Hindsight effect: What are the actual cash flow timing skills of mutual fund investors?

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Abstract

This paper analyzes the cash flow timing skills of mutual fund investors, controlling for the hindsight effect (HE) by implementing the method developed by Hayley (2014) for stock market investors. Previous papers in the literature studying the timing skills of mutual fund investors do not control for this effect, which biases downward the actual timing skills of these investors. Accordingly, we analyze a sample of US domestic equity mutual funds in the period from January 1990 to January 2016. For each fund in the sample, we compute, over the entire period analyzed, the dollar-weighted monthly (DW) return, the geometric monthly (GM) return, the gap (the difference between the DW and the GM), the HE and the corrected timing measure after correcting for this effect.

Before controlling for the HE, we find that mutual fund investors worsen the return that they achieve with their timing decisions by 1.80% annually (similar to the evidence provided previously in the literature). However, after controlling for the HE, we observe that investors really harm the returns that they achieve with their timing decisions by 0.71% annually. We establish several controls for different investment styles, and we obtain empirical evidence of the same phenomenon for all of them.

Besides, we control for the size and age of the mutual fund (proxies for the level of information available for the fund). The results obtained indicate that investors in older and bigger funds show better timing skills than investors in younger and smaller funds. We also analyze how investors' level of sophistication affects our results by controlling for the net expense ratio, net income ratio, turnover ratio, institutional/non-institutional character, load/no-load regime and gap results. In general terms we observe that more sophisticated investors show better timing results and that the HE is more relevant to less sophisticated investors.

JEL Codes: G11; G20

Keywords: Cash flow timing skills; Level of information; Level of investor sophistication; Hindsight effect

1. Introduction

The investment decisions of mutual fund investors are a topic of interest in the financial literature. Three topics are highlighted in this research field:

i) The influence of past financial performance on mutual fund investors' investment and withdrawal decisions (financial performance–fund flow relationship).

ii) Investors' skills in selecting funds that will show superior financial performance in subsequent periods (the smart-money effect or selection skills).

iii) Investors' skills in selecting the proper time to invest in or disinvest from a mutual fund (cash flow timing skills).

In this paper we focus on the third of these research topics, that is, the cash flow timing skills of mutual fund investors. This is the least explored of the topics in the literature. The scarce empirical evidence regarding this issue in the prior literature shows in general terms that mutual fund investors make wrong timing decisions. These wrong decisions lead them to achieve a worse financial result than mutual fund managers. However, mutual fund investors are not a homogeneous group, and different investor profiles exist according to the kind of mutual fund in which they invest. In this way, in some of the prior studies, it is found that the most sophisticated and informed investors show good timing skills.

The vast majority of papers analyzing this question to date use as a methodology the difference between the geometric monthly return and the dollar-weighted (DW) monthly return of the mutual funds (the dollar-weighted return is a measure of the return that considers the effect of fund flows in its computation). All these papers provide interesting empirical evidence about the cash flow timing skills of mutual fund investors; however, Hayley (2014) shows that the results achieved using this methodology are biased (the

hindsight effect). The hindsight effect supposes that the empirical evidence reported to date reflects worse cash flow timing skills than the actual timing skills of mutual fund investors. Hayley (2014) not only identifies this hindsight effect but also provides a method to control for it. However, this author's paper focuses on equity investors and analyzes equity indices but not the specific case of mutual fund investors. In fact, Hayley (2014) challenges researchers to implement his method for a sample of mutual fund investors. As far as we know, there are no papers that analyze cash flow timing skills controlling for the hindsight effect for a sample of mutual fund investors. With this paper we fill this gap in the financial literature and extend the empirical evidence that is currently available on this topic.

Accordingly, first we analyze cash flow timing skills using the methodology in the literature: computing the difference between the geometric monthly return and the dollar-weighted return for a sample of US mutual funds that invest in domestic equity. Then, we implement the method developed by Hayley to determine the relevance of the hindsight effect to the timing skills of the investors in our sample. In this way we can obtain the actual cash flow timing skills (without suffering from the hindsight effect bias). Besides, we implement several controls to determine whether the hindsight effect has the same importance for all the investors in mutual funds or whether there are differences according to the type of mutual fund investor analyzed.

2. Literature Review

Friesen and Sapp (2007) point out that mutual fund investors could improve their financial results by selecting mutual funds that subsequently obtain superior financial performance (smart-money effect) or by choosing the proper moment to invest in or disinvest from a

mutual fund (cash-flow timing skills) or by showing both skills. On literature contains a number of papers that study the first of them, that is, the selection skills of mutual fund investors. We can highlight the following, among others: Gruber (1996), Zheng (1999), Sawicki and Finn (2002), Sapp and Tiwari (2004), Frazzini and Lamont (2008), Keswani and Stolin (2008a), Renneboog et al. (2008), Renneboog et al. (2011), Vicente et al. (2011), Yu (2012), Feng et al. (2014) and Laborda and Muñoz (2016). In all these papers, we can find analyses of different mutual fund samples in different time periods, the use of different methodological approaches and the implementation of different controls, providing mixed empirical evidence according to the matters involved. However, we do not analyze these articles in greater depth, since in this paper we focus on cash flow timing skills rather than selection skills.

Among the most remarkable papers concerning the second type of skills, cash flow timing skills, are the following: Friesen and Sapp (2007), Dichev and Yu (2011), Chieh-Tse Hou (2012), Navone and Pagani (2015) and Muñoz (2016).

Friesen and Sapp's (2007) study is the first to analyze the timing skills of mutual fund investors using data of fund flows at the individual fund level. These authors pose the following question: 'Do equity fund investors put cash in and take cash out at the right moment on average?' (Friesen and Sapp, 2007, p. 2797). To answer this question, these authors analyze a sample of US market equity mutual funds in the period 1991 to 2004. The results achieved show that on average the investors analyzed worsen the returns that they achieve by 1.56% yearly with their timing decisions. To reach this conclusion, they compute for each of the funds in the sample the *performance gap*, that is, the difference between the geometric monthly return achieved by the fund and the dollar-weighted monthly return. Thus, if this performance gap is positive, then the investors are worsening

their financial results with their timing decisions. Conversely, if this performance gap is negative, the investors are improving their financial results with their timing decisions.

The geometric monthly return represents the return that an investor could achieve with a passive investment strategy, that is, a strategy consisting of investing in the mutual fund and holding his/her investment throughout its life. This result would be the same as the return obtained by the mutual fund manager. However, Friesen and Sapp (2007) and Dichev and Yu (2011) point out that the monthly geometric return is a poor proxy for the actual return obtained by the average investor, since it does not take into account the effect of fund flows. In the computation of the geometric monthly return, all the returns considered have the same weight; meanwhile, the computation of the dollar-weighted monthly return takes into account the fact that the fund flows through the mutual fund's life have an influence on the weight of the returns in each period considered. Thus, as pointed out by Dichev and Yu (2011), the dollar-weighted return would be a better representation of the actual return that an average investor obtains from investing in the mutual fund after its inception date and changing the amount of capital invested in the fund over time with his or her investment and withdrawal decisions. On the other hand, the geometric monthly return would represent the return achieved by a less realistic investor who joins the fund on its inception date and maintains the amount of money invested in the fund unchanged throughout the entire time period considered.

The dollar-weighted return in this way represents the return weighted by the amount of money invested at each moment, and it can be computed as the return rate that makes the value of the initial total net assets of the mutual fund plus the accumulated value of the fund flows equal to the value of the total net assets of the mutual fund at the end of the period considered. Dichev and Yu (2011) provide a very intuitive view of this return; that is, the investment in the mutual fund could be considered as an investment project in

which the initial total net assets and subsequent contributions would be the inflows, whereas the end total net assets and the subsequent redemptions would be the outflows. Accordingly, by computing the internal rate of return of the project, we would obtain the return achieved by an average investor in the fund. Thus, as pointed out by Dichev and Yu (2011), the dollar-weighted return would reflect 'the actual experience of real-life investors, who consciously or unconsciously time their capital flows into and out of the funds, and thus, their actual realized return can differ substantially from that of the fund' (Dichev and Yu, 2011, p. 251).

We provide this methodological explanation since it is the methodology used in all the papers quoted at the beginning of this section. This methodology, which we will develop in the next sections and have already referred to in the introduction, leads to biased results of mutual fund investors' timing skills (the hindsight effect pointed out by Hayley, 2014). Next, we will comment on the main findings of all these papers, which constitute the antecedents of our research.

Continuing with the results achieved by Friesen and Sapp (2007), we have already indicated that they obtain empirical evidence of negative timing skills for their sample of mutual fund investors. Another interesting result obtained by these authors is that investors in passive mutual funds (index funds) show better timing skills than investors in active management mutual funds (for both samples the timing skills are negative, but they are less negative for investors in index funds). Friesen and Sapp (2007) also control their results for several mutual fund characteristics, such as the age, size, level of expenses, turnover ratio, size of fund flows, volatility or financial performance of the fund. The results attained indicate that the negative results of timing skills increase with the load fees, the turnover ratio and the number of observations of returns considered in the analysis. This empirical evidence could be interpreted as showing that investors in older

and more expensive funds make worse timing decisions. In addition, poor timing skills increase with the volatility and risk-adjusted financial performance of mutual funds.

Another interesting analysis implemented by Friesen and Sapp (2007) consists of studying the investment and redemption decisions separately to test whether investors make wrong decisions when choosing the time to invest in the fund, the time to disinvest from the fund or both cases. They compute the dollar-weighted returns separately for net positive cash flows (a proxy for investment decisions) and for net negative cash flows (a proxy for withdrawal decisions). For investment decisions a good result occurs if mutual fund investors put their money into the fund before the fund achieves a good return; that is, the dollar-weighted return on net positive cash flows should be higher than the geometric monthly return. On the other hand, from the point of view of withdrawal decisions, an investor will show good timing skills if he/she disinvests from the fund before a bad return period. Thus, good timing skills will occur if the dollar-weighted return on net negative cash flows is lower than the geometric monthly return. The results achieved by Friesen and Sapp (2007) show that both decisions (investments and redemptions) contribute in the same way to poor timing skills. However, withdrawal decisions are more salient for that evidence of bad timing than investment decisions.

The explanation provided by these authors for their results is related to the existence of return-chasing behavior on the part of mutual fund investors, that is, behavior consisting of investing in funds that have achieved a previous high return and in disinvesting from funds with a low previous return. In this framework the poor timing skills of mutual fund investors would be the result of a combination of a fund's weak return persistence and poor skills in modifying their exposure to the fund at the proper time. If mutual fund investors put their money into funds that have achieved a high return above the mean and disinvest from funds that have achieved a low return below the mean, they lose in average

terms, due to the tendency of fund returns to converge to the mean. As Friesen and Sapp (2007) explain, although there is a certain fund return persistence, the investors could show overconfidence in their skills to exploit this persistence, and, if they are not able to invest in and disinvest from the fund at the appropriate time, they could worsen the financial results that they would achieve with their timing decisions.

Dichev and Yu (2011) follow the same methodological approach as Friesen and Sapp (2007), but in this case they analyze a sample of hedge fund investors. The results achieved show that in average terms the timing decisions of investors worsen their returns between 3% and 7% annually. Another interesting result presented in this article shows that investors in hedge funds with more restrictions on redemptions (hedge funds that establish a minimum time of tenure or allow redemptions less frequently) show better timing results than investors in hedge funds with fewer restrictions. Thus, imposing restrictions on investors with regard to their capacity to withdraw their investment improves their financial result. These authors also conclude that the poor timing skills of investors originate from their return-chasing behavior.

Two additional works that investigate the same issue using the same methodology are those by Chieh-Tse Hou (2012), who analyzes a sample of equity mutual funds from Taiwan, achieving similar results to those obtained by Friesen and Sapp (2007), and Navone and Pagani (2015), who compare the results for load funds with those for no-load funds. The scope of Navone and Pagani's (2015) paper is wider, and it analyzes the impact of these loads on fund flows. As an additional analysis, the authors study the cash flow timing skills of the investors in their sample. The results achieved show that in general terms the investors in the funds analyzed show negative timing skills (a result similar to that obtained by Friesen and Sapp, 2007). Navone and Pagani (2015) carry out several interesting controls of their results. Thus, they show that bigger and older fund

investors demonstrate better timing skills. This result is interpreted as investors with more information making better timing decisions (age and size are considered as proxies for the level of information available for a mutual fund). Another interesting result indicates that load funds attract investors with worse timing skills than no-load funds. The literature shows that no-load funds attract more sophisticated investors than load funds, which suggests that sophisticated investors and investors with more information make better timing decisions than the average investor.

Muñoz (2016) analyzes the cash flow timing skills of a sample of socially responsible (SR) mutual fund investors. The analysis of the specific case of SR mutual fund investors is interesting due to the differences between these investors and conventional mutual fund investors. As we have pointed out previously, papers in the literature consider that the cash flow timing skills of investors and the relationship between fund flows and past financial performance are related (return-chasing behavior). However, the fund flows–past financial performance relationship is different for SR mutual fund investors; thus, we could also expect the cash flow timing skills of these investors to differ. Besides, there are two segments of SR mutual fund investors. One of them is formed by the investors for whom personal values are the main driver of their investment decisions (value-driven investors). These investors are less sensitive to past financial performance when making their investment decisions (that is, these investors do not, or perhaps to a lesser degree, show return-chasing behavior). The other segment consists of investors for whom the SRI is a strategy to achieve a good financial result, and they engage in behavior that is more similar to conventional mutual fund investors with regard to the fund flows–past financial performance relationship (profit-seeking investors).

Muñoz (2016) analyzes a sample of SR domestic equity mutual funds in the US market during the period January 1991 to May 2015, and he controls for the type of SR mutual

fund investor (value-driven investors who are approached by investors in religious mutual funds and profit-seeking investors who are approached by investors in green funds). He further controls for the level of information and level of sophistication of the investors and analyzes the results for purchase and withdrawal decisions separately.

The results when all the SR mutual funds are analyzed together, without controlling for the SR strategy, show that investors neither improve nor worsen their financial results with their timing decisions (a result that is better than that obtained for conventional mutual fund investors in the prior literature). When controlling the results for the SR strategy, each of the subsamples shows a different result. Green fund investors demonstrate poor timing skills (the same result as that obtained for conventional mutual fund investors in prior articles). Religious mutual fund investors and ESG (environmental, social and governance) mutual fund investors obtain non-significant results, but the former show positive timing. That is, according to the SR strategy implemented by the fund, it caters for investors with different characteristics. Investors in green funds show behavior similar to conventional mutual fund investors, and investors in religious funds demonstrate the most different behavior from conventional mutual fund investors.

Another interesting result in this paper is that SR mutual fund investors make good timing decisions with regard to net purchases but wrong decisions concerning net withdrawals. That is, the better result that is obtained for SR mutual fund investors in relation to their conventional peers has its origin in the positive skill of SR investors to choose the time at which to invest in the funds. When controlling for the SR strategy, these results are observed in all the subsamples, but in green funds purchasing decisions neither improve nor worsen the returns that green investors obtain, and the withdrawal decisions made by these investors are the most harmful of all the subsamples.

When controlling for the level of information available for the fund, it is observed that funds for which more information is available (bigger funds with longer manager tenure) cater for more sophisticated investors. Lastly, to approach the level of sophistication of investors, the author controls his results for the net expense ratio, fee level of the fund, turnover ratio and the character of institutional/non-institutional funds and load/no-load funds. The results obtained show that more sophisticated investors have better timing skills than less sophisticated investors (more sophisticated investors being those who invest in funds with a lower net expense ratio, a lower level of fees, no-load funds, institutional funds and funds with a lower turnover ratio). When controlling these results for the SR strategy, it is observed that the empirical evidence obtained at the aggregate level (without controlling for the SR strategy) is mainly related to green and ESG mutual funds, whereas religious mutual funds show mixed evidence for all these controls. That is, green and ESG funds' results are more similar to those obtained for conventional mutual funds, and religious mutual funds (the proxy for value-driven investors) account for the results that are the most different from those of conventional funds.

As we have pointed out in the introduction and throughout this section, all the previous papers discussed provide us with valuable empirical evidence about the cash flow timing skills of mutual fund investors. However, all these studies implement the same methodology, a methodology that, as Hayley (2014) demonstrates, biases the actual mutual fund investors' timing skills downward. In the next section we explain the bias identified by Hayley (2014) and his method of controlling for it.

3. Research hypotheses, the hindsight effect and Hayley's method of controlling for it

Our main research hypothesis is that the poor timing skills of mutual fund investors found previously in the literature are not that bad in reality. We think that part of this negative

empirical evidence is due not to poor timing skills but to a bias inherent to the methodology used in these studies (the hindsight effect pointed out by Hayley, 2014).

Dichev's (2007) paper is one of the most relevant concerning dollar-weighted returns. This author highlights the necessity of distinguishing the stock return from the return that the investor in the stock obtains (the dollar-weighted return weights the different observations of the return through the time sample considered by the exposure of the investor to these returns). Dichev (2007) explains that we can expect differences between the geometric monthly return and the dollar-weighted return if the time at which the fund flows[1] occur is correlated with the past returns or with the future returns. Using data from the NYSE/AMEX and NASDAQ indices, Dichev computes the Pearson correlation coefficient between the distributions of a period and the past and future returns (he uses a window of three years in two ways). The results achieved for the two indices show a negative correlation between the distributions and the past returns and a positive correlation between the distributions and the future returns. As Dichev (2007) points out, these results indicate that inflows of money occur after high past returns and before future low returns, and the contrary applies to money withdrawals. In this framework the dollar-weighted monthly return can be expected to be lower than the geometric monthly return, thus showing a positive performance gap that would represent negative timing skills of stock investors.

The results reported by Dichev represent return-chasing behavior (in this case in the stock market), the same reason that later articles about the cash flow timing skills of mutual fund investors use to explain the poor results achieved (as we have pointed out in the previous section). It is remarkable that, although the work of Dichev (2007) had an impact

[1] Dichev uses the term distribution to refer to the withdrawal of money from the stock market, a negative distribution thus being an investment flow in this market.

on the literature, we can also find works that question the robustness of his results, such as that by Keswani and Stolin (2008b), who show the dependence on the time sample considered of the results achieved following Dichev's approach. However, the articles that adopt this methodology use it to establish controls for the temporal period considered.

Hayley (2014) explains that Dichev (2007) considers both correlations (the correlation between past returns and distributions and the correlation between future returns and distributions) to indicate good or bad timing of investors (according to their sign). However, Hayley considers that, whereas the correlation between distributions and future returns clearly represents timing, the correlation between distributions and past returns represents something different, due to this correlation modifying the computation of the dollar-weighted return retrospectively, indicating a hindsight effect that does not exert an impact on investors' wealth and thus not referring to timing.

Hayley (2014) explains that the correlation between distributions and future returns would modify the size of the investment in the fund before the returns occur. Thus, the change in the weight of these returns in the dollar-weighted return computation would reflect a change in the investor's exposure to these returns. However, the correlation between past returns and distributions does not affect the size of the investment until after these returns have occurred. Thus, the relative weight of these returns in the dollar-weighted return computation changes retrospectively. Hayley (2014), in his original article, provides several very intuitive examples that offer a better understanding of this effect.

Taking into account Hayley's reasoning explained above and considering the empirical evidence that indicates that mutual fund investors' poor timing skills are due to return-chasing behavior, we can expect these results to reflect not only true bad cash flow timing skills but also the hindsight effect described by Hayley (2014).

Our research hypotheses are, therefore, the following:

H1: In general terms mutual fund investors' actual timing skills are better than the empirical evidence in the prior literature indicates.

H2: The results previously obtained in the literature are biased to different degrees according to the mutual fund investors' characteristics. The results of investors who do not show return-chasing behavior or show this behavior but to a lesser extent are less biased downward by the hindsight effect.

To test these hypotheses, we will analyze a sample of US equity mutual funds in the period January 1990–January 2016. For each mutual fund in the sample, we will compute the geometric monthly return and the dollar-weighted monthly return to determine the results with the methodology previously used in the literature. Then we will compute the hindsight effect for each of the funds to identify the part of the previous result that is due not to timing but to the effect pointed out by Hayley (2014). Furthermore, we will analyze all these issues controlling for different fund characteristics that could be relevant, for example the level of information of the investors when making their investment decisions and the level of sophistication of the investors.

To control for the hindsight effect, we will use the method proposed by Hayley (2014). Although some recent works criticize this methodology, such as the paper by Johnston et al. (2015), which considers that, in some extreme cases, Hayley's method does not appropriately reflect mutual fund investors' actual timing skills, they do not propose an alternative method to control for the hindsight effect. Thus, we consider it of interest to test the methodology proposed by Hayley with a sample of mutual fund investors, as far as we know for the first time.

As Hayley (2014) explains, when in period m there is a money withdrawal, which affects simultaneously both the weights of past returns and the weights of future returns (overweighting past returns and underweighting future returns), it seems that the two effects are necessarily linked.

However, Hayley proposes a method that allows us to isolate the two effects. This method consists of analyzing the effect of each of the fund flows that occur in the time period considered under the premise that all subsequent returns to the fund flow are constant and equal to the geometric monthly return. As Hayley explains, under this premise a fund flow cannot be either correctly timed or wrongly timed; thus, the change in the dollar-weighted return after the consideration of this fund flow will be generated fully for the hindsight effect. By conducting this analysis for each of the fund flows and adding the effect that each of the fund flows has on the dollar-weighted returns, we can identify the part of the difference between the geometric monthly return and the dollar-weighted return that is due to the hindsight effect.

More specifically, for each fund it will be necessary to undertake the following. First, the geometric monthly return will be computed for the time sample analyzed (in our case this time sample spans from the inception date of the fund to the last date for which we have information for the fund). Next, it is necessary to make the premises that the return in each of the periods is equal to the geometric monthly return and that the fund flows are equal to zero. Under these premises, at the first moment, the geometric monthly return and the dollar-weighted return are equal. Then, for each of the observations in the historical data series available for the fund, it is necessary to implement two steps. The first step is to substitute in the historical return series the first observation for its actual value and then recompute the dollar-weighted return after this change. The second step involves substituting in the historical fund flows series the zero for its actual value and again

recomputing the dollar-weighted return after this change. This two-step sequence will be implemented for each of the observations up to the end of the historical data series. After the completion of this procedure, the dollar-weighted return will converge to its actual value. Thus, as Hayley (2014) points out, the aggregate effect of including each of the values of the fund flows (that is, the sum of all the changes that the dollar-weighted return undergoes), would represent the total effect of the relationship between the fund flows and the past returns (that is, the hindsight effect). On the other hand, the aggregate effect when including each of the return data (that is, the sum of all the changes experienced by the dollar-weighted returns) would reflect the total effect of the relationship between the returns and the previous fund flows (that is, the timing skills of the mutual fund investors). The sum of these two effects would be the performance gap (the difference between the geometric monthly return and the dollar-weighted return).

Taking into account Hayley's reasoning, the necessity of decomposing the performance gap into the two components described above to detect the actual timing skills of mutual funds' investors is appreciable.

4. Data and methods

We analyze a sample of US domestic equity mutual funds in the period January 1990–January 2016. The data are obtained from the Morningstar database. Following the literature, we exclude from the sample the funds with fewer than 24 monthly observations. To determine whether our results are robust to the potential outliers in the performance measure, we eliminate the observations of the performance gap at the ninety-ninth and first percentiles, following authors such as Yuan et al. (2008).

These considerations lead to a sample formed by 6056 domestic equity mutual funds for which we obtain information about the monthly net return, the monthly total net assets

and additional information such as the inception date, the turnover ratio, the net expense ratio, the investment style allocated by Morningstar, the manager tenure, the income ratio, the character of a load or no-load fund and the character of an institutional or non-institutional fund.

Table 1 reports the main descriptive statistics of our mutual fund sample. It displays the mean, median, twenty-fifth percentile, seventy-fifth percentile and standard deviation of the total net assets, age, mean manager tenure, turnover ratio, net expense ratio and net income ratio.

Insert Table 1

The average total net assets for all the funds is around $494 million, the mean age is 13.59 years, the average mean manager tenure is 7.18 years and the mean turnover ratio is 78.75%. The average net expense ratio is 1.24%, and the average net income ratio 0.40%.

To study how the different fund characteristics influence the results, for some of these characteristics we implement a quartile analysis, the first quartile (Q1) containing the funds with the lowest values for the item considered and the other one (Q4) containing the funds with the highest values for the item. Table 2 reports the descriptive statistics for the fund characteristics. It provides the number of funds, mean, median, twenty-fifth percentile, seventy-fifth percentile and standard deviation of the different characteristics of the funds for which we control our results, distinguishing between Q1 and Q4 for each item.

Insert Table 2

The average net expense ratio for the funds with the lowest values (Q1) is 0.62%, and for the funds with the highest values (Q4) it is 1.962%. The mean net income ratios are -0.803% Q1 and 1.691% (Q4). The mean turnover ratios are 22.908% (Q1) and 160.977%

(Q4). The mean manager tenures are 2.330 years for the first quintile and 13.562 years for the fourth quartile. The average ages are 4.965 years and 24.606 for each quartile, respectively. Finally, the average sizes are $4.122 million (Q1) and $1783.083 million (Q4).

The methodology that we adopt as a reference is used by authors such as Friesen and Sapp (2007), Dichev and Yu (2011), Navone and Pagani (2015) and Muñoz (2016). For each fund we compute the geometric monthly mean return, the dollar-weighted mean return and the performance gap as the difference between them. Additionally, we determine the hindsight effect for each fund and the corrected timing, as Hayley (2014) suggests.

Geometric returns are appropriate for measuring past fund manager performance and the average return on a dollar invested during the entire sample period.

The geometric average monthly return for a fund is calculated as:

$$r_G = \left(\prod_{t=1}^{T}\left(1 + r_{i,t}\right)\right)^{1/T} - 1$$

where $r_{i,t}$ is the monthly return achieved by fund i in month t.

However, the average return earned by fund investors is measured by the dollar-weighted average return. The dollar-weighted average return for a fund is calculated as:

$$r_{DW}: TNA_{i,t} \times (1 + r_{i,dw})^{-T} = TNA_{i,0} + \sum_{t=1}^{T} NFC_{i,t} \times (1 + r_{i,dw})^{-t}$$

where $NCF_{i,t} = TNA_{i,t} + TNA_{i,t-1} \times (1 + r_{i,t})$, $TNA_{i,t}$ is the total net assets of fund i in period t and $r_{i,t}$ is the monthly return of fund i in period t.

We follow Friesen and Sapp (2007)[2] and define the measure of investor timing for a fund (the performance gap) as the difference between the dollar-weighted return and the geometric fund return:

$$PG = r_{DW} - r_G$$

Finally, we control each fund for the hindsight effect proposed by Hayley (2014) and calculate the corrected timing after controlling for this effect, which was explained in the previous section.

5. Empirical results

5.1. Cash flow timing skills of US domestic equity mutual fund investors

First we analyze the timing abilities of all the mutual fund investors in the sample of US domestic equity mutual funds considered. In Table 3 we can observe the mean, median, twenty-fifth percentile, seventy-fifth percentile and standard deviation for the dollar-weighted monthly return (DW), the geometric monthly return (GM), the gap (computed as the difference between the dollar-weighted return and the geometric monthly return), the hindsight effect (HE) described by Hayley (2014) and the corrected timing measure after controlling for this effect. We compute all these measures for each of the mutual funds in our sample over the entire period.

Insert Table 3

[2] Friesen and Sapp (2007) really define the performance gap as the difference between the GM and the DW, a negative value being indicative of a good timing skill. We define the performance gap as the difference between the DW and the GM, with a negative value being a signal of poor timing. We consider this way of presenting the results to be more intuitive.

We can observe that in average terms the dollar-weighted return is lower than the geometric monthly return. This result means that on average the investors in our sample worsen the returns that they achieve with their timing decisions. More specifically, the poor timing skills of investors reduce the returns that they achieve by 0.149% monthly (1.8% annually). This is a similar result to that achieved by Friesen and Sapp (2007) (1.56% annually). However, this result is biased by the hindsight effect pointed out by Hayley (2014). After controlling for the hindsight effect, we can see that investors reduce the returns that they achieve by 0.059% monthly, that is, by 0.71% annually. Accordingly we can reach two conclusions:

i) Mutual fund investors show poor timing skills, since they worsen the returns that they achieve with their cash flow timing decisions.

ii) After controlling for the HE, the timing skills of mutual fund investors are not as bad as the prior literature indicates.

We thus show the relevance of controlling for the HE to determine the actual magnitude of investors' cash flow timing skills.

In Table 4 we provide the results for this analysis but control for the investment styles of the mutual funds. We analyze the cases of investors in index funds and in funds within the following investment style categories: large cap blend, large cap growth, large cap value, mid cap blend, mid cap growth, mid cap value, small cap blend, small cap growth and small cap value. For all the groups considered, we observe empirical evidence in the same way. That is, for all the subsamples, the timing skills before controlling for the HE are poor but improve after controlling for the HE. Accordingly, we can conclude that controlling for the HE is relevant for investors in funds with different investment styles.

Insert Table 4

The best results are obtained for index funds with a gap before controlling for the HE of -0.071% monthly (-0.86% annually) and with a corrected timing measure after controlling for the HE of -0.036% monthly (-0.43% annually). The worst results are found for investors in mid cap value funds with a gap before controlling for the HE of -0.207% monthly (-2.51% annually) and a corrected timing measure after controlling for the HE of -0.094% monthly (-1.13% annually). The rest of the fund samples obtain results between those of the index funds and the mid cap value funds.

5.2. Results controlling for the level of information and sophistication of investors

The literature about investor timing skills shows the relevance of controlling for mutual fund characteristics (Friesen and Sapp, 2007; Dichev and Yu, 2011; Navone and Pagani, 2015; Muñoz, 2016, among others). These controls are necessary, since certain mutual fund characteristics are related to the level of investor sophistication or the level of information available to investors when making investment decisions. Consequently, it is reasonable to expect that an investor with a higher level of information or a more sophisticated investor will make better timing decisions.

The fund size, age, level of fees, institutional/non-institutional character and turnover ratio, among other things, are identified in the literature as proxies for the level of sophistication of investors or for the level of information available to them[3]; however, none of these studies controls the timing results for the HE.

[3] However, there are other proxies for financial sophistication that are used in the literature: income and wealth (Barber and Odean, 2000; Vissing-Joergensen, 2003; Dhar and Zhu, 2006; Calvet et al., 2007, 2009; Li et al., 2015; Barber et al., 2016), portfolio diversification (Grinblatt and Keloharju, 2001; Clavet et al., 2007; Goetzman and Kumar, 2008), prior investment experience (Goetzman and Kumar, 2008; Nicolosi et al., 2009; Seru et al., 2010), educational attainment (Calvet et al., 2007, 2009; Christiansen et al., 2008), investment in more complex financial instruments (Genesove and Mayer, 2001; Goetzmann and Kumar, 2008), IQ (Grinblatt

Besides, these controls are interesting, since we can expect the HE to be more relevant to uninformed or unsophisticated investors, who are more likely to show return-chasing behavior. Return-chasing behavior supposes a positive correlation between past returns and fund flows (the source of the HE, as we have explained in prior sections).

5.3. Size and age mutual fund characteristics: Level of information of the investor when making his/her investment decisions

The literature considers that mutual funds' size and age characteristics can affect investors' timing ability. Navone and Pagani (2015) find that older and larger funds cater for investors with better cash flow timing skills. They explain that investors in these funds have more information when making their investment decisions and thus can make better cash flow timing decisions. Friesen and Sapp (2007) find the opposite, however: older funds are associated with an investor clientele that is especially poor in cash flow timing. We control our results for both characteristics by forming subsamples of mutual funds ordered according to these characteristics. In this way we analyze the cash flow timing skills of mutual fund investors in the first and fourth quartiles of the mutual funds according to their size (small and large mutual funds, respectively). We are more exigent and implement this analysis again but for the mutual funds in the first and tenth deciles. The results are reported in Table 5.

Insert Table 5

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et al., 2011, 2012), broker-sold funds (Del Guercio and Reuter, 2013), the level of trading (Brown et al., 2003; Ben Rephael et al., 2012), the disposition effect (Dhar and Zhu, 2006), the level of market participation (Mankiw and Zeldes, 1991; Haliassos and Bertaut, 1995; Vissing-Joergensen, 2003; Christiansen et al., 2008; Grinblatt et al., 2011), the level of performance (Seru et al., 2010; Grinblatt et al., 2012) or reduced behavioral biases (Feng and Seasholes, 2005; Calvet et al., 2009).

In panel A we can observe the results for the first and fourth quartiles. The results indicate that, before controlling for the HE, small fund investors show worse timing skills than large fund investors (the first investors reduce their returns with their timing decisions by 0.198% monthly (2.4% annually) vs 0.101% monthly (1.22% annually) in the case of investors in large funds). After controlling for the HE, the difference between the two groups of investors is maintained (a corrected timing measure of -0.116% monthly (-1.4% annually) for investors in small funds vs -0.014% monthly (-0.17% annually) for investors in large funds). This empirical evidence is consistent with the results of Navone and Pagani (2015), who indicate that investors in large funds have more information and make better timing decisions. However, the HE has a similar magnitude for both groups of investors, reaching a figure of around 0.08% monthly (1% annually). In this way the HE has similar relevance to investors in large and small funds. This result could indicate that, although mutual fund investors in large funds make better cash flow timing decisions than investors in small funds, they also present return-chasing behavior that biases their timing results downward significantly. In panel B we show the results gained when we build deciles instead of quartiles. The empirical evidence obtained from deciles is consistent with the results obtained from quartiles.

Table 6 shows the results when we control for age. Age is computed by comparing the inception date of the fund with the date of the last observation for this fund. We measure this difference in years. We conduct quartile (panel A) and decile (panel B) analyses.

Insert Table 6

From the quartile analyses, the results before controlling for the HE indicate that investors in young funds (Q1) show worse timing skills than investors in old funds (Q4) (investors in young funds worsen the return that they achieve with their cash flow timing decisions

by 0.329% monthly (4.01% annually), while investors in old funds worsen the return that they achieve by 0.156% monthly (1.89% annually)). After controlling for the HE, investors in young funds reduce the return that they achieve with their timing decisions by 0.175% monthly (2.12% annually), while investors in old funds only harm their returns by 0.021% monthly (0.25% annually). The HE has a greater magnitude in the case of young fund investors than in the case of old fund investors (although the difference is small). However, this difference is clearer when we control for deciles. Consequently, it seems that it is more relevant to control for the HE for investors in young funds than for investors in old funds.

In short, investors in large funds and in older funds make better timing decisions before and after controlling for the HE. The HE has a similar magnitude for investors in large and small funds, but it is greater for investors in young funds than investors in old funds.

5.4. Net expense ratio, net income ratio, turnover ratio, load/no-load funds and institutional/non-institutional investors: level of sophistication of investors

The literature shows the relevance of controlling for the sophistication level of investors when analyzing their cash flow timing skills. There are several proxies for implementing this control, as explained before (see footnote 2). The most frequent is to control for the level of expenses in the fund and for the institutional/non-institutional characteristic. It is observed that the cheapest funds cater for the most sophisticated investors, as documented by Houge and Wellman (2007), Zhao (2008), Bergstresser et al. (2009) and Navone and Pagani (2015). We thus use the net expense ratio and the load/no-load characteristic of the fund as proxies. Institutional investors should also benefit from better information and more sophisticated assessment techniques, as documented by Del Guercio and Tkac (2002), Keswani and Stolin (2008a), Evans and Fahlenbrach (2012) and Sialm et al.

(2015). Chalmers et al. (2013) also emphasize that funds with a lower turnover ratio cater for more sophisticated investors. We also use these two features as proxies for sophistication. Additionally, we consider the net income ratio as a proxy for investor sophistication. It is defined as the percentage of current income earned per share. This ratio is computed by dividing the net investment income of a fund by its average net assets (the net investment income is the total income of the funds less expenses). In this way the ratio could adopt a negative value if the fund expenses are higher than the incomes; therefore, this could be a good proxy for investor sophistication, as it is expected that funds with the highest net income ratio cater for the most sophisticated investors.

In Table 7 we show the results when controlling for the net expense ratio.

Insert Table 7

We build quartiles (panel A) and deciles (panel B) according to the net expense ratio of funds. Q1/D1 contains the funds with the lowest mean net expense ratio (most sophisticated investors) and Q4/D10 contains the funds with the highest mean net expense ratio (less sophisticated investors).

From the quartile results, before controlling for the HE, we can observe that investors in funds with the lowest net expense ratio show better timing results than investors in funds with the highest net expense ratios (a gap of -0.108% monthly (-1.31% annually) for the first group vs -0.190% monthly (-2.3% annually) in the case of the second group). Controlling for the HE, we can observe that this effect is more relevant to investors in the funds with the highest net expense ratios. In fact, after controlling for the HE, it is apparent that the poor timing is similar for both groups of investors (net timing of around -0.06% monthly). This result could indicate that return-chasing behavior is more relevant in the case of investors in mutual funds with high net expense ratios. However, at the

same time, we can observe that, after controlling for the HE, the corrected timing measure is very similar for the two groups of investors. From the decile analyses, we can observe similar empirical evidence.

Table 8 presents the results when controlling for the net income ratio.

Insert Table 8

We form quartiles (panel A) and deciles (panel B) according to the net income ratio of the funds. Q1/D1 contains the funds with the lowest mean net income ratio (less sophisticated investors) and Q4/D10 contains the funds with the highest mean net income ratio (more sophisticated investors).

The results obtained are consistent with our hypotheses. Before controlling for the HE, we can observe that investors in the funds with the lowest income ratio show worse timing skills than investors in the funds with the highest mean income ratio (a gap of -0.183% monthly (-2.21% annually) for the first group vs a gap of -0102% monthly (-1.23% annually) for the second group). After controlling for the HE, we can observe that the HE is most relevant to the investors in the funds with the lowest income ratio and that the corrected timing measure is better for more sophisticated investors (-0.046% vs -0.060% monthly (-0.55% vs -0.72% annually) for the investors in the funds with the lowest net income ratio). This empirical evidence is clearer when analyzing the results from the decile analysis.

In Table 9 we report the results when controlling for the turnover ratio.

Insert Table 9

We build quartiles (panel A) and deciles (panel B) according to the turnover ratio. Q1/D1 contains the funds with the lowest turnover ratio (more sophisticated investors) and Q4/D10 contains the funds with the highest turnover ratio (less sophisticated investors).

From the quartile analyses, we can observe that, before controlling for the HE, investors in funds with the lowest turnover ratio show better timing results than investors in funds with the highest turnover ratio (a gap of -0.126% monthly (-1.52% annually) for the first group vs a gap of -0.165% monthly (-2.00% annually) for the second group). The HE has a greater magnitude in the case of investors in funds with the highest turnover ratio, and, after controlling for that, the results of timing of the two groups of investors converge (albeit still being slightly better for investors in funds with the lowest turnover ratio than for investors in funds with the highest turnover ratio). In the decile analyses, these results are clearer.

In Table 10 we show the results of our analyses when controlling for institutional/non-institutional investors and for load/no-load funds.

Insert Table 10

Panel A shows the results for institutional and non-institutional fund investors. Before controlling for the HE, we can observe that institutional fund investors show better timing skills than non-institutional investors, although this difference is small. More specifically, institutional fund investors show a gap of -0.137% monthly (-1.66% annually) and non-institutional fund investors show a gap of -0.152% monthly (-1.84% annually). After controlling for the HE, we can observe that the HE is more important in the case of non-institutional investors, as we would expect. However, the corrected timing measure is better for non-institutional fund investors than for institutional fund investors. Although this last result may seem surprising, the explanation could be that both categories,

institutional and non-institutional funds, are particularly broad categories of funds comprising very different kinds of funds. In fact, James and Karceski (2006), when analyzing the smart-money phenomenon and controlling for institutional/non-institutional investors, conclude that 'although institutional funds might be a natural place to look for "smart-money", agency costs associated with delegated monitoring may lead to less monitoring and worse overall performance,' and they highlight the relevance of splitting institutional investors according to the degree of investor oversight.

Panel B shows the results for load and no-load fund investors. Before controlling for the HE, we can observe that load fund investors show worse timing skills than no-load fund investors (the first group shows a gap of -0.175% monthly (-2.12% annually) and the second group shows a gap of -0.125% monthly (-1.50% annually)). The HE has a greater magnitude for load fund investors, as we would expect, and, after controlling for it, the timing skills of both groups of investors improve, continuing to be better for no-load fund investors than for load fund investors (a corrected timing measure of -0.046% monthly (-0.55% annually) in the first case vs a corrected timing measure of -0.063% monthly (-0.75% annually) for the second group of investors).

Finally, we control the results for the gap achieved before controlling for the HE (Table 11). We build quartiles (panel A) and deciles (panel B) according to the gap. Q1/D1 contains the funds with the worse gap (representing the investors with the worst timing results before controlling for the HE), and Q4/D10 contains the funds with the best gap (representing the investors with the best timing results before controlling for the HE).

Insert Table 11

From the quartile analyses, we can observe that the HE is more relevant to funds that show a poor gap (the traditional measure of timing) than for funds that show a good gap.

In fact, for the second group, the timing skills of investors are not downward biased for the HE but the reverse, that is, upward biased. After controlling for the HE, the first group of investors improves its timing skills, while the second group worsens the before-control results. Accordingly, we can conclude that the HE biases the results of timing skills downward when the traditional measure of timing finds a negative timing skill. From the decile analysis, we can extract the same conclusions.

6. Conclusions

We analyze for the first time, as far as we know, the cash flow timing skills of mutual fund investors controlling for the hindsight effect described by Hayley (2014) for stock investors. Previous papers in the literature that analyze cash flow timing skills for mutual fund investors use as a methodology the difference between the dollar-weighted return and the geometric mean return of funds. However, these results could be biased downward by the HE, as Hayley (2014) demonstrates and as we have explained in previous sections. We compute, for each fund in our sample (more than 6000 in a sample of US domestic equity mutual funds in the period from January 1990 to January 2016), the dollar-weighted monthly return, the geometric monthly return, the traditional measure of mutual fund investor timing skills (the gap between DW and GM returns), the part of this gap that corresponds to the HE (implementing the methodology proposed by Hayley, 2014) and the corrected timing measure. Besides, we control our results for several proxies for the level of sophistication and information of investors when making their investment decisions.

When we analyze the results for all the mutual funds in our sample considered together, we can observe that in average terms investors in US equity mutual funds show negative timing skills that reduce the returns that they achieve by 1.80% annually before

controlling for the HE. After controlling for the HE, the actual timing skills are not as bad, and in fact the investors reduce the returns that they achieve by 0.71% annually. We control these results for different investment styles. More specifically, we show these analyses for index funds and for funds with one of the following investment styles: large cap blend, large cap growth, large cap value, mid cap blend, mid cap growth, mid cap value, small cap blend, small cap growth and small cap value. For all the categories, the results indicate the same phenomenon, that is, a negative timing skill that is less negative after controlling for the HE. The magnitudes range between the results for the funds with the mid cap value style, which are the group with the worst timing skills (a gap before controlling for the HE of -0.207% monthly (-2.51% annually) and a corrected timing measure after controlling for the HE of -0.094% monthly (-1.13% annually)) and the results of index funds, which form the group with the better timing skill results (with a gap before controlling for the HE of -0.071% monthly (-0.86% annually) and a corrected timing measure after controlling for the HE of -0.036% monthly (-0.43% annually)).

When controlling our results for size and age, proxies used previously in the literature as the level of information available for the fund when investors make their cash flow timing decisions, the empirical evidence obtained shows that investors in the bigger and older funds show better timing skills than investors in the smaller and younger funds. These results occur before and after controlling for the HE. Besides, the magnitude of the HE is larger for young fund investors than for old fund investors (in the case of the size control, the magnitude of the HE is similar for large and small fund investors).

To analyze the influence of investors' sophistication on our results, we control our analyses for the net expense ratio, net income ratio and turnover ratio. Furthermore, we analyze the cash flow timing skills of institutional vs non-institutional investors and of load fund vs no-load fund investors. In general terms (with some exceptions explained in

the results section), we find that more sophisticated investors show better timing results than less sophisticated investors and that the HE has a larger magnitude in the case of less sophisticated investors. We also observe that the HE biases downward the timing skills of investors when poor traditional timing skills are found but that it biases upward the empirical evidence of mutual fund investors who show good traditional timing skills.

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Table 1. Summary statistics for the entire sample

	Mean	Median	25th percentile	75th percentile	Standard deviation
Total net assets ($ millions)	493.81	67.48	11.97	305.51	2099.81
Age (years)	13.59	12.36	7.52	17.41	9.19
Mean manager tenure (years)	7.18	6.17	3.75	9.75	4.68
Turnover (%/year)	78.75	64.92	37.78	96.67	76.69
Net expense ratio (%/year)	1.24	1.18	0.89	1.52	0.54
Net income ratio (%/year)	0.40	0.35	-0.26	1.04	1.01

Table 1 reports summary statistics for the mutual fund sample obtained from the Morningstar database. The sample comprises all the funds with a domestic equity investment aim domiciled in the US market in the period from January 1990 to January 2016. The table reports information for the total net assets, age, mean manager tenure, turnover ratio, net expense ratio and net income ratio.

Table 2. Descriptive statistics for the quartiles (Q1 and Q4)

	Number of funds	Mean	Median	25th percentile	75th percentile	Standard deviation
Q1 Net expense ratio funds (low) (%/year)	1514	0.620	0.694	0.483	0.800	0.231
Q4 Net expense ratio funds (high) (%/year)	1514	1.962	1.935	1.718	2.116	0.376
Q1 Net income ratio funds (low) (%/year)	1514	-0.803	-0.688	-1.025	-0.442	0.490
Q4 Net income ratio funds (high) (%/year)	1514	1.691	1.523	1.271	1.922	0.653
Q1 Turnover ratio funds (low) (%/year)	1514	22.908	24.125	16.692	30.286	9.289
Q4 Turnover ratio funds (high) (%/year)	1514	160.977	126.949	108.455	162.100	112.444
Q1 Manager tenure funds (low) (years)	1513	2.330	2.630	1.500	3.210	1.071
Q4 Manager tenure funds (high) (years)	1513	13.562	12.370	10.810	14.920	3.954
Q1 Age (young) (years)	1514	4.965	4.868	3.825	6.114	1.316
Q4 Age (old) (years)	1514	24.606	21.010	18.878	24.673	11.056
Q1 Size (small) ($ millions)	1514	4.122	3.161	0.967	6.886	3.470
Q4 Size (large) ($ millions)	1514	1783.083	727.459	463.873	1536.263	3925.624

Table 2 shows the summary statistics of the mutual fund sample when quartile analysis is implemented. The sample is formed by US domestic equity investment mutual funds in the period from January 1990 to January 2016. The table reports information for the quartiles (Q1/Q4 containing the funds with the lowest/highest values for the item) constructed on the basis of the net expense ratio, net income ratio, turnover ratio, manager tenure and size.

Table 3. Timing ability of US domestic equity mutual fund investors

All the funds in the sample (6056 funds)	Mean	Median	25th percentile	75th percentile	Standard deviation
Dollar-weighted monthly return (DW) (%)	0.459	0.499	0.271	0.693	0.364
Geometric monthly return (GM) (%)	0.608	0.593	0.452	0.753	0.237
Gap (%)	-0.149	-0.095	-0.308	0.063	0.348
t-Statistic/Wilcoxon test	(-33.302***/-29.775***)				
Hindsight effect (HE) (%)	-0.090	-0.062	-0.195	0.031	0.214
t-Statistic/Wilcoxon test	(-32.776***/-31.462***)				
Corrected timing (%)	-0.059	-0.025	-0.110	0.045	0.207
t-Statistic/Wilcoxon test	(-22.018***/-18.625***)				

This table provides information about the dollar-weighted monthly return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect described by Hayley (2014) and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the sample period. For each of these measures, we provide the mean, the median, the twenty-fifth percentile, the seventy-fifth percentile and the standard deviation. The t-test and Wilcoxon test statistics are provided to check the significance of the gap, hindsight effect and corrected timing measures.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 4. Timing ability of US domestic equity mutual fund investors: Controls for investment styles

Panel A: Index funds (446 funds)	Mean	Median	25th percentile	75th percentile	Standard deviation
Dollar-weighted monthly return (DW) (%)	0.538	0.564	0.408	0.706	0.337
Geometric monthly return (GM) (%)	0.610	0.594	0.472	0.718	0.208
Gap (%)	-0.071	-0.015	-0.174	0.124	0.344
t-Statistic/Wilcoxon test	(-4.368***/-2.509**)				
Hindsight effect (HE) (%)	-0.035	-0.007	-0.096	0.065	0.202
t-Statistic/Wilcoxon test	(-3.712***/-2.180**)				
Corrected timing (%)	-0.036	-0.009	-0.081	0.061	0.210
t-Statistic/Wilcoxon test	(-3.592***/-1.945*)				
Panel B: Large cap blend funds (1182 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.457	0.473	0.264	0.676	0.338
Geometric monthly return (GM) (%)	0.574	0.540	0.413	0.699	0.227
Gap (%)	-0.117	-0.085	-0.267	0.072	0.320
t-Statistic/Wilcoxon test	(-12.579***/-11.244***)				
Hindsight effect (HE) (%)	-0.064	-0.044	-0.157	0.044	0.188
t-Statistic/Wilcoxon test	(-11.683***/-11.090***)				
Corrected timing (%)	-0.053	-0.029	-0.099	0.039	0.191
t-Statistic/Wilcoxon test	(-9.53***/-9.144***)				
Panel C: Large cap growth funds (1272 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.509	0.545	0.305	0.771	0.375
Geometric monthly return (GM) (%)	0.636	0.619	0.463	0.805	0.258
Gap (%)	-0.126	-0.071	-0.305	0.102	0.351
t-Statistic/Wilcoxon test	(-12.832***/-10.859***)				
Hindsight effect (HE) (%)	-0.077	-0.045	-0.182	0.054	0.230
t-Statistic/Wilcoxon test	(-11.895***/-10.809***)				
Corrected timing (%)	-0.050	-0.031	-0.106	0.044	0.194
t-Statistic/Wilcoxon test	(-9.089***/-8.563***)				
Panel D: Large cap value funds (988 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.428	0.457	0.230	0.656	0.327
Geometric monthly return (GM) (%)	0.560	0.540	0.422	0.702	0.208
Gap (%)	-0.132	-0.082	-0.294	0.077	0.317
t-Statistic/Wilcoxon test	(-13.095***/-11.462***)				
Hindsight effect (HE) (%)	-0.083	-0.059	-0.184	0.032	0.194
t-Statistic/Wilcoxon test	(-13.371***/-12.573***)				
Corrected timing (%)	-0.050	-0.025	-0.107	0.043	0.177
t-Statistic/Wilcoxon test	(-8.808***/-7.480***)				

Table 4. Timing ability of US domestic equity mutual fund investors: Controls for investment styles

Panel E: Mid cap blend funds (317 funds)	Mean	Median	25th percentile	75th percentile	Standard deviation
Dollar-weighted monthly return (DW) (%)	0.469	0.554	0.317	0.681	0.383
Geometric monthly return (GM) (%)	0.667	0.640	0.528	0.780	0.251
Gap (%)	-0.197	-0.124	-0.342	0.025	0.376
t-Statistic/Wilcoxon test	(-9.345***/-8.673***)				
Hindsight effect (HE) (%)	-0.120	-0.086	-0.214	0.008	0.234
t-Statistic/Wilcoxon test	(-9.151***/-9.389***)				
Corrected timing (%)	-0.077	-0.024	-0.140	0.035	0.231
t-Statistic/Wilcoxon test	(-5.937***/-4.922***)				
Panel F: Mid cap growth funds (541 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.501	0.556	0.335	0.733	0.363
Geometric monthly return (GM) (%)	0.651	0.639	0.510	0.788	0.250
Gap (%)	-0.150	-0.105	-0.328	0.071	0.361
t-Statistic/Wilcoxon test	(-9.689***/-8.597***)				
Hindsight effect (HE) (%)	-0.100	-0.065	-0.212	0.036	0.242
t-Statistic/Wilcoxon test	(-9.575***/-9.021***)				
Corrected timing (%)	-0.051	-0.022	-0.106	0.050	0.200
t-Statistic/Wilcoxon test	(-5.915***/-4.859***)				
Panel G: Mid cap value funds (347 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.427	0.492	0.228	0.681	0.381
Geometric monthly return (GM) (%)	0.634	0.635	0.521	0.761	0.218
Gap (%)	-0.207	-0.148	-0.376	0.005	0.355
t-Statistic/Wilcoxon test	(-10.875***/-10.064***)				
Hindsight effect (HE) (%)	-0.113	-0.092	-0.221	0.001	0.188
t-Statistic/Wilcoxon test	(-11.241***/-10.552***)				
Corrected timing (%)	-0.094	-0.030	-0.156	0.039	0.235
t-Statistic/Wilcoxon test	(-7.43***/-6.190***)				

Table 4. Timing ability of US domestic equity mutual fund investors: Controls for investment styles

Panel H: Small cap blend funds (546 funds)	Mean	Median	25th percentile	75th percentile	Standard deviation
Dollar-weighted monthly return (DW) (%)	0.437	0.505	0.295	0.666	0.383
Geometric monthly return (GM) (%)	0.601	0.603	0.466	0.757	0.231
Gap (%)	-0.164	-0.090	-0.319	0.056	0.370
t-Statistic/Wilcoxon test	(-10.338***/-9.386***)				
Hindsight effect (HE) (%)	-0.111	-0.080	-0.219	0.022	0.227
t-Statistic/Wilcoxon test	(-11.465***/-10.979***)				
Corrected timing (%)	-0.052	-0.011	-0.093	0.064	0.233
t-Statistic/Wilcoxon test	(-5.259***/-2.876***)				
Panel I: Small cap growth funds (547 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.417	0.462	0.245	0.650	0.367
Geometric monthly return (GM) (%)	0.614	0.590	0.461	0.741	0.222
Gap (%)	-0.197	-0.152	-0.373	0.028	0.368
t-Statistic/Wilcoxon test	(-12.52***/-11.357***)				
Hindsight effect (HE) (%)	-0.115	-0.093	-0.233	0.012	0.226
t-Statistic/Wilcoxon test	(-11.895***/-11.239***)				
Corrected timing (%)	-0.082	-0.030	-0.135	0.039	0.237
t-Statistic/Wilcoxon test	(-8.093***/-6.818***)				
Panel J: Small cap value funds (312 funds)	**Mean**	**Median**	**25th percentile**	**75th percentile**	**Standard deviation**
Dollar-weighted monthly return (DW) (%)	0.416	0.500	0.252	0.695	0.414
Geometric monthly return (GM) (%)	0.604	0.627	0.467	0.742	0.251
Gap (%)	-0.188	-0.114	-0.303	0.027	0.372
t-Statistic/Wilcoxon test	(-8.92***/-8.217***)				
Hindsight effect (HE) (%)	-0.117	-0.102	-0.215	-0.013	0.200
t-Statistic/Wilcoxon test	(-10.357***/-9.858***)				
Corrected timing (%)	-0.070	-0.010	-0.130	0.062	0.242
t-Statistic/Wilcoxon test	(-5.121***/-2.865***)				

This table provides information about the dollar-weighted monthly return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect described by Hayley (2014) and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the sample period. For each of these measures, we provide the mean, median, twenty-fifth percentile, seventy-fifth percentile and standard deviation. The t-test and Wilcoxon test statistics are provided to check the significance of the gap, hindsight effect and corrected timing measures. Panel A provides information for index funds, Panel B for large cap blend funds, Panel C for large cap growth funds, Panel D for large cap value funds, Panel E for mid cap blend funds,

Panel F for mid cap growth funds, Panel G for mid cap value funds, Panel H for small cap blend funds, Panel I for small cap growth funds and Panel J for small cap value funds.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 5. Timing ability of US domestic equity mutual fund investors: Size control

Panel A: Size control by quartiles	**Q1 (Small funds, 1514 funds)**	**Q4 (Large funds, 1514 funds)**
Mean TNA ($ millions)	4.122	1783.08
Dollar-weighted monthly return (DW) (%)	0.375	0.574
Geometric monthly return (GM) (%)	0.573	0.675
Gap (%)	-0.198	-0.101
t-Statistic/Wilcoxon test	(-18.457***/-15.802***)	(-13.889***/-13.241***)
Hindsight effect (HE) (%)	-0.082	-0.087
t-Statistic/Wilcoxon test	(-14.66***/-14.313***)	(-16.344***/-16.235***)
Corrected timing (%)	-0.116	-0.014
t-Statistic/Wilcoxon test	(-16.265***/-13.517***)	(-4.508***/-4.513***)
Panel B: Size control by deciles	**D1 (Small funds, 606 funds)**	**D10 (Large funds, 606 funds)**
Mean TNA ($ millions)	0.826	3644.6
Dollar-weighted monthly return (DW) (%)	0.385	0.613
Geometric monthly return (GM) (%)	0.597	0.705
Gap (%)	-0.212	-0.092
t-Statistic/Wilcoxon test	(-12.198***/-10.465***)	(-9.076***/-8.986***)
Hindsight effect (HE) (%)	-0.081	-0.078
t-Statistic/Wilcoxon test	(-9.134***/-9.172***)	(-10.203***/-10.407***)
Corrected timing (%)	-0.131	-0.014
t-Statistic/Wilcoxon test	(-11.107***/-9.354***)	(-3.398***/-3.448***)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for size, for which we use the mean TNA. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for size and the other containing the funds in the fourth quartile according to the size of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The mean TNA in $ millions is provided, and the t-test and Wilcoxon test statistics are given to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 6. Timing ability of US domestic equity mutual fund investors: Age control

Panel A: Age control by quartiles	Q1 (Young funds, 1514 funds)	Q4 (Old funds, 1514 funds)
Mean age (years)	5.03	24.61
Dollar-weighted monthly return (DW) (%)	0.474	0.485
Geometric monthly return (GM) (%)	0.802	0.641
Gap (%)	-0.329	-0.156
t-Statistic/Wilcoxon test	(-29.605***/-24.802***)	(-23.002***/-21.328***)
Hindsight effect (HE) (%)	-0.153	-0.135
t-Statistic/Wilcoxon test	(-29.555***/-25.415***)	(-25.197***/-23.984***)
Corrected timing (%)	-0.175	-0.021
t-Statistic/Wilcoxon test	(-22.125***/-129.572***)	(-8.223***/-8.915***)
Panel B: Age control by deciles	**D1 (Young funds, 606 funds)**	**D10 (Old funds, 606 funds)**
Mean age (years)	3.68	32.34
Dollar-weighted monthly return (DW) (%)	0.346	0.593
Geometric monthly return (GM) (%)	0.750	0.713
Gap (%)	-0.404	-0.120
t-Statistic/Wilcoxon test	(-22.598***/-17.507***)	(-10.915***/-10.357***)
Hindsight effect (HE) (%)	-0.186	-0.110
t-Statistic/Wilcoxon test	(-21.92***/-17.516***)	(-12.713***/-12.430***)
Corrected timing (%)	-0.218	-0.010
t-Statistic/Wilcoxon test	(-17.725***/-15.334***)	(-2.795***/-2.481**)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for age, for which we use the difference between the inception date and the date for which the last observation for the fund is available. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for age and the other containing the funds in the fourth quartile according to the age of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The mean age in years is provided, and the t-test and Wilcoxon test statistics are given to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 7. Timing ability of US domestic equity mutual fund investors: Net expense ratio control

Panel A: Net expense ratio control by quartiles	**Q1 (Low net expense ratio funds, 1514 funds)**	**Q4 (High net expense ratio, 1514 funds)**
Mean net expense ratio (%)	0.62	1.96
Dollar-weighted monthly return (DW) (%)	0.554	0.339
Geometric monthly return (GM) (%)	0.663	0.529
Gap (%)	-0.108	-0.190
t-Statistic/Wilcoxon test	(-12.081***/-10.016***)	(-21.489***/-19.552***)
Hindsight effect (HE) (%)	-0.050	-0.129
t-Statistic/Wilcoxon test	(-9.67***/-9.595***)	(-21.739***/-20.287***)
Corrected timing (%)	-0.058	-0.061
t-Statistic/Wilcoxon test	(-10.864***/-9.595***)	(-12.106***/-11.557***)
Panel B: Net expense ratio control by deciles	**D1 (Low net expense ratio funds, 606 funds)**	**D10 (High net expense ratio funds, 606 funds)**
Mean net expense ratio (%)	0.385	2.26
Dollar-weighted monthly return (DW) (%)	0.566	0.284
Geometric monthly return (GM) (%)	0.657	0.506
Gap (%)	-0.091	-0.222
t-Statistic/Wilcoxon test	(-6.883***/-5.972***)	(-16.439***/-14.63***)
Hindsight effect (HE) (%)	-0.030	-0.157
t-Statistic/Wilcoxon test	(-4.234***/-4.732***)	(-16.064***/-14.82***)
Corrected timing (%)	-0.061	-0.065
t-Statistic/Wilcoxon test	(-7.562***/-6.247***)	(-9.014***/-9.077***)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for the net expense ratio. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for the net expense ratio and the other containing the funds in the fourth quartile according to the net expense ratio of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The mean net expense ratio is provided as a percentage, and the t-test and Wilcoxon test statistics are given to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 8. Timing ability of US domestic equity mutual fund investors: Net income ratio control

Panel A: Net income ratio control by quartiles	Q1 (Low net income ratio funds, 1514 funds)	Q4 (High net income ratio, 1514 funds)
Mean net income ratio (%)	-0.803	1.691
Dollar-weighted monthly return (DW) (%)	0.389	0.514
Geometric monthly return (GM) (%)	0.571	0.616
Gap (%)	-0.183	-0.102
t-Statistic/Wilcoxon test	(-19.614**/-17.603***)	(-12.412***/-10.393***)
Hindsight effect (HE) (%)	-0.123	-0.056
t-Statistic/Wilcoxon test	(-19.450***/-18.094***)	(-11.835**/-11.608***)
Corrected timing (%)	-0.060	-0.046
t-Statistic/Wilcoxon test	(-11.322***/-10.399***)	(-9.292***/-6.746***)
Panel B: Net income ratio control by deciles	**D1 (Low net income ratio funds, 606 funds)**	**D10 (High net income ratio, 606 funds)**
Mean net income ratio (%)	-1.25	2.238
Dollar-weighted monthly return (DW) (%)	0.311	0.547
Geometric monthly return (GM) (%)	0.534	0.637
Gap (%)	-0.224	-0.090
t-Statistic/Wilcoxon test	(-14.866***/-13.288***)	(-7.618***/-6.346***)
Hindsight effect (HE) (%)	-0.156	-0.059
t-Statistic/Wilcoxon test	(-14.451***/-13.265***)	(-8.541***/-8.083***)
Corrected timing (%)	-0.068	-0.031
t-Statistic/Wilcoxon test	(-8.123***/-7.722***)	(-4.533***/-2.82***)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for the net income ratio. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for the net income ratio and the other containing the funds in the fourth quartile according to the income ratio of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The mean net income ratio is provided as a percentage, and the t-test and Wilcoxon test statistics are given to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 9. Timing ability of US domestic equity mutual fund investors: Turnover ratio control

Panel A: Turnover ratio control by quartiles	**Q1 (Low turnover ratio funds, 1514 funds)**	**Q4 (High turnover ratio, 1514 funds)**
Mean turnover ratio (%)	22.91	160.98
Dollar-weighted monthly return (DW) (%)	0.504	0.407
Geometric monthly return (GM) (%)	0.630	0.572
Gap (%)	-0.126	-0.165
t-Statistic/Wilcoxon test	(-15.047***/-13.294***)	(-17.868***/-15.922***)
Hindsight effect (HE) (%)	-0.071	-0.108
t-Statistic/Wilcoxon test	(-14.473***/-14.177***)	(-17.315***/-16.453***)
Corrected timing (%)	-0.055	-0.058
t-Statistic/Wilcoxon test	(-10.852***/-7.823***)	(-10.999***/-10.360***)
Panel B: Turnover ratio control by deciles	**D1 (Low turnover ratio funds, 606n funds)**	**D10 (High turnover ratio, 606 funds)**
Mean turnover ratio (%)	13.35	232.07
Dollar-weighted monthly return (DW) (%)	0.531	0.400
Geometric monthly return (GM) (%)	0.630	0.572
Gap (%)	-0.099	-0.172
t-Statistic/Wilcoxon test	(-8.118***/-7.208***)	(-10.719***/-9.248***)
Hindsight effect (HE) (%)	-0.049	-0.113
t-Statistic/Wilcoxon test	(-6.872***/-6.599***)	(-10.425***/-9.813***)
Corrected timing (%)	-0.050	-0.060
t-Statistic/Wilcoxon test	(-6.827***/-5.504***)	(-6.515***/-5.566***)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for the turnover ratio. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for the turnover ratio and the other containing the funds in the fourth quartile according to the turnover ratio of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The mean turnover ratio is provided as a percentage, and the t-test and Wilcoxon test statistics are given to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 10. Timing ability of US domestic equity mutual fund investors: Institutional/non-institutional and load/no-load fund controls

Panel A: Type of investor control	**Institutional funds, 1398 funds**	**Non-institutional funds, 4658 funds**
Dollar-weighted monthly return (DW) (%)	0.508	0.444
Geometric monthly return (GM) (%)	0.646	0.596
Gap (%)	-0.137	-0.152
t-Statistic/Wilcoxon test	(-14.294***/-12.283***)	(-30.19***/-27.254***)
Hindsight effect (HE) (%)	-0.068	-0.097
t-Statistic/Wilcoxon test	(-12.572***/-12.086***)	(-30.437***/-29.202***)
Corrected timing (%)	-0.069	-0.055
t-Statistic/Wilcoxon test	(-11.519***/-9.036***)	(-18.773***/-16.404***)
Panel B: Load and no-load funds	**Load funds, 2547 funds**	**No-load funds, 2111 funds**
Dollar-weighted monthly return (DW) (%)	0.394	0.504
Geometric monthly return (GM) (%)	0.570	0.628
Gap (%)	-0.175	-0.125
t-Statistic/Wilcoxon test	(-26.001***/-23.615***)	(-16.481***/-14.355***)
Hindsight effect (HE) (%)	-0.112	-0.078
t-Statistic/Wilcoxon test	(-26.312***/-24.689***)	(-16.494***/-16.044***)
Corrected timing (%)	-0.063	-0.046
t-Statistic/Wilcoxon test	(-15.974***/-14.780***)	(-10.415***/-8.185***)

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for the type of investor (institutional/non-institutional) and for load and no-load funds. The table also reports the t-test and Wilcoxon test statistics to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 11. Timing ability of US domestic equity mutual fund investors: Gap control

Panel A: Gap control by quartiles	**Q1 (Worst gap, 1514 funds)**	**Q4 (Best gap, 1514 funds)**
Dollar-weighted monthly return (DW) (%)	0.072	0.749
Geometric monthly return (GM) (%)	0.687	0.520
Gap (%)	-0.615	0.229
t-Statistic/Wilcoxon test	(-84.403***/-33.703***)	(65.46***/33.703***)
Hindsight effect (HE) (%)	-0.333	0.125
t-Statistic/Wilcoxon test	(-62.816***/-33.569***)	(36.577***/29.548***)
Corrected timing (%)	-0.282	0.105
t-Statistic/Wilcoxon test	(-42.027***/-32.896***)	(37.797***/29.677***)
Panel B: Gap control by deciles	**D1 (Worst gap, 606 funds)**	**D10 (Best gap, 606 funds)**
Dollar-weighted monthly return (DW) (%)	-0.166	0.857
Geometric monthly return (GM) (%)	0.730	0.489
Gap (%)	-0.896	0.368
t-Statistic/Wilcoxon test	(-90.6***/-21.328***)	84.886/21.328
Hindsight effect (HE) (%)	-0.438	0.213
t-Statistic/Wilcoxon test	(-43.693***/-21.271***)	36.509***/20.725***
Corrected timing (%)	-0.458	0.155
t-Statistic/Wilcoxon test	(-37.069***/-21.208***)	31.457***/20.225***

This table provides information about the dollar-weighted return (DW), the geometric monthly return (GM), the gap (computed as the difference between the DW and the GM), the hindsight effect and the corrected timing measure after controlling for this effect. We compute all these measures for each fund over the entire sample period. We control for the gap result. We build two groups of funds, one containing the funds in the first quartile of the sample when controlling for the gap and the other containing the funds in the fourth quartile according to the gap of the fund (panel A). We also build two groups in a similar way but considering deciles instead of quartiles (panel B). The table also provides the t-test and Wilcoxon test statistics to check the significance of the gap, the HE and the corrected timing measure.

*** Significant at 1%, ** significant at 5%, * significant at 10%.