Mutual Fund Flows and Performance: A Survey of Empirical Findings

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Abstract

This survey presents a brief overview of the literature on the relationship between mutual fund flows and performance. The two questions most concerned are whether the flow-performance relationship is convex and what possible reasons for this convexity are. Research in this area has generated a large amount of conflicting results. A focus of the survey is how the literature, mostly empirical, deals with these conflicts, establishes their own findings and evolves.

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1 Introduction

Do mutual fund investors chase performance? The answer is not that simple. In a rational world this should depend on the predictability of past performance on future performance. For example, whether fund performance is *"persistent"*. In reality, empirical evidence has generally suggested that flows into and out of mutual funds seems to be related to lag measures of returns, however defined. Moreover, it has long been observed, especially after the papers of Sirri and Tufano (1998) and Chevalier and Ellison (1997), that the fund flow-performance relationship is asymmetric in nature. Investors rush into funds with high lagged performance, while tend to stay in funds that has performed poorly. Although there are still some conflicting results, this phenomenon has been documented and widely accepted as the *convex flow-performance relationship*.

The question becomes more and more important as the mutual fund industry is bigger than ever. According to the ICI, there are over 15000 mutual funds in the United States by 2011, with combined assets of over $13 trillion, which accounts for almost one fourth of household total financial assets. Despite different data sources and methodologies various studies have employed, this convex relationship is fairly robust. The reasons for the convexity, however, is still unclear.

While there has been no consensus regarding the causes of the convexity, researchers struggle to find explanations that is in line with the rational investor theory. However, it is quite a puzzle given previous researches on the persistence of fund performance. Going as far back as Jensen (1968)'s pioneer work on risk adjusted performance of mutual funds, people has been arguing on whether fund performance is persistent over time and whether fund managers are *skilled*. This *hot hands* effect was extensively examined during the late 1990s, yielding conflicting results. Early results suffer from a number of statistical biases including selection bias, survivorship bias and omission bias. A notable work in this area is Hendricks, Patel and Zeckhauser (1993), which suggests persistence in the near term. However, their findings have been heavily criticized by many other scholars. For example, Carhart (1997) employs a dataset that is largely free of survivorship bias and finds no evidence of persistence, except for worst performing funds, and dismisses the existence of manager skills. He attributes this nonexistence of skills as a natural result of market efficiency. Suppose, for a moment, that mutual funds do not exhibit persistence in performance, then it is even harder to explain the investors' behavior of chasing good performing funds.

The fund flow-performance relationship is essential to understand the risk taking behavior of both investors and managers. Investor incentives are explicitly documented by the relationship. And since fund manager compensation is usually tied to total assets under management, managerial incentives are also affected by the relationship. Superior returns attract more cash flow into the fund, while poor returns will not have a symmetrically bad consequence. As a result, managers will be encouraged to take on higher risks. This leads to the *tournament hypothesis*.

The rest of the survey is structured as follows. Section Two reviews the measurement of flows and performance, as well as the establishment of the flow-performance relationship. In particular both the relationship between returns and subsequent flows and the relationship between flows and subsequent returns are included. Section Three explores possible explanations for this convexity. Section Four discusses its implications and section Five concludes.

2 The Flow-Return Relationship

2.1 Measuring Performance

The evaluation of fund performance, or more broadly the performance of managed portfolios has long been a central problem of financial economists. Any real empirical study of flow-performance relationship would have to address this measurement. The primary databases to construct the measurement are CRSP survivorship free mutual fund database and SEC filings in EDGAR, including N-Q, N-SAR, semiannual and annual reports[1]. Research in this area has been concentrated in risk taking concerns and informational content of measures (i.e. conditional and unconditional measures). Each of these measures will be discussed in the following sections.

Figure 1 below summaries typical metrics of performance assessment. The measurements most frequently being used including raw returns, market adjusted returns, Jensen's α, factor models α, conditional α and the rank of the above respectively. Table 1 details the functional form of selected most popular measurements.

[1]It is worth mentioning that as pointed out by Elton, Gruber and Blake (2001) CRSP survivorship free mutual fund data base is not free of omission bias, which has the same effect as survivorship bias.

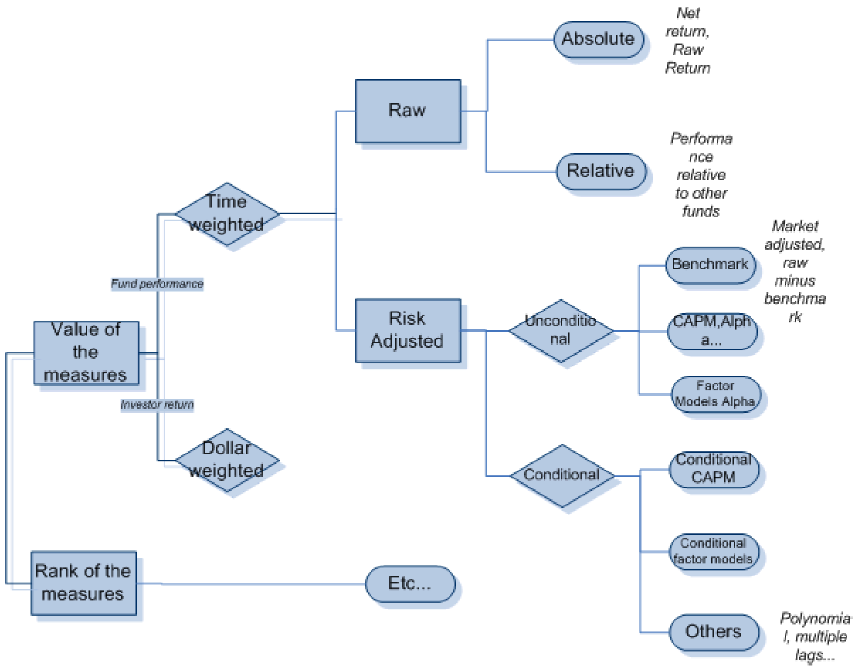

Figure 1: Various measurements of fund performance

Measurement	Expression
Raw returns	$R_{i,t}$
Excess return over the market	$R_{i,t} - R_{m,t}$
Excess return-single factor model	$r_{pt+1} = \alpha_p + \beta_{1p} r_{mt+1} + \epsilon_{pt+1}$
Excess return-Fama French	$r_{pt+1} = \alpha_p + \beta_{1p,RMRF} RMRF_t + \beta_{1p,HML} HML_t + \beta_{1p,SMB} SMB_t + \epsilon_{pt+1}$
Excess return-conditional single factor	$r_{pt+1} = \alpha_p + \delta_{1p} r_{mt+1} + \delta'_{2p}(z_t r_{mt+1}) + \epsilon_{pt+1}$
Excess return-conditionalFama French	$r_{pt+1} = \alpha_p + \delta_{1p,RMRF} RMRF_t + \delta_{1p,HML} HML_t + \delta_{1p,SMB} SMB_t + \delta_{2p,RMRF}(z_{t-1} RMRF_t) + \delta_{2p,HML} z_{t-1} HML_t + \delta_{2p,SMB} z_{t-1} SMB_t + \epsilon_{pt+1}$

Table 1: Selected most popular mutual fund performance measurements

A. Raw and risk adjusted mutual fund performance

Do risks matter in measuring the performance of managed portfolios? The answer to this question for the majority of the scholars is yes. Jensen (1968) proposed his famous Jensen's α back in the 1960s. Numerous economists continue to work on this issue. Elton, Gruber, Das and Hlavka (1993) explicitly documented that failure to include a risk factor leads to a substantial overestimate of performance. The article serves as a major critic of Ippolito (1989), who finds persistent above zero return for the mutual fund industry even after accounting for transaction costs.

Elton, Gruber, Das and Hlavka (1993) studied the effect of non S&P assets, namely bonds and non S&P stocks, on fund performance. They show in order to check the effect of inclusion of an asset, it is only necessary to estimate the α of that asset. Utilizing return on several alternative passively managed portfolio as proxies of bond and non S&P stock performance, they find dramatically high α in the exact same time period of Ippolito (1989), thereby establishing their critics that Ippolito's results are due to failure to appropriately adjust for risk in their performance measurements.

A recent work by Clifford, Fulkerson, Jordan and Waldman (2011), however, dismissed the advantage of using risk adjusted returns from the investors' perspective. They confirmed the flow-performance relationship and illustrated that investors chase past *raw* performance *without regard to risk*. If return is regressed on both raw returns and the standard deviation of the return, the risk measure, the coefficient on standard deviation is not statistically significant. Given that risk is immaterial to average mutual fund investors, they interpreted the reason that managers are not able to persistently produce positive risk adjusted returns to be the incentive of the managers, not the lack of skills. Managers will choose high raw return stock, although sometimes it is value destroying.

Notice although there are some proposals to use raw returns, Jensen's α and market adjusted return (the difference of net return and the return of some benchmark) are still the most popular measurements among the research of fund flow-performance relationship.

B. Conditional risk adjusted measures

Standard measures of performance, as noted by Ferson and Schadt (1996), are subject to a number of biases. If economic conditions vary over time, such that the risk and return profile fluctuates, then it is not reliable to use unconditional measures. The authors modified Jensen's α to accommodate conditioning information. The conditional CAPM is given by:

$$r_{it+1} = \beta_{im}(Z_t) r_{mt+1} + u_{i,t+1}$$
$$E(u_{i,t+1}|Z_t) = 0$$
$$E(u_{i,t+1} r_{mt+1}|Z_t) = 0$$

First order Taylor approximate this function linearly and state it in a regression form:

$$r_{pt+1} = \alpha_p + \delta_{1p} r_{mt+1} + \delta'_{2p}(z_t r_{mt+1}) + \epsilon_{pt+1}$$

Where δ_{1p} is the mean of conditional beta, while δ_{2p} is the response coefficients of the conditional beta with respect to the instrument variables of public information. The equation can also be interpreted as an unconditional factors model, with the two factors being market index and the product of market index and lagged information index. The conditional measure controls for common variation as a result of publicly available information by using instruments that represent time-varying situation. Thus if, hypothetically, the flow-performance relationship becomes insignificant after imposing the conditional performance measure, it suggests investors are rationally responding to macroeconomic variables. The authors examined monthly data of a not so comprehensive mutual fund set, 67 funds, and found both statistically and economically significant conditioning information factor, thus they conclude that the conditional measures is superior to traditional unconditional measures.

C. Absolute and relative measures, time weighted and dollar weighted measures

Both absolute and relative measurements are popular in flow-performance researches. The relative measures, usually ranks of the returns within a comparable category, are natural ways to incorporate investors' behavior resulting from social comparison theory before making investment decisions. The criterions implemented to distinguish different groups can be fund families, Morning star ratings, size of funds, and age of funds and so on. Sirri and Tufano (1998) ranked all funds in their data set at a given year and within a given category into twenty bins based on their realized 1 year, 2years and 3 years returns net expenses. Ivkovic and Weisbenner (2009) and Ivkovich and Weisbenner (2006) find fund inflows are sensitive to relative performance measures (relative to other funds pursuing the same objective) while fund outflows are sensitive only to absolute measures. Besides, as noticed by Kempf and Ruenzi (2004), the relative performance of a fund within its family has important implication for the future inflows.

Another interesting paper by Friesen and Sapp (2007) tried to reveal fund investors' timing ability. To capture investors' timing ability they used the difference between time weighted return and dollar weighted return. Time weighed return is the performance measure mentioned above, which serves a measure of the performance of the funds. While dollar weighed return is the internal rate of return of money under management, which is supposed to be a measure of the performance of investors. They found poor timing ability largely offsets positive risk adjusted α gained from good performing funds.

D. Which measure to use?

Zheng (1999) utilizes different measures of returns and risk adjusted returns and finds these measures are generally robust to his empirical tests. Although it should be noticed what he tested is the "smart money" effect, the relationship between fund flow and subsequent fund performance. By constructing portfolios of past winners (positive net flow) and losers separately, he finds the smart money effects exists and is short lived, regardless of the performance measures employed: excess return, various alpha, and conditional measures of the mentioned metrics. The coefficient estimates of the conditional model are generally higher for positive portfolios than the traditional one, and lower for negative portfolios. But the differences are minimal and not always consistent.

The table below lists various measurements proposed by notable researches of mutual funds[2]. Despite the differences in measuring performance, as well as differences in modelling technology and data source, the asymmetric nature of flow and performance is very robust, which suggests the choice of performance measures will not likely affect the analysis of fund flow-performance relationship. However, as the table below show risk adjusted and conditional measures are employed more frequently than raw measures.

[2]Source: Clifford, Fulkerson, Jordan and Waldman (2011).

Authors	Year	Performance measure								
		Net return	Market-adjusted return	Alpha	Net return rank	Risk-adjusted rank	Residuals	Spline or Kinks	Polynomial	Multiple lags
Ippolito	1992						x	x		x
Chevalier and Ellison	1997		x							x
Sirri and Tufano	1998				x					
Khorana	2001			x						
Bergstresser and Poterba	2002	x								
Del Guercio and Tkac	2002		x	x				x		
Karceski	2002		x							
Elton, Gruber, and Blake	2003				x					
Lynch and Musto	2003			x				x		
Nanda, Wang, and Zheng	2004			x						
O'Neal	2004			x		x				x
Barber, Odean, and Zheng	2005		x						x	
Berk and Tonks	2007	x		x	x				x	
Cashman, Deli, Nardari, and Villupuram	2007a					x				
Cashman, Deli, Nardari, and Villupuram	2007b			x						x
Coval and Stafford	2007	x								x
Huang, Wei, and Yan	2007					x				
Del Guercio and Tkac	2008	x								
Keswani and Stolin	2008			x						
Gil-Bazo and Ruiz-Verdu	2009			x						
Ivkovic and Weisbenner	2009	x			x					
Kim	2009		x			x			x	x
Sensoy	2009		x	x				x		
Singal and Xu	2009				x					
Spiegel and Zhang	2009		x			x		x		
Evans	2010				x	x				
Reuter and Zizewitz	2010			x						x
Yadav	2010				x					

Figure 2: Summary of performance measures utilized by notable papers

2.2 Measuring Flows

The treatment of measuring mutual fund flows is largely homogenous in the literature. The growth rate of total net assets (TNA) has been used in some most influential papers. TNA data is available in CRSP survivorship free mutual fund data base. For instance, in Sirri and Tufano (1998) the fund flow is measured by:

$$f_{i,t} = \frac{TNA_{i,t} - (1 + R_{i,t})TNA_{i,t-1}}{TNA_{i,t-1}}$$

Where $f_{i,t}$ is the net flow into fund i at time t, and $R_{i,t}$ is the respective return of the fund.

Most studies to date considered only net flows, as the data is readily available while the data of inflows and outflows have to be collected from SEC filings. As net flows are the result of offsetting effects of gross inflows and gross redemptions, and they may be affected by performance in very different manners, it is worthwhile to explore the flow-performance relationship for gross inflows and gross outflows (redemptions) separately. Several researches have dug into this issue. These include Bergstresser and Poterba (2002), Edelen (1999), Johnson (2007),Ivkovic and Weisbenner (2009) and Clifford, Fulkerson, Jordan and Waldman (2011). All of them rely on SEC filings except for Johnson (2007), who has a data set of transactions of over 50000 investors within one fund family, thus has only limited representativeness, and Ivkovic and Weisbenner (2009), whose data comes from a discount broker.

Due to the difficulty in acquiring required data from SEC filings, Bergstresser and Poterba (2002) conducted research on the top 200 largest equity funds in their primary data set[3]. They search for these funds in Edgar, Edgar Pro and fund web pages for fund's purchases and redemptions from year 1994 to 1998. Filings provided by Edgar is often messy, they come in different formats, with values missing and not user friendly. The files been explored here is generally N-SAR. Edelen (1999), for example, collect information on total inflow and total outflow from N-SAR (This information is provided *monthly*, i.e. six inflows and six outflows per N-SAR report, given that N-SAR is filed semiannually. The information is in item 28.), as well as total purchases and total sales of securities trading (This information is provided *semiannually*, the information is in item 71). His sample consists of 166 randomly selected funds. A more impressive data collection process is detailed in Clifford, Fulkerson, Jordan and Waldman (2011). Instead of concentrating on a few funds, they exact data from the entire universe of N-SAR filings and merge it with CRSP. A informative guideline on how to exact data from Edgar's N-SAR filings is provided in the appendix of Clifford, Fulkerson, Jordan and Waldman (2011).

[3]Their primary data source is exacted from MorningStar.

Bergstresser and Poterba (2002), Clifford, Fulkerson, Jordan and Waldman (2011) and Edelen (1999) found the inflow-performance relationship is much stronger than that of outflow. Ivkovic and Weisbenner (2009), however, found both inflow and outflow are sensitive to past performance, and that inflow is more responsive to relative performance while outflow is affected by absolute performance.

Spiegel and Zhang (2010) propose using market share as the dependent variable instead of growth rate of TNA. The logic lies behind is that when taking percentage growth as the measure of fund flow, implicitly it has to be assumed that fractional fund flow is a constant and independent of performance. However, if aggregate fund flows are high so would the average of each individual fund flows. Employing market share as the measure can address this problem.

2.3 The Establishment of Convexity

A. Early studies

Ippolito (1992) is among the first to investigate investor reaction to fund performance. Besides he also noticed the relationship between flow and performance maybe nonlinear. The sample estimated comprises 143 open ended mutual funds with substantial market share. The sample period is from 1965 to 1984. The performance of funds is measured by a residual in the CAPM equation, which is essentially Jensen's α plus an error term. Fund flow is again measured by (annual) growth rate. The basic specification is given by:

$$G_{i,t} = C_1 V_{i,t-1} + dF + eY + error$$

Where G is the measure of growth of TNA and V is the measure of performance mentioned above. F and Y are fund and year dummies, respectively. The regression results confidently reject the hypothesis that fund flow is independent of recent performance. The coefficient on performance measure of all 1 year, 2years and 3 years lag are all statistically significant.

Re-estimate by separating positive and negative returns, he found all coefficients on positive returns are positive and statistically significant while all coefficients on negative ones are not significant. He concluded that "the market's reaction is disproportionately concentrated to new investments compared to transferring money from existing investments". Investors are willing to put money in new investment opportunities but reluctant to withdraw from existing investments.

While most studies concentrated on individual mutual fund performance and flow, Warther (1995) took a different perspective by analyzing *aggregate* cash flows into all mutual funds and market wide returns. He argued that the micro and macro setting differs dramatically since individual fund inflows are largely outflows of other funds. Thus the micro analysis focuses on the competition within mutual fund industry, whilst the macro analysis concerns the industry as a whole.

The paper found directly contradictory results compared with individual fund level studies. There is no clear evidence that aggregate fund flows are affected by past performance. He did on some level support the "smart money" effect and did not reject the positive correlation between flows and subsequent returns.

B. Later studies

The most influential papers in the area are Chevalier and Ellison (1997) and Sirri and Tufano (1998). Chevalier and Ellison (1997) followed a semiparametric approach. The baseline specification is given as the following[4]:

$$\begin{aligned} FLOW_{it+1} = & \sum_k \gamma_k Agek_{it} f(r_{it} - rm_t) + \sum_k \delta_k Agek_{it} \\ & + \alpha_1 (r_{it-1} - rm_{t-1}) + \alpha_2 (r_{it-2} - rm_{t-2}) \\ & + \alpha_3 (r_{it+1} - rm_{t+1}) + \alpha_4 IndustryGrowth_{t+1} \\ & + \alpha_5 log(Assets_{it}) + \epsilon_{it+1} \end{aligned}$$

The semiparametric specification puts few prior restrictions on the shape of the flow-performance relationship. In the above equation, $FLOW$ is the same fund flow measure as before, namely the growth rate of TNA. Age is a dummy indicating the age of the fund. $Agek$ means a fund falls into the one of age category labeled k,

[4] Since clear time sequence is entailed in the specification the possibility of reverse casuality is ruled out.

$2, 3, 4, 5, 6-7, 8-10, > 11$. The excess returns are denoted $r_{it} - rm_t$. The shape of the function is estimated by unknown function f. *Age* times f allows the sensitivity to vary across fund ages. The data set contains flow and performance of 3036 fund-years over the period 1982-1992, which is extracted from Morningstar Mutual Funds Ondisc.

The data set is further divided into 2 subsamples, young funds aged 2-5 and old funds of age 6 or more. Thus the setting allows the shape of flow-performance relationship differ between young and old funds. The identification of the model is given by omitting one age category's coefficients (γ and δ) in each subsample, that is to create base line cases. If the coefficient estimates γ_k is positive, then the flow-performance relationship is more sensitive in age group k than the omitted age category. Similarly if the estimation result of δ_k is positive, then the flow is higher in category k than in the omitted group.

The estimation proceeds in three steps: Firstly estimate the α coefficient. For each subsample of a single age category, a consistent estimator of α can be obtained by performing kernel regression of both $FLOW_{it+1}$ and X_{it} on $r_{it} - rm_t$ and then regress the residuals on the residuals. Computing the sample size weighted average of each age category's α yields the estimator of α. In the second step, notice that in each age category $\gamma_k f + \delta_k$ can be consistently estimated from the kernel regression of $FLOW_{it+1} - \alpha X_{it}$ on $r_{it} - rm_t$[5], using each age category's data only. Denote this estimates of $\gamma_k f + \delta_k$ as $\hat{g}_k$, and combining with the baseline case of $\hat{g}_0$. With appropriately chosen support values, $\hat{\gamma}_k$ and $\hat{\delta}_k$ can be obtained. As a last step, an estimation of f can be produced from another kernel regression of:

$$\hat{y}_t \equiv \frac{FLOW_{it+1} - \sum_k \hat{\delta}_k Agek_{it} - \hat{\alpha} X}{1 + \sum_k \hat{\gamma}_k Agek_{it}}$$

[5]This is suggested by Robinson (1988).

In the two figures (figure 1 and figure 2) of the paper the major estimation results are presented. Fund flows are responsive to past returns. The authors noticed the nonlinearity of the flow-performance relationship but suspected that it is convex. Further, the sensitivity of flow-performance relationship is higher for younger funds.

For a sample of 690 funds offered by 288 distinction fund families, Sirri and Tufano (1998) explicitly documented the convex relationship between fund flow and performance for the period from December 1971 through December 1990. The data was acquired from the Investment Company Data Institute (ICDI), and was cross checked with Wiesenberger Investment Reports and Morningstar Mutual Fund data. The baseline specification of the estimation of flow-performance relationship is given by[6]:

$$FLOW_{i,t} = (Return_{i,t-1}, Riskiness_{i,t-1}, Expenses_{i,t-1}, OBJFLOW_t, logTNA_{i,t-1})$$

Where $FLOW$ is again the net percentage growth of fund TNA for *year t*. They rank all funds in their data set at a given year and within a given category into subgroups based on their realized 1 year, 2years and 3 years returns net expenses. Since the topic of interest is the asymmetry of flow-performance relationship, a *linear piecewise regression* is utilized. Each fund is assigned a rank ranging from 0 to 1. They estimate the regression for each RANK quintile (1st to 5th) separately. $OBJFLOW$ represents the growth rate of a fund objective category. $logTNA$ is the size proxy. Thus the above specification is effectively:

$$FLOW_{i,t} = (RawreturnRANK_{i,t-1}, ReturnStd_{i,t-1}, Totalfees_{i,t-1}, OBJFLOW_t, logTNA_{i,t-1})$$

[6]A comprehensive list of fund flow determinants proposed in various previous studies is been detailed in Appendix A.

Notice it is possible that each fund-year is not an independent observation such that the standard errors would be inappropriately underestimated and the t statistics would be overestimated. Therefore the authors adopt the Fama and MacBeth (1973) approach and estimate each year??s observations separately. The reported coefficients and t statistics are based on the mean of the time series of coefficient estimates.

They confirmed the previous research that mutual fund flows are sensitive to past performance, and the sensitivity is not linear. Those top performers in the top quintile in their respective objective category are much more sensitive to prior returns than those in the lower quintiles. There is also some evidence that consumers are averse to risk since the coefficient on standard deviation of lagged returns is negative, although not that statistically significant. The authors further pointed out that this asymmetry in the relationship will encourage managers to take on higher level of risk since if the return turned out to be high, the fund will have more inflows and assets while if the return out to be low the loss of the fund assets is only moderate. The managers can exploit the option like nature of their payoff by increasing the variance of returns.

Another interesting point as noted by Sirri and Tufano (1998) is that investors' response to fee changes is also asymmetric. Fee increases are not statically associated with growth of fund flow while fee decreases are. For a 20 basis point decrease in fees, the net fund flow increases by 4.3 percent. A further analysis of the relationship between fees and performance is detailed by Gil-Bazo and Ruiz-Verd (2009).

The paper carefully addressed the survivorship bias issue. If the fund performed badly disappeared from the sample, would it lower the relevant sensitivity? They re-estimated the above specification with a survivorship bias free database over the period 1987-1990 and still found stronger flow-performance relationship for high performers than poor performance, which suggests the survivorship bias is not the cause of the low sensitivity for poor performers.

One of the possible explanations for the convex flow-performance relationship provided by Sirri and Tufano (1998) is differential search costs for high and poor performers. They argue that the fund manager and the fund family will put more effort to advertise a fund performed well in the past. Top funds would have significant media coverage while funds with low returns would virtually receive no coverage. These differences in the marketing strategy lead to differential search costs. Since "consumer would purchase those funds that are easier or less costly for them to identify", funds with higher prior returns would attract more inflows. This is also in line with the asymmetric nature of the fees-flow relationship. When the search costs are low, the cash inflow would be significant higher. However, when the search costs are high, the cash outflow would not be as much.

C. Macro level studies

Mutual fund flow-performance relationship has been a topic of intense study since Ippolito (1992), Carhart (1997) and Sirri and Tufano (1998). As mentioned earlier, Warther (1995) conducted a macro aggregate level study. Studies with macro level data, i.e. treat the entire market as a whole, differ fundamentally from micro level study. Mutual funds compete against each other to attract investor cash. At the macro level, flows between funds net out. The macro level analysis thus concerns only aggregate flow into and out of the entire market. The results support the s-mart money hypothesis but question the positive relationship between returns and subsequent flows. This contrasts most micro level studies. The primary data source is Investment Company Institute. They have monthly inflows and outflows of each defined fund objective group. Taking stock, bond and gold bonds as examples, the author find flows into stock funds are correlated with stock returns, flows into bond funds are correlated with bond returns, and flows into gold funds are correlated with gold prices. However, the relationship between returns and subsequent flow is not positive as expected in micro level data. And the relationship between flow and subsequent returns is positive, which is inconsistent with the price pressure argument.

The macro level research is further extend by Edelen and Warner (2001), who employ high frequency aggregate flows from Trim Tabs. They study the relation between aggregate flow into U.S. equity funds and market returns. With respect to the flow-on-return regression, they find concurrent performance positively impact flow but this effect is not statistically significant. The coefficient estimates of lagged returns, however, are strong and statistically significant. The positive flow-subsequent return relationship is confirmed by the return-on-flow regression, which show a standard deviation of flow shock is associated with 37 basis points of abnormal return.

D. Other considerations

Bergstresser and Poterba (2002) took a different perspective and inspected the relationship between after-tax performance measurements and fund inflow/outflow. The authors compare the explanatory power of pre-tax and after-tax fund returns and find the after-tax returns explain more variation of fund inflows based on a data set comprised 42806 fund-year observations over the period 1993 through 1999. Although the paper confirms the positive relationship between performance and subsequent returns, no tests of convexity is conducted. They do find gross inflow is sensitive to past pre-tax returns and tax burden, while gross outflow is not sensitive to both.

One of the concerns of the study may be the measurement of after-tax returns. Since each investor faces different personal tax rate, it is beyond possible to find a one-for-all tax rate. Bergstresser and Poterba (2002) decide to construct the after-tax returns that are applicable to hypothetical upper-income investors. This of course is somewhat problematic. As noticed by Dickson and Shoven (1995), the difference of the relative ranking of funds on a pre-tax and after-tax return basis can be dramatic. But given the fact that the absolute difference of tax rate is not significant, ranging from 28% to 39.6% on short term capital gains and 20% on long term capital gains, this simplification is not likely to be misleading. Additionally, the authors found capital gain overhang discourages both cash inflows and outflows, but the effect on inflows strictly dominates that of outflows.

Several papers have been looked at the behavior of institutional and retail investors separately. Birnbaum, Kallberg, Koutsoftas and Schwartz (2004) considered separately institutional and retail funds and found less convex (i.e. more linear) flow-performance relationship. Based on the data acquired from Lipper, they examined over 3000 equity funds over the time period 1994 to 2003. The most surprising result is that in the poor performed deciles, mutual funds suffered from huge outflow. The figure of flow growth for the worst funds are -15%. Adding up the estimation evidence in the paper that good performing funds attract significant cash inflows, the flow-performance relationship is much more linear than previous studies. The study also found institutional investors react less positively on superior past performance.

An earlier international study echoes the linear flow-performance relationship but only for institutional investors. Sawicki (2000) documents the Australian evidence of flow-performance relationship in the Australian wholesale funds market setting. Although Australian institutional investors react to past performance, the convex relationship widely observed elsewhere is not the case in Australia. In fact, the relationship is almost linear as the coefficient estimates of returns from six quintiles (based on piecewise linear regression) are very close in magnitude. This immediately suggests the Sirri and Tufano (1998) explanation for convexity, the marketing and media coverage argument, is not likely to be applied in the wholesale funds market.

Clifford, Fulkerson, Jordan and Waldman (2011), however, disagreed with their contribution. They find both retail and institutional investor inflows and outflows strongly chase past raw performance. The baseline model employed is a simple panel regression model, with raw returns as then return measure and a number of other controls. This paper has been discussed before as it constructed a comprehensive data set from N-SAR filings that separates inflows and outflows. The baseline model confirms performance-inflow relationship is more sensitive to performance-outflow relationship.

To test whether all investors, institutional and retail, chase past performance, the authors create a dummy variable "Institution". Most of the funds in their data set is either institutional or retail, with few being the mix of the two. They find no evidence of institutional investors' sophistication. Institutional inflows and net flows chase performance as well. Besides, institutional investors seem to chase volatility. Beyond the baseline model, the authors also test a panel quantile regression model, which tells a consistent story. The coefficient on returns are generally two to three times higher at the 90th percentile than in the baseline model.

Gallaher, Kaniel and Starks (2006) studied the flow-performance relationship while treated a family of funds as one signal entity. They found the relationship is convex just as individual fund level studies. Kempf and Ruenzi (2004) detailed the influence of the position of a fund within its family. That is, how is fund flow affected by the relative performance of a fund within its market segment and within its fund family. The modelling technology is to replace returns with two controls on the baseline model, segment relative performance and family relative performance. Adopting the piecewise linear regression methodology as in Sirri and Tufano (1998) and estimate the regression for the three quintiles separately, they find fund flow has a convex relationship with both of the two return measures. Khorana and Servaes (2004) further illustrated the fee structure of mutual funds and its impact on the market share of families. Massa (2003) modelled products differentiating within a family and its implications.

There are two papers, Ivkovich and Weisbenner (2006) and Ivkovic and Weisbenner (2009), employ a data set from a private broker and find investors are reluctant to sell mutual funds that have appreciated while willing to flee out the losers, in contrast with other studies that investors are not sensitive to poor performers. However, this is consistent with the hypothesis that mutual fund performance is persistent over time. They argue that this is not necessarily contradicting Sirri and Tufano (1998) and Chevalier and Ellison (1997)'s convexity finds since funds' existing investors may have driven the observed convexity. Before them Gruber (1996) also noticed poorly performing funds experienced large capital outflows. This does not necessarily imply concavity but does suggest a more linear flow-performance relationship. Put these few studies aside, the fact that most previous literature documented a convex flow-performance relationship is likely to suggest that the answer to whether the fund performance is persistent may not be one or the other. Suppose the performance is persistent, then there is no reason for investors to stay in worst performing funds, assuming that investors are rational. Suppose otherwise, such that the performance is not persistent, then it seems unreasonable for investors to chase high performers. Berk and Green (2004), which will be introduced later[7], pro-

[7]See section 3.1.B.

pose a model that allows strong responses of flow to past performance even without the presence of persistence.

There is little research that explicitly looking at flow-performance relationship for bond funds. They either do not distinguish between equity funds and bond funds, or most of the time they exam equity funds only. Bond funds distribute a lot of dividends, at most times even more frequent than the bonds itself. This should be accounted for in the research. Some papers has included fund objective (dummy, or performance rank within same objective group for example) as one of the determinants[8]. They generally categorize fund objectives into value, growth, or blend, but not equity, bond, and index. Rakowski and Wang (2009), however, actually separate domestic bond funds from equity funds in their fund objective categories. The difference of bond funds and equity funds is not an emphasis of the paper but they find there are some differences in the regression coefficients for bond funds and equity funds. The magnitude of coefficient estimates differs a lot across equity and bond fund regressions. For example, the coefficient of return on flow in the bond regression is twice as large as the equity regression. Another point to notice is that size generally matters a lot in the flow-performance regression, the coefficient for size is almost always highly significant, which you can be confirmed in the appendix A. However, in the bond fund regression, coefficient of size is not statistically significant. Besides, they find the R squared is much lower for the bond fund regression.

E. International evidences

Ferreira, Keswani, Miguel and Ramos (2010) provide evidence of convex fund flow-performance relationship around the globe. In all of the 28 countries examined, the convexity is observed. The authors rank countries according to the level of convexity

[8] See appendix A.

and propose it as the convexity of the countries. The convexity is less obvious in countries with higher level of mutual fund industry development. They suspect the reason is investors in more developed countries are more sophisticated and face lower participating costs. Deaves (2004) analyzes Canadian mutual fund industry and finds clear evidence of persistence. Besides, he confirms investors rush into winners and flee from losers. A convex relationship is further documented in this Canadian data set.

2.4 Convex or Not?

Although there is no consensus regarding the level of the convexity between performance and subsequent flows, it is still widely accepted that the relationship is positive and asymmetric. But this statement seems to work only with mutual funds. Del Guercio and Tkac (2002) compared the flow-performance relationship of mutual funds and pension funds. They find little evidence of convexity in pension funds, thus no risk shifting incentives for pension fund managers.

Some recent studies, for example Xie (2011) and Kim (2011), conduct their research from a time series analysis perspective. Xie (2011) work on the time series of the sensitivity of the relationship while Kim (2011) proposes that flows become less sensitive to high performance following periods of volatile markets and following periods of less dispersion in performance across funds. And thus there is no or only little convexity in the 2000s. Yet the determinants of convexity, if it is so, are still largely unexplored. Both cross-sectional and time varying factors can be contributed to convexity.

2.5 Fund Flow and Subsequent Return

A. Smart money

All literature above concerns the relationship between fund performance and subsequent fund flows. There is also a line of research on fund flow-subsequent fund return relationship. This is named the "*smart money*" and "*dumb money*" argument. When considering the flow-performance relationship, the three possible arguments of causality still hold. Investors may chase returns and rush into past winning funds. Flow into funds could drive stock returns, if the action contains information on market risk premium expectations. Or there can be no causality between flow and performance but instead they are just reacting to common information[9]. Edelen and Warner (1999) try to establish the causality to see whether flows drive returns or returns drive flows (feedback trading) and it turns out to be very difficult. Edelen and Warner (1999) employs high frequency data (daily and intraday) from Mutual Fund Trim Tabs (MFTT) and finds that flow responses to returns, and returns respond to flow as well. The evidence that end-of-the-day returns predict flow much better than early returns suggest it could be the case that flow drives returns. However, no correlation between flow and subsequent-day returns is found in his sample. Thus the question remains unsolved.

The purely descriptive paper by Gruber (1996) proposes a puzzle: why, given that mutual funds' performance is inferior to index funds on average, that mutual funds and especially actively managed mutual funds are growing fast. If performance is persistent and predictable, then at least some sophisticated investors will recognize this fact and follow the predictions. This is confirmed by the summary statistics that investors who supplied the new money benefit from the action and earn higher

[9]Notice most papers discussed in chapter two are free from this problem since clear time sequence is entailed in their specifications

risk adjusted returns than both the average active and average passive fund. The remaining question is that when a fund is predicted to do poorly in the future, why investors would hold the fund. The author's explanation is that only a fraction of investors are rational while others are not that sophisticated.

Zheng (1999) documents the above phenomenon as the smart money effect. If money flows into a fund, it is a valid indication that the fund will perform well in the future, although he finds the effect is short-lived. Besides, money is not so smart when taken the analysis to the aggregate level.

To test whether investors is smart ex ante, it is necessary to inverse the dependent and independent variables. The survivorship free data set used is the same as Carhart (1997), which is collected from FundScope Magazine, United Babson Reports, Wiesenberger, the Wall Street Journal and printed reports of ICDI. Regress the performance measures on positive and negative net flows respectively, he find clear evidence that fund with positive previous inflows exhibit higher returns, the coefficient is positive and significant. While the coefficient on fund with negative previous inflows is negative and significant. he tests for robustness by employing various performance measures as mentioned in the section above and the results are fairly consistent. Together with Gruber (1996), these two papers serve as major origination of the smart money argument.

Why would a fund with more inflows perform well in the future? Investors chase top performers and invest heavily in these funds, and managers of these funds would put the new inflows in momentum stocks and continue to outperform other funds for at least two years. This is the reasoning and empirical results given by Wermers (2003). The research decomposes returns into those winning and losing funds. Invest in growth funds is a superior strategy which beats market average by 2 to

3 percent for at least two years. A recent research by Rakowski and Wang (2009) analyze a vector auto regression (VAR) of flows and returns. Using daily mutual fund flows data, they confirmed that past flows have a positive impact on future returns.

B. Dumb money

An obvious critic of the smart money argument, the dumb money effect, is proposed by Frazzini and Lamont (2008). They admit that in the short run of about one quarter, there is some evidence of smart money hypothesis. In longer horizons the dumb money effect, cash flows into funds with poor future performance, dominate the smart money effect. Investors lose money by relocating to growth funds.

The data base in use is the CRSP Mutual Fund Database. The author state the research by Gruber (1996) and Zheng (1999) largely focus on the flow-performance relationship over the next few months. For example, Frazzini and Lamont (2008) report a 0.628 percent return (per month) for funds ranked with lowest 3 months inflow, and a 0.661 percent return (per month) for funds ranked with highest 3 months inflow. This is consistent with the smart money hypothesis. When taken to a longer horizon, however, a 1.026 percent return (per month) is recorded for funds ranked with lowest 3 years inflow, while only 0.180 percent return (per month) is recorded for funds ranked with highest 3 years inflow. The difference is statistically significant and suggests an obvious dumb money effect.

The authors show the dumb money effect is due to value effect. Since there is a widely accepted positive relationship between fund performance and subsequent net inflows, money flows into funds with more growth stocks, and flows out of those funds with more value stocks.

3 Causes of the Convexity

3.1 Persistence

A. Hot hands

As early as Jensen (1968) scholars have been worked on whether managers have superior stock picking ability to sustainably outperform the market average. Hendricks, Patel and Zeckhauser (1993) and Brown and Goetzmann (1995) find the relative performance of no-load mutual funds is persistent at least in the short term. Empirical results of Hendricks, Patel and Zeckhauser (1993) show such persistence is strongest within one year horizon. Recent poor performers continue to perform poorly in the near future while recent top performers do better than typical benchmarks, although the persistence of top performers is less obvious than that of poor performers.

The basic idea of Hendricks, Patel and Zeckhauser (1993) is to test whether there is autocorrelation in the selected return measures. The data is acquired from Wiesenberger (1974-88), CDA Investment Technologies (1975-84), Lipper (1982-88) and Higgins Associates (1989-90). The baseline specification is a simple J lags model:

$$r_{i,t} - M_{t-1}(r_{i,t}) = k_t + \Sigma_{j=1}^{J} \alpha_{jt} r_{i,t-j} + u_{it}$$

The t statistics reported clearly rejects the null that there is no autocorrelation. The α coefficient for lag 1 to 4 is positive and jointly statistically significant, while the α coefficient of higher order lags are not as significant. Thus if the persistence exists, following the strategy of betting on the winners of last year (within 4 quarters), substantial gains were available. Ippolito (1989) shows mutual fund returns are comparable to index funds in a long horizon. Wermers (2003) further the research by applying several different performance measurements and find returns strongly persist over multi-year periods. The authors claim that this hot hands effect is not driven by known anomalies and biases. However, since the publication of the papers, critics of them never stops.

Regarding the reason of the hot hands effect, Brown and Goetzmann (1995) believe the persistence is due to a common strategy that is not captured by standard stylistic categories or risk adjustment procedure, possibly skills. Numerous other researches, for instance Carhart (1997), do not support the existence of skilled mutual fund managers.

B. Critics of hot hands

Scholars have been critical of Hendricks, Patel and Zeckhauser (1993) and Brown and Goetzmann (1995), attributing the persistence they found to survivorship bias and misspecification of the benchmark models of risk. Although Gruber (1996) employs a data set largely free of survivorship bias and still find evidence of persistence, the most direct and strong criticism comes from Carhart (1997). He controls for the 4 factors (including momentum and the Fama French 3 factors) and find no evidence of persistence. Thus many researchers have since believe the persistence is simply a display of momentum effects.

The theocratical model proposed by Berk and Green (2004) and Berk and Tonks (2007) also employs a non-persistent setting. In the model setting past performance cannot be used to predict future returns, and it is not an inference of managerial skills. However, the nonexistence of persistence also does not imply the managers do not have superior skills. The model perfectly incorporates the flow-performance relationship mentioned above.

It is assumed by Berk and Green (2004) that investors compete to find skilled managers. If superior past performance is an indication of the skills, then rational investors would chase high performance. The critical set up is that the managers' ability to outperform the market is assumed to exhibit decreasing returns of scale, performance of funds decreases with inflows. Therefore the funds would continue to outperform the market until the money inflow reaches a threshold. Similarly for poorly performed funds, they would continue to under-perform the market until the money outflow reaches a threshold. Berk and Green (2004)'s setting incorporates the top performers chasing behavior of investors with the non-persistent fund returns.

An interesting point to notice is the research on worst performing funds. Brown and Goetzmann (1995) document the strong evidence of persistence amongst the worst performing funds. So does Carhart (1997), although he dismissed persistent of average mutual fund. Berk and Tonks (2007) observe persistence in the worst performers and propose the unwillingness of investors in these funds to respond to bad performance as a reason. However, there is also research suggests the contrary. Lynch and Musto (2003) predict that performance repeats among winners but not losers in their theoretical setting.

3.2 Other Explanations

Many papers have struggled to find the causes of the convex relationship. There are two lines of research. The first one being disadvantaged clientele theory. That is the differential ability or situation of investors.

It has been discussed before that in Sirri and Tufano (1998) differential search costs for high and poor performers are proposed as the reason for convexity. Since fund managers and the fund families will put more effort to advertise a fund performed well in the past. Top funds would have significant media coverage while funds with low returns would virtually receive no coverage. These differences in the marketing strategy lead to differential search costs. Thus funds with higher prior returns would attract more inflows. And since the fees-flow relationship is also asymmetric. When the search costs are low, the cash inflow would be significant higher. However, when the search costs are high, the cash outflow would not be as much. In fact, Elton, Gruber, Das and Hlavka (1993) show mutual funds do not earn returns that justify their information acquisitions costs. Gallaher, Kaniel and Starks (2006) examined the effect of advertising expenditure, while Jain and Wu (2000) do not support the idea of Sirri and Tufano (1998). They find no superior performance in the post advertisement period although they find advertised funds attract significantly more money.

Huang, Wei and Yan (2007) propose a theoretical and empirical setting in which new investors are relatively better able to overcome their participation costs and respond to good performance. Funds with high participation costs receive less inflow, while funds with low participation costs have higher fees. Thus the paper establish that higher participation costs will have a more convex flow-performance relationship.

The second line of research follows from Berk and Green (2004)'s rational investor story. They show that inactive of investors in face of poor performance is the reason for convexity. This is confirmed in the empirical work of Berk and Tonks (2007). However, a number of other researches challenge some basic assumptions of Berk and Green (2004). For example, Fama and French (2010) find managers have negative alphas on net returns, which violates Berk and Green (2004)'s equilibrium in which fund managers have zero alphas on net returns.

Other possible explanations proposed by various researches including:

- managers who present poor returns would be fired, Lynch and Musto (2003).
- new investors must drive the observed non-linearity, Huang, Wei and Yan (2007) and Cashman, Nardari, Deli and Villupuram (2008).
- trade by trade analysis shows both new and old shareholders buy shares during periods of good returns; however, shareholder outflows essentially unrelated to fund returns, Johnson (2007).
- Trading frictions, expectations of a change in management, or behavioral biases, Gruber (1996), Lynch and Musto (2003) and Ivkovich and Weisbenner (2006).

4 Implications on Fund Manager Behaviour

It is exactly the convex flow-performance relationship that generates manager incentive to take on higher level of risk. As noticed in Chevalier and Ellison (1997), superior returns attract more cash flow into the fund, while poor returns will not have a symmetrically bad consequence. And since fund manager compensation is usually tied to total assets under management, managerial incentives are also affected by the relationship. Chevalier and Ellison (1997) took the flow-performance question further to empirically check whether fund managers alter their risk profile towards the end of the year due to the flow-performance relationship. After examining portfolio holdings for funds in September and December respectively, they shown managers do alter the riskiness of their portfolios in a manner that is consistent with their September incentives to take the level of risk derived from the flow-performance relationship.

Such manager incentives and the convex flow-performance relationships create an implicit tournament for cash flows. Mutual fund managers may alter their portfolio holdings and risk profile according to their year-to-date performance (Falkenstein (1996),Massa and Patgiri (2009)) or even use derivatives to alter their level of riskiness (Adam and Guettler (2012)). Hu, Kale, Pagani and Subramanian (2010) explicitly model the relationship between prior performance and relative risk and turns out to be U shaped.

Huang, Sialm and Zhang (2011) investigate the performance consequences of risk shifting and find funds that altered their risk profile towards the end of the year experience interior performance comparing with those funds keep stable risk profiles. Further those managers who are expecting higher benefits suffer most from the risk shifting practice.

5 Conclusions

The survey focuses on the relationship between mutual fund performance and subsequent flow. The general consensus is that the relationship is positive, asymmetric and possibly convex. In terms of technical aspects, while scholars seem to agree on the measure of fund flow, various fund performance metrics has been employed. Risk adjusted and conditional measures are increasingly popular. The establishment of convex flow-performance relationship is generally robust to different return measures. Primary data bases include CRSP, MorningStar and Edgar. The benefit of exploring Edgar is to separately exam gross inflow and gross outflow. Model technic varies from piecewise regression to direct estimating the functional shape of flow-performance relationship through nonparametric or semiparametric methods.

Although the convexity of performance-subsequent flow relationship is almost established. It is still not clear regarding whether the relationship between flow and subsequent performance is possible or not. This is the smart money versus dumb money argument. And there are still fights on the persistence of fund performance and whether managers have superior skills. When conducting empirical experiments to study these relationships it is necessary to consider macroeconomic situations. Many other factors, for example liquidity, unrealized capital gains, will also affect the flow and returns.

Given the convex flow-performance relationship, managers will have risk shifting incentives. However, the investors' reaction to those modifications of risk profiles should also be taken into account. If a manager is to take on higher volatile portfolio holdings to attract more cash inflow, investors may withdraw their money, not due to the poor performance (since investors are not sensitive to poor performance) but due to their attitude towards risk. This may scarify the validity to still engage in risk shifting.

6 Appendix A

This section lists major determinants of fund flow that appear in various previous studies. To make the list manageable we do not distinguish between different measures of fund flow, nor did we do so when considering any other determinants. For example fund flow maybe measured by notional value, market share or flow growth rate; it can be daily, monthly or quarterly flows; and it can be inflow, outflow or net flow. In addition, the specification, methodology...etc. are quite different across papers. Thus the significance levels given below are just rough indicators. However, the list can be helpful to motivate desired specification in future research[10]. Statistical significance at the 1%, 5%, and 10% levels are denoted by ***, **, and *, respectively.

1. **Various performance(return) measures at** $t-1$: Ippolito (1992)***, Chevalier and Ellison (1997)**, Sirri and Tufano (1998)***, Clifford, Fulkerson, Jordan and Waldman (2011)***, Bergstresser and Poterba (2002)**, Cao, Chang and Wang (2008)**, Cashman, Nardari, Deli and Villupuram (2008) × ***, Chen, Goldstein and Jiang (2010)**, Ivkovich and Weisbenner (2006) × ***, Ivkovic and Weisbenner (2009), Gallaher, Kaniel and Starks (2006)***, Del Guercio and Tkac (2002)*** (analysis of certain different determinants measures), Jain and Wu (2000)***, Khorana and Servaes (2004)***, Kim (2011)***, Rakowski and Wang (2009)***, Edelen and Warner (2001)** ...etc.

2. **Age/log age**: Chevalier and Ellison (1997)**, Clifford, Fulkerson, Jordan and Waldman (2011)***, Bergstresser and Poterba (2002)**, Cashman, Nardari, Deli and Villupuram (2008)***, Chen, Goldstein and Jiang (2010)**, Kim (2011)***, Ferreira, Keswani, Miguel and Ramos (2010)***, Nanda, Wang

[10]Notice most determinants listed are control variables, apart from advertising, which is an "action" variable. More work can be devoted to exam other action variable determinants of fund flow, such as CDS usage, change of asset allocation, change of fund name or managers...etc. The research on reverse effects maybe also interesting since managers react on fund flow changes.

and Zheng (2004)***, Rakowski and Wang (2009)*** ...etc.

3. **Size/TNA/log size**: Sirri and Tufano (1998)***, Clifford, Fulkerson, Jordan and Waldman (2011)***, Bergstresser and Poterba (2002)**, Cashman, Nardari, Deli and Villupuram (2008)***, Chen, Goldstein and Jiang (2010) × **, Kim (2011)***, Ferreira, Keswani, Miguel and Ramos (2010)***, Nanda, Wang and Zheng (2004)***, Rakowski and Wang (2009)***, Gallaher, Kaniel and Starks (2006)***, Jain and Wu (2000)***

4. **Expense/expense ratio**: Clifford, Fulkerson, Jordan and Waldman (2011), Bergstresser and Poterba (2002)**, Cashman, Nardari, Deli and Villupuram (2008)***, Chen, Goldstein and Jiang (2010)**, Nanda, Wang and Zheng (2004)***, Gallaher, Kaniel and Starks (2006)***, Kim (2011)***, Khorana and Servaes (2004)***, Ivkovich and Weisbenner (2006)**, Ivkovic and Weisbenner (2009)***

5. **Turnover**: Clifford, Fulkerson, Jordan and Waldman (2011)**, Bergstresser and Poterba (2002), Cao, Chang and Wang (2008)**, Gallaher, Kaniel and Starks (2006)**, Ivkovich and Weisbenner (2006)**, Ivkovic and Weisbenner (2009)**, Khorana and Servaes (2004), Rakowski and Wang (2009)

6. **Load/Noload/Frontend/Backend**: Clifford, Fulkerson, Jordan and Waldman (2011)***, Bergstresser and Poterba (2002), Cashman, Nardari, Deli and Villupuram (2008)***, Chen, Goldstein and Jiang (2010)**, Ivkovich and Weisbenner (2006), Ivkovic and Weisbenner (2009), Ferreira, Keswani, Miguel and Ramos (2010)*, Gallaher, Kaniel and Starks (2006)***

7. **Lagged flow**: Chevalier and Ellison (1997)**, Cao, Chang and Wang (2008) × **, Chen, Goldstein and Jiang (2010)**, Edelen and Warner (2001)**, Ferreira, Keswani, Miguel and Ramos (2010)***, Gallaher, Kaniel and Starks (2006)**, Del Guercio and Tkac (2002)***, Jain and Wu (2000)***

8. **Volatility of return/log volatility**: Sirri and Tufano (1998), Clifford, Fulkerson, Jordan and Waldman (2011), Kim (2011), Cashman, Nardari, Deli and Villupuram (2008), Cao, Chang and Wang (2008)**, Gallaher, Kaniel and Starks (2006)***

9. **Squared return**: Clifford, Fulkerson, Jordan and Waldman (2011)***, Kim (2011)***, Gallaher, Kaniel and Starks (2006)***, Rakowski and Wang (2009) × ***

10. **Lagged return**: Edelen and Warner (2001)**

11. **Family size/log family size**: Clifford, Fulkerson, Jordan and Waldman (2011)*, Nanda, Wang and Zheng (2004)***, Rakowski and Wang (2009)

12. **Position/Segment within family**: Gallaher, Kaniel and Starks (2006)***, Kempf and Ruenzi (2004)***

13. **Number of funds in a family**: Khorana and Servaes (2004)***

14. **Morning star rating**: Bergstresser and Poterba (2002)**, Ivkovich and Weisbenner (2006)**, Ivkovic and Weisbenner (2009)***

15. **Fund objective-value/growth.../HHI of objective**: Bergstresser and Poterba (2002), Ivkovic and Weisbenner (2009)***, Gallaher, Kaniel and Starks (2006)**, Khorana and Servaes (2004)***

16. **New share class/multi share class**: Clifford, Fulkerson, Jordan and Waldman (2011)***, Cashman, Nardari, Deli and Villupuram (2008), Nanda, Wang and Zheng (2004)***

17. **Advertising/Media attention**: Khorana and Servaes (2004)***, Gallaher, Kaniel and Starks (2006)***, Jain and Wu (2000)***

18. **12b-1 fee**: Cashman, Nardari, Deli and Villupuram (2008)***, Rakowski and Wang (2009)**, Gallaher, Kaniel and Starks (2006)

19. **Redemption fee**: Cashman, Nardari, Deli and Villupuram (2008)***
20. **Short term fee**: Clifford, Fulkerson, Jordan and Waldman (2011)***
21. **Tax burden**: Bergstresser and Poterba (2002)**
22. **Geography**: Ferreira, Keswani, Miguel and Ramos (2010)***
23. **Number of countries sold**: Ferreira, Keswani, Miguel and Ramos (2010)***
24. **Fund invest in liquid/iliquid assets**: Chen, Goldstein and Jiang (2010)**
25. **Number of accounts/log accounts**: Clifford, Fulkerson, Jordan and Waldman (2011)***
26. **Fund's stock of unrealized capital gains**: Bergstresser and Poterba (2002) × **
27. **Other nonsignificant factors appeared**: Overhang, price/book ratio, market cap, fraction of total returns distributed...etc.

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