

Research on the Causes and Economic Consequences of Factor Crowding in China's Capital Market ——Take the Phenomenon of Grouping of Public Funds as an Example

Fafu Xu

Zhejiang University of Finance & Economics, Hangzhou, Zhejiang, 310018, China
18380127680@163.com

Abstract: The factors driving stock returns in investment activities have been a hot topic of research in modern finance. Previous researchers have proposed several multi-factor models for the drivers of stock returns in investment activities to improve the decision models of specific influencing factors in investment decisions. Based on research on public funds' grouping behavior in investment decision-making, this paper analyzes a series of decision behaviors of fund managers in the context of factor strategy crowding. Therefore, we identify the specific influences and behavioral contexts in which fund managers make investment decisions and provide a specific analysis of fund managers' investment decision opinions under factor strategy crowding, illustrating the economic mechanisms involved.

Keywords: Stock returns; Mutual funds; Factor crowding; Factor volatility; Pair correlation

1. Introduction

In modern finance, research content has played a significant role in determining stock returns. As a result of Markowitz's article "Portfolio Selection" published in the Journal of Finance, investment activities have gradually shifted from expressing financial ideas in descriptive language to measuring asset returns and risks using the mean and variance. By combining these two perspectives, tens of thousands of securities asset portfolios are selected [1]. The capital asset pricing model and an arbitrage pricing model were both developed based on this pioneering research. While it does determine capital market equilibrium asset returns under strict assumptions, it has also linked asset risk to expected returns. A portfolio's return reflects the compensation it receives for taking on market risk, according to this view. This is because market factors determine investment returns. Moreover, the latter overcomes the fact that the former is undetectable by extending the driving force of portfolio returns to multiple factors. As time progressed and the market changed, various multi-factor risk models were proposed. Fama has proposed a three-factor model, and French (1993) and Daniel Hirshleifer Sun (2017), respectively; a four-factor model has been proposed by Carhart (1997), Novy-Marx (2013), Hou, Xue, and Zhang (2015), Stambaugh and Yuan (2017); Fama and French (2015) have proposed a five-factor model. Factor investment research has continually been enhanced by these proposals, such as the release of 59 new factors between 2010 and 2012 [2], forming a factor zoo (John Cochrane 2011). Up to now, the vast majority of portfolio returns can be explained by country, sector, style, and strategy factors.

Factor investing offers transparent investment processes, low management fees, and above-average performance potential, which has attracted many assets away from traditional active management practices. The number and scale of Smart Beta ETFs in the domestic market reached 34 and 32.296 billion yuan by the end of 2021. The number and scale of Smart Beta ETFs in the domestic market reached 34 and 32.296 billion yuan by the end of 2021. Regarding this fact, Linnanmaa et al. [3] compared the in-sample and out-of-sample performance of 36 factors derived from U.S. stock accounting data by constructing three data segments: ex-ante out-of-sample, in-sample, and ex-post out-of-sample and found that the vast majority of the factors were invalid outside the sample. Mclean et al. [4] studied 97 publicly published factors from finance and accounting journals and found that the out-of-sample effects of factors decreased by an average of 26%, and their effects even slipped by 58% after the papers were published. And the higher and more significant the in-sample returns of the

factors, the greater the average decline in returns. In addition to the excluding that the in-sample and out-of-sample differences are due to reasons such as over-fitting, i.e., after determining the true validity of the factors, the research literature on differences in the effects of factors in and out-of-sample is mainly explained in terms of exposure leading to weaker mispricing, transaction costs, and factor crowding. Specifically, Bowles et al. [5] found that the vast majority of factors had significant excess returns within 120 days of the latest data update by examining factors derived from financial data, but after that, the excess returns will disappear. Asness et al. [6] found that the HML measured by monthly frequency data had a better performance than the HML in the Fama and French three-factor models the HML had better performance than the HML in the Fama and French three-factor model. Both Bowles and Asness showed that the data are time-sensitive and that factors can earn excess returns in the short run, but the excess returns will disappear in the long run as mispricing is corrected. Chen et al.[7] and Novy-Marx et al.[8], on the other hand, noted that the returns of factors will decrease when transaction costs are taken into account. From the perspective of factor crowding, this paper explores whether public fund holding behavior causes factor crowding and how it works, starting from public fund grouping behavior.

The advantages of factor investing include transparency of investment processes, low management fees, and above-average performance potential, which has attracted many assets away from active management. By the end of 2021, Smart Beta ETFs accounted for 34 and 32.296 billion yuan in the domestic market. Smart Beta ETFs reached 34 and 32.296 billion yuan in the domestic market by the end of 2021, respectively. Regarding this fact, Linnanmaa et al. By constructing three data segments: ex-ante out-of-sample, in-sample, and ex-post out-of-sample, Linnanmaa et al. [3] compared the performance of 36 factors derived from U.S. stock accounting data. They concluded that most of the factors were invalid outside the sample. Mclean et al. [4] studied 97 publicly published factors from finance and accounting journals and found that out-of-sample effects decreased by an average of 26%, and their effects even decreased by 58% after the papers were published. Furthermore, the higher and more significant the in-sample returns of the factors, the greater the average decline in returns. After excluding the possibility that in-sample and out-of-sample differences are caused by factors such as overfitting, i.e., after determining the true validity of the factors, research literature indicates that differences between the effects of factors in and out-of-sample are primarily the result of exposure, which results in weaker mispricing, transaction costs, and factor crowding. Specifically, Bowles et al. [5] found that the vast majority of factors had significant excess returns within 120 days of the latest data update by examining factors derived from financial data, but after that, the excess returns will disappear. Asness et al. [6] found that the HML measured by monthly frequency data had a better performance than the HML in the Fama and French three-factor models the HML had better performance than the HML in the Fama and French three-factor model. Bowles and Asness both demonstrated that the data are time-sensitive and that factors can earn excess returns in the short run, but that the excess returns will disappear in the long run as mispricing is corrected. In contrast, Chen et al.[7] and Novy-Marx et al.[8] observed that factor returns decrease when transaction costs are considered. Starting from the perspective of factor crowding, this paper examines whether public fund holding behavior leads to factor crowding and how it works.

2. Fund Grouping and Factor Crowding

Factor crowding increases as factor investing becomes more popular, resulting in lower out-of-sample returns and a negative correlation between factor crowding and factor future returns, making it necessary to measure factor crowding. At present, there are no reliable measures of factor crowding that take into account the perspectives of stock holdings, pricing, and returns. In particular, Chue et al. [9] examined the correlation between mutual funds and their best average past performance from the perspective of relative holdings and found that the higher the correlation, the worse the performance in the future; Zhong et al. [10], Greenwood et al. [11]. In their studies, Hanson et al. [12] constructed factor crowding metrics based on absolute holdings, mutual fund positions, and flows, as well as stock short interest data, and concluded that factor crowding and future factor returns are negatively correlated. According to the measurement of pricing and return, when factor strategies are crowded, the correlation between related stocks will increase, and the mobility stability will decrease. Based on stock correlations and volatility, Lou et al.[13], Wang et al.[14] and Daniel et al. measure factor crowding. Based on factor risk and return, George et al. measure factor crowding from five perspectives: valuation spread, short interest spread, pairwise correlation, factor volatility, and factor reversal, and use a simple mean to measure relative factor crowding.

Research on securities investment funds typically assumes that the funds are a single entity,

maintaining economic rationality, and involve fewer interfund relationships and interactions to simplify the research model. In recent years, studies have begun linking fund units into networks, thinking that investors may be able to obtain more information from social networks to assist in their investment decisions. Social networks related to funds can be constructed based on channel information from fund managers' social relationships in securities investment funds and position information from securities investment funds, and their influence on trading decisions and investment performance can be studied. As a result of the construction of the fund network based on complex network theory and financial intersection, individual heterogeneity is incorporated into the inquiry, allowing us to fully examine the impact of information transmission on capital markets.

3. The Specific Impact of the Grouping Behavior of Public Funds on the Crowding of Shareholding Factors

How does the grouping behavior of public funds affect the crowding of stock holding factors? By sorting out existing research literature, relevant analysis paths can be obtained as follows: when the grouping behavior of public funds exists, performance for some funds chasing the same factor and position higher correlation consistency, although the fund performance can still be improved and numerous cash flows continue to pour in, resulting in more money available to chase a set of securities. As a result, it will become more expensive than other securities, and a set of securities has shown that the factor is overcrowded. The existing fund network studies can be divided into fund managers' social relationships and fund holding networks' social relationships. These networks are discussed separately during the construction and discussion of public fund-holding networks. Based on network construction genesis, the first approach considers fund networks as social relationships. A fund inter-unit holding network is considered based on the grouping measurement index.

It is important to note that when serving as a fund manager's social network, one or more social relationships contribute to the emergence of fund managers' grouping, and fund managers make investments based on the information they receive. The formation of a social network will either facilitate or inhibit the performance of its internal members and external investors. Particularly, fund managers can establish funds based on relationships such as mutual alumni relationships, alumni relationships with managers of the holding company, alumni relationships with managers of the holding company's educational background, alumni relationships based on the holding company's location, mutual geographic relationships based in the same city, or even the same city and community, and mutual colleague relationships, or even fund managers' family relationships based in the fund company where they are located. Establish a network of fund manager relationships, facilitate the transfer of private information, and enhance the fund's performance. Specifically, in actual investment decisions, fund managers' performance will be lower if they rely only on public information, i.e., fund networks have higher performance if they use public information to a lesser extent. Furthermore, fund managers' social networks facilitate the transmission of private information within the network, providing them with more accurate inside information as well as better stock analysis as a means of reducing agency and information asymmetry issues in opaque markets, obtaining private information needed for trading decisions, and generating excess returns as a result.

4. Fund Managers' Behavior and Factor Crowding

What is the impact of fund managers' investment behavior on factor crowding? Due to factor crowding, capital will become concentrated in a single or several specific strategies due to absolute and relative concentrations, which occurs when capital is chased or liquidated in a single strategy instead of allocating it over a long-term perspective. However, fund managers' investment decisions, whether for strategic or irrational reasons, will determine the direction of capital allocation and concentration, resulting in factor crowding. By focusing on the crowding of equity market factors due to funding managers' irrational behavior, this paper distinguishes the impact of fund managers' strategic abilities on the overall long-term expected risk and return.

4.1. Intrinsic Determinants of Fund Managers' Investment Behavior

Fund managers' intrinsic decision mechanisms have been examined in the literature, and they have shown heterogeneity due to the influences of the market system, cultural environment, and individual characteristics. Particularly, performance rankings of funds managed by fund managers, incentives,

current and historical size, and establishment years, as well as personal characteristics such as the fund managers' own professional reputations and demographic background characteristics, affect the investment behavior of fund managers, which in turn has an impact on fund performance and factor crowding in the equity market. According to the study, age, tenure, years of education, and presence of MBA degrees are all related to fund performance. In particular, younger fund managers, those with a longer tenure, those with MBAs, and those who graduated from a high SAT level institution are exposed to lower levels of risk and are likely to outperform their peers.

4.2. Analysis of the Irrational Investment Behavior of Fund Managers

Investment decisions are influenced by the factors listed above. Because this paper examines capital allocation to a single strategy that is distinct from the long-term strategic intent behavior of fund managers, the paper examines the impact mechanisms of fund managers' behavior by using variables such as irrational herding behavior, window dressing effects, and overconfidence. This study examines whether and to what extent factor crowding is affected by their behavior.

4.3. Analysis of the Investment Model of Fund Managers' Herd Behavior

In herd behavior, individuals in a group act together without being explicitly directed. Herd behavior is an irrational behavior that is common among most people rather than considering personal information under uncertain circumstances. The LSV model, PCM model, CSSD model, and CSAD model have been confirmed by scholars domestically and internationally. In addition, relevant research by domestic scholars has demonstrated that herding behavior in the domestic financial market is much higher than in the U.S. stock market (Chen Hao, 2004). However, there is disagreement regarding herding behavior's role in the stock market. When security fund managers process the same information and arrive at the same conclusions to guide their own behavior, they demonstrate that they have processed the information normally, making the market more efficient (LSV 1992), accelerating the return of market prices to optimal, and preventing irrational market fluctuations from occurring. However, when the herding behavior of fund managers is considered irrational, such as when the common preference of fund managers for stock selection is considered herding behavior, herding behavior is likely to have a significant impact on stock market prices and cross-quarter demand. Further, the direction of a fund's herding behavior as well as its magnitude is dependent upon market conditions, season, time, fund size, fund earnings, market size, and market dynamics, and it is impossible to determine the extent to which fund manager herding behavior impacts the stock market. Additionally, existing studies on herd behavior and fund performance are inconclusive, and herd behavior may improve fund performance or may not significantly improve investment returns based on the study of herd behavior alone. Therefore, it is unclear whether and to what extent herd behavior contributes to the formation of market factor crowding.

4.4. Analysis of Investment Model of Window Dress Behavior of Fund Managers

Many countries have confirmed that Window Dress Behaviour exists in pension funds, stock funds (Zweig), money funds, mutual funds, public funds, open-end equity funds, and other institutions that manage assets on behalf of others. Specifically, by selling the worst-returning small-cap stocks at the end of the year and selling more underperforming stocks in the fourth quarter of each year than in the other three quarters, the fund manager will pull up the net worth at the end of the year. The fund manager intends to show better performance and greater safety at year-end or at the end of the period by dumping underperforming assets and adding to a portfolio that has recently performed better. But the fact is that when fund managers with poor recent performance groom themselves through window-dressing behavior, the fund's future performance will be lower, causing losses to investors. However, regardless of the effect of window-dressing behavior on subsequent performance, its impact on the stock market cannot be answered uniformly. Most foreign research scholars and some domestic scholars' studies support a positive performance-fund flow feedback relationship. When funds perform better, they introduce excess inflows and even attract inflows for other funds within the same family. However, some scholars have found that the growth of fund NAV is subject to the so-called "redemption anomaly", i.e., there is a negative performance-flow relationship in the fund market, where fund performance grows, and redemption rates rise instead of falling. Based on this, window-dressing has a negative impact on the future short-term and long-term performance of the fund. It is unknown whether the fund manager's trimmed performance growth will increase fund flows, reducing the factor inflows to equity market investments. Therefore, the fund manager's window-dressing behavior will

reduce the factor's crowding.

Several countries have confirmed that Window Dress Behavior occurs in pension funds, stock funds (Zweig), money funds, mutual funds, public funds, open-end equity funds, and other institutions that manage assets on behalf of others. Specifically, the fund manager will increase the fund's net worth by selling the lowest-performing small-cap stocks at the end of the year and by selling more underperforming stocks in the fourth quarter than in the other three quarters. The fund manager intends to show better performance and greater safety at year-end or at the end of the period by dumping underperforming assets and adding to a portfolio that has recently performed better. The reality is that when fund managers with poor recent performance groom themselves through window-dressing behavior, the fund's future performance will be lower, causing losses to investors. However, regardless of the impact of window-dressing behavior on subsequent performance, its effect on the stock market cannot be answered uniformly. The majority of foreign research scholars' studies and some domestic studies, support a positive relationship between performance and fund flow. As funds perform better, they introduce excess inflows and may even attract inflows for other funds within the same family. However, some scholars have found that the growth of fund NAV is subject to the so-called "redemption anomaly", i.e., there is a negative performance-flow relationship in the fund market, where fund performance grows, and redemption rates rise instead of falling. Therefore, window-dressing negatively affects the fund's short-term and long-term performance. The fund manager's trimmed performance growth is unknown to what extent it will increase fund flows, thereby reducing the factor inflows into equity markets. Consequently, the fund manager's window-dressing will reduce the factor's crowding.

5. Conclusion

A detailed analysis of the different investment strategies of fund managers in the face of factor crowding is presented in this paper. As a result of overly biased perceptions of their own abilities, fund managers may exhibit overconfident investment behaviors when faced with difficult circumstances and large excess returns in the previous period. A fund manager who exhibits overconfident behavior is likely to have a more positive self-evaluation and overconfidence in their own ability, make blindly optimistic predictions about market trends, and increase trading frequency, which will lead to higher trading costs, adversely affecting fund performance and a more volatile market. As an example, overconfident fund managers, due to their capital advantage and leading role in the market, increase the number of stock trades from their own large amount of capital and drive other capital into stocks. As an example, overconfident fund managers, due to their capital advantage and leading role in the market, increase the number of stock trades from their own large amount of capital and drive other capital into stocks. As a result, stock trading becomes more frequent, and stock prices rise in the short term. Furthermore, the overconfident investment behavior of fund managers will result in certain factors gathering more funds and crowding out others.

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