

Research on the Asymmetric Effect of the Graded Fund's Return Rate

Min Li¹, Junyi He², Lichao Tao¹, Qianhan Zhang²

¹Zhejiang College of Construction, Hangzhou 311231, Zhejiang, China

²Zhejiang University of science and Technology, Hangzhou 310023, Zhejiang, China

*Corresponding Author.

Abstract

In order to study the asymmetric effect of the tiered fund returns, the GARCH family model is introduced to improve the volatility and Monte Carlo simulation is used to price it. First, select China International Finance Shanghai 50 Index (stock funds) and E Fund Juying Index (bond funds) classified fund of funds as the research objects, and use the trading days between the two conversion days as the sample period, and then the GARCH family model fitting Volatility; finally pricing it with Monte Carlo simulation taking into account asymmetric effects. The results show that: asymmetry exists in the return rates of E Fund Juying Index and China International Finance SSE 50 Index Fund of Funds. Both E Fund Juying Index Fund of Funds and China International Financial SSE 50 Index Fund of Funds have more obvious response to the good news, and after considering the asymmetric effect of the rate of return, a better pricing effect is obtained.

Keywords: GARCH family model, Asymmetry, Grading Fund pricing, Monte Carlo simulation, Fund

I. Introduction

Tiered funds did not appear in China until 2007, and they are relatively young products. Therefore, there is little research on the asymmetric effect of tiered fund returns in China. Domestic scholars' research on asymmetric effects is mainly based on GARCH models, and the main research objects are Shanghai Composite Index, Shibor, stock index futures and spot. Dong Lili[1] used the EGARCH model to prove that there is an asymmetric effect in the volatility of the Shanghai Stock Exchange Index, and that the positive impact will have a greater impact on the stock index when the price fluctuates sharply downwards; Bi Pengcheng[2] found that the correlation between stock index futures and spot markets has asymmetric effects, and the reaction to bad news is more obvious Under the ADCC-EGARCH model; Zhang Shengjie[3] used the asymmetric GARCH family model found that bad news has a greater impact on the SME board of the Shanghai stock market, the main board of the Shenzhen stock market and the ChiNext. Wang Dongyong[4] studied the Shibor overnight interest rate and other asymmetric effects under the GARCH family model, and found that the bad news and other images are larger; In addition to using GARCH models, Chen Lifeng[5] built a dynamic stochastic general equilibrium model and found that bank credit screening makes monetary policy asymmetric; Chen Hao[6] found that media sentiment has an asymmetric effect on the relative return of individual stocks based on the dynamic threshold model; Also, Liu Jingyi[7] used the generalized forecast error variance decomposition method to study the obvious asymmetric effect of volatility spillovers between industries in the stock market.

Since 2020, the fund market has been soaring. Data show that the post-90s generation accounted for more than half of the "new foundations". Fund investment is gradually shifting from wealth management products to social media. A graded fund is a structured fund. According to different risks and returns, it is divided into A shares with lower risk and return and B shares with higher risk and return. Therefore, the biggest difference between a graded fund and a general fund is that the purchaser can base on its own Risk appetite to buy fund shares with different risks. At present, there are three main methods for pricing financial derivatives such as tiered funds: Black-Scholes model pricing method, binomial model pricing method and Monte Carlo simulation method. John[8] introduced these three pricing methods. In order to study the asymmetric effect of tiered fund returns, this paper uses Tgarch and Eggarch models to improve volatility and uses Monte Carlo simulation to price it.

II. Model introduction and sample selection

2.1 Model

The GARCH model was proposed by Boleslov in 1986. It is a model based on the aggregation characteristics of volatility, that is, there is a certain relationship between current volatility and past volatility. The generalized autoregressive conditional heteroscedasticity model (GARCH model) is proposed on the basis of the ARCH model. It is believed that the variance of the error term depends on the error term itself in addition to its past variance. Because the GARCH model is not a The problem of symmetric effects is not applicable. Nelson and Zakoian proposed the Tgarch model and the Eggarch model in 1991 and 1994, respectively, which can study the asymmetric effects of financial asset returns. Therefore, this paper introduces the Tgarch and Eggarch models to improve the performance of tiered funds. Volatility. The general expressions of the model are as follows:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^r r_i \varepsilon_{t-i}^2 d_{t-i} + \sum_{i=1}^q \beta_i \sigma_{t-i}^2 ; \ln(\sigma_t^2) = \alpha_0 + \sum_{i=1}^p \alpha_i \frac{|\varepsilon_{t-i}|}{\sigma_{t-i}} + \sum_{i=1}^r \gamma_i \frac{\varepsilon_{t-i}}{\sigma_{t-i}} + \sum_{i=1}^q \beta_i \ln(\sigma_{t-i}^2) \quad (1)$$

2.2 Sample selection

Select China International Finance Shanghai 50 Index and E Fund Juying as sample funds. In order to eliminate the impact of the fund conversion mechanism, the trading day between the two conversion dates is selected as the sample period. The sample periods are: May 2, 2018 to April 26, 2019 and November 7, 2018 to November 8, 2019. The data comes from the wind financial database.

III. Empirical Research

In order to test the asymmetric effect of tiered funds, the ARCH effect test was first performed on the data of Yifangda Juying Index and China National Finance Shanghai 50 Index. The test results show that there is an ARCH effect in the return series, so we continue to use the GARCH family model to fit the volatility and obtain the model expression of the volatility. Finally, after considering the asymmetric effect, Monte Carlo simulation is used, and the selected simulation path is 1000 to price the tiered funds.

3.1 ARCH effect test

Take E Fund Juying Index Fund of Funds and China International Finance Shanghai 50 Index Fund of Funds as examples to use GARCH family models to improve volatility. First, the residuals are tested by ARCH-LM, and the results are as table 1 and table 2:

Table 1 ARCH test results of E Fund Juying index fund of funds

variable	value	Standard error	t value	P value
C	4.64E-34	7.03E-34	0.634 5	0.526 4
Resid ² (-1)	0.997 018	0.00546 6	182.403 6	0
R ²	0.992 720	Mean of dependent variable	1.28E-35	
Adjusted R ²	0.992 690	Standard deviation of dependent variable	5.37E-35	
Regression standard deviation	4.42E-34	SSR	4.89E-64	
F statistics	33271.06	D-W test	1.821662	
P(F statistics)	0			

Table 2 ARCH test results of Guojin SSE 50 index fund of funds

variable	value	Standard error	t value	P value
C	2.95E-35	1.22E-35	2.416 25	0.0164
Resid ² (-1)	0.899 612	0.027956	32.179 31	0
R ²	0.809 302	Mean of dependent variable	2.94E-34	
Adjusted R ²	0.808 52	Standard deviation of dependent variable	3.15E-35	
Regression standard deviation	1.42E-34	SSR	4.98E-67	
F statistics	1035.508	D-W test	2.395 891	
P(F statistics)	0			

The ARCH effect test results show that the p value is 0, rejecting the null hypothesis, indicating that the return series of Yifangda Juying and Guojin 50 have heteroscedasticity, that is, the ARCH effect. Therefore, the GARCH family model can be further used to improve the volatility.

3.2 Model building

Table 3 Estimation results of GARCH (1,1) model of E Fund Juying index fund of funds

variable	value	Standard error	t value	P value
Constant	4.54e-07	0.441e-07	2.27	0.659
GARCH(-1)	0.872	0.0330	0.0369	0
Resid ² (-1)	0.103	0.0369	2.79	0

Model estimation results:

$$\sigma_t^2 = 4.54 \times 10^{-7} + 0.103 \times \varepsilon_{t-1}^2 + 0.872 \sigma_{t-1}^2 \quad (2)$$

Table 4 Estimation results of GARCH (1,1) model of Guojin SSE 50 index fund of funds

variable	value	Standard error	t value	P value
Constant	6.73e-06	2.97e-06	2.26	0.023 2
GARCH(-1)	0.911	0.0407	22.3	0
Resid ² (-1)	0.0457	0.0253	1.81	0

Model estimation results:

$$\sigma_t^2 = 6.73 \times 10^{-6} + 0.0457 \times \varepsilon_{t-1}^2 + 0.911 \sigma_{t-1}^2 \quad (3)$$

It can be seen from Tables 3 and 4 that all parameters have passed the test, and the coefficients of the ARCH term and the GARCH term satisfy the sum of less than 1, which conforms to the stationary sequence constraint.

Table 5 Estimation results of TGARCH (1,1) model of E Fund Juying index fund of funds

variable	value	Standard error	t value	P value
RESID(-1) ²	0.249	0.105	2.36	0.0018
RESID(-1) ² * (RESID(-1) < 0)	-0.0467	0.109	-0.429	0.00000
GARCH(-1)	0.743	0.0633	11.7	0.00000

Model estimation results:

$$\sigma_t^2 = 8.82 \times 10^{-7} + 0.249 \times \varepsilon_{t-1}^2 - 0.0467 \varepsilon_{t-1}^2 d_{t-1} + 0.743 \sigma_{t-1}^2 \quad (4)$$

Table 6 Estimation results of TGARCH (1,1) model of Guojin SSE 50 index fund of funds

variable	value	Standard error	t value	P value
RESID(-1)^2	0.0503	0.0564	0.892	0.0016
RESID(-1)^2 *(RESID(-1)<0)	-0.0357	0.0822	-0.434	0.00000
GARCH(-1)	0.915	0.0597	15.3	0.00000

Model estimation results:

$$\sigma_t^2 = 7.36 \times 10^{-6} + 0.0503 \times \varepsilon_{t-1}^2 - 0.0357 \varepsilon_{t-1}^2 d_{t-1} + 0.915 \sigma_{t-1}^2 \quad (5)$$

From Tables 5 and 6, it can be concluded that the asymmetry coefficient of E Fund Juying Index Fund of Funds, that is, the threshold coefficient is -0.046723 is not equal to 0, and the P value is 0 at the 5% significance level, indicating that the return rate sequence has Asymmetric effect and anti-leverage effect. Based on this, it can be judged that the impact of good news and bad news on the Yi Fangda Juying Index FOF yield is different, and the impact of good news is greater than that of bad news. Said that when the good news brings a 0.248516 times impact to the E Fund Juying Index Fund of Funds, the bad news brings a 0.201793 times impact to the E Fund Juying Index Fund of Funds; similarly, the asymmetry of the China National Financial SSE 50 Index Fund of Funds The term coefficient, that is, the threshold coefficient of -0.035702 is not equal to 0, and the P value is 0 at the 5% significance level, indicating that the return rate sequence has an asymmetric effect and an anti-leverage effect. Based on this, it can be judged that good news and bad news are The impact of the IFC SSE 50 Index of Funds of Fund's yield is different, and the impact of good news is greater than the bad news. Specifically, when the good news brings a 0.05309 to the IFC SSE 50 Index of Funds of Funds At the time of the shock of times, the bad news brought a 0.014607 times shock to the China International Finance SSE 50 Index Fund of Funds.

Table 7. Estimation results of EGARCH (1,1) model of E Fund Juying index fund of funds

variable	value	Standard error	t value	P value
C(2)	-0.0995	0.172	-0.580	0.0005
C(3)	0.0546	0.0589	3.07	0.0021
C(4)	0.181	0.0374	1.46	0.0001
C(5)	0.992	0.0146	67.9	0.0000

Model estimation results:

$$\ln(\sigma_t^2) = -0.0995 + 0.0546 \frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} + 0.181 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + 0.992 \ln(\sigma_{t-1}^2) \quad (6)$$

Table 8. Estimation results of EGARCH (1,1) model of Guojin SSE 50 index fund of funds

variable	value	Standard error	t value	P value
C(2)	-0.0102	0.119	-0.00862	0.0009
C(3)	0.00745	0.0321	2.32	0.0002
C(4)	0.0619	0.0234	2.64	0.0008
C(5)	0.999	0.0137	73.2	0.0000

Model estimation results:

$$\ln(\sigma_t^2) = -0.0102 + 0.00745 \frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} + 0.0619 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + 0.999 \ln(\sigma_{t-1}^2) \quad (7)$$

It can be seen from Tables 7 and 8 that the asymmetry coefficient of E Fund Juying Index Fund of Funds, that is, the threshold coefficient is 0.181 094 61, which is not equal to 0, and the P value is 0.0001 at the 5% significance level, indicating the rate of return The sequence has an asymmetric effect and an anti-leverage effect. Based on this, it can be judged that the impact of good news and bad news on the Yi Fangda Juying Index FOF yield is different, and the impact of good news is greater than that of bad news. Specifically, when the bad news brought an impact of 0.235 740 52 times to the E Fund Juying Index Fund of Funds, the good news brought an impact of 0.126 448 7 times to the E Fund Juying Index Fund of Funds; similarly, the National Financial SSE 50 The asymmetry coefficient of the index fund of funds, that is, the threshold coefficient is 0.0618 72, which is not equal to 0, and the P value is 0.0008 at the 5% significance level, indicating that the return rate sequence has asymmetric effects and anti-leverage effects, which can be judged The impact of good news and bad news on the yield of the China International Finance SSE 50 Index of Fund of Funds is not the same, and the impact of good news is greater than that of the bad news. Specifically, when the bad news affects the China International Finance SSE 50 Index When the fund of funds brought an impact of 0.0693 306 times, the good news brought an impact of 0.0544 134 times to the IFC SSE 50 Index Fund of Funds.

3.3 Pricing results considering asymmetric effects

The initial value is the net value of the closing price of the International Financial SSE 50 Index and E Fund Juying Fund on the starting date of the valuation. The volatility of the day before the sample date is taken as the historical volatility, and the time interval = 1/the total number of working days during the sample period is 1/247. The random seed number is set to 10000, and the simulation path is 1000. Based on this, use MATLAB software to program the price. The result is as follows:

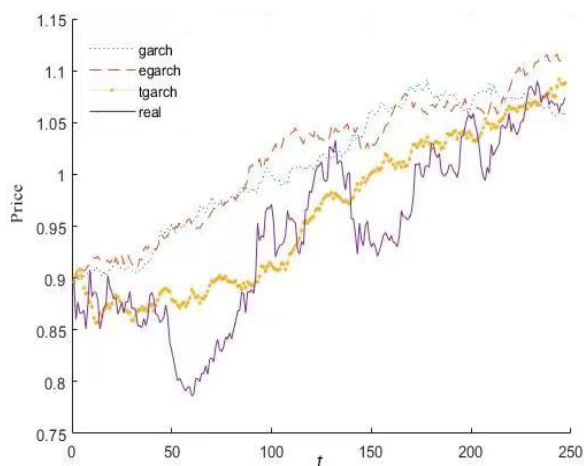


Fig.1 Pricing results of E Fund Juying index fund of funds

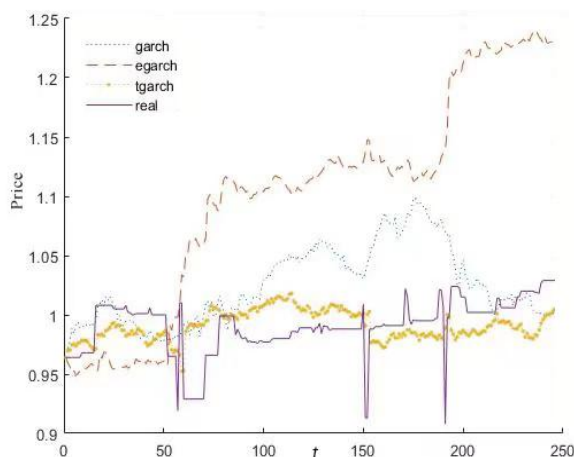


Fig.2 Pricing results of Guojin SSE 50 index fund of funds

It can be seen from Figure 1 and Figure 2 that the price trends of E Fund Juying Index Fund of Funds and China National Finance SSE 50 Index Fund of Funds are relatively stable. After using GARCH to fit the volatility, the true trend can be roughly fitted, especially It shows a better fitting effect in the later period of the sample period. After considering the asymmetric effect, the introduced TGARCH and EGARCH models have a better fitting effect, especially when the price of the fund of funds rises or falls relatively quickly, at this time, it shows obvious asymmetric effects.

IV. Conclusion

Combining this research with practice, we select stock-type and bond-type grading funds as the objects respectively to study the asymmetry in the return rate of grading funds. In the empirical work, the GARCH family model is used to fit the volatility and Monte Carlo simulation is used to price it. The results show that the asymmetry of the return rate exists in the E Fund SSE 50 Index and Sino Financial SSE 50 Index Fund of Funds. The Fund of Funds of the Sino Financial SSE 50 Index and the E Fund SSE 50 Index are more sensitive to good news and are considering The asymmetry effect will get a better pricing effect in the future. Analyzing the reasons for the more significant response to the good news in the sample funds, I think there are mainly the following: First, most of the investors who invest in my country's tiered funds are retail investors and are gradually showing a younger trend, and their investment psychology and risk awareness are not mature enough. , And the short-term operation is the main reason, which has increased the instability of the market, and the reaction of the new citizens to the good news is often greater than the reaction to the bad news, resulting in the asymmetric effect of the sample graded funds; the second is that the graded funds are in The appearance of my country is relatively short, the market is still very immature compared to foreign countries, and most investors do not have relevant professional knowledge, which is prone to "herd effect". After that, we will continue to study other characteristics of tiered funds, and continue to enhance investors' understanding of tiered funds.

In the past ten years or so, the scale of the development of graded funds in my country is obvious to all. The number of graded funds is also rising sharply. Naturally, some risky graded fund products will be mixed among them, which will affect the judgment of investors. Destroy the stability of the financial market. In this regard, the following suggestions are put forward: consolidate the governance structure of tiered funds, including the company director system, independent principal system, and the company's restraint and incentive mechanism; strengthen the tiered fund supervision mechanism, conduct dynamic and comprehensive supervision of the tiered fund market, and strengthen the company's Supervision; improve the construction of the hierarchical fund system, and improve the

innovation capability of hierarchical fund products.

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