An Analysis of Mutual Fund Managers' Timing Abilities – *Evidence From Chinese Equity Funds*

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Received: May 9, 2020 Accepted: June 15, 2020 Online Published: July 7, 2020

doi:10.5430/ijfr.v11n4p214 URL: https://doi.org/10.5430/ijfr.v11n4p214

Abstract

This paper examines Chinese mutual fund managers' market, volatility, and liquidity abilities. Using a daily frequency sample of Chinese open-end equity funds from 2015 to 2019, we find evidence that mutual fund managers can time the market. Among the funds with different investment styles, the active funds have better market and liquidity timing ability, whereas the steady funds have better volatility timing ability. In different investment periods, there are more funds with timing ability in the fall period than in the rise period. We find the same results in the market (T-M), volatility, and liquidity timing models. It is especially for the active funds, nearly half of which have liquidity timing ability in the fall period. Among the funds with stock selection ability, the funds with market timing ability can outperform than the funds with other timing ability.

Keywords: market timing, volatility timing, liquidity timing, mutual fund

1. Introduction

There has been an endless debate on whether mutual fund managers have timing skills. Since the seminal paper of Treynor and Mazuy (1966), many scholars have conducted extensive research on the timing ability of funds. For example, Henriksson and Merton (1981), Chang and Lewellen (1984), Henriksson (1984), Jiang (2003), Jiang, Yao and Yu (2007), Gao, O'Sullivan and Sherman (2019), but their research could not prove fund managers have the ability of timing. However, Bollen and Busse (2001) found that compared with the monthly data, the daily data of the fund showed a more significant ability of timing. Busse (1999) and Giambona and Golec (2009) found that funds increased their market exposure when market volatility decreased, thus achieving better performance and proving the fund's ability to fluctuate at market timing. Liao, Zhang and Zhang (2017) use monthly fund data to examine Chinese funds, proving that Chinese fund managers have market, volatility, and liquidity timing abilities. In a word, there is no conclusive study on whether the fund has timing ability, and most of the literatures are based on the studies of developed economies, while few literatures have examined the timing ability of funds in emerging economies. As the world's second-largest economy, China is also the world's largest emerging economy. The development of China's capital market in recent years is more worthy of our in-depth understanding. This paper focuses on the timing ability of Chinese mutual funds, including market timing, volatility timing, and liquidity timing, and discusses the timing ability of funds with different investment styles and different periods.

Since the establishment of the first open-end fund in China in 2001, with the rapid development of China's GDP, the size of the Fund has also shown an upward trend. According to figure 1, the net value of funds exceeded 8.2 trillion yuan at the end of 2015. By the end of 2019, the number of open-end funds was 5683, and the net value of funds was up to 13.2 trillion yuan, an increase of 60% in five years. With the opening up of the Chinese market, the government's push for the entry of domestic medium-and long-term funds into the market, the removal of restrictions on the entry of foreign funds into the market, and the inclusion of the MSCI and FTSE indices, more funds will enter China, so it will be more meaningful to study the Chinese stock market, and the Chinese market because of its particularity in several aspects, we speculate that the timing ability of Chinese funds is different from other markets.

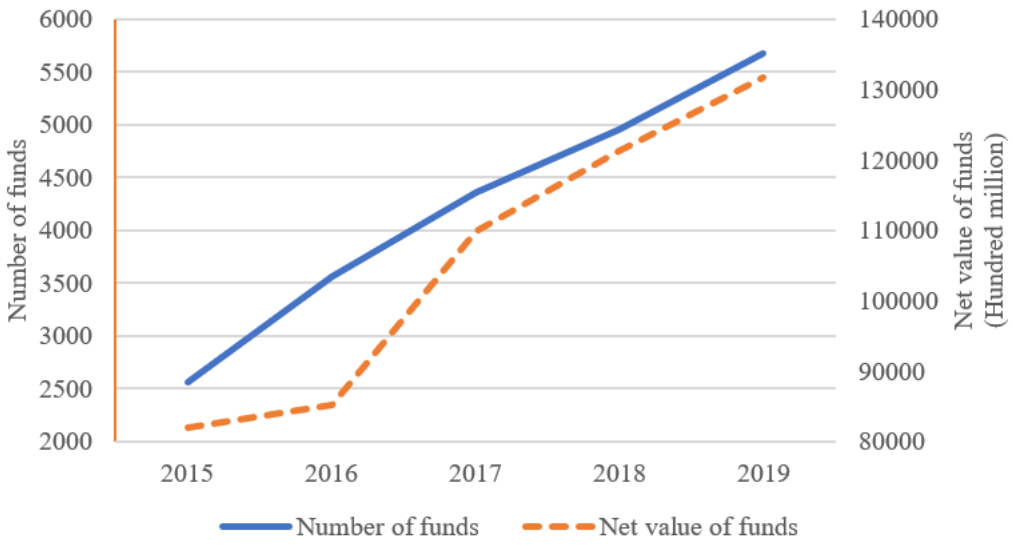

Figure 1. 2015-2019 Trend of the number and net value of Chinese open-end funds

First, individual investors have a leading position in the Chinese market. At the end of the third quarter of 2019, Chinese institutional investors accounted for 49.66% of the market value of A-shares, compared with individual investors, experienced institutional investors have fewer behavioral preferences, and the irrational preferences and investment characteristics of individual investors lead to the predictability of the Chinese Stock Market (Yi & He, 2016), suggesting that there may be timing ability in Chinese funds.

Second, the rapid development of Chinese funds in a relatively short time, the imperfect market system and the absence of short selling mechanism brought about the results of high volatility and high liquidity, especially in times of economic shocks (Tang, Wang & Xu, 2012; Jun, Li & Shi, 2014). High volatility provides an ideal environment for testing whether Chinese fund managers have abilities to time the markets.

Third, compared with the developed economies, China has a serious information asymmetry problem (Morck, Yeung & Yu, 2000), compared with individual investors, institutional investors, particularly funds have stronger information excavation capacity (Liao, Liu & Wang, 2011), also, the presence of short-selling restrictions in China, individual investors are difficult to quickly to arbitrage mispriced stocks (Chen, Kim, Yao & Yu, 2010). All of this provides an informational advantage for funds to use for timing arbitrage (Munoz & Vicente, 2018).

Finally, the Chinese stock market is highly influenced by changes in government policies, such as the introduction of restrictions on Dividend issuance, or the issuance of support policies for certain industries, these policy events will affect the Chinese stock market by influencing the trading behavior of retail investors, and since retail investors are the main force in the Chinese stock market, the change of policy events will greatly affect the future market trend (Wang, Tsai & Li, 2017), such macro-events have spurred more intensive timing in China.

Although previous scholars have made some researches on the ability of mutual fund managers in China, most of the researches have focused on the ability of stock selection of funds, and only a few have made a preliminary study on the ability of fund timing, there is no classification of the Fund's investment style or investment period. And most of the past research used the monthly fund data, for a mature market, the monthly fund data may be a suitable choice. But as the foreword suggests, the volatility of the Chinese market is so high that the market index could reverse in a matter of days, with a standard deviation of 1.54% for the CSI 300 Index between January 1,2015, and December 31,2019, with Dow Jonnes, S & P 500 and Nasdaq at 0.85% , 0.85% and 1.02% respectively over the same period, using higher frequency fund day data is a better test of Chinese mutual fund timing.

Based on Liao et al., (2017) 's research, we have conducted an in-depth study on Chinese open-ended equity funds. This paper uses the daily data of 324 open-end stock funds from January 1,2015 to December 31,2019 to test the market timing, volatility timing and liquidity timing, to test the timing ability of Chinese mutual fund managers, we also used Active and Steady funds to test the timing ability of different types of funds, based on the Fabozzi and Francis (1979) and Pagan and Sossounov (2003) criteria for market rise and fall, the market is divided into different

stages to study the timing ability of the funds in different periods, so as to make up for the lack of current research.

The remainder of the paper proceed as follows, section 2 introduces the data and research methods, section 3 is the results of empirical analysis, section 4 is the further test, and section 5 is the conclusion.

2. Data and Methodology

2.1 Chinese Mutual Funds

Our Mutual Fund data comes from RESSET financial research dataset (RESSET), and the rest comes from China Stock Market & Accounting Research (CSMAR), where we have access to a total of 904 open-end equity funds, we screened out index funds with at least 250 days of fund day data for a total of 1,219 trading days between January 1,2015, and December 31,2019, during the study period, so our total sample contains 324 funds, and according to their investment style is divided into Active and Steady, the number of 120 and 204 funds.

Table 1. Summary statistics

	N	Mean	STD	25%	Median	75%
Total	324	-0.3801	1.5693	-1.0842	-0.3869	0.3688
Active	120	-0.3760	1.5801	-1.0862	-0.3895	0.3692
Steady	204	-0.3822	1.5636	-1.0831	-0.3851	0.3686
MKT	1219	-0.4181	1.5444	-0.9853	-0.3750	0.2643
SMB	1219	0.0292	1.1184	-0.4315	0.1155	0.5845
HML	1219	-0.0098	0.7899	-0.3778	-0.0429	0.3433
V	1219	1.2284	0.8077	0.6759	1.0258	1.4817
L	1219	5.5889	22.9277	2.0161	3.2385	5.5214

This table reports the data summary statistics. The excess returns of the fund summarize the daily returns of the whole fund (Total), active (Active) and steady (Steady) funds. The summary of other variables in the table includes market excess return (CSI 300 index), size factor (SMB), book-to-market ratio factor (HML), market volatility measure (V), and Amihud market illiquidity measure (L), all of which are presented as percentages. N is the number of funds during the sample period. The sample period is from 1 January 2015 to 31 December 2019.

Table 1 reports the summary statistics of Chinese mutual fund samples. According to the average value of Table 1, in the whole sample period, the daily excess returns of Total, Active and Steady types are -0.3801%, -0.3760% and -0.3822%, respectively. The returns of the three types of funds are all better than the market excess returns of -0.4181% in the same period, while SMB and HML are 0.0292% and -0.0098%, respectively, with a volatility of 1.2284% and Amihud illiquidity of 5.5889%.

2.2 Methodology

In this Section, we will use the portfolio performance evaluation model proposed by Jensen (1968):

$$R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \varepsilon_{p,t} \quad (1)$$

Where $R_{p,t}$ is the daily return of fund p minus the risk-free interest rate in period t, and the risk-free interest rate is the daily one-year fixed deposit return. Because most of the performance reference standards of China mutual funds are benchmarked to the CSI 300 index, this paper defines the CSI 300 index as the market index, and MKT_t is the daily return of the market index minus the risk-free interest rate in period t.

Some scholars, such as Elton (1993), think that the multi-factor model can explain the performance evaluation of funds better, so we introduce scale factor and book-to-market ratio factor:

$$R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \varepsilon_{p,t} \quad (2)$$

Where, SMB_t and HML_t respectively for size and book-to-market ratio simulation portfolio in period t. Based on Formula (2), we construct a timing model from Formula (3) to Formula (6) to test the three timing abilities of fund managers, namely, market timing, volatility timing and liquidity timing.

2.2.1 Market Timing Model

We use T-M model (Treynor & mazuy, 1966) and H-M model (Henriksson & Merton, 1981) to test whether fund managers have market timing ability:

Treynor and mazuy (1966) believe that market exposure is linearly related to market returns:

$$R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p MKT_t^2 + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t} \quad (3)$$

Among them, MKT_t^2 is the square of the market's excess return in period t, and the estimation coefficient γ_p reflects the market's timing ability. Positive γ_p implies that the fund manager has timing ability.

Henriksson and Merton (1981) believed that market exposure depended on the market's directional response:

$$R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p max(MKT_t, 0) + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t} \quad (4)$$

Where $max(MKT_t, 0)$ euqals the market excess return in period t when it is positive and zero otherwise. positive γ_p means that the fund manager has successfully adjusted the portfolio exposure, so it has the timing ability.

2.2.2 Volatility Timing Model

We use the following regression to test the volatility timing model:

$$R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p(V_{m,t} - \bar{V}_m)MKT_t + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t} \quad (5)$$

Among them, γ_p is the volatility timing factor, $V_{m,t}$ is the volatility timing measure of the market in period t. We use the standard deviation of market excess return of 10 periods before period t to calculate $V_{m,t}$, and use the average of the standard deviation of market excess return of 10 periods to calculate $\bar{V}_m$. negative γ_p indicates that the fund manager has the ability to choose the time of volatility, because it indicates that the adjustment of the fund exposure decrease (increase) with the increase (decrease) of market volatility.

2.2.3 Liquidity Timing Model

We use a method similar to formula (5) to construct a liquidity timing model:

$$R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p(L_{m,t} - \bar{L}_m)MKT_t + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t} \quad (6)$$

Where $L_{m,t}$ is the illiquidity measure in period t proposed by Amihud (2002), $\bar{L}_m$ is the average of the data in 10 periods before period t. Because $L_{m,t}$ is a measure of illiquidity, when $L_{m,t}$ is larger (smaller), the market liquidity is poorer (better). If γ_p is negative, it means that the fund manager has liquidity timing ability, because it means that the adjustment of fund exposure decreases (increases) with the increase (decrease) of market illiquidity.

In order to calculate $L_{m,t}$, we use the data of outstanding A-shares from January 1, 2015 to December 31, 2019, and according to the practice of Amihud (2002), we exclude the stocks whose accumulated trading days in the previous year are less than or equal to 200 days, and at the same time, we exclude the stocks whose annual illiquidity value in the previous year accounts for the first 1% and the last 1% of the illiquidity value in the same period of all stocks on the market. First, we calculate the illiquidity measurement of stocks:

$$L_{i,t} = \frac{1}{D_i}\sum_{d=1}^{D_i}\frac{|r_{i,d}|}{vol_{i,d}} \quad (7)$$

Where $L_{i,t}$ is the illiquidity of stock i in period t, D_i is the trading days of stock i, $r_{i,d}$ is the yield of stock i on day d, and $vol_{i,d}$ is the trading amount of stock i on day d. After calculating the daily illiquidity of each stock, the market illiquidity is obtained by simple arithmetic average of the illiquidity of each stock:

$$L_{m,t} = \frac{1}{N_t}\sum_{i=1}^{N_t} L_{i,t} \quad (8)$$

Where N_t is the number of sample stocks in period t. If the change of market trading volume causes the fluctuation of market index to be larger (smaller), the greater (smaller) $L_{m,t}$, the worse (better) market liquidity.

3. Empirical Analysis

In this Section, we examine the market, volatility and liquidity timing ability of mutual fund managers, and then analyze the funds with timing ability in detail.

First, we use the timing models expressed by regression Eqs. (3), (4), (5), and (6) to assess market timing, volatility timing and liquidity timing ability for the total, active, and steady funds.

Table 2. Cross-sectional distribution of t-statistics for the timing coefficients across individual funds

Percentage of funds								
Timing	Model	Category	t≤-2.326	t≤-1.960	t≤-1.645	t≥1.645	t≥1.960	t≥2.326
Market	T-M	Total	22.2222	26.2346	29.0123	13.5802	10.4938	7.0988
		Active	25.0000	27.5000	28.3333	20.0000	16.6667	13.3333
		Steady	20.5882	25.4902	29.4118	9.8039	6.8627	3.4314
	H-M	Total	23.7654	29.3210	33.3333	8.6420	7.0988	4.9383
		Active	22.5000	25.0000	30.0000	14.1667	11.6667	10.0000
		Steady	24.5098	31.8627	35.2941	5.3922	4.4118	1.9608
Volatility		Total	9.5679	12.0370	17.2840	13.8889	8.6420	5.2469
		Active	5.0000	6.6667	15.0000	14.1667	8.3333	4.1667
		Steady	12.2549	15.1961	18.6275	13.7255	8.8235	5.8824
Liquidity		Total	8.9506	12.0370	16.9753	6.1728	5.2469	4.3210
		Active	9.1667	12.5000	20.0000	5.8333	4.1667	4.1667
		Steady	8.8235	11.7647	15.1961	6.3725	5.8824	4.4118

Regression from Eqs. (3) to (6):

(3) $R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \gamma_p MKT_t^2 + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \varepsilon_{p,t}$

(4) $R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \gamma_p max(MKT_t, 0) + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \varepsilon_{p,t}$

(5) $R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \gamma_p (V_{m,t} - \bar{V}_m) MKT_t + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \varepsilon_{p,t}$

(6) $R_{p,t} = \alpha_p + \beta_{p,1} MKT_t + \gamma_p (L_{m,t} - \bar{L}_m) MKT_t + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \varepsilon_{p,t}$

This table summarizes the distribution of t-statistics for market timing, volatility timing, and liquidity timing coefficients. For each Chinese open-end equity fund with a return of at least 250 days during the sample period from 1 January 2015 to 31 December 2019, we estimate total, active and steady market timing, volatility timing and liquidity timing. Columns 4 to 9 list the percentage of funds which the t-statistics of the timing coefficient exceed the indicated values.

Table 2 reports the percentage of funds which the t-statistics of the timing coefficient excess the indicated cutoff values.

In the T-M model of market timing, 13.5802%, 20.0000% and 9.8039% of the total, active and steady fund are greater than or equal to 1.645, respectively. Which means that fund have significant market timing ability (Later in this paper, t value greater than or equal to 1.645 is define as the fund have significant market timing ability, t value less than or equal to -1.645 is define as the fund have significant volatility or liquidity timing ability). We see similar results in the H-M model of market timing, with 14.1667% for active funds and 5.3922% for steady funds, the results show that the active funds are better than the steady funds in the ability to grasp the market timing. But on the whole, only a few funds have the market timing ability, and the percentage of 13.5802% with market timing ability is much less than that of 29.0123% with no market timing ability. Our results are similar to those of pilbeam and Preston (2019), they studied 355 Japanese equity funds from 2011 to 2016 based on the T-M model, and found that about 9.30% of the funds had the market timing ability.

In terms of volatility timing, 17.2840%, 15.0000% and 18.6275% of the total, active fund and steady fund have significant volatility timing ability, respectively. There is no significant difference among the three types of fund results, while 18.6275% of the steady fund is slightly higher than 15.0000% of the active fund, which is consistent with the investment style of the steady fund and the demand to reduce volatility.

In terms of liquidity timing, 16.9753%, 20.0000% and 15.1961% of the total, active and steady fund respectively

have liquidity timing ability, and the proportion of the three types of funds without liquidity timing ability is 6.1728%, 5.8333% and 6.3725% respectively, showing a significant distribution with the left tail thicker than the right tail. Our results are similar to those of wattanatorn and tansupswatdikul (2018), wattanatorn et al., (2020). Their research on emerging markets proves that fund managers have liquidity timing ability.

After that, we make an in-depth analysis of the fund with timing ability. Table 3 to Table 6 report the fund with timing ability under each model, and we also analyze the fund manager's stock selection ability.

Table 3. Summary analysis of funds with market timing ability (T-M model)

Panel A Percentage of funds							
Category		α_p+		γ_p+		α_p+γ_p+	
Total		2.1605		17.9012		0.6173	
Active		2.5000		25.0000		0.8333	
Steady		1.9608		13.7255		0.4902	
Code	γ_p	p value	α_p	p value	$\beta_{p,1}$	p value	R^2
Panel B Total							
120	2.2146	0.0000	-0.0014 ***	0.0000	0.6703	0.0000	0.6834
155	2.1259	0.0000	-0.0010 ***	0.0000	0.7671	0.0000	0.8962
144	2.7422	0.0000	-0.0007 ***	0.0010	0.8800	0.0000	0.7539
137	2.3628	0.0000	-0.0008 ***	0.0000	0.7771	0.0000	0.7990
129	4.5094	0.0000	-0.0001	0.4112	1.0584	0.0000	0.7113
Panel C Active							
120	2.2146	0.0000	-0.0014 ***	0.0000	0.6703	0.0000	0.6834
155	2.1259	0.0000	-0.0010 ***	0.0000	0.7671	0.0000	0.8962
270	2.8914	0.0003	-0.0015 ***	0.0000	0.6728	0.0000	0.7312
271	2.8798	0.0003	-0.0015 ***	0.0000	0.6725	0.0000	0.7316
194	4.2264	0.0005	-0.0007 *	0.0799	0.7024	0.0000	0.6151
Panel D Steady							
144	2.7422	0.0000	-0.0007 ***	0.0010	0.8800	0.0000	0.7539
137	2.3628	0.0000	-0.0008 ***	0.0000	0.7771	0.0000	0.7990
129	4.5094	0.0000	-0.0001	0.4112	1.0584	0.0000	0.7113
138	2.5917	0.0001	-0.0008 ***	0.0029	0.8595	0.0000	0.8562
128	1.5759	0.0004	-0.0006 ***	0.0002	0.7973	0.0000	0.8360
Panel E Funds with the ability of stock selection and timing							
313	1.7376	0.0154	0.0006 **	0.0158	1.0207	0.0000	0.7772
149	1.1879	0.0171	0.0004 **	0.0470	0.8817	0.0000	0.7739

Regression with Eqs. (3):

(3) $R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p MKT_t^2 + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t}$

α_p+ means that the fund's α_p is significantly positive, γ_p+ means that the fund's γ_p is significantly positive, α_p+γ_p+ means that the fund's α_p and γ_p both significantly positive. *, ** And *** Respectively indicate that the stock selection ability is significant at the level of 10%, 5% and 1%.

Table 3 reports the summary analysis of funds with market timing ability (T-M model).

Panel A reports percentage of funds that in the T-M model, α_p is significantly positive, γ_p is significantly positive, α_p and γ_p are significantly positive.

Panel B, Panel C and Panel D respectively report the top five funds with market timing ability in the T-M model. It can be seen that among the three types of funds, only 2.1605%, 2.5000% and 1.9608% of them are significantly positive. There is no significant difference among the three types of funds, indicating that in the sample period, Chinese open-end stock funds almost do not have significant stock selection ability and cannot obtain excess return. However, the positive ratio of γ_p is 17.9012%, 25.0000% and 13.7255% respectively, indicating that a small number of fund managers had market timing ability during the sample period, and the active fund was 11.2745% higher than the steady fund, which may be due to the difference of fund investment style. Due to the scarcity of funds with stock selection ability, only 0.6173%, 0.8333% and 0.4902% of the funds with stock selection ability and market timing ability respectively.

Panel E reports the funds with both stock selection and market timing ability. During the sample period, we obtained two funds with both stock selection ability and market timing ability through the T-M model, among which fund 313 is a steady fund and fund 149 is an active fund.

Table 4. Summary analysis of funds with market timing ability (H-M model)

Panel A Percentage of funds							
Category		α_p+		γ_p+		α_p+γ_p+	
Total		9.5679		14.1975		0.0000	
Active		11.6667		22.5000		0.0000	
Steady		8.3333		9.3137		0.0000	
Code	γ_p	p value	α_p	p value	$\beta_{p,1}$	p value	R^2
Panel B Total							
129	0.4450	0.0000	-0.0014 ***	0.0048	0.8503	0.0000	0.7155
194	0.3564	0.0004	-0.0018 ***	0.0056	0.5263	0.0000	0.6154
282	0.3523	0.0004	-0.0017 ***	0.0063	0.5277	0.0000	0.6163
303	0.0605	0.0006	-0.0003 **	0.0180	0.9436	0.0000	0.9500
270	0.2193	0.0008	-0.0021 ***	0.0000	0.5621	0.0000	0.7299
Panel C Active							
194	0.3564	0.0004	-0.0018 ***	0.0056	0.5263	0.0000	0.6154
282	0.3523	0.0004	-0.0017 ***	0.0063	0.5277	0.0000	0.6163
270	0.2193	0.0008	-0.0021 ***	0.0000	0.5621	0.0000	0.7299
271	0.2187	0.0008	-0.0021 ***	0.0000	0.5621	0.0000	0.7303
172	0.2155	0.0022	-0.0008 **	0.0292	0.7788	0.0000	0.7172
Panel D Steady							
129	0.4450	0.0000	-0.0014 ***	0.0048	0.8503	0.0000	0.7155
303	0.0605	0.0006	-0.0003 **	0.0180	0.9436	0.0000	0.9500
138	0.1829	0.0012	-0.0013 ***	0.0006	0.7644	0.0000	0.8548
255	0.2325	0.0088	-0.0011 **	0.0452	0.8238	0.0000	0.7492
144	0.1111	0.0155	-0.0009 ***	0.0018	0.7968	0.0000	0.7487

Regression with Eqs. (4):

(4) $R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p max(MKT_t, 0) + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t}$

α_p+ means that the fund's α_p is significantly positive, γ_p+ means that the fund's γ_p is significantly positive, α_p+γ_p+ means that the fund's α_p and γ_p both significantly positive. *, ** And *** Respectively indicate that the stock selection ability is significant at the level of 10%, 5% and 1%.

Table 4 reports the summary analysis of funds with market timing ability (H-M model).

Panel A reports percentage of funds that in the H-M model, α_p is significantly positive, γ_p is significantly positive, α_p and γ_p are significantly positive.

Panel B, Panel C and Panel D respectively report the top five funds with market timing ability in the H-M model. We can see the similar results with T-M model. In the positive percentage of γ_p, 22.5000% of active funds is 13.1863% higher than 9.3137% of steady funds. We can see that under H-M model, the market timing ability of active funds is still better than that of steady funds. The difference is that the percentage of α_p is significantly higher than that of T-M model, and the three types of funds are 9.5679%, 11.6667% and 8.3333% respectively. But at the same time, it is puzzling that when the percentage of funds with stock selection ability rises and the funds with market timing ability do not fluctuate significantly, the funds with these two abilities change to 0. We see the same results in all three types of funds.

Table 5. Summary analysis of funds with volatility timing ability

Panel A Percentage of funds							
Category		α_p+		γ_p-		α_p+γ_p-	
Total		1.5432		20.9877		0.3086	
Active		2.5000		20.0000		0.8333	
Steady		0.9804		21.5686		0.0000	
Code	γ_p	p value	α_p	p value	$\beta_{p,1}$	p value	R^2
Panel B Total							
38	-13.0753	0.0000	-0.0006 ***	0.0000	0.8177	0.0000	0.8574
85	-14.6087	0.0000	-0.0009 ***	0.0000	0.8436	0.0000	0.8431
89	-16.4047	0.0000	-0.0006 **	0.0110	0.8877	0.0000	0.8203
93	-16.7187	0.0000	-0.0008 ***	0.0002	0.8414	0.0000	0.7966
120	-13.3740	0.0000	-0.0010 ***	0.0000	0.6671	0.0000	0.6804
Panel C Active							
120	-13.3740	0.0000	-0.0010 ***	0.0000	0.6671	0.0000	0.6804
75	-8.6622	0.0004	-0.0001	0.2834	0.8487	0.0000	0.8328
60	-4.5986	0.0005	-0.0001	0.2949	0.9531	0.0000	0.9472
44	-5.2146	0.0008	0.0002 *	0.0545	1.0156	0.0000	0.9359
107	-10.1539	0.0012	-0.0002	0.1040	0.9219	0.0000	0.8016
Panel D Steady							
38	-13.0753	0.0000	-0.0006 ***	0.0000	0.8177	0.0000	0.8574
85	-14.6087	0.0000	-0.0009 ***	0.0000	0.8436	0.0000	0.8431
89	-16.4047	0.0000	-0.0006 **	0.0110	0.8877	0.0000	0.8203
93	-16.7187	0.0000	-0.0008 ***	0.0002	0.8414	0.0000	0.7966
102	-16.8695	0.0000	-0.0005 ***	0.0071	0.8645	0.0000	0.7928
Panel E Funds with the ability of stock selection and timing							
44	-5.2146	0.0008	0.0002 *	0.0545	1.0156	0.0000	0.9359

Regression with Eqs. (5):

(5) $R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p(V_{m,t} - \bar{V}_m)MKT_t + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t}$

α_p+ means that the fund's α_p is significantly positive, γ_p- means that the fund's γ_p is significantly negative, α_p+γ_p- means that the fund's α_p is significantly positive and γ_p is significantly negative. *, ** And *** Respectively indicate that the stock selection ability is significant at the level of 10%, 5% and 1%.

Table 5 reports the summary analysis of funds with volatility timing ability.

Panel A reports percentage of funds that in the volatility model, α_p is significantly positive, γ_p is significantly positive, α_p and γ_p are significantly positive.

Panel B, Panel C and Panel D respectively report the top five funds with volatility timing ability. It can be seen that the percentage of α_p significantly positive remains at a very low level, while the volatility timing ability of the three types of funds is almost the same, 20.9877%, 20.0000 and 21.5686% respectively. Among the top five active funds, we have rarely seen a fund with an excess return.

Panel E reports on funds with both stock selection ability and volatility timing ability. We use the volatility timing model to obtain a fund that differs from the T-M market timing model. Fund 44 is an active fund.

Table 6. Summary analysis of funds with liquidity timing ability

Panel A Percentage of funds							
Category		α_p+		γ_p-		α_p+γ_p-	
Total		1.5432		25.0000		0.3086	
Active		1.6667		28.3333		0.0000	
Steady		1.4706		23.0392		0.4902	
Code	γ_p	p value	α_p	p value	$\beta_{p,1}$	p value	R^2
Panel B Total							
22	-0.4640	0.0000	-0.0004 *	0.0603	0.8460	0.0000	0.8085
315	-0.3894	0.0000	-0.0007 ***	0.0014	0.7959	0.0000	0.8305
25	-0.3537	0.0000	-0.0005 ***	0.0082	0.9289	0.0000	0.8526
75	-0.3739	0.0000	-0.0003	0.1389	0.8272	0.0000	0.8334
71	-0.2552	0.0003	-0.0015 ***	0.0000	0.7282	0.0000	0.8276
Panel C Active							
75	-0.3739	0.0000	-0.0003	0.1389	0.8272	0.0000	0.8334
71	-0.2552	0.0003	-0.0015 ***	0.0000	0.7282	0.0000	0.8276
1	-0.1229	0.0005	-0.0003 ***	0.0021	0.8851	0.0000	0.9601
26	-0.2531	0.0007	-0.0003 *	0.0825	0.8783	0.0000	0.8770
90	-0.3193	0.0010	-0.0011 ***	0.0000	0.9011	0.0000	0.8190
Panel D Steady							
22	-0.4640	0.0000	-0.0004 *	0.0603	0.8460	0.0000	0.8085
315	-0.3894	0.0000	-0.0007 ***	0.0014	0.7959	0.0000	0.8305
25	-0.3537	0.0000	-0.0005 ***	0.0082	0.9289	0.0000	0.8526
42	-0.3098	0.0007	-0.0006 ***	0.0052	0.8959	0.0000	0.8625
144	-0.3423	0.0014	-0.0004 **	0.0243	0.8442	0.0000	0.7498
Panel E Funds with the ability of stock selection and timing							
313	-0.1974	0.0456	0.0008 ***	0.0014	1.0098	0.0000	0.7766

Regression with Eqs. (6):

(6) $R_{p,t} = \alpha_p + \beta_{p,1}MKT_t + \gamma_p(L_{m,t} - \bar{L}_m)MKT_t + \beta_{p,2}SMB_t + \beta_{p,3}HML_t + \varepsilon_{p,t}$

α_p+ means that the fund's α_p is significantly positive, γ_p- means that the fund's γ_p is significantly negative, α_p+γ_p- means that the fund's α_p is significantly positive and γ_p is significantly negative. *, ** And *** Respectively indicate that the stock selection ability is significant at the level of 10%, 5% and 1%.

Table 6 reports the summary analysis of funds with liquidity timing ability.

Panel A reports percentage of funds that in the liquidity model, α_p is significantly positive, γ_p is significantly positive, α_p and γ_p are significantly positive.

Panel B, Panel C and Panel D respectively report the top five funds with volatility timing ability. The percentage of funds with a significant positive value is still very low, with only 1.5432%, 1.6667% and 1.4706% of the three types of funds, respectively. However, the percentage of funds with α_p significant positive value is further increase, with a quarter of the funds with a significant positive value of γ_p, and 28.3333% of the active funds with liquidity timing ability.

Panel E reports on funds with both stock selection ability and liquidity timing ability. Fund 313 also have market timing ability in T-M model.

Next, we summary the funds with timing ability obtained from the above models.

Table 7. Summary of funds with stock selection ability and timing ability

Panel A Funds with the ability of stock selection and timing							
Code	γ_p	p value	α_p	p value	$\beta_{p,1}$	p value	R^2
313 (T-M)	1.7376	0.0154	0.0006 **	0.0158	1.0207	0.0000	0.7772
149	1.1879	0.0171	0.0004 **	0.0470	0.8817	0.0000	0.7739
44	-5.2146	0.0008	0.0002 *	0.0545	1.0156	0.0000	0.9359
313 (Lquidity)	-0.1974	0.0456	0.0008 ***	0.0014	1.0098	0.0000	0.7766

Panel B Comparison of fund and market returns					
Code	N	CFR	CMR	Mean	Std
313	682	75.8200	17.9449	0.0918	1.3481
149	1001	156.5420	10.5412	0.1045	1.4343
44	1165	31.2302	21.6716	0.0432	1.9835

Code is the sample fund code, N is the sample days, CFR is cumulative fund return, CMR is cumulative market return.

Table 7 reports the summary of funds with stock selection ability and timing ability.

Panel A reportes three funds with the stock selection ability and timing ability. Among which fund 313 have the stock selection ability and timing ability in T-M model and liquidity timing model respectively, fund 149 have the stock selection ability and timing ability in T-M model, fund 44 have the stock selection ability and timing ability in volatility timing model, H-M model do not find the fund with the above ability. Among the three funds with timing ability, $\beta_{p,1}$ of two funds is greater than 1.

Panel B reports the comparison of fund and market returns. The returns of the two funds with market timing ability

are 75.8200% and 156.5420% respectively, which are significantly higher than the market returns of the same period. At the same time, the return of these two funds is also higher than that of fund 44 (which have volatility timing ability). In these two funds, the return of fund 149 (only have market timing ability) is significantly higher than that of fund 313 (which have two timing abilities). While the return of fund 44 with volatility timing ability is 31.2302%, which is higher than the market return of 9.5586% in the same period.

4. Further Analysis

In order to effectively study the timing ability of funds in different periods, this paper further divides the study period into rise and fall periods base on Fabozzi and Francis (1979) and Pagan and Sossounov (2003)'s criterion of market rise and fall, in which Fabozzi and Francis (1979) divides the study period into rise and fall periods base on market trends, if the market index rises for 3 consecutive months from a low in a particular band, or falls for 3 consecutive months from a high in a particular band, it is define as the starting point of the rise period and the fall period respectively. In addition, each period of this paper must be in accordance with Pagan and Sossounov (2003)'s definition, that is the index must rise 20% from the low point or fall 20% from the high point.

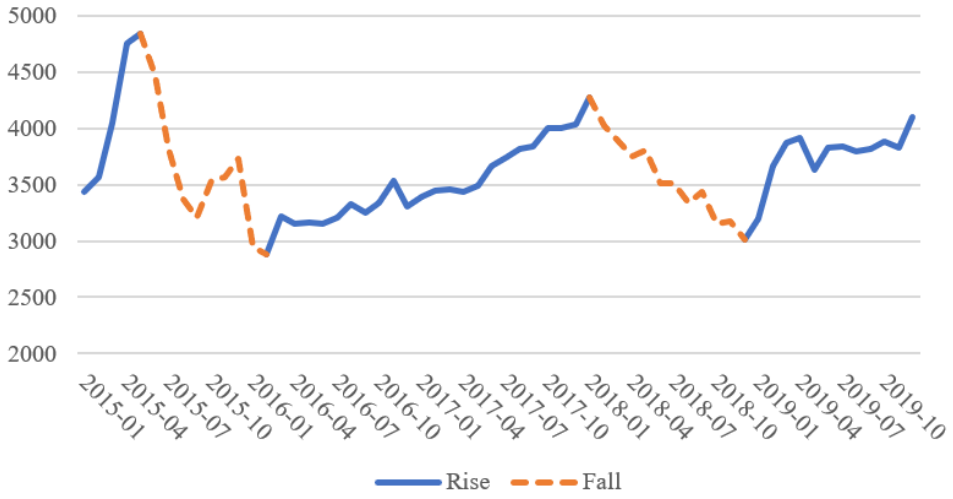

Figure 2. Trend of CSI 300 index

Figure 2 shows the trend of the market index.

Table 8. Index change and period return in rise and fall periods

Period	Index change	Return	N	Trend
2015/01-2015/05	3533.71-4840.83	36.99%	5	Rise
2015/06-2016/02	4840.83-2877.47	-40.56%	9	Fall
2016/03-2018/01	2877.47-4275.90	48.60%	23	Rise
2018/02-2018/12	4275.90-3010.65	-29.59%	11	Fall
2019/01-2019/12	3031.65-4096.58	36.07%	12	Rise

N is the number of months in the period.

Table 8 shows the index change and period return in the rise and fall periods.

After the above classification, in order to retain the fund with at least 250 days of trading data in the sample period, the number of our three types of fund samples is change to 253, 78 and 175 in the rise period, respectively, while 133, 41 and 92 in the fall period, respectively. Then we test the market timing, volatility timing and liquidity timing again.

Table 9. Cross-sectional distribution of t-statistics for the timing coefficients across individual funds

Percentage of funds								
Panel A Market Timing								
Period	Model	Category	t≤-2.326	t≤-1.960	t≤-1.645	t≥1.645	t≥1.960	t≥2.326
Rise	T-M	Total	8.6957	12.2530	14.6245	5.1383	3.5573	2.3715
		Active	7.6923	10.2564	12.8205	6.4103	3.8462	2.5641
		Steady	9.1429	13.1429	15.4286	4.5714	3.4286	2.2857
	H-M	Total	11.4625	16.2055	20.9486	3.9526	1.9763	1.5810
		Active	14.1026	15.3846	19.2308	5.1282	3.8462	3.8462
		Steady	10.2857	16.5714	21.7143	3.4286	1.1429	0.5714
Fall	T-M	Total	26.3158	32.3308	36.0902	7.5188	6.0150	3.0075
		Active	26.8293	39.0244	43.9024	7.3171	4.8780	0.0000
		Steady	26.0870	29.3478	32.6087	7.6087	6.5217	4.3478
	H-M	Total	24.8120	32.3308	42.1053	4.5113	3.0075	1.5038
		Active	17.0732	26.8293	36.5854	2.4390	2.4390	0.0000
		Steady	28.2609	34.7826	44.5652	5.4348	3.2609	2.1739
Panel B Volatility Timing								
Period	Model	Category	t≤-2.326	t≤-1.960	t≤-1.645	t≥1.645	t≥1.960	t≥2.326
Rise		Total	7.9051	13.0435	16.6008	6.3241	5.1383	2.7668
		Active	6.4103	7.6923	14.1026	6.4103	3.8462	2.5641
		Steady	8.5714	15.4286	17.7143	6.2857	5.7143	2.8571
Fall		Total	13.5338	20.3008	25.5639	10.5263	5.2632	1.5038
		Active	12.1951	21.9512	24.3902	7.3171	0.0000	0.0000
		Steady	14.1304	19.5652	26.0870	11.9565	7.6087	2.1739
Panel C Liquidity Timing								
Period	Model	Category	t≤-2.326	t≤-1.960	t≤-1.645	t≥1.645	t≥1.960	t≥2.326
Rise		Total	0.3953	2.3715	5.5336	0.0000	0.0000	0.0000
		Active	0.0000	2.5641	5.1282	0.0000	0.0000	0.0000
		Steady	0.5714	2.2857	5.7143	0.0000	0.0000	0.0000
Fall		Total	22.5564	28.5714	33.0827	19.5489	18.7970	14.2857
		Active	34.1463	43.9024	46.3415	12.1951	12.1951	9.7561
		Steady	17.3913	21.7391	27.1739	22.8261	21.7391	16.3043

This table reports the t-statistic distribution of market timing, volatility timing and liquidity timing coefficients. We test the market timing, volatility timing and liquidity timing ability of total, active and steady funds in the rise and fall periods respectively. Panel A reports the results of market timing model, Panel B reports the results of volatility timing model, and Panel C reports the results of liquidity timing model. Columns 4 to 9 list the percentage of funds which the t-statistics of the timing coefficient exceed the indicated values.

Table 9 reports the percentage of funds market timing, volatility timing and liquidity timing ability coefficient of Total, Active and Steady funds in the rise and fall periods exceed the indicated value.

Panel A reports the results of the market timing T-M model. Generally speaking, the percentage of funds with significant market timing ability in the fall period is higher than that in the rise period, indicating that fund managers are more able to select the market timing in the fall period. In particular, the percentage of active funds with market

timing ability decrease more than that of the whole period, with an increase period of 6.4103% and a decrease period of 7.3171%, compared with 20.0000% in the whole period (Table 2). The results of market timing H-M model in rise and fall periods are almost the same, both of which are below 8%. Similar to the results of the whole period, there is almost no market timing ability in the sample period.

Panel B reportes the results of the volatility timing model. The percentage of the three types of funds with the volatility timing ability in the rise period was 16.6008%, 14.1026% and 17.7143%, which were about 1% lower than the whole period, while the percentage of the funds with the volatility timing ability in the fall period is 25.5639%, 24.3902% and 26.0870%, which are significantly higher than the whole period, and the percentage of the three types of funds is little different. It can be seen that Chinese open-end equity funds are more able to adjust fund exposure according to market volatility in the fall period to resist risks.

Panel C reports the results of liquidity timing ability, which is similar to that of volatility timing ability. Only 5.5336%, 5.1282% and 5.7143% of the three types of funds in the rise period have liquidity timing ability, which are significantly lower than that in the whole period, but opposite in the fall period. The percentage of the three types of funds is 33.0827%, 46.3415% and 27.1739%, which are respectively higher than that in table 2, it is 16.1074%, 26.3415% and 11.9778% higher in the whole period. It can be judged that when the market falls, fund managers have more liquidity timing ability, especially active funds. In the fall period, nearly half of the funds (46.3415%) have liquidity timing ability significantly.

5. Conclusion

This paper focuses on the test of timing ability of Chinese open-end equity funds. The sample period lasts for 1219 trading days in 5 years, covering the bull market and sharp fall of Chinese stock market in 2015, as well as the shocks and reversals in the following years, which is enough to effectively observe the timing ability of fund managers in different periods.

Through empirical analysis, we find that during the sample period, Chinese open-end equity funds can hardly obtain excess returns, and only a few funds have the ability to choose the time. Specifically, in terms of the market timing ability in the whole period, Active funds perform better than Steady funds, but divided into rise period and fall period, active funds lost this advantage, falling into a lower level with steady funds. In terms of volatility timing ability, about one-seventh of the funds had volatility timing ability during the whole period, and the percentage of the sample funds that had volatility timing ability increase by about 10% during the fall period, it can be seen that Chinese open-end equity funds have a good volatility performance in the fall period, up to a quarter of the fund has volatility timing ability. Similar to the result of volatility timing ability, the percentage of funds with liquidity timing ability is higher, and it is more noticeable that the percentage of active funds with liquidity timing ability is as high as 45.34% in the fall period, far outperform during the rise period.

Among the funds with both stock selection ability and timing ability, those with market timing ability through T-M model have excellent stock selection ability, among them, the fund with market timing ability is higher than the fund with both market timing ability and liquidity timing ability, and the fund with volatility timing ability is slightly higher than the market return. Based on this, it can be inferred that investors may obtain higher excess returns by choosing funds with market timing ability through T-M model, and can also obtain a small amount excess returns by choosing funds with volatility and liquidity timing ability.

Due to the generally poor performance of Chinese open-end equity funds during the sample period, only a few funds can obtain excess returns, which leads to the inability to better explain the impact of timing ability on fund returns. However, due to the influence of Chinese current policies, the positions of equity funds must be kept at more than 80%, and it is impossible to avoid risks by reducing positions when the market falls, which may become an important factor limiting the performance of equity funds.

Overall, our study provides some insights on whether fund managers have different types of timing ability and whether they have such timing ability in the rise and fall periods. Future research can explore new types of timing ability, or funds of more different types of investment or of different frequencies.

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Appendix

Chinese equity funds

Code	Fund Code	Style	Code	Fund Code	Style	Code	Fund Code	Style	Code	Fund Code	Style
1	000082	1	101	001528	2	201	004075	2	301	160127	2
2	000309	2	102	001541	2	202	004241	1	302	164205	1
3	000326	1	103	001542	2	203	004272	2	303	165310	2
4	000409	1	104	001556J	2	204	004273	2	304	167703	1
5	000411	2	105	001557J	2	205	004292	1	305	167706	1
6	000418	2	106	001576	2	206	004350	1	306	206012	2
7	000457	2	107	001577	1	207	004352	2	307	320020	2
8	000471	1	108	001579	2	208	004403	2	308	320022	2
9	000513	1	109	001583	2	209	004404	2	309	376510	2
10	000524	2	110	001605	2	210	004450	1	310	399011	1
11	000549	2	111	001616	2	211	004476	2	311	450009	2
12	000577	2	112	001626	2	212	004484	1	312	519167	2
13	000586	1	113	001628	2	213	004485	1	313	519193	2
14	000592	1	114	001637	2	214	004606	1	314	519606	2
15	000594	1	115	001638	2	215	004616	1	315	519673	2
16	000628	1	116	001643	1	216	004640	2	316	519714	2
17	000688	2	117	001644	1	217	004683	2	317	519935	2
18	000696	2	118	001645	2	218	004686	2	318	519965	1
19	000697	2	119	001649	2	219	004698	1	319	519975	2
20	000711	1	120	001651	1	220	004716	2	320	540008	2
21	000729	2	121	001663	2	221	004730	2	321	540009	1
22	000746	2	122	001672	2	222	004784	1	322	540010	2
23	000751	1	123	001677	2	223	004805	1	323	671030	2
24	000756	2	124	001678	2	224	004812	1	324	673090	2
25	000761	2	125	001692	2	225	004813	1			
26	000778	1	126	001696	2	226	004851	2			
27	000780	1	127	001703	2	227	004858	1			
28	000793	2	128	001705	2	228	004925	1			
29	000803	2	129	001707	2	229	004995	2			

30	000828	1	130	001714	1	230	004997	2
31	000831	2	131	001717	2	231	005009	2
32	000854	1	132	001718	2	232	005033	2
33	000866	2	133	001719	2	233	005034	2
34	000867	2	134	001725	2	234	005035	2
35	000884	1	135	001726	2	235	005036	2
36	000893	1	136	001733	1	236	005037	2
37	000913	2	137	001736	2	237	005038	2
38	000916	2	138	001749	2	238	005106	2
39	000925	2	139	001764	1	239	005161	2
40	000955	2	140	001766	2	240	005188	1
41	000960	1	141	001781	2	241	005189	1
42	000971	2	142	001790	2	242	005209	1
43	000974	1	143	001825	2	243	005210	1
44	000978	1	144	001849	2	244	005235	2
45	000979	2	145	001877	1	245	005236	2
46	000985	2	146	001878	2	246	005237	2
47	000991	2	147	001915	2	247	005238	2
48	000996	2	148	001917	2	248	005239	2
49	001008	1	149	001938	1	249	005240	2
50	001009	2	150	001956	2	250	005259	1
51	001028	2	151	001974	2	251	005267	2
52	001036	2	152	001975	2	252	005268	2
53	001039	2	153	002121	1	253	005303	2
54	001040	2	154	002168	1	254	005304	2
55	001042	2	155	002210	1	255	005310	2
56	001043	1	156	002229	2	256	005328	2
57	001044	2	157	002289	2	257	005402	2
58	001047	2	158	002300	2	258	005457	2
59	001048	1	159	002332	1	259	005495	1
60	001050	1	160	002333	1	260	005496	1
61	001054	2	161	002334	2	261	005502	1
62	001070	2	162	002335	2	262	005515	2
63	001072	2	163	002386	2	263	005516	2
64	001097	2	164	002556	2	264	005530	2
65	001104	2	165	002595	2	265	005569	1
66	001105	1	166	002621	1	266	005570	1
67	001126	2	167	002697	1	267	005612	1
68	001158	1	168	002861	2	268	005620	1
69	001162	2	169	002871	2	269	005621	1

70	001163	2	170	002952	2	270	005628	1
71	001166	1	171	002980	2	271	005629	1
72	001167	1	172	003053	1	272	005635	1
73	001171	1	173	003054	1	273	005636	1
74	001178	2	174	003069	1	274	005662	2
75	001186	1	175	003145	2	275	005663	2
76	001188	1	176	003190	1	276	005669	2
77	001193	2	177	003191	1	277	005763	1
78	001195	2	178	003230	1	278	005777	2
79	001208	2	179	003231	1	279	005802	2
80	001223	1	180	003232	1	280	005825	2
81	001230	1	181	003233	1	281	005826	2
82	001236	2	182	003298	2	282	005885	1
83	001245	2	183	003299	2	283	005894	2
84	001277	2	184	003312	2	284	005927	1
85	001291	2	185	003416	2	285	005928	1
86	001313	2	186	003492	2	286	005960	1
87	001319	2	187	003622	1	287	005961	1
88	001396	1	188	003623	1	288	005962	1
89	001404	2	189	003624	1	289	005963	1
90	001409	1	190	003625	1	290	005968	1
91	001410	2	191	003634	1	291	005969	1
92	001416	2	192	003745	2	292	006002	1
93	001421	2	193	003834	2	293	006003	1
94	001473	2	194	003853	1	294	006138	2
95	001476	2	195	003865	1	295	006195	1
96	001482	2	196	003956	2	296	006265	2
97	001490	2	197	003984	2	297	006346	2
98	001496	2	198	003985	2	298	006347	2
99	001520	2	199	004040	1	299	006478	2
100	001521	2	200	004041	1	300	110022	2

Style 1: Active fund

Style 2: Steady fund