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Cross-Sectional Alpha Dispersion of Investment Funds and Performance Evaluation: Is There a Connection? (Evidence from an Emerging Market)

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Abstract

The investment decisions of managers of investment funds (especially equity investment funds) have an impression on the returns of individuals who have deposited their capital in these funds. Therefore, the issue of evaluating the performance of investment funds and their managers is imperative for investors. The research aims to investigate the effect of cross-sectional alpha dispersion on investors' evaluation of the performance of investment funds. We extract data regarding 31 equity investment funds from 2012 till 2022 and calculate the interquartile ratio of Jensen's alpha called "IQR" and "Performance-Flow Sensitivity" along with control variables. Then, the hypothesis test model was fitted using the multivariate regression analysis using the Generalized Least Squares method. Empirical findings show a negative and significant connection between the alpha dispersion of investment funds and performance-flow sensitivity. Based on the results, one credit increase in the standard deviation of alpha dispersion leads to a decrease of about 0.4% in the ratio of performance-flow sensitivity. Environments with high alpha dispersion of investment funds will targeted by unskilled managers to introduce themselves as successful and skilled managers to investors and mislead them. Therefore, when the alpha of investment funds has a higher dispersion, the type I error possibility investors will face increases. Individuals may consider an inefficient manager to be competent and skilled. We will provide some suggestions in this regard.

Keywords: Investment Funds, Performance Evaluation, Bayesian Model, Jensen's Alpha, Behavioral Models

Introduction

Among the financial intermediary institutions, we can mention investment funds that provide large financial resources for investing in various financial markets by pooling small investors' small capital. In Iran, with the approval of the Securities Market Law in 2004, the way to start the activity of investment funds was provided. Since 2008, their number has gradually increased so that by December 2022, more than 360 investment funds with a net asset value of 6,415,000 billion rials have been operating in the Iranian capital market (Fipiran database, December 2022). Investment funds are an investment option for risk-averse investors without expertise. These funds usually have managers who perform the correct diversification of the securities portfolio for their investors; therefore, the main task of managing investors' resources is assigned to fund managers. Investment funds are essential in two ways; on the one hand,

they can attract novice or conservative investors, and on the other hand, they are considered a significant source of finance for investing in the stock market to attract much individual capital. The managers of these funds, who consider themselves professionals in the financial field, determine the investment policies of these funds. According to the claims of these funds, the risk of investing in these funds has been minimized. (Hirschfeller et al., 2011). Of course, it should be noted that fund investment managers, like individual investors, may be exposed to cognitive biases that affect their performance. Since the investment decisions of these managers can affect the investment of countless people who have deposited their capital in these funds, the issue of evaluating the performance of investment funds and their managers becomes doubly imperative for the investors of these funds.

The chronicles of the studies conducted regarding the performance of investment funds in the last 50 years show that many have yet to earn more returns than the market's average return. Investors active in investment funds have been struggling with distingushing investment funds that outperform most funds with poor performance for a long time. Unsurprisingly, no investors like to invest in low-return or no-return investment funds (they do not tend to commit the type I error). At the same time, they do not like to quickly lose the opportunity to invest in a high-return fund (type II error) (Kusauki et al., 2006). The dispersion of returns of investment funds is one of the essential variables that affect the balance between type I and type II errors and is among the information that investors pay attention to in their investment decisions and when picking incessant investment funds (Harvey & Liu, 2018).

According to the studies conducted in developed markets, when the dispersion of returns and alpha of investment funds increases, managers needing more skills and knowledge can quickly introduce themselves to investors as successful and skilled managers and cause investors to deviate. As a result, potential and practical investors may doubt the investment fund's performance and subsequently consider the alpha obtained for the investment fund to be significantly less than it actually is (Baras et al., 2010). Chen and colleagues (2017) divided investment funds into different performance groups and developed a model based on which most investment funds had zero alpha. According to the results of the study, investment funds with zero alpha can also generate an alpha greater than zero for their investors by taking systematic risks in a certain period. The systematic risk of investment funds with zero alpha is itself a function of the dispersion of the fund's alpha. It indicates the amount of contraction (decrease) that investors should pay attention to in evaluating the performance of investment funds and take away from the fund's

return (Harvey & Liu, 2018).

The high dispersion in fund alphas makes it easier to mistake funds with a typical zero alpha as a fund whose managers are highly skilled, resulting in a higher type I error (i.e., misidentifying a mutual fund with zero alpha as a fund with high returns). In investment funds with positive alpha (high return), the high average level of systematic risk in the previous periods leads to a decrease in the average systematic risk in the succeeding periods, which means a severe drop in alpha for these funds (Pastor & Stanbaugh, 2012). This ultimately leads to a decrease in the sensitivity of the future flow to the past performance of investment funds (Sensui, 2009). Therefore, it can be supposed that the higher alpha dispersion of investment funds leads to less sensitivity of the fund's future flow to its past performance and, subsequently, the possibility of the type I error (considering unskilled and inefficient managers as skilled and accomplished managers) and managerial biases will increase (Spiegel & Zhang, 2013; Stark & Sun, 2016; Harvey & Liu, 2018).

From the theoretical view points, the studies that have been carried out so far around investment funds are often focused on estimating the functional distribution of investment funds, and none of them have addressed the alpha dispersion of investment funds as well as its effect on the performance of the managers. Also, the studies examined the actions investors should take to evaluate the performance of investment funds and their managers. At the same time, this research shows what actions investors take to evaluate the performance of investment funds and their managers in the real world. As we mentioned, the main objective of this research is to investigate the effect of cross-sectional alpha dispersion of investment funds on their performance. Due to the fact that most individuals start their investment in the financial markets through institutions such as funds, and on the other hand, the volume of transactions of these funds is also noticeable, the necessity of studying the behaviors of the professionals managing these funds is evident. Since no study has been done, this study can be the first step. Investigating and understanding the empirical relationships between the alpha dispersion of investment funds at different time cross-sections can help potential and practical investors identify appropriate investment funds with higher returns and sturdier and more efficient managers. The following section is dedicated to theoretical foundations and literature review. The third and fourth sections contain methodology and experimental findings, respectively. The fifth part of the research also deals with discussion and conclusions.

Theoretical Foundations

Mutual funds are financial intermediaries that invest in a diverse portfolio of securities by selling units to the public and receiving their funds. Each investment unit sold in investment funds represents a proportional fraction of the securities portfolio the investment fund manages as a proxy on behalf of its unitholders (Raee & Pouyanfar, 2019). An investment fund is a set of shares, bonds, and other securities that allow investors to invest a small amount of their capital in a diverse portfolio of assets instead of investing in a solitary company, and thus share in the profits and losses of the portfolio. Also, the investor can withdraw capital from the fund whenever he wants; by doing this, investment units are redeemed from the fund's resources at the current asset value rate (Holland et al., 2016). According to the definition given in Article 1, Clause 20 of the Stock Market and Securities Law, an investment fund is a financial institution whose primary activity is investing in securities, and its owners share in the profits and losses of the fund relative to their investments. The financial resources these investors receive are invested in a diverse combination of securities such as stocks, bonds, short-term instruments of the money market, and property, and investors can invest in funds with guaranteed profitability or without guarantee according to their risk tolerance. These funds, in fact, (through investing in various portfolios, each of which has specific characteristics) have been able to cover the taste of most of their unitholders in terms of a suitable combination of risk and return and make the market more gorgeous for them to have more opportunities and choices with less risk and higher returns (Qalibaf Asal et al., 1400). Investment funds, which are management investment companies, are mainly divided into two general categories, closed-end capital, and open-end capital, according to their structure. Investment funds are classified into short-term, money market, and long-term categories according to the type of securities that they invest in line with their targets and time horizons.

Among the fundamental problems in the performance evaluation of investment funds is the tendency to focus on the portfolio yield and not paying enough attention to the risk we have taken to obtain the desired yield. Hoewer, the performance evaluation should include identifying the combination of yield and risk taken an investment. Performance evaluation measures asset management skills, and the primary basis of its work is the comparison of returns with another suitable portfolio. The emergence of the modern portfolio theory by Markowitz (1952) advanced portfolio performance measurement. This caused the change of performance measurement from underdone criteria to adjusted risk measures, which ensured higher accuracy. From the beginning

of the 1960s until now, many researchers have provided different methods to measure portfolio performance to achieve a suitable and accurate model or standard. On the other hand, researchers have also analyzed which model provides the best evaluation technique. In addition to paying attention to the method used for measurement, the appropriate model depends on the appropriateness of the criteria for the data and the market (Yu et al., 2020).

In the previous decades, the fund's performance was measured by relying on the portfolio return, which was done using monetary-weighted and time-weighted returns. The monetary weighted return (internal rate of return) is a discount rate that equates the final price of the portfolio with the sum of cash flow and initial value during the period. On the other hand, the weighted return method is equal to the geometric mean of the portfolio return of the periods. A group of critics have commented on the choice of efficiency measurement methods. For example, Sharp and Alexander (1990) have stated that the weighted return method is better because it is not affected by the size and timing of cash flows, and managers cannot control it. Spaulding (2003) showed that the selection of the return measurement method does not make a difference when measuring portfolio performance in the short term and with low cash flows. Kempsey (2004) stated that the monetary-weighted return method is better for measuring active investments.

Based on modern and ultra-modern portfolio theory, by considering risk in the performance evaluation models of investment funds and their managers, different criteria such as the Sharpe index, Trainor index, evaluation ratio, Jensen's alpha, etc., can be recycled. The Sharpe index is one of the performance measurement indices based on this theory, known as the "Return to Variability Ratio" (RVAR) based on the historical capital market line. In the mid-1960s, Trainor proposed an index called the reward-to-volatility ratio (RVOL) (Buddy et al., 2006). The valuation ratio results from dividing the portfolio's alpha by the systematic risk. This index measures the unusual return of any unit of unsystematic risk that can be distinguished from the market index by holding a portfolio (Badi et al., 1996). Sortino's index was presented by Sortino and Price (1994), which is very similar to Sharpe's model. The only difference between this index and the Sharpe index is their definition of risk. In the same way, there are other criteria, such as the omega index, optimal beta ratio, etc., to evaluate the performance of investment funds.

One of the efficient indicators for measuring the performance of investment funds is Jensen's alpha index. Jensen's differential return criterion is based on the pricing model of capital assets. This index is related to the

Trainer's index. As a result, these two indicators can provide an almost similar ranking of the stock portfolio's performance (Saeidi & Moghadisian, 2019). This index is the difference between the expected rate of return of the portfolio and whatever it is expected to achieve if the portfolio is placed on the line of the stock market. For Jensen's criterion, the equation is as equation 1 and equation 2:

$$E(\mathrm{R_p}) = \mathrm{R_f} + \beta_\mathrm{p}(\mathrm{E(R_m)} - \mathrm{R_f}) \quad (1)$$

$$\mathrm{R}_{pt} = R_{ft} + \beta_p(R_{mt} - R_f) + E_{pt} \quad (2)$$

Where:

R_{pt}, return of stock portfolio p in period t, R_{ft}, risk-free rate of return in period t, R_{mt}, market return in period t, E_{pt}, the standard error of the stock portfolio p in period t (Cheng et al., 2010). Jensen argues that by adding alpha, one can determine the lower and upper performance of the portfolio's efficiency frontier; so equation 2 is converted to equation 3 where alpha or the starting point of the line is on the vertical axis:

$$\mathrm{R}_{pt} - R_{ft} = \acute{\alpha}_p + \beta_p(R_{mt} - R_f) + E_{pt} \quad (3)$$

Therefore, when alpha is at zero, the balance is established, and in this case (alpha) expresses the portfolio manager's performance. If alpha is very positive, it indicates good performance. If alpha is very negative, it indicates negative and low performance, and if alpha is zero, it indicates that the portfolio manager has adapted the market based on adjusted risk.

Most researchers have proposed portfolio performance criteria based on the concept of capital asset pricing model called CAPM. Among several non-regression criteria, the two most important and widely used criteria are the Sharpe and Trainer ratios, and the information related to these two criteria has been presented in the previous section. Using the above criteria to evaluate performance only helps to compare whether the fund's performance is better or worse than other portfolios. However, interpreting better or worse performance is statistically and economically impossible. For this reason, investors use new methods, such as regression methods, to evaluate performance (Harvey & Liu, 2019).

One of the most common performance measures is the single-factor model proposed by Michael Jensen (1968). This criterion uses the capital asset pricing model concepts by measuring the portfolio's performance. It is the difference

between the portfolio's expected return and what is expected if the portfolio is placed on the stock market line. In the capital asset pricing theory, the relationship between the beta of an asset and its corresponding yield is measured. If the market efficiency is semi-strong according to the Fama (1970) classification, Jensen's alpha is expected to be zero for the passive portfolio. Therefore, a positive alpha indicates a better portfolio performance than the underlying portfolio. For this reason, Jensen's alpha criterion was used to measure the return on the investment fund.

Fama and French (2008) investigated the performance of US mutual funds. They used Fama and French's three-factor model and Carhart's four-factor model to estimate performance and concluded that mutual funds produce a portfolio close to the market portfolio but with high active management costs. The classification of funds based on the estimation of three factors shows the impact of information on the future returns of past winners and losers. Hoppint and Johnson (2011) designed another four-factor model (including market factor, investment factor, profitability factor, liquidity factor), which was obtained by adding the liquidity factor to the three-factor model of Chen et al. (2010). According to this study, when the momentum factor was added to the three-factor model of Fama and French (1993), the model's performance was significantly improved.

On the other hand, when the liquidity factor was added to the three-factor model mentioned above, the effects of the new factor were not statistically and economically significant and tended to be zero. Gregory et al. (2013) conducted a study using the Fama and French one-factor model in the London market to evaluate the performance of investment funds. The results showed that the three-factor model of Fama and French is the best and most optimal fit for the performance of investment funds in the London capital market.

Kim (2017) examines the effect of cross-sectional standard deviation of performance on the convexity of the relationship between capital flow and the performance of investment funds. He finds that the degree of convexity decreases when the cross-sectional standard deviation of returns is low. Harvey and Liu (2017) show that the lower the dispersion in investment fund returns, the greater the sensitivity of capital flow to the performance of investment funds. In their research, Harvey and Liu (2019) investigated the effect of cross-sectional alpha dispersion of equity investment funds on the performance of investment fund managers. The obtained results show that when the dispersion of alpha (return) of investment funds increases, unskilled managers (without skills or low skills) can easily introduce themselves as skilled and expert

managers and mislead the investor. Therefore, when the alpha of investment funds has a higher dispersion, investors may face the type I error (considering an inefficient manager as a competent and skilled manager). Ballon and Bass (2020), in research, entitled "Short-term stability in the performance of investment funds" evaluated standard stock selection indicators and market timing models with the help of quarterly returns and daily returns of 230 investment funds. The results of this research showed that when funds are evaluated over a long period of time, there is no abnormal return. Hughes and Verbeck (2021) investigated and evaluated the performance of US investment funds using multifactor models. Based on the results, multifactor models systematically ignore the performance of valuable funds and previous losers.

Saeedi and Moghadisian (2009), while evaluating the performance of stock investment funds, showed that there is no significant difference between the performance of mutual investment funds according to the Sharpe, Trainor, and Sortino indexes. In a research study, Roshangarzadeh and Ahmadi (2013) investigated the performance of investment funds in the Tehran Stock Exchange, which was grounded on indicators, modern portfolio theory, and ultra-modern portfolio theory. The results showed a significant relationship between the ranking of indicators based on modern and post-modern portfolio theory and the negative skewness of investment fund returns. In their research, Jabbari et al. (2013) measured stock investment funds' performance and portfolio selection. The results show that National Bank, Poya, and Sahm Ashna funds have achieved the highest performance in the studied period after ranking. Abbasi and Ghazaljeh (2011), in a research study to measure the performance of investment funds in the Tehran Stock Exchange, examined the three-factor model of Fama and French. The results showed a significant effect of beta factors, size, and the ratio of book value to market value on stock portfolio returns. In a research, Sadeghi Sharif et al. (2013) investigated the effect of the momentum factor on the explanatory power of the Fama and French three-factor model to measure the performance of investment funds in the Tehran Stock Exchange. The results show that the portfolio of growth stocks compared to the portfolio of value stocks and the portfolio of winning stocks compared to the portfolio of losing stocks have greater returns. Salehabadi et al. (2017) investigated the stability of mutual investment fund performance by using independent evaluation models in performance and tables related to reciprocated events from the beginning of 2007 to the end of 2013, which includes 62 mutual investment funds. In the results of this research, no evidence and inferences indicating stability in the funds' behavior were found. In a study, Rahmani and Hekmat (2021) investigated the effects of the alpha of investment funds on the stability of the performance of these

funds. By applying the alpha approach and considering that the abnormal return of each fund originates from two factors of stock selection and appropriate market timing, they confirmed that the performance of Iran's mutual investment funds is stable.

When the dispersion of alpha (return) of investment funds increases, subsequently, we see an increase in the level of unsystematic (unique) risk of each of the investment funds (especially investment funds whose alpha is close to zero). In these situations, unskilled managers (without skills or low skills) can easily introduce themselves as skilled managers and mislead the investor. Therefore, when the alpha of investment funds has a higher dispersion, investors may face the type I error (considering an inefficient manager as a competent and skilled manager). Rational investors should be more skeptical of the performance of investment fund managers in high alpha dispersion periods and exercise more caution for reported performance in environments with high alpha dispersion because the real performance of managers will be far less than what is stated (Haveri & Liu, 2018). Based on studies conducted (Barras et al., 2010; Ferson & Chen, 2017; Harvey & Liu, 2018), the higher the alpha dispersion of investment funds, the lower the sensitivity of the future flow to the past performance of the fund.

In addition, the lower the sensitivity of the future capital flow to the past performance of the fund, the more opportunities managers have for self-expression, and the probability of overestimating their own skills (the behavioral tendency of self-aggrandizement) increases. As a result of this issue, the possibility of committing type I error by real investors will increase. Based on the Bayesian performance evaluation model developed by Bax et al. (2001) and Howry and Liu (2018), investors who use the Bayesian model to evaluate the performance of investment funds and their managers evaluate the skills of managers using past performance. Investment funds and information related to the cross-sectional returns of those funds are evaluated. Therefore, it is assumed that by having information about the historical returns of the investment fund in several periods, investors can easily judge the performance of the investment fund and the skill level of the managers (investment funds with zero alpha have unskilled and ineffective managers and vice versa). According to the Bayesian model, investors ascribe more importance to short-term information (less than three months) to evaluate the performance of investment funds and their managers. However, the main hypothesis of the research can be formulated as follows:

There is a significant and negative relationship between the cross-sectional alpha dispersion of investment funds and the flow-performance sensitivity of investment funds.

Research Methodology

The design of this research is considered to be applied-developmental. From the point of view of methodology, the upcoming research is in the category of descriptive-correlational research Because it is determined to achieve a more complete and comprehensive understanding of the relationships and its current situation and forecast for the future through examining the past behavior of the research variables (postnatal). According to the methodology used, the reasoning of the researcher in this research is of the deductive approach. Considering the "correlation" nature of this research and the need to measure and operationalize the variables under investigation, the most suitable method for conducting this research is the mono method. Due to the investigation of the relationship between research variables among active investment funds in Iran's capital market and the extraction of variables from existing documents and archives, the strategy used in this research is also among archival strategies. The statistical population of research is all investment funds active in the capital market of Iran during the years 2012 to 2022.

The final list of investment funds was extracted from the Fipiran website in December 2022, and the data needed to calculate the research variables was collected. According to the latest statistics in 2022, there were 387 active investment funds in the capital market, of which 103 were equity investment funds that spend most of AUM on stocks. Considering that the research period was between 2012 and 2022, out of 103 investment funds, only 31 were eligible. In the following, the required information and data about the alpha of investment funds of the research sample, rate of return, the net value of assets, expenses, assets under management, size, etc., were compiled, and the final data model was created in Excel. The reason for separating investment funds in stocks from other funds is that the managers of fixed or mixed income investment funds must invest a large part of their resources in bonds with fixed income (low risk). Naturally, in such a situation, one can expect little dispersion for the alpha of these types of funds. The primary data of this research includes the information on investment funds, which were collected depending on the case by referring to the database of investment funds (Fipiran), the capital market database, Rahavard Navin software, the library of the Securities and Exchange Organization and, if necessary, referring to the deputy of Information Technology of Tehran Stock Exchange.

To test the research hypothesis, following Franzoni and Smalls (2017) and Harvey and Leo (2018), a multivariate regression model was used in the form of Equation 4:

$$Flow - Performance\ Sensivity_{i.t+1\to t+12} = C_{i,t} + \beta_0 Disp_{i,t} \times \alpha_{i,t} + \beta_1 Std(\propto i,t-11\to t)_{i,t} \times \alpha_{i,t} + \beta_2 State_{i,t} \times \alpha_{i,t} + \beta_3 VOL_{i,t} + \beta_4 ExpRatio_{i,t} + \beta_5 Turnover_{i,t} + \beta_6 Size_{i,t} + \beta_7 Age_{i,t} + \varepsilon_{i,t} \quad (4)$$

Following Burke and Green (2004) and Franzoni and Smalls (2017), this research uses the Bayesian model to evaluate the performance of investment funds and their managers. The index used in this model is the "Flow-Performance Sensitivity" of the fund, which is calculated from Equation 5:

$$Flow - Performance\ Sensivity_{i.t+1\to t+12} = \frac{TNA_{i,t+12} - TNA_{i,t} * (1+R_{i,t+1\to t+12})}{TNA_{i,t}} \quad (5)$$

Where:

$TNA_{i,t}$ Stands for the net value of the assets of investment fund i at the end of month t. 〖1+R〗 _(i,t+1→t+12) is also the annual return rate of investment fund i (between month t+1 and month t+12). The reason for using annual data for the return variable of investment funds is to avoid quarterly fluctuations in the return of funds (Wermers, 2017). The lower the "Flow-Performance Sensitivity" values, the more unfavorable the performance of the investment fund and its managers, and the more likely the investors will commit the type I error.

The independent variable of this research is the alpha dispersion of the equity investment funds. First, it is necessary to measure the alpha of the investment fund. The alpha of the investment fund, or Jensen's alpha, is calculated in this research using the Jansen model as the excess of the fund's return compared to the standard return. The benchmark return in this research is the risk-adjusted rate of return for the investment fund, which is calculated on a monthly basis. Equation 6 shows how to measure the alpha variable of an equity investment fund:

$$\propto_{i,t} = R_{i,t} - \{Rf_{i,t} + \beta_{i,t} * (Rf_{i,t} - Rm_{i,t})\} \quad (6)$$

In this model, RF and RM represent the risk-free rate of return and the average rate of return of the stock market (return of the total index of the

Tehran Stock Exchange) in the desired financial period. $\mathfrak{b}_{i,t}$ represents the beta coefficient of the investment fund. $R_{i,t}$ is also the return of the investment fund in the desired period. Therefore, Jensen's alpha is calculated as the fund's excess return compared to the fund's risk-adjusted return. The cross-sectional focus on alpha and its calculation for monthly periods is because it gives investors the opportunity to obtain information about returns at different times and incorporate them in decisions. The dispersion of alpha in this research is the interquartile range (IQR) of returns (alpha) of investment funds at different periods. This index briefly shows the range of performance among the funds. As such, the IQR gives investors a sense of performance changes that would be expected based on chance alone. The independent variable of the research can be extracted from Equation 7:

$$Disp_{i,t} = IQR\ of\ \propto_{i,t \to i,t+12} \quad (7)$$

The control variables used in this research are as follows:

- Following Franzoni and Smalls (2017) and Harvey and Liu (2019), in order to evaluate the effect of uncertainty on risk factors and investors' investment decisions, the market condition is entered into the model as a control variable. To calculate this variable, a threshold of 5% is first determined. Then, an index is defined that will take the value of one if the absolute value of the 12-month average alpha of investment funds is greater than the desired threshold (5% here) and zero otherwise.
- The volatility of fund yield $\mathrm{VOL}_{i,t}$ is defined as Jensen's alpha standard deviation.
- The expense ratio is the resources the investment fund spends on administrative affairs. This ratio is obtained by dividing the general-administrative and operational costs by the total assets under management (AUM) during the period in question.
- Turnover of an investment fund is the average ratio of the total value of the bid-ask transactions of the fund's assets to the total assets under the investment fund's management. This ratio usually measures the turnover of assets in a mutual fund and is presented to investors as a percentage over one year. A 100% turnover for a mutual fund means that the fund in question sells all of its assets in 12 months and replaces them with new ones.

- Size is calculated in the form of a natural logarithm of the net asset value of the fund in the given year.
- Age in the form of a natural logarithm is calculated as the number of months that have passed since the subscription of the fund to the stock exchange.
- In order to control the effect of uncertainty in estimating the alpha of the investment fund based solely on its time series information, the estimation error variable has been used in the alpha of the fund. This variable is calculated as the product of the standard deviation of the alpha of investment funds over the past year and the average alpha of the fund in that year.

Results

In this section, after calculating the variables of the research and examining the descriptive statistics, in the inferential statistics, the reliability of the variables, determining the model estimation method, controlling the regression assumptions, and fitting the final model have been discussed. We used the distribution method to control outliers. In this way, we added 1.5 times the median to the third quartile of the data and subtracted 1.5 times the median from the first quartile. The upper and lower limits of the obtained data were considered outliers and replaced with the average. Table 1 shows the results of the research in the descriptive statistics section.

Table 1. descriptive statistics

Variable	Mean	Median	Max.	Min.	Std. dev.	Skewness	Kortusis
Performance-Flow Sensitivity	3.73	0.17	248.09	-36.45	17.73	9.10	119.94
Algha	3.65	3.70	149.62	-71.64	5.76	9.64	257.02
IQR	6.26	6.37	11.62	-0.74	2.06	-0.34	3.12
$VOL_{i,t}$	4.15	3.56	42.80	1.96	3.92	7.37	62.76
ExpRatio	0.005	0.006	0.006	0.004	0.01	0.03	1.81
Turnover	67.64	67.42	86.73	49.90	0.11	0.00	1.73
Size	11.62	11.68	13.93	9.32	1.01	-0.18	3.32
Age	4.35	4.43	5.12	2.48	0.52	-1.01	3.87
Standard error	18.27	13.16	611.73	-47.52	54.81	9.46	94.47

The average of the dependent variable of the research, "Performance-Flow Sensitivity" (considered an index for evaluating the fund's performance), is equal to 3.73, and its standard deviation is equal to 17.73. Considering that the

standard deviation obtained for this variable is relatively high, it shows that the statistical sample of the research is not homogeneous in terms of the sensitivity of the future capital flow to the past performance of the fund and there is a difference between the funds. The Jansen alpha variable of investment funds has an average of 3.65% and a standard deviation 5.76. Considering that this variable's mean and the mean are close to each other, most of Jansen's alpha observations are distributed around the mean. The mean of the alpha dispersion variable is equal to 6.26, and its median is equal to 6.37. The closeness of the median to the mean indicates that most of the observations of interquartile alpha dispersion lie in this interval.

The reliability (stationarity) of model variables (dependent, independent, and control variables) is one of the critical assumptions used in statistical analysis using panel data. To test the reliability of continuous variables, the unit root test by Levin, Lin, and Chu (LLC) method was used at a significance level of 5%. The results are presented in Table 2, and since the significance level of 5% is low, the probability value obtained for each of the variables under investigation is less than 5%, and all the continuous variables of the research are reliable.

Table 2. unit root test results

Variable	Obs.	LLC	Sig.	Result
Performance-Flow Sensitivity	310	-13.54	0.000	stationar
IQR	310	-4.73	0.000	stationar
$VOL_{i,t}$	310	-106.19	0.000	stationar
ExpRatio	310	-15.26	0.000	stationar
Turnover	310	-7.56	0.000	stationar
Size	310	-9.99	0.000	stationar
Age	310	-12.56	0.000	stationar
Standard error	310	-249.90	0.000	stationar

The F-limer test was used to determine the correct method of estimating the regression model. In single-equation estimations, the F-Limer test statistic or Chave test is used to obtain the latest decision. The null hypothesis in this test is that the intercept of the model is the same in all sections (The pooling method is the case). First, the models with constant intercepts and constant sections are estimated to perform the F-Limer test, and then the F-Limer statistic is calculated. Table 3 represents the F-limer test results at a 5% significance level.

Table 3. F-limer test results

Regression model	Obs.	t-statistics	Sig.	Result

Performance-Flow Sensitivity	310	28.58	0.000	Reject H0

Based on the obtained results, at the significance level of 5%, considering that the obtained P-value is less than 5%, the H0 is rejected. That is, there is no reason to assume the same intercepts of different cross-sectional units and the data are panel-structured. Based on the results, it is more appropriate to use the panel model than the pooled one to fit the hypothesis test model. When the panel structure is used to fit the regression models, the Hausman test must be performed. Therfore, the Hausman test must be implemented to determine the estimation method (effects of cross-sections and periods). The null hypothesis in this test is that the coefficient difference is not systematic (the model has random effects). Subsequently, the surrogate assumption is the use of fixed effects in the model, the reason for which is the systematic difference in the coefficients for different stages. Table 4 summarizes the results of this test.

Table 4. Hausman test results

Regression model	Obs.	Chi-squared	Sig.	Result
Performance-Flow Sensitivity	310	31.16	0.000	Reject H0

The level of significance obtained for this test is less than 5%, implying the superiority of the fixed effects method over random effects. As a result, regression with fixed effects should be used in model fitting. The initial model is patterned by the ordinary least square (OLS) method, and the classical regression assumption is checked. Figure 2 shows the residual diagram of the OLS model.

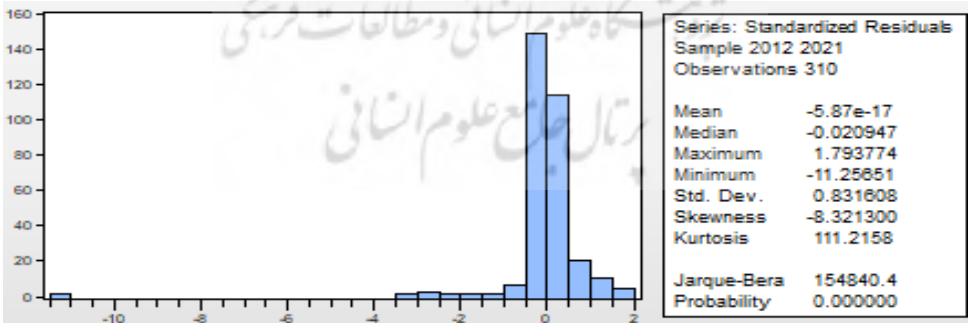

Figure 2. Residual normality of the OLS model

The correlation matrix was used to check the collinearity between the explanatory variables. Because the correlation coefficient between the

variables of alpha estimation error and the fluctuation of investment fund returns has crossed the critical threshold and there has been a strong co-linearity between these two variables, to solve this problem, in the final fitting, the return volatility has been removed. Another classic assumption of regression is the homogeneity of varianceof of residuals of regression models. To identify and check the assumption of homogeneity of the variance of the error sentences in the regression model, the Brush-Pagan test was used at a significance level of $\alpha = 5\%$. The results show that the model estimated based on the OLS method suffers from the problem of heterogeneity of the variance of error components. Therefore, the OLS method is not precise, so the generalized least square (GLS) method should be applied. However, due to the heterogeneity of the variance of disturbance components, the model fitted by the OLS method loses its GOF. However, this section also examines the autocorrelation of disturbance components. The brioche-Godfrey autocorrelation test was used to control the serial autocorrelation of disturbance components. According to the test probability value, the model fitted by OLS does not suffer from serial autocorrelation between error components. Therefore, there is no need to use White's statistic or the first interval autocorrelated variable (AR1) in the model.

It can be seen that the regression model fitted by the OLS method has the heterogeneity of the variance of the error components, the residuals of the model do not have a normal distribution, and there is strong collinearity between the two explanatory variables of the model. To solve the problems of heterogeneity of the variance of error components and the non-normality of disturbance components, the estimation method of generalized least squares (GLS) and weighting of sections should be used. In order to solve the problem of strong collinearity between the explanatory variables, the variable of fund return volatility has been removed from the final model fitting. To test the hypothesis, the regression model fitting using the GLS method was used without the explanatory variable of return volatility. The results of the hypothesis test model estimation using panel fitting are summarized in Table 5:

Table 5. Estimation of research hypothesis test model

Variable	Coefs.	Standard errors	t-statistics	Sig.
IQR	-0.0039	0.0018	-2.1205	0.0348
Age	0.0331	0.0349	-0.9482	0.3438
ExpRatio	1.1929	2.8976	0.4117	0.6809
Size	-0.0432	0.0181	-2.3862	0.0176
State	0.0096	0.0115	0.8303	0.4071
Turnover	0.2360	0.1694	1.3926	0.1648
Standard error	-0.0006	0.0004	1.3971	0.1634

Constant	0.6082	0.2976	2.0438	0.0418
F-statistics	2.5917	F – sig.	0.0131	
R2	0.367	Adj. R2	0.349	

Fisher's probability statistic is less than 5%; therefore, the significance of the model fitted by the GLS method is confirmed. The explained variance or explanatory coefficient of the model is equal to 0.367. It shows that approximately 36.7 % of the changes in the dependent variable (the sensitivity of future capital flow to past performance) in investment funds are explained by the explanatory variables of the model. The independent variable in the research hypothesis is the alpha dispersion of investment funds (interquartile ratio of fund alpha in 12 months of the year). According to Table 3, the beta coefficient of this variable is equal to -0.0039. Since the corresponding p-value statistic is less than 0.05, a negative and significant relationship exists between the alpha dispersion and fund performance evaluation at a significance level of 5% (95% confidence interval). Therefore, the first hypothesis of the research is confirmed. Based on the obtained model, the alpha dispersion of investment funds is effective on individuals's evaluation of the performance of investment fund managers.

Based on the obtained results, there is a negative and significant relationship between the alpha dispersion variable of investment funds in stocks and the sensitivity of the future capital flow to the past performance of the fund. In other words, based on the obtained results, each unit increase in the standard deviation of the alpha dispersion variable of investment funds in stocks leads to a decrease of about 0.4% in the sensitivity ratio of capital flow to performance. That is, during the period when we see an increase in dispersion in the alpha of investment funds, the sensitivity of the fund's capital flow to past performance decreases; That is, the role of the fund's past performance in the fund's future capital flow is reduced, and this opportunity is provided for opportunistic managers (low or unskilled) in investment funds to consider themselves as efficient and skilled managers.

Discussion and Conclusion

This research aims to investigate the impact of the Jensen alpha dispersion of investment funds on the investors' evaluation of the performance of the fund and managers of equity investment funds. For this purpose, the information collected about 31 equity investment funds from 2012 to 2022 (for ten years) was analyzed using the multivariable regression model. The statistical results related to the hypothesis test were presented. Based on the acquired grades and

empirical findings, there is a negative and significant relationship between the alpha dispersion variable of equity investment funds and the future capital flow's sensitivity to the fund's past performance (Performance-Flow sensitivity). In other words, based on the findings from data analysis, one credit increase in the standard deviation of the alpha dispersion variable of equity investment funds leads to a decrease of about 0.4% in the sensitivity ratio of capital flow to past performance. That is, when we see an increase in dispersion in the alpha of investment funds, the sensitivity of the fund's capital flow to past performance decreases. Then, the role of the fund's past performance in the fund's future capital flow is abridged, and this opportunity is provided for opportunistic managers (low-skilled or unskilled) in investment funds to consider themselves as efficient, talented, and skilled managers.

In order to justify the obtained results, we must delve into the theoretical foundations of the research. In general, high dispersion in mutual fund alphas makes it easier to mistake funds with typical zero alphas as having highly skilled managers, resulting in a higher type I error (i.e., misidentifying a mutual fund with zero alpha as an investment fund with high returns). In investment funds with positive alpha (high return), the high average level of systematic risk in the previous periods leads to a decrease in the average systematic risk in the subsequent periods, which means a severe drop in alpha for these funds (Pastor & Stanbaugh, 2012). This issue leads to a decrease in the sensitivity of the future capital flow to the past performance of investment funds (Sensui, 2009). Therefore, the higher the alpha dispersion of investment funds, the less sensitive the fund's future capital flow to its past performance and, subsequently, the probability of the type I error (mistaking unskilled and inefficient managers for skilled and expert managers) and the distortion of self-aggrandizement on the part of managers increases (Spiegel & Zhang, 2013; Stark & Sun, 2016; Harvey & Liu, 2018). Based on theoretical developments, when the dispersion of alpha (return) of investment funds increases, subsequently, we see an increase in the level of unsystematic (unique) risk of each investment fund (especially investment funds whose alpha is close to zero). In these situations, unskilled managers (without skills or low skills) can easily introduce themselves as skilled managers and mislead the investor. Therefore, when the alpha of investment funds has a higher dispersion, investors may face the type I error (considering an inefficient manager as a competent and skilled manager). Based on studies (Barras et al., 2010; Ferson & Chen, 2017; Harvey & Liu, 2018), the higher alpha dispersion of investment funds results in less sensitivity of future capital flow to the fund's past performance. In addition, the lower the sensitivity of the future capital flow to the past performance of the fund, the more opportunities managers have for

self-expression and the probability of them overestimating their own skills (behavioural bias of self-aggrandizement) increases. As a result of this issue, the possibility of committing type I error by real investors will increase. The findings of this research are in line with the findings of Baras et al. (2010) and Chen et al. (2017) and confirm the results of Harvey and Liu (2019).

It is recommended that policy-making institutions active in the capital market pay attention to the types I and II errors and consider the alpha dispersion of investment funds in their evaluations when rating investment funds and identifying funds that have reported better performance. Furthermore, the interested researchers are advised to measure the performance of investment funds as much as possible using other indicators such as Carhart's four-factor model, Fama and French's three-factor model, Fama's and French's five-factor model, etc. measures and compare their results with this research. This research was conducted for equity investment funds, and caution should be taken when generalizing the results to all investment and mutual funds. The complex and multi-dimensionality of the issue of performance evaluation, which is partially linked to behavioral finance, makes it impossible to evaluate all factors affecting investment fund performance accurately.

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