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A Study on the Economy of Sacle in Chinese Mutual Fund Industry with Forward Demeaning Method

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Abstract: ***China's securities investment fund market has experienced rapid expansion in the past two decades, and the impact of fund size expansion on fund performance presents a complex relationship. On the one hand, the theory of economies of scale indicates that an increase in scale may bring cost savings and better resource allocation; on the other hand, actual research shows that as fund size increases, fund performance tends to decline, and there is a phenomenon of diminishing returns to scale. Based on the forward mean method, this paper takes China's actively managed equity and equity-oriented hybrid funds from 2005 to 2023 as samples to empirically test the relationship between fund size and performance. The study found that there is a significant economy of scale effect in China's fund market: for every 1% increase in fund size, the risk-adjusted total return in the next quarter will increase by about 0.258% (equivalent to 1.03% annualized), which is in sharp contrast to the traditional "diseconomies of scale" theory and the experience of the US market. The study further pointed out that factors such as the low efficiency of China's capital market, abundant investment opportunities, and intensified fee competition provide unique conditions for economies of scale. The research conclusions provide a new perspective for understanding the characteristics of the emerging market fund industry and verify the effectiveness of the forward mean method in solving the endogeneity problem.***

Keywords: Fund size, Fund performance, Economies of scale, Forward mean removal method.

1. Research Background and Significance

1.1 Research Background

The Chinese securities investment fund market has experienced leapfrog development in the past two decades. In 2005, the asset management scale of public funds was only 0.5 trillion yuan, and by 2023 it had exceeded 30 trillion yuan, with an average annual compound growth rate of 25%, ranking second in the world. Behind this growth, it has benefited from the explosion of residents' wealth management needs and the deepening reform of the capital market, and is also closely related to the improvement of the active management capabilities of the fund industry. However, with the expansion of scale, a core controversy has always been unresolved: Will the growth of fund scale drive performance improvement, or will it be subject to the law of "diseconomies of scale"?

1.2 Research Significance

This study reveals the positive relationship between fund scale and performance in the Chinese market, and uses a more complete estimation method in terms of methodology. In theory, the study breaks through the traditional theoretical framework of diseconomies of scale and finds that there is an increasing return to scale phenomenon in the Chinese market.

2. Research Status and Hypothesis

There are different views on the relationship between fund size and performance in the existing literature. In the US securities investment fund market, there is more evidence to support the conclusion of Berk and Green (2004) that fund size has diminishing returns, and that the expansion of the size of actively managed funds will lead to a decline in performance due to rising transaction costs and information dilution. However, the applicability of this conclusion may be restricted by the stage of market development. In China's capital market, the low market efficiency, rapid expansion of the capital market, and the rapid decline in fees caused by market competition may provide unique conditions for economies of scale [1].

First, the asset pricing efficiency of China's capital market is low, and the market efficiency is at a low level. Low market efficiency is not conducive to resource allocation. However, for fund managers, there are more potential investment opportunities in the market with low efficiency. In the process of scale expansion, fund managers can find more investment opportunities and obtain better performance. Chen et al. (2004) pointed out that the impact of scale on performance is closely related to asset liquidity, and the presence of a large number of small and medium-cap stocks in China's capital market may enable large funds to gain bargaining power through scale advantages and reduce transaction friction. For example, Yang Kun et al. (2013) found in their study of the Chinese market that "star funds" can continue to attract capital inflows without showing significant performance decline, suggesting that scale expansion may coexist with a positive feedback mechanism [2][6].

Secondly, the rapid expansion of the capital market leads to more investment opportunities. The issuance review system of IPOs in China's stock market has been continuously reformed, from the approval system before 2000 to the approval system, to the sponsor system in 2004, and then to the registration system in 2014. In the process of continuously improving and reforming the stock issuance review system, the pace of the CSRC's review of IPOs has significantly accelerated.

Finally, the increasing competition in the domestic securities investment fund market has led to a rapid decline in explicit transaction costs such as fund management fees. China's fund market has developed rapidly, with the number of funds increasing by about 87 times from 223 in 2005 to 19,421 in 2023. The rapid expansion of the number has also brought

about fierce competition, the most obvious of which is the decline in fund fees, and the proportion of total fund fees to fund management assets has continued to decline. For example, in 2023, the management fees of public funds totaled 135.615 billion yuan, a year-on-year decrease of 7.04%. Among them, the largest proportion was mixed funds, with a total management fee of 55.749 billion yuan, a year-on-year decrease of 19.91%. Custody fees totaled 28.738 billion yuan, a year-on-year decrease of 6.33%.

Based on the above theoretical deduction and empirical evidence, this paper proposes the hypothesis:

H1: In the Chinese fund market, when the fund size increases, the increase in the size of securities investment funds will significantly improve their performance, and the market as a whole will show economies of scale.

3. Research Design

3.1 Forward Demeaning Method

Berk and Green (2004) established a theoretical model of fund size and performance [1]. It is assumed that the fund's excess return is determined by the fund manager's investment ability and the random error term. The fund manager's investment ability is unknown and follows a normal distribution. When the fund receives capital inflows, the fund size increases, and the fund manager can only invest the funds in suboptimal investment opportunities, resulting in a decrease in the fund's excess return [1]. That is:

$$r_{it} = \alpha_i + \beta x_{it-1} + \gamma controls_{it-1} + \mu_{it} \quad (3.1)$$

r_{it} is the performance of fund i in quarter t; $x_{i,t-1}$ is the size of fund i in quarter t-1; $controls_{it-1}$ are various control variables. β is significantly greater than 0, which means that the larger the fund size, the better the fund performance. The fund has economies of scale; β is significantly less than 0, which means that the larger the fund size, the worse the fund performance. The fund has diseconomies of scale. β is indifferent from 0, which means that the fund size has no significant effect on fund performance.

Early studies mostly used ordinary least squares (OLS) estimation and testing (3.1). However, since the investment ability of fund managers cannot be observed, there will be omitted variables when estimating the relationship between fund size and performance; in addition, changes in fund size affect fund asset portfolio management, thereby affecting fund performance; and changes in fund performance will affect the inflow of funds from fund investors, thereby affecting fund size. Therefore, model (3.1) has an endogeneity problem. Using ordinary least squares (OLS) to estimate (3.1), the estimation results have finite sample bias (Pastor et al; 2015). In panel data regression, finite sample bias refers to the phenomenon that the estimated value deviates from the true parameter due to the limited sample size. When estimating the relationship between fund performance and size, even if a fixed effect model is used, the traditional OLS estimation will still produce bias.

Pástor et al. (2015) proposed to use recursive demeaning to eliminate endogeneity in model (3.1) [4]. The method of Pástor et al. (2015) includes two steps:

First, the variables are forward demeaned, that is:

$$\overline{q}_{it} = q_{i,t-1} - \frac{1}{T_i - t + 1} \sum_{s=1}^{T_i} q_{i,s-1} \quad (3.2)$$

$$\overline{R}_{it} = R_{i,t} - \frac{1}{T_i - t + 1} \sum_{s=t}^{T_i} q_{i,s} \quad (3.3)$$

This eliminates the individual fixed effect α_i, and the model is transformed into:

$$\overline{R}_{it} = \beta \overline{q}_{it} - \bar{\varepsilon}_{it} \quad (3.4)$$

Secondly, the two-stage instrumental variable method is used to estimate (3.4).

Use the backward mean-devalued $q_{i,t-1}$ as the $\overline{q}_{it}$ instrumental variable:

$$\underline{q}_{i,t-1} = q_{i,t-1} - \frac{1}{t-1} \sum_{s=1}^{t-1} q_{i,s-1} \quad (3.5)$$

$\underline{q}_{i,t-1}$ depends only on historical information (t-1 period and before), and has nothing to do with future errors $\bar{\varepsilon}_{it}$, satisfying exogeneity.

The two-stage least squares method is used for regression, and the first-stage regression is:

$$\overline{q}_{i,t-1} = \gamma \underline{q}_{i,t-1} + \mu_{i,t} \quad (3.6)$$

Second phase of return:

$$\overline{R}_{i,t-1} = \beta \widehat{\overline{q}_{i}} + e_{i,t} \quad (3.7)$$

By using instrumental variables to strip off the error-related components in $\overline{q}_{i,t-1}$, an unbiased estimator $\hat{\beta}_{RD}$ is obtained.

However, Zhu (2018) found that when Pástor et al. (2015) used the two-stage instrumental variable method to estimate (3.4), they did not include the intercept term in the first stage. This will lead to a decrease in the goodness of fit in the first stage and an increase in the variance of β. Zhu (2018) proposed an improved method that allows the intercept term to be included in the first-stage regression in the two-stage instrumental variable method estimation (3.4) and uses the more recent fund size as an instrumental variable [5]. The specific calculation method of the instrumental variable is as follows:

$$\overline{x}_{i,t-1} = x_{i,t-1} - \frac{1}{T_i - t + 1} \sum_{s=t}^{T_i} x_{i,s-1} \quad (3.8)$$

Similarly, the rate of return R_(i,t) is also forward-meaned to ¯R_(i,t) to eliminate fixed effects.

Zhu (2018) uses the lagged term $x_{i,t-1}$ of fund size as the instrumental variable for $\overline{x}_{i,t-1}$ and adds an intercept term to the first-stage regression in the two-stage instrumental variable method estimation (3.4) [5]. That is:

$$\overline{x}_{i,t-1} = \phi + \rho_1 x_{i,t-1} + \eta_{i,t} \quad (3.9)$$

Since $x_{i,t-1}$ is obviously correlated with $\overline{x_{i,t-1}}$, and since

$x_{i,t-1}$ does not contain information after t-1 and is unrelated to the disturbance term $\eta_{i,t}$, $x_{i,t-1}$ meets the selection criteria for instrumental variables. It is related to the endogenous variables in the original model and unrelated to the disturbance term in the original model. Then regress the fitted value $\widehat{\overline{x}}_{i,t-1}$ obtained from the first stage regression on the forward mean return:

$$\overline{R}_{i,t-1} = \beta\widehat{\overline{x}}_{i,t-1} + u_{i,t} \quad (3.10)$$

The final estimated coefficient β reflects the impact of fund size on performance.

4. Sample Selection and Variable Calculation

4.1 Sample Selection

This paper selects the quarterly net asset data of equity and equity-oriented hybrid active management funds in China's open-end funds from the Guotai An Database (CSMAR) from January 1, 2005 to December 31, 2023. The initial data is screened as follows: (1) Money market funds and bond funds are excluded; (2) Passive management funds, such as index funds and enhanced index funds, are excluded; (3) Bond-oriented hybrid funds are excluded; (4) ETFs, LOFs, and QDII funds are excluded; (5) Umbrella funds and structured funds are excluded.

4.2 Variable Calculation

This paper uses the total return adjusted by the market benchmark (GrossMarketAdj), the total return calculated based on CAPM (GrossCAPMalpha), and the total return calculated by the Fama-French three-factor model (GrossFaMa3alpha) to calculate fund performance. When estimating the equation, this paper includes the following control variables: fund age (FundAge), fund company asset management scale (lnCompanyTna), fund flow (Flow), and the number of fund products managed by the fund management company (FundNum).

5. Empirical Test

5.1 Descriptive Statistics

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
GrossMarketAdj	53950	.007	.084	-.735	3.097
GrossCAPMalpha	53950	.009	.078	-.737	3.022
GrossFaMa3alpha	53950	.014	.075	-.775	3.024
lnTna	53950	20.009	1.591	16.119	25.059
lnCompanyTna	53950	23.718	1.414	16.141	26.882
FundAge	53950	30.893	14.049	14	90
FundNum	53950	73.849	64.037	1	303
Flow	53950	.034	.456	-.644	3.22

Based on a data set containing 53,950 fund observations, this study conducted descriptive statistics on fund performance and operating characteristics, as shown in Table 1. The following is an analysis of the distribution characteristics of the core variables:

In terms of fund performance, the mean of the market-adjusted total return (GrossMarketAdj) is 0.7%, and the standard deviation is 8.4%, indicating that the fund as a whole slightly outperforms the market but has significant fluctuations. Its extreme values range from -73.5% to 309.7%, highlighting the high differentiation of returns in extreme market environments. The mean of the total return (GrossCAPMalpha) adjusted by the CAPM model rose to 0.9%, and the standard deviation slightly dropped to 7.8%, indicating that the overall performance of the fund has improved and the degree of dispersion has decreased after risk adjustment. The mean of the return (GrossFaMa3alpha) adjusted by the Fama-French three-factor model further increased to 1.4%, and the standard deviation narrowed to 7.5%, reflecting that the multi-factor model can more accurately capture the fund's true excess returns while reducing measurement volatility.

The fund size characteristics show that the mean of the logarithmized net assets of the fund (lnTna) is 20.009 (approximately corresponding to US$540 million), and the standard deviation of 1.591 reveals that there are significant differences in the sizes of different funds, with the smallest size (16.119) and the largest size (25.059) differing by more than three orders of magnitude. The mean of the total assets of the management company (lnCompanyTna) is 23.718, which is about two logarithmic units higher than the size of a single fund, indicating that the leading companies have a significant scale agglomeration effect.

In terms of operation, the average duration of the fund exceeds 30 quarters (about 7.5 years), but the standard deviation of 14.05 indicates that there are both old-fashioned funds and new-generation products in the industry. The mean number of products managed by fund companies (FundNum) is 73.8, but the standard deviation of 64.0 and the extreme range (1-303) jointly point to the differentiation of industry concentration, and the leading institutions have formed a significant advantage through product line expansion.

The fund flow (Flow) presents an asymmetric distribution, with an average net inflow of 3.4% accompanied by a high standard deviation of 45.6%, and a sharp contrast between the minimum value of -64.4% and the maximum value of 322%. Such violent fluctuations may reflect investors' overreaction to market shocks, as well as phenomena such as the siphon effect of star funds and large-scale redemptions of funds with poor performance.

Overall, the data reveal the significant heterogeneity of the fund industry in terms of performance, size distribution, and fund flow, providing an important benchmark for understanding the market competition pattern and investor behavior.

5.2 Empirical Results

This section first recursively removes the mean of the variables in equation (3.1) according to the method of Zhu (2018), then estimates equation (3.9) to obtain the predicted value of fund size, and finally estimates equation (3.10). When estimating equation (3.10), this paper controls time fixed effects and individual fixed effects. The regression results are shown in Table 4-2.

According to the regression results in Table 4-2, the

coefficient estimate of fund size (lnTna) is between 0.00258 and 0.00532, and the t-value of the significance test is between 5 and 12. The coefficient of lnTna is significantly positive at the significance level of 1%. This shows that the larger the fund size, the better the fund performance. Overall, the fund asset portfolio management process shows economies of scale. Taking Table 2 as an example, when estimating fund performance using the Fama-French three-factor model, when the total net value of the fund asset portfolio increases by 1%, the fund's total excess return in the next quarter will increase by 0.258%, which is converted into an annual return of 1.03%. Therefore, the performance improvement brought about by the growth of fund size in the domestic market is very obvious, and there is a significant phenomenon of increasing returns to scale at the fund level. However, Chen (2004) and Yan (2008) found that there is a phenomenon of decreasing returns to scale in the US fund market. Obviously, the relationship between fund size and fund performance in the domestic fund market is significantly different from that in the United States [2] [3].

Table 2

VARIABLES	(1) GrossMarketAdj	(2) GrossCAPMalpha	(3) GrossFaMa3alpha
lnTna	0.00258***	0.00352***	0.00312***
	(5.09)	(7.75)	(7.03)
lnCompanyTna	-0.00334***	0.00451***	0.00209***
	(-3.72)	(5.62)	(2.65)
FundAge	-0.00870***	-0.00892***	-0.00667***
	(-14.19)	(-16.26)	(-12.44)
FundNum	-0.00011***	-0.00013***	-0.00019***
	(-3.49)	(-4.75)	(-6.98)
Flow	0.01530***	0.01850***	0.01870***
	(17.73)	(23.97)	(24.78)
Constant	-0.03402	-0.23703***	-0.16003***
	(-1.54)	(-12.04)	(-8.31)
Observations	51,067	51,067	51,067
R-squared	0.142	0.164	0.144
Id FE	YES	YES	YES
Year FE	YES	YES	YES

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

6. Conclusion and Policy Recommendations

6.1 Conclusion

This paper reveals the positive relationship between scale and performance in the Chinese fund market through an improved forward demeaning method, which supports the research hypothesis of this paper. Unlike the US market, the expansion of Chinese fund scale has not led to performance decline. Instead, it has formed an increasing scale return effect through improved bargaining power, reduced transaction friction and full utilization of diversified investment opportunities. This difference may be due to the characteristics of the development stage of China's capital market: low market efficiency creates excess return space for active management, the rapidly expanding IPO market provides sufficient investment targets, and the fee competition forces management efficiency to improve.

6.2 Recommendations

First, encourage the moderate scale development of the fund industry, support leading institutions to improve resource integration capabilities through mergers and reorganizations, and strengthen differentiated competition among small and medium-sized fund companies to avoid market monopoly. Second, deepen capital market reform, optimize IPO review and delisting mechanisms, ensure the supply of high-quality assets, and provide sustainable investment opportunities for funds. Third, strengthen information disclosure and investor education, guide the rational flow of funds, and reduce the impact of short-term speculation of "star funds" on market stability. Fourth, improve the fee supervision system, balance industry competition and service quality, and prevent vicious price wars from damaging investors' long-term interests. Through the above measures, the scale economy potential of the fund industry can be further released and the high-quality development of the capital market can be promoted.

References

[1] Berk, J.B. and Green, R.C. (2004), 'Mutual fund flows and performance in rational markets', Journal of Political Economy 112(6), 1269-1295.

[2] Chen, J, Hong, H, Huang, M. and Kubik, J.D. (2004), 'Does fund size erode [21] mutual fund performance? the role of liquidity and organization', American Economic Review 94(5),1276-1302.

[3] Yan, X. S. (2008), 'Liquidity, investment style, and the relation between fund size and fund performance', Journal of Financial and Quantitative Analysis 43(03), 741-767.

[4] Pastor, L., Stambaugh, R. F. and Taylor, L. A. (2015), 'Scale and skill in active management', Journal of Financial Economics 116(1),23-45.

[5] Zhu, M. (2018), "Informative fund size, managerial skill, and investor rationality', Jourrnal of Financial Economics 130(1), 114-134.

[6] Yang Kun, Cao Hui, Song Shuangjie Fund performance and fund flow: star effect and bottom effect [J]. Journal of Management Science, 2013,16 (05): 29-38.