Investor Behavior under Prospect Theory: Evidence from Mutual Funds*

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Abstract

This paper studies the investment behavior of investors and fund managers within the mutual funds industry. We find that investors are biased in their mutual fund purchase decisions in a way described by prospect theory: The prospect theory value predicts future mutual fund flows, despite the fact that it is not related to the mutual funds' future performance. We show that the mutual funds' prospect theory value contains incremental information compared to historical performance measures already discovered in the mutual fund flow literature, and subsumes the information content of variables related to the convexity in the flow-performance relationship. We find that mutual fund managers are not subject to any behavioral bias identifiable by prospect theory when selecting stocks for their mutual fund portfolio. The results are robust to various specifications.

Keywords: Mutual Funds Flows, Prospect Theory, Investing Biases, Mutual Funds Performance, Convexity in the Flow-Performance

JEL: G11, G23, G41

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Abstract

This paper studies the investment behavior of investors and fund managers in the mutual funds industry. We find that investors base their mutual fund purchase decisions in a way described by prospect theory. As a direct consequence, the prospect theory value predicts future fund flows, despite the fact that it is not related to the funds' future performance. We find that the funds prospect theory value contains incremental information compared to historical performance measures already discovered in the fund flow literature, and, helps to explain the convexity in the flow-performance relationship. Mutual fund managers are not subject to this kind of behavioral bias when they select stocks for their mutual fund portfolio. The results are robust to various specifications.

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1 Introduction

Mutual funds belong to the most important and largest investment vehicles in the United States: more than 80% of the US-registered investment company total net assets belong to mutual funds.[1] Due to the large size of the mutual fund industry (roughly 21.3 trillion USD), mutual fund investors naturally determine the flows in and out of mutual funds, and, therefore, they affect not only the mutual fund managers' incentives but ultimately also asset prices. Understanding the preferences and the different investment behaviors of both the mutual fund investors and managers is, therefore important.

The literature on prospect theory (Kahneman and Tversky (1979) and Tversky and Kahneman (1992)) suggests that investors in general mentally represent an investment by its distribution of the investment's past returns. As outlined by Barberis, Mukherjee, and Wang (2016), the past return distribution of a stock is viewed as a good and easily accessible proxy for the distribution of the stock's future return. Based on the return distribution, the value a prospect theory agent assigns to it, is called the prospect theory value.

In this paper, we transfer the concept from stocks to mutual funds and exploit its framework and information content to better understand various aspects of the behavior of the mutual fund investors and managers. The main questions we want to answer in this paper are: Are mutual fund investors and managers prone to evaluate their investment decisions under consideration of prospect theory? Does this behavioral bias affect mutual fund flows, mutual fund performance, and mutual fund portfolio holdings?

We test these hypotheses for mutual fund investors and managers in order to investigate whether they evaluate a potential investment in or for a mutual fund based on the past return distribution under prospect theory. The prospect theory value is the primary variable of interest, which we contrast from existing traditional predictors, and which we are connecting to future mutual fund flows, future mutual fund performance, the convexity in the flow-performance relationship, and the mutual funds holdings.

Our main results can be summarized as follows: i) We show that the prospect theory value of mutual funds predicts mutual fund flows for horizons up to 10 months despite the fact that

[1] See the Investment Company Institute – Fact Book (2020): https://www.ici.org/pdf/2020_factbook.pdf

the prospect theory value fails to explain the mutual funds future performance in the cross-section. ii) The information content inherited in the prospect theory value is fundamentally different from known mutual fund flow predictors associated with the historical mutual fund performance or lottery-like payoff measures, and, helps to explain the convexity in the flow-performance relationship. iii) Analyzing the prospect theory value of the mutual funds individual holdings reveals that the mutual fund managers are not subject to any behavioral bias identifiable from prospect theory when selecting stocks for their mutual fund portfolio.

To obtain the aforementioned results, we proceed as follows. To access the prospect value of a mutual fund, we adapt the literature on prospect theory for individual firms and stock returns following Barberis, Mukherjee, and Wang (2016) and apply it to the mutual funds universe. To investigate the predictive relationship between the mutual funds prospect value and mutual fund flows, we estimate a Fama and MacBeth (1973) specification that simultaneously controls for multiple mutual fund characteristics and performance measures. We find that the mutual funds' prospect theory value predicts future mutual fund flows positively for horizons from one month up to 10 months. Therefore, an investor's investment decision will be biased and based on its prospect theory value (as a kind of mental accounting), assuming that the future return distribution can be represented as a function inferred from the historical return distribution. As a consequence, the investor's investment decision affects mutual fund flows. Since mutual fund flows can be seen as a function of the mutual fund's total net asset value and its realized return, we also analyze the relationship between the funds' prospect theory value and the mutual funds' future performance. While Barberis, Mukherjee, and Wang (2016) show that the prospect values on the individual stock level can be treated as a systematic factor, the equivalent mutual funds prospect value does not reliably forecast future mutual fund returns. We therefore conclude that mutual fund investors are subject to a behavioural bias when allocating money.

In the next step, we contrast the prospect theory value from various traditional mutual fund flow predictors, such as the mutual funds' average return, volatility, skewness, and lottery-like measures, such as the highest and lowest return over the past. We find that the prospect theory value of the mutual funds contains fundamentally different and incremental information compared to these traditional predictors discovered in the literature. The results remain valid when we orthogonalize the prospect values considering traditional performance measures (such as return, volatility, and skewness). In addition, we show that the prospect theory value also subsumes the information content of mutual funds performance measures related to the convexity in the flow-performance relationship as documented by Chevalier and Ellison (1997). We analyze the individual building blocks of the prospect theory value (loss aversion, concavity and convexity, and probability weighting) and discover that the concavity and convexity feature, which means that the value function is concave over gains and convex over losses, plays an essential role in mutual fund flow prediction, while the probability weighting property inherits the information content from already discovered variables capturing the convexity in the flow-performance relationship.

To analyze the behavior of the mutual funds managers, we carefully investigate the prospect theory value of the individual mutual fund holdings in various dimensions. An aggregated prospect theory value computed for each mutual funds reveals that the prospect theory value of the individual stocks does not matter for the mutual funds managers' portfolio selection process. This finding indicates that mutual funds managers are not subject to any behavioral bias identifiable by prospect theory. The difference between the prospect theory measure on a fund level and the weighted sum of the funds holdings can be attributed to the absolute level of the portfolios' diversification and the market timing skills of the portfolio manager.

Overall, the empirical results are robust to various specifications, including sample splits, alternative definitions of the prospect theory value and the performance measures, the clustering of standard errors, and the incorporation of idiosyncratic volatility and idiosyncratic skewness.

1.1 Literature Review

The paper contributes to two strands of literature. First, our paper advances the understanding of investors' behavior in mutual funds. Prior research (e.g., Chevalier and Ellison (1997) and Sirri and Tufano (1998)) shows that mutual fund investors chase past performance. Zheng (1999) finds that mutual fund flows can predict future mutual fund performance in the cross-section, suggesting information-based investment decisions. Berk and Green (2004) built a rational Bayesian equilibrium model to show that the mutual fund flows rationally respond to past performance in the model even though performance is not persistent and investments with active managers do not outperform passive benchmarks on average. Berk and Van Binsbergen (2016) and Barber, Huang, and Odean (2016) examine the sensitivity of mutual fund flows to alternative performance metrics such as the CAPM alpha and multi-factor alphas. Akbas and Genc (2020) and Chen and Dai (2020) show that extreme positive payoffs and tail risks in the distribution of monthly mutual fund returns have a positive relationship with future mutual fund flows. While these performance metrics use various risk adjustments in explaining mutual fund flows, our paper focuses on risks that are departed significantly from the predictions of expected utility functions (prospect theory, Tversky and Kahneman (1992)).

Our paper is also related to prior work that uses prospect theory to analyze the cross-section of average returns in stock markets. Barberis and Huang (2008) study asset prices in a one-period economy in which investors derive prospect theory utility from the change in their wealth throughout the period. This framework generates a new prediction, one that does not emerge from the traditional analysis based on expected utility, namely, that a security's expected future skewness – even including idiosyncratic skewness – will be priced: A stock whose future returns are expected to be positively skewed will be "overpriced" and earn a lower average return. Over the past few years, several papers, using various measures of expected skewness, have presented evidence in support of this prediction (Kumar (2009); Boyer, Mitton, and Vorkink (2010) and Bali, Cakici, and Whitelaw (2011); Conrad, Dittmar, and Ghysels (2013)). Moreover, the idea that expected skewness is priced has been analyzed to make sense of a variety of empirical facts, including the low average returns of IPO stocks, distressed stocks, high volatility stocks, stocks sold in over-the-counter markets, and out-of-the-money options (all of these assets have positively skewed returns); the diversification discount; and the lack of diversification in many household portfolios. Barberis, Mukherjee, and Wang (2016) find that, when thinking about allocating money to a stock, investors mentally represent the stock by the distribution of its past returns and then evaluate this distribution in the way described by prospect theory and find that a stock whose past return distribution has a high (low) prospect theory value earns a low (high) subsequent return, on average. In more recent research, Barberis, Jin, and Wang (2020) present a new model of asset prices in which investors evaluate risk according to prospect theory and examine its ability to explain 22 prominent stock market anomalies. However, few papers show whether prospect theory can be used to analyze mutual fund return and flow. Our paper finds that prospect theory value can predict future mutual fund flows but not future mutual fund returns.

We also acknowledge the recent work by Gu and Yoo (2021) connecting prospect theory to mutual fund flows. In our work we are not only investigating the mutual fund-flow prediction over a longer horizon (from 1985), but we also try to understand the potential mechanism behind it by analyzing the relationship between prospect theory and future mutual fund performance measures, so as the mutual funds individual holdings.

The rest of the paper is organized as follows: We start with a revision of Tversky and Kahneman (1992) in Section 2. The data description is outlined in Section 3. Section 4 analyzes the behavioral biases of the investors and relates the prospect theory value to mutual fund flows. Section 5 investigates the mutual fund holdings. Robustness is presented in Section 6. Section 7 concludes the article.

2 Conceptual Framework – Prospect Theory

In this section we review the work of Kahneman and Tversky (1979) and Tversky and Kahneman (1992), which serves as the foundation for our empirical analysis. Readers already familiar with this theory may prefer to jump to Section 3.

To see how cumulative prospect theory works, consider the gamble

$$\{x_{-m}, p_{-m}; ......; x_{-1}, p_{-1}; x_0, p_0; x_1, p_1; ......; x_n, p_n\}, \tag{1}$$

where x_i is the value of gain and loss and p_i is the probability of x_i for all $i \in [-m, n]$ where $x_i < x_j$ for $i < j$, $x_0 = 0$. Hence, x_{-m} through x_{-1} are losses and x_1 through x_n are gains, and $\sum_{i=-m}^{n} p_i = 1$. For example, tossing coins could be written as $\{-1, 50\%; 1, 50\%\}$. In the expected utility framework, an individual with utility function U evaluates the gamble in (1) by computing

$$EU = \sum_{i=-m}^{n} p_i U(W + x_i), \tag{2}$$

where W is his current wealth. A cumulative prospect theory individual, by contrast, assigns the gamble the value

$$TK = \sum_{i=-m}^{n} \pi_i v(x_i), \tag{3}$$

with

$$\pi_i = \begin{cases} w^+(p_i + ... + p_n) - w^+(p_{i+1} + ... + p_n) & 0 \leq i \leq n \\ w^-(p_{-m} + ... + p_i) - w^-(p_{-m} + ... + p_{i-1}) & -m \leq i < 0, \end{cases} \tag{4}$$

$$v(x) = \begin{cases} x^\alpha & x \geq 0 \\ -\lambda(-x)^\alpha & x < 0, \end{cases} \tag{5}$$

where w^+ and w^- are known as the probability weighting functions and v as the value function. Tversky and Kahneman (1992) propose the following functional form for the probability weighting functions w^+ and w^-:

$$w^+(p) = \frac{p^\gamma}{(p^\gamma + (1-p)^\gamma)^{1/\gamma}}, \tag{6}$$

$$w^-(p) = \frac{p^\delta}{(p^\delta + (1-p)^\delta)^{1/\delta}}, \tag{7}$$

where $\alpha, \gamma, \delta \in (0,1)$ and $\lambda > 1$. In equation (4) the weighted total probability of all outcomes equal to or better than x_i, namely, $p_i + ... + p_n$ is getting deducted by the total probability of all outcomes strictly better than x_i, namely, $p_{i+1} + ... + p_n$. Similarly, for an outcome $x_i < 0$, the total weighted probability of all outcomes equal to or worse than x_i is getting deducted by the total weighted probability of all outcomes strictly worse than x_i. Overall, in the setting of cumulative prospect theory, agents do not consider objective probabilities to evaluate their utility function. They rather use a weighting function w^+ and w^- to transform probabilities, and, hence, the extreme gain and loss, which is the tail of the gamble distribution, is overweight. A popular example of the probability overweighting are lotteries where individuals prefer the improbable gain of \$500 over a save gain of \$5. For an insurance, individuals are willing to lose \$5 for sure rather than to lose \$500 with a low probability. The degree to which the agent overweights the tails decreases in the parameters γ and δ.

There are several differences for the two utility functions as defined in (2) and (3), which are worth discussing: First, in (3) the cumulative prospect theory utility function, the inputs

(x_i) are the potential gains and losses and, therefore, do not relate to their final wealth (in contrast to (2)). Second, while U is differentiable everywhere, v is kinked in $x = 0$. Intuitively, this can be interpreted as loss-aversion since it means that the agent is more sensitive to a potential loss than a gain. The severity of the kink and, therefore, of the loss-aversion is increasing in λ. Third, while U is concave, v is only concave (convex) when x is positive (negative). Therefore risk aversion is changing in the potential gains, and, therefore, agents who follow cumulative prospect theory are risk-averse in gains and risk-seeking losses. The parameter that determines the shape of the utility curve in both domains is denoted by α.

3 Data and Methodology

In this section, we define the fundamental quantities that we adopt to conduct our empirical analysis. We start by describing the measure of the prospect theory value following Barberis, Mukherjee, and Wang (2016), which we adopt directly to the mutual funds returns and in a later step also to the mutual funds individual holdings. In the next step we present the details on calculating the mutual fund flows and other relevant variables that we are exploiting in our empirical analysis.

3.1 Prospect Theory Value

In order to calculate the prospect theory value (TK) of a given mutual fund i, we first compute the mutual funds monthly style adjusted return, following Teo and Woo (2001), deducting from the raw monthly fund returns the cross-sectional average return of all mutual funds belonging to the same style.[2] For the calculation of TK we consider style adjusted returns over the past five years on a monthly frequency.[3] In the next step we sort the total of

[2]Mutual funds are often confined to trade stocks within their styles, which causes high cross-sectional return correlations. Style-adjusted returns control for this time-varying style effect and mitigate concerns related to the categorization of mutual funds. There is considerable empirical evidence that investor decisions are based on mutual fund and style returns; see Barberis and Shleifer (2003), Pomorski (2004) and Mullainathan (2002).

[3]As presented in Section 6, we obtain the same qualitative results when i) we use raw returns instead of style adjusted returns and ii) we shorten the length of the backward-looking window to four years or three years.

60 monthly style-adjusted returns ascending. Suppose that m of these returns are negative (where the most negative return is labeled as r_{-m}), while the remaining $n = 60 - m$ are positive (the most positive return is labeled r_n). The historical return distribution of the mutual fund that implicitly assigns an equal probability to each of the 60 excess returns is then given by

$$(r_{-m}, \frac{1}{60}; r_{-m+1}, \frac{1}{60}; ...; r_{-1}, \frac{1}{60}; r_1, \frac{1}{60}; ...; r_n, \frac{1}{60}). \tag{8}$$

Following Barberis, Mukherjee, and Wang (2016), the prospect theory value for each mutual fund and for each point in time is then given by (3) and denoted by $TK_{i,t}$. We refer to the relative cross-sectional rank, that is, the the corresponding quintile of TK_t, as $TK_{i,t}^{Rank}$.

3.2 Data Description and Variable Definitions

Mutual fund returns, holdings, and other mutual fund characteristics are obtained from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free US Mutual Fund Database. The sample covers actively managed domestic equity mutual funds from January 1980 (when CRSP initiated the reporting of monthly net asset values) to December 2019.[4] We select equity mutual funds that fall into one of the six CRSP objective codes (EDCI, EDCM, EDCS, EDYB, EDYG, or EDCL), thus excluding bond, balanced, international, sector funds, and index funds from the sample. Since the analysis is on the fund-level, we aggregate all share classes of each fund. Barber, Odean, and Zheng (2005) show that observations with zero (or negative) expense most likely indicate missing information, and, therefore, these observations are removed. Evans (2010) explores an incubation bias for small size and short maturity mutual funds in the CRSP mutual fund database: This is why we exclude funds with less than 1 million USD total assets from our sample and due to the calculation method of TK, which requires at least five years of historical returns, short maturity funds are eliminated as well.[5] We end up with a sample that contains more than 6.062 mutual funds and 1032 mutual fund families, over 408 calendar months.

The mutual fund net flow, reflecting the growth rate of a fund i due to new investments

[4]The mutual funds individual holdings are reported starting from 2004 since the SEC requires all US mutual funds to disclose their portfolio holdings thereafter.

[5]We consider a funds' TK for a given point in time if we have at least 50 style adjusted returns over the last 60 months available.

at time t, is defined as

$$FLOW_{i,t} = \frac{(TNA_{i,t} - TNA_{i,t-1})(1 + RET_{i,t})}{TNA_{i,t-1}}, \tag{9}$$

where $RET_{i,t}$ denotes the return of mutual fund i over month t, and $TNA_{i,t}$ the total net asset value of the mutual fund i at the end of month t. Following Elton, Gruber, and Blake (2011), we filter out the top and bottom 1% tails of the mutual fund flow data (for each point in time).[6]

Additional control variables in the main analysis are motivated, labeled, and defined as follows: Following Chevalier and Ellison (1997) and Barber, Odean, and Zheng (2005), we include the logarithm of the total net assets of a mutual fund ($\log(TNA)$), the logarithm of total net assets of the mutual funds that belong to the same family ($\log(FTNA)$), and the logarithm of the number of months since a mutual fund's date of inception ($\log(AGE)$). Sirri and Tufano (1998) and Barber, Odean, and Zheng (2005) show that the total operating expenses expressed as a percentage of a mutual fund's average net assets (EXP), and the monthly turnover ration of a mutual fund ($TURN$) are related to mutual fund flows. We also include performance measures of the mutual funds, such as the mean ($MEAN$), the standard deviation (VOL), and the skewness ($SKEW$) of monthly style-adjusted returns over the previous five years. We also add the highest (MAX) and lowest (MIN) return over the last 12 months to capture lottery-like payoffs. As shown by Kosowski, Timmermann, Wermers, and White (2006), the momentum effect for stock returns also translates into the returns of mutual funds. As outlined by Akbas and Genc (2020), MAX displays a strong positive correlation with the future flow and is consistent with investors' preference for extreme positive payoffs in the distribution of asset returns (lottery-like investments). Chen and Dai (2020) show that investor flows are significantly sensitive to tail risk (MAX and MIN) in the cross-section, even after controlling for mutual fund performance and characteristics.

As visible from Table 2 most variables display a rather low average absolute correlation among each other with the exception of TK and $MEAN$. Therefore, in the empirical

[6] Elton, Gruber, and Blake (2011) report that the top and bottom percentiles of mutual fund flows are likely affected by the merge of mutual funds, and, therefore, these extreme flows should not be considered.

	mean	std	min	max
TK	-0.015	0.016	-0.161	4.569
FLOW	0.049	12.836	-2.845	43.662
log(TNA)	4.862	2.061	-2.303	12.634
log(FTNA)	9.166	2.201	-2.303	14.352
log(AGE)	5.046	0.517	3.932	6.545
EXP	0.077	0.122	0.025	0.752
TURN	0.022	0.549	-8.25	2.877
MEAN	0.000	0.005	-0.029	1.830
VOL	0.017	0.031	0.000	14.162
SKEW	-0.067	1.010	-7.746	7.746
MAX	0.026	0.088	-.0128	13.693
MIN	-0.026	0.0249	-1.017	0.0157
N	740070			

Table 1: Summary Statistics. This table reports summary statistics for several mutual fund characteristics. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a fund, the total net assets of the mutual funds that belong to the same family and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

analysis, we test for multicollinearity,[7] and, to alleviate further concerns, we also consider an orthogonal TK measure. Hence, for each mutual fund, we estimate the following specification over the full sample:

$$TK_i = \alpha_i + \beta_{MEAN} \times MEAN_i + \beta_{VOL} \times VOL_i + \beta_{SKEW} \times SKEW_i + \varepsilon_i, \qquad (10)$$

where we consider ε_i as the Residual TK.

To assess the mutual funds' performance we calculate additional measures such as the style adjusted return $SRET$, and risk-adjusted returns ("alphas"), which are obtained as the intercept of the regression (over a 12 months rolling window) of a mutual funds excess returns (raw mutual fund returns minus the risk-free rate) on various factors such the market factor Sharpe (1964), Carhart (1997) four-factor model, and Fama and French (2015) five-factor model, Treynor and Mazuy (1966) TM timing conditional beta model, and Henriksson and Merton (1981) HM timing conditional beta model. Monthly style-adjusted and risk-adjusted returns are then cumulated over the respective time horizon of the performance measurement.

[7] From Table A1 one can infer that the maximum variance inflation factor reaches 4.91 for the $MEAN$.

Variables	TK	FLOW	log(TNA)	log(FTNA)	log(AGE)	EXP	TURN	MEAN	VOL	SKEW	MAX	MIN
TK	1.000											
FLOW	0.005	1.000										
log(TNA)	0.249	0.019	1.000									
log(FTNA)	0.267	0.008	0.345	1.000								
log(AGE)	0.051	-0.000	0.215	0.127	1.000							
EXP	-0.001	0.000	-0.007	-0.016	0.021	1.000						
TURN	-0.007	-0.000	-0.029	0.006	-0.025	-0.002	1.000					
MEAN	0.727	-0.000	0.278	0.187	0.024	0.000	0.005	1.000				
VOL	-0.641	-0.006	-0.120	-0.230	-0.038	0.002	0.008	-0.146	1.000			
SKEW	0.130	-0.041	-0.056	-0.047	-0.048	-0.000	-0.011	0.031	0.115	1.000		
MAX	0.007	-0.000	0.002	0.011	-0.009	0.004	-0.002	-0.000	-0.014	0.004	1.000	
MIN	-0.006	-0.001	0.001	-0.012	0.006	-0.002	0.002	0.004	0.013	-0.006	-0.458	1.000

Table 2: Correlation - Mutual Funds Characteristics. This table reports the time-series averages of cross-sectional correlations for several mutual fund characteristics. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years) and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

To investigate the potential behavioral bias of the mutual funds manager we calculate, for each mutual funds i, and for each point in time, the holdings' average absolute TK value ($AvgTK_i$), and, the holdings' average relative cross-sectional rank TK value ($AvgTK_i^{Rank}$) as follows:

$$AvgTK_i = \sum_{j}^{N} w_{j,i} TK_j, \tag{11}$$

$$AvgTK_i^{Rank} = \sum_{j}^{N} w_{j,i} TK_j^{Rank}. \tag{12}$$

Thereby, $w_{j,i}$ denotes the mutual funds' portfolio weight of stock j, TK_j the stocks' absolute TK value as computed in (3) using a rolling window of 60 monthly observations, and TK_j^{Rank} the stocks' TK cross-sectional rank (the corresponding quintile of the TK_j).

The computation of the necessary measures allows us to assess the potential behavioral biases in various dimensions of the two mutual funds participants, that is, the investor and the mutual fund manager.

4 Investors' Behavioral Biases

In this section, we conduct and report the main results of our empirical analysis related to the mutual fund investors, future mutual fund flows, and future mutual fund performance measures. We show that the mutual funds' TK predicts mutual fund flows with a positive sign and for horizons up to 10 months. In the next step, we demonstrate that TK for mutual funds does not reliably predict mutual fund returns and alternative mutual fund performance measures. We conclude this section by analyzing the connection between the mutual funds' TK building blocks and the convexity in the flow-performance relationship as documented by previous studies.

4.1 TK and Mutual Funds Flows

To investigate the relationship between TK and future mutual fund flows, we estimate the following Fama and MacBeth (1973) specification that controls for multiple mutual fund characteristics simultaneously; that is,

$$FLOW_{i,t} = \alpha + \beta_{i,t-1} \times TK_{i,t-1} + \lambda_{i,t-1} \times X_{i,t-1} + \epsilon_{i,t-1}, \tag{13}$$

where $FLOW_{i,t}$ denotes the mutual fund flow for mutual fund i at month t, $TK_{i,t-1}$ denotes the prospect theory value for mutual fund i at month $t-1$, and $X_{i,t-1}$ denotes the control variables as described in Section 3.2. For the calculation of the standard errors, we rely on Newey and West (1987) and correct for autocorrelation and heteroscedasticity with five lags.

Table 3 reports the parameter estimates from the outlined regressions in (13) for different specifications: i) considering unstandardized variables (columns 1, 2, and 3) and ii) to compare and assess each independent variable's relative importance, we also explore the same specifications using standardized variables (columns 4, 5, and 6). In conformity with the intuition, the mutual funds' TK and its future mutual fund flows are positively related: The parameter estimates associated with TK are all positive and strongly significant at the 1% level. The relationships among future mutual fund flows ($FLOW$) and mutual fund size ($\log(TNA)$), family size ($\log(FNA)$), age ($\log(AGE)$), mutual fund expenses (EXP), and turnover ($TURN$) are consistent with the findings of previous studies, such as Chevalier and Ellison (1997) and Huang, Wei, and Yan (2007). Also, the mean ($MEAN$), volatility (VOL), skewness ($SKEW$), and the maximal return over the last year (MAX) does not subsume the effect of the mutual funds' TK in any specification.[8]

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	2.640***	13.081***	13.402***	0.003**	0.015***	0.016***
	(2.79)	(2.65)	(2.67)	(2.53)	(2.61)	(2.66)
FLOW	-0.128	-0.192	-0.206	-0.189	-0.227*	-0.227*
	(-0.86)	(-1.52)	(-1.64)	(-1.46)	(-1.82)	(-1.82)
log(TNA)	-0.027	-0.033	-0.034*	-0.007*	-0.006*	-0.006*
	(-1.35)	(-1.60)	(-1.65)	(-1.73)	(-1.83)	(-1.86)
log(FTNA)	0.006	0.007	0.008	0.001	0.002**	0.002**
	(1.06)	(1.38)	(1.52)	(1.47)	(1.97)	(1.98)
log(AGE)	0.024	0.018	0.018	0.001	0.001	0.001
	(0.93)	(0.68)	(0.71)	(1.09)	(0.73)	(0.73)
EXP	-81.181	-80.632	-80.780	-0.741	-0.763	-0.765
	(-1.44)	(-1.40)	(-1.39)	(-1.39)	(-1.40)	(-1.39)
TURN	0.001	0.004	0.002	-0.003	-0.000	-0.000
	(0.09)	(0.66)	(0.27)	(-0.63)	(-0.69)	(-1.45)
MEAN		-21.681**	-22.442**		-0.007*	-0.007**
		(-2.06)	(-2.12)		(-1.92)	(-2.07)
VOL		8.810***	8.989***		0.018***	0.018***
		(2.70)	(2.72)		(2.70)	(2.72)
SKEW		-0.080**	-0.079**		-0.006**	-0.006**
		(-2.08)	(-2.05)		(-2.03)	(-2.10)
MAX			0.309			0.002
			(0.83)			(0.84)
MIN			0.270			0.001
			(1.34)			(1.15)
CONS	0.0887***	0.155***	0.160***	0.009	0.009	0.010
	(3.13)	(3.26)	(3.24)	(1.16)	(1.19)	(1.23)
N	733028	733028	733028	733028	733028	733028
R^2	0.295	0.312	0.312	0.295	0.312	0.312

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 3: Mutual Funds Flows and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), and TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

In Table 4 we report the coefficient estimates considering the orthogonal Residual TK measure as calculated in (10). Residual TK is positively and significantly related to future

[8]We present the results without the consideration of TK in Table A2. In this setting, the coefficients for $MEAN$, VOL are positive, while the coefficient for $SKEW$ is negative.

mutual fund flows, and, therefore, the results remain qualitatively unchanged.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
Residual TK	7.284*	13.091***	13.404***	0.005*	0.008***	0.009***
	(1.93)	(2.65)	(2.67)	(1.79)	(2.60)	(2.64)
FLOW	-0.193	-0.192	-0.206	-0.230*	-0.227*	-0.227*
	(-1.50)	(-1.52)	(-1.64)	(-1.83)	(-1.82)	(-1.82)
log(TNA)	-0.028	-0.033	-0.034	-0.005	-0.006*	-0.006*
	(-1.41)	(-1.59)	(-1.65)	(-1.63)	(-1.82)	(-1.84)
log(FTNA)	0.005	0.007	0.008	0.002*	0.002**	0.001**
	(1.15)	(1.36)	(1.50)	(1.67)	(1.98)	(1.97)
log(AGE)	0.020	0.018	0.018	0.001	0.001	0.001
	(0.77)	(0.68)	(0.70)	(0.93)	(0.72)	(0.63)
EXP	-81.212	-80.633	-80.778	-0.762	-0.763	-0.765
	(-1.37)	(-1.40)	(-1.39)	(-1.36)	(-1.40)	(-1.39)
TURN	-0.008	0.001	-0.002	0.012	-0.000	-0.000
	(-0.33)	(0.09)	(-0.28)	(1.38)	(-0.69)	(-1.45)
MEAN		13.078***	13.153***		0.005***	0.005***
		(3.17)	(3.13)		(3.41)	(3.30)
VOL		8.557***	8.721***		0.017***	0.018***
		(2.70)	(2.72)		(2.70)	(2.72)
SKEW		-0.051*	-0.049*		-0.004*	-0.004*
		(-1.79)	(-1.73)		(-1.69)	(-1.81)
MAX			0.309			0.002
			(0.83)			(0.84)
MIN			0.270			0.000
			(1.34)			(1.14)
CONS	0.0668**	-0.0337	-0.0343	0.00760	0.00924	0.00968
	(2.32)	(-0.89)	(-0.92)	(0.93)	(1.19)	(1.23)
N	733028	733028	733028	733028	733028	733028
R^2	0.297	0.312	0.312	0.297	0.312	0.313

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Mutual Funds Flows and Residual TK. This table reports the relationship between future mutual fund flows and Residual TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), Residual TK (as calculated in (10)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

4.1.1 Horizon Effects

Next, we extend our analysis in two dimensions: How strong remains the prediction of mutual fund flows i) if investors have a delayed excess to the past return distribution (hence, affecting the calculation of TK) and ii) if we investigate the prediction of mutual fund flows over longer horizons.

In the first part, we explore whether TK constructed by lagging the past return distribution preserves its predictive power. By doing so, we take into account that some investors may not rely on the newest mutual funds data to make an investment decision. Therefore, we simply lag the mutual funds TKs by 1 to 12 months.[9] Figure 1 displays the coefficients and t-statistics of the reestimated specifications as outlined in (13) using lagged TK. The results show that the TKs based on the past return distribution considering lags from one to seven months maintain its strong predictive power for quarterly mutual fund flows.

(a) Coefficient of lagged TK (b) t-statistic of the lagged TK coefficient

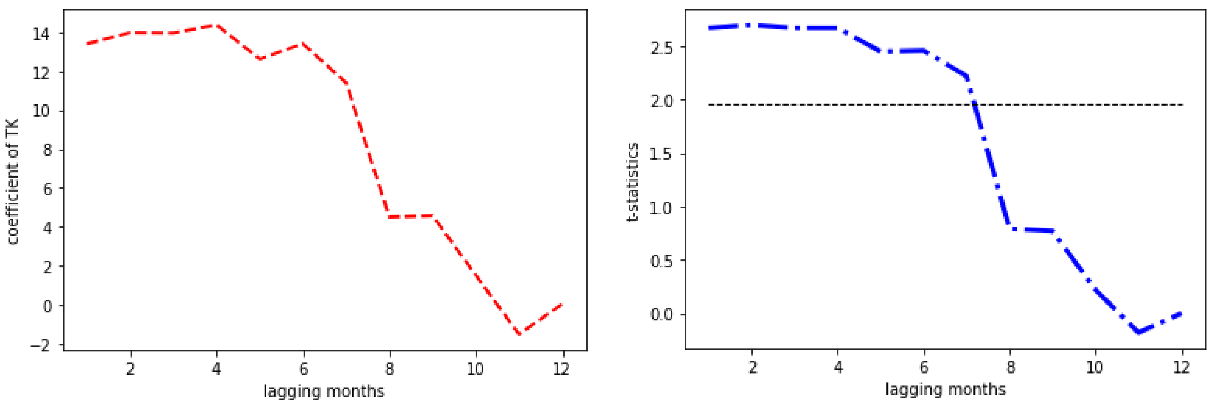

Figure 1: Mutual Funds Flows and lagged TK - Horizon Effects. This Figure reports the coefficients and t-statistics of TK as outlined in (13) considering lagged return distributions for the calculation of TK. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

In the second part, we explore the predictive power of the mutual funds' TK associated to mutual fund flows over longer horizons, where we again apply the specification as given in (13). Figure 2 displays the coefficient of TK and its t-statistic for the different predictive horizons of $FLOW$. As visible from the plot, TK predicts mutual fund flows for horizons up to 10 months.[10]

[9] For example, a (monthly) lag of 2 means that the TK for month t is calculated by the past return distribution from month $t-62$ to month $t-2$.

[10] See the Tables A3, A4, A5, and A6 for the detailed results of our analysis when predicting quarterly, half-yearly, nine-monthly, and yearly mutual fund flows.

(a) Coefficient of TK (b) t-statistic of the TK coefficient

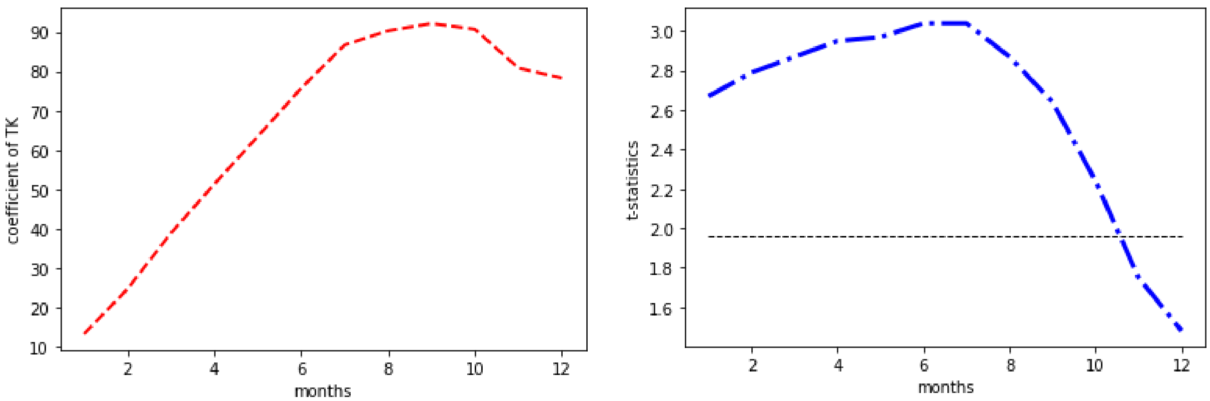

Figure 2: Mutual Funds Flows and TK - Horizon Effects. This figure reports the coefficients and t-statistics of TK as outlined in (13) for 12 different predictive horizons of future mutual fund flows. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)) over the respective predictive horizon, TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

4.1.2 Convexity in the Flow-Performance Relationship

The positive predictability of mutual fund flows by TK motivates us to investigate whether prospect theory can contribute in explaining the convexity in the flow-performance relationship, where Chevalier and Ellison (1997) document that the inflow of mutual funds with a good performance exceeds the outflow of mutual funds with a bad investment performance. Sirri and Tufano (1998) and Barber, Odean, and Zheng (2005) show that the squared performance is positively related to mutual fund flows. Other studies, such as Guercio and Tkac (2008), fail to confirm the relationship empirically.

In order to explore the functioning and existence of the convexity in the flow-performance relationship, we incorporate the mutual funds' squared mean return ($MEAN^2$) (which captures the documented convex flow–performance relationship) in our setting, as specified in (13), and report the results in Table 5. In line with Sirri and Tufano (1998) and Barber, Odean, and Zheng (2005), we find that $MEAN^2$ has a positive and significant coefficient. However the coefficient of $MEAN^2$ becomes insignificant (and even changes is sign) once we add TK (or its orthogonal counterpart Residual TK) to the specification. The results indicate that TK subsumes the information content of $MEAN^2$ and, therefore, captures the relevant information regarding the convexity in the flow-performance relationship.[11]

	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW
TK		13.40***	13.43**		
		(2.67)	(2.57)		
Residual TK*				13.22***	13.43**
				(2.60)	(2.57)
$MEAN^2$	770.847***		-135.234		53.463
	(2.94)		(-0.36)		(0.16)
FLOW	-0.210*	-0.206	-0.208*	-0.206	-0.208*
	(-1.65)	(-1.64)	(-1.65)	(-1.64)	(-1.65)
log(TNA)	-0.034	-0.034*	-0.034*	-0.034	-0.034
	(-1.65)	(-1.65)	(-1.65)	(-1.64)	(-1.64)
log(FTNA)	0.009	0.008	0.008	0.008	0.008
	(1.59)	(1.52)	(1.52)	(1.51)	(1.51)
log(AGE)	0.021	0.018	0.019	0.018	0.018
	(0.83)	(0.71)	(0.71)	(0.70)	(0.71)
EXP	-80.684	-80.781	-80.163	-80.885	-80.164
	(-1.39)	(-1.39)	(-1.39)	(-1.40)	(-1.39)
TURN	-0.003	0.002	0.002	-0.002	-0.002
	(-0.44)	(0.27)	(0.31)	(-0.26)	(-0.25)
MEAN	8.533***	-22.441**	-22.693**	10.04***	10.21***
	(2.81)	(-2.12)	(-2.01)	(2.91)	(2.97)
VOL	-0.614	8.989***	9.099**	5.406***	5.470**
	(-1.22)	(2.72)	(2.44)	(2.60)	(2.34)
SKEW	-0.060*	-0.079**	-0.079**	-0.043	-0.043
	(-1.84)	(-2.05)	(-2.03)	(-1.63)	(-1.63)
MAX	0.280	0.309	0.309	0.310	0.309
	(0.77)	(0.83)	(0.83)	(0.83)	(0.83)
MIN	0.286	0.270	0.275	0.271	0.275
	(1.39)	(1.34)	(1.36)	(1.34)	(1.36)
CONS	0.093***	0.160***	0.158***	0.022	0.020
	(3.22)	(3.24)	(3.34)	(0.89)	(0.76)
N	733028	733028	733028	733028	733028
R^2	0.311	0.312	0.322	0.314	0.320

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Mutual Funds Flows, Performance Convexity, and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), and TK (as calculated in (3)), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

The just obtained results present new evidence that the mutual fund investors' behav-

[11]Residual TK is constructed as in (10) including $MEAN^2$ to the orthogonalization procedure.

ioral preference extracted from prospect theory contribute in explaining the convexity in the flow-performance relationship. In the next step we want to better understand why TK incorporates the information content of $MEAN^2$, and, therefore, we investigate the individual building block of TK and its connection to $MEAN^2$ and future mutual fund flows.

In order to assess the relative importance of the individual TK components, that is i) loss aversion (LA), driven by λ and as introduced in (5), ii) concavity and convexity (CC), as a function of α, as introduced in (5), and iii) probability weighting (PW), as introduced in (6) and (7), we run the specifications as outlined in (13) and present the results in Table 6. For example, in the specification LA, the prospect value is only calculated considering loss aversion, hence $\lambda = 2.25, \alpha = \gamma = \delta = 1$. In CC we set $\alpha = 0.88, \lambda = \gamma = \delta = 1$. In PW we set $\gamma = 0.61, \delta = 0.69, \alpha = \lambda = 1$. Transitioning to two components, column $LACC$ retains loss aversion and concavity and convexity but does not consider probability weighting and, therefore, corresponds to $\alpha = 0.88, \lambda = \gamma = 1, \delta = 2.25$. $LAPW$ and $CCPW$ are calculated in a similar way.

From the analysis there are two main results emerging: First, regarding the mutual fund flow prediction by TK, one already obtains significance at the 10% level when predicting future mutual fund flows considering only LA, or PW as one ingredient of TK. For the specifications involving two components, such as $LACC$, and $CCPW$, the results display significance at the 5% level. Especially the analysis of the combined building blocks reveals that even though CC does not load significantly on future mutual fund flows in a university setting, it seems to be the most important part when combining it with other building blocks of TK. Second, when analyzing the level of significance across the variables, PW, which corresponds to the probability weighting property of TK, incorporates the information content inherited in $MEAN^2$.

Overall, the evidence suggests that the synergy effects from all three components, but especially from CC, are important and responsible for the positive predictive relationship of TK and $FLOW$. In addition, PW as part of TK, already contains the information content of $MEAN^2$ and, therefore, relates prospect theory to the convexity in the flow-performance relationship.

	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW	(7) FLOW	(8) FLOW
LA		37.641*						
		(1.70)						
CC			-14.913					
			(-0.51)					
PW				22.112*				
				(1.73)				
LACC					21.184**			
					(2.26)			
LAPW						9.778*		
						(1.71)		
CCPW							29.512**	
							(1.97)	
TK								13.431**
								(2.57)
MEAN^2	770.8***	622.032**	423.143*	-100.834	38.641	58.522	-162.633	-135.245
	(2.94)	(2.12)	(1.72)	(-0.30)	(0.12)	(0.18)	(-0.43)	(-0.36)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	733028	733028	733028	733028	733028	733028	733028	733028
R^2	0.303	0.312	0.313	0.312	0.313	0.312	0.311	0.313

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Mutual Funds Flows and TK components. This table reports the relationship between future mutual fund flows and TK components as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), loss aversion (LA) as introduced in (5), ii) concavity and convexity (CC) as introduced in (5), and iii) probability weighting (PW) as introduced in (6) and (7), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN, which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

4.2 TK and the Mutual Funds Performance

In this section, we investigate weather the investors' investment decision, which is driven by the mutual funds TK, is related to the mutual funds future performance. In summary, we find that there is a positive but significant relationship between the mutual funds' TK and various performance measures (including market timing measures). Hence, investors care about the mutual funds TK despite the fact that it is not related to any future outperformance of the mutual funds. This leads to the conclusion that mutual fund investors are subject to a behavioral bias explained by prospect theory when investing in a mutual fund.

In order to test the hypothesis we examine whether a high mutual funds' TK also predicts superior mutual funds performance. To answer this question, we exploit the following regression model:

$$PERF_{i,t} = \alpha + \beta_{i,t-1} \times TK_{i,t-1} + \lambda_{i,t-1} \times X_{i,t-1} + \epsilon_{i,t-1}, \tag{14}$$

where $PERF_{i,t}$ denotes the performance of mutual fund i at month t, that is, the cumulative style-adjusted return ($SRET$) or risk-adjusted return (from different factor models as described in Section 3.2). Table 7 reports the coefficients of the specification as outlined in (14) where we include the usual control variables as defined in Section 3.2. In summary, we cannot confirm the hypothesis that superior future mutual fund performance is already reflected in a higher mutual funds TK.[12]

[12] We also perform the predictive performance regression for a quarterly horizon with similar results; see Table A15.

	(1) SRET	(2) CAPM Alpha	(3) 4-factor Alpha	(4) 5-factor Alpha	(5) TM Alpha	(6) HM Alpha
TK	0.120	0.068	0.058	0.031	-0.054	-0.041
	(1.14)	(1.39)	(1.33)	(0.78)	-1.21	(-0.98)
FLOW	0.005	0.014***	0.008***	0.007***	0.024**	0.024**
	(0.57)	(5.00)	(4.00)	(2.77)	(2.06)	(2.07)
log(TNA)	-0.004	-0.001	-0.000	-0.001	-0.000	-0.001
	(-1.36)	(-1.46)	(-0.37)	(-0.94)	(-1.32)	(-0.93)
log(FTNA)	0.002	0.001**	0.001	-0.012***	-0.001***	-0.014***
	(1.34)	(2.13)	(0.90)	(-3.83)	(-2.03)	(-2.93)
log(AGE)	0.003	-0.000	-0.001	-0.000	-0.001	-0.000
	(1.19)	(-0.60)	(-0.59)	(-0.24)	(-1.39)	(-1.24)
EXP	-0.715***	-0.521***	-0.506***	-0.366***	-0.239*	-0.220
	(-2.71)	(-4.54)	(-6.37)	(-4.21)	(-1.78)	(-1.57)
TURN	0.001	-0.000	0.000	0.001	0.003	0.004
	(0.82)	(-0.29)	(0.39)	(0.72)	(0.79)	(0.90)
MEAN	0.462**	0.398***	0.289***	0.377***	0.615***	0.587***
	(2.52)	(3.21)	(2.69)	(3.85)	(4.44)	(4.69)
VOL	-0.104**	0.053	0.039	0.040	-0.045	-0.035
	(-2.08)	(1.56)	(0.92)	(1.15)	(-1.14)	(-1.08)
SKEW	-0.000	-0.001	-0.000	0.001	-0.003**	-0.003***
	(-0.05)	(-1.39)	(-0.40)	(0.51)	(2.19)	(-2.69)
MAX	-0.007	0.001	-0.000	-0.000	0.011	0.011
	(-1.25)	(0.79)	(-0.08)	(-0.16)	(1.13)	(1.09)
MIN	0.006	0.000	0.000	-0.001	0.010	0.007
	(1.03)	(0.35)	(0.12)	(-0.92)	(0.89)	(0.71)
CONS	-0.002	-0.002	0.000	-0.167***	0.007***	0.010***
	(-0.44)	(-1.54)	(0.27)	(-8.02)	(3.67)	(5.24)
N	733028	733028	733028	733028	733028	733028
R^2	0.350	0.493	0.418	0.409	0.440	0.437

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Monthly Mutual Funds Performance and TK. This table reports the relationship between the next month' mutual fund performance and TK as specified in (14). Thereby, variables are defined as in Section 3: $SRET$ (style-adjusted return), CAPM Alpha (risk-adjusted return of CAPM), 4-factor Alpha (risk-adjusted return of Carhart (1997) four-factor model), five-factor Alpha (risk-adjusted return of Fama and French (2015) five-factor model), TM Alpha (risk-adjusted return of Treynor and Mazuy (1966) timing model), HM Alpha (risk-adjusted return of Henriksson and Merton (1981) timing model), $FLOW$ (as calculated in equation (9)), TK (as calculated in equation (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

In addition to the multivariate regression as outlined in (14), we also report the returns of a portfolio sorting within our mutual fund universe. Therefore, at the beginning of each month, we rank mutual funds into deciles based on their TK and calculate equally and value-weighted portfolio returns for each decile over the subsequent month. Thereby, decile 1 (10) comprises mutual funds with the lowest (highest) TK. Table 8 exhibits the performance and the alphas (for a set of risk factors) for the different deciles, as well as for the difference between the two extreme portfolios (high TK – low TK). The fact that mutual funds with a high TK seem not to exhibit superior future performance suggests that directing incremental flows into mutual funds with a high TK is not necessarily beneficial for mutual fund investors. Hence, buying high TK mutual funds and selling low TK mutual funds is not a profitable strategy.

		P1 low TK	P2	P3	P4	P5	P6	P7	P8	P9	P10 high TK	TK high-low
SRET	EW	-0.099	0.063	-0.066	-0.001	-0.020	0.101	-0.061	-0.010	0.033	-0.019	0.080
		(-1.32)	(1.21)	(-1.60)	(-0.01)	(-0.51)	(0.92)	(-1.71)	(-0.34)	(0.98)	(-0.45)	(1.00)
SRET	VW	-0.093	0.065	-0.056	0.026	0.052	0.107	0.014	0.034	0.063	0.014	0.107
		(-1.07)	(1.10)	(-1.05)	(0.47)	(0.75)	(3.34)	(0.36)	(1.00)	(1.82)	(0.35)	(1.22)
CAPM Alpha	EW	-0.064	0.073	-0.050	0.019	-0.024	0.112	-0.061	-0.012	0.022	-0.041	0.013
		(-0.85)	(1.38)	(-1.19)	(0.39)	(-0.60)	(1.01)	(-1.67)	(-0.38)	(0.66)	(-0.98)	(0.85)
CAPM Alpha	VW	-0.038	0.079	-0.046	0.048	0.069	0.114	0.026	0.048	0.057	0.000	0.038
		(-0.44)	(1.31)	(-0.86)	(0.86)	(0.99)	(3.54)	(0.64)	(1.42)	(1.62)	(-0.02)	(1.36)
4-factor Alpha	EW	-0.030	0.087	-0.036	0.027	-0.009	0.0892	-0.068	-0.015	0.007	-0.040	-0.010
		(-0.47)	(1.78)	(-0.88)	(0.53)	(-0.23)	(0.79)	(-1.88)	(-0.53)	(0.23)	(-1.01)	(-0.41)
4-factor Alpha	VW	0.036	0.112	-0.007	0.067	0.081	0.114	0.029	0.039	0.039	0.004	-0.032
		(0.52)	(2.03)	(-0.13)	(1.22)	(1.15)	(3.67)	(0.71)	(1.16)	(1.24)	(0.09)	(-0.72)
5-factor Alpha	EW	-0.203	-0.009	-0.051	0.012	-0.038	0.144	-0.035	0.038	0.84	0.019	0.222
		(-1.04)	(-0.18)	(-1.19)	(0.22)	(-0.91)	(1.12)	(-0.92)	(1.30)	(2.83)	(0.47)	(1.43)
5-factor Alpha	VW	-0.136	0.012	-0.020	0.052	-0.028	0.104	0.023	0.088	0.113	0.046	0.182
		(-1.68)	(1.21)	(-0.36)	(0.91)	(-0.39)	(3.22)	(0.57)	(2.56)	(1.47)	(1.12)	(1.45)

Table 8: Decile Portfolio Analysis. This table reports average monthly excess returns and alphas, for both equal-weighted (EW) and value-weighted (VW) portfolios sorted on the mutual funds TK value. Portfolios are rebalanced monthly. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)) and TK (as calculated in (3)). Numbers are represented in percentages. The sample ranges from 1985 to 2019.

Barberis, Mukherjee, and Wang (2016) argue that investors, when taking an investment decision, mentally represent the stock distribution in the way described by prospect theory. Therefore, investors tilt their portfolios toward stocks whose past return distributions are appealing under prospect theory, causing them to become overvalued and earn subsequent low returns. However, for mutual funds, we find no substantial evidence to support the explanation of TK as a mutual fund return predictor, and, hence, our analysis shows that the outlined mechanism does not work in this setting. A high (low) TK mutual fund does not necessarily earn a low (high) subsequent return. We argue that a potential reason could be the difference in trading mechanisms between stocks and mutual funds: Stocks are almost purely traded in secondary markets, and, therefore, the high demand for one stock (due to its high TK) will result in a high current price and a subsequent low return. Mutual fund shares can be traded in primary and secondary markets; that is, investors can trade their mutual fund shares with other investors (in secondary markets) or purchase and redeem them for the market price by the respective mutual funds directly. Therefore, especially when acquiring mutual funds shares on the secondary market, the market price of the mutual funds holdings will not be directly affected and nor will the mutual funds' subsequent return.

This section analyzed the behavioral bias of mutual fund investors explained by prospect theory. Our empirical analysis reveals that the mutual funds TK predicts future mutual fund flows even though it is not related to the mutual funds' future performance. In the next section we want to change our focus to the mutual funds managers and investigate if they are also subject to a behavioral bias, which can be explained by prospect theory.

5 Mutual Funds Managers' Behavioral Biases

In the last part of our analysis we are investigating whether mutual fund managers are also subject to a behavioral bias, which can be explained by prospect theory. Therefore, as described in Section 3.2, we analyze the mutual funds managers' investment decisions, that is, the mutual funds' individual holdings over time, and in the scope of prospect theory.

Before we start with the main analysis of this section, we provide some summary statistics and basic graphs for the mutual funds holdings, that is, the individual stock universe. In Figure 3 the histogram of the stocks TK time-series averages is displayed. The histogram displays a dispersion in the stocks (average) TK value.

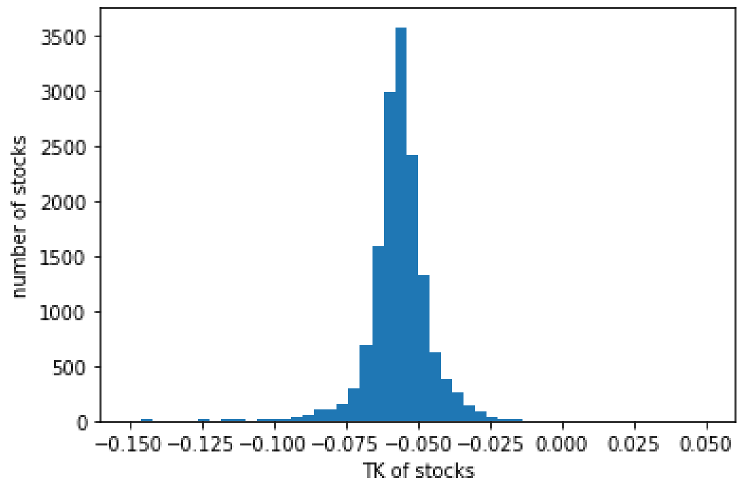

Figure 3: Histogram – TK of Individual Stocks. This figure displays the histogram for the time-series averages of the individual stocks' TK, where TK is calculated as in (3). We only select stocks that were reported at least once as a holding of any mutual fund. The sample ranges from 2004 to 2019.

In order to investigate whether the mutual fund manager is also subject to a behavioral bias identifiable by prospect theory, we construct, as discussed in Section 3.2, the mutual funds holdings average TK value ($AvgTK$) by simply value-weighting the mutual funds' portfolio holdings TK using the mutual funds' reported portfolio weights. A high $AvgTK$ indicates that the mutual fund holds a high proportion of stocks with a high TK. In Figure 4 the histogram of the mutual funds $AvgTK$ is displayed.

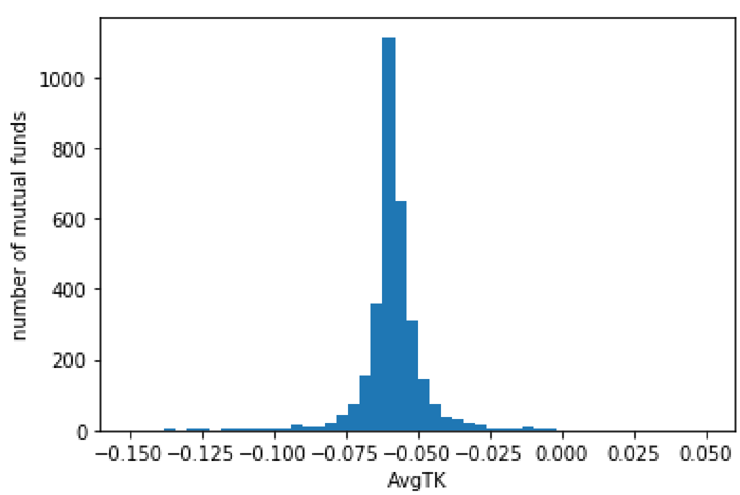

Figure 4: Histogram – AvgTK. This figure displays the histogram for the time-series averages of the mutual funds' $AvgTK$. Thereby, $AvgTK$ is calculated as in (11). The sample ranges from 2004 to 2019.

In the next step we investigate if there is any spillover effect of the investment behavior of the mutual fund managers reflected in the mutual funds $AvgTK$ to the mutual funds TK (as calculated in (3)). To answer this question we investigate the distribution of the mutual funds $AvgTK$ across the mutual funds, dividing them by their TK. We display the series of histograms in Figure 5 and their corresponding summary statistics in Table 9. As immediately inferable, there is no visible difference among the (average) holdings' TK across different buckets split by the mutual funds' TK. Therefore, the analysis provides a first indication that mutual fund managers do not base their investment decision on the stocks' TK value.

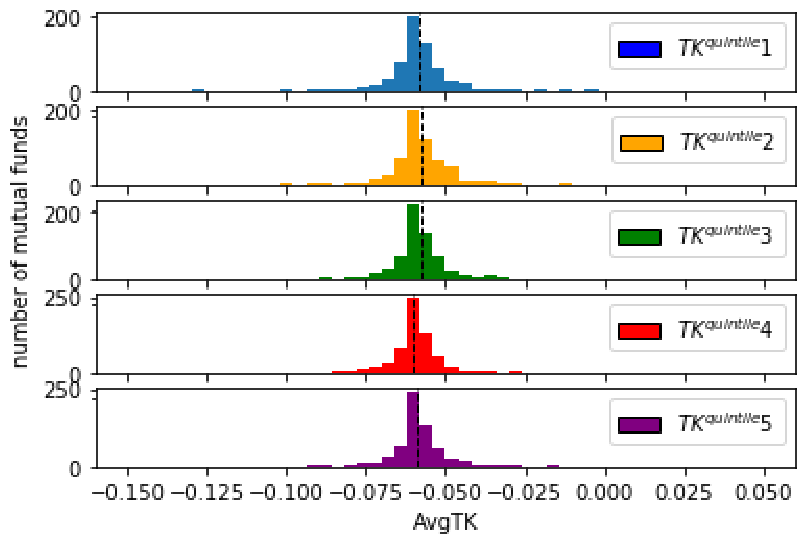

Figure 5: Histogram – AvgTK and TK. This figure displays the histograms for the time-series averages of the mutual funds $AvgTK$ depending on the mutual funds TK. Thereby, variables are defined as in Section 3: TK (as calculated in equation (3)), $AvgTK$ (as calculated in equation (11)). The sample ranges from 2004 to 2019.

	mean	std	min	max
$\text{AvgTK}_{TKquintile1}$	-0.058	0.021	-0.175	0.037
$\text{AvgTK}_{TKquintile2}$	-0.058	0.011	-0.119	0.035
$\text{AvgTK}_{TKquintile3}$	-0.058	0.015	-0.145	0.071
$\text{AvgTK}_{TKquintile4}$	-0.060	0.021	-0.251	-0.010
$\text{AvgTK}_{TKquintile5}$	-0.059	0.011	-0.162	-0.009
N	632			

Table 9: Summary Statistics – AvgTK and TK. This Table reports the summary statistics (mean, std, min, max) of the mutual funds $AvgTK$ depending on the mutual funds TK. Thereby, variables are defined as in Section 3: TK (as calculated in equation (3)), $AvgTK$ (as calculated in equation (11)). The sample ranges from 2004 to 2019.

In order to assess any statistical significance we estimate a Fama and MacBeth (1973) specification where we simply regress the mutual funds $TK_{i,t}$ on the mutual funds $AvgTK_{i,t}$.

To be independent of the absolute levels of TK and $AvgTK$, we repeat the analysis exploiting the cross-sectional rank of the variables (12) in an additional specification. The results are shown in Table 10 and display a positive but not significant relationship between the two variables. This leads us to the conclusion that the aggregated prospect theory value of the mutual funds' holdings is not reflected in the mutual funds prospect theory value (TK). In the next section we inspect the potential sources of the differences between TK and $AvgTK$.

	(1)	(2)
	TK	TK^{rank}
AvgTK	0.048	
	(0.54)	
AvgTK^{Rank}		0.527
		(0.58)
CONS	-0.010	1.332
	(-1.46)	(0.48)
N	49455	49455
R^2	0.055	0.057

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: AvgTK and TK. This table reports the coefficients of the contemporaneous regression of the mutual funds TK value on its $AvgTK$. Thereby variables are defined as in Section 3: TK (as calculated in (3)) and $AvgTK$ (as calculated in (11)). The sample ranges from 2004 to 2019.

5.1 The Differences between TK and $AvgTK$

In order to shed light into the differences of TK and $AvgTK$ we investigate if the two measures can be attributed to the portfolio managers' portfolio construction, and timing skills. Therefore we relate both measures, TK and $AvgTK$, to portfolio diversification, portfolio performance, and the market timing skills of the portfolio manager, by simply applying the following regression model

$$Y_{i,t} = \alpha + \beta_{i,t} \times X_{i,t} + \epsilon_{i,t}. \tag{15}$$

where $Y_{i,t}$ denotes the performance or timing measures for each mutual funds' i at time t and $X_{i,t}$ the mutual funds' TK and $AvgTK$ respectively.

5.2 Diversification

The definitions of TK (3) and $AvgTK$ (11) reveal immediately that the covariance between the individual portfolio holdings must be a crucial determinant of the difference between the two measures, since it is implicitly incorporated into the mutual funds portfolio return but not in the weighted sum of the individual portfolio holdings. The correlation between stocks measures diversification benefits, which limits portfolio risk, and is hence connected to one of the main objectives of the portfolio manager.

It seems natural to check if TK is related to portfolio diversification (as opposed to $AvgTK$). Therefore we calculate, for each point in time, and for each mutual funds, the Herfindahl-Index (HHI) as the sum of the squared portfolio weights. We then regress following (15) the mutual funds' HHI on the mutual funds' TK and $AvgTK$. The results are displayed in Table 11.

	(1) TK	(2) AvgTK
HHI	0.032**	0.002
	(1.98)	(0.28)
CONS	-0.021***	-0.058***
	(-30.61)	(-77.65)
N	49455	49455
R^2	0.028	0.022

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: TK, $AvgTK$ and Diversification. This table reports the relationship between the mutual funds Herfindahl-Index (HHI), TK (3)), and $AvgTK$ as specified in (14). The sample ranges from 2004 to 2019.

As already presumed, the HHI displays a strong positive contemporaneous relation with the mutual funds TK but not to the mutual funds $AvgTK$. This is in line with the intuition, since the stocks covariance is implicitly incorporated in TK but not in $AvgTK$.

5.3 Performance and Market Timing

In this section we investigate weather TK and $AvgTK$ are contemporaneously related to the mutual funds' performance or the funds managers market timing capabilities.

The results of the regression (15) for TK and $AvgTK$ are presented in Table 12 and Table 13. For TK they indicate a positive significant contemporaneous relationship to the mutual funds' performance. It is worth pointing out that, the strongest significance is found for performance measures related to market timing (Treynor and Mazuy (1966) TM Alpha and Henriksson and Merton (1981) HM Alpha). On the contrary, for $AvgTK$ the results display no significant relationship to any of the mutual funds' performance measures.

	(1) SRET	(2) CAPM Alpha	(3) 4-factor Alpha	(4) 5-factor Alpha	(5) TM Alpha	(6) HM Alpha
TK	0.618	0.111^{**}	0.106^{**}	0.043^{*}	0.123^{***}	0.121^{***}
	(1.49)	(2.17)	(2.19)	(1.86)	(4.25)	(3.20)
CONS	0.009	0.001	0.001	0.01^{*}	-0.018	-0.018^{***}
	(1.43)	(1.52)	(1.73)	(1.80)	(-7.14)	(-8.86)
N	733028	733028	733028	733028	733028	733028
R^2	0.164	0.261	0.225	0.224	0.240	0.237

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Fund Performance and TK – Contemporaneous. This table reports the relationship between the month' mutual fund performance and TK as specified in (15). Thereby, variables are defined as in Section 3: $SRET$ (style-adjusted return), CAPM Alpha (risk-adjusted return of CAPM), 4-factor Alpha (risk-adjusted return of Carhart (1997) 4-factor model), 5-factor Alpha (risk-adjusted return of Fama and French (2015) 5-factor model), TM Alpha (Treynor and Mazuy (1966)), and HM Alpha (Henriksson and Merton (1981)). The sample ranges from 2004 to 2019.

	(1) SRET	(2) CAPM Alpha	(3) 4-factor Alpha	(4) 5-factor Alpha	(5) TM Alpha	(6) HM Alpha
AvgTK	0.058	-0.072	0.068	0.126	0.025	0.082
	(0.80)	(-1.06)	(0.78)	(0.60)	(0.45)	(0.63)
CONS	0.010^{*}	-0.006	0.004	-0.082^{***}	0.001	0.002
	(1.67)	(-1.31)	(0.65)	(-4.65)	(0.25)	(0.36)
N	48665	48665	48665	48665	48665	48665
R^2	0.064	0.105	0.078	0.084	0.081	0.061

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Fund Performance and $AvgTK$ – Contemporaneous. This table reports the relationship between the month' mutual fund performance and $AvgTK$ as specified in (15). Thereby, variables are defined as in Section 3: $SRET$ (style-adjusted return), CAPM Alpha (risk-adjusted return of CAPM), 4-factor Alpha (risk-adjusted return of Carhart (1997) 4-factor model), 5-factor Alpha (risk-adjusted return of Fama and French (2015) 5-factor model), TM Alpha (Treynor and Mazuy (1966)), and HM Alpha (Henriksson and Merton (1981)). The sample ranges from 2004 to 2019.

The empirical analysis in this section reveals that TK and $AvgTK$ contain different information, which seems natural due the definition of both measures. The difference of the measures can be attributed to the diversification of the portfolio and the market timing skills of the portfolio manager.

6 Robustness

To verify the robustness results of the analysis to various specifications, a series of tests are carried out and reported in Appendix A. Overall, the results in the paper are robust.

6.1 Sub-periods Analysis

To analyze a possible change in the relationship between TK and $FLOW$ over time, we repeat the regressions outlined in (13) over the two sub-periods, that is, i) from 1985-01 to 2008-12 and ii) from 2009-01 to 2019-12. Table A7 and Table A8 indicate that TK remains significant in both periods but with a different economic magnitude. One potential explanation is that after the financial crisis, mutual investors are more aware about the behavioral biases connected to prospect theory, which increases the magnitude of the coefficient.

6.2 Alternative Definitions of TK

As described in Section 3.1, TK is calculated using monthly style-adjusted returns over a period of 60 months. In this section, we experiment with various alternative TK measures to assess the sensitivity of the relationship between TK and $FLOW$. While the style adjustment is intuitive in the mutual fund universe, we repeat the main analysis with an alternative TK measure called RTK, where we consider raw returns in the calculation of TK (see Table A9). In a second step we also calculate TK considering shorter rolling windows, that is, over 48 months (see Table A10) and 36 months (see Table A11).[13] Overall, we find that neither the usage of raw returns nor a shorting of the backward-looking window for the calculation of TK affects the major results outlined in the paper.

6.3 Clustered Standard Errors

Although we present results with standard errors corrected for autocorrelation and heteroscedasticity using Newey and West (1987), Petersen (2009) outlines that standard errors

[13] We consider a mutual funds TK for a given point in time if we have at least 40 observations (out of 48 months) or 30 observations (out of 36 months) available.

might be still underestimated. In Table A12, we test the TK-flow relationship using a panel regressions with standard errors clustered on two dimensions, that is, mutual fund and time, following Barber, Odean, and Zheng (2005) and Elton, Gruber, and Blake (2011). The results show that the effect and the magnitude of the coefficient of TK are similar to what we present in Table 3.

6.4 Idiosyncratic Volatility and Idiosyncratic Skewness

TK implicitly inherits the concept of probability weighting, which is also driven by the idiosyncratic components of the return distribution. To accommodate concerns that TK serves purely as a good proxy for idiosyncratic risk, we control for two additional idiosyncratic risk measures: idiosyncratic volatility and idiosyncratic skewness.

Idiosyncratic volatility is calculated as the standard deviation of the residuals from the regression of the individual mutual funds style adjusted excess returns on the Carhart (1997) four-factor model using a backward-looking window of 60 months, as follows:

$$R_{i,t}-r_{f,t} = \alpha_i+\beta_{m,i}\times(R_{m,t}-r_{f,t})+\beta_{HML,i}\times HML_t+\beta_{SMB,i}\times SMB_t+\beta_{UMD,i}\times UMD_t+\epsilon_{i,t}. \tag{16}$$

To decompose skewness into an idiosyncratic and systematic components, we follow Harvey and Siddique (2000) and estimate the following regression for each mutual fund over the previous 60 months, as follows:

$$R_{i,t} - r_{f,t} = \alpha + \beta_i \times (R_{m,t} - r_{f,t}) + \theta_i \times (R_{m,t} - r_{f,t})^2 + \epsilon_{i,t}, \tag{17}$$

where idiosyncratic skewness (Iskewness) is defined as the skewness of monthly residuals $\epsilon_{i,t}$, and the systematic skewness (Sskewness) is defined as the slope coefficient θ_i.

Table A13 reports the time-series average of the cross-sectional regressions for the mutual fund flows. In some settings, $IVOL$ loads negatively on future mutual fund flows even though the overall significance is rarely given (in contrast to the total volatility VOL, as reported in Table 3). This indicates that investors respond to the total risk of the mutual funds rather than its idiosyncratic risk. It turns out that the negative and significant relationship between skewness and TK (Table 3) is driven solely by systematic skewness component. The coefficients for TK remain highly significant in all specifications. In conclusion, the additional tests confirm that the impact of TK on future mutual fund flows is robust to the inclusion of idiosyncratic volatility and idiosyncratic skewness.

6.5 Alternative Mutual Funds Performance Measures

Berk and Van Binsbergen (2016) and Barber, Huang, and Odean (2016) examine the sensitivity of mutual fund flows to alternative performance metrics, such as the CAPM alpha and multi-factor alphas, where they report that the CAPM alpha displays the strongest predictive power. To incorporate their findings, Table A14 reports the parameter estimates from the outlined regressions in (13) but considers the CAPM alpha as a mutual fund performance measure (instead of its mean return).

6.6 $AvgTK$ as Main Predictor

We repeat the i) mutual fund flow prediction and ii) the prediction of the mutual funds performance exploiting $AvgTK$ as a predictor (instead of TK). The results are displayed in Table A16 and in Table A17 and reveal that there is no significant relationship between $AvgTK$ and future mutual fund flows or the future mutual funds performance.

7 Conclusion

This paper studies the behavioral biases identifiable by prospect theory for mutual fund investors and mutual fund managers. We conjecture that mutual fund investors and mutual fund managers evaluate their investment decisions under prospect theory.

We relate future mutual fund flows and performance measures to the mutual funds' prospect theory value and find that the mutual funds prospect theory value predicts mutual fund flows for long horizons controlling for multiple mutual fund characteristics. Therefore, our results suggests that investors mentally represent an investment by the distribution of the investment's past returns. The fact that the mutual funds' prospect theory value is not related to the mutual funds future performance identifies behavioral biases for mutual fund investors. Our analysis reveals that the prospect theory value of the mutual funds contains fundamentally different and incremental information compared to traditional predictors identified in the literature. In addition, the prospect theory value also subsumes the information content of mutual fund performance measures related to the convexity in the flow-performance relationship.

To investigate the behavioral bias of the mutual funds managers we analyze the individual holdings of the mutual funds over time and in the cross-section. The aggregation of the mutual funds holdings' prospect theory values displays no significant relation to the mutual funds prospect theory value. Therefore, our results show that mutual fund managers do not select the mutual fund holdings based on their prospect theory values and, are therefore, not subject to any behavior bias identifiable by prospect theory. The identification of the link between the holdings prospect theory values and the mutual funds prospect value is left for further research.

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Appendix

A Additional Tables

	(1)	(2)	(3)	(4)
	VIF	SQRT VIF	TORELANCE	R-SQURE
TK	3.512	1.871	0.285	0.715
FLOW	1.000	1.000	1.000	0.000
log(TNA)	1.261	1.122	0.796	0.204
log(FTNA)	1.191	1.090	0.837	0.163
log(AGE)	1.083	1.041	0.922	0.078
EXP	1.000	1.000	1.000	0.000
TURN	1.000	1.000	0.998	0.002
MEAN	4.911	2.211	0.204	0.796
VOL	2.042	1.431	0.490	0.510
SKEW	1.182	1.091	0.845	0.155
MAX	1.000	1.000	1.000	0.000
MEAN VIF	1.74			

Table A1: VIF of TK and Other Control Variables. This table reports the variance inflation factors (VIF) of TK and other control variables. Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
FLOW	-0.095	-0.193	-0.207	-0.178	-0.228*	-0.228*
	(-0.61)	(-1.51)	(-1.63)	(-1.37)	(-1.81)	(-1.81)
log(TNA)	-0.024	-0.033	-0.034	-0.004	-0.006*	-0.006*
	(-1.18)	(-1.58)	(-1.63)	(-1.21)	(-1.81)	(-1.85)
log(FTNA)	0.006	0.008	0.009	0.002*	0.002**	0.002**
	(1.05)	(1.47)	(1.61)	(1.78)	(2.06)	(2.04)
log(AGE)	0.024	0.021	0.022	0.001	0.001	0.001
	(0.89)	(0.81)	(0.84)	(0.81)	(0.86)	(0.85)
EXP	-84.171	-80.512	-80.764	-0.779	-0.762	-0.764
	(-1.41)	(-1.39)	(-1.38)	(-1.38)	(-1.39)	(-1.38)
TURN	0.143	-0.000	-0.003	0.000	-0.000	-0.000
	(0.78)	(-0.05)	(-0.41)	(0.02)	(-0.88)	(-1.56)
MEAN		7.725***	7.652***		0.003***	0.003***
		(2.62)	(2.62)		(2.86)	(2.79)
VOL		0.107	0.052		0.001	0.000
		(0.28)	(0.13)		(0.63)	(0.25)
SKEW		-0.062*	-0.060*		-0.005*	-0.005*
		(-1.89)	(-1.83)		(-1.81)	(-1.91)
MAX			0.283			0.002
			(0.78)			(0.80)
MIN			0.291			0.001
			(1.40)			(1.36)
CONS	0.0308	0.0810***	0.0845***	0.00769	0.00924	0.00965
	(0.88)	(2.99)	(3.07)	(0.95)	(1.18)	(1.22)
N	733028	733028	733028	733028	733028	733028
R^2	0.288	0.306	0.306	0.288	0.306	0.306

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Fund Flow without TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in equation (9)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1)	(2)	(3)	(4)	(5)	(6)
	FLOW	FLOW	FLOW	FLOW	FLOW	FLOW
TK	5.654***	38.681***	38.962***	0.004***	0.025***	0.026***
	(2.81)	(2.85)	(2.87)	(2.64)	(2.81)	(2.86)
FLOW	-0.198	-0.389	-0.402	-0.206	-0.261	-0.261
	(-0.53)	(-1.20)	(-1.25)	(-1.10)	(-1.45)	(-1.45)
log(TNA)	-0.012	-0.026	-0.028	-0.003	-0.002	-0.003
	(-0.49)	(-1.18)	(-1.29)	(-1.35)	(-1.44)	(-1.57)
log(FTNA)	0.009	0.013*	0.014*	0.000	0.001*	0.001**
	(0.89)	(1.67)	(1.88)	(0.28)	(1.95)	(2.07)
log(AGE)	0.001	-0.018	-0.016	0.000	-0.000	-0.000
	(0.03)	(-0.46)	(-0.41)	(0.33)	(-0.44)	(-0.38)
EXP	-136.912**	-132.321**	-132.434**	-0.696*	-0.705*	-0.705*
	(-1.80)	(-1.75)	(-1.74)	(-1.71)	(-1.75)	(-1.74)
TURN	-0.042	0.015	0.000	-0.003	0.000	0.000
	(-0.50)	(1.09)	(0.00)	(-0.38)	(0.47)	(0.02)
MEAN		-77.831***	-78.072***		-0.014**	-0.014**
		(-2.44)	(-2.46)		(-2.34)	(-2.41)
VOL		25.271***	25.402***		0.029***	0.029***
		(2.79)	(2.81)		(2.79)	(2.81)
SKEW		-0.232**	-0.227**		-0.010**	-0.010**
		(-2.32)	(-2.27)		(-2.21)	(-2.28)
MAX			-1.110			-0.004
			(-1.19)			(-1.20)
MIN			-0.316			-0.000
			(-0.39)			(-0.36)
CONS	0.256***	0.479***	0.499***	0.00803	0.00808	0.00813
	(3.38)	(3.41)	(3.35)	(1.30)	(1.35)	(1.39)
N	714321	714321	714321	714321	714321	714321
R^2	0.311	0.328	0.328	0.313	0.323	0.329

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Quarterly Fund Flow and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	9.762***	75.812***	75.691***	0.004***	0.034***	0.034***
	(3.09)	(3.03)	(3.04)	(3.03)	(2.99)	(3.03)
FLOW	-0.041	-0.351	-0.377	-0.125	-0.167	-0.166
	(-0.08)	(-0.92)	(-1.00)	(-0.84)	(-1.17)	(-1.16)
log(TNA)	0.050	0.021	0.013	0.002	-0.000	-0.001
	(1.09)	(0.62)	(0.39)	(0.70)	(-0.24)	(-0.35)
log(FTNA)	-0.001	0.007	0.010	0.000	0.001*	0.001*
	(-0.06)	(0.68)	(0.97)	(0.27)	(1.74)	(1.90)
log(AGE)	-0.055	-0.094	-0.088	-0.001	-0.001	-0.001
	(-1.20)	(-1.60)	(-1.50)	(-1.08)	(-1.22)	(-1.20)
EXP	-208.721**	-195.832**	-196.310**	-0.712**	-0.709**	-0.711**
	(-2.23)	(-2.14)	(-2.14)	(-2.08)	(-2.14)	(-2.14)
TURN	-0.053	0.029	0.013	-0.002	0.000	0.000
	(-0.51)	(1.35)	(1.15)	(-0.19)	(0.75)	(0.54)
MEAN		-160.823***	-159.543***		-0.020**	-0.020***
		(-2.66)	(-2.67)		(-2.55)	(-2.62)
VOL		49.238***	49.166***		0.038***	0.038***
		(2.89)	(2.90)		2.89	2.90
SKEW		-0.431**	-0.413**		-0.013**	-0.013**
		(-2.40)	(-2.32)		(-2.33)	(-2.41)
MAX			-1.218			-0.003
			(-1.29)			(-1.30)
MIN			-0.401			-0.000
			(-0.32)			(-0.40)
CONS	0.479***	0.958***	0.976***	0.005	0.008	0.009*
	(3.86)	(3.71)	(3.83)	(0.89)	(1.58)	(1.66)
N	695614	695614	695614	695614	695614	695614
R^2	0.301	0.321	0.321	0.310	0.323	0.324

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Half Yearly Fund Flow and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	14.121***	92.442***	92.103***	0.005***	0.032**	0.032***
	(3.52)	(2.62)	(2.64)	(3.59)	(2.58)	(2.62)
FLOW	0.265	-0.245	-0.313	-0.039	-0.117	-0.118
	(0.43)	(-0.56)	(-0.73)	(-0.28)	(-0.92)	(-0.93)
log(TNA)	0.078	0.051	0.052	0.004	0.001	0.001
	(1.34)	(0.98)	(0.99)	(1.51)	(0.47)	(0.34)
log(FTNA)	-0.002	0.006	0.007	0.000	0.001	0.001*
	(-0.08)	(0.39)	(0.45)	(0.08)	(1.48)	(1.76)
log(AGE)	-0.097	-0.156*	-0.159*	-0.001*	-0.002	-0.002
	(-1.60)	(-1.78)	(-1.82)	(-1.88)	(-1.59)	(-1.57)
EXP	-287.302***	-244.832**	-245.337**	-0.775***	-0.695**	-0.696**
	(-2.76)	(-2.48)	(-2.47)	(-2.60)	(-2.48)	(-2.47)
TURN	-0.075	0.046*	0.022	-0.005	0.000	0.000
	(-0.39)	(1.66)	(1.56)	(-0.47)	(1.51)	(1.20)
MEAN		-202.734**	-200.939**		-0.019**	-0.020**
		(-2.36)	(-2.37)		(-2.24)	(-2.31)
VOL		55.813**	55.644**		0.034**	0.034**
		(2.35)	(2.36)		(2.36)	(2.36)
SKEW		-0.494*	-0.487*		-0.012**	-0.012**
		(-1.91)	(-1.90)		(-1.98)	(-2.05)
MAX			-2.520**			-0.005**
			(-2.03)			(-2.04)
MIN			-0.814			-0.001
			(-0.40)			(-0.47)
CONS	0.793***	1.417***	1.466***	0.00461	0.00780*	0.00825*
	(4.77)	(3.55)	(3.77)	(0.83)	(1.67)	(1.79)
N	676907	676907	676907	676907	676907	676907
R^2	0.331	0.332	0.332	0.330	0.332	0.333

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Nine-Monthly Fund Flow and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	18.861***	79.072	78.263	0.006***	0.022	0.023
	(3.80)	(1.48)	(1.48)	(3.83)	(1.45)	(1.47)
FLOW	0.165	-0.344	-0.374	-0.056	-0.106	-0.105
	(0.21)	(-0.64)	(-0.71)	(-0.41)	(-0.82)	(-0.82)
log(TNA)	0.125	0.078	0.080	0.005	0.002	0.001
	(1.57)	(1.05)	(1.08)	(1.62)	(0.68)	(0.58)
log(FTNA)	-0.00676	0.0155	0.0153	0.000	0.001*	0.001*
	(-0.22)	(0.80)	(0.79)	(0.21)	(1.69)	(1.83)
log(AGE)	-0.150*	-0.212*	-0.214*	-0.002**	-0.002	-0.002
	(-1.90)	(-1.82)	(-1.84)	(-2.06)	(-1.61)	(-1.59)
EXP	-343.623***	-299.947***	-301.032***	-0.767***	-0.705***	-0.707***
	(-2.97)	(-2.74)	(-2.74)	(-2.78)	(-2.74)	(-2.74)
TURN	-0.220	0.0415	0.0286	-0.006	0.000	0.000
	(-0.81)	(1.55)	(1.44)	(-0.57)	(1.07)	(0.93)
MEAN		-184.643	-181.423		-0.014	-0.015
		(-1.55)	(-1.54)		(-1.43)	(-1.49)
VOL		39.15	38.80		0.020	0.019
		(0.99)	(0.98)		(0.99)	(0.98)
SKEW		-0.416	-0.410		-0.009	-0.009
		(-1.16)	(-1.15)		(-1.23)	(-1.28)
MAX			-1.706			-0.003
			(-1.10)			(-1.10)
MIN			-1.180			-0.001
			(-0.47)			(-0.58)
CONS	1.051***	1.702***	1.715***	0.004	0.007	0.008*
	(5.49)	(3.31)	(3.57)	(0.70)	(1.58)	(1.73)
N	658200	658200	658200	658200	658200	658200
R^2	0.311	0.323	0.324	0.310	0.323	0.323

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Yearly Fund Flow and TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	0.179***	2.662***	2.591***	0.009*	0.005***	0.005***
	(2.65)	(2.61)	(2.76)	(1.81)	(2.73)	(2.76)
FLOW	0.112***	-2.432	-2.850*	0.469	0.548*	0.547*
	(2.67)	(-1.51)	(-1.81)	(1.21)	(1.76)	(1.75)
log(TNA)	-0.002	-0.050	-0.063	-0.008	-0.002	-0.002
	(-0.27)	(-1.21)	(-1.48)	(-0.35)	(-0.48)	(-0.48)
log(FTNA)	0.0000	0.014	0.019*	0.013	0.003*	0.003*
	(0.01)	(1.30)	(1.71)	(0.76)	(1.70)	(1.71)
log(AGE)	-0.002	0.010	0.013	0.002	0.001	0.001
	(-0.46)	(0.64)	(0.89)	(0.28)	(0.95)	(0.95)
EXP	-5.069***	-9.508	-9.540	-0.321	-0.707***	-0.708***
	(-2.81)	(-1.38)	(-1.38)	(-0.23)	(-4.12)	(-3.13)
TURN	-0.009	-0.064	0.032	0.212	0.001	0.001
	(-0.57)	(-0.96)	(0.97)	(1.41)	(1.07)	(1.08)
MEAN		-2.231***	-2.231***		-0.013***	-0.013***
		(-3.29)	(-3.31)		(-4.21)	(-3.19)
VOL		-0.650	-0.762		-0.002	-0.002
		(-0.67)	(-0.79)		(-0.67)	(-0.70)
SKEW		-0.001	0.002		0.003	0.003
		(-0.08)	(0.20)		(1.42)	(1.42)
MAX			0.072			0.002
			(0.19)			(0.15)
MIN			0.063			0.031
			(1.29)			(1.04)
CONS	0.039***	0.170	0.185*	0.027	0.021**	0.021**
	(5.18)	(1.58)	(1.67)	(0.98)	(2.26)	(2.25)
N	314427	314427	314427	314427	314427	314427
R^2	0.410	0.431	0.431	0.413	0.431	0.431

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Robustness: Fund Flow and TK - before the financial crisis. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	8.517***	46.278***	47.379***	0.010***	0.054***	0.055***
	(2.96)	(3.12)	(3.16)	(2.96)	(3.12)	(3.16)
FLOW	-0.905**	-0.898**	-0.898**	-0.906**	-0.899**	-0.898**
	(-2.25)	(-2.28)	(-2.28)	(-2.25)	(-2.28)	(-2.28)
log(TNA)	-0.105	-0.113*	-0.113*	-0.017	-0.018*	-0.018*
	(-1.62)	(-1.69)	(-1.69)	(-1.62)	(-1.69)	(-1.69)
log(FTNA)	0.029*	0.026*	0.026*	0.005*	0.004*	0.005*
	(1.89)	(1.75)	(1.78)	(1.89)	(1.75)	(1.78)
log(AGE)	0.091	0.060	0.060	0.004	0.002	0.002
	(1.06)	(0.67)	(0.64)	(1.06)	(0.67)	(0.64)
EXP	-262.621	-267.434	-267.932	-2.486	-2.531	-2.536
	(-1.38)	(-1.37)	(-1.36)	(-1.38)	(-1.37)	(-1.36)
TURN	-0.007	-0.012	-0.014	-0.000	-0.001	-0.001
	(-1.21)	(-1.42)	(-1.52)	(-1.21)	(-1.42)	(-1.52)
MEAN		-81.338**	-84.023**		-0.027**	-0.028**
		(-2.46)	(-2.54)		(-2.46)	(-2.54)
VOL		30.959***	31.598***		0.063***	0.064***
		(3.17)	(3.21)		(3.17)	(3.21)
SKEW		-0.277**	-0.280**		-0.022**	-0.022**
		(-2.28)	(-2.29)		(-2.28)	(-2.29)
MAX			1.090			0.008
			(0.85)			(0.85)
MIN			0.956			0.002
			(1.40)			(1.40)
CONS	0.220**	0.504***	0.528***	0.032	0.035	0.036
	(2.46)	(3.67)	(3.77)	(1.25)	(1.34)	(1.35)
N	415406	415406	415406	415406	415406	415406
R^2	0.290	0.312	0.312	0.291	0.312	0.312

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Robustness: Fund Flow and TK - after the financial crisis. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
RAW TK	2.768***	8.962**	9.087**	0.003***	0.010**	0.010**
	(2.77)	(2.36)	(2.37)	(2.59)	(2.33)	(2.33)
FLOW	-0.181	-0.219*	-0.235*	-0.222*	-0.239*	-0.239*
	(-1.34)	(-1.70)	(-1.83)	(-1.70)	(-1.87)	(-1.87)
log(TNA)	-0.030	-0.033	-0.032	-0.006	-0.006*	-0.006*
	(-1.47)	(-1.57)	(-1.50)	(-1.59)	(-1.82)	(-1.84)
log(FTNA)	0.007	0.008	0.007	0.002**	0.002**	0.002**
	(1.43)	(1.50)	(1.40)	(1.99)	(2.02)	(2.05)
log(AGE)	0.024	0.017	0.015	0.001	0.001	0.001
	(0.95)	(0.64)	(0.58)	(0.96)	(0.84)	(0.77)
EXP	-80.791	-82.942	-83.149	-0.759	-0.785	-0.787
	(-1.40)	(-1.40)	(-1.39)	(-1.39)	(-1.40)	(-1.39)
TURN	-0.011	-0.004	-0.008*	0.003	-0.000	-0.000
	(-0.82)	(-0.68)	(-1.80)	(0.63)	(-1.32)	(-1.41)
RAW MEAN		-10.491*	-10.762*		-0.004*	-0.004*
		(-1.68)	(-1.70)		(-1.65)	(-1.70)
RAW VOL		5.655**	5.696**		0.012**	0.012**
		(2.38)	(2.39)		(2.38)	(2.39)
RAW SKEW		-0.074*	-0.075*		-0.005*	-0.005*
		(-1.96)	(-1.96)		(-1.78)	(-1.86)
MAX			0.271			0.002
			(0.73)			(0.73)
MIN			0.302			0.001
			(1.45)			(1.45)
CONS	0.0916***	0.145***	0.153***	0.00829	0.00902	0.00943
	(3.01)	(3.46)	(3.46)	(1.05)	(1.12)	(1.15)
N	733028	733028	733028	733028	733028	733028
R^2	0.296	0.314	0.315	0.296	0.314	0.315

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A9: Robustness: Fund Flow and Raw TK. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), RTK (as calculated in (3) considering raw monthly returns), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $RAWMEAN$, $RAWVOL$, $RAWSKEW$, (the mean, standard deviation, and skewness of monthly raw returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Varibles		
	(1)	(2)	(3)	(4)	(5)	(6)
	FLOW	FLOW	FLOW	FLOW	FLOW	FLOW
TK48	2.006***	12.023***	12.411***	0.003***	0.014**	0.015***
	(3.12)	(2.61)	(2.66)	(3.28)	(2.58)	(2.65)
FLOW	-0.155	-0.201	-0.219*	-0.195	-0.230*	-0.230*
	(-1.13)	(-1.59)	(-1.75)	(-1.51)	(-1.85)	(-1.85)
log(TNA)	-0.027	-0.032	-0.030	-0.005	-0.006*	-0.006*
	(-1.36)	(-1.54)	(-1.48)	(-1.49)	(-1.82)	(-1.83)
log(FTNA)	0.007	0.007	0.007	0.001	0.002**	0.001**
	(1.23)	(1.36)	(1.29)	(1.33)	(2.04)	(1.97)
log(AGE)	0.023	0.018	0.016	0.001	0.001	0.001
	(0.87)	(0.66)	(0.60)	(0.85)	(0.81)	(0.77)
EXP	-83.068	-81.922	-82.002	-0.776	-0.775	-0.776
	(-1.43)	(-1.38)	(-1.38)	(-1.41)	(-1.38)	(-1.38)
TURN	-0.018	0.011	-0.002	-0.011	-0.000	-0.000
	(-0.55)	(1.17)	(-0.46)	(-1.43)	(-0.80)	(-1.48)
MEAN48		-21.982**	-22.913**		-0.008**	-0.008**
		(-2.19)	(-2.26)		(-2.12)	(-2.23)
VOL48		7.906***	8.142***		0.016***	0.017***
		(2.68)	(2.73)		(2.67)	(2.73)
SKEW48		-0.082**	-0.083**		-0.005*	-0.006**
		(-2.10)	(-2.12)		(-1.89) (-1.99)	
MAX			0.281			0.002
			(0.76)			(0.78)
MIN			0.267			0.001
			(1.32)			(1.41)
CONS	0.079***	0.146***	0.154***	0.008	0.009	0.010
	(2.79)	(3.17)	(3.28)	(1.02)	(1.17)	(1.20)
N	733028	733028	733028	733028	733028	733028
R^2	0.295	0.313	0.314	0.296	0.313	0.314

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Robustness: Fund Flow and TK - 48 months window. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), $TK48$ (as calculated in (3) over a 48 months window), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN48$, $VOL48$, $SKEW48$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous four years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK36	0.864	11.971**	12.492***	0.001*	0.015**	0.016**
	(1.35)	(2.52)	(2.61)			
FLOW	-0.252*	-0.215*	-0.221*	-0.206	-0.232*	-0.232*
	(-1.74)	(-1.71)	(-1.77)	(-1.61)	(-1.86)	(-1.86)
log(TNA)	-0.035*	-0.036*	-0.036*	-0.005	-0.006*	-0.006*
	(-1.68)	(-1.80)	(-1.82)	(-1.47)	(-1.84)	(-1.83)
log(FTNA)	0.0111*	0.0108**	0.0109**	0.002**	0.002**	0.002**
	(1.78)	(1.97)	(2.03)	(2.15)	(2.03)	(2.02)
log(AGE)	0.027	0.021	0.021	0.001	0.001	0.001
	(1.00)	(0.80)	(0.79)	(0.93)	(0.89)	(0.80)
EXP	-85.491	-82.158	-82.234	-0.799	-0.778	-0.778
	(-1.40)	(-1.39)	(-1.39)	(-1.39)	(-1.39)	(-1.39)
TURN	-0.014	0.006	0.002	0.002	-0.000	-0.000
	(-0.59)	(0.79)	(0.34)	(0.33)	(-0.76)	(-1.09)
MEAN36		-24.818**	-25.973**		-0.010**	-0.011**
		(-2.37)	(-2.44)		(-2.33)	(-2.42)
VOL36		7.514**	7.849**		0.016**	0.017**
		(2.43)	(2.52)		(2.43)	(2.53)
SKEW36		-0.088**	-0.089**		-0.006**	-0.006**
		(-2.23)	(-2.23)		(-2.18)	(-2.27)
MAX			0.293			0.002
			(0.78)			(0.79)
MIN			0.297			0.001
			(1.40)			(1.37)
CONS	0.064**	0.141***	0.148***	0.009	0.009	0.010
	(1.98)	(3.15)	(3.27)	(1.05)	(1.17)	(1.20)
N	733028	733028	733028	733028	733028	733028
R^2	0.296	0.315	0.316	0.296	0.315	0.316

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Robustness: Fund Flow and TK - 36 months window. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in equation (9)), $TK36$ (as calculated in equation (3) over a 36 months window), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN36$, $VOL36$, $SKEW36$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous three years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW
TK	16.660**	33.830*	33.870*	0.082**	0.167*	0.173*
	(2.01)	(1.91)	(1.93)	(2.01)	(1.91)	(1.93)
FLOW	-0.014***	-0.015***	-0.016***	-0.183***	-0.196***	-0.198***
	(-3.85)	(-3.69)	(-3.69)	(-3.62)	(-3.33)	(-3.33)
log(TNA)	-0.586*	-0.644*	-0.654*	-1.204*	-1.323*	-1.343*
	(-1.89)	(-1.88)	(-1.86)	(-1.89)	(-1.84)	(-1.88)
log(FTNA)	0.134	0.144	0.154	0.295	0.316	0.346
	(1.24)	(1.23)	(1.13)	(1.24)	(1.33)	(1.23)
log(AGE)	0.160	0.152	0.162	0.083	0.079	0.085
	(1.36)	(1.15)	(1.55)	(1.35)	(1.45)	(1.15)
EXP	0.008	-0.005	-0.005	0.001	-0.001	-0.001
	(0.61)	(-0.36)	(-0.36)	(0.61)	(-0.36)	(-0.36)
TURN	-0.013	-0.010	-0.010	-0.007	-0.006	-0.006
	(-1.33)	(-1.19)	(-1.19)	(-1.33)	(-1.19)	(-1.19)
MEAN		-0.277	-0.276		-0.022	-0.023
		(-1.54)	(-1.57)		(-1.55)	(-1.62)
VOL		-1.160	-1.159		-0.030	-0.030
		(-0.95)	(-0.95)		(-0.95)	(-0.95)
SKEW		-0.238	-0.234		-0.240	-0.247
		(-1.21)	(-1.24)		(-1.21)	(-1.25)
MAX			-0.023			-0.002
			(-1.01)			(-1.01)
MIN			0.012			-0.003
			(1.23)			(1.23)
CONS	0.865	1.108	1.108	0.0497*	0.0587**	0.0587**
	(1.52)	(1.53)	(1.53)	(1.89)	(2.04)	(2.04)
Mutual Fund FE	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES
N	733015	697888	697888	733015	697888	697888
R^2	0.313	0.324	0.323	0.313	0.315	0.326

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A12: Robustness: Fund Flow and TK - Clustered Standard Errors. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in equation (9)), TK (as calculated in equation (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables				Standardized Variables			
	(1) FLOW	(2) FLOW	(3) FLOW	(4) FLOW	(5) FLOW	(6) FLOW	(7) FLOW	(8) FLOW
TK	13.401***	4.293***	4.827***		0.016***	0.005***	0.006***	
	(2.67)	(2.82)	(2.80)		(2.66)	(2.75)	(2.83)	
FLOW	-0.206	-0.187	-0.227*	-0.226*	-0.227*	-0.234*	-0.234*	-0.233*
	(-1.64)	(-1.44)	(-1.78)	(-1.77)	(-1.82)	(-1.84)	(-1.84)	(-1.83)
log(TNA)	-0.034*	-0.034*	-0.036*	-0.037*	-0.006*	-0.006*	-0.006*	-0.006*
	(-1.65)	(-1.68)	(-1.81)	(-1.83)	(-1.86)	(-1.76)	(-1.75)	(-1.74)
log(FTNA)	0.008	0.010**	0.011**	0.011**	0.002**	0.002**	0.002**	0.002**
	(1.52)	(1.97)	(2.17)	(2.26)	(1.98)	(2.03)	(2.01)	(1.97)
log(AGE)	0.018	0.025	0.028	0.029	0.001	0.001	0.001	0.001
	(0.71)	(1.00)	(1.14)	(1.16)	(0.73)	(1.06)	(1.04)	(1.06)
EXP	-80.781	-81.942	-81.713	-81.150	-0.765	-0.776	-0.773	-0.768
	(-1.39)	(-1.40)	(-1.40)	(-1.38)	(-1.39)	(-1.40)	(-1.40)	(-1.38)
TURN	0.002	0.004	0.002	0.002	-0.000	-0.000	-0.000	-0.000
	(0.27)	(0.67)	(0.46)	(0.41)	(-1.45)	(-1.21)	(-1.28)	(-1.32)
MEAN	-22.441**	-2.888	-4.325	6.488**	-0.007**	-0.001	-0.001	0.002**
	(-2.12)	(-1.09)	(-1.40)	(2.40)	(-2.07)	(-0.90)	(-1.40)	(2.52)
VOL	8.989***				0.018***			
	(2.72)				(2.72)			
SKEW	-0.079**				-0.006**			
	(-2.05)				(2.10)			
IVOL		1.320	1.535	-1.988**		0.003	0.003	-0.004**
		(1.20)	(1.22)	(-2.12)		(1.20)	(1.22)	(-2.10)
SSKEW			-0.007**	-0.006**			-0.001**	-0.001*
			(-2.45)	(-2.33)			(-2.38)	(-1.78)
ISKEW		-0.290	-0.293	-0.287		-0.001	-0.001	-0.001
		(-0.89)	(-0.90)	(-0.92)		(-0.86)	(-0.89)	(-0.91)
MAX	0.309	0.320	0.338	0.315	0.002	0.002	0.002	0.002
	(0.83)	(0.86)	(0.91)	(0.85)	(0.84)	(0.91)	(0.90)	(0.91)
MIN	0.270	0.400*	0.385*	0.392*	0.000	0.001*	0.001*	0.001
	(1.34)	(1.72)	(1.66)	(1.69)	(1.15)	(1.68)	(1.83)	(1.64)
CONS	0.160***	0.103***	0.100***	0.080***	0.010	0.009	0.009	0.009
	(3.24)	(3.67)	(3.32)	(3.08)	(1.23)	(1.12)	(1.11)	(1.09)
N	733028	733028	733028	733028	733028	733028	733028	733028
R^2	0.296	0.310	0.304	0.313	0.296	0.310	0.304	0.313

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A13: Robustness: Fund Flow and TK - Idiosyncratic Volatility, Idiosyncratic Skewness. This table reports the relationship between future mutual fund flows and Residual TK as outlined in (13). Thereby, variables are defined as in Section 3 and 6.4: $FLOW$ (as calculated in equation (9)), TK (as calculated in equation (3)), $\log(TNA)$, $\log(FTNA)$, $\log(AGE)$ (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1)	(2)	(3)	(4)	(5)	(6)
	FLOW	FLOW	FLOW	FLOW	FLOW	FLOW
TK	2.640***	2.551***	2.554**	0.003**	0.003***	0.003**
	(2.79)	(2.64)	(2.57)	(2.53)	(2.81)	(2.58)
FLOW	-0.128	-0.209	-0.195	-0.189	-0.233*	-0.236*
	(-0.86)	(-1.61)	(-1.49)	(-1.46)	(-1.83)	(-1.85)
log(TNA)	-0.027	-0.031	-0.033*	-0.006*	-0.005	-0.005*
	(-1.35)	(-1.54)	(-1.67)	(-1.73)	(-1.57)	(-1.69)
log(FTNA)	0.006	0.008	0.009*	0.001	0.001	0.002*
	(1.06)	(1.55)	(1.90)	(1.47)	(1.56)	(1.93)
log(AGE)	0.024	0.024	0.025	0.001	0.001	0.001
	(0.93)	(0.96)	(1.00)	(1.09)	(0.99)	(1.01)
EXP	-81.182	-78.903	-79.260	-0.741	-0.747	-0.750
	(-1.44)	(-1.40)	(-1.39)	(-1.39)	(-1.40)	(-1.39)
TURN	0.001	-0.007	-0.002	-0.003	0.000	-0.000
	(0.09)	(-0.58)	(-0.25)	(-0.63)	(0.29)	(-0.65)
ALPHA		0.982**	0.944**		0.001**	0.001**
		(2.51)	(2.37)		(2.44)	(2.56)
MAX			0.303			0.002
			(0.82)			(0.93)
MIN			0.398*			0.001
			(1.71)			(1.62)
CONS	0.089***	0.091***	0.097***	0.009	0.008	0.008
	(3.13)	(3.27)	(3.35)	(1.16)	(0.99)	(1.10)
N	733028	733028	733028	733028	733028	733028
R^2	0.288	0.316	0.316	0.288	0.316	0.316

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A14: Robustness: Fund Flow and TK - Alpha as Performance Measure. This table reports the relationship between future mutual fund flows and TK as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), and TK (as calculated in (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $ALPHA$, (the CAPM alpha over one year of return data), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	(1) SRET	(2) CAPM Alpha	(3) 4-factor Alpha	(4) 5-factor Alpha
TK	0.350	0.343*	0.248*	0.042
	(1.34)	(1.67)	(1.74)	(0.34)
FLOW	-0.003	0.039***	0.024***	0.027***
	(-0.32)	(5.29)	(5.39)	(3.95)
log(TNA)	-0.009	-0.002	-0.000	-0.000
	(-1.50)	(-1.46)	(-0.04)	(-0.06)
log(FTNA)	0.005*	0.004**	0.002	-0.037***
	(1.94)	(2.16)	(0.69)	(-3.77)
log(AGE)	0.006	-0.001	-0.002	-0.003
	(1.09)	(-0.54)	(-0.66)	(-0.87)
EXP	-1.958***	-1.669***	-1.634***	-1.214***
	(-3.03)	(-4.51)	(-4.83)	(-4.64)
TURN	0.000	-0.001	0.000	0.002
	(0.06)	(-0.55)	(0.08)	(0.78)
MEAN	1.221**	0.797*	0.648*	1.101***
	(2.50)	(1.75)	(1.96)	(3.68)
VOL	-0.283**	0.285**	0.205	0.0854
	(-2.02)	(1.99)	(1.48)	(0.80)
SKEW	0.006	-0.006*	-0.005	0.001
	(1.00)	(-1.69)	(-1.51)	(0.09)
MAX	-0.003	0.004	-0.002	-0.002
	(-0.39)	(0.98)	(-0.62)	(-0.41)
MIN	0.001	-0.000	-0.000	-0.005
	(0.19)	(-0.07)	(-0.20)	(-1.56)
CONS	-0.008	-0.007*	-0.002	-0.497***
	(-0.93)	(-1.70)	(-0.59)	(-7.97)
N	718952	718952	718952	718952
R^2	0.350	0.493	0.418	0.409

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A15: Quarterly Fund Performance and TK. This table reports the relationship between the next quarters' mutual fund performance and TK as outlined in (14). Thereby, variables are defined as in Section 3: $SRET$ (style-adjusted return), CAPM Alpha (risk-adjusted return of CAPM), 4-factor Alpha (risk-adjusted return of Carhart (1997) 4-factor model), 5-factor Alpha (risk-adjusted return of Fama and French (2015) 5-factor model), $FLOW$ (as calculated in equation (9)), TK (as calculated in equation (3)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 1985 to 2019.

	Unstandardized Variables			Standardized Variables		
	(1)	(2)	(3)	(4)	(5)	(6)
	FLOW	FLOW	FLOW	FLOW	FLOW	FLOW
AvgTK	0.117	0.512	1.181	0.000	0.002	0.004
	(0.08)	(0.81)	(1.28)	(0.08)	(0.87)	(1.16)
FLOW	-7.461	-7.249	-7.221	-7.466	-7.248	-7.216
	(-1.45)	(-1.46)	(-1.46)	(-1.45)	(-1.46)	(-1.46)
log(TNA)	-0.029*	-0.028	-0.029	-0.005*	-0.004	-0.004
	(-1.80)	(-1.50)	(-1.51)	(-1.76)	(-1.31)	(-1.35)
log(FTNA)	-0.015*	-0.025***	-0.024**	-0.002	-0.004**	-0.004**
	(-1.69)	(-2.62)	(-2.41)	(-1.65)	(-2.27)	(-2.18)
log(AGE)	0.035*	-0.048	-0.034	0.002*	-0.002	-0.002
	(1.81)	(-0.83)	(-0.65)	(1.73)	(-0.98)	(-0.85)
EXP	-442.532	-347.142	-349.238	-4.189	-3.285	-3.300
	(-1.37)	(-1.41)	(-1.42)	(-1.37)	(-1.41)	(-1.42)
TURN	-1.624	-0.544	-0.371	-0.070	-0.023	-0.015
	(-1.49)	(-1.33)	(-1.41)	(-1.49)	(-1.33)	(-1.41)
MEAN		31.164*	31.813**		0.011**	0.011**
		(1.93)	(1.99)		(1.98)	(2.04)
VOL		-8.403*	-8.586*		-0.017*	-0.017*
		(-1.76)	(-1.71)		(-1.76)	(-1.72)
SKEW		-0.185	-0.192		-0.014	-0.015
		(-1.28)	(-1.29)		(-1.23)	(-1.26)
MAX			-5.874			-0.040
			(-1.43)			(-1.40)
MIN			-0.517			-0.001
			(-0.83)			(-0.85)
CONS	0.769	1.231*	1.319	0.043	0.025	0.024
	(1.24)	(1.66)	(1.60)	(1.38)	(1.28)	(1.27)
N	49294	49294	49294	49294	49294	49294
R^2	0.295	0.312	0.312	0.295	0.312	0.312

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table A16: Fund Flow and AvgTK. This table reports the relationship between future mutual fund flows and $AvgTK$, exploiting a similar specification as outlined in (13). Thereby, variables are defined as in Section 3: $FLOW$ (as calculated in (9)), $AvgTK$ (as calculated in (11)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a mutual fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 2004 to 2019.

	(1) SRET	(2) CAPM Alpha	(3) 4-factor Alpha	(4) 5-factor Alpha
AvgTK	-0.041	-0.014	-0.004	-0.019
	(-1.14)	(-1.61)	(-0.56)	(-1.48)
FLOW	0.004	0.010***	0.005***	0.004**
	(0.81)	(4.42)	(4.40)	(2.33)
log(TNA)	0.000	0.000	-0.000	0.000
	(1.40)	(0.81)	(-0.04)	(0.60)
log(FTNA)	0.000	0.000	0.000	-0.000**
	(0.66)	(0.51)	(0.66)	(-2.05)
log(AGE)	-0.002	0.000	0.000	-0.002
	(-1.00)	(0.71)	(0.82)	(-1.61)
EXP	-0.446	-0.137	-0.204	-0.252
	(-1.35)	(-0.78)	(-1.24)	(-1.57)
TURN	-0.016	-0.008***	-0.007***	-0.011***
	(-1.57)	(-2.94)	(-3.60)	(-2.83)
MEAN	0.092	0.700***	0.474***	0.557***
	(0.55)	(8.48)	(5.76)	(5.56)
VOL	0.057	-0.000	-0.013	0.024
	(1.19)	(-0.00)	(-0.60)	(0.88)
SKEW	-0.000	0.000	0.000	-0.001*
	(-0.25)	(0.68)	(0.75)	(-1.90)
MAX	0.096	0.016	0.006	0.033
	(1.14)	(0.90)	(0.90)	(1.22)
MIN	0.009	-0.005	-0.001	-0.002
	(0.74)	(-1.44)	(-0.17)	(-0.72)
CONS	0.003	-0.005	-0.003	-0.083***
	(0.39)	(-1.47)	(-1.25)	(-4.01)
N	49294	49294	49294	49294
R^2	0.350	0.493	0.418	0.409

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A17: Monthly Fund Performance and AvgTK. This table reports the relationship between the next month' mutual fund performance and $AvgTK$ as specified in (14). Thereby, variables are defined as in Section 3: $SRET$ (style-adjusted return), CAPM Alpha (risk-adjusted return of CAPM), 4-factor Alpha (risk-adjusted return of Carhart (1997) 4-factor model), 5-factor Alpha (risk-adjusted return of Fama and French (2015) 5-factor model), $FLOW$ (as calculated in equation (9)), $AvgTK$ (as calculated in equation (11)), log(TNA), log($FTNA$), log(AGE) (the logarithm of) the total net assets of a mutual fund, the total net assets of the mutual funds that belong to the same family, and the number of months since a fund's inception date, EXP (the total operating expenses), $TURN$ (the monthly turnover ratio), $MEAN$, VOL, $SKEW$, (the mean, standard deviation, and skewness of monthly style-adjusted returns over the previous five years), and MAX and MIN which denote the highest and lowest return over the last 12 months. The sample ranges from 2004 to 2019.