

Influencing Factors of Change Rate of Individually Held Fund Units in Equity Funds

-- A Panel Analysis of 120 Funds from 2017 to 2021

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Abstract. Funds are one of the most actively traded instruments in China's security market, and individual investors are the main force in fund purchases. A study of the factors affecting the change rate of individually held fund units in equity funds is conducive to the healthy operation of funds. This article uses the panel model to study the annual data of 120 funds from 2017 to 2021 as a sample and finds that the change rate of individually held units in equity funds is negatively correlated with fund performance, fund investment concentration and establishment year. This article also uses quadratic and segmented regressions to study the quadratic and segmented relationships between fund performance and dependent variables and use them as a basis to analyze the causes of "redemption anomalies".

Keywords: Equity fund; Individually held fund units; Redemption anomaly; Panel model.

1. Introduction

In financial terms, a fund is a financial product that collects the scattered funds of investors, hands them over to professional fund management institutions to purchase financial assets, and distributes income to the investors in accordance with the units held. With the development of China's capital market, the fund industry has also seen unprecedented expansion. Based on data from Wind, by the end of 2021, the total assets under management (AUM) of China reaching 25 trillion yuan.

Equity funds are an important part of the fund market. It invests primarily in the equity market and has a variable fund size that can issue new shares or be redeemed by investors at any time depending on market supply and demand. This nature can reflect the incentive of fund investors to fund managers. When a fund performs well and is recognized by investors, investors will increase their subscriptions to it, resulting in an expansion of the fund size and an increase in the fund manager's management income; when the fund performs poorly, investors may not prefer it and withdraw their capital by way of redemptions, resulting in a shrinkage of the fund size and a decrease in the manager's income. Thus, the healthy operation of equity funds requires a positive correlation between performance and capital inflows to play the role of "survival of the fittest".

It is of great economic significance to study the factors affecting fund redemption. It not only helps fund managers to adjust their strategies promptly and maintain the healthy operation of funds, but also reflects the healthiness of fund market.

2. Literature Reviews

Previous studies have found that many factors may affect investors' purchase decisions. Factors such as lagged long-term interest rates, stock market returns and disposable personal income (Santini and Aber, 1998), redemption fees and charging methods (Greene, 2001), brand (Chakarabarti and Rungta, 2000), and other factors all affect investors decision.

Investors purchase funds in a similar process to purchasing merchandise. It is not a completely rational decision. Because of the existence of shoe-leather costs, investors do not have enough energy or ability to measure the risks and returns of funds and purchase the most suitable products. They are more likely to base their own purchase decisions on factors that can be easily obtained and compared, such as annualized returns, volatility, and other indicators.

2.1 Analysis of performance factors affecting the change rate of open-end fund units

Among the many factors influencing investors, historical performance is the most easily relied upon when they select funds (Gruber, 1996). The “National Public Fund Market Investor Status Survey Report (2020)” released by the AMAC based on 84,807 individual investor questionnaires also shows that fund performance is the primary factor affecting individual investors’ investment in open-end funds. Among much research, the literature on the performance-fund flow relationship (PFR) is also the most abundant.

2.1.1 Related research in markets outside of China

Studies on PFR focus on the relationship between the historical performance of funds and capital inflows, that is, the relationship between fund performance and investors’ subscription and redemption. Early scholars believed that there was a positive correlation between a fund’s historical performance and its future capital inflows. Spitz (1970) analyzed the relationship between the performance and net capital inflows of 20 mutual funds in the United States from 1960 to 1967 and found that there was a positive correlation between performance and net capital inflows. Barber (2000) conducted a study on the investment behavior of household investors in American mutual funds from 1991 to 1996 and found that the main basis for investors to choose funds was the fund’s past performance. Investors will also consider their existing performance when selling the fund. Comparing the two, although the probability of selling profitable funds is higher, meanwhile more funds flow into profitable funds. Therefore, the funds with better performance generally see net subscriptions with size continue to expand.

However, some later studies have found that the performance-capital flow relationship is not symmetrical. There is a positive correlation between performance and capital inflows in general; however, the proportion of capital inflows resulting from superior performance is greater than the proportion of capital outflows resulting from inferior performance, that is, investors are willing to inject funds into well-performing funds, but are unwilling to withdraw funds from poorly performing funds.

Due to the existence of transaction costs, investors cannot frequently redeem funds with inferior performance and buy funds with superior performance. It is more likely that investors will make additional purchases in funds with superior performance that they already hold. Sirri and Tufano (1998) confirmed a positive relationship between performance and financial inflows in PFR and found that the relationship between PFR was not symmetrical. Funds with the highest returns received the most money from investors in the next period, while the funds ranked at the bottom had no significant outflows. Brown, Harlow, and Starks (1996) argue that over-performing funds can obtain capital inflows from investors while under-performing funds are not punished by capital outflows, a mechanism that is remarkably similar to call options, therefore the PFR is a convex function. Hu, Kale, and Subramanian (2002) took the US funds from 1962 to 1996 as a sample and found that the above nonlinear relationship still exists even after controlling for the variable of the fund’s establishment period, and the funds with a short establishment period have more obvious characteristics of asymmetry and convexity.

In general, research in markets outside of China revealed that fund performance has a positive correlation with capital inflow, and the impact of performance on capital inflow and outflow is asymmetric, so PFR exhibits a positive convex curve shape.

2.1.2 Related research in China’s market

However, due to the short development time of China’s fund market, investors are not mature enough. Related research has found that China’s fund market performance-capital flow relationship is different from the positive convex curve in other markets. Instead, there is a “redemption anomaly” that the better the fund performance, the higher the redemption rate.

Liu Zhiyuan and Yao Yi (2004) found that China’s funds had redemption confusion, that is, as the fund’s performance increased, its redemption rate did not drop but rose, and the net subscription of funds did not appear when the fund’s performance was at its highest, but precisely when it was at its

lowest. Li Yao (2003) conducted a regression analysis on the net redemption ratio and net value growth rate of 17 open-end funds in China in the first half of 2003 and found that with the increase in the fund net value growth rate, the redemption rate also increased. Lu Rong et al. (2007) found that the relationship between the performance and capital flow of China’s open-end funds was different from that of developed markets, showing a negative correlation and a concave shape. Investors’ choices did not introduce a “survival of the fittest” mechanism, with better-performing funds facing greater redemption pressure. Based on an empirical analysis of monthly dynamic panel data, Peng Hui et al. (2012) believed that there was a strong “redemption paradox” in the current-period performance of the fund, but not in the historical performance. The better the historical performance of the fund, the better the incoming cash flow, and the redemption paradox exists only in older funds.

2.2 Analysis of other factors affecting the change rate of open-end fund units

Zhao Xu and Wu Chongfeng (2003) analyzed several open-end funds established in China before 2003 and proposed that the fund’s dividend amount, redemption rate, investor preference and structure, and herd behavior affect open-end fund redemption behavior. Lu Rong et al. (2007) analyzed the panel data of 14 equity open-end funds in China and found that the factors affecting investors’ redemption include the returning stability, dividends, fund size, and other factors. Wang Huijian (2007) believed that the fund investment strategy was a key factor affecting the redemption rate—the higher the Herfindahl Index (HI), the greater the redemption rate; the higher the dividends, the smaller the redemption rate, and the capital market trend will also affect investors’ redemption decision.

Roston (1996) and Wang Huijian (2007) found that the longer the fund exists, the higher the investor’s recognition of the fund; the more prominent the brand effect, and the lower the redemption rate compared to newly established funds. However, Xiao Jun, Shi Jin (2011) and Mo Taishan (2013) found that the change rate in fund units was negatively correlated with the fund’s establishment period, which is conducive to investors’ subscription, whereas Mo attributed this effect to the lower net value of funds with shorter establishment period which benefits subscription. In addition, the new funds were actively traded in the initial stage of issuance with many subscriptions and redemptions.

A review of the literature reveals that the relationship between fund performance and capital flows follows a different pattern in the China’s market than in other major markets around the world. There is a "redemption anomaly" in the China’s market where the better the fund performance, the higher the redemption rate. Several other factors, such as fund dividend metrics, size, duration, etc., are significantly related to the rate of change in fund shares.

However, the previous literature took the overall change of fund units as the research object and did not distinguish the transaction behaviors of non-individual investors and individual investors. Changes in fund units are mainly affected by the above two transaction behaviors. Non-individual investors, including corporates, special funds, fund companies, and other units, hold a substantial proportion of fund units and continue to increase (Figure 1). And its trading behavior is more planned and less affected by the factors mentioned in the literature.

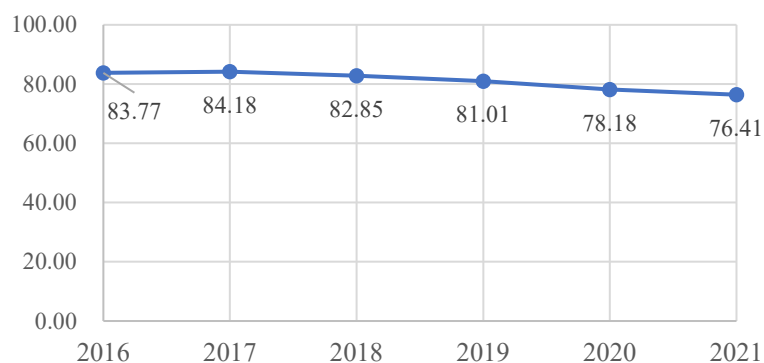


Figure 1. Annual average of shares held by individual investors in the sample funds

3. Data processing and variable description

3.1 Sample selection

To better reflect the influence of various factors on investors' fund redemption choices in recent years, this paper takes 2017 to 2021 as the research scope and with a data interval of six months. At the same time, to exclude abnormal changes in fund units caused by "following funds" and the fund lock period in the early stage of the funds, this article excludes funds that have been established for less than one year, a total of 120 common equity funds with a size of more than 100 million yuan as of the first quarter of 2022 and open for subscription and redemption were selected.

3.2 Variable selection and economic significance

3.2.1 Change rate in individually held fund units

To better investigate the effect of several factors on the change rate of individually held units in equity funds, this paper calculates the value as the dependent variable of the study based on the semi-annual and annual reports published by fund managers.

The change rate of individually held fund units is the change rate in fund units held by individuals within a unit time interval. The change is caused by the subscription and redemption of fund investors during the period. A positive fund unit change rate means that fund investors' subscription is greater than redemption, and the fund size becomes larger; a negative fund unit change rate means that fund investors' subscription is smaller than redemption, and the fund size becomes smaller. The size and the plus and minus signs of the fund unit change rate can reflect the investor's preference for the fund.

3.2.2 Jensen Index

The Jensen index was proposed by Michael C. Jensen in "Performance of Mutual Funds Between 1945 and 1964" published in 1968. It reflects the difference between the actual return of the portfolio and the expected return of the portfolio in the securities market and is expressed as

$$Jensen = (r_i - r_f) - \beta_i(r_m - r_f)$$

Where r_m is the rate of return of the market portfolio, r_i is the rate of return of the portfolio, r_f is the risk-free rate of return, and β is the systematic risk assumed by the portfolio. The entire index reflects the excess returns of the fund's performance over the market benchmark portfolio. In this paper, the Shanghai Composite Index is the benchmark portfolio return, and the one-year fixed deposit interest rate (before tax) is the risk-free rate of return. A positive Jensen index indicates that the fund's performance outperforms the market's benchmark portfolio return. This paper conjectures that the better the Jensen index, the greater the return to individual investors, thus attracting subscriptions from individual investors. There is a positive relationship between this index and the dependent variable.

3.2.3 The ratio of the total market value of the top 10 held stocks to the total market value of the overall stock investment

The ratio of the total market value of the top 10 held stocks to the total market value of the overall stock investment is the proportion of the market value of the top ten stocks held by the total market capitalization disclosed in the fund announcement to the market value of all stocks of the fund. This indicator can reflect the concentration of fund investment to a certain extent. This paper conjectures that the higher the concentration of fund investments, the more vulnerable they are to shocks from uncertain events in the stocks of individual companies, the higher the investment risk and the weaker the willingness of individual investors to subscribe. There is a negative correlation between this value and the dependent variable.

3.2.4 Fund establishment period

The length of fund inception is the time interval between a fund at a certain point and its inception date, in years. This paper conjectures that the length of fund inception can reflect the fund's management ability to a certain extent, and funds with longer inception also have more mature

investment styles and strategies and are more likely to be preferred by individual investors, so this paper conjectures that there is a positive correlation between this value and the dependent variable.

4. Model Validation

4.1 Model design

This paper uses panel data for analysis. Panel data can accommodate both time series and cross-sectional data, which greatly expands the number of observations and improves the possibility of effective parameter estimation. Moreover, the panel data model can overcome the bias caused by omitted variables by controlling unobserved individual heterogeneity.

In the model, the change rate of individual investors' holding units, the Jensen index, the total market value of the ratio of top 10 held stocks to the overall stock investment market value, and the fund's establishment year are expressed by FEBHL, Jensen, ZCGP, and CLNX respectively. Their coefficients are $\beta_1, \beta_2, \beta_3$ respectively. α_i is the fixed effect term and u_{it} is the random disturbance term. To reduce the effect of autocorrelation on the regression, CLNX is taken as logarithm. The model is as follows

$$FEBHL_{it} = \beta_1 Jensen_{it} + \beta_2 ZCGP_{it} + \beta_3 \log(CLNX_{it}) + \alpha_i + u_{it}$$

After the unit root test of the above variables, Levin, Lin & Chuy and ADF values show that the variables have no unit root, and the variables are stationary.

4.2 Descriptive statistics of variables

Table 1. Descriptive statistics of variables

	FEBDL	Jensen	ZCGP	CLNX
Mean	-0.022864	0.003171	51.29910	2.388333
Median	-0.094260	0.002750	51.54200	1.790000
Stdev	0.414904	0.004712	16.00703	1.831883
Kurtosis	29.67174	0.537683	-0.247574	11.96244
Skewness	4.603512	3.778641	2.999309	3.266191
Minimum	-0.863165	-0.010900	8.131400	1.000000
Maximum	3.272456	0.022800	95.00630	12.35000
Observations	1200	1200	1200	120

Note: A positive change rate in units indicates that the fund units have increased, and net subscriptions have occurred.

Based on the descriptive statistics table of variables, we can find that the change rate of individual investors' holding units is negative, indicating that the overall units of the funds selected for the study show a downward trend on average, but the standard deviation of this variable is relatively large with large differences between mean and median, and minimum and maximum values. A positive Jensen index indicates that these funds can obtain returns that exceed the expected returns of the market portfolio, reflecting the professional ability of the fund managers. The total market value of the top 10 stocks accounts for 51.30% of the average value of the stock investment market value, indicating that the research sample has a relatively concentrated investment. The fund's establishment period is also widely distributed, with the shortest being only one year and the longest being 12.35 years.

4.3 Preliminary regression analysis

Due to the use of panel data model, this paper needs to use F-test to decide whether to use mixed effects model or fixed effects model for panel data and Hausman test to decide whether to use fixed effects model or random effects model for panel data. The results of the tests are shown in Table 2.

Based on regression analysis, the F-test rejects mixed effects at the 1% significance level and the Hausman test rejects random effects at the 1% significance level. Therefore, we choose the fixed

effects model. The fixed effects model gives different intercept values for different samples throughout the period. Fund samples have different investment structures and operational characteristics. The use of fixed-effect models is not only more in line with the actual situation, but also can overcome the endogeneity of the model to a certain extent.

Table 2. Model Validation Selection Results

F-test		
Critical value (1%)	Actual value	Conclusion
1.350841	2.257541	Reject mixed effects, accept fixed effects
Hausman test		
Chi-Sq. Statistic	Prob.	Conclusion
32.144892	0.0000	Reject random effects, accept fixed effects

4.4 Model cointegration test

After the unit root test of the residuals, Levin, Lin & Chuy and ADF values show that the variables have no unit root, and the model passes the cointegration test.

4.5 Model results

The heteroscedasticity and endogeneity between cross-sections are factors that need to be considered when using panel data. Combined with the sample status and research purposes of this paper, the cross-section weighted method is used to estimate the equation with the results shown in Table 3.

Table 3. Regression Analysis Results

Variable	Est. value	t-value	Prob
Jensen	-2.709491	-2.796917	0.0057
ZCGP	-0.001415	-3.180474	0.0015
log (CLNX)	-0.040511	-3.491912	0.0005

After analyzing the results, we found that:

(1)The Jensen index is negatively correlated with the change rate of individually held fund units. The larger the Jensen index, the smaller the net subscription rate of the fund (the change rate in units is negative). This is contrary to the empirical judgment, and the “redemption anomaly” still exists. Individual investors will reduce purchases or even redeem when the fund market becomes better, and the “survival of the fittest” role of the fund market has not played well. This paper conjectures that the existence of "redemption anomalies" may be related to the loss aversion and disposal effect of individual fund investors in China. They tend to hold underperforming funds for a long period of time to recoup their capital, while quickly liquidating in the face of gains from better-performing funds. The empirical analysis of this aspect will be developed in Part V of this paper.

(2)The ratio of the total market value of the top 10 held stocks to the market value of the stock investment is negatively correlated with the change rate in the units held by individual fund investors. The larger the proportion of the market value of the heavily held stocks in the fund’s total market value, the smaller the change rate of individually held fund units (the change rate of units is negative), which is the same as the empirical judgment. The larger the value, the lower the risk diversification of the fund’s investment portfolio, and the more vulnerable it is to be impacted by a black swan event of a certain company.

(3)The establishment period is negatively correlated with the change rate in the units held by individual investors. The longer the fund has been established, the smaller the change rate of the units held by individual investors (the change rate of units is negative), which is contrary to the empirical judgment, indicating that with the increase of the fund establishment period, the units held by individual investors shows a downward trend.

The issuance of new funds will attract some investors with limited funds and make them redeem old funds. From 2017 to 2021, the number of newly issued funds increased from 975 to 1,898 a year, and the issuance units also nearly tripled. And with the rapid development of fund distribution platforms, investors have more ways to obtain new fund issuance information and it is more convenient for investors to subscribe to new funds. Therefore, individual investors are more likely to redeem the funds they originally held to subscribe to funds with new investment hotspots and new themes.

5. Analysis of the causes of redemption anomalies

The fourth part of the empirical analysis shows that the Jensen index is negatively correlated with the change rate of individual investors' holding units, and the larger the Jensen index, the smaller the net fund subscription rate (negative rate of change in shares). This paper conjectures that the emergence of this phenomenon may be related to the loss aversion psychology and disposition effect of individual investors. The binscatter command of Stata software can reveal that there may be a non-linear relationship between Jensen index and the change rate of individual investors' holding units.

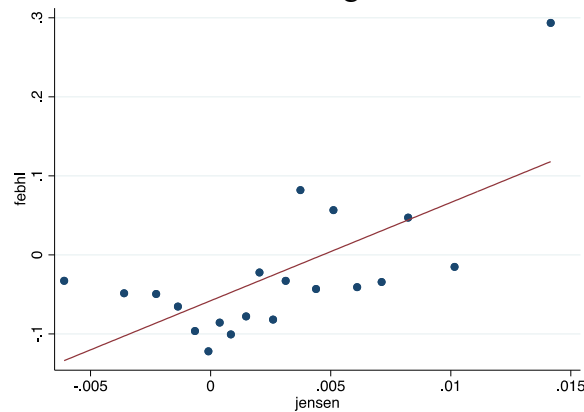


Figure 2. binscatter scatter plot

5.1 Secondary regression

From Figure 2, it can be found that there may be a squared relationship between the Jensen index and the change rate of individual investors' holding units. To test whether a squared term should be added to the model, it was verified using Linktest test and Reset test with the results in Table 4.

Table 4. Results of the square setting test

Test	Null Hypothesis	No squared term introduced t-statistic (p-value)	Squared term introduced t-statistic (p-value)
Linktest	The coefficient of the squared term of the fitted value is 0	3.30 (0.001)	-1.72 (0.086)
Reset	No omitted variables	5.24 (0.001)	2.21 (0.085)

The Linktest test rejects the null hypothesis at the 1% significance level before the introduction of the squared term, indicating that the model should include the squared term, and the test result was improved after the introduction of the squared term. The Reset test, on the other hand, concluded that before the introduction of the squared term, the test rejected the null hypothesis at the 1% significance level and the model had omitted variables. After introducing the squared term, the omitted variables were improved.

Therefore, the above empirical results show that Jensen index has a squared relationship with the change rate of individual investors' holding units to some extent.

5.2 Segmented regression

As can be seen in Figure 2, there may be a segmented relationship between the Jensen Index and the change rate of individual investors' holding units with a segmentation point of zero.

In terms of the economic significance of the Jensen index, we consider the fund to have outperformed the market benchmark performance and achieved excess returns when it is greater than zero. Whereas a Jensen index less than zero indicates that the fund underperformed. From the secondary regression part, the parabolic minimum of the change rate of individual investors' holding units is located around zero after a secondary regression with the Jensen index. Therefore, this paper conjectures that there may be a segmented relationship between the Jensen index and the change rate of individual investors' holding units with a segmentation point of zero.

Using the `Reghdfe` external command of Stata, a fixed effects model is built by including individual and time in the absorption term to overcome the effect of different individual and time data characteristics on the explanatory variables, and a regression model is built by clustering the data by individual to overcome the problem of heteroskedasticity in the data. The results are shown in Table 5.

Table 5. Segmented regression results

Est. value	t-value	Prob
	Jensen > 0	
42.89928	5.46	0.000
	Jensen < 0	
-10.81624	-3.07	0.003

Table 5 shows that there is a significant segmented relationship between the Jensen index and the change rate of individual investors' holding units when the Jensen value is zero. When Jensen is less than zero, it has a negative relationship with the change rate of individual investors' holding units, and when Jensen is greater than zero, it has a positive relationship with it, and the absolute value of the slope is larger compared to the value when Jensen is less than zero.

5.3 Analysis of the reasons for the redemption anomalies of individual investors

The empirical analysis and test above reveal that there is a non-linear relationship between Jensen index and the change rate of individual investors' holding units, and the relationship is negatively correlated when Jensen is less than zero and positively correlated when it is greater than zero. When the Jensen value is about zero, the overall change rate of individual investors' holding units is negative with the shareholding decreasing.

In terms of economic significance, individual investors instead increase their subscriptions to funds when the fund performance is poor. They have the strongest intention to redeem when the fund performance is about the average of markets and actively make subscriptions when the fund performance is better. This is similar to the finding of Lu Rong et al. (2007) that the relationship between performance and capital flows of Chinese open-end funds has a concave shape, with funds that perform well facing higher redemption pressure. According to the empirical results above, this paper further argues that funds with average performance, face more pressure from individual investors to redeem, while funds with better or worse performance can receive subscriptions from individual investors.

The reason for the "redemption anomaly" of individual investors on equity funds is related to the loss aversion and disposition effect of individual fund investors. When the fund performance is poor, individual investors are reluctant to redeem and leave the market to turn the book loss into real loss. They may try to reduce the average holding cost by increasing subscriptions and fixed investments to increase the possibility of returning the capital. When a fund performs reasonably well, individual investors receive relatively small losses or gains. When faced with smaller losses, investors have less resistance to make redemption decisions. But when faced with smaller gains, investors are more inclined to redeem as early as possible and leave the fund in the bag due to the disposition effect.

Only when a fund performs better, investors will be more likely to believe in its ability to deliver long-term returns and thus increase their subscriptions to it.

In addition, this phenomenon may also be related to the changing investment philosophy of individual investors in recent years. The concept of fixed investment has been widely accepted by individual investors, and a survey conducted by the AMAC shows that 71.1% of respondents have a more positive attitude towards fixed investment. They will continually purchase when the fund market is bad and wait to sell at the high point for profit. This irrational investment behavior in economics may bring investors more solid returns in actual investment decisions.

6. Conclusion and Suggestions

Through the above empirical research, this paper observes that the fund performance as reflected by the Jensen index illustrated a non-linear relationship with the change rate of individually held units of equity funds. The fund investment concentration as reflected by the total market value of the ratio of top 10 held stocks to the overall stock investment market value, and establishment period, are negatively correlated with the change rate of individually held units of equity funds.

This shows that in recent years, from the standpoint of individual investors, China's equity funds still have the phenomenon of "redemption anomaly" in terms of fund performance, and there are investment irrationalities introduced by factors such as the disposal effect and vision theory, investor literacy, and philosophy; individual investors prefer to invest in funds with a lower concentration to avoid a black swan event from a certain company; with the increase of the fund's establishment years, individuals may redeem old funds to invest in new funds or meet their stop-profit and stop-loss target.

Therefore, for the fund to operate in a healthier and long-term manner, fundamental performance is still a factor that fund managers should pay attention to. In addition to thematic funds, fund managers should moderately avoid excessively heavy positions in a few companies' stocks and avoid risks through more diversified investments. Finally, although the large-scale issuance of new funds is conducive to the expansion of the overall asset under management of fund companies and to generate more income, the issuance of new funds will impact the operation of old funds, which is not conducive to the sustainable development of funds and the creation of high-quality funds.

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