

**A Study on Index Fund
Development and Performance
in China**

by

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Abstract

The overall passive fund market has been growing at a compellingly high rate over the recent years in terms of both market size and cash inflow, especially in the US. Compared to the US counterpart, Chinese index funds have a much shorter 16-year history and are still largely under development. Chinese index funds, including index mutual funds and ETFs, started to boom since 2010. In the context of the unique Chinese financial market system, the Chinese index fund industry turn out to be different from that in the US in a variety of ways, such as in the aspects of market composition and indices followed. By giving a closer examination of the specifics of the Chinese index fund industry and index practices, this paper first explores how Chinese index funds have been developing and how they are distinctive. This paper also employs the latest 5-year and 3-year data and fund samples related to the most influential indices in China to conduct empirical analysis on how Chinese index funds performed compared to Chinese actively managed funds, as well as the results from previous studies. It is found that Chinese index funds still did not perform so well as active funds and the US's index funds in general during the recent periods; the contamination of the purely passive investment philosophy with active factors in practices of fund management could be one of the main explanations. This paper finally suggests returning to focus on core ideas and advantages of index funds, accompanied by trying some new ways of indexing design, for the sake of further and healthier development of the Chinese index fund industry in the long run.

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Introduction

The financial world today witnesses a roaring age of passive funds and indexing practices. Over the past few years, the booming trend in passive investment has been more than impressive in the aspect of both market size and net cash flow, as the year of 2017 marked the eighth straight in which rapid growth in passive funds at double-digit rates paralleled sharp aggregate outflows from actively managed funds in North America (McKinsey&Company, 2018). In 2017 alone, passive equity funds in the US attracted more than \$505 billion inflows, doubling from \$234 billion in 2016 (McKinsey&Company, 2018), while the assets held in ETFs throughout the world smashed through the \$5 trillion barrier in January 2018. From the first index funds emerging in the 1970s, confronted with much criticism and ridicule in the very beginning, to a giant market representing over 26 percent of the assets under management by investment companies nowadays, it is amazing to learn how the landscape between active funds and index funds has shifted. Passive investment has become one of the most important ideas in asset management.

Back in 1951, John Bogle, the iconic creator of the world's first index mutual fund "Vanguard 500" in 1976, pointed out the persistent conflict between the fund manager lauded to himself and his duty to the investors in his senior thesis at Princeton. Based on his belief that most people are investors rather than speculators, Bogle commended that investors would inevitably receive a better return than those who pay active fund managers to juggle, if they settle for index funds with the average market return. It was not until the years of 1994 to 1996, when the growth rate of return of S&P 500 index funds surpassed that of 91% of the stock funds in the market, that the index fund market became a hit and truly began to prosper. Compared to actively managed funds traditionally dominating the market, index funds have two major advantages: low costs and transparency. Aligned with its "buy-and-hold" strategy,

index fund managers do not have to invest considerable time and energy in stock selection and trade frequently, thus reducing the management fees, expenses and transaction costs significantly. How the fund is organized to track the index is made clear to investors. In addition, index funds are capital gain tax efficient in the US market given their low turnover rates, and feature diversification of investment with their broad ranges of securities held.

The index fund market in China set off in 2002 with the launch of the first index mutual fund “Hua’an SSE 180 EIF”. The first Chinese ETF, “Huaxia SSE 50 ETF”, was initiated at the end of 2004, when ten index funds existed in the market then. Starting much later than its US counterpart, the Chinese index fund industry has experienced a rather wandering way of development during the first eight years, while more expansion in the market size was observed only in more recent years after 2010. According to Wind financial database, there were 637 passive investment funds out of 5020 funds in the Chinese market by October 1st, 2018, taking up a 3.96% of the market total net asset; 185 out of all passive investment funds were ETFs with a 3.4% of the industry’s total net asset, the remaining of which were normal index funds.¹ As it is seen, despite the lower count of ETFs than that of index funds, ETFs accounted for the majority of total net asset in the index investment industry; this might indicate that a lot many Chinese index mutual funds were actually very small in net asset value. The major obstacle in the way of development of Chinese index fund market could still largely be the immaturity of the Chinese financial market mechanisms. Very different from the typical US market, the Chinese financial market is unique and still under development in a variety of aspects such as information transmission, where some fundamental assumptions bolstering index investment may not hold.

¹ This data might be somehow problematic with regard to the issue of Chinese structured funds when Wind database calculated the statistics of the industry. More discussions later in the paper.

Research about indexing theories and index investment practices is still in its early age in China. Although some introductory and preliminary studies have been conducted by Chinese scholars, systematized quantitative and empirical studies on the Chinese index fund market have been relatively few. This paper is intended to narrow the gap of understanding passive investment in the Chinese market, especially on the perspective of fund performance, and to cast some new light on the specialness of Chinese index funds in a different context from the developed US market, by giving a closer look at some specifics of the Chinese fund industry and indexing practices, choosing new fund subjects for study, and analyzing results with potential explanations based on data compared to existing literature. This paper has several main sections as follows: Firstly, a review on previous relevant studies in the US and China, covering both theoretical and empirical ones, is conducted. Secondly, the paper talks about some new discoveries about details when looking into the overall Chinese fund market and indexing practices. Thirdly, the data sample and methodology for this study are introduced. Then this section is followed by regression analyses and interpretation of results regarding fund performance. The last section is the conclusion.

Literature Review

An index fund, in a broad definition, is a mutual fund or exchange-traded fund(ETF) constructed to follow certain predetermined rule(usually a market index) so that it can match or track a specified basket of underlying investments. The biggest difference between ETFs and index mutual funds is that ETFs are traded in both primary market and secondary market; purchases and redemptions occur in kind in the primary market for qualified large investors, while ETFs can also be traded just like a stock in the secondary market for non-institutional investors. Traditionally, there has been a rich repository of academic researches on security

prices, portfolio management and fund performance in the US that impact studies of index funds.

The two pivotal theories giving rise to the idea of index funds are Efficient Market Hypothesis (EMH) and Random Walk Theory. To the modern form of the theories, Paul Samuelson (1965) provided a mathematical proof that future prices fluctuate randomly, explained by the competition between investors. At the same time, Eugene Fama (1965) reacted similarly to the empirical studies demonstrating the randomness of stock prices, arguing that it's impossible to 'beat the market' because the price of a stock already incorporates all available information in the market and prices converge to the fundamental value. In his paper "Efficient Capital Markets: A Review of Theory and Empirical Work" (1970), he further divided EMH into three major forms—weak, semi-strong, and strong(or radical). The weak form claims that the current stock price only reflects all past publicly available information; the semi-strong form states that prices reflect all publicly available information and change instantly to reflect new information, such as previously private information made available now; in the strong form, prices even adjust instantly to reflect private 'insider' information. On the condition of EMH, Random Walk Theory, first popularized by Paul H. Cootner's book (1964), asserted that future price movements follow a completely 'random walk' as new information appears, thus no one would be able to predict the upward or downward direction based on any past information. This resulted in the drastic incredulity at active funds run by 'experts' and the plausibility of passive funds.

Evaluation of fund performance has long been a critical part in studying mutual funds. With regard to risk-adjusted return, three classical metrics have been widely applied. William F. Sharpe (1966) defined the well-known Sharpe Ratio as follows: $S_p = (R_p - R_f)/\delta_p$, where δ_p takes both systematic risk and idiosyncratic risk into consideration; Jack L. Treynor (1965) proposed the Treynor Ratio: $T_p = (R_p - R_f)/\beta_p$, where β_p only considers systematic

risk of the fund portfolio; Michael C. Jensen (1968) formulated the Jensen's alpha as $J_p = R_p - [R_f + \beta_p(R_m - R_f)]$, which measures the absolute return obtained by bearing risk beyond the systematic part. If $J_p > 0$ in Jensen's alpha, the return of the fund is higher than that of the market portfolio. All these three single-factor model use risk-free rate. To better compare the index fund performance with its underlying index performance, the first measures Elton, Gruber and Souza (2018) used were average monthly differential return (fund return minus index return in percentage terms) and average standard deviation of differential return; the other measure employed three characteristics of running a regression of the fund return against the underlying index return: the intercept(α), regression coefficient(β), and the coefficient of determination(R^2) of the regression.

Empirical studies on the performance of US index funds have indicated interesting results evolving through different periods. In Elton, Gruber and Busse (2004), 52 open-end S&P 500 index mutual funds were selected as the sample existing through the sample period from January 1996 to December 2001. The summary statistics for the average differential return across the sample was negative(-0.485% per year), while the risk-adjusted excess return(alpha) averaged -0.410% per year, suggesting that index funds on average underperformed their underlying index economically significantly, very likely due to the negative influence of expenses on performance to a large extent. On the other hand, Elton et al. (2018)'s most recent research chose 174 ETFs and 396 index funds following same indices with at least 12 months of data from January 1994 to November 2016 for the common existing period of at least one index fund and one corresponding ETF as the sample. They figured out that in both cases of ETFs and index funds the differential return was interestingly very close to zero, inferring that fund managers were able to employ sophisticated management techniques now to counter losses due to transaction costs in trying to handle index changes. It was also found that both index mutual funds and ETFs did an excellent job

of tracking the underlying indices with regression betas close to 1 and an average R^2 above 0.996.

Drawing upon the research theories and methodologies from the Western side, a few Chinese scholars completed some empirical research on index fund performance in the Chinese setting. Li, Li and Yang (2004) used weekly data of only 3 close-end index funds through the end of May, 2000 to the end of October, 2003 as the sample, finding that the correlations between the three funds and their respective underlying index were strong. However, generally speaking, the index funds failed to get a relatively decent return regardless of market conditions, probably because of the inability to leverage various advantages of index funds such as low costs and simple management then. They also had a vital discovery that the sample index funds performed worse than the underlying indices in a bullish market, but became more resilient in a bearish market. Ye and Su (2005) provided an additional evidence to this, using two open-end index mutual funds both following SSE 180 index during April 2003 to April 2004 as the sample, and further explained that the Chinese government's policy at that initial period of introducing stock funds imposed a mandatory proportion of holding in treasury bills (at least 20% of fund TNA), which could be attributed to the main factor impacting fund performance then. Designed to compare performance between index funds and actively managed funds instead of focusing only on index funds, Qi and Wang (2011) studied all stock funds launched before January 1st, 2005—including 7 index funds and 22 active funds—for a 5-year window with the three single-factor performance metric discussed above, summarizing that the index funds did not excel the market average return and active funds still had an upper hand sometimes, due to several critical factors including the less-than-weak efficiency of Chinese market, deficiencies of indexing itself (no CSI 300 index at that time) and the lack of derivative instruments for risk hedging then.

Closely related to the topic of fund performance is a key concept, “tracking error”.

Chen (2005) reviewed three principal formulation of tracking error: absolute value method--

$TE_1 = (\sum |R_{f,t} - R_{b,t}|)/n$ (Note: $t = 1, 2, 3, \dots, n$ (sample period); $R_{f,t}$ is the return rate of

index fund at period t ; $R_{b,t}$ is the return rate of the underlying index at period t); standard

deviation method-- $TE_2 = \sqrt{\frac{1}{n-1} \sum_{t=1}^n [(R_{f,t} - R_{b,t}) - \frac{1}{n} \sum_{t=1}^n (R_{f,t} - R_{b,t})]^2}$; regression

residual method—define tracking error as the standard deviation of residual error of

regressing the return rate of the index fund against the return rate of the underlying index

with CAPM model. Tang and Chen (2009) divided the source of fund performance into two

contributing aspects--fluctuation of value of the underlying asset and fund management

skills, and showed the negative correlation between fund NAV return rate and tracking error

(low tracking error indicates good management skills), given similar fluctuation of value of

the underlying asset. In Elton et al. (2004), a number of factors that might influence the

performance of an index fund (including average differential return and average standard

deviation of differential return) were put forward, including the matching procedure,

procedure for handling inflows and outflow to the fund, transaction costs, expenses, capital

gains taxes, cash position and others.

This paper tries to probe the special context where Chinese index funds have been developing and the different conditions of these funds from US's index funds, while making use of the latest data to gain updated insights about performance of Chinese index funds.

A Closer Look at the Chinese Index Fund Industry & Indices

In comparison with prosperity and maturity of the fund industry in the developed markets, the Chinese fund industry in overall has a much shorter history, let alone passive investment products as a relatively new member in the family introduced to China in 2002.

Actively managed funds have been dominating the Chinese fund industry today both in numbers and amount of asset held; although the portion of passive funds still seem to be small, it's noteworthy how the passive investment segment expanded over recent years since 2010. According to market summary data from Wind database, the percentage of passive funds in total counts first exceeded 10% in 2010, with similar pattern of percentage in overall total net asset observed. The peak years in expansion went around 2012-2013, while the latest period from 2016-2018 showed some sign of shrinkage and slower pace of expansion. The percentage of passive funds in overall TNA decreased more sharply than its percentage in total counts, highlighting the fact that though passive funds took up a bigger percentage in TNA than in the number of funds during early years, the trend appeared to reverse now. This could somehow deliver a warning indication that more newly established passive funds were smaller in size, calling for more attention to the “quality” of growth of passive investment in China rather than simply extensive growth.

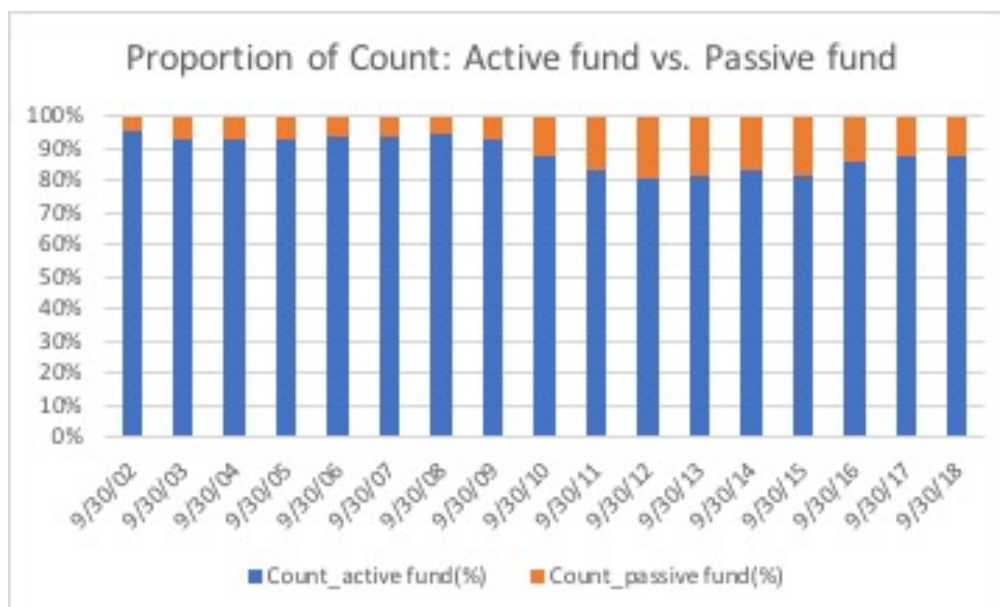


Figure 1: Proportion of Active and Passive Funds in terms of Counts

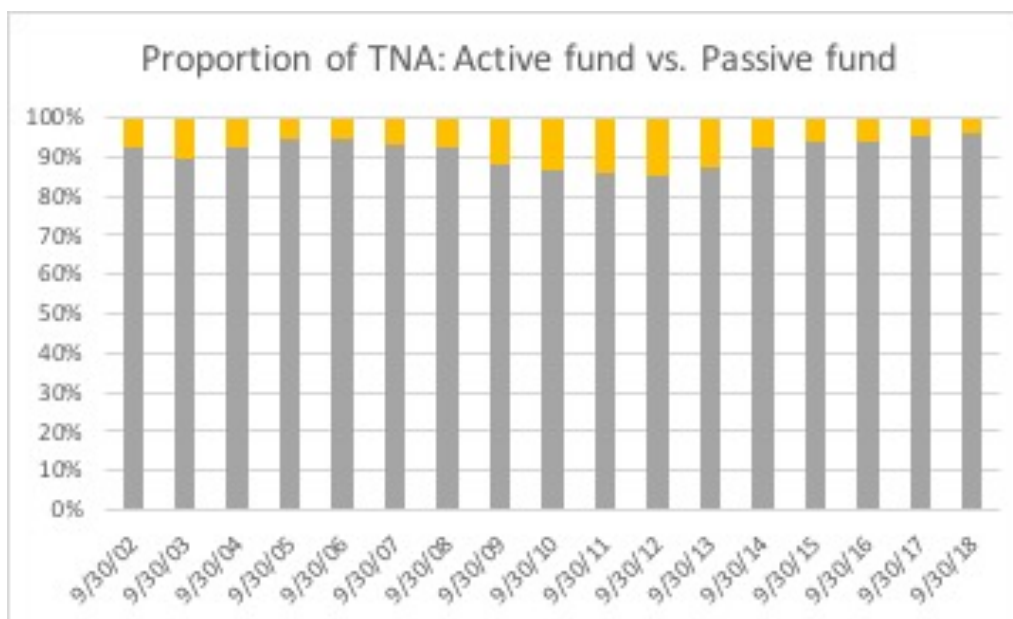


Figure 2: Proportion of Active and Passive Funds in terms of Total Net Asset(TNA)

The Chinese passive fund market went through several stages of growth during its 16 years of history. From 2002 to 2018, the industry emerged from only 3 passive funds to one with 638 funds, growing 212 times in counts; the market size also expanded 61 times from 8.8 billion to 545.1 billion. With regard to counts, after around 8 years of sluggishness, the number of passive funds began to surge upwards since 2009 till now. Regarding the market TNA, there were two crucial periods featuring prominent jumps along the way: 2007 and 2015. The year of 2007 became the first milestone when the market TNA amazingly skyrocketed ten times in a single year, crushing the new high of 200 billion at one action. The second turning point came to the year of 2015 when the overall TNA doubled, climbing to above 500 billion. Although 2016-2017 saw some moderate slide in market TNA, the most recent 2018 seemed to bounce off to a higher value than 2015. The momentum for future growth would still be there, and the space for development is large.

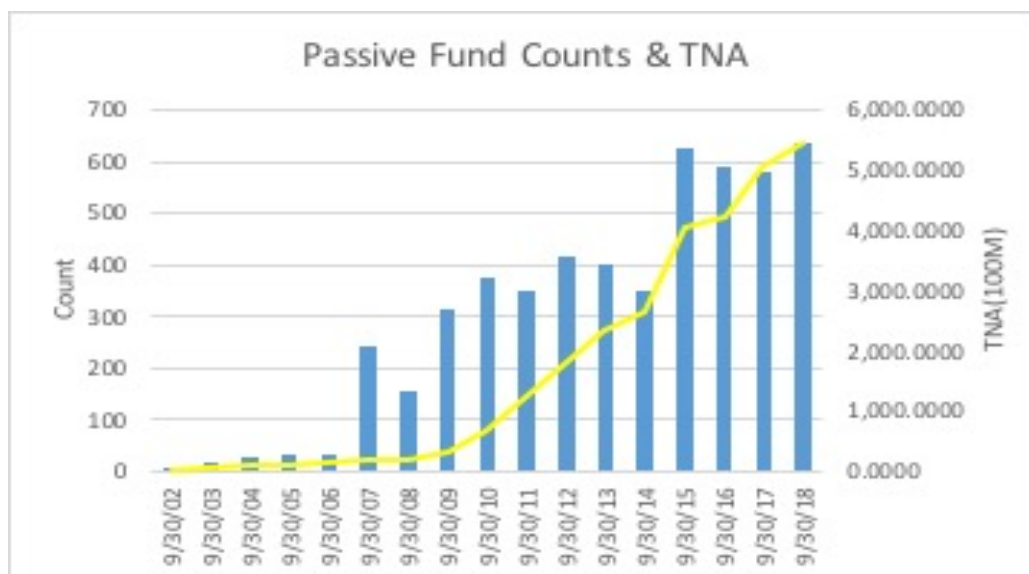


Figure 3: Historical Development of Passive Funds in terms of Counts & TNA

Based on Wind database, Chinese passive funds can be classified by several asset types—stock index funds, bond index funds, commodity index funds, QDII index funds (including QDII stock index funds and QDII alternative investment index funds), and others (such as flexibly asset allocated fund). QDII (Qualified Domestic Institutional Investors) funds only exist in China, where capital control still persists, to provide a limited and supervised access to the overseas market for Chinese investors. During the period 9/30/2013 – 9/30/2018, stock index funds maintained the superiority in numbers over all other types of passive funds with proportions consistently above 70%, even exceeding 80% in 2015 and 2016. Apparently stock is the most common asset class invested by passive funds in China.

Passive funds normally include two categories: index mutual funds and ETFs. In China, the first ETF, “SSE 50 ETF”, was listed in market at the end of 2004. Since then, ETFs turned into a budding choice for fund investors. Compared to the gradual upward spiral in numbers of ETFs, the percentage of ETFs in total market size has been moving ahead at a compelling rate over the past few years. Starting from 2009, accelerated expansion of ETFs in the passive segment was observed every year except 2015 & 2017, when the greatest leap occurred from 2015 to 2016 ending up with a more than 90% of passive market TNA. What

became even more remarkable was that ETFs took up a nearly 99% of market TNA despite only a less than 30% of total counts in 2018, envisioning a time of full blast for ETFs.²

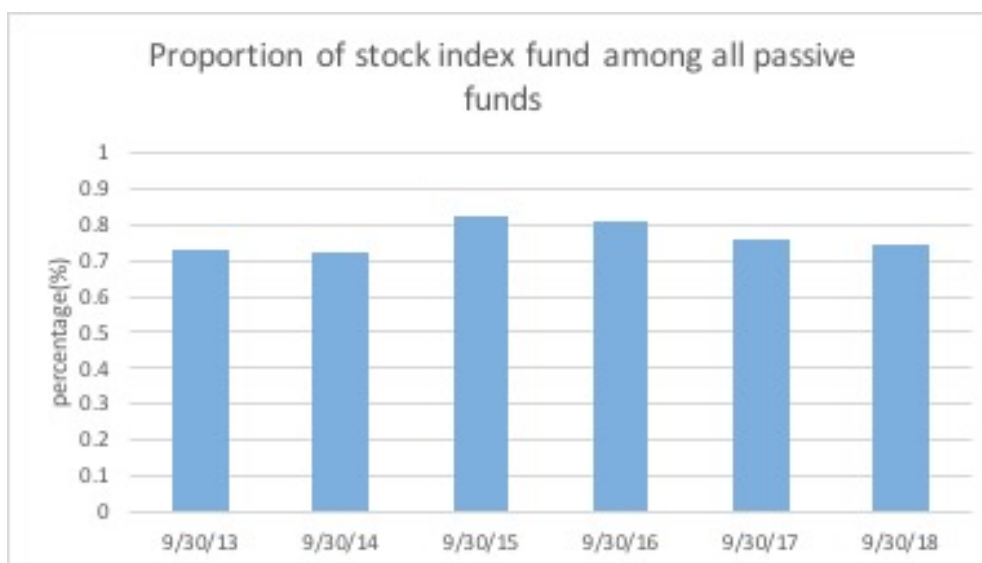


Figure 4: Proportion of Stock Index Funds among All Passive Funds

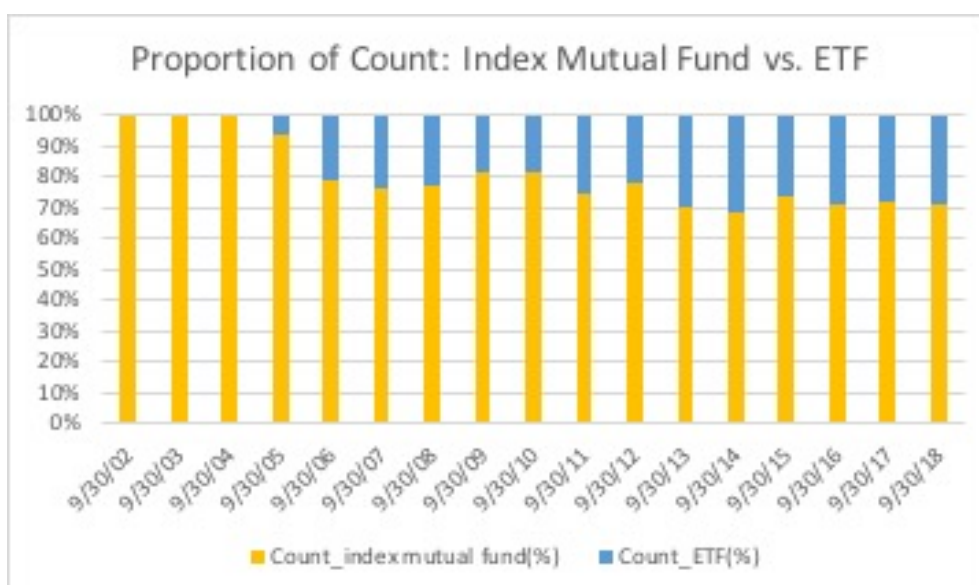


Figure 5: Proportion of Index Mutual Funds and ETFs in terms of Counts

² Chinese ETFs increased 35 billion RMB in the third quarter of 2008 alone.

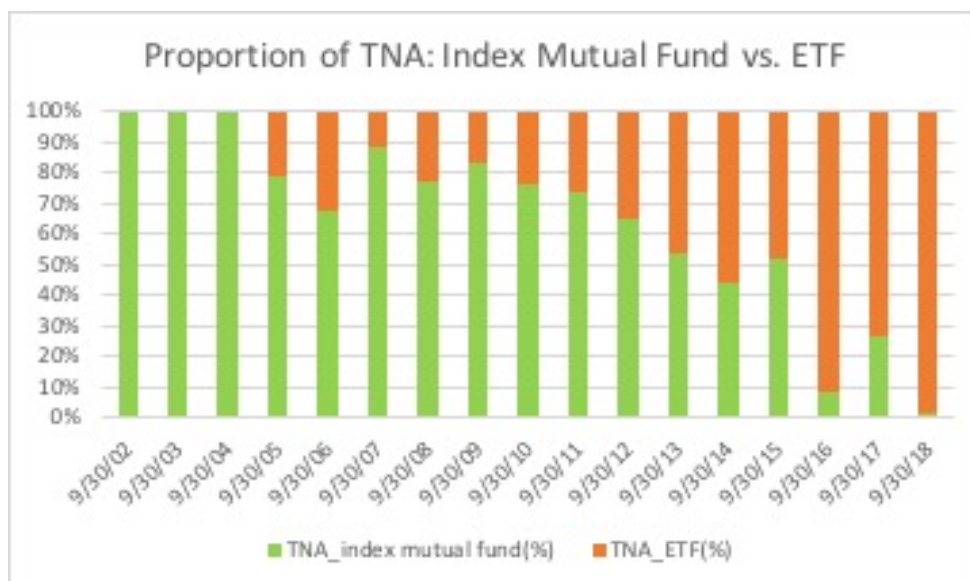


Figure 6: Proportion of Index Mutual Funds and ETFs in terms of TNA

In fact, the tendency of the Chinese stock market on the whole over the years exerted a substantial effect on the development of the passive fund industry. Taking the Shanghai Stock Exchange Composite Index(000001.SH) monthly line over October 2002 – October 2018 as the reference, one of the most magnificent bull markets took place roughly from June 2005 to October 2007, rising more than 450% to a historical high of 5955 point in about two years. This period paralleled the first stage of gallop in total net asset of passive funds as described in Figure 3. Following this great bullish market was an acute bearish market from October 2007 to October 2008 when the Financial Crisis outbroke, resulting in the apparent contraction in the growth of passive fund industry. The second biggest bullish market during recent years happened through the low-lying June 2014 to May 2015, followed by a retreat till February 2016, which was reflected in the total counts and market TNA of the passive investment segment as well. By comparing the two graphs, it's easy to observe a similar trend of ups and downs. In this way, we could know that the development of Chinese passive fund industry has a close relationship with the Chinese stock market climate—when the overall market does well, index funds are much more likely to thrive.

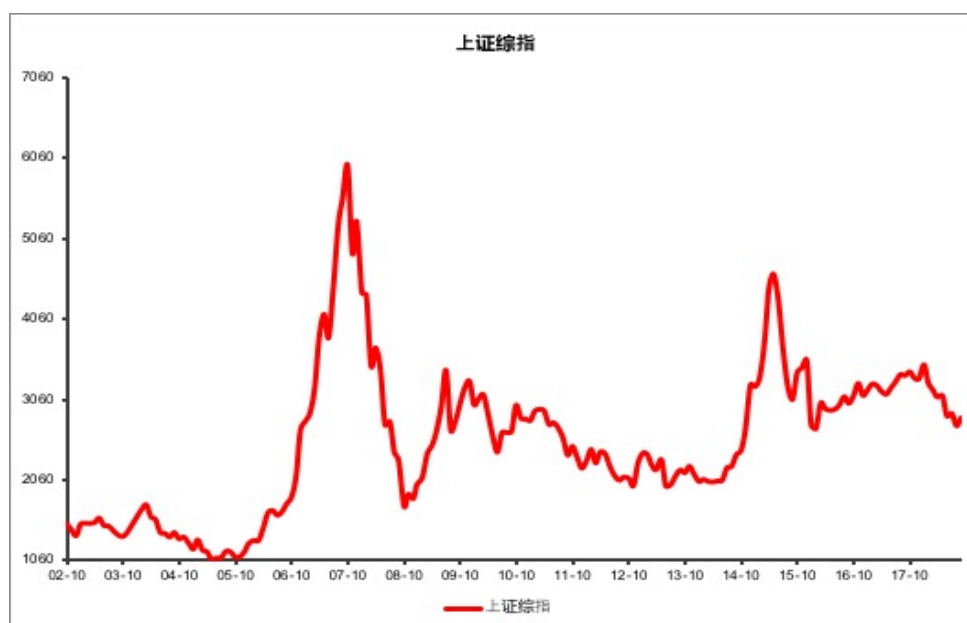


Figure 7: Historical Overall Stock Market Trend (Shanghai Securities Composite Index)

The passive fund industry in China is different from the US side in a few interesting ways. Firstly, besides the passive forms of ETFs and index mutual funds, China has its own innovation LOF(Listed Open-end Fund). Such a type of fund is a common open-end fund in nature, with additional ways of trading in exchanges added, but unlike ETFs, LOFs are not traded in kind. LOFs do not impose specific requirements on investors' qualifications to participate in purchases and redemptions (such as only allowing investors with a minimum of 500,000 fund shares to enter the primary market in the case of ETFs); they are not necessarily passively managed either—active LOFs also exist. Secondly, a great many Chinese ETFs have their ETF feeder funds, which invest the majority of their asset into the target ETFs in the exchange in order to achieve similar results of tracking the underlying index. Though there's certain feeder fund in the US market as well, they are not as commonly seen in passive investment. The major purpose of setting up Chinese ETF feeder funds is to remove the obstacle for the multitude of Chinese grassroots investors to involve in investment of ETFs due to the high bar for purchases and redemptions, so that the ETF market can be further activated. Thirdly, there are still quite a few close-end passive funds listed in the Chinese market currently, whose sizes would not change

throughout their life. Some of the oldest funds in China that adopted index investment ideas—“Fund Xinghe”, “Fund Pufeng” and “Fund Jingfu” were close-end funds.

Rooted in the distinctive Chinese context, sometimes Chinese index funds did not follow a path of development as typical as their US counterparts. A notable phenomenon in particular is the prevalence of EIFs in China. Historically, many Chinese index funds are actually not purely ‘passive’ but blend in certain ‘active’ component instead. According to Hwabao Securities Research’s *Themed Report on Index funds I: Overview of the Index Fund Market* (2017), EIF is the most common type within the category of index mutual funds in China. This might twist some of the initial intentions of passive investment. On the other hand, different policies and operations on expenses and fees may prevent Chinese passive funds to bring their advantages fully into play. For example, Chinese index mutual funds generally charge a management fee rate of 1% (of fund TNA on previous day), which is only about 33% less than what actively managed funds charge (usually 1.5% of fund TNA on previous day). This fixed item of expense is still much higher than that in the US passive fund industry—normally between 0.2% and 0.5%. Management expense for ETFs is less. Additionally, Chinese government does not levy capital gain taxes at present, and all fund investors are exempted from paying stamp duty either, so there’s no difference between passive funds and active funds regarding tax benefits.

When data is collected about purely passive stock index mutual funds in China specifically, an extremely intriguing phenomenon arose after the complete list of index mutual funds was examined in detail: a significant proportion of funds carry alphabets within their names as suffixes, such as “A”, “B”, “C”, “D” or others. For instance, over 20% of fund entries in the original data in 2018 had an “A” suffix. More interestingly, multiple entries with different suffixes could appear under the name of the same fund—for example, “Zhaoshang CSI Bulk Commodity Index Fund” has two “versions”: “Zhaoshang CSI Bulk Commodity Index Fund A” and “Zhaoshang CSI Bulk Commodity Index Fund B”. Through careful and comprehensive

investigation on this issue, two important possible scenarios as denoted by the suffixes may apply: 1). the suffixes indicate different shares within the same fund charging investors for fees in different ways. In China, investors would be charged fees including subscription fee, purchase fee, redemption fee, or sales commission when they want to buy or sell fund shares they own. Here, shares with “A” suffix normally ask for an upfront purchase fee and decreasing redemption fee as the investor’s holding period lengthens, while shares with “B” suffix charge an on-delivery purchase fee instead of the upfront one and decreasing redemption fee with prolonged holding period as well. Both manners benefit long-term investors more than short-term investors. However, shares with “C” suffix signal another way of charging that favours short-term investors: no purchase fee or redemption fee at all, but a sales commission calculated on a daily basis. Moreover, shares with other suffixes, such as “D”, “E”, “G”, may mark special channels of sales such as Internet sales or other special conditions. 2). the fund is actually a Chinese structured fund that can be separated into “A”, “B” or “C” hierarchical shares. Such kind of funds generally have a “parent” fund which shows no difference from an ordinary fund, but investors may split shares of the “parent” fund they bought into “A”, “B” shares or “A”, “C” shares listed, or simply trade individual shares of the structured fund separately in the secondary market. Notably, these hierarchical shares have different risk and return characteristics—“A” share of the fund is priority share like a fixed income instrument with contracted steady risk and return, while “B” share is leveraged share with high risk and return by “borrowing” money from “A” share and gaining returns only after the return of “A” share is guaranteed. “C” share, less commonly seen in the market, is a reversely leveraged share with returns in the opposite direction. In summary, which scenario turns out to be the reality depends on specific funds, and requires careful checks manually case by case.

However, the Wind database used in this research does not capture elaborate information on this issue. Each fund or fund share with suffixes is treated as an individual entry with a unique

fund symbol, where some of the observations do not record consolidated fund TNA data to the original “parent” fund. Given these fund entries with suffixes, searching for any related “parent” fund or other hierarchical shares in the list, and completing necessary data integration and revision remain vital. After rigorous data processing, graphs about counts, overall TNA and average fund TNA of stock index mutual funds(not including EIFs) are displayed below. In contrast with the explosion in overall TNA of the ETF market discussed previously, both counts and overall TNA of stock index mutual funds reduced drastically in 2018. The average fund TNA also shrunk over the past two years, verifying that stock index mutual funds are becoming smaller in size.

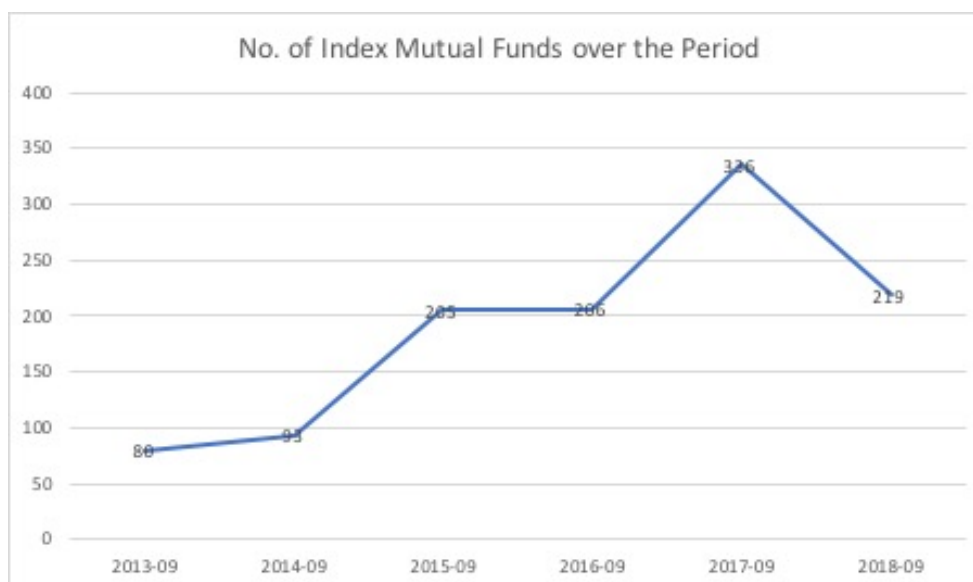


Figure 8: Counts of Index Mutual Funds during 09/2013 – 09/2018

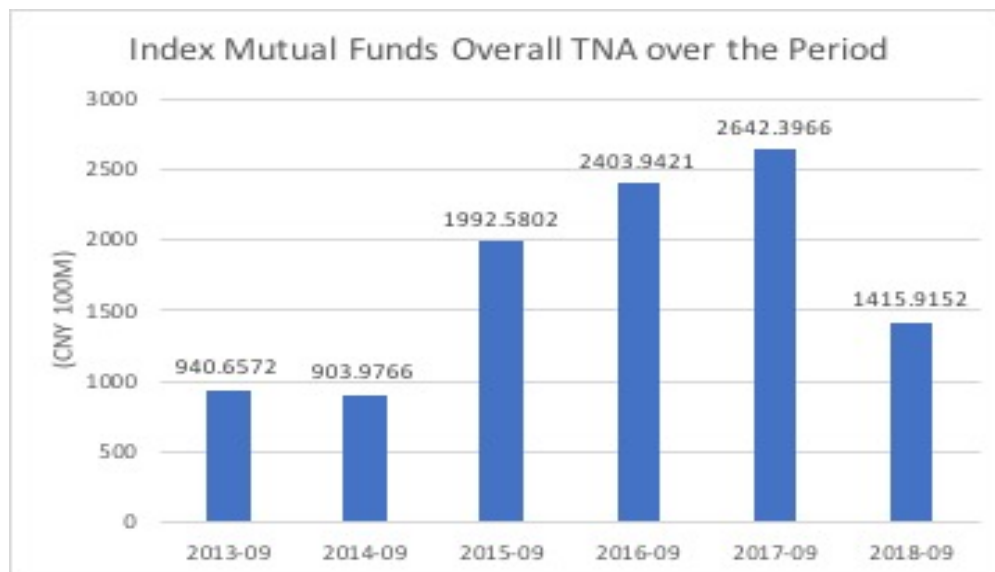


Figure 9: Overall TNA of Index Mutual Funds during 09/2013 – 09/2018

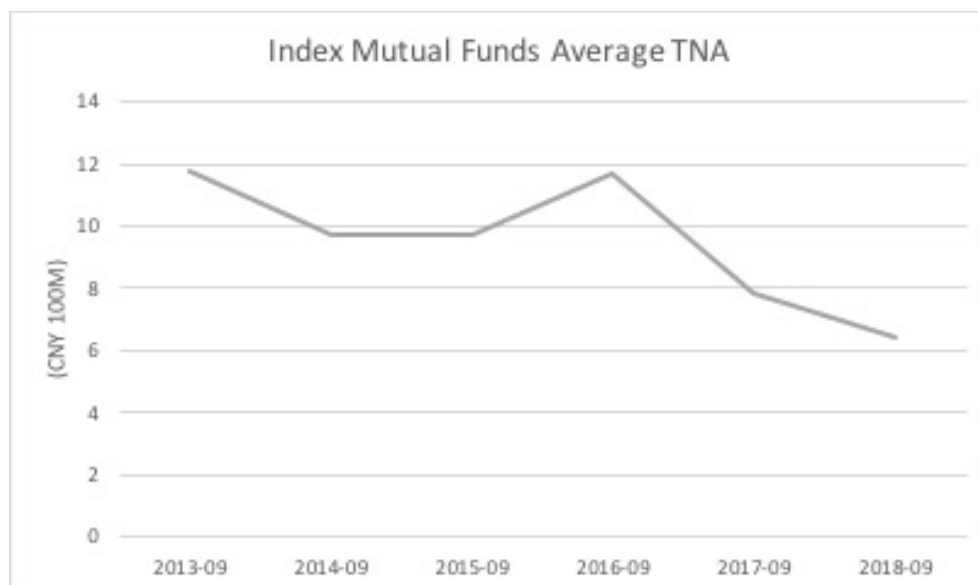


Figure 10: Average TNA of Index Mutual Funds during 09/2013 – 09/2018

In order to have a better understanding of Chinese passive funds, knowing about the big picture of indices and indexing practices in China is indispensable. A handful of indexing giants take the duty to formulate, issue, and maintain the vast majority of common indices in the market, among which CSI (“China Securities Index Co.Ltd.”, co-founded by Shanghai and Shenzhen Stock Exchange), Shanghai Stock Exchange, and Shenzhen Stock Exchange are the best known, followed by CNI (managed by Shenzhen Securities Information Company Limited) and SWS Index(managed by “Shenwan Securities Research”) in publicity. A wide range of

indices have been designed over the years, mainly belonging to one of the four categories—broad-based indices, sector or thematic indices (such as CSI Alcoholic Drink Index, CSI China Mainland Natural Resource Index, etc.), strategy indices (such as CSI RAFI 50 Index), and overseas market indices made by large global indexing companies (such as MSCI China A Inclusion Index).

When investigating the topic of common indices that Chinese index funds follow, it's extremely engaging to see how the circumstance differs from that in the US market. While more than a third of index mutual funds follow the famous S&P500 index in the US, the indices Chinese index funds track seem to be much more dispersive among different types, meaning that a large number of index funds follow an assortment of niche indices, such as sector or thematic indices, rather than concentrating on a specific significant index. According to China Merchants Securities's *Index Fund Report Series I: Overview of Chinese and US's Index Fund Development* (2018), about 24% of Chinese index funds followed sector or thematic indices, which far exceeded the small proportion in the US index market. This distinguishable phenomenon arose partly due to the fact that amid the uplifting bull market during 2015, Chinese structured funds became highly favored because of its leveraging advantages, observed in the class of index mutual funds especially; and the most common type of indices followed by structured funds is niche sector or thematic indices in which big fund management companies and managers showed increasing interest (Hwabao Securities Research's *Themed Report on Index funds I: Overview of the Index Fund Market*, 2017). Speaking of broad-based indices, though Chinese ETFs track broad-based market indices much more than index mutual funds, there are still a couple of main indices to choose from, such as SSE 50, CSI 300, Shenzhen 100, and the degree of centralization on a specific index is less obvious.

The following graph displays the percentage of indices followed by only one fund in all indices followed for each year, given the author's transformed Wind data on stock index mutual

funds. Clearly, the percentage of indices followed by only one fund surpassed 60% during all years between 2013 and 2018 except 2017, fluctuating slightly on account of market preferences, which confirms the widespread condition of indices followed in the Chinese market lately.

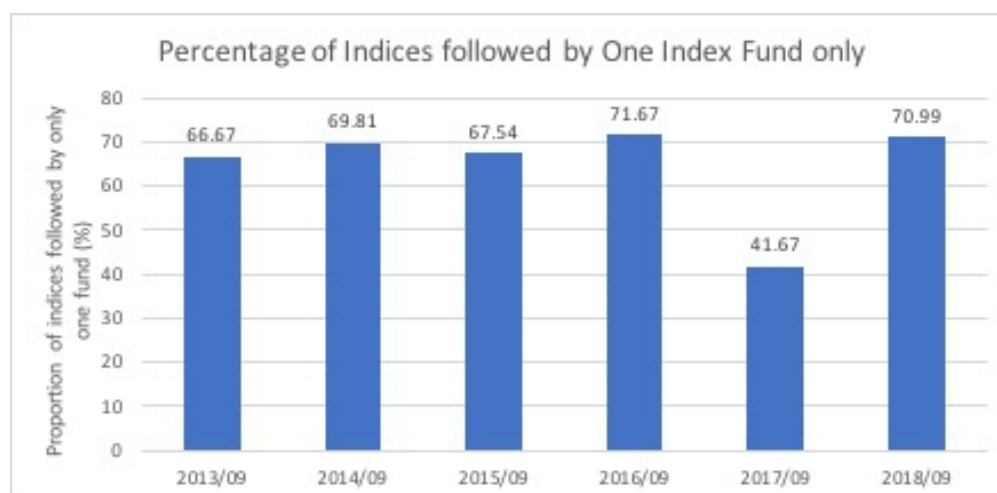


Figure 11: Proportion of Indices followed by Only One Index Fund

The top five indices followed by the most Chinese stock index mutual funds for each year (2013-2018) are listed in the following table, after generating statistics from processed data.

| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------|--------------------------|---|---|--|---|
| CSI 300 (15) | CSI 300 (16) | CSI 300 (17) | CSI 300 (17) | CSI 300 (24) | CSI 300 (17) |
| CSI 500 (7) | CSI 500 (7) | CSI Banking Industry (8) | CSI Banking Industry (8) | CSI Banking Industry (13) | CSI Banking Industry (8) |
| CSI 100 (6) | CSI 100 (6) | CSI 100 (8) | CSI 100 (8) | CSI Composite Securities Company (11) | CSI 100 (7) |
| SZSE 100 P (3) | SZSE 100 P (3) | CSI 500 (7) | CSI Environmental Protection Industry (6) | CSI Environmental Protection Industry (10) | CSI Composite Securities Company (7) |
| SZSE Composite (3) | SZSE Composite (2) | CSI Environmental Protection Industry (6) | CSI Composite Securities Company (6) | CSI 500 (10) | CSI 500 (7) |

Table 1: Top five indices followed by the Most Chinese Stock Index Mutual Funds during 2013 - 2018

(Note: value in the parenthesis under the index name is the number of index funds following it.)

Remarkably, CSI 300 Index held the championship in the list for six straight years, showcasing its supreme influence on the development of Chinese index market and good indexing practices as the foundation for investment product innovations. The second most popular indices turned out to be CSI 100 Index and CSI 500 Index, both emerging five times out of six. We may also notice some taste being developed over the years for certain hot industries, such as banking and securities industry, due to its exceptionally lucrative nature and functionality as a good indicator of the growing Chinese economy, as well as the theme of environmental protection. In brief, important market indices are still among the most typical choices for index funds, with shifting trends of occurring heated topics in the market.

As revealed in data, there are a few mainstream broad-based indices that play a momentous role in depicting the whole market and that Chinese investors resort to most frequently. CSI 300 Index, one of the most influential indices released in 2005, picks the top 300 stocks in terms of market value among all listed in Shanghai and Shenzhen Stock Exchange, using capitalization-weighted indexing approach based on a 1000 base point on the last day of 2004. This is the first index in China providing an overview of the two market of Shanghai and Shenzhen through the most representative blue chip stocks, compiled in preparation for the launching of index products and stock options specifically. CSI 100 Index is a sub-index of CSI 300 Index, using the top 100 stocks in market value across Shanghai and Shenzhen and featuring the performance of big caps more. CSI 500 Index, which selects its sample of 500 according to the ranking of average daily market value after dismissing component stocks included in CSI 300, serves as a gauge of the overall condition of mid- and small-caps. These three major indices in the Chinese market play a vital part in this study as discussed later.

Data Sample and Methodology

I. Data

This paper only studies purely passive Chinese stock index mutual funds, not including ETFs and EIFs. The initial data is the category of stock index mutual funds in the complete list of all passive investment funds downloaded from Wind database. To constrain the study within the scope of the Chinese market, funds tracking indices compiled by international indexing companies such as MSCI and FT, or funds tracking indices composed of stocks listed in the overseas markets, such as “CSI Overseas China Internet 50 Index”, are excluded. Also, those tracking indices involved in the Hong Kong or Taiwan market, such as “Hang Seng Hong Kong Stock Connect High Divident - Low Volatility Index”, are excluded, based on the consideration of the currency issue, possibly distinctive regulations, and different market contexts from the local Chinese one.

In this study, both a sample of index mutual funds and a sample of actively managed mutual funds using the same benchmark index are chosen, so as to draw insights from the comparison of their performance. The sample of index funds consists of 22 Chinese stock index mutual funds, tracking the three major Chinese indices respectively—11 funds tracking CSI 300 Index, 6 tracking CSI 100 Index, and 5 tracking CSI 500 Index. In this way, both representative large-caps and mid-and-small-caps indices are covered to give a more comprehensive picture of the entire market. The sample of active funds is made up of 16 Chinese actively managed mutual funds using the major indices as their performance benchmarks correspondingly—12 funds with CSI 300 Index as the benchmark, and 4 with CSI 500 Index as the benchmark. Unfortunately, we do not have actively managed funds using CSI 100 Index as the benchmark in the market. Notice that as for the sample of active funds, those with apparently different risk characteristics from that of a typical index fund following the same index, such as investing in much riskier stocks, are excluded to ensure the comparability. (Note: Please see Appendix A for the complete list of the index fund and active fund samples.)

The initial period of study is a five-year window from September 1st, 2013 to September 30th, 2018. Compared to most other scholarly research in the similar field employing earlier data, this period is specifically chosen to reflect the latest progress and dynamics of Chinese index funds after about 15 years of development, and covers at least one cycle of bullish and bearish market periods. Monthly data is used to make the results more stable and to minimize the overestimation of differential return triggered by possible autocorrelation effect as presented in higher frequency data (e.g.: daily or weekly data), based on the suggestion in He (2005). Later, after the discovery that most actively managed funds following the same major indices were actually founded more recently during or after 2015, the second period of study is decided to be a three-year window from September 1st, 2015 to September 30th, 2018, where the performance between index funds and active funds can be compared. All entities in the sample of index funds were founded before September 1st, 2013 and maintained active status throughout the five-year period of study, while all entities in the sample of active funds were established before September 1st, 2015 and subsisted throughout the three-year period. Close-end funds which terminated before the end of the periods of study (September 30th, 2018) have been removed from the samples.

With regard to the issue of multiple share classes within the same fund, denoted by alphabetical suffixes as discussed in previous section, if the fund is a Chinese structured fund, then only the “parent” fund with the characteristics of normal stock funds would be studied; if it is the case that different shares have different ways of charging investors, then only the “A” share which is the most common share class would be examined.

All data used in the study is collected from the Wind financial database, with extra checks and verifications from “Tiantian Jijin (天天基金网)” website (fund.eastmoney.com), a popular website for Chinese fund investors.

II. Methodology

In this paper, the author examines the performance of Chinese stock index mutual funds and actively managed stock mutual funds after some expenses³, which roughly measures the fund performance that investors would receive. This paper mainly adopts the methodology used in the performance analysis part of Elton, Gruber, Souza(2018). In the tables attached, summary performance statistics and results of regression analysis for the sample of index funds and active funds over the periods of study are presented. Specifically, the particular metric “Growth Rate of Adjusted NAV” on the monthly basis from Wind database is employed to measure the monthly return of the fund, since “adjusted NAV” takes the dividend distributed and reinvested by the fund and any possible effect on its size and return correspondingly into careful account.⁴ “Growth Rate of Adjusted NAV” can manifest the fund performance to its closest reality and becomes one of the key indicators commonly used in reports and assessments.

Two kinds of performance measures are utilized in this paper. The first approach calculates the average monthly fund return and the average monthly index return correspondingly. Then, the second approach runs a regression of the fund monthly return(growth rate of adjusted NAV) on each index fund or active fund against the monthly return of its underlying/benchmark index. Each fund in the sample is treated as a separate entity for the regression. The simple regression model used can be written as follows:

$$R_i = \alpha_i + \beta_i R_{idx} + e_i$$

where R_i is the monthly return on fund i , R_{idx} is the monthly return on the corresponding index idx . Three characteristics of the regression are captured to evaluate the fund

³ The expenses already deducted in the data from Wind database here include the fund management fee, custodian fee, service and sales commission fee(if any), and transaction cost incurred by the fund’s trading activities, but not include purchase fee and redemption fee charged on investors.

⁴ Source from Wind: The formula of calculating periodic “Growth Rate of Adjusted NAV” is “(end-of-period adjusted NAV - adjusted NAV of the last trading day before start of the period) / adjusted NAV of the last trading day before start of the period * 100%”.

performance— α , the intercept from the regression; β , the coefficient for the single covariate; and R^2 , the coefficient of determination of the regression. Usually, α would indicate how better or worse a specific fund is doing compared to its benchmark index; β would signify how well the fund is tracking or following the risk and return characteristic of its benchmark index; and R^2 evaluates how much of the variability in monthly return of the fund could be “explained by” the variation in the monthly return of the index as its statistical meaning. The summary statistics are reported over all sample funds during that specific period.

Empirical Results and Interpretations

The results for regressions of index fund and actively managed fund performance over 3-year period and 5-year period are presented in the three summary tables in **Appendix B**.

Let’s first have a look at the performance of CSI 300 stock index mutual funds during the two different periods. The average return of the underlying index over the 5-year period is 68 basis points higher than that over the 3-year period; the average index fund return is 56 basis points higher. This notable gap in index return results from the bullish market lasting from 2014 to late 2015, which was the second biggest bullish market after 2007 as mentioned previously. We can see that CSI 300 index funds, in general, followed the underlying index to make a move accordingly. When we inspect the alpha, a most conspicuous phenomenon catches our eye: with only weak statistical significance though, the mean alphas for both the 5-year and the 3-year periods are positive, which is very unusual compared to the common expectation that the alpha would be negative mainly due to the encumbrance of the cost of index funds (e.g.: transaction costs). It also contradicts the results presented in Elton et al. (2004), where the mean differential return and alpha were negative, and in Elton et al. (2018), where the mean alpha turned out to be very close to zero. Therefore, in light of such a difference in alpha, Chinese CSI 300 index funds not only managed to make up for losses incurred in the investment process, but even made a

profit over the index. A probable explanation could be that CSI 300 index fund managers still blended in some active components of adjustments, such as the procedure in handling index components change or addressing stock illiquidity issue, which dragged the fund away from the purely passive investment philosophy. Another engaging observation about alpha comes to that the 5-year mean alpha is lower than the 3-year one, and has a wider range with negative minimum value, while all alphas during the 3-year period are positive. The case adds evidence implicitly to Ye and Su (2005)'s findings by suggesting that CSI 300 index funds also tend to do better during downward markets than upward markets (i.e. becoming more resilient to stock market declines), using recent data.

Obviously, all betas during the two periods are strongly statistically significant; the 5-year mean beta is higher than the 3-year beta with stronger statistical significance, accompanied by a higher R-squared as well. We may then roughly interpret that the higher 5-year average fund return came from passively tracking the rising market to a greater extent than active adjustments. However, the beta and R-squared for Chinese CSI 300 index funds are still smaller than the results from research on US's index funds (an average of 0.998 beta and 0.996 R-squared for index funds in Elton et al. (2018)); the number of securities held also showed a warning sign of a big gap between the maximum and minimum values, despite the average number close to 300. This reveals that Chinese CSI 300 index funds, in general, didn't perform so well as the US counterparts in tracking the underlying index.

When it comes to comparing performance between CSI 300 index funds and active funds using the same index as benchmark, we find that CSI 300 active funds have a slightly higher average fund return and average alpha during the 3-year period, but there's no statistical significance, and the range of alpha for active funds is much broader, extending from -67 basis points to as high as 89 basis points. The average beta for CSI 300 active funds exceeds 1 to be 1.05 times as volatile as the overall market, yet the average beta for index

funds lower than 1 mainly due to the matching issue. From these results, CSI 300 active funds have illustrated their ability to attain a slight superiority in performance during the latest period, while a remarkable difference among outstanding active funds and poorly performing ones in terms of stock picking capability, timing and other factors to grasp excess returns persists. Moreover, whether CSI 300 active funds can keep this excess return all along remains to be questioned. While the beta is always strongly statistically significant for both cases, CSI 300 active funds possess a much smaller average R-squared than index funds, together with an outstretched span of number of securities held from as many as 427 to only 39. So in consistent with the common sense, the variability of return of active funds can be explained much less by the index return than that of index funds.

Some particular funds worth our extra examination. With regard to CSI 300 index funds, two stand out during the 5-year period: Bosera Yufu CSI 300 Index Fund (Symbol: 050002.OF) and UBS SDIC Ruihe CSI 300 Index Structured Fund (Symbol: 150009.OF). Bosera Yufu CSI 300 Index Fund exhibited the highest value of alpha with the highest statistical significance of alpha during the 5-year period, demonstrating its extraordinary excess return over the underlying index return. At the same time, it had a relatively lower R-squared compared to the other funds. The fact that it held the fewest number of CSI 300 component stocks testifies to this, over 100 stocks fewer than what would be needed under complete replication strategy. After studying its in-depth records, it showed that the fund made a greater concentration of investment (more than 10%) in those more profitable stocks in the index, as well as adopting active operation techniques evidently, including selection of component stocks as indicated in its small number of securities held, noticeable adjustments of weight of holdings and others. For instance, the top-weighted industry originally in the CSI 300 index is financial services (34.61% of the entirety), but the sector with the highest weight of holdings in the investment of Bosera Yufu CSI 300 fund turns out to be

manufacturing and production, which takes up 36.7%. Such alterations would keep the fund further away from just tracking the specific index. The other fund, UBS SDIC Ruihe CSI 300 Index Structured Fund, becomes the only one with a beta significantly greater than 1 in the 5-year period among all CSI 300 index funds, while disclosing the lowest R-squared of only 0.90 at the same time. In this case, it somehow indicates that the fund was less capable of following the underlying index well, by holding too much on more risky stocks as a possible reason. Speaking of CSI 300 active funds, the most distinguished one is HSBC Jintrust Large-Cap Equity Fund(Symbol: 540006.OF), whose monthly alpha of 89 basis points is the biggest with the strongest statistical significance as well. Concurrently, it has the lowest beta of 0.94; the number of stocks held appears to be relatively small. According to these outcomes, it's very likely that this fund manager is good at and dedicated to pursuing individual opportunities of few especially profitable stocks, standing firmly by the active philosophy in practice. Based on information from Wind, the core investment idea of the fund is summarized to be "High position; Large-Cap Blue Chips; Selective Research", meaning that the fund chooses persistently those undervalued large-caps with leadership in their sectors and sustainable steady growth in profitability, through comprehensive research on a variety of aspects including prospects of development in the industry, competitiveness, financial conditions and other factors, in order to make wise investment decisions. Its "bottom-up" strategy of stock selection has been proved to be successful. However, to view CSI 300 active funds as a whole, there're much fewer patterns for relationships between alpha, beta, R-squared and the number of securities held than CSI 300 index funds.

The results about CSI 100 index funds during the 5-year and 3-year periods are similar to those in the CSI 300 case generally. Besides, CSI 100 index funds have a larger average beta in the 3-year period than in the 5-year one, which is kind of different from the CSI 300 index funds. Their R-squared's are also higher than CSI 300 index funds in both

periods, with a much narrower range between the maximum and minimum values. In short, the small number of component stocks seems to make the index easier to track than more complicated indices. We don't have CSI 100 active funds to compare as mentioned before.

CSI 500 index funds bring up some results of performance different from the CSI 300 index funds. Strikingly, the average index fund return during the 3-year period is negative, far lower than that of CSI 300 index funds. Nevertheless, the average alpha during the 3-year period exceeds that during the 5-year period tremendously, featuring the bigger multitude of difference of 29 basis points than any other discussion of index funds. There are two plausible reasons for explaining the substantial alpha in the 3-year period: Firstly, the underlying index itself that CSI 500 index funds track was generally inclined to underperform the major large-cap indices like CSI 300, due to its composition of mainly smaller stocks with more unstable performance instead of market leaders; this character probably got magnified amid the downward market during the 3-year period which caused the index to do worse, where smaller stocks became more impacted than larger caps. Secondly, it's highly possible that Chinese CSI 500 index fund managers were reluctant to see the asset value of their funds deflated drastically along with the slumped market without doing anything, so they might have incorporated some active adjustments or strategies into the passive style again more proactively. Factors on these two sides joined together to push up the average alpha. Apart from the higher 3-year alpha, another difference noticed from the scenario of CSI 300 index funds goes to the higher average beta and R-squared during the 3-year period rather than the 5-year period, suggesting a possibly better alignment of the funds with the underlying CSI 500 index more recently than before. Furthermore, we need to be aware of the considerably reduced number of securities held in these CSI 500 index funds than that contained in the index, which gives nearly 100 fewer on average; in extreme circumstances, even less than 40% of the index component stocks were actually held in the fund. Generally

speaking, this phenomenon that index fund managers seem to breach the complete replication requirement further when facing indices with more component stocks is worth our attention.

On the other end, the substantial 3-year average alpha of CSI 500 index funds is even overshadowed by the alpha of CSI 500 active funds. With statistical significance at the 0.01 level as well as a much smaller range, the average alpha of CSI 500 active funds on the monthly basis transcends 1% to 108 basis points, making the largest ever average alpha across all conditions. Accordingly, there forms a huge difference of over 60 basis points in average alpha as a measure of performance between CSI 500 index funds and active funds during this largely bearish 3-year period. Simultaneously, CSI 500 active funds reveal a lower average beta, yet a higher R-squared as compared to CSI 300 active funds. Upon these findings, we could contend that there are still possibilities for Chinese active funds to make prominent returns even amidst a bearish market. By seeking idiosyncratic stock investment opportunities and controlling exposure to the risk of the downward market trend, CSI 500 active funds did very well in pursuing excess returns overall. These active funds using CSI 500 Index as the benchmark normally hold 100 to 200 stocks.

Through analyses of the CSI 500 active funds in more depth, we reach a further interesting discovery that in fact, the four active funds in the sample are all quantitative funds. Quantitative funds employ financial engineering techniques and advanced quantitative models, such as dynamic multi-factor alpha selection model and sector rotation research, so as to mine valuable investment opportunities and customize their portfolios with the help of computer programs. Judging from the results we've found, quantitative actively managed funds tend to have a spectacular performance in spite of the downside of the market, demonstrating in some way the effectiveness of such quantitative strategies currently in the Chinese market.

The last thought-provoking part to be discussed here is about another metric of measurement aside from α , β , and R^2 : “ $\beta - 1$ ”, mainly used to detect whether the regression beta significantly varies from 1. The outcomes we have figured out turn out to be somehow surprising, in comparison with the results in previous research on the US side that betas generally equaled 1 for ETFs or close to 1 for index mutual funds (Elton et al., 2018): In the Chinese context here, the average beta is found to be statistically significantly different from 1 for CSI 300 and CSI 100 index funds during the 5-year period, while the average beta of CSI 500 index funds is not; it is also uncovered that the statistical significance of the difference between β and 1 as for CSI 300 and CSI 100 index funds vanishes during the more recent 3-year period. Interestingly, all active funds using CSI 300 Index and CSI 500 Index as the benchmarks, on the other hand, do not display betas statistically significantly different from 1. To sum up, while some circumstance of beta significantly different from 1 exists in the index fund sample during the 5-year period, neither index funds nor active funds in the samples show betas significantly different from 1 in the 3-year window. As a result, it may be supposed that whether the fund’s beta statistically significantly differs from 1 is correlated with the different market conditions of uptrend or downtrend. The divergent outcomes between CSI 300 index funds, CSI 100 index funds and CSI 500 index funds during the 5-year period might have connections with idiosyncratic risk of stocks being held as an crucial factor of tracking error, as inspired by He (2005), since CSI 300 and CSI 100 index funds possibly have a greater exposure to idiosyncratic risk of stocks than CSI 500 index funds. CSI 300 and CSI 100 index funds, on the whole, have a more limited numbers of stocks held in accordance with their underlying indices, thus their holdings might be less diversified than the CSI 500 funds. In addition, CSI 300 Index and CSI 100 Index are biased towards those stocks with giant market capitalization in nature, with certain component stock weighted heavily: for example, Ping An Insurance (Group) of China (601318.SH), the top weighted

component stock in CSI 300 Index, takes up a weight of 7.09%, whereas all component stocks in CSI 500 Index only have weights below 1%. As we've noticed before that both CSI 300 and CSI 100 index funds tend to hold more than required, once the fund selects to intensively hold an additional large-cap, increased idiosyncratic risk could be huge.

Conclusions & Implications

This paper examines the uniqueness in characteristics and conditions of the Chinese fund market and index fund industry distinguished from the practices in the US, through the lens of Chinese index funds' 16 years of history of development since 2002; and does an empirical analysis on comparison of performance between Chinese index funds and active funds based on the latest 5-year and 3-year data. Chinese index funds have started to rise since 2010 in terms of both count and market total net asset, propelled by the two significant bullish market periods during the past decade, and ETFs in particular have had an eye-catching growth in total asset size during the most recent years. The Chinese index fund industry is found to have many distinctive structural patterns and designs that are less commonly observed on the US side, mainly in the aspects such as the prevalence of Chinese structured funds, the popularity of EIFs and the more dispersive distribution of indices followed. Given the results from empirical analysis on fund performance and interpretations in detail, we may come to the following conclusions:

Chinese index funds as a whole has not performed so well as Chinese actively managed funds using the same mainstream index as the benchmark during the 3-year period; therefore, there are still quite a few opportunities for those properly structured, well-operated active funds to seize excess returns even amidst a bearish or normal market, by utilizing effective strategies of selection of individual stocks or sectors. This might still be largely attributed to the inconsistency of the Chinese financial context with the Efficient Market

Hypothesis as the foundational theory of index investment, considering that the Chinese market embodies a very weak efficient form at most with information asymmetry, insider trading, excessive economic control and other problems still existing.

An important explanation for why Chinese index funds may not have brought out their ideal advantages fully is the contamination of passive investment principles with active ingredients. Still under the dominance of active strategies, Chinese index fund managers are more likely to mix factors of active modifications into the original purely passive investment methodology, such as replacing complete replication with sample replication approach and assigning the weights of component stocks held at the manager's own discretion, so that the fund deviates from the performance which should have been under strict tracking and monitoring. At the same time, the main advantages of passive investment in cost saving and tax benefit turn out to be negligible from active funds in China. This is a marked phenomenon noticed from the research.

With reference to results from previous research, it's clear that in general, US index funds perform better in tracking the underlying indices than the Chinese index funds following the three major indices. However, the data also provides a slight indication of improvement in alignment for Chinese index funds over the latest 3 years than the 5 years.

Using the new data, this research brings about one similar finding to what has been raised in Chinese scholars' papers before: index funds in China tend to perform better during bearish market periods, showing more powerful resilience when the index slumps, than during bullish market periods, though the average fund returns always appear to be higher than the corresponding average index returns.

There are also some interesting observations about index funds following different indices. Chinese CSI 300 and CSI 100 index funds usually hold a handful of more securities than what are contained in the underlying index, yet CSI 500 index funds normally hold a lot

fewer. The range of the number of securities held by CSI 500 index funds also spreads more than that in the other two kinds. Generally speaking, CSI 500 Index is harder to track than CSI 100 Index and CSI 300 Index with a smaller number of component stocks.

Although we have talked about that active funds may still manage to outperform index funds in China, in most cases, this magnitude of excess return that a Chinese active fund could grasp is indeterminate, taking the greater volatility of the Chinese stock market into account especially. From another perspective, the returns between the top-performing active funds and those ranked in the bottom actually develop a significant polarization as well, as noticed from the data.

On the basis of our conclusions, there are several implications to be put forward for further development of the Chinese index fund industry in the future:

Firstly, speaking of management of funds, purely passive fund managers should become more self-disciplined to stay consistent with the investment methodologies and plans elaborated in the fund prospectus in practice, which require them to strictly stick to the passive strategy without too much active intervention. This would preserve the properties of passive investment funds better, which is essential for healthier development of the Chinese index fund industry in the long run.

Secondly, as for practices of index making, Chinese index companies may consider exploring the design of new indices with some alternative indexing approaches other than simply the market capitalization weighted method or circulation market value weighted method, which are currently used in the indexing of CSI 300 Index, CSI 100 Index and other major Chinese indices. For instance, equal-weighted method or other custom weighted approaches might also be good choices. This research suggests that the most commonly used market capitalization weighted indexing method may not come out as the optimal design for

indices fit for passive investment products in certain circumstance, mostly due to possible distortion of value caused by mega-caps.

Lastly, fund managers and government administrators need to continue working on building up the advantages of Chinese index funds in joint efforts. Policymakers and regulators could consider introducing more beneficial policies regarding tax or other relevant aspects to index funds and creating a more supportive market environment for index funds to flourish. Fund managers, specifically, ought to be more dedicated to improving the operational efficiency and transparency of the funds, reducing costs and avoiding unwarranted risk in the asset management process as much as possible. It is only through the focus back on the enduring core ideas of passive investment—securing the average market return instead of trying every means to beat it—that Chinese index funds can genuinely advance afterwards.

This research can be improved or strengthened in a number of areas. A more rigorous empirical study methodology, including further granular processing of data samples and more sophisticated models to dig into the influential factors underlying the differentiation of performance between Chinese index funds and the indices tracked, might be proposed. For example, researchers may get more intriguing discoveries when more detailed issues about the data are taken into consideration—such as the subtle difference in construction of the same index (“Price” Index or “Return” Index, with dividends distributed of component stocks treated differently; e.g.: “CSI 100(Price) Index” and “CSI 100(Return) Index”), the different riskless asset held and the different percentage of tracking the underlying index(e.g.: “95%*CSI 300 Index + 5%*China Inter-bank Offered Rate”). We hope this research paves the way for more innovative studies on Chinese index funds yet to come.

Appendix A

List of Funds in the Index Fund Sample (5-year & 3-year periods)

| CSI 300 Index Fund | | |
|---------------------------|-------------------------|--|
| Fund Symbol | Chinese Name | English Name |
| 519300.OF | 大成沪深 300 指数证券投资基金 | Dacheng CSI 300 Index Equity Fund |
| 160417.OF | 华安沪深 300 指数分级证券投资基金 | Huaan CSI 300 Index Structured Fund |
| 165515.OF | 信诚沪深 300 指数分级证券投资基金 | Citic-Prudential CSI 300 Index Structured Fund |
| 160807.OF | 长盛沪深 300 指数证券投资基金 (LOF) | Changsheng CSI 300 Index Fund(LOF) |
| 150009.OF | 国投瑞银瑞和沪深 300 指数分级证券投资基金 | UBS SDIC Ruihe CSI 300 Index Structured Fund |
| 165309.OF | 建信沪深 300 指数证券投资基金 (LOF) | CCB Principal CSI 300 Index Fund (LOF) |
| 481009.OF | 工银瑞信沪深 300 指数证券投资基金 | ICBCCS CSI 300 Index Fund |
| 160615.OF | 鹏华沪深 300 指数证券投资基金 (LOF) | Penghua CSI 300 Index Fund(LOF) |
| 050002.OF | 博时裕富沪深 300 指数证券投资基金 | Bosera Yufu CSI 300 Index Fund |
| 020011.OF | 国泰沪深 300 指数证券投资基金 | Guotai Shanghai-Shenzhen 300 Index Fund |
| 660008.OF | 农银汇理沪深 300 指数证券投资基金 | ABC-CA CSI 300 Index Equity Fund |

| CSI 100 Index Fund | | |
|---------------------------|--------------------------|---|
| Fund Symbol | Chinese Name | English Name |
| 410008.OF | 华富中证 100 指数证券投资基金 | Harfor CSI 100 Index Fund |
| 320010.OF | 诺安中证 100 指数证券投资基金 | Lion CSI 100 Index Fund |
| 162509.OF | 国联安双禧中证 100 指数分级证券投资基金 | GTJA Allianz Shuangxi CSI 100 Structured Fund |
| 240014.OF | 华宝中证 100 指数证券投资基金 | Hwabao WP CSI 100 Index Fund |
| 162307.OF | 海富通中证 100 指数证券投资基金 (LOF) | HFT CSI 100 Fund (LOF) |
| 519100.OF | 长盛中证 100 指数证券投资基金 | Changsheng China Securities 100 Index Fund |

| CSI 500 Index Fund | | |
|--------------------|-------------------------|--|
| Fund Symbol | Chinese Name | English Name |
| 660011.OF | 农银汇理中证 500 指数证券投资基金 | ABC-CA CSI 500 Index Equity Fund |
| 162216.OF | 泰达宏利中证 500 指数分级证券投资基金 | Manulife Teda CSI 500 Index Structured Fund |
| 160616.OF | 鹏华中证 500 指数证券投资基金 (LOF) | Penghua CSI Small Cap 500 Index Fund(LOF) |
| 164809.OF | 工银瑞信睿智中证 500 指数分级证券投资基金 | ICBCCS Ruizhi CSI 500 Index Structured Fund |
| 165511.OF | 信诚中证 500 指数分级证券投资基金 | Citic-Prudential CSI 500 Index Structured Fund |

List of Funds in the Active Fund Sample (3-year periods)

| Active Fund Using CSI 300 As Benchmark | | |
|--|---------------------------|--|
| Fund Symbol | Chinese Name | English Name |
| 360001.OF | 光大保德信量化核心证券投资基金 | E&P Quantitative Core Stock Fund |
| 540006.OF | 汇丰晋信大盘股票型证券投资基金 | HSBC Jintrust Large-Cap Equity Fund |
| 165310.OF | 建信双利策略主题分级股票型证券投资基金 | CCB Principal Double Interest Policy Topics Structured Equity Securities Investment Fund |
| 206012.OF | 鹏华价值精选股票型证券投资基金 | Penghua Value Selected Equity Fund |
| 000411.OF | 景顺长城优质成长股票型证券投资基金 | Invesco Great Wall Quality Growth Equity Fund |
| 000688.OF | 景顺长城研究精选股票型证券投资基金 | Invesco Great Wall Research Selected Equity Fund |
| 000916.OF | 前海开源股息率 100 强等权重股票型证券投资基金 | First Seafront Dividend Yield 100 Equal Weight Equity Fund |
| 320022.OF | 诺安研究精选股票型证券投资基金 | Lion Research Selected Equity Fund |
| 001042.OF | 华夏领先股票型证券投资基金 | ChinaAMC Leading Equity Fund |
| 001277.OF | 博时国企改革主题股票型证券投资基金 | Bosera State-Owned Enterprises Reform Theme Equity Fund |
| 001236.OF | 博时丝路主题股票型证券投资基金 | Bosera Silk Road Theme Equity Fund |

| Active Fund Using CSI 500 As Benchmark | | |
|--|-------------------------|---|
| Fund Symbol | Chinese Name | English Name |
| 000978.OF | 景顺长城量化精选股票型证券投资基金 | Invesco Great Wall Quantitative Selected Equity Fund |
| 001050.OF | 汇添富成长多因子量化策略股票型证券投资基金 | China Universal Growth Multi-Factor Quantitative Strategy Equity Fund |
| 001421.OF | 南方量化成长股票型证券投资基金 | China Southern Quantitative Growth Equity Fund |
| 163110.OF | 申万菱信量化小盘股票型证券投资基金 (LOF) | SWS MU Quantitative Small Cap Equity Fund(LOF) |

Characteristics of Return and Regression Results for CSI 300 Index Funds, 5-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| Mean | 11 | 0.8922 | 1.0218 | 0.1540 | 1.8165 | 0.9726 | 92.0215 | -3.9926 | 0.9848 | 295.0606 |
| Maximum | 11 | 0.8922 | 1.4097 | 0.5523 | 5.1730 | 1.1520 | 138.3330 | 3.1410 | 0.9969 | 315.0000 |
| Minimum | 11 | 0.8922 | 0.8502 | -0.0211 | -0.2480 | 0.9310 | 23.8040 | -6.9100 | 0.9041 | 192.5000 |

Characteristics of Return and Regression Results for CSI 300 Index Funds, 3-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| Mean | 11 | 0.2155 | 0.4599 | 0.2529 | 2.5249 | 0.9606 | 61.6035 | -2.0292 | 0.9791 | 296.7727 |
| Maximum | 11 | 0.2155 | 0.7844 | 0.5755 | 4.3450 | 0.9968 | 84.3570 | -0.1640 | 0.9950 | 317.0000 |
| Minimum | 11 | 0.2155 | 0.2703 | 0.0645 | 0.6750 | 0.8524 | 15.7530 | -3.6740 | 0.8729 | 174.2500 |

Characteristics of Return and Regression Results for CSI 300 Active Funds, 3-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| Mean | 11 | 0.2155 | 0.4809 | 0.2546 | 0.8599 | 1.0503 | 13.7677 | 0.3436 | 0.8042 | 141.0682 |
| Maximum | 11 | 0.2155 | 1.0961 | 0.8936 | 3.7270 | 1.1378 | 22.9350 | 1.4480 | 0.9358 | 427.5000 |
| Minimum | 11 | 0.2155 | -0.4255 | -0.6675 | -0.8670 | 0.9396 | 7.9880 | -1.3790 | 0.6357 | 39.2500 |

Table 1

Note: the columns “average index return”, “average fund return” and “alpha” all use percentage term as the unit of measurement. All data is monthly data.

Characteristics of Return and Regression Results for CSI 100 Index Funds, 5-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| Mean | 6 | 1.1211 | 1.2119 | 0.1377 | 1.7577 | 0.9582 | 92.9962 | -4.0537 | 0.9931 | 101.0833 |
| Maximum | 6 | 1.1211 | 1.2956 | 0.2127 | 2.5390 | 0.9665 | 99.1330 | -3.0610 | 0.9939 | 108.5000 |
| Minimum | 6 | 1.1211 | 1.0690 | 0.0072 | 0.0930 | 0.9471 | 86.9560 | -5.1380 | 0.9921 | 97.8333 |

Characteristics of Return and Regression Results for CSI 100 Index Funds, 3-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| Mean | 6 | 0.5937 | 0.7687 | 0.1899 | 1.9508 | 0.9751 | 54.1000 | -1.3797 | 0.9876 | 102.6667 |
| Maximum | 6 | 0.5937 | 0.8765 | 0.2959 | 2.8780 | 0.9867 | 60.6800 | -0.7770 | 0.9903 | 114.2500 |
| Minimum | 6 | 0.5937 | 0.6329 | 0.0592 | 0.6660 | 0.9579 | 47.7680 | -2.3610 | 0.9845 | 98.2500 |

Table 2

Characteristics of Return and Regression Results for CSI 500 Index Funds, 5-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| Mean | 5 | 0.7521 | 0.8653 | 0.1209 | 0.7428 | 0.9898 | 81.3988 | -1.2622 | 0.9853 | 415.9667 |
| Maximum | 5 | 0.7521 | 1.2851 | 0.5401 | 3.2540 | 1.0165 | 151.8520 | 0.8120 | 0.9974 | 508.0000 |
| Minimum | 5 | 0.7521 | 0.5280 | -0.2366 | -2.0120 | 0.9729 | 45.2200 | -4.2350 | 0.9715 | 222.0000 |

Characteristics of Return and Regression Results for CSI 500 Index Funds, 3-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| Mean | 5 | -0.5989 | -0.1803 | 0.4141 | 2.7612 | 0.9924 | 77.8748 | -0.9588 | 0.9870 | 404.6000 |
| Maximum | 5 | -0.5989 | 0.4523 | 1.0492 | 4.7800 | 1.0046 | 163.7320 | 0.3270 | 0.9987 | 511.5000 |
| Minimum | 5 | -0.5989 | -0.5940 | -0.0096 | -0.2360 | 0.9758 | 30.9330 | -4.0530 | 0.9637 | 192.0000 |

Characteristics of Return and Regression Results for CSI 500 Active Funds, 3-year period

| Metric | Number of Observations | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|---------|------------------------|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| Mean | 4 | -0.5989 | 0.5087 | 1.0849 | 3.8758 | 0.9622 | 23.6975 | -0.8415 | 0.9224 | 167.3125 |
| Maximum | 4 | -0.5989 | 0.7270 | 1.2510 | 4.8220 | 1.0107 | 34.9640 | 0.2790 | 0.9714 | 218.2500 |
| Minimum | 4 | -0.5989 | 0.3293 | 0.9165 | 2.1090 | 0.8747 | 15.4220 | -2.5710 | 0.8681 | 136.7500 |

Table 3

Table 1: Characteristics of Return and Regression Results for All CSI 300 Index Funds, 5-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2(adjusted) | Average Number of Securities Held |
|-------------|--|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|---------------|-----------------------------------|
| 519300.OF | Dacheng CSI 300 Index Equity Fund | 0.8922 | 0.9093 | 0.0690 | 1.1630 | 0.9417 | 111.6360 | -6.9100 | 0.9952 | 305.1667 |
| 160417.OF | Huaan CSI 300 Index Structured Fund | 0.8922 | 0.8502 | 0.0019 | 0.0250 | 0.9507 | 85.1190 | -4.4180 | 0.9918 | 303.0000 |
| 165515.OF | Citic-Prudential CSI 300 Index Structured Fund | 0.8922 | 0.8880 | 0.0573 | 0.7040 | 0.9310 | 80.5080 | -5.9640 | 0.9908 | 301.0000 |
| 160807.OF | Changsheng CSI 300 Index Fund(LOF) | 0.8922 | 0.8514 | -0.0211 | -0.2480 | 0.9778 | 80.8170 | -1.8320 | 0.9909 | 298.3333 |
| 150009.OF | UBS SDIC Ruihe CSI 300 Index Structured Fund | 0.8922 | 1.3073 | 0.2794 | 0.8210 | 1.1520 | 23.8040 | 3.1410 | 0.9041 | 309.8333 |
| 165309.OF | CCB Principal CSI 300 Index Fund (LOF) | 0.8922 | 0.9916 | 0.1398 | 2.1440 | 0.9546 | 102.9500 | -4.8950 | 0.9944 | 315.0000 |
| 481009.OF | ICBCCS CSI 300 Index Fund | 0.8922 | 0.9762 | 0.1205 | 2.4710 | 0.9591 | 138.3330 | -5.9030 | 0.9969 | 305.3333 |
| 160615.OF | Penghua CSI 300 Index Fund(LOF) | 0.8922 | 1.1068 | 0.2458 | 3.3600 | 0.9649 | 92.7800 | -3.3720 | 0.9931 | 301.1667 |
| 050002.OF | Bosera Yufu CSI 300 Index Fund | 0.8922 | 1.4097 | 0.5523 | 5.1730 | 0.9609 | 63.3100 | -2.5740 | 0.9852 | 192.5000 |
| 020011.OF | Guotai Shanghai-Shenzhen 300 Index Fund | 0.8922 | 0.9525 | 0.1132 | 1.7390 | 0.9407 | 101.6230 | -6.4090 | 0.9942 | 312.0000 |
| 660008.OF | ABC-CA CSI 300 Index Equity Fund | 0.8922 | 0.9967 | 0.1358 | 2.6290 | 0.9649 | 131.3560 | -4.7830 | 0.9965 | 302.3333 |

Table 2: Characteristics of Return and Regression Results for All CSI 300 Index Funds, 3-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|-------------|--|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| 519300.OF | Dacheng CSI 300 Index Equity Fund | 0.2155 | 0.2703 | 0.0645 | 0.7990 | 0.9551 | 64.7910 | -3.0470 | 0.9915 | 309.5000 |
| 160417.OF | Huaan CSI 300 Index Structured Fund | 0.2155 | 0.3344 | 0.1208 | 1.4450 | 0.9916 | 64.9570 | -0.5540 | 0.9915 | 305.2500 |
| 165515.OF | Citic-Prudential CSI 300 Index Structured Fund | 0.2155 | 0.4786 | 0.2768 | 2.9270 | 0.9366 | 54.2300 | -3.6740 | 0.9879 | 312.5000 |
| 160807.OF | Changsheng CSI 300 Index Fund(LOF) | 0.2155 | 0.2873 | 0.0725 | 0.6750 | 0.9968 | 50.7970 | -0.1640 | 0.9862 | 298.7500 |
| 150009.OF | UBS SDIC Ruihe CSI 300 Index Structured Fund | 0.2155 | 0.7221 | 0.5384 | 1.8170 | 0.8524 | 15.7530 | -2.7280 | 0.8729 | 316.2500 |
| 165309.OF | CCB Principal CSI 300 Index Fund (LOF) | 0.2155 | 0.4493 | 0.2388 | 3.3850 | 0.9771 | 75.8440 | -1.7740 | 0.9938 | 310.0000 |
| 481009.OF | ICBCCS CSI 300 Index Fund | 0.2155 | 0.3697 | 0.1617 | 2.5810 | 0.9655 | 84.3570 | -3.0180 | 0.9950 | 309.0000 |
| 160615.OF | Penghua CSI 300 Index Fund(LOF) | 0.2155 | 0.5453 | 0.3338 | 4.3450 | 0.9814 | 69.9470 | -1.3250 | 0.9927 | 307.0000 |
| 050002.OF | Bosera Yufu CSI 300 Index Fund | 0.2155 | 0.7844 | 0.5755 | 3.6660 | 0.9692 | 33.8010 | -1.0740 | 0.9694 | 174.2500 |
| 020011.OF | Guotai Shanghai-Shenzhen 300 Index Fund | 0.2155 | 0.4289 | 0.2194 | 3.4190 | 0.9722 | 82.9460 | -2.3740 | 0.9948 | 317.0000 |
| 660008.OF | ABC-CA CSI 300 Index Equity Fund | 0.2155 | 0.3883 | 0.1795 | 2.7150 | 0.9687 | 80.2160 | -2.5890 | 0.9944 | 305.0000 |

Table 3: Characteristics of Return and Regression Results for All CSI 300 Active Funds, 3-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|-------------|--|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| 360001.OF | E&P Quantitative Core Stock Fund | 0.2155 | 0.0435 | -0.1860 | -0.3460 | 1.0653 | 10.8590 | 0.6660 | 0.7646 | 427.5000 |
| 540006.OF | HSBC Jintrust Large-Cap Equity Fund | 0.2155 | 1.0961 | 0.8936 | 3.7270 | 0.9396 | 21.4590 | -1.3790 | 0.9273 | 69.0000 |
| 165310.OF | CCB Principal Double Interest Policy Topics Structured Equity Securities Investment Fund | 0.2155 | 0.8388 | 0.6135 | 2.4570 | 1.0459 | 22.9350 | 0.3212 | 0.9358 | 148.0000 |
| 206012.OF | Penghua Value Selected Equity Fund | 0.2155 | 0.1347 | -0.0846 | -0.1750 | 1.0177 | 11.5470 | 0.2010 | 0.7861 | 39.2500 |
| 000411.OF | Invesco Great Wall Quality Growth Equity Fund | 0.2155 | 0.3970 | 0.1584 | 0.2860 | 1.1072 | 10.9450 | 1.0600 | 0.7674 | 76.0000 |
| 000688.OF | Invesco Great Wall Research Selected Equity Fund | 0.2155 | 0.7307 | 0.4855 | 0.9320 | 1.1378 | 11.9570 | 1.4480 | 0.7977 | 89.0000 |
| 000916.OF | First Seafront Dividend Yield 100 Equal Weight Equity Fund | 0.2155 | 0.5378 | 0.3323 | 1.2620 | 0.9535 | 19.8200 | -0.9660 | 0.9159 | 114.2500 |
| 320022.OF | Lion Research Selected Equity Fund | 0.2155 | 0.5770 | 0.3504 | 0.7010 | 1.0515 | 11.5090 | 0.5640 | 0.7850 | 83.7500 |
| 001042.OF | ChinaAMC Leading Equity Fund | 0.2155 | -0.4255 | -0.6675 | -0.8670 | 1.1230 | 7.9880 | 0.8750 | 0.6357 | 91.5000 |
| 001277.OF | Bosera State-Owned Enterprises Reform Theme Equity Fund | 0.2155 | 0.3175 | 0.1002 | 0.2370 | 1.0086 | 13.0770 | 0.1110 | 0.8252 | 367.2500 |
| 001236.OF | Bosera Silk Road Theme Equity Fund | 0.2155 | 1.0426 | 0.8048 | 1.2450 | 1.1037 | 9.3490 | 0.8780 | 0.7059 | 46.2500 |

Table 4: Characteristics of Return and Regression Results for All CSI 100 Index Funds, 5-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|-------------|---|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| 410008.OF | Harfor CSI 100 Index Fund | 1.1211 | 1.2592 | 0.1897 | 2.4300 | 0.9540 | 92.1300 | -4.4450 | 0.9930 | 100.8333 |
| 320010.OF | Lion CSI 100 Index Fund | 1.1211 | 1.2956 | 0.2127 | 2.5390 | 0.9660 | 86.9560 | -3.0610 | 0.9921 | 100.8333 |
| 162509.OF | GTJA Allianz Shuangxi CSI 100 Structured Fund | 1.1211 | 1.0690 | 0.0072 | 0.0930 | 0.9471 | 92.0340 | -5.1380 | 0.9930 | 98.5000 |
| 240014.OF | Hwabao WP CSI 100 Index Fund | 1.1211 | 1.2241 | 0.1559 | 1.9720 | 0.9528 | 90.8950 | -4.4990 | 0.9928 | 108.5000 |
| 162307.OF | HFT CSI 100 Fund (LOF) | 1.1211 | 1.2065 | 0.1271 | 1.7360 | 0.9628 | 99.1330 | -3.8250 | 0.9939 | 100.0000 |
| 519100.OF | Changsheng China Securities 100 Index Fund | 1.1211 | 1.2172 | 0.1336 | 1.7760 | 0.9665 | 96.8290 | -3.3540 | 0.9936 | 97.8333 |

Table 5: Characteristics of Return and Regression Results for All CSI 100 Index Funds, 3-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R ² | Number of Securities Held |
|-------------|---|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|----------------|---------------------------|
| 410008.OF | Harfor CSI 100 Index Fund | 0.5937 | 0.8348 | 0.2558 | 2.4410 | 0.9752 | 49.2290 | -1.2510 | 0.9854 | 101.7500 |
| 320010.OF | Lion CSI 100 Index Fund | 0.5937 | 0.8765 | 0.2959 | 2.7320 | 0.9780 | 47.7680 | -1.0750 | 0.9845 | 101.7500 |
| 162509.OF | GTJA Allianz Shuangxi CSI 100 Structured Fund | 0.5937 | 0.6329 | 0.0592 | 0.6660 | 0.9664 | 57.4710 | -1.9980 | 0.9892 | 98.2500 |
| 240014.OF | Hwabao WP CSI 100 Index Fund | 0.5937 | 0.8334 | 0.2476 | 2.8780 | 0.9867 | 60.6800 | -0.8160 | 0.9903 | 114.2500 |
| 162307.OF | HFT CSI 100 Fund (LOF) | 0.5937 | 0.6922 | 0.1235 | 1.3100 | 0.9579 | 53.7500 | -2.3610 | 0.9877 | 101.0000 |
| 519100.OF | Changsheng China Securities 100 Index Fund | 0.5937 | 0.7426 | 0.1571 | 1.6780 | 0.9863 | 55.7020 | -0.7770 | 0.9885 | 99.0000 |

Table 6: Characteristics of Return and Regression Results for All CSI 500 Index Funds, 5-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|-------------|--|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| 660011.OF | ABC-CA CSI 500 Index Equity Fund | 0.7521 | 0.6314 | -0.1003 | -2.0120 | 0.9729 | 151.8520 | -4.2350 | 0.9974 | 501.3333 |
| 162216.OF | Manulife Teda CSI 500 Index Structured Fund | 0.7521 | 1.2851 | 0.5401 | 3.1700 | 0.9905 | 45.2200 | -0.4360 | 0.9715 | 222.0000 |
| 160616.OF | Penghua CSI Small Cap 500 Index Fund(LOF) | 0.7521 | 0.8196 | 0.0726 | 0.7970 | 0.9932 | 84.7900 | -0.5810 | 0.9917 | 508.0000 |
| 164809.OF | ICBCCS Ruizhi CSI 500 Index Structured Fund | 0.7521 | 0.5280 | -0.2366 | -1.4950 | 1.0165 | 49.9750 | 0.8120 | 0.9765 | 505.3333 |
| 165511.OF | Citic-Prudential CSI 500 Index Structured Fund | 0.7521 | 1.0624 | 0.3286 | 3.2540 | 0.9757 | 75.1570 | -1.8710 | 0.9895 | 343.1667 |

Table 7: Characteristics of Return and Regression Results for All CSI 500 Index Funds, 3-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|-------------|--|----------------------|---------------------|---------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| 660011.OF | ABC-CA CSI 500 Index Equity Fund | -0.5989 | -0.5940 | -0.0096 | -0.2360 | 0.9758 | 163.7320 | -4.0530 | 0.9987 | 502.0000 |
| 162216.OF | Manulife Teda CSI 500 Index Structured Fund | -0.5989 | 0.4523 | 1.0492 | 4.7800 | 0.9966 | 30.9330 | -0.1050 | 0.9637 | 192.0000 |
| 160616.OF | Penghua CSI Small Cap 500 Index Fund(LOF) | -0.5989 | -0.2817 | 0.3200 | 3.3250 | 1.0046 | 71.1520 | 0.3270 | 0.9929 | 511.5000 |
| 164809.OF | ICBCCS Ruizhi CSI 500 Index Structured Fund | -0.5989 | -0.4187 | 0.1748 | 1.8660 | 0.9910 | 72.0970 | -0.6570 | 0.9931 | 508.0000 |
| 165511.OF | Citic-Prudential CSI 500 Index Structured Fund | -0.5989 | -0.0595 | 0.5359 | 4.0710 | 0.9941 | 51.4600 | -0.3060 | 0.9866 | 309.5000 |

Table 8: Characteristics of Return and Regression Results for All CSI 500 Active Funds, 3-year period

| Fund Symbol | Fund Name | Average Index Return | Average Fund Return | Alpha | t-value of Alpha | Beta | t-value of Beta | t-value of (Beta-1) | R^2 | Number of Securities Held |
|-------------|---|----------------------|---------------------|--------|------------------|--------|-----------------|---------------------|--------|---------------------------|
| 000978.OF | Invesco Great Wall Quantitative Selected Equity Fund | -0.5989 | 0.6458 | 1.2510 | 4.8060 | 1.0107 | 26.4570 | 0.2790 | 0.9510 | 136.7500 |
| 001050.OF | China Universal Growth Multi-Factor Quantitative Strategy Equity Fund | -0.5989 | 0.3325 | 0.9165 | 4.8220 | 0.9751 | 34.9640 | -0.8920 | 0.9714 | 170.2500 |
| 001421.OF | China Southern Quantitative Growth Equity Fund | -0.5989 | 0.3293 | 0.9213 | 2.1090 | 0.9883 | 15.4220 | -0.1820 | 0.8681 | 218.2500 |
| 163110.OF | SWS MU Quantitative Small Cap Equity Fund(LOF) | -0.5989 | 0.7270 | 1.2509 | 3.7660 | 0.8747 | 17.9470 | -2.5710 | 0.8992 | 144.0000 |

References

- Chen, S. (2005). Empirical Analysis on Tracking Error of Index Funds (《指数型基金跟踪误差的实证分析》). *Dangdai Jingji Kexue* (当代经济科学), (04), 59-64+111.
- China Merchants Securities. (2018). *Index Fund Report Series I: Overview of Chinese and US's Index Fund Development* (《指数基金系列报告之一：中美股票指数基金发展概览》).
- Cootner, P. H. (1964). *The random character of stock market prices*. Cambridge, Massachusetts: MITPress.
- Elton, E. J., Gruber, M. J., & Busse, J. A. (2004). Are investors Rational? Choices Among Index Funds. *The Journal of Finance*, 59(1), 261–288.
- Elton, E. J., Gruber, M. J., & Souza, A. (2018). *Passive Mutual Funds and ETFs: Performance and Comparison* (Unpublished paper). New York University Stern School of Business, New York.
- Fama, E. F. (1965). The Behavior of Stock-Market Prices. *Journal of Business*, 38(1), 34–105.
- Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, 25(2), 383–417. <https://doi.org/10.2307/2325486>
- He, X. (2005). *A Research on Complete Replication and Profit Enhanced Index Fund* (Unpublished master dissertation). Tsinghua University, Beijing.
- Hwabao Securities Research. (2017). *Themed Report on Index funds I: Overview of the Index Fund Market* (《指数基金专题报告（一）：指数基金市场概览》).
- Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance*, 23(2), 389–416. <https://doi.org/10.2307/2325404>

- Li, J., Li, C. & Yang, D. (2004). Empirical Analysis and Evaluation on Our Country's Index Fund Performance (《我国指数基金绩效的实证分析与评价》). *Juece Cankao* (决策参考), (08), 37-39.
- McKinsey & Company. *North American asset management 2018: The New Great Game*. 34.
- Qi, Y. & Wang, W. (2011). Analysis on Index Fund Investment Performance (《指数基金投资绩效分析》). *Jingji Wenti* (经济问题), (02), 95-98+115.
- Samuelson, P. A. (1965). Proof That Properly Anticipated Prices Fluctuate Randomly. *Industrial Management Review* (Pre-1986), 6(2), 41-49.
- Sharpe, W. F. (1966). Mutual Fund Performance. *The Journal of Business*, 39(1), 119-138.
- Tang, G. & Chen, F. Analysis on Correlation between Managerial Skills and Index Fund Performance (《管理技能与指数基金业绩相关性分析》). *Study & Exploration* (学习与探索), (02), 153-155.
- Treynor, J. L. (1965). How to Rate Management of Investment Funds. *Harvard Business Review*, 43(1), 63-75.
- Ye, S. & Su, M. (2005). Analysis on Our Country's Open-end Index Fund Performance (《我国开放式指数基金绩效分析》). *Jingji Luntan* (经济论坛). (n.d.). 50-52.