FINANCIAL SERVICES REVIEW

Financial Services Review 24 (2015) 289–311

The performance and market timing ability of Chinese mutual funds

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Abstract

We examine the performance and market timing ability of actively managed Chinese stock mutual funds and investigate how fund characteristics and fund flows relate to performance and market timing ability. Based on daily return data and several four-factor models, only about 7.5% of these funds have statistically significant risk-adjusted abnormal returns and even fewer demonstrate market timing ability. After controlling for fund size, management fees, average amount, and volatility of fund flows, older funds show higher Sharpe ratios. Our evidence also reveals the volatility of fund flows has an inverted-U shape relationship with fund performance.

JEL classification: G11; G23

Keywords: Chinese mutual funds; Sharpe ratio; Treynor ratio; alpha; market timing

1. Introduction

Although the Chinese mutual fund industry started in 1991 with the establishment of the first closed-end fund, it became stagnant because of lack of product diversity and investor interest. The lack of professional management and insufficient supervision from the regu-

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1057-0810/15/$ – see front matter

lators also contributed to the sluggish performance. In 1997, China introduced the Interim Regulations on the Securities Investment Funds, which revitalized the industry's growth by providing a new framework for developing the investment management industry. After China joined the World Trade Organization in 2001, open-end mutual funds started to thrive as foreign investment management firms brought their practices and expertise into the Chinese capital market and setup joint ventures with Chinese firms. Since then, the Chinese mutual fund industry has become the biggest institutional investor in one of the world's largest emerging markets.

Currently, China's mutual fund industry is only about one-tenth the size of the U.S. market but is likely to grow because of its potential to attract foreign and domestic investors. Many Chinese mutual funds, such as the China Index Fund (FXI), provide a way to invest in China and potentially the ability to ride China's growth wave. The possible appreciation of the Chinese Yuan against the U.S. dollar makes investments in Chinese mutual funds even more attractive to international investors. Meanwhile, if the Chinese middle class continues to expand and increasingly invest in stock through mutual funds, the Chinese mutual fund market has the potential to become one of the biggest in the world.

Much of the previous research on Chinese mutual fund performance and market timing skills is written in Chinese. For example, Shen and Huang (2001) and Zhang and Du (2002) consider only the market factor and a very limited number of closed-end funds. Li and Ma (2004) and Zou and Lin (2004) expand the Fama-French three-factor model but their sample size remains small because of the short history in the early stage of the Chinese mutual fund industry. Guo (2010) has a much larger sample than the previous studies but the regression model is limited to the market factor. Extending the sample period to the first half of 2010, Tang et al. (2012) find that fund size and performance exhibits an inverted-U shape relationship. However, their performance measures are limited to the capital asset pricing model (CAPM) alpha, Fama-French three-factor alpha, and style benchmark-adjusted return, but the last measure does not show the inverted-U shape relationship between size and performance.

Understanding the behavior and characteristics of Chinese mutual funds can supply crucial knowledge of the financial development dynamics in emerging markets. To facilitate our understanding of this industry, we provide baseline empirical facts on the performance of actively managed Chinese stock mutual funds. In this study, we investigate the performance and market timing ability of these funds using an updated sample extracted from the CSMAR China Funds Market Research Database–Open-End Funds. We also examine how some basic fund characteristics and fund flows influence the performance of these mutual funds.

We use a standard four-factor model to evaluate the daily performance of Chinese mutual funds. We also provide and analyze the Sharpe ratio, Treynor ratio, alphas, and market timing skill coefficients in our market timing models between 2001 and 2011. We further examine how some fund characteristics, such as fund size, management fees, fund age, together with the average fund flows and volatility of fund flows, relate to the performance of the actively managed Chinese stock mutual funds. We then split our full sample into two sub-periods to check the robustness of our results on these relationships. We apply the robust standard error formula HC2 in MacKinnon and White (1985) in all of our regressions to

control for heteroskedasticity.

Using daily mutual fund return data between 2001 and 2011, we find that only about 7.5% of active Chinese mutual funds have statistically significant positive αs. This finding is similar to the results of Eling and Faust (2010) on emerging market mutual funds. Furthermore, older funds tend to have higher Sharpe ratios. Our results also confirm a positive correlation between average fund flows and fund performance and the volatility of fund flows shows an inverted-U shape relationship with performance.

Our study differs from previous studies of Chinese mutual funds in several ways. First, to our knowledge, we are the first to use a four-factor model to analyze the performance of actively managed Chinese stock mutual funds. Our model leads to a more accurate calculation of mutual fund abnormal returns. Second, our sample is larger, covers a longer time period, and includes more recent data (until the end of 2011) than previous studies of Chinese mutual funds. Third, we focus on daily returns whereas previous studies use weekly returns. Bollen and Busse (2001) show that using daily returns to examine the market timing skill is more appropriate. These enhancements result in a more comprehensive and refined study with more robust findings. We also pay particular attention to fund flows by incorporating both their mean and standard deviation when examining their relationships to performance jointly with other fund characteristics.

Our study contributes to the literature on mutual funds in several ways. First, we establish a performance profile of the Chinese mutual fund industry in its early years, which can help researchers interested in examining the evolution of this industry together with the development of China's capital market. On average, the more than 300 actively managed stock mutual funds in our sample period fail to beat the market after the fees. The average risk-adjusted return (α in the four-factor model) is very close to zero. Our results show that only about 7.5% of the funds produce positive and statistically significant αs. This inability to generate superior net-of-fees returns or risk-adjusted returns is consistent with the literature on mutual fund performance in both developed and emerging markets (Eling and Faust, 2010; Fama and French, 2010; French, 2008).

Furthermore, we find that less than 5% of our funds demonstrate market timing ability with statistical significance, which is similar to the 6.6% in Cao and Jayasuriya (2012) for emerging market hedge funds and the 2% in Fung et al. (2002) for global hedge funds. This result, however, is in stark contrast with the findings on managed portfolios in the United States. For example, Bollen and Busse (2001) show that more than 40% of mutual funds of their actively managed stock mutual funds in the United States (U.S.) demonstrate statistically significant market timing skill. These findings indicate that actively managed Chinese stock mutual funds have a long way to go to catch up with their developed world counterparts.

Secondly, the relationship among fund characteristics, fund flows, and performance contributes to our understanding of how the mutual fund industry behaves both in general and in a large emerging economy in particular. In our sample, Chinese funds established earlier produce higher Sharpe ratios and four-factor αs, which is consistent with the concept of the learning effect in Bauer et al. (2005). The positive relationship between average fund flows and performance is consistent with performance chasing behavior considered in Berk

and Green (2004) and the empirical findings in Rakowski and Wang (2009) and Rakowski (2010). Besides smart money chasing good performance, we also believe that the redemptions from poor performing funds after the collapse of the Chinese stock market in 2008 contribute to this result.

The inverted-U relationship between volatility of fund flows and performance indicates that both very high and very low volatility in fund flows are related to poor performance. For high flow volatility, we find the same performance dragging effect as in Rakowski (2010). As we discuss in more details later, the low volatility of fund flows in our sample may result from steady outflows from the poor performing funds, which is another consequence of the 2008 collapse. Rakowski's sample ends in 2006. In contrast, our sample ends in 2011 so our results add to our understanding in this issue by looking at post financial crisis fund behavior.

Third, our findings have important implications for the investment decisions made by both individual and institutional investors. Our evidence on the current performance profile of the actively managed Chinese stock mutual funds indicates that investors should focus on index funds in China unless they have solid evidence that some active managers have the ability to consistently generate excess risk-adjusted returns. Investors interested in these actively managed funds need to learn how to identify the different sources of returns, such as pure luck, rewards for various risk exposures, and genuine skills. On the other hand, Chinese active fund managers could improve their skills by learning from their international and domestic predecessors when developing their investment strategies. Finally, the regulators of the Chinese mutual fund industry can set higher professional conduct standards to ensure quality work and establish better disclosure requirements to educate the investing public about the sources of returns.

The article proceeds as follows. Section 2 discusses the development of the Chinese mutual fund industry and provides a broad context for our study. Section 3 examines performance and market timing measures. Section 4 describes the data and sample selection. Section 5 reports the empirical findings and Section 6 offers a summary and conclusions.

2. The Chinese mutual fund market

The development of the Chinese mutual fund industry consists of three stages: (1) the exploration stage (1991–1997), (2) the experimental and learning stage (1998–2004), and (3) the growth stage (post 2004). During the first stage, the ZhuXin Fund emerged as the first closed-end fund in August 1991 shortly after the establishment of Chinese stock market. ZhuHai International Trust and Investment Corporation sponsored the ZhuXin fund. The WuHan Securities Investment Fund and the ShenZhen NanShan Venture Capital Fund started in October 1991. By 1992, China had 37 closed-end funds. Several factors hindered further development of the closed-end fund market including the lack of professional management, illiquidity, fund product homogeneity, and the lack of systematic supervision of the fund managers' behavior.

A breakthrough occurred in 1997 when the China Securities Regulatory Commission issued Interim Regulations on the Securities Investment Funds. This document provided a framework for promoting the growth of investment funds. The end of the closed-end fund era

occurred in 1997 with a transition toward open-end mutual funds. Over the last decade, open-end mutual funds gradually replaced closed-end funds and became the primary and largest type of fund investment. The China Securities Regulatory Commission has offered extensive support to the industry by intensively monitoring and implementing regulations that are similar to those of the U.S. Securities and Exchange Commission (SEC).

The next stage in the development of the Chinese mutual fund industry occurred between 1998 and 2004. After China joined the World Trade Organization in 2001, the Chinese government gradually opened up access to China's capital markets to foreign financial firms. Since then Chinese open-end mutual funds have actively sought to collaborate with successful investment management firms in the developed markets to develop innovative fund products and improve management skills. The forms of collaboration range from technical support to joint ventures. The management teams of these new funds include many Chinese portfolio managers who returned to China with their experiences from the world's leading investment management firms.

With the support from JPMorgan Fleming Asset Management, the first open-end mutual fund called HuaAn Innovations fund started in September 2001. This event is a milestone in the Chinese mutual fund history. By November 2002, China had 17 mutual funds with an asset value approaching 56.4 billion Yuan. Meanwhile, the regulatory authority in China realized the importance of regulating the mutual fund industry. China's national legislature, the National People's Congress, issued the Law of the People's Republic of China's Securities Investment Funds on October 28, 2003 and it went into effect on June 1, 2004. This law established a formal legal framework for China's investment fund industry. As a result, NanFang Progressive Allocation Fund became the first listed mutual fund in October 2004. China's first exchange-traded fund (ETF), the SSE 50 ETF, started in late 2004. As Chinese investors recognized the benefits of ETFs as a form of low cost indexing alternative, the ETF sector continued to grow.

Several events characterize the third development phase of the Chinese mutual fund industry, which started in 2005. To better monitor the excessive risk-taking behaviors of fund managers and to motivate the funds to diversify their portfolio in the international market, the China Securities Regulatory Commission, People's Bank of China, and State Administration of Foreign Exchange jointly issued measures on admission of domestic securities investments of Qualified Domestic Institutional Investor (QDII) in 2006. In 2007, the asset value of the investment fund industry reached 3.28 trillion Yuan.

Starting in 2008, the Chinese mutual fund industry has undergone dramatic structural changes as evidenced by the emergence of different investment philosophies, fund structures, and behaviors. Fund managers started seeking both returns and fund flows and incorporating international bonds and stocks into their portfolio. Consequently, these funds began to attract more institutional investors. In 2008, China and the United States agreed to allow Chinese citizens to invest in the U.S. stock market through mutual fund organizations or other asset fund companies in China. For the first time, domestic Chinese citizens could invest in the U.S. stock market (Rodier, 2009).

Like most major economies, the global financial crisis of 2007–2009 adversely affected the Chinese economy. For example, the asset value of the Chinese mutual fund industry decreased to 2.21 trillion Yuan (equivalent to $351 billion) on March 31, 2012 from its peak

of around 3.28 trillion Yuan (equivalent to $448 billion) on December 13, 2007. By the end of 2012, 1241 mutual funds had a total of 2.865 trillion Chinese Yuan (around $460 billion) of assets under management (AUM) in the Chinese mutual fund industry.

A diverse group of both individual and institutional investors contributed to the rapid growth of the Chinese mutual fund industry through active participation in various mutual fund families. By the end of 2006, the number of mutual fund shareholders reached 14.27 million with a growth rate of 166% compared with 2005. Over the next several years, the desire to meet investor needs led to creating many fund forms such as balanced funds, index funds, and social security funds. These new varieties are mainly responsible for attracting the new investors. By June 2011, the Chinese mutual fund industry had 91.6 million shareholders.

Chinese mutual funds may become attractive for international investors as they seek opportunities in the emerging markets and international diversification if the following events occur. First, the Chinese economy must continue to grow. Second, maturing Chinese capital markets must bring higher efficiency, more transparency, and better regulation. Finally, the Chinese Yuan needs to maintain a steady exchange rate.

Another factor triggering the growth of mutual funds in China is its unique investor clientele. Chinese investors, unlike investors in many western countries, have a long history of saving for future uncertainties. The Chinese are accustomed to saving 30% to 40% of their disposable income, which is much higher than the savings rate in many western countries. The Chinese are responsible for making their retirement plans. Given the low yields on bank accounts, mutual funds appear to be attractive for small investors. The Chinese government is promoting private retirement planning, leading to potential growth in the mutual fund industry to accommodate the needs of investors for pension funds and special purpose funds. If the Chinese middle class continues to expand and increasingly invest in mutual funds, this creates an opportunity for mutual funds to launch more innovative products to meet investor demand. However, the Chinese mutual fund industry is relatively young. Our results show that the mutual fund managers in China need to improve their portfolio management skills to draw closer to their peers.

3. Issues about fund performance and market timing

3.1. Performance and market timing measures

We use conventional measures of portfolio performance and market timing to study Chinese mutual funds. Then we examine how fund characteristics and fund flows might influence a fund's performance and market timing ability.

Our study has three major objectives. The first objective is to determine whether active Chinese stock mutual funds can generate superior risk-adjusted returns. Three widely used risk-adjusted performance appraisal measures are: (1) the Sharpe ratio (also known as reward-to-variability), (2) the Treynor ratio (also known as reward-to-volatility or excess return to non-diversifiable risk), and (3) ex post α (also known as Jensen's α) (Maginn et al., 2007).

The Sharpe ratio (Sharpe, 1966) has become an industry standard in measuring risk-

adjusted performance. The Sharpe ratio compares excess returns to the fund's total risk as measured by its standard deviation of excess returns. Traditionally, the ex post Sharpe ratio is given by:

$$S_p = \frac{\bar{R}_p - \bar{r}_f}{\hat{\sigma}_p} \tag{1}$$

where $\bar{R}_p$ is the average fund return; $\bar{r}_f$ is the average risk-free rate; and $\hat{\sigma}_p$ is the standard deviation of the excess return $(R_{p,t} - r_{f,t})$. In the case of the Sharpe ratio, the benchmark is based on the ex post capital market line (CML). A skillful fund manager will produce returns that place the fund above the CML.

In contrast, the Treynor measure (Treynor, 1965) relates a fund's excess returns to the fund's systematic risk (beta or β). The calculation of the Treynor ratio is given as:

$$T_p = \frac{\bar{R}_p - \bar{r}_f}{\hat{\beta}_p} \tag{2}$$

where $\bar{R}_p$ and $\bar{r}_f$ are the average values of each variable over the evaluation period and $\hat{\beta}_p$ is the fund's β. The Treynor ratio of the market portfolio is the slope of the security market line (SML). Thus, a skillful manager will produce a Treynor ratio greater than that of the ex post SML.

Researchers use various risk factors to analyze the performance of mutual funds. Building upon the work of Fama and French (1993) where size (SMB for small minus big) and value or book-to-market equity (HML for high minus low) factors are first introduced, Carhart (1997) uses an additional momentum factor (MOM) besides the market, SMB, and HML factors to study the performance persistence of U.S. mutual funds. Researchers widely follow this methodology. Our standard four-factor model takes the following form:

$$R_{pt} - r_{ft} = \alpha_p + \beta_p\,(R_{Mt} - r_{ft}) + \beta_S SMB_t + \beta_V HML_t + \beta_M MOM_t + \varepsilon_{pt} \tag{3}$$

where for period t, R_{pt} is the fund's return; r_{ft} is the risk-free rate; R_{Mt} is the return on the market index; and SMB_t, HML_t, and MOM_t are returns on value-weighted, zero-investment, factor-mimicking portfolios for size, book-to-market equity, and momentum, respectively. The term α_p is the intercept of the regression; the βs are the fund's sensitivity to different risk factors; and ε_{pt} is the random error term. The sign and value of the ex post α (α_p) indicates the ability of the manager to generate abnormal risk-adjusted returns.

Our second objective is to investigate the market timing abilities of fund managers. In terms of total returns instead of relative returns, a fund's performance comes from three sources: (1) decisions involving the strategic allocation, (2) market timing (i.e., returns attributable to shorter-term tactical deviations from the strategic asset allocation), and (3) security selection (i.e., skill in selecting individual securities within an asset class) (Maginn et al., 2007). If fund managers have market timing ability, they should increase portfolio exposure to the market before the market advances and reduce market exposure before the market declines. Earlier literature on the market timing skills finds little evidence of fund managers possessing this skill (Elton et al., 1993; Henriksson, 1984; Jensen, 1969; Treynor

and Mazuy, 1966). More recently, using daily data, Bollen and Busse (2001) and Chance and Hemler (2001) find evidence of market timing for a substantial number of funds in the United States.

Based on the standard four-factor model, we extend the Treynor and Mazuy (1966) (hereafter referred to as TM) approach in detecting market timing ability using the following regression equation.

$$r_{p,t} = \alpha_p + \beta_p r_{m,t} + \gamma_p r_{m,t}^2 + f(SMB_t, HML_t, MOM_t) + \varepsilon_{pt} \quad (4)$$

where $r_{p,t}$ is the excess return on a portfolio at time t; $r_{m,t}$ is the excess return on the market; $f(SMB_t, HML_t, MOM_t)$ is the linear combination of these risk factors as expressed in Eq. (3); and γ_p measures market timing ability. The coefficient on the quadratic term of fund returns, γ_p should be positive if mutual fund managers exhibit the market timing ability by adjusting their portfolio's market exposures before the market swings to capture the upside and avoid the downside.

Henriksson and Merton (1981) (hereafter referred to as HM) propose another approach of modeling market timing. We also examine their timing coefficient in our four-factor model as Eq. (5) shows:

$$r_{p,t} = \alpha_p + \beta_p r_{m,t} + \gamma_p I_t r_{m,t} + f(SMB_t, HML_t, MOM_t) + \varepsilon_{pt} \quad (5)$$

where I_t equals one if the market's excess return and $r_{m,t}$ is positive and zero otherwise. The HM regression allows for the β risk to be different in ex post up and down markets. The term γ_p measures fund managers' ability to time the market by altering the portfolio's β. Researchers often consider the αs in the TM and HM models as evidence of security selection skill if the estimated value is positive and statistically significant.

3.2. Fund characteristics, fund flows, and fund performance

The third objective of this study is to examine how the characteristics and flows of actively managed Chinese stock mutual funds explain fund performance and market timing ability. Many studies attempt to explain how fund characteristics such as fund size, age, expense ratios or management fees, and investment style help to explain fund performance. With some exceptions, the previous literature generally supports an inverse relationship between scale and fund returns. According to the "liquidity hypothesis," fund size erodes performance because of the higher trading costs associated with illiquid stocks. Large funds are not as flexible as small funds in divesting illiquid stocks (Perold and Salomon, 1991). Chen et al. (2004) reinforce the inverse relationship between fund size and returns for various performance benchmarks and attribute the adverse scale effects to lack of liquidity and organizational diseconomies. In contrast, Grinblatt and Titman (1989) find mixed evidence that fund returns decline with fund size. Otten and Bams (2002) also report a positive relationship between size and fund abnormal performance for European mutual funds.

Because the Chinese mutual fund industry only has a short history, their sizes are potentially relatively small to generate a price impact on illiquid stocks. Furthermore, unlike manufacturing corporations, at the fund level, the size of the fund management team does not

have to increase together with the size of AUM, especially when the funds are relatively small. The fund management company can also provide basic infrastructure and services to its mutual funds so as to gain economies of scale that can offset the organizational diseconomies. Consequently, we do not expect that fund size has much influence on the mutual funds in our sample.

Another fund characteristic that draws researchers' attention is the fund's age. Fund performance may improve over time as the fund managers accumulate more experience in managing their portfolios and operating their funds. Bauer et al. (2005) hypothesize the presence of a learning effect for fund managers. They also recognize the high startup costs associated with newly launched funds, which potentially offsets the advantages of organizational simplicity. Thus, we expect older funds to outperform younger funds.

Researchers such as Sharpe (1966), Golec (1996), Droms and Walker (1996), Carhart (1997), and Jan and Hung (2003) find that expense ratios or management fees are the largest component of expenses and reduce fund performance. Haslem et al. (2008) also find that U.S. mutual funds with low expense ratios outperform those with higher expense ratios. However, Elton et al. (1996) find that expense ratios are virtually the same for all mutual funds in different deciles and are only slightly responsible for the differences in performance between high ranked and low ranked funds in general.

Researchers also recognize that fund flows can influence the performance of mutual funds. Berk and Green (2004) provide a theory suggesting that fund inflows can erode the performance of the mutual funds. Furthermore, some empirical evidence supports this negative relationship (Frazzini and Lamont, 2008; Friesen and Sapp, 2007). In a study on daily mutual fund flows, Rakowski and Wang (2009) find that past flows have a positive impact on future returns and an information effect drives this relationship. Furthermore, Rakowski (2010) shows that volatility of fund flows can hurt the performance of the mutual funds as dramatic changes in the flow pattern can force the fund manager to engage in costly trading.

4. Data and methodology

We obtain the sample from the CSMAR China Funds Market Research Database–Open-End Funds. For the time period ending on December 31, 2011, this database contains 1,005 open-end funds including 529 stock mutual funds, which consist of 433 contractual mutual funds, 55 listed open-end funds, and 41 ETFs. We focus on stock funds because no Chinese bond indices have a sufficiently long history to be useful for our analysis. Furthermore, to select the active funds, we drop index funds (164 including 40 ETFs), an ETF following an aggressive growth index (1), balanced funds (8), and new funds (9) that started in 2012 with insufficient performance records in the CSMAR database. Thus, of the 529 stock mutual funds, we have 347 actively managed stock mutual funds in our sample between 2001 and 2011.

To ensure the reliability of the performance measures estimated, we require a fund to have at least 100 daily returns on record to be included in our sample. This filter results in excluding 39 of the 347 stock funds. We first summarize some basic information on our 347

Table 1 Actively managed Chinese stock mutual funds: Investment style and fund type

Investment style	Fund type		Total
	Contractual open-end funds	Listed open-end funds	
Active	1	0	1
Aggressive growth	27	8	35
Appreciation	35	4	39
Enhanced index	0	1	1
Growth	68	6	74
Income	19	0	19
Stable appreciation	3	0	3
Stable growth	126	8	134
Stable value-added	2	0	2
Value	36	3	39
Total	317	30	347

This table reports the number of actively managed Chinese stock mutual funds classified by investment styles and fund type between 2001 and 2011.

funds in Tables 1, 2, and 3. Then we analyze the performances of the 308 funds with sufficient return history and examine how the fund characteristics and flows are related to their performances and skill coefficients.

Table 1 contains the self-reported investment styles and the organizational forms of the 347 active Chinese stock mutual funds. Most of these funds (317 of 347) are contractual open-end funds, which are open-end investment trusts. A contractual fund is set up as an agreement among fund managers, the fund trustee, and investors specifying the rights and obligations of the three parties. Investors can purchase or redeem the shares of these funds at most Chinese commercial banks, which provide over-the-counter (OTC) transaction services, at their net asset value (NAV) plus some fees. To some extent, such funds are closer in nature to U.S. closed-end funds except that these funds continuously offer shares to

Table 2 Number of new actively managed Chinese stock mutual funds between 2001 to 2011

Year	*N*	%	Cumulative %	Total assets (billions of RMB)	GTA A-share index return (%)
2001	2	0.58	0.58	5.06	−24.66
2002	2	0.58	1.15	10.52	−19.80
2003	12	3.46	4.61	20.71	−4.02
2004	12	3.46	8.07	46.73	−17.61
2005	21	6.05	14.12	51.66	−11.75
2006	39	11.24	25.36	211.64	133.63
2007	39	11.24	36.60	1708.76	182.03
2008	35	10.09	46.69	751.14	−65.23
2009	47	13.54	60.23	1174.14	106.36
2010	66	19.02	79.25	1103.10	−8.87
2011	72	20.75	100.00	851.55	−23.82
Total	347	100.00			

This table is a summary of the number of new actively managed Chinese stock mutual funds between 2001 and 2011, total fund size, and annual market returns. Not all funds have total assets recorded in the GTA China Funds Database.

Table 3 Descriptive statistics for daily returns from October 19, 2001 to December 31, 2011

Strategy	*N*	Mean (%)	Median (%)	Min (%)	1%	99%	Max (%)	*SD* (%)
Panel A: mutual fund returns								
Aggressive growth	35,525	0.039	0.057	−14.401	−3.584	3.312	13.280	1.225
Appreciation	34,604	0.025	0.057	−13.163	−3.922	3.562	15.112	1.376
Growth	59,253	0.031	0.060	−8.987	−3.667	3.223	8.705	1.271
Stable growth	70,777	0.005	0.030	−11.647	−3.836	3.368	12.603	1.349
Value	44,243	0.057	0.060	−9.131	−3.452	3.188	8.481	1.170
Others	20,211	0.031	0.045	−7.761	−3.385	3.049	7.468	1.170
All strategies	264,613	0.029	0.052	−14.401	−3.695	3.306	15.112	1.277
Panel B: Market return and the risk-free rate								
GTA A-share index	2379	0.032	0.091	−9.125	−5.611	4.945	9.917	1.894
Risk-free rate	2379	0.007	0.006	0.005	0.005	0.011	0.011	0.002

Panel A of this table reports the summary statistics of daily returns of actively managed Chinese stock mutual funds by investment style: aggressive growth, appreciation, growth, stable growth, value, and others. Panel B shows the market return and the risk-free rate. The GTA A-share index is a value-weighted index using the market capitalization calculated with the outstanding negotiable A shares and the closing price. The proxy for the Chinese market risk-free rate is a one-year large denomination time deposit rate. All returns are in percentages.

investors upon demand. A listed open-end fund (LOF), which is a special form of Chinese open-end fund, can be traded in a stock exchange like a closed-end fund. Investors can either invest in the funds through the OTC market provided by Chinese commercial banks or trade their shares on an exchange. Through a transfer process, investors can convert their non-tradable shares of a mutual fund into tradable shares on an exchange. Table 1 also shows that most funds are concentrated in six major investment styles: aggressive growth, appreciation, growth, income, stable growth, and value. Each of these styles has more than 10 funds under its respective category.

Table 2 shows the number of funds established each year, AUM for the 347 funds in our sample, and annual market index return between 2001 and 2011. Only 49 funds or 14% of our sample funds started before 2006. By January 2006, the Chinese mutual funds market had entered into a growth stage for more than a year and was ready to take off under an established operating environment. As Table 2 shows, the AUM for the sample funds increased from 51.66 billion of RMB in 2005 to 211.64 billion in 2006, together with the substantial increase in the market price level as seen from the 133.63% GTA A-share index return in 2006. This boom ended in 2008 as the global financial crisis spread from the developed markets to emerging markets. Shortly after a limited rebound in 2009, the Chinese stock market entered into a sideways mode with a moderate downward trend. Thus, the period between 2006 and 2011 provides a rich market environment to study how fund characteristics and flows are related to fund performance. Furthermore, the 2006–2008 and 2009–2011 sub-periods can provide a contrast of fund behavior in different market cycles. For the above reasons, we choose the period between 2006 and 2011 to study the relationship between fund characteristics, fund flows, and fund performance. Despite lackluster stock

market performance after 2008, the number of actively managed Chinese stock mutual funds keeps growing and their AUM remains much higher than before 2006.

To guard against possible data errors on mutual fund returns in the CSMAR database, we clean the mutual fund return data in the following ways. First, we drop fund returns showing no activity, (i.e., the fund NAV remains unchanged at 1 Yuan within the first 20 days of the fund performance record). Second, we identify erroneous "reverse" values in NAV records (i.e., consecutive extreme values (i.e., $>$ 99.9 percentile or $<$ 0.1 percentile) with opposite signs in either unit NAV returns or accumulated NAV returns). We eliminate returns related to this kind of error from our sample. We use accumulated NAV returns with share splits and cash dividends considered as our mutual fund returns as long as they are not extreme (i.e., outside of the 0.002% to 99.998% range). The erroneous or extreme values are set as missing instead of being winsorized to ensure the reliability of our results. This cleaning procedure gives missing values to about 0.037% of all daily unit NAV returns in the CSMAR database regardless of fund types.

Table 3 provides a summary of descriptive statistics for the cleaned daily returns for different investment styles, the GTA A-share index, and the risk-free rate in China. These daily returns are net of fee returns, which are the returns on the NAV per share of the funds fully adjusted for share split/consolidation and cash dividends. As Panel A shows, the value and aggressive growth styles have the highest mean daily returns at 0.057% and 0.039%, respectively, whereas the stable growth style has the lowest mean daily return at 0.005%. From both the standard deviation and the range between the 1st percentile and 99th percentile, we observe the appreciation followed by the aggressive growth styles have the most volatile return profiles.

As Panel B of Table 3 shows, we use the market index for all negotiable GTA A-shares provided by the CSMAR database as the market benchmark. GTA A-share stocks are stocks listed on the Chinese exchanges that are denominated and traded in Chinese Yuan. The negotiable shares of a company are the shares that can be traded in the secondary market. For some Chinese firms, especially those state-owned or subsidiaries of state-owned companies, part of their common equities cannot be traded in the secondary market without the approval of governmental authorities. The state usually owns these non-negotiable shares. We use the current-value-weighted daily aggregated market returns with cash dividends reinvested of all the negotiable GTA A-shares as our benchmark index. The current value refers to the market capitalization calculated as the product of the negotiable shares outstanding and the firm's closing stock price. This index includes the stocks on both the Shanghai Stock Exchange and Shenzhen Stock Exchange. Our proxy for the Chinese market risk-free rate is a one-year large denomination time deposit rate. The returns reported in Table 3 represent daily rates.

As Table 3 shows, the average daily return on the GTA A-share index is 3.2 basis points, yet the net-of-fees daily return on actively managed Chinese stock mutual funds is 2.9 basis points. We calculate the average daily total expense ratio from our database, which is about 0.7 basis points. Therefore, the average gross daily return for these mutual funds is 3.6 basis points (i.e., 0.4 basis points above the daily average index return). This calculation shows that these funds on average perform slightly better than the market before the fees but not after. In the spirit of French (2008), Chinese investors pay about 0.3 basis points (3.2 minus 2.9) per day for price discovery in the Chinese stock market.

Table 4 Descriptive statistics for actively managed Chinese stock mutual fund characteristics and flows

Fund characteristics	*N*	Mean	Min	Max	*SD*
Panel A: Basic statistics					
Management fees (%) (2006–2011)	308	1.527	0.500	8.250	0.403
Median fund size (10 billions of Yuan)	308	0.362	0.006	2.303	0.441
Fund age (years)	308	3.592	0.471	10.285	2.288
Mean net flows (%)	308	−0.057	−0.473	0.179	0.114
Standard deviation of net flows	308	0.274	0.017	0.692	0.151

	Management fees	Median fund size	Fund age	Mean net flows
Panel B: Correlation coefficients				
Median fund size (10 billions of Yuan)	−0.022			
Fund age (years)	−0.082	0.494*		
Mean net flows (%)	−0.163*	0.468*	0.632*	
Standard deviation of mean net flows	−0.023	0.035	0.268*	0.192*

This table summarizes the characteristics of actively managed Chinese stock mutual funds including management fees, fund size, the mean, and the standard deviation (SD) of net flows, and fund age for the full sample. Management fees and net flows are in percentages and fund size is measured in 10 billion Yuan. Fund age is the length of time since fund inception.

*Significant at the 0.01 level.

Besides the market factor, we also include popular risk factors for mutual fund performance analysis in our study. Following Tang et al. (2012), we use the size (Small minus Big, SMB) and value (High minus Low, HML) factors provided by the TianXiang Investment Analysis System. Using the data provided in the CSMAR China Stock Market Trading Database, we also calculate the zero investment portfolio returns on the momentum factor and the cash flows factor. To construct the momentum factor returns, we follow the Fama-French approach described on Kenneth French's website.[1] We form six value-weighted portfolios based on size and prior (2–12) monthly returns, with the median size as the break point for size and the 30th percentile and 70th percentile as the break points for prior (2–12) monthly returns. We then calculate the zero-investment momentum factor return as the average return on the two high prior return portfolios (Small High and Big High) minus the average return on the two low prior return portfolios (Small Low and Big Low).

To study the relationship between fund characteristics and fund performance, we use 2006 to 2011 as the observation period for performance (hereafter called the full period). To test the robustness of our results, we further split our sample into the 2006–2008 and 2009–2011 sub-periods.

Because the mutual funds in China report their fund information on a quarterly basis, most fund characteristics summarized in Table 4 are quarterly data. The exception is management fees, which are an annualized percentage rate charged as a percentage of daily NAV. That is, the rate is an annual rate but when the fee is charged to fund investors, it typically accrues on a daily basis. We report the average management fee rate over the period in which the fund performance is measured because some funds adjust their management fees during these periods. As this expense item provides compensation for the fund managers, it should have some implications for fund performance. Chinese mutual funds incur other expenses

such as sales service fees and custody fees but they are not directly related to the incentives provided to fund managers. As Table 4 shows, the management fees have an average of about 1.527%. Despite the wide range shown in Table 4, funds typically set the management fee at 1.5% for most of the sample period, which may contribute to our result that this item has no significant relationship with performance.

We measure fund size as the median AUM over the sample period or sub-periods to avoid the influence of small initial sizes because the older funds tend to experience fast growth during the market boom in 2006 and 2007. However, the initial sizes of the younger funds may be too large because they may have dwindled since establishment in the sluggish markets after 2009. We measure fund age as the number of years between a fund's establishment date and January 1, 2012. For these 308 funds, the average size is 3.62 billion RMB and the average age is 3.59 years. The CSMAR China open-end funds database provides quarterly data on fund share flows. We use the difference between shares subscribed (sold to investors) and shares redeemed as the net fund flows in a quarter and normalize the net fund flows using the average of shares outstanding at the beginning and end of that quarter. We then calculate mean net flow for a fund over the sample period. As Table 4 shows, on average, the 308 funds lost 0.057% of their shares outstanding each quarter, which may result from a loss of investor interest during the market crash in 2008 and the prolonged downward trend since 2009. We measure the volatility of the net flows with their standard deviations, which have an average of 0.274%, almost five times larger than the average mean net flows.

As Panel B in Table 4 shows, fund size is positively correlated to fund age and mean net flows, whereas fund age and mean net flows are also statistically positively correlated. In other words, older funds tend to be larger and attract higher net flows. This is not surprising considering that younger funds may have been operating in a depressed market since they started after the market crash, which increased the difficulty of attracting positive net flows. By contrast, management fees are slightly negatively related to the mean net flows and statistically significant. The standard deviation of net flows is positively related to fund age and the mean net flows with statistical significance. Thus, older funds attract higher net flows and the volatility of their net flows is also higher. The positive correlation between mean net flows and the standard deviation of net flows also indicates funds with a low standard deviation in net flows have mean negative net flows, which we observe from our data. The low volatility results from the steady negative net flows. As mentioned earlier, we believe this is one of the underlying reasons for the inverted-U shape relationship between fund flow volatility and fund performance.

The CSMAR database does not provide a data field to identify whether a fund is "dead" or "alive" (i.e., no longer exists or still operates). Thus, we check to determine whether a fund's daily returns are reported until the last trading day of 2011 (December 30, 2011) to infer the fund's status. Our analysis reveals that the database contains four dead blend funds. Thus, all stock funds, active or indexed, were still operating at year-end 2011. Because our sample is a subset of stock funds, it contains no dead funds. This result is not surprising because all funds in our sample are relatively young compared with those in developed markets. The CSMAR open-end funds database, which is now part of Wharton Research Data Services (WRDS), maintains the records for all funds whether they are dead or alive. Therefore, having no dead funds in our sample is neither a consequence of our sample

Table 5 A. Risk-adjusted performance appraisal methods applied to 308 actively managed Chinese stock mutual funds between 2006 and 2011

Performance measures and coefficients	*N*	Mean	Median	Min	5%	95%	Max	*SD*
Panel A: Four-factor Model								
Sharpe ratio (%)	308	−1.86	−0.92	−19.35	−12.89	4.52	37.49	6.04
Treynor ratio (%)	308	−0.27	−0.02	−72.45	−0.21	0.10	0.15	4.13
Four-factor α (%)	308	0.00	0.00	−0.15	−0.06	0.04	0.07	0.03
GTA A-share index	308	0.69	0.71	0.00	0.44	0.89	1.25	0.14
SMB	308	0.07	0.06	−0.51	−0.22	0.35	0.52	0.18
HML	308	−0.27	−0.24	−1.16	−0.60	−0.03	0.42	0.19
MOM	308	0.02	0.02	−0.08	−0.02	0.05	0.06	0.02
Adjusted R^2	308	0.78	0.84	−0.01	0.28	0.92	0.96	0.18
Panel B: Four-factor HM Model								
HM α (%)	308	−0.01	−0.01	−0.26	−0.07	0.08	0.17	0.05
HM timing	308	0.01	0.02	−0.39	−0.16	0.11	0.25	0.08
Adjusted R^2	308	0.78	0.84	−0.02	0.29	0.92	0.96	0.18
Panel C: Four-factor TM Model								
TM α (%)	308	−0.001	0.001	−0.22	−0.06	0.05	0.12	0.04
TM timing	308	0.002	0.06	−5.25	−2.68	2.34	5.42	1.40
Adjusted R^2	308	0.78	0.84	−0.02	0.29	0.92	0.96	0.18

This table reports the risk-adjusted performance of actively managed Chinese open-end stock mutual funds using four-factor models between 2006 and 2011. Panel A shows the performance measures are the Sharpe ratio, Treynor ratio, and Jensen's α in the four-factor model. The coefficients on the market (excess return on the GTA A-share index), size (SMB), book-to-market equity (HML), and momentum (MOM) factors are also shown for the four-factor model. Panel B lists the α and the HM timing coefficients for the four-factor Henriksson and Merton (1981) model. Panel C presents the α and the TM timing coefficients for the four-factor Treynor and Mazuy (1966) model. *N* is the number of funds. Mean, Median, Min, 5%, 95%, Max, and *SD* are the mean, median, minimum, 5th percentile, 95th percentile, maximum, and standard deviation.

selection process nor a database issue. Consequently, we do not believe that our sample suffers from survivorship bias.

5. Empirical results

In this section, we first examine the performance of actively managed Chinese stock mutual funds for the full sample period and the two sub-periods. Next, we analyze the results of cross-sectional regressions on how fund characteristics and fund flows are related to fund performance.

5.1. Chinese stock mutual fund performance: 2001–2011

We first present the performance of actively managed Chinese open-end stock mutual funds between October 19, 2001 and December 31, 2011. Panel A of Table 5A presents the results for the Sharpe ratio, Treynor ratio, four-factor α, βs, and adjusted-R^2 in the four-factor model regressions. Panel B of Table 5A reports the α and HM timing coefficients for the four-factor HM model. Panel C presents the α and the timing coefficients for the

Table 5 B. Risk-adjusted performance appraisal methods applied to 170 actively managed Chinese stock mutual funds between October 19, 2001 and December 30, 2011

Performance measures and coefficients	N+	N+*	N−	N−*
Panel A: Four-factor model				
Four-factor α (%)	175	23	133	11
GTA A-share index	308	306	0	0
SMB	183	165	125	92
HML	11	1	297	252
MOM	259	124	49	3
Panel B: Four-factor HM model				
HM α (%)	128	7	180	17
HM timing	204	14	104	10
Panel C: Four-factor TM model				
TM α (%)	159	18	149	14
TM timing	172	8	136	7

This table summarizes the signs and statistical significance of the coefficients in three four-factor models of actively managed Chinese open-end stock mutual funds between October 19, 2001 and December 30, 2011. Panel A shows the α, coefficients on the market (excess return on the GTA A-share index), size (SMB), book-to-market equity (HML), and momentum (MOM) factors for the four-factor model. Panel B lists the α and the HM timing coefficients for the four-factor Henriksson and Merton (1981) model. Panel C presents the α and the TM timing coefficients for the four-factor Treynor and Mazuy (1966) model. N+ and N− are the numbers of funds with positive and negative coefficients, respectively. N+* and N−* are the number of funds that report significantly positive or significantly negative coefficients, respectively.

four-factor TM model. To ensure the validity of our results, we use the robust standard error formula HC2 in MacKinnon and White (1985) for all regressions.

In Table 5A, the average adjusted R^2 is 78% in all three panels, which indicates that our standard four-factor model has strong explanatory power of the performance of these mutual funds. Table 5A also shows that the average daily α is basically zero. Among the four factors, the GTA A-share index has the largest average coefficient value, which is not surprising because these funds are actively managed stock mutual funds that should have substantial market exposure. The coefficients of size (SMB) tend to center more around zero compared with those of value (HML), which are overwhelmingly negative. According to this evidence, these funds place more weight on growth stocks, which is reasonable in an emerging economy. The momentum (MOM) factor has coefficients that are distributed around zero in a relatively small range indicating that managers of Chinese mutual funds do not place much emphasis on this factor when making portfolio allocations. In Panels B and C, the average αs for both market timing models are slightly negative and the average timing coefficients are slightly above zero.

Table 5B shows the number of statistically significant coefficients in the four-factor models for our mutual fund sample based on the 0.05 level. As Panel A of Table 5B shows, 23 of 308 active funds have significantly positive (N+*) αs in our baseline model but this number decreases in the market timing regressions. Almost all funds have statistically significant and positive exposure to the market factor. For the size factor (SMB), 165 funds have statistically significant and positive exposure, which is almost twice the number of funds having statistically significant and negative exposure. However, 96% of the funds (297 of 308) have statistically significant and negative exposure to the value

Table 6 Regressions on actively managed Chinese stock mutual fund characteristics and performance measures between 2006 and 2011

Fund characteristics	Sharpe ratio	Treynor ratio	Four-factor α	Four-factor HM α	Four-factor HM timing	Four-factor TM α	Four-factor TM timing
Management fees	−0.120	0.280	0.000		0.001	−0.002	0.238
	(1.222)	(0.414)	(0.002)		(0.060)	(0.017)	(0.802)
Fund size	−0.627	−0.286	0.000		0.005	−0.004	0.223
	(0.427)	(0.284)	(0.003)		(0.010)	(0.004)	(0.135)
Age	1.517***	−0.057	0.002**	0.002*	−0.001	0.003***	−0.069**
	(0.133)	(0.083)	(0.001)	(0.001)	(0.002)	(0.001)	(0.034)
Mean net flows	11.530**	6.707	0.095***		0.139*	0.076**	1.338
	(4.952)	(6.117)	(0.023)		(0.077)	(0.035)	(1.501)
SD of net flows	12.310	10.190	0.097**	0.038	0.056	0.109**	−1.661
	(7.982)	(9.716)	(0.046)	(0.080)	(0.139)	(0.054)	(2.398)
(*SD* of net flows)^2	−18.06	−14.37	−0.186**	−0.071	−0.127	−0.190**	1.845
	(11.640)	(13.600)	(0.076)	(0.133)	(0.230)	(0.092)	(3.825)
Constant	−7.852***	−1.389	−0.011	−0.018*	0.0132	−0.013	0.157
	(2.149)	(1.341)	(0.009)	(0.011)	(0.090)	(0.026)	(1.256)
N	308	308	308	308	308	308	308
Adjusted R^2	0.528	0.018	0.201	0.002	0.014	0.12	0.004

This table shows the regression results of actively managed Chinese open-end stock mutual fund performance on fund characteristics and investment styles between 2006 and 2011. The dependent variable is fund performance as measured by the Sharpe ratio, Treynor ratio, four-factor α, four-factor HM α, four-factor HM timing, four-factor TM α, and four-factor TM timing. The independent variables are various fund characteristics. Management fees and mean net flows are in percentages and fund size is measured in 10 billion Yuan. Fund age is the length of time since fund inception. Standard errors are in parentheses. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

factor (HML). Although the momentum (MOM) factor may not be economically significant for these mutual funds, compared with the size (SMB) and value (HML) factors, more than a third (124 out of 308) of the funds demonstrate positive and significant exposures to this factor.

Panels B and C of Table 5B indicate both the market timing and security selection skills of these active funds. The four-factor HM model shows more significantly positive market timing coefficients (14 or 4.5% of 308) than the TM model (8 or 2.6% of 308). Although not shown in Table 5, our further investigation of the results shows that only five funds (1.6% of 308) appear to have market timing ability in both models. We observe that seven funds in the HM model and 18 funds in the TM model demonstrate positive and statistically significant αs, which indicate security selection skills. After further analysis, we find that among these funds, only six (2% of 308) show selection skills in both models. However, no fund shows both security selection and market timing skills. Overall, only a very small fraction of these fund managers appear to have either market timing skills or security selection skills.

5.2. Fund characteristics, fund flows, and fund performance: 2006–2011

Tables 6 through 8 show the relationship among characteristics, fund flows, and the performance measures observed between 2006 and 2011. Table 6 presents the results for the whole period while Tables 7 and 8 present evidence for the first and second sub-periods, respectively. The adjusted R^2s are positive for all regressions in Tables 6 through 8. The fund

Table 7 Regressions on actively managed Chinese stock mutual fund characteristics and performance measures between 2006 and 2008

Fund characteristics	Sharpe ratio	Treynor ratio	Four-factor α	Four-factor HM α	Four-factor HM Timing	Four-factor TM α	Four-factor TM timing
Management fees	−3.874	−0.539	−0.087	0.125	−0.176	0.013	−1.014
	(8.169)	(0.659)	(0.157)	(0.092)	(0.195)	(0.064)	(1.039)
Fund size	0.783	0.031	0.001	0.034***	−0.027**	0.021**	−0.195***
	(0.732)	(0.033)	(0.009)	(0.012)	(0.011)	(0.010)	(0.072)
Age	1.981***	0.059***	0.005*	0.005	0.001	0.005	−0.025
	(0.310)	(0.011)	(0.003)	(0.004)	(0.003)	(0.004)	(0.023)
Mean net flows	−5.098**	−0.185*	−0.074	−0.291*	0.172*	−0.208*	1.238*
	(2.520)	(0.096)	(0.051)	(0.163)	(0.098)	(0.113)	(0.640)
SD of net flows	44.36***	1.814***	0.096	0.246**	−0.123	0.257**	−1.659**
	(6.895)	(0.341)	(0.119)	(0.121)	(0.115)	(0.114)	(0.762)
(*SD* of net flows)^2	−49.65***	−2.012***	−0.097	−0.153	0.050	−0.213*	1.271
	(7.885)	(0.382)	(0.129)	(0.122)	(0.123)	(0.118)	(0.801)
Constant	−12.60	0.139	0.103	−0.283**	0.318	−0.093	2.066
	(12.680)	(1.020)	(0.243)	(0.140)	(0.301)	(0.097)	(1.609)
N	147	147	147	147	147	147	147
Adjusted R^2	0.577	0.544	0.062	0.302	0.253	0.241	0.280

This table shows the regression results of actively managed Chinese open-end stock mutual fund performance on fund characteristics and investment styles between 2006 and 2008. The dependent variable is fund performance as measured by the Sharpe ratio, Treynor ratio, four-factor α, four-factor HM α, four-factor HM timing, four-factor TM α, and four-factor TM timing. The independent variables are various fund characteristics. Management fees and mean net flows are in percentages and fund size is measured in 10 billion Yuan. Fund age is the length of time since fund inception. Standard errors are in parentheses. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

performance measures as defined in Section 4 are the dependent variables. To avoid data mining, we keep all fund characteristics and flow variables as explanatory variables when possible. Table 6 shows the one exception, which is the regression for the HM α in Table 6. In this situation, we drop management fees, fund size, and mean net flows because the values of their t-statistic are almost zero. Thus, including them would result in a negative or lower adjusted R^2. The adjusted R^2s for the Sharpe ratio, four-factor α, and TM α are comparable with those reported in Fung et al. (2002). However, the adjusted R^2s are not very high for other risk-adjusted performance measures. One may expect to see this kind of result from a market equilibrium perspective. If a fund characteristic indicates better risk-adjusted performance, investment inflows may chase the characteristic until it disappears (Berk and Green, 2004).

In Table 6, fund age is positively related to the Sharpe ratio, four-factor αs in both the standard and TM models with a statistical significance above the 0.05 level. The adjusted R^2 of these regressions ranges from 12% to 53%. Furthermore, Tables 7 and 8 show this significantly positive effect for the Sharpe ratio for both sub-periods at the 0.01 level. For the four-factor α, this positive effect appears in the first sub-period in Table 7 at the 0.10 level. These findings support the idea that funds with a longer operating history can generate better risk-adjusted returns. By contrast, fund age is negatively related to the TM timing coefficients and Table 8 shows a similar result for the second sub-period. Because the adjusted R^2 values are quite low in both regressions, we hesitate to interpret too much out of this negative impact of age on the TM timing coefficient.

Mean net flows are positively related to the Sharpe ratio, as well as to the αs in both the

Table 8 Regressions on actively managed Chinese stock mutual fund characteristics and performance measures between 2009 and 2011

Fund characteristics	Sharpe ratio	Treynor ratio	Four-factor α	Four-factor HM α	Four-factor HM Timing	Four-factor TM α	Four-factor TM timing
Management fees	−0.155	0.225	−0.000	−0.002	0.003	−0.004	0.278
	(1.067)	(0.239)	(0.002)	(0.027)	(0.051)	(0.012)	(0.669)
Fund size	1.562***	0.360	0.012***	0.003	0.017	0.006	0.258
	(0.520)	(0.346)	(0.004)	(0.007)	(0.010)	(0.005)	(0.165)
Age	1.357***	0.112	−0.002***	−0.002*	−0.001	−0.001	−0.098**
	(0.158)	(0.097)	(0.001)	(0.0014)	(0.002)	(0.001)	(0.046)
Mean net flows	15.500***	5.895	0.087***	0.019	0.136*	0.059*	1.698
	(4.378)	(5.292)	(0.021)	(0.042)	(0.073)	(0.031)	(1.401)
SD of net flows	11.90	8.508	0.131***	0.102	0.029	0.139***	−1.311
	(7.377)	(8.175)	(0.043)	(0.067)	(0.122)	(0.047)	(2.183)
(*SD* of net flows)^2	−14.69	−10.04	−0.232***	−0.174	−0.075	−0.236***	1.295
	(9.604)	(9.544)	(0.072)	(0.121)	(0.218)	(0.083)	(3.566)
Constant	−7.081***	−1.699	−0.012	−0.015	0.010	−0.013	0.168
	(2.180)	(1.601)	(0.009)	(0.040)	(0.077)	(0.020)	(1.081)
N	308	308	308	308	308	308	308
Adjusted R^2	0.491	0.018	0.118	0.004	0.021	0.045	0.010

This table shows the regression results of actively managed Chinese open-end stock mutual fund performance on fund characteristics and investment styles between 2009 and 2011. The dependent variable is fund performance as measured by the Sharpe ratio, Treynor ratio, four-factor α, four-factor HM α, four-factor HM timing, four-factor TM α, and four-factor TM timing. The independent variables are various fund characteristics. Management fees and mean net flows are in percentages and fund size is measured in 10 billion Yuan. Fund age is the length of time since fund inception. Standard errors are in parentheses. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

four-factor standard and TM models with high levels of statistical significance. Table 8 shows similar findings for mean net flows on these performance measures in the second sub-period. Furthermore, the mean net flows have a positive and statistically significant relationship with the HM timing coefficients at the 0.10 level, which also occurs in both sub-periods. Even for the TM timing coefficient, this positive relationship appears in the first sub-period at the 0.10 level and for the whole period. Although the sign is positive in the second sub-period, it is not statistically significance at normal levels. This evidence is consistent with the performance chasing behavior of investors. Although fund flows often chase good performance, the negative fund flows from underperforming funds in the sluggish sideways market after the global financial crisis of 2007–2009 also merit attention.

As Table 6 shows, the positive coefficient on the standard deviation of net flows and the negative coefficients on its quadratic term indicate an inverted-U shape relationship. This is significant at the 0.05 level for the αs in both the four-factor standard and TM models. The signs are consistent for this pair of coefficients across all regressions except the TM timing coefficient, which shows no statistical significance. Furthermore, both sub-periods have similar results for the four-factor TM α. The second sub-period provides a similar conclusion for the α in the four-factor standard model. Table 6 also shows that management fees and fund size do not have any statistically significance coefficients for any of the regressions. Moreover, the signs of these coefficients are in different directions for the various performance measures.

As Table 7 shows, the first sub-period yields similar effects for the volatility of fund flows on the Sharpe and Treynor ratios. As previously discussed, this inverted-U relationship is

consistent with the idea that high flow volatility hurts fund performance by disrupting the portfolio managers' operations with costly trading. By contrast, low flow volatility is correlated with poor performance because the net negative flows from the underperforming funds can be relatively steady.

As previously noted, the two sub-periods (2006–2008 and 2009–2011) generally provide evidence supporting the main findings in Table 6 for the full sample period. However, some results differ among the sub-periods. For example, fund size in Table 7 is positively related to the αs in the two timing models and its coefficients are statistically significant. Because some of these results cannot be cross-validated or supported by theory, we refrain from over speculating on their meaning. Nonetheless, some results still merit worth discussion. First, the regression for the Treynor ratio in Table 7 contains highly statistically significant coefficients, which support similar conclusions on fund age and fund flow volatility for other performance measures in Table 6. Furthermore, in Table 7, fund size and fund flow volatility can negatively affect the timing coefficients in both the HM and TM models. This is consistent with our expectation that the price impact from larger fund sizes or disruptive fund flows can negatively influence timing ability. Table 7 also shows that the mean net flows are negatively and significantly related to the Sharpe ratio, Treynor ratio, and αs in the two timing models. A plausible explanation is that heavy cash flows poured into the new funds before the peak in 2007, then the market crashed (post October 2007 to December 2008) and these funds performed poorly. Thus, the high mean net flows may be correlated with inferior risk-adjusted performance. For the majority of the statistically significant coefficients in Table 8, the results are consistent with Table 6.

5.3. Robustness checks

We run similar regressions using the fund characteristics and fund flows with other dummy variables on fund investment styles or fund types (LOF or contractual) as robustness checks. The results for the fund characteristics and fund flows are similar. However, the regression results show very few statistically significant and consistent coefficients for various investment styles. The fund type dummy in the performance or skill regressions has no statistically significant coefficients. Therefore, we omit reporting these results, which are available on request.

6. Summary and conclusions

We examine the performance and market timing ability of actively managed Chinese open-end stock mutual funds using daily return data. We also study the relationship between fund characteristics, fund flows, and various risk-adjusted performance measures and market timing skills. To our knowledge, we are the first to examine the performance of such mutual funds using the CSMAR database based on a four-factor model. The background information that we provide on the development of the Chinese mutual fund industry and its unique features may help future researchers design new studies involving this expanding sector of the global capital market.

Based on our results, only about 7.5% of the actively managed Chinese stock mutual funds in our sample have positive and statistically significant risk-adjusted returns based on a four-factor model. Less than 5% of the funds show statistically significant market timing skills or stock selection skills.

Our investigation of the relationship of fund characteristics, fund flows, and fund performance indicates that older funds tend to perform better, especially using the Sharpe ratio. This finding may reflect the presence of a learning effect. Net flows are positively related to performance, which relates not only to investors chasing good performance but also to redemptions from underperforming funds. We find an inverted-U shape relationship between fund flow volatility and performance. This relationship suggests that poor performance is related both to disruptive high fund flow volatility and relatively steady net outflows as investors withdraw their money from underperforming funds.

Overall, our results provide a broad look at the performance and market timing skills of actively managed Chinese stock mutual funds. Our study may serve as a catalyst for others who address such questions as: Have managers of actively managed Chinese stock mutual funds improved their portfolio management skills over time? What is the dynamic relationship among the fund performance, manager skills, and fund flows? As the Chinese mutual fund industry continues to grow, our study may help academic researchers, policy makers, and investors better understand this potentially important sector in the world capital markets.

Notes

1 This website is http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_mom_factor.html.

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