Size and Performance of Chinese Mutual Funds: The Role of Economy of Scale and Liquidity

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Abstract

Using detailed stockholding for a comprehensive sample of Chinese mutual funds from 2004 to 2009, we investigate the economy of scale and liquidity on the relation between fund size and performance. We find that there exists an inverted U-shape relation between fund size and performance accounting for various performance benchmarks. Both economy of scale and liquidity exist and play an important role to Chinese mutual funds, and their combination can explain reasonably well the inverted U-shape between size and performance discovered in this paper.

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Keywords: Chinese mutual funds, size, performance, economy of scale, liquidity

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1. Introduction

After 18 years of rapid development, the scale of China's capital market has risen to the third in the world and is playing a very important role in the world economy. After the launch of the first mutual fund in China, "Hua An Chuang Xin", in Sep. 2001, the mutual fund industry has been among the fastest growing financial industries in China. A survey conducted by China Securities Journal in the end of 2007 showed that 83% of 14,800 respondents would like to pick mutual funds as the first choice for their wealth management.[1] Yu and Du (2008) show that equities held by mutual funds represented about 28% of the total Chinese equity markets at the end of year 2007. The number of Chinese fund management company has reached 61, with 544 funds under management including equity, currency, bond, and index funds with total assets of 2.3 trillion Yuan in 2009. The mutual fund industry is expected to grow drastically as China opens its doors to international trading via the gate of Qualified Foreign International Investors (QFII). Figure 1 shows the total asset value that the Chinese equity-based mutual funds have from 2004 to 2009. It shows that the Chinese mutual fund industry experienced dramatic growth from 2004 to 2007, although it decreases slightly during the credit crisis after 2007. Figure 2 plots the averaged performance measures (Sharpe ratio, CAPM alpha and Fama-French alpha) across all equity funds in the mutual funds industry from 2004 to 2009. It surprisingly shows that the average alphas in CAPM and Fama-French were all positive in these years, which indicates that the equity mutual funds in total performed quite well.

Insert Figure 1 and 2 here.

Fund performance relates to many features of Chinese mutual funds; among them, size is widely considered an important issue to the funds management industry. In this paper, we mainly investigate the following question: *What is the relationship between fund size and performance, and why?* Although the effect of fund scale on its performance is an important question, the academic literature has only recently begun to address this issue in general from

[1] Refer to the web page:
http://www.industryweek.com/articles/china_mutual_fund_industry_nearly_quadruples_in_2007_15562.aspx

both theoretical and empirical perspectives. In the meantime, there is nearly no research on this issue with regard to Chinese mutual funds. With the growth of the Chinese mutual fund industry, the size of Chinese mutual funds also increased (refer to figure 3), hence a thorough understanding of this question would naturally benefit market investors.

Insert Figure 3 here.

From an economy of scale point of view, researchers argue that larger funds will have less brokerage commissions and marketing and research costs than smaller funds and hence should perform better. However, many researchers propose a negative relationship between fund size and performance due to various reasons such as organizational diseconomy and liquidity. Williamson (1988) favors the organizational diseconomy of scale, arguing that bureaucracy and related coordination costs will erode the fund performance. Stein (2002) argues that, in the presence of hierarchy costs, small firms tend to outperform large firms in processing information; furthermore, agents tend to have difficulties convincing their colleagues of implementing good strategies. Perold and Salomon (1991) argue that large asset bases might erode fund performance because of high transactional costs. Becker and Vaughan (2001) argue that the fund managers of large funds lose the flexibility to change positions.

Using samples of American equity mutual funds, Chen, Hong, Huang, and Kubik (2004) find that fund returns, both before and after fees and expenses, decline with lagged fund size. They explore the idea that scale erodes fund performance because of the interaction of liquidity and organizational diseconomies. Yan (2008) also finds a significant inverse relationship between fund size and fund performance for American equity mutual funds. This relationship is more pronounced among growth and high turnover funds that tend to have high demands for immediacy. He mainly attributes this inverse relationship to liquidity constraints of funds. Using Australian equity fund data, Chan, Faff, Gallagher, and Looi (2005) show that fund size detracts from performance because of market impact and transaction cost.

In this paper, we document that there is an inverted U-shape relationship between fund size and performance for Chinese mutual funds. Furthermore, we show that the initial positive

relationship between fund size and performance is very likely caused by the economies of scale. In other words, growth in fund size provides cost advantages, as brokerage commissions, research and marketing costs don't increase in direct proportion to fund size. However, when the fund becomes larger, liquidity problems might be substantial, causing fund size to erode the fund performance. More specifically, large funds tend to hold large portions of portfolios that are not easily bought or sold at an ideal price, thus forcing large funds to pay more trading costs than small funds. Moreover, when facing the liquidity problem, large funds tend to liquify their portfolio, e.g. adding some unfavorable but liquid stocks into the portfolio; this erodes the fund's performance as well.

We test the roles of economy of scale and liquidity in the relationship of fund size and performance through several hypotheses in this paper. Results confirm that both economy of scales and liquidity constraints exist in the Chinese fund industry, which simultaneously influence Chinese mutual fund performance. The combination of the two effects explains the inverted U-shape.[2]

The remainder of this paper is organized as follows. Section 2 shows the data used in this study. Section 3 documents the relationship between fund size and fund performance. Sections 4 and 5 study, respectively, the effect of economy of scale and liquidity in determining the relationship between fund size and fund performance. Section 6 concludes.

2. **Data**

Our primary data come from the Tianxiang Investment Analysis System in a semi-annual frequency. We restrict our analysis of Chinese mutual funds to the period from the first semi-annual of 2004 to the first semi-annual of 2009. The reason to choose data after 2004 is that, before 2004, there were a small amount of funds in the mutual funds industry; hence, this time period might not be sufficient to test the significance of fund size and its performance. Following many prior studies, we restrict our analysis to equity funds, which exclude bond, currency and index funds. The rest of the funds can be sorted into two types: closed-end funds and open-end funds. Funds must have at least one year life in order to be

[2] Due to lack of organizational data of Chinese mutual funds, we do not study the effect of organizational diseconomy on the size-performance relationship.

included in our dataset.

Table 1 presents the descriptive statistics for fund characteristics. In each semi-annual, we divide all the funds into five size quintiles based on the total net asset of the end of the *previous* semi-annual, with the smallest funds in quintile 1 and the largest ones in quintile 5. In addition to separate summary statistics for each fund size quintile, we also report the summary statistics for all funds as a group. We first calculate the averages of each data item in each semi-annul, and then report the time-series averages.

Insert Table 1 here.

In each semi-annual, there are on average 138 funds in our sample. They have average total net assets (TNA) of ¥3781 million. The average TNA in the smallest fund size quintile is ¥626 million, while the average TNA in the largest fund size quintile is more than ¥8 billion. The family size, which means the size of the family that the fund belongs to, is on average ¥27.3 billion.

The average fund turnover rate is 178.06%. Those in the smallest quintile have an average turnover of 311.46%, whereas the ones in the top quintile have an average turnover of 116.44%. The average expense ratio is 2.35% per year, while the funds in the smallest quintile have an average expense ratio of 2.71% and the largest ones have expense ratio of 2.15%. Flow here is the proportion of the new capital inflows. We see that the fund turnover rate and expense ratio decrease with fund size. Table 2 presents the correlations among various fund characteristics. We calculate the correlations on the cross-section each semi-annual, and then report the time-series averages.

Insert Table 2 here.

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3. Size and Performance

In this section, we mainly study the relationship between fund size and performance

using Fama-MacBeth (1973) cross-sectional regression.[3] We first estimate the regression on each cross section and then report the time-series average coefficients. We use three asset pricing models to measure the fund performance: the Sharpe ratio, the CAPM alpha and the alpha in Fama-French 3-factor model. We also introduce several simplified control variables in our regression, including fund family size, fund type, turnover rate, expense ratio and cash flow.

Before constructing the regression, we need to guess what the relationship between fund size and performance roughly is. Figure 4 shows us the relation intuitively. The level of fund performance increases from quintile 1 to quintile 2, and then declines from quintile 3 to quintile 4 to quintile 5, for all three measures used in this paper.

Insert Figure 4 here.

The introduction section shows that the economy of scale and the liquidity constraints might exist simultaneously. Therefore, for small funds, the liquidity issue might not be an important issue as they do not hold large stock positions. However, the economy of scale would play an important role at this stage because, as fund size grows, the funds can save their broker fees, marketing fees, etc. Thus, at this stage, fund performance improves with fund size. In contrast, when funds become very large, the economy of scale effect might not be improved, but the liquidity issue might be more important instead. Hence, fund size damages fund performance at this stage. Therefore, there might be an inverted U-shape relationship between fund size and performance, and an optimal size exists in terms of fund performance. In other words, fund performance increases with the scale when it is below the optimal size but decreases when it is above the optimal size. Hence, we hypothesize:

H1: Fund size and performance exhibit an inverted U-shape relationship.

In order to test this hypothesis, we examine a quadratic relation between fund size and performance. The specification of the cross-sectional regression is as follows:

[3] Note that we use Fama-MacBeth method in all of our empirical estimation in this paper.

$$\alpha_{i,t} = a_{0,t} + a_{1,t}\text{LOGTNA}_{i,t-1} + a_{2,t}(\text{LOGTNA}_{i,t-1})^2 + a_{3,t}\text{LOGFAM}_{i,t-1} + a_{4,t}\text{TYPE}_{i,t-1} + a_{5,t}\text{TURNOVER}_{i,t-1} + a_{6,t}\text{EXP}_{i,t-1} + a_{7,t}\text{FLOW}_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where α is the measure of fund performance, LOGTNA is the base 10 logarithm of fund TNA with a unit of ¥10 million，and LOGFAM is the base 10 logarithm of fund family size. TYPE, a dummy variable, is the type of the fund, which equals one if the fund is an open-end fund and zero otherwise. TURNOVER is the averaged stock turnover rate of the fund, EXP is the fund expense ratio, FLOW is the proportion of new capital inflows, and ε is the random error term.

Table 3 reports the regression results. For all three of the performance measures, we show that a positive relationship exists between fund performance and fund flow. This relationship is likely caused by the fact that fund inflows can help the fund management restructure its portfolio and hence enhance the fund performance. In the meanwhile, fund performance is significantly positively related to the size of the fund family. We will analyze this phenomenon in a later section. More importantly, the coefficients of LOGTNA and $(\text{LOGTNA})^2$ are significantly positive and negative, respectively. This result shows that there exists an inverted U-shape relationship between fund size and performance. The optimal size associated with CAPM and Fama-French measures is around 1 billion yuan. Fund performance increases with the scale when it is below the optimal size while performance decreases when the scale is above the optimal size. Figure 5 shows the theoretical inverted U-shape. Note that using an American dataset, Indro, Jiang, Hu and Lee (1999) also document an inverted U-shape relationship between fund size and performance, which is consistent with our result.

Insert Table 3 and Figure 5 here.

If fund managers expect a negative relationship between fund size and fund performance when fund size is over the optimal value, the fund managers tend to start a new fund when new money comes in. This should be the case especially when the Chinese mutual funds industry experienced a fast growth and the funds size became larger and larger (refer to

Figure 3). Therefore, we expect that the averaged fund numbers per fund family increase with time. Figure 6 shows the average number per fund family from 2004 to 2009, which confirms our expectation.

Insert Figure 6 here.

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4. The Economy of Scale

To explain the inverted U-shape between fund size and fund performance, we need to check whether the economy of scale exists in mutual funds. If the economy of scale exists in mutual funds, we expect that the expense ratio would decrease with fund size since many costs associated with mutual funds, such as sunk costs, marketing and research costs, are not directly proportional to fund size. However, as funds grow large, the fixed amount of cost does not account for a significant portion of the total cost; instead, costs related to fund size, such as commission fees and broker fees, may play an important role instead. Thus, we expect the marginal impact of the fund size on fund expense ratio to decrease as the fund grows. Hence there might be some nonlinearity in the relationship between expense ratio and fund size, which might correspond to the nonlinear relationship in the size-performance relationship. We hypothesize:

H2: The fund size negatively influences expense ratio but with a decreasing marginal impact.

To test this hypothesis, we ran the following regression

$$\begin{aligned} \mathrm{EXP}_{i,t} = b_{0,t} + b_{1,t}\mathrm{LOGTNA}_{i,t} + b_{2,t}(\mathrm{LOGTNA}_{i,t})^2 + b_{3,t}\mathrm{TYPE}_{i,t} \\ + b_{4,t}\mathrm{LOGFAM}_{i,t} + b_{5,t}\mathrm{FLOW}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Table 4 shows the results. From the table, one can see that the coefficient of LOGTNA is significantly negative at the 95% confidence level. Also, the coefficient of $(\mathrm{LOGTNA})^2$ is positive with a p value of 11%. This indicates that *the marginal effect of fund size on expense rate decreases with fund size.* Hence, as the fund grows the scale of economy becomes less important. We do not see other variables, such as fund type, family size or fund flow,

influencing significantly the expense ratio. Note that using the US mutual fund data, Tufano and Sevick (1997) also showed that there is a negative linear relationship between fund size and size expense rate.

Insert Table 4 here.

Also, in the framework of economy of scale, funds with a large family should have a scale effect of lowering the average fixed cost. Hence, we hypothesize:

H3: Fund performance is positively correlated with fund family size.

This hypothesis was already tested in (1) and the results are shown in Table 3. No matter which fund performance measure is used, we always find that fund performance has a significantly positive relationship with the fund family size.

5. The Role of Liquidity

As mentioned above, when fund size exceeds a threshold, fund performance is eroded by fund size, which is likely to be caused by liquidity. In this section, we design some tests to check whether liquidity influences the fund performance. We divide the effects of liquidity into two aspects: 1) the transaction (or market impact) cost incurred from holding a large position, and 2) the distortion of the fund portfolio caused by liquidity constraints.

5.1 Market Impact Cost

To investigate the relationship between fund performance and liquidity, the most obvious and most cited aspect is the market impact cost. We first begin our investigation by checking the relationship between aggregate market impact costs incurred by each fund and its relationship with the fund size. It is easy to understand that, for small funds, the market impact costs should be very small or even insignificant, but, as funds grow larger, the market impact cost should be dramatically increased. That is, the influence of fund size on market impact increases with the fund size. We thus hypothesize:

H4: Fund size positively influences market impact costs with an increasing

marginal impact.

In order to test this hypothesis, we have to first calculate the market impact for each fund. On the choice of measures of market impact, we follow a similar method of Yan (2008) and use the average market impact (MI) across all stocks held by a certain fund. Intuitively, the market impact of a large trade for a mutual fund should positively correlate with the position of a certain stock in the fund and negatively with the trading volume of this stock. Specifically, we define MI as the weighted average across all stocks of the ratio of the holding of a certain stock to its total trading volume. Mathematically, MI is defined as

$$\mathrm{MI} = \frac{1}{\sum_{i=1}^{N} w_i} \sum_{i=1}^{N} \left[w_i \times \frac{w_i}{\mathrm{DVOL}_i} \right] \tag{3}$$

where w_i is the holding of a stock i and DVOL_i is the average daily trading volume of stock i over the past semi-annual. The key feature of MI is to measure the difficulty of trading for an institution. The larger the *relative* order size of a stock for a fund, the more market impact the trade will bring. Yan (2008) also takes MI as one measure of liquidity along with the bid-ask spread; the larger the MI, the lower the fund liquidity.

To investigate how liquidity varies along with the time, we plot the average market impact of Chinese mutual funds from 2004 to 2009 in Figure 7. The portfolio liquidity of the Chinese mutual funds has improved since the year 2004, especially in the year 2007. The average MI decreased from 1.2 in 2004 to 0.5 in 2007. We can explain this phenomenon in two ways. First, the Chinese stock market has grown rapidly since insurance funds and annuity funds were permitted to enter the stock market in 2004, enlarging the size and increasing the investment products of the capital market, thus improving the liquidity of the market. Second, the Chinese stock market was extremely bullish in 2007, improving the funds' liquidity. The liquidity of the mutual fund industry decreased slightly from the end of 2007 along with the burst of the Chinese capital market bubble.

Insert Figure 7 here.

To test hypothesis 4, we ran the following regression and Table 5 shows the results.

$$\begin{aligned} \mathrm{MI}_{i,t} = c_{0,t} + c_{1,t}\mathrm{LOGTNA}_{i,t} + c_{2,t}(\mathrm{LOGTNA}_{i,t})^2 + c_{3,t}\mathrm{LOGFAM}_{i,t} \\ + c_{4,t}\mathrm{TYPE}_{i,t} + c_{5,t}\mathrm{TURNOVER}_{i,t} + c_{6,t}\mathrm{EXP}_{i,t} + c_{7,t}\mathrm{FLOW}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4)$$

The significant positive coefficient of $(\mathrm{LOGTNA})^2$ shows that the market impact of a certain fund is significantly related to its size, i.e., a large fund tends to have more market impact than small funds if trading its portfolio. It also shows that *the marginal effect of fund size on market impact increases with fund size*. Hence, market impact becomes more significant as funds grow larger.

Insert Table 5 here.

5.2 Portfolio Construction and Trading Activity

If large fund managers face higher expected market liquidity than small fund managers, their portfolio construction and trading activity should reflect these liquidity constraints. For instance, private information should be more valuable to a small fund than a large fund since a small fund is able to transact more quickly without incurring a higher market transaction cost. Therefore, we should detect a difference in how the managers of large and small funds construct their trade portfolios.

Facing large market impact, large fund managers should be hesitant to trade considering the large market impact cost the fund may cause. Hence, the fund stock turnover rate should be smaller for large funds than for small funds. We hypothesize that:

H5: The fund's turnover rate is negatively correlated with fund size.

To test H5, we ran the following regressions, and Table 6 reports the results.

$$\begin{aligned} \mathrm{TURNOVER}_{i,t} = e_{0,t} + e_{1,t}\mathrm{LOGTNA}_{i,t} + e_{2,t}(\mathrm{LOGTNA}_{i,t})^2 + e_{3,t}\mathrm{LOGFAM}_{i,t} \\ + e_{4,t}\mathrm{TYPE}_{i,t} + e_{5,t}\mathrm{FLOW}_{i,t} + e_{6,t}\mathrm{EXP}_{\mathrm{i,t}} + \varepsilon_{i,t} \end{aligned} \quad (5)$$

We see that both funds with a larger size and family size tend to have a smaller turnover rate. This is consistent with the notion that managers in large funds tend to think twice about strategies involving heavy trading. It is easy to understand the positive correlation between

fund expense rate and turnover rate: when funds trade stocks more frequently, they tend to pay more money to brokers, thus increasing the expense ratio. It is also interesting to note that open-ended funds tend to have a higher turnover rate than close-ended funds.

Insert Table 6 here.

In the presence of trading volume constraints, large funds managers tend to consider the liquidity issue more than small funds, and hence, will choose to hold more stocks even if they might have some negative views on their performance. Thus, we hypothesize that:

H6: The number of securities in the portfolio is positively correlated with fund size.

To test this hypothesis, we ran the following regression and Table 7 shows the results.

$$\begin{aligned} \text{NUMBER}_{i,t} = {} & d_{0,t} + d_{1,t}\text{LOGTNA}_{i,t} + d_{2,t}(\text{LOGTNA}_{i,t})^2 + d_{3,t}\text{LOGFAM}_{i,t} \\ & + d_{4,t}\text{TYPE}_{i,t} + d_{5,t}\text{FLOW}_{i,t} + d_{6,t}\text{EXP}_{i,t} + d_{7,t}\text{TURNOVER}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (6)$$

where NUMBER is the number of stocks that a fund holds. The significant coefficient on $(\text{LOGTNA})^2$ shows that the number of stocks per fund increases quadratically with the fund size. This is consistent with the notion that liquidity becomes substantial as funds grow very large. Also, we find a significant negative relationship between stock numbers and turnover rate, indicating that large funds likely have to hold more stocks and simultaneously trade less frequently because of the strong liquidity constraints.

Insert Table 7 here.

From H5 and H6, we see that large and small funds tend to have different behavior in portfolio construction and trading activities due to liquidity constraints.

5.3 Fund Performance and Liquidity

In this section, we mainly study how fund liquidity influences fund performance. Given two funds that have the same size, the fund with bad liquidity should perform worse than the one with good liquidity. Hence, we should also discover that fund performance has a

negative relationship with fund liquidity even after controlling fund size. Many researchers, such as Yan (2008), also use the averaged bid-ask spread to measure the liquidity; however, because the data of bid-ask spread is not available for Chinese mutual funds, we only use the market impact as our measure for the liquidity. We thus hypothesize:

H7: The fund's performance is negatively correlated with its market impact.

We thus ran the following regression to test this hypothesis, and the results are shown in Table 8.

$$\begin{aligned}\alpha_{i,t} = e_{0,t} + e_1 \mathrm{MI}_{i,t-1} + e_{2,t}\mathrm{LOGTNA}_{i,t-1} + e_{3,t}(\mathrm{LOGTNA}_{i,t-1})^2 + e_{4,t}\mathrm{LOGFAM}_{i,t-1} \\ + e_{5,t}\mathrm{TYPE}_{i,t-1} + e_{6,t}\mathrm{TURNOVER}_{i,t-1} + e_{7,t}\mathrm{EXP}_{i,t-1} + e_{8,t}\mathrm{FLOW}_{i,t-1} + \varepsilon_{i,t}\end{aligned} \quad (7)$$

The coefficient of MI is negatively related to the fund performance for all three performance measures, except that *t* statistics are not very significant when using CAPM alpha and Fama-French alpha as fund performance measures. This is consistent with the hypothesis that the liquidity erodes the fund performance. The inverted-U relation between fund size and performance is still present, with the *t*-stat for LOGTNA^2 less strong than that in regression (1).

Insert Table 8 here.

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6. Conclusion

This paper aims to examine the impact of the liquidity and economy of scale on the relation between fund size and fund performance in the Chinese mutual fund industry. Using stock transaction data along with detailed stockholdings of Chinese equity mutual funds from 2004 to 2009, we document that the size-performance relationship follows an inverted U-shape.

In explaining this relationship between fund size and performance, we focus on the economy of scale and the liquidity factors. We first document that the economy of scale makes funds spend less and results in a positive size-performance relationship; additionally, liquidity constraints cause fund size to erode fund performance. Moreover, the marginal

impact of fund size on the economy of scale decreases with fund size; in contrast, the marginal impact of fund size on liquidity increases with fund size. Hence, for small funds, the scale of economy plays a more important role than liquidity; however, for large funds, liquidity is more important than the scale of economy. Therefore, the combination of economy of scale and liquidity explain reasonably well the inverted U-shape between fund size and fund performance.

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Tables and Figures

TABLE 1 Descriptive Statistics

Table 1 presents the summary statistics for the fund characteristics. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds excluding currency, bond, and index funds. TNA is the fund's total net asset with a unit of ¥100 million. LOGTNA is the base 10 logarithm of TNA. FAM is the size of the family which the fund belongs to. LOGFAM is the base 10 logarithm of the family size. Turnover is the fund's stock turnover rate. EXP is the expense ratio. Flow is the proportion of new capital inflows.

		Fund Size Quintile				
Data Item	All funds	1(small)	2	3	4	5(large)
Number of Funds	138	27	28	28	28	27
TNA (¥100 million)	37.81	6.26	17.94	30.84	48.15	86.92
LOGTNA (¥100 million)	1.31	0.62	1.15	1.4	1.59	1.81
FAM (¥100 million)	273.16	135.89	217.12	257.31	348.01	410.85
LOGFAM (¥100 million)	2.1	1.68	2.03	2.12	2.3	2.4
TURNOVER (%)	178.06	311.46	190.61	149.25	118.84	116.44
EXP (%)	2.35	2.71	2.37	2.3	2.2	2.15
FLOW (%)	40.82	-8.04	35.08	29.1	18.58	131.4

TABLE 2 Time-Series Averages of Correlations

Table 2 presents the correlation among fund characteristics. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese securities investment funds by excluding currency, bond, and index funds.

	LOGTNA	LOGFAM	TURNOVER	EXP	FLOW
LOGTNA	1				
LOGFAM	0.57	1			
TURNOVER	-0.47	-0.34	1		
EXP	-0.16	-0.09	0.47	1	
FLOW	0.25	0.1	-0.01	0.03	1

TABLE 3 The Relation between Fund Size and Fund Performance

Table 3 examines the relation between fund size and performance. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, and index funds. Because alphas of CAPM and Fama-French three factors model are too small, we multiply the them by 100, respectively. We use Fama-Macbeth method to estimate the results. The *t*-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

Independent Variable	Sharpe Ratio		CAPM		Fama-French	
	est	tstat	est	tstat	est	tstat
INTERCEPT	0.210	1.844	0.240	2.433	0.191	1.827
LOGTNA	0.027	2.036	0.133	3.357	0.149	4.482
$(LOGTNA)^2$	-0.019	-2.233	-0.070	-2.501	-0.083	-3.223
LOGFAM	0.018	3.392	0.052	2.584	0.067	3.256
TYPE	-0.007	-0.585	-0.017	-0.409	-0.028	-0.634
TURNOVER	0.001	0.403	0.009	1.231	0.007	1.092
EXP	-2.889	-1.068	-3.361	-0.715	-3.921	-0.803
FLOW	0.049	1.983	0.147	2.474	0.156	2.678

TABLE 4 The Relation between Expense Ratio and Fund Size

Table 4 examines the relation between fund size and performance. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, and index funds. We use Fama-Macbeth method to estimate the results. The t-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

Independent Variable	EXP	
	est	tstat
INTERCEPT	0.0360	4.6350
LOGTNA	-0.0074	-2.5176
$(LOGTNA)^2$	0.0012	1.7772
TYPE	-0.0003	-0.4100
LOGFAM	-0.0014	-1.6214
FLOW	0.0008	0.3774

TABLE 5 Market Impact (MI) and Fund Size

Table 5 examines the relation between fund liquidity and various fund characteristics. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, and index funds. We use Fama-Macbeth method to estimate the results. The *t*-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

INDEPENDENT VARIABLE	MI	
	est	tstat
INTERCEPT	-0.589	-1.824
LOGTNA	0.364	1.786
$(LOGTNA)^2$	0.426	6.488
TYPE	0.007	0.166
LOGFAM	0.063	1.694
TURNOVER	0.008	0.478
EXP	24.138	1.961
FLOW	-0.019	-0.122

TABLE 6 Fund Size and Turnover Rate

Table 6 examines the relationship between fund size and fund turnover rate. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, index funds. We use Fama-Macbeth method to estimate the results. The t-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

INDEPENDENT VARIABLE	TURNOVER	
	est	tstat
INTERCEPT	0.679	1.246
LOGTNA	-1.641	-3.855
(LOGTNA)2	0.254	1.374
TYPE	0.273	2.788
LOGFAM	-0.135	-2.874
FLOW	0.554	1.742
EXP	105.300	6.493

TABLE 7 Fund Size and the Number of Stocks

Table 7 examines the relation between fund size and fund average trading volume. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, and index funds. We use Fama-Macbeth method to estimate the results. The *t*-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

INDEPENDENT VARIABLE	NUMBER	
	est	tstat
INTERCEPT	35.744	4.547
LOGTNA	-7.921	-1.379
(LOGTNA)2	12.343	3.691
TYPE	2.119	1.421
LOGFAM	3.343	2.468
FLOW	6.452	1.150
EXP	-123.350	-0.258
TURNOVER	-4.297	-3.375

TABLE 8 The Fund Performance and Market Impact

Table 5 examines the relationship between fund performance and its market impact with control on fund size. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds by excluding currency, bond, index funds. Because alphas of CAPM and Fama-French three factors model are too small, we multiply them by 100, respectively. We use Fama-Macbeth method to estimate the results. The t-statistics of 1%, 5% and 10% levels are respectively 3.17, 2.23 and 1.81, respectively.

INDEPENDENT VARIABLE	SHARPE RATIO		CAPM		FAMA-FRENCH	
	est	tstat	est	tstat	est	tstat
INTERCEPT	0.202	1.771	0.233	2.219	0.195	1.756
MI	-0.020	-1.703	-0.023	-0.939	-0.017	-1.085
LOGTNA	0.026	2.109	0.133	3.443	0.146	4.660
$(LOGTNA)^2$	-0.006	-0.563	-0.055	-1.635	-0.072	-2.573
LOGFAM	0.020	3.804	0.056	2.794	0.069	3.354
TYPE	-0.004	-0.450	-0.014	-0.350	-0.027	-0.609
TURNOVER	0.001	0.491	0.009	1.269	0.007	1.084
EXP	-2.637	-0.948	-3.308	-0.690	-4.139	-0.830
FLOW	0.046	2.210	0.140	2.689	0.154	2.828

Figure 1 Total Amount of Asset Managed by the Chinese Mutual Funds Industry

Figure 1 plots the total amount of asset managed by the Chinese mutual funds industry each year. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds excluding currency, bond, and index funds.

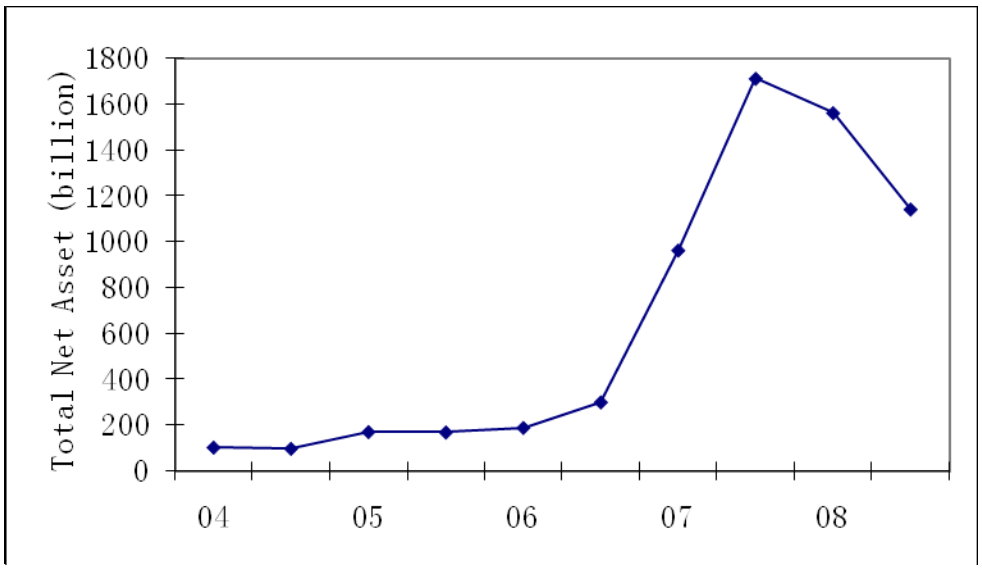

Figure 2 The Average Performance of the Chinese Mutual Funds Industry

Figure 2 plots averaged three performance measures by the Chinese mutual funds: Sharpe ratio, CAPM alpha, Fama-French alpha. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds excluding currency, bond, and index funds.

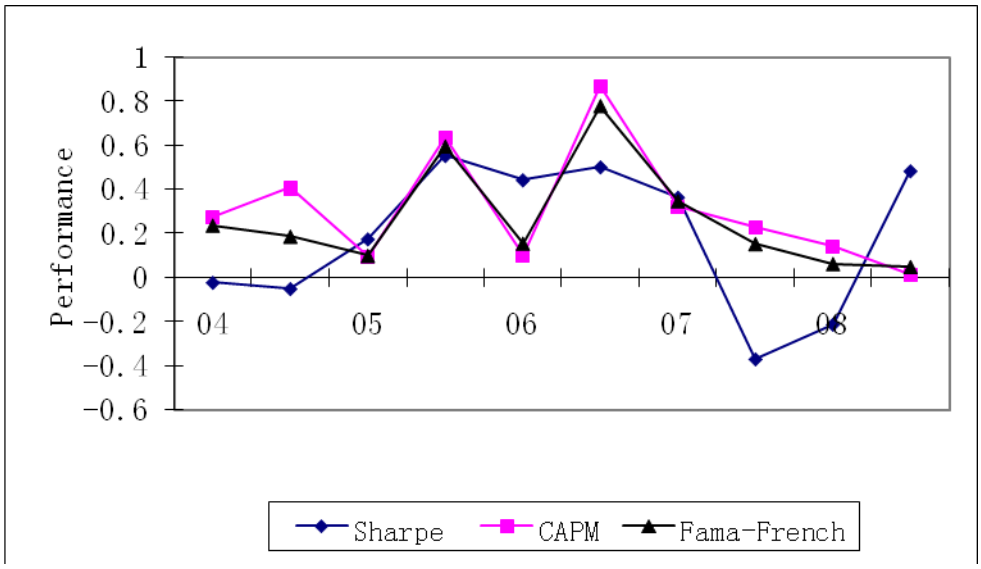

Figure 3 The Average Fund Size of the Chinese Mutual Funds

Figure 3 plots the average fund size of the Chinese mutual funds. The sample period is from year 2004 to the first semi-annual of year 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds excluding currency, bond, and index funds.

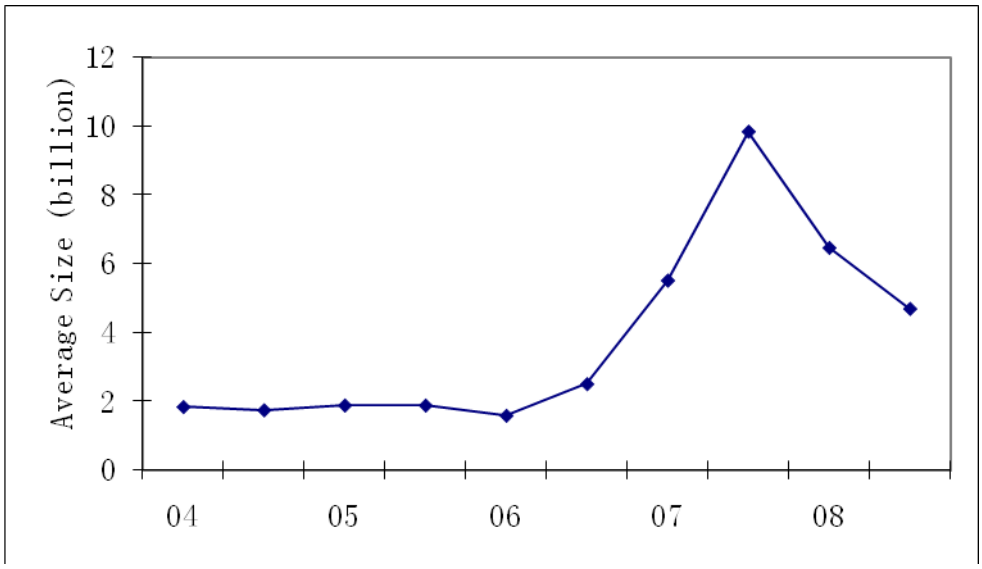

Figure 4 Relationship between Size Quintile and Performance

Figure 4 plots the relation between size quintile and performance. The funds are sorted into five quintiles by fund size. Quintile 1 contains the smallest funds, while quintile 5 contains the largest ones. Using three fund performance measures, we first calculate the averages of the performance in each quintile on the cross-section and report the time-series averages of the cross-sectional averages.

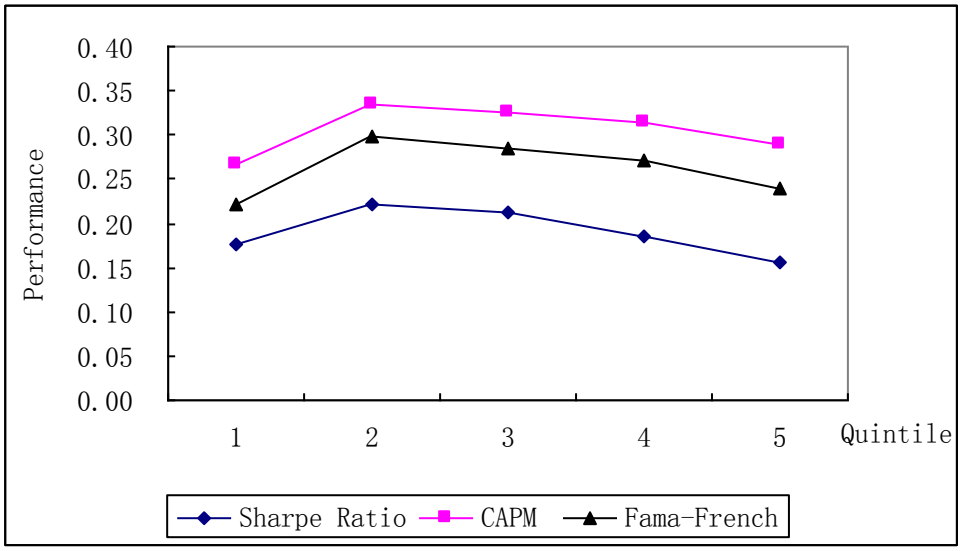

Figure 5 Relationship between Fund Size and Performance

Figure 5 plots the relation between fund size and performance based on the regression using Sharpe ratio, CAPM alpha, and Fama-French alpha as the performance measure. First, we calculate the mean of the control variables respectively and substitute them into the regression equation, then report the performance under various funds TNA based on the regression equation.

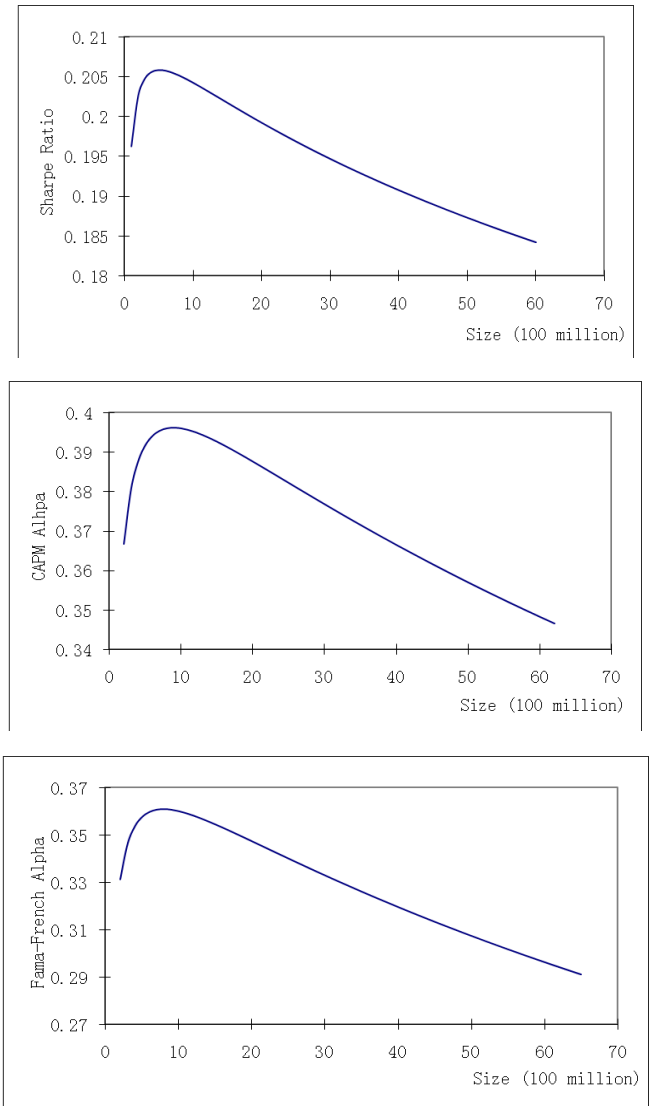

Figure 6 Averaged Fund Number per Family

Figure 6 plots the averaged fund number per family in Chinese mutual fund industry. The sample period is from year 2004 to 2009. The data are from Tianxiang Investment Analysis System.

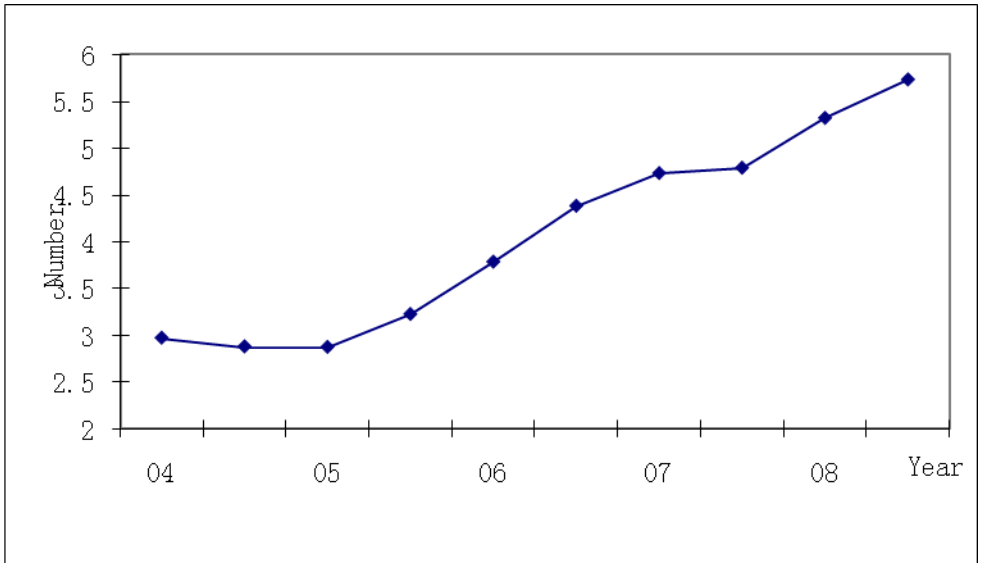

Figure 7 Average Market Impact (MI) of Chinese Mutual Funds' Portfolio

Figure 4 plots the averaged market impact of Chinese mutual funds. The sample period is from year 2004 to 2009. The data are from Tianxiang Investment Analysis System. The sample includes all Chinese mutual funds excluding currency, bond, and index funds.