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Review Article

The Impact of Liquidity Risk on Open-end Fund Performance

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Abstract

Since 2001, China's first open-end fund - Huaan Innovation has been listed since its listing, China's securities market has made a pivotal role in the development of the investment market, the securities investment fund has played a pivotal role, gradually gain market recognition, while the open-end fund with its unique The advantage has attracted a large number of investors, and the scale has gradually expanded, which has also had an increasingly large impact on the A-share market. However, the evaluation mechanism of open-end fund performance is relatively backward, which brings great inconvenience to the investment work of stakeholders. Therefore, how to effectively evaluate fund performance has become a hot issue in the fund industry. Years of market operation have made people gradually realize that the important role of liquidity risk in open-end funds has also attracted more and more attention from the fund industry. This paper analyzes the impact of turnover rate and information ratio on China's fund performance (measured by Sharpe ratio, Treynor index, Jensen index) through empirical research, and attempts to help fund industry choose the right way to improve fund performance through research results. This paper selects the panel data of 476 funds from 2009 to 2015, and analyzes the relationship between liquidity risk and fund performance by using the fixed effect model of heteroscedasticity control. There is a positive correlation between turnover rate and information ratio and fund performance. Finally, this paper combines the reality of China and the empirical results from the perspective of investors, fund management companies and regulatory agencies.

Keywords: Liquidity risk, open-end fund, performance evaluation, panel data.

INTRODUCTION

Since the establishment of the first open-end fund in 1924, the Massachusetts Investment Trust, open-end funds have become an indispensable force in the field of financial investment. In less than 95 years of development history, the role and impact of the fund on countries and the world's financial markets cannot be underestimated. In September 2001, Bank of Communications issued China's first open-end fund, Hua'an Innovation Securities Investment Fund. Since then, China's securities investment funds have entered a new stage of rapid development. Since then, open-end funds have gradually injected new vitality into the development of China's securities investment fund industry, and opened up a new era for the innovation of China's fund products. Open-end funds have become an important part of China's mutual funds.

Liquidity is the ability to quickly convert financial assets into cash, but without loss of value. For open-end funds, liquidity refers to the ability of fund managers to realize the portfolio they hold in the market. Liquidity risk is a special and very important risk for open-end funds. If the liquidity assets of open-end funds are temporarily unable to satisfy the redemption needs of investors, which will lead to liquidity risk problems, and further lead to the substantial redemption of open-end funds. Therefore, liquidity risk has become a problem that must be considered in the process of fund management.

Studying the impact of liquidity risk on China's fund performance has the following significance: For investors, through the study of liquidity risk, investors can obtain relevant scientific basis to determine their investment style and scale, in addition, It can improve investors' ability to choose funds, so as to make correct and effective investment decisions in different markets and at different times. For fund companies and fund managers, the quantitative assessment of liquidity risk on fund performance can be used by fund managers. Objectively and fairly evaluate the positioning of the portfolio and the ability of future development expectations and the performance level of

the fund manager. At the same time, it can help the fund manager to find out some problems or deviations in the investment strategy or timing selection to improve the fund investment level and Fund management efficiency; by studying the impact of liquidity risk on fund performance, the regulatory authorities can also obtain information with important reference value, so as to fully understand the operation status of the fund and the fund company, and then can solve the problems in the development of the fund And relevant regulatory measures can be improved.

Based on the research results at home and abroad, this paper analyzes the liquidity risk (change rate, information ratio), total assets, net assets, total asset change rate, and net asset change rate through empirical research on China's fund performance (The impact of the Sharpe ratio, the Treynor Index, and the Jensen Index, and attempts to help the fund industry choose the right way to improve fund performance through research results. This paper selects the panel data of 476 funds from 2009 to 2015, and analyzes the relationship between liquidity risk and fund performance by using the fixed effect model of heteroscedasticity control. There is a positive correlation between turnover rate and information ratio and fund performance. In this paper, the Treynor index, Sharp index and Jensen index are used as explanatory variables. It is more objective to study the impact of many factors such as liquidity risk on fund performance through fixed effect model. Finally, this paper combines the reality of China and the empirical results from the perspective of investors, fund management companies and regulatory agencies.

RELATED LITERATURE

In order to measure the performance of the fund, Sharp [1], Lin Turner [2] and Mosang 1966 extended and improved the research on portfolio based on Markowitz, and jointly proposed the capital asset pricing model. The arbitrage pricing theory model (APT) proposed by Ross [3] is the most representative. He relaxed the assumptions of the CAMP model, which can introduce other risk factors. Lehman and Modeste [4] argue that in the case of non-effective markets, the anomalous effects of fund performance cannot be explained by the single-factor model. At this time, it is necessary to establish a multi-factor model to measure the performance of mutual funds. . Market average index returns, book value-to-market ratio, price-to-earnings ratio, market size, and pre-sales growth rate are used as factors affecting fund performance for fund performance research. Saudi Arabia and Felsen [5] used a multivariate CAPM model to characterize the fund's expected total return. In order to consider the temporal variability of β, the former information variable is added to the model, and β is considered to have a linear relationship with the variable. Fama and French [6, 7] established a three-factor model based on the CAPM model, including book market value, company size, and stock market. Considering common stocks, the difference in returns between small cap stocks and large cap stocks, and the difference factor model of stock price levels can better measure fund performance. Kahat [8] proposed the Carhart four-factor model, which combines the resilience factors of stock returns held by funds that are not available in the Fama-French three-factor model, including market factors, scale factors, value factors and momentum factors. The factor inside is the factor of model improvement. Based on the Fama-French three-factor model, Cahart studied the sustainability of US mutual funds and increased the indicator momentum factor to measure the sustainability of stock performance. Therefore, the results of the US mutual fund show that in the three-factor model the average pricing error will be significantly reduced. Fama-French [7] proposed a five-factor model together. Compared with the three-factor model, the model increases the two factors of credit risk premium and bond maturity. Gan Jinyu, Khan Mix Spring [9] introduced a management model of the open-end fund reserve ratio from the perspective of fund managers. This model can increase the possibility of meeting the demand for timely redemption, given the various models in the model. The distribution of random variables and the estimation of each parameter, using statistical methods to achieve the expression of the dynamic calculation formula of the optimal cash reserve rate.

In the process of studying the performance of securities investment funds, the evaluation indicators to measure risks have been proposed. Harry Markowitz [11] proposed to use the mean variance of securities returns to quantify risk. Fund performance evaluation mainly focuses on qualitative analysis, and quantitative analysis methods are not used reasonably and systematically to analyze portfolio risk. Treno [10] proposed the “Treno Index” based on the CAPM model, which uses the unit system risk premium of the portfolio and the excess return rate of the unit system risk as the evaluation index. Sharp [12] proposed the Sharp Index, which divides the risk premium of the portfolio by the overall standard deviation and uses it as an indicator to measure the overall risk of the fund, which is used to assess fund performance. Jensen [13] compares the CAPM model to calculate expected returns and actual returns, and proposes the “Jensen Index”, which can be used as an absolute indicator to measure overall performance, and can more directly reflect the investment ability of the investment manager and the additional performance of the management. Frank Soltino [14] proposed an index similar to the Sharpe ratio, the Sortino Ratio, which differs from the Sharpe ratio, mainly in that the standard deviation of the risk is deviated from its mean degree. Murchi, Choi, Desai [15] first introduced the DEA model to establish the performance evaluation indicator DPEI.

For the influencing factors of liquidity risk, Zhao Xianbing [16] qualitatively analyzed the influencing factors of open-end fund liquidity risk, and proposed the idea of redemption cash amount and retained cash balance equilibrium model. He believed that by constructing the linear function of total income objective function the planning model can obtain a feasible domain solution. Xue Feng, Hao Aimin [17] conducted a qualitative analysis of the characteristics of fund holders, redemption motives, fund marketing, risk hedging tools, etc. by comparing open-end fund liquidity management in the United States, Japan, and Taiwan. The impact of these factors on the redemption fund. Chen Rihua, Wu Lei [18], based on how the liquidity risk of open-end funds is generated, analyzes the principal agent and supply demand, and then draws the following seven factors: the liquidity of the securities market, the fund The scope of product structure, fund investor factors, diversification of the fund's investable varieties, market development trends, financing policies, fund managers and other factors. He Juan and Mao Weijing [19] used empirical research to study the open-end funds in China, and obtained the indicators such as the timing ability, stock selection ability, fund income and risk adjustment income of the fund manager. Then, through the factor analysis method of research and standardization process, it is concluded that most open-end funds in China can surpass the market, but the stock picking and timing ability are weak.

Regarding the impact of liquidity risk on fund performance, Xu Hanjiang [20] used the Treynor Index, Sharp Index and Jensen Index to use the Shanghai Composite Index as a market benchmark to evaluate the fund performance of the top 10 funds in 1999 and found that Xinghua The income performance of funds such as Galaxy Revenue and Yuyang was significantly higher than that of the Shanghai Composite Index. Liu Hailong, Zhong Liming and Wu Chongfeng [21] used quantitative analysis to study how to optimize the control of liquidity risk of open-end funds. The price of securities is subject to discrete time arithmetic Brownian motion, which is assumed by them, and then the optimal assets are obtained. The control strategy of liquidity risk and the strategic sensitivity analysis of related parameters. Peng Lina and Yang Xiangyu [22] conducted an empirical analysis of Huaxia Growth and Huaan Innovation, and proposed a Hurst index model of risk measurement to measure the risk of open-end funds. By citing the unit net value of open-end funds, we calculated Hurst index. Si Sheng Yuan [23] used the fund redemption rate as a measure of the size of the fund redemption to determine the magnitude of the external liquidity risk faced. An empirical analysis was made. The following conclusions were drawn: redemption rate measurement fund redemption the scale of return has no substantive relationship with the size of the fund, but the redemption scale measured by the redemption ratio has a certain degree of correlation with the fund performance. Pang Liyan [24] applied the revised Sharp Index, combined with the fund timing ability, stock picking ability and other traditional methods to evaluate the performance of China's open-end funds, summed up the stock-based open-end fund's overall income index better than the broader market, thus obtaining The following conclusions are drawn: In future investments, investors will prefer open-end funds to achieve high returns.

The existing domestic research on fund performance uses a lot of turnover rate as an explanatory variable to explain fund performance. This paper believes that more variables need to be selected to explain fund performance.

The Data

This paper selects open-end funds for research. Fund liquidity indicator turnover rate and other explanatory variable information ratios, interpreted variable Treynold index, Jensen index and Sharpe ratio, as well as fund performance yield and fund characteristics data, ie control variable fund assets total value, fund net asset value The change rate of total assets and the rate of change in net assets are all obtained from the Wind database. This article filters the data and deletes the missing information.

First, select the basic annual data of 870 open-end funds from 2009 to 2015 in the Wind database and filter them to remove the missing data, and finally get 476 observations. An empirical sample that satisfies the analysis conditions:

Table-1 gives descriptive statistics for the variables:

Table-1: Descriptive Statistics

Variable	Number of Observation	Mean	Standard Deviation	Minimum	Maximum
SHARPE	476	0.0648922	0.1528598	-0.5053	0.5249
TREYNOR	476	0.00848	0.602471	-16.5372	4.6104
JENSEN	476	0.045382	0.134561	-0.5451	0.9618
TURNOVER RATE	476	2.002939	7.345167	0	96.3308
INFORMATION RATE	476	1.039641	9.319274	-23.6216	25.9897
TOTAL ASSETS	476	2.45e+09	6.39e+09	4500000	4.60e+10
NET ASSETS	476	2.10e+09	3.92e+09	976.11	5.00e+10
TOTAL ASSETS CONVERSION	476	36.7733	258.55	-91.1393	4744.7
NET ASSETS CONVERSION	476	65.40038	728.7194	-99.9845	18777.17

As can be seen from Table-1, the Sharpe ratio is between -0.5053 and 0.5249, and the mean is about 0.0648922, indicating that some fund returns are higher than the risk of volatility, and some funds operate at a higher risk than the rate of return. The average net growth rate of the fund exceeds the risk-free rate. In the case of the bank deposit interest rate as the risk-free rate for the same period, the investment fund is better than the bank deposit; the Treynor index is between -16.5372 and 4.6104, with an average of about 0.00848. The higher the unit risk premium, the better the overall performance of the open-end fund, the risk of the fund manager in the management process is beneficial to investors profit; the Jensen index is between -0.5451 and 0.9618, the average value is about It is 0.045382, indicating that the performance of the fund as a whole is better than the market benchmark combination. The more the big one, the better the performance; the maximum turnover rate is about 96.3308, and the average value is about 7.345167, indicating that the stock has entered a relatively active state, and even As the emergence of strong stocks, the stock price is highly active; the information ratio is between -23.6216 and 25.9897, and the average is about 1.039641, indicating The overall performance of the fund continues to outperform the broader market.

Empirical Analysis

$$Treynor/Jensen/Sharpe = \alpha + \beta_1 TR + \beta_2 IR + \beta_3 TA + \beta_4 NA + \beta_5 TAC + \beta_6 NAC + \varepsilon$$

In the above model, α is the intercept, βi (i = 1, 2, 3, 4, 5, 6) is the model regression coefficient, and ε is the random error term.

A summary of all variable names and meanings is shown in Table-2:

Table-2: Variable Description

	Variable	Meaning
Explained Variable	TREYNOR	The risk premium obtained per unit of risk is a measure of whether the risk of a fund manager in the process of managing the fund is beneficial to the investor and a measure of the excess return of the unit risk.
	JENSEN	The difference between the portfolio return rate and the equilibrium yield calculated from the beta coefficient of the combination, based on the expected return determined by the CAPM model as the benchmark yield.
	SHARPE	The purpose of the Sharpe ratio is to calculate how much excess compensation the portfolio will incur for each unit of risk.
Explanatory Variables	TURNOVER RATE	The frequency of stock exchanges in the market for a certain period of time is usually used to express the liquidity of the portfolio.
	INFORMATION RATE	The information ratio is based on Markwitz's uniform model, which can measure the heterogeneous characteristics of the fund. It represents the excess return brought by the unit's active risk.
Control variable	TOTAL ASSETS	The total asset value of the fund.
	NET ASSETS	The net asset value of the fund.
	TOTAL ASSETS CONVERSION	The total asset change value of the fund this year is divided by the total asset value of the previous year.
	NET ASSETS CONVERSION	The net asset value change of the fund this year is divided by the net asset value of the previous year.

After the unit root test, it is found that each variable is stable. Therefore, this paper does not perform cointegration test for non-stationary economic variables. After the Breusch & Pagan Lagrangian Multiplier, the random effect model was found to be superior to the least squares method. After F test, the fixed effect model was found to be better than OLS model. After Hausman's test, it was found that the fixed effect model is better than the random effect model. So this paper chooses the fixed effect model. After Pesaran and Friedman cross-sectional correlation tests, it was found that the panel data did not have cross-sectional correlation. After Davidson-MacKinnon endogenous testing, it was found that there were no endogenous problems in all variables. After Wald's heteroscedasticity test, it is found that the panel data used in this paper has very significant heteroscedasticity, and it is necessary to consider controlling the heteroscedasticity when building the model.

The regression results are shown in Table-2:

Table-3: Regression Results and Robustness Check

Explanatory Variables	Treynor	Jensen	Sharpe
TR	.0019748**	.0019989*	.0019878**
	(2.01)	(1.78)	(2.21)
IR	.0087104***	.0087134***	.0094379***
	(2.581)	(4.78)	(2.82)
TA	0.0170**	0.0157**	0.0184***
	(2.054)	(2.24)	(8.25)

NA	0.361 （-0.90）	0.252** (2.28)	0.166*** (-7.80)
TAC	-0.000415*** (-8.34)	0.0000193 (1.08)	-0.0000152 (0.89)
NAC	0.0000838*** (7.47)	0.00000180 (-0.60)	-0.00000955 (-1.50)
_CONS	.0497089 (1.33)	.0479089 (1.52)	.0496879** (2.03)
R^2	0.8424	0.8324	0.8487

Note: ***, **, and * denotes significance at 1%, 5%, and 10% significance level, respectively.

Under other conditions, the TR changes by 1 unit, the Treynold index changes by about 0.00197, the Janssen quality changes by about 0.00199, and the Sharpe index changes by about 0.00198. There is a positive correlation between the turnover rate and the Treynor index, and it is significant in the regression; there is a positive correlation between the turnover rate and the Jensen index, and it is significant in the regression; there is a positive correlation between the turnover rate and the Sharp Index, and it is in return. Significantly. It shows that there is a positive correlation between turnover rate and fund performance.

The IR change is 1 unit, the Treynold index changes by about 0.0087, the Jensen quality change is about 0.0087, and the Sharpe index changes by about 0.0094. There is a positive correlation between the information ratio and the Treynold index, and it is significant in the regression; the information ratio has a positive correlation with the Jensen index and is significant in the regression; the information ratio has a positive correlation with the Sharp Index and is significant in the regression. Explain that the information ratio has a positive correlation with fund performance, and when the information ratio is high, the fund performance performs better.

The TA changes by 1 unit, the Treynold index changes by about 0.0170, the Janssen quality changes by about 0.0157, and the Sharpe index changes by about 0.0184. There is a positive correlation between the total assets of the fund and the Treynor index, and it is significant in the regression; the total value of the fund assets has a positive correlation with the Jensen index and is significant in the regression; there is a positive correlation between the total fund assets and the Sharp Index. And significant in the return. Funds showing high fund asset value have better overall performance.

NA changes by 1 unit, the Treynor index changes by about 0.361, the Janssen quality changes by about 0.252, and the Sharpe index changes by about 0.166. There is a negative correlation between the net asset value of the fund and the Treynor index, and it is not significant; there is a positive correlation between the net asset value of the fund and the Jensen index, and it is significant in the regression.

The TAC changes by 1 unit, the Treynor index changes by about -0.000415, the Jensen quality change is about 0.0000193, and the Sharpe index changes by about -0.0000152. There is a negative correlation between the fund asset change rate and the Treynor index, and it is significant in the regression; the total asset change rate has a positive correlation with the Jensen index and is significant in the regression; the total asset change rate has a negative correlation with the Sharp index. And not significant in the return.

The NAC changes by 1 unit, the Treynor index changes by about 0.0000838, the Jensen quality changes by about 0.0000018, and the Sharpe index changes by about -0.00000955. There is a positive correlation between the rate of change in the net asset value of the fund and the Treynor index, and it is significant in the regression; the relationship between the rate of change in net assets and the Jensen index is not significant; the rate of change in net assets is negatively correlated with the Sharpe index and is not significant.

CONCLUSION AND POLICY IMPLICATIONS

Based on the regression results, this paper finds that there is a positive correlation between turnover rate and fund performance, indicating that there is a positive correlation between liquidity risk and fund performance, and when the turnover rate is high, the average yield of asset portfolio is also higher. There is a positive correlation between information ratio and fund performance, and fund performance performs better when the information ratio is higher.

There is a positive correlation between the total value of fund assets and fund performance, indicating that funds with high fund assets have better overall performance. There is a positive correlation between fund net asset value and fund performance, and it is not significant, indicating that the fund's net asset value has nothing to do with fund performance. There is a negative correlation between fund asset change rate and fund performance, and it is significant in partial regression. A foundation that indicates that there is reason to believe that the fund's asset movement rate is high has poor performance. There is a positive

correlation between the fund's net asset value change rate and fund performance, and it is significant in some regressions. It shows that there are reasons to believe that foundations with high fund asset change rates have better performance.

Through research, it can be concluded that there is a certain positive correlation between the liquidity risk of the fund's investment portfolio and the fund's performance. However, both investors and fund managers need to pay attention to the liquidity risk of open-end funds. This paper proposes the following suggestions: For investors, they need to establish a correct investment philosophy. In terms of investment style, we must pay attention to our own risks. Preference. Although high risk means high returns, it also has to bear certain consequences. If investors are committed to pursuing high returns, they can choose funds with high turnover and high performance. They also recommend investors to choose medium-sized funds. For fund managers, they need to develop a reasonable fund manager evaluation system to avoid waste of resources. And the configuration is not reasonable. At the same time, it is necessary to improve the training system of fund managers. A good training mechanism can promote fund managers to replace their own qualities, and continue to learn and improve fund performance. For fund supervision, they need to improve the efficiency of the fund market and have many factors affecting fund performance. And it appears at all levels, but many situations are more complicated. Therefore, the regulatory authorities can establish a scientific and rational supervision mechanism and establish a predictive mechanism for the redemption of open-end fund shares, which will help the healthy development of open-end funds. The open fund share redemption forecasting mechanism can guarantee the fund company's good operation.

In summary, excellent liquidity risk control capabilities are one of the essential elements for an open-end fund to achieve impressive results. Only through the stable operation of the securities market, help fund investors to continuously obtain profits from the securities market, in order to obtain long-term trust of investors, can get more capital inflows from investors, and open-end fund markets and fund management companies can Further development.

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