanations" that are based on rational time-varying risk premiums or "behavioral explanations" such as investor sentiment. Assuming investors are rational and markets are efficient, our results can be explained by equilibrium models with heterogeneous agents having heterogeneous constraints, income or preferences. However, assuming that individual investors try to “time” the markets by channeling their money in and out of mutual funds, our results indicate that they are bad performers.
References


Table 1 – Sample Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Std Dev</td>
</tr>
<tr>
<td>netflow</td>
<td>83</td>
<td>0.52</td>
<td>1.75</td>
</tr>
<tr>
<td>assets</td>
<td>83</td>
<td>152</td>
<td>52</td>
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<td>market</td>
<td>83</td>
<td>2,576</td>
<td>519</td>
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<tr>
<td>return</td>
<td>83</td>
<td>1.05</td>
<td>4.54</td>
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<tr>
<td>rreturn</td>
<td>83</td>
<td>0.72</td>
<td>4.59</td>
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<td>mret</td>
<td>83</td>
<td>1.13</td>
<td>4.98</td>
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<tr>
<td>nflow</td>
<td>83</td>
<td>0.019</td>
<td>0.066</td>
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<tr>
<td>fr</td>
<td>83</td>
<td>5.70</td>
<td>1.01</td>
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</table>

Table 1 presents descriptions and sample summary statistics for variables of flows, asset values and returns. The sample includes two sub-periods: 1984-1990 and 1991-2003, where the first month of each sub-period is excluded. Fund flows and net asset values were obtained from the Investment Company Institute and include domestic equity funds of the following categories: Growth, Aggressive Growth, Growth and Income, Income Equity and Sector. The calculation of the nominal monthly return on the equity funds is presented in equation (2.1). The total value of the equity market was obtained from the Center for Research in Security Prices (CRSP) as the total value of NYSE, AMEX and NASDAQ stocks. Real values are calculated using CPI data (All Urban Consumers).
Table 2 – Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>nflow</th>
<th>lag (nflow)</th>
<th>return</th>
<th>lag (return)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nflow</td>
<td>1</td>
<td>0.646 (≤0.0001)</td>
<td>0.482 (≤0.0001)</td>
<td>0.192 (0.0003)</td>
</tr>
<tr>
<td>lag (nflow)</td>
<td>1</td>
<td>-0.02 (0.756)</td>
<td>0.452 (≤0.0001)</td>
<td></td>
</tr>
<tr>
<td>return</td>
<td></td>
<td>1</td>
<td>0.075 (0.247)</td>
<td></td>
</tr>
<tr>
<td>lag (return)</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 presents the correlation matrix of two variables, nflow and return, and their lagged values for the full sample period (1984-1990, 1991-2003). See Table 1 for the description of the variables.
Table 3 presents the simulation results for seven tests. In each round of the simulation a terminal value was calculated using the initial real net asset value, real flows, and shuffled monthly real returns or unexpected returns. For each test, the first column describes the type of funds or market tested and the shuffling method.

<table>
<thead>
<tr>
<th>Test</th>
<th>Type of Funds</th>
<th>Description</th>
<th>1984-1990</th>
<th>1991-2003</th>
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<tbody>
<tr>
<td>TEST-1</td>
<td>Equity funds</td>
<td>Actual terminal funds’ value</td>
<td>291</td>
<td>3,167</td>
</tr>
<tr>
<td></td>
<td>Shuffled: Real returns</td>
<td>Average simulation result</td>
<td>311</td>
<td>3,914</td>
</tr>
<tr>
<td></td>
<td>% of results lower than actual</td>
<td>16.7</td>
<td>534.6</td>
<td></td>
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<tr>
<td>TEST-2</td>
<td>Equity funds</td>
<td>Actual terminal funds’ value</td>
<td>291</td>
<td>3,167</td>
</tr>
<tr>
<td></td>
<td>Shuffled: Unexpected funds returns</td>
<td>Average simulation result</td>
<td>311</td>
<td>3,641</td>
</tr>
<tr>
<td></td>
<td>% of results lower than actual</td>
<td>11.5</td>
<td>360.1</td>
<td></td>
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<tr>
<td>TEST-3</td>
<td>Equity funds, Equity premiums</td>
<td>Actual terminal funds’ value</td>
<td>291</td>
<td>3,167</td>
</tr>
<tr>
<td></td>
<td>Shuffled:</td>
<td>Average simulation result</td>
<td>306</td>
<td>3,900</td>
</tr>
<tr>
<td></td>
<td>% of results lower than actual</td>
<td>16.2</td>
<td>520.1</td>
<td></td>
</tr>
<tr>
<td>TEST-4</td>
<td>Whole US Equity market</td>
<td>Actual terminal market value</td>
<td>4,104</td>
<td>14,582</td>
</tr>
<tr>
<td></td>
<td>Shuffled: Real returns</td>
<td>Average simulation result</td>
<td>3,981</td>
<td>15,403</td>
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<tr>
<td></td>
<td>% of results lower than actual</td>
<td>68.76%</td>
<td>1.33%</td>
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<td>TEST-5</td>
<td>Equity market &quot;non-equity funds&quot; flows</td>
<td>Actual terminal market value</td>
<td>3,805</td>
<td>11,148</td>
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<td></td>
<td>Shuffled: Real returns</td>
<td>Average simulation result</td>
<td>3,655</td>
<td>11,166</td>
</tr>
<tr>
<td></td>
<td>% of results lower than actual</td>
<td>71.20%</td>
<td>43.47%</td>
<td></td>
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<tr>
<td>TEST-6</td>
<td>Bond and money market funds</td>
<td>Actual terminal funds’ value</td>
<td>1,088</td>
<td>3,293</td>
</tr>
<tr>
<td></td>
<td>Shuffled: Real returns</td>
<td>Average simulation result</td>
<td>1,110</td>
<td>3,397</td>
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<tr>
<td></td>
<td>% of results lower than actual</td>
<td>10.0</td>
<td>41.6</td>
<td></td>
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<tr>
<td>TEST-7</td>
<td>Bond, money market and equity funds</td>
<td>Actual terminal funds’ value</td>
<td>1,378</td>
<td>6,460</td>
</tr>
<tr>
<td></td>
<td>Shuffled: Real returns</td>
<td>Average simulation result</td>
<td>1,416</td>
<td>7,112</td>
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<tr>
<td></td>
<td>% of results lower than actual</td>
<td>27.5</td>
<td>414.7</td>
<td></td>
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</table>

Table 3 – Simulation Results Summary
Table 4 – Selected Statistics for Monthly Fund Returns

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Real monthly returns:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.72%</td>
<td>0.75%</td>
</tr>
<tr>
<td>Value weighted average</td>
<td>0.45%</td>
<td>0.36%</td>
</tr>
<tr>
<td>Geometric mean</td>
<td>0.63%</td>
<td>0.67%</td>
</tr>
<tr>
<td>IRR</td>
<td>0.53%</td>
<td>0.46%</td>
</tr>
<tr>
<td>Nominal monthly returns:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>1.05%</td>
<td>0.95%</td>
</tr>
<tr>
<td>Value weighted average</td>
<td>0.77%</td>
<td>0.52%</td>
</tr>
<tr>
<td>Geometric mean</td>
<td>0.96%</td>
<td>0.87%</td>
</tr>
<tr>
<td>IRR</td>
<td>0.86%</td>
<td>0.65%</td>
</tr>
</tbody>
</table>

Table 4 presents selected statistics regarding the monthly returns in the two sub-periods. All figures were calculated using the aggregated equity funds data from ICI. Average returns represent simple arithmetic means of the monthly returns. Value weighted average returns were weighted using the equity fund assets. The geometric mean represents the average compounded monthly return, assuming a "buy and hold" investment. The IRR was calculated using real net flows and the initial and terminal net asset values (a unique IRR exists for each sub-period).
Figure 1 demonstrates the underperformance of aggregate equity funds portfolio relative to the performance of the market portfolio over time. Equity funds monthly returns were calculated using net aggregate flows and balance from the ICI dataset, assuming net flows from funds occur half at the beginning of the month and half at the end of the month. Market returns were based on the CRSP total return. Due to technical changes in the ICI database from 12/90 to 1/91, with the inclusion of additional funds in the database, we could not calculate the Jan 91 equity funds return, so used the market return for this specific month.
Figure 2 – Net Flows to Equity Funds

Figure 2 depicts net flows (new sales plus "exchanges in" minus redemptions and "exchanges out", in January 1984 real dollar terms into the equity funds through time. Due to technical changes in the ICI database from 12/90 to 1/91, with the inclusion of additional funds in the database, the sample is separated into two sub-periods: until Dec 90 and from Jan 91.
Figure 3 – Values of Equity Markets and Equity Funds

Figure 3 depicts the increase in the value of the equity market, the equity funds (both in real dollar terms, indexed to 100 in Jan 1984), and in the FR (the ratio of the value of equity funds to all equity market value). An annual real growth of 21.1% in the equity fund aggregated total assets, relative to a modest 11% annual growth in the total equity market value lead to an increase in FR from around 4% in 1984 to around 22% at the end of 2003.
Figure 4-A graphically presents the distribution of the 10,000 simulation results for Bootstrap Test 1 (see Table 3). The red dotted line represents the actual value at the end of the period.
Figure 4-B graphically presents the distribution of the 10,000 simulation results for Bootstrapping Test 1 (see Table 3). The red dotted line represents the actual value at the end of the period.
Appendix

Lemma A1

There are N investors. Investor’s i initial wealth is $W_i$. Her utility is based on $W$, the total wealth at the end of period $U(W) = -e^{-\rho W}$. The riskless interest rate is $r$. A risky asset pays $H$ or $L$ with probabilities $q$ and $(1-q)$, respectively. The demanded quantity of each of the agents, $d_i$, of the risky asset conditional on its price, $p$, is:

$$d = \frac{\ln \left( \frac{q}{1-q} \cdot \frac{H - p(1+r)}{P((1+r)^{-1}) - L} \right)}{\rho (H - L)}$$

and the price of the risky asset is

$$p = \frac{qH + (1-q)L e^{\frac{\rho(H-L)X}{N}}}{q + (1-q) e^{\frac{\rho(H-L)X}{N}}}/(1+r)$$

Proof:

Buying $d$ units of the risky asset imply two possible wealth levels at the end of the period:

$$[W_i(1+r) + (H - p(1+r))d] \quad \text{or} \quad [W_i(1+r) + (L - p(1+r))d]$$

The expected utility is:

$$EU = -q e^{-\rho[W_i(1+r) + (H - p(1+r))d]} - (1 - q) e^{-\rho[W_i(1+r) + (L - p(1+r))d]}$$

Deriving by $d$ yields
\[ e^{-\rho W_i (1+r)} \{ q[H - p(1+r)] e^{-\rho[H - p(1+r)]d} + (1-q)[L - p(1+r)] e^{-\rho[L - p(1+r)]d} \} \]

Equating to 0 to find the maximum yields:

\[ q[H - p(1+r)] e^{-\rho[H - p(1+r)]d} = (1-q)[p(1+r) - L] e^{-\rho[L - p(1+r)]d} \]

After rearranging we get

\[ \frac{e^{L - p(1+r)\frac{p(1+r) - L}{H - p(1+r)}}}{e^{H - p(1+r)\frac{p(1+r) - L}{H - p(1+r)}}} = 1 - q \cdot \frac{p(1+r) - L}{H - p(1+r)} \]

\[ \Leftrightarrow e^{\rho d(L - H)} = \frac{1 - q}{q} \cdot \frac{p(1+r) - L}{H - p(1+r)} \]

\[ \Leftrightarrow e^{\rho d(H - L)} = \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} \]

\[ \Leftrightarrow \rho d(H - L) = \ln\left\{ \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} \right\} \]

and

\[ d = \frac{\ln\left( \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} \right)}{\rho(H - L)} \]

At the equilibrium price \( X = Nd \)

Therefore

\[ \frac{\ln\left( \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} \right)}{\rho(H - L)} = X \]

After rearranging we get

\[ \ln\left( \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} \right) = \frac{X \rho(H - L)}{N} \]

\[ \Leftrightarrow \frac{q}{1 - q} \cdot \frac{H - p(1+r)}{p(1+r) - L} = e^{\frac{X \rho(H - L)}{N}} \]
⇔ qH - qp(1 + r) = (1 - q)\{p(1 + r) - L\} e^{\frac{X_p(t-L)}{N}}

⇔ qH + (1 - q) L e^{\frac{X_p(t-L)}{N}} = p(1 + r)\{(1 - q) e^{\frac{X_p(t-L)}{N}} + q\}

and

\[
p = \left\{\frac{qH + (1 - q) L e^{\frac{p(H-L)X}{p(H-L)X}}}{q + (1 - q) e^{\frac{p(H-L)X}{p(H-L)X}}}\right\}/(1 + r)
\]

Q.E.D