Timing Ability in Fund of Mutual Funds Placements: Empirical Evidence from China

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ABSTRACT
This paper examines Market timing ability in China's fund of mutual funds placements. We study the Treynor-Mauzy-Busse Model, which evaluate the market return timing and volatility timing at the same time. We use China's fund of funds data and compare empirical results of Treynor-Mauzy Model, Henriksson-Merton Model, Busse Model, and Treynor-Mauzy-Busse model. We find that most China's fund of funds have significant volatility timing ability, but there is not evidence to prove that they have the ability of market timing. The empirical results are consistent with those of previous models.

Keywords: *Fund of mutual funds, Volatility, Timing.*

1. INTRODUCTION

Fund of funds(FOF)—also known as a multi-manager investment—is a pooled investment fund that invests in other types of funds. As for the development of FOF in China, In 2016, the China Securities Regulatory Commission (CSRC) issued operation Guidelines for Publicly Raised Securities Investment Funds No. 2 -- Fund of Funds Guidelines, opening the era of FOF. The Guidelines define FOF as a fund that invests more than 80\% of its assets in mutual fund shares approved or registered by the China Securities Regulatory Commission in accordance with the law. According to CSRC's definition is more accurately called fund of mutual funds(FOMF),.

Most of the research on FOF focuses on the selection of funds. Wolf and Wunderlin used multiple testing methods to select the fund, and found that the resulting FOF portfolios have attractive return properties compared to the 1/N portfolio [1]. Studies have shown that by selecting appropriate funds (skilful fund manager) and time can yield better returns than natural competitor. Lejeune proposed the VaR-Black-litterman model to construct FoFs which imposed by the Value-at-Risk market risk measure, and find it is very efficient [2]. Form a large number of candidate funds, FOF managers face the challenge of picking up a small number of funds that significantly outperform. Nguyen et al. found that FOHF did not outperform the constructed efficient portfolios of hedge funds by using Mean-variance optimization method to construct efficient portfolios of 100 long/short hedge funds with highest Sharpe ratios for each of the selected regions [3]. FOF manager's fund selection ability and timing ability play an important role in fund performance.

Although there are many methods to evaluate fund performance, there are few indicators that can adapt to FOF, especially FOMF. Measuring the timing ability of fund is the core issue concerned by financial theorists in recent years, This paper focused on timing ability of FOMF using several models.

2. MODEL

2.1. Proposed Model

2.1.1. Treynor-Mauzy Model

Treynor-Mauzy model(T-M model) is a traditional quadratic regression model improved by Treynor and Mauzy on the basis of CAPM framework by adding the second order term of market excess returns [4]. The model expression is as follows:

$$r_i - r_f = \alpha + \beta_1 (r_m - r_f) + \beta_2 (r_m - r_f)^2 + \varepsilon \quad (1)$$

The r_i for the return on fund, r_m for the return on the market portfolio, r_f as the risk-free interest rate. β_2 is the timing factor, reflecting the fund manager's timing ability. β_2 is the timing factor, reflecting the fund manager's timing ability.

Y. Jiang et al. (Eds.): ICEDBC 2022, AEBMR 225, pp. 1080–1084, 2022.
https://doi.org/10.2991/978-94-6463-036-7_159

It can be seen that: if $\beta_2 > 0$, it shows that the fund manager has an overall grasp and judgment of the whole market by virtue of personal professional quality, can see the future trend, the fund manager is able to choose the time; Otherwise, it indicates that fund managers have yet to be strengthened in terms of professional literacy and experience, and cannot judge their advantages in timing ability.

2.1.2. Henriksson-Merton Model

Henriksson-Merton Model is the attribution model proposed by Henriksson and Merton [5]. This model is a binomial random variable model based on a simpler explanation of Treynor-Mauzy Model, and the model expression is as follows:

$$r_i - r_f = \alpha + \beta_1 (r_m - r_f) + \beta_2 (r_m - r_f) I_{(r_m > r_f)} + \varepsilon \quad (2)$$

and

$$I_{(r_m > r_f)} = \begin{cases} 1 & r_m > r_f \\ 0 & r_m \le r_f \end{cases} \quad (3)$$

r_i for the return on fund, r_m for the return on the market portfolio, r_f as the risk-free interest rate. I is a dummy variable, $I=1$, when $r_m > r_f$, $I=0$, when $r_m \leqslant r_f$, α still represents the fund manager's fund selection ability, while β_2 represents the fund manager's timing ability, reflecting the fund manager's ability to grasp the market trend to increase the proportion of risk assets when the overall market trend is rising, as can be seen: If $\beta_2 > 0$, it shows that the fund manager has a positive timing ability.

2.1.3. Busse Model

Busse Model was proposed by Busse based on the research of market volatility [6]. Busse believed that it was easier for fund managers to judge based on market volatility than on market trend, so the timing ability of funds could be measured from the perspective of volatility.

When fund managers think volatility will rise, they reduce their funds' exposure to the market. It can improve the performance of the fund without adding additional risk. Therefore, the model expression of Busse model is as follows:

$$r_t - r_f = \alpha + \beta_1 (r_m - r_f) + \gamma (\sigma_{mt} - \overline{\sigma_m} (r_m - r_f)) + \varepsilon \quad (4)$$

r_i for the return on fund, r_m for the return on the market portfolio, r_f as the risk-free interest rate. α represents the fund selection ability of the fund manager, β_1 represents the market risk borne by the portfolio, and γ represents the volatility timing factor. σ_m is the market volatility and $\overline{\sigma_m}$ is the average market volatility.

If $\gamma > 0$, it indicates that the fund manager has positive volatility timing ability, that is, can predict market fluctuations and make positive trading behaviour.

2.1.4. Treynor-Mauzy-Busse Model

Because the Busse model does not consider the return timing ability, the prediction of market volatility based on the fund manager's volatility timing ability is related to the prediction of market return trend in return timing ability. Therefore, in the empirical aspect, Yu combined T-M model and Busse model, added fluctuation timing factor on the basis of T-M model, distinguished return timing ability and fluctuation timing ability, and formed the T-M-B model [7]. The model expression is as follows:

$$\mathrm{R_t} = \alpha + \beta_1 \mathrm{R}_m + \beta_2 \mathrm{R}_m{}^2 + \gamma (\sigma_{mt} - \overline{\sigma_m} \mathrm{R}_m) + \epsilon \quad (5)$$

and

$$\mathrm{R_m} = r_\mathrm{m} - r_f \quad (6)$$

$$\mathrm{R_t} = r_\mathrm{t} - r_f \quad (7)$$

r_i for the return on fund, r_m for the return on the market portfolio, r_f as the risk-free interest rate. $\mathrm{R_t}$ represents the excess of the fund's return over the risk-free interest rate, $\mathrm{R_m}$ represents the excess of the market portfolio over the risk-free interest rate.

α represents the fund manager's fund selection ability, β_1 represents the market risk borne by the portfolio, β_2 represents the return timing factor, represents the fund manager's return timing ability. γ is the volatility timing factor, indicating the volatility timing ability of the fund manager. σ_m is the market volatility and $\overline{\sigma_m}$ is the average market volatility.

3. MODEL SELLECTION

The above empirical methods are commonly used by scholars at home and abroad to evaluate the timing ability of FOMF, and each has its own advantages and disadvantages. In order to ensure the rigor of the study, this paper will select T-M model, H-M model, Busse model and T-M-B model, and analyse their consistency.

Table 1. Definition of variables

Variable	Definition
r_i	The weekly return on FOMF.
r_m	The weekly return on the market portfolio.
r_f	The risk-free interest rate.

σ_{mt}	The market portfolio volatility of week.
$\overline{\sigma_m}$	The average of market portfolio volatility.

4. DATA

The samples selected in this paper are all from China's FOMF. Considering that investors pay more attention to the long-term performance of FOMF, this paper selects 133 FOMFs established before December 1, 2019 for empirical study, and the sample selection time is From December 1, 2019 to March 4, 2022. A total of 116 weekly data. All data in this article were taken from the Choice Financial database.

According to the existing weekly data, stata software was used to calculate the mean, standard deviation, skewness and kurtosis of the weekly returns of 133 FOF. According to the statistical results, the average return of 133 FOMFs is positive, among which 131 FOMFs is positive, and only 2 funds are negative. The maximum value is 0.42. In terms of the skewness value, the skewness of most FOMFs is negative, indicating that there are many sample values and negative extreme values in FOMF returns data that are less than the average value.

4.1. Rate Of Fund Return

In this paper, the rate of return can better reflect the net growth of the fund interval net growth ratio. The formula is as follows:

$$r_{pt} = \frac{NAV_{p,t} + D_{pt}}{NAV_{p,t-1}} \tag{8}$$

$NAV_{p,t}$ represents the unit net value of $FOMF_p$ in the first T period,$NAV_{p,t}$ represents the unit net value of $FOMF_p$ in the $T-1$ period, and $D_{p,t}$ represents the dividend of fund.

4.2. Rate Of Market Portfolio Return

Since the investment object of FOMFs are mutual funds, this paper selects CSI Open-end Fund Index (H11020.CSI), which reflects the overall performance of China's mutual fund market, as the market benchmark yield.

4.3. Risk-free Interest Rate

Combined with the domestic and foreign financial markets, the setting of risk-free interest rate is studied, and the actual situation of China's financial market is considered. In the empirical study of this paper, the one-year bank time deposit interest rate is taken as the risk-free rate, and the weekly rate of return is calculated by 52 weeks per year for the empirical study.

4.4. Market Volatility

In this paper, weekly market volatility is measured using the existing calculation method of Volatility proposed by Anderson (1998), and the formula is as follows:

$$\sigma_{mt} = \left[\sum_{n=1}^{n} (r_{mit} - \overline{r_{mt}})^2\right]^{\frac{1}{2}} \tag{9}$$

r_{mit} represents the FOMF return on the day i of week t, and $\overline{r_{mt}}$ represents the average return, there are n transactions during this week.

5. EMPIRICAL RESULTS

5.1. Empirical Results

5.1.1. T-M Model

As shown in empirical results, the empirical results of shows that the mean value of R^2 of 133 FOF is 0.5567, and the coefficient of β_2 is negative, and only 40 FOF are significant, indicating that there is not enough reason to show that FOMFs have the ability to timing returns.

5.1.2. H-M Model

The empirical results of H-M model shows that the mean value of R^2 of 133 FOF samples is 0.5525, and the coefficient of β_2 is negative. Only 33 empirical samples are significant. It also shows that there is not enough reason to justify the return timing capability of FOMF. The empirical results of T-M model is consistent with H-M model in the test of return timing ability.

5.1.3. Busse Model

The empirical results of Busse model show that the average value of R^2 of 133 FOF is 0.6055, Most of the value of γ_1 is positive and significant at the level of 1%. The empirical results indicate that FOMF has significant positive volatility timing ability.

5.1.4. T-M-B Model

The empirical results of T-M-B model show that the mean value of R^2 of 133 FOF is 0.6088, and the value of β_2 of most of the empirical samples is negative and not significant. Only a few funds have significant positive return timing ability. The empirical results of T-M-Busse model is consistent with the T-M model and H-M model, and there is not enough evidence that FOMF has the ability of return timing.

As for volatility timing, most of the empirical samples have positive values of γ_1 and are significant at the 1% level. The empirical results of T-M-B model agree with

those of Busse model. Most FOMFs have positive volatility timing.

The empirical results of the test models show that most Chinese FOMFs do not have the ability of return timing, but have a significant and positive ability of volatility timing. The empirical results are consistent with Yu studies [7].

What is noteworthy is that we find that individual funds have significant positive return timing ability, but do not have volatility timing ability. There seems to be a substitution relationship between return timing ability and volatility timing ability.

5.2. Empirical Results By Kinds

In order to explore the differences in timing ability of different types of FOMF, this paper conducts classification tests on sample data. In this study, T-M-B model and Busse model will be used to classify the sample numbers according to the fund classification standards of China Securities Regulatory Commission (CSRC) (Qualified Domestic Institutional Investor,(QDII), the mutual fund of skewer-stock, the mutual fund of skewer-debt, balanced mutual fund).

5.2.1. Stationarity test

As the samples are classified for empirical analysis, The data is panel data, and a series of relevant tests are required to determine whether they meet the prerequisite conditions of panel data regression.

According to the results of *ADF* test, *P* values of all variables are less than 0.01, indicating that the sequence of all variables is stable.

5.2.2. Model selection of panel data

Since panel data is used, we use Hausman test for model selection of panel data.

The results of Hausman test show that the fixed effect model is suitable for samples.

In this section, we use fixed effect model for empirical test.

Table 2. Empirical results by kinds

	T-M-B model	
Categories of FOMF	Return timing	Variable timing
The mutual fund of skewer-debt	0.00674**	0.979***
	(0.00295)	(0.0386)
The mutual fund of skewer-stock	0.00150	0.846***
	(0.00610)	(0.0386)
Balanced mutual fund	0.00712*	0.844***
	(0.00428)	(0.0355)
Qualified domestic institutional investor	-0.0656***	0.511***
	(0.0180)	(0.0677)

As shown in the following table of classification regression results, according to classification test results, FOMF of all categories do not have sufficient evidence to prove that they have return timing ability, but they all have volatility timing ability, which is consistent with the empirical results above. Only a few funds have significant positive return timing ability, there seems to be a substitution relationship between return timing ability and volatility timing ability. Among them, the mutual fund has similar volatility timing ability, and the mutual fund of skewer-stock, skewer-debt and balanced mutual fund has basically the same volatility timing ability, and the mutual fund of skewer-debt has the strongest volatility timing ability.

6. CONCLUSION

The empirical research results in this paper show that the timing ability of FOMF is mainly reflected in the variable timing ability. Neither T-M model nor H-M model can prove that FOMF has the return timing ability, and the test results of the two models are consistent, which also conforms to the previous research results, deepening our judgment that FOMF does not have the return timing ability. The empirical test results of Busse model show that almost all FOMF have significant positive volatility timing ability. In the test of T-M-Busse model, t-M-Busse model evaluates both the return timing ability and volatility timing ability of FOMF. The empirical results are consistent with t-M model, H-M model and Busse model. The empirical results strengthen our understanding of T-M-Busse model.

The conclusion of this study is similar to that of existing domestic studies, which confirms that the timing ability of China's FOMFs is mainly reflected in variable timing ability. And almost all China's FOMFs have positive volatility timing ability.

AUTHORS' CONTRIBUTIONS

Cheng He: Conceptualization, Methodology, Software, Formal analysis, Writing - Original Draft.

ACKNOWLEDGMENTS

Throughout the writing of this dissertation I have received a great deal of support and assistance.

I first would like to I would like to acknowledge Professor, Dr. Li Xingrong. whose suggestions and encouragement have given me much insight into these studies.

I particularly would like to Mr. Wang Zhiqiong, for inspiring my interest in the development of model.

I also would like to Mr. Feng Zhenghua, for pushing me to sharpen my thinking and bring my work to a higher level.

In addition, I would like to thank my parents for their wise counsel and sympathetic ear. You are always there for me.

Finally, I am really grateful to all those who devote much time to reading this thesis and give me much advice, which will benefit me in my later study.

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