Prediction of Fund Unit Net Value Based on H-P Filtering Method—Take NOHAIN Growth Hybrid Fund as an Example

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Abstract: In recent years, various types of funds, mainly investment funds, have developed rapidly in the global financial market. The unit net value of fund can reflect its income status and use it as a criterion for whether to buy and which fund to buy. Therefore, the research on the unit net value of fund has important application value. The H-P filtering method is a time series analysis method in the state space, which is equivalent to the minimization of the fluctuation variance. This article is based on the H-P filtering analysis to predict the unit net value of fund. First obtain the volatility trend of NOHAIN Growth Hybrid Fund, and then establish the OLS regression model and the Tobit regression model to obtain the OLS regression fitting equation and the Tobit regression fitting equation. We respectively predicted the unit net value of fund after extending different periods under the two regression models, and compared the results of the two regression methods to obtain the same prediction results, thus verifying that the model has good robustness.

1. Introduction

Funds, as an important product in modern financial derivatives, broadly refer to a certain amount of funds set up for a certain purpose, including investment funds, provident funds, insurance funds, retirement funds, etc. This article focuses on investment funds. Investment funds, also known as mutual funds or mutual funds, are institutions that raise capital through the public offering of fund shares and then invest in securities. They are managed by fund managers, fund custodians custody, and conduct securities investment activities in the form of asset portfolios, which are fund shares. Service for the interests of the holder. For convenience, hereinafter referred to as investment funds as funds.

This article mainly studies the forecast of the unit net value of fund. In recent years, the fund has been highly sought after by the public, and it has a certain effect on the prosperity of the macro economy and financial markets. Studying the unit net value of fund not only allows the masses to choose whether to purchase the fund objectively, but also analyzes and predicts the current macroeconomic situation through the trend of the unit net value of fund. However, there are few researches on the net value prediction of domestic funds at present, so this issue still needs to be discussed in depth.

In this paper, based on the HP filter, data collection and processing and simple descriptive statistics in stata them in the HP filter analysis; secondly using OLS regression and Tobit regression net value of fund units to make a prediction, and robustness test; finally summarize the research conclusions and research prospects of this article based on the results.

2. Literature review

2.1 Financial products and financial derivatives

At present, domestic and foreign scholars mainly study financial products and related issues as bank credit (Lu Feng&Cui Na, 2021; Yu Zhaopeng, 2021), bank savings (Liu Zhonglu&Zhao Jing, 2019), etc. On the whole, scholars' research on financial products has become mature. With the continuous and in-depth development of the international financial system, financial derivatives have become popular, and various studies have also begun.

Striving for the research of financial derivatives, the main research directions of existing scholars are financial derivatives risk management (Cheng Enyuan, 2019; Duan Junshan&Zhang Ruihao, 2016).Financial derivatives Analysis of product value fluctuations (Hua Yutao, 2021).Due to the substantial increase in public attention to funds in recent years, research on funds as the mainstay dominates in various financial derivatives. Including fund risk management (Fu Xingzhong, 2020), fund pricing (Lin Chengwang, 2018), fund income forecast (Dong Yi, 2021) and fund index forecast (Lu Haixia, 2019), etc.

2.2 Fund's net worth forecast

2.2.1 Theoretical research on the prediction of the net value of the fund

Modern scholars have established their own theoretical models before conducting empirical analysis on fund net value prediction. Jing Yang (2016) used the wavelet theory, combined the wavelet multi-resolution analysis theory with the ARMA-GARCH model, and constructed a wavelet ARMA-GARCH fund net value prediction model. The wavelet power spectrum analysis method provides a method to analyze the distribution of fund volatility and its correlation with market volatility from the perspective of time-frequency domain, it has certain reference significance for fund performance evaluation and supervision.

2.2.2 Research method to predict the unit net value of fund

Data collection and empirical analysis are indispensable in the study of fund net value forecasting. Wang Yuhang and Zhang Qinglong(2019)are based on the data of HSBC Jinxin 2026 Cycle Hybrid Fund from January 4,2016 to March 23,2018, after normalizing it, the GA-BP neural network model was used to predict the net value of fund.Jiang Shiyin and Chen Xi selected HSBC Jinxin 2016 and Dacheng 2020 two complete cycles of fund data for analysis. After completing various tests on the data, they established the EGARCH model, the improved Carhart four-factor model, and the BP neural network model. Carry out VaR value calculation, performance evaluation and net value prediction.

2.3 Literature review

In summary, a large number of existing financial products and financial derivatives' researches, especially funds, have provided the basis and ideas for the research of this article. Although scholars have done a lot of researches on funds, in recent years there has been less research on the net value of funds forecasting, and domestic related researches are even rarer Since most of the research years of fund net value predictions are far away, in terms of data collection, some studies have large deviations in the prediction results due to insufficient samples; they are relatively old in terms of theoretical construction and research methods. For example, some research models need to determine the index weights in advance, the subjective effects of large man-made, and lack of timeliness. Moreover, the continuous deepening of financial market reforms has also had an impact on the development of various financial products and derivatives. As a financial derivative product that has developed rapidly in recent years, funds have always been innovating with the development of the times. The theoretical construction and research methods should also keep up with the current situation and conform to the current actual situation.

Therefore, compared with previous studies, this article analyzes the fund according to the current macroeconomic situation and the latest data obtained, and uses the H-P filtering method to predict its unit net value under the condition of ensuring sufficient samples. Most of the existing scholars use BP neural network model to predict the net value of funds, but HP filtering method is rarely used in the research of fund net value prediction, so it has been supplemented on the basis of the original research methods, and this the method does not need to assign index weights, and the human influence is small, and the predicted result can be closer to the actual result under the condition of removing the force majeure.

3. Introduction and research data of NOHAIN Growth Hybrid Fund

3.1 Introduction to the Fund

NOHAIN Growth Hybrid Fund (320007) is established in a common hybrid open-end funds March 10, 2009, the expected risks and returns are lower than stock funds and higher than bond funds. Its net assets are as high as 32.776 billion, ranking 4088 in the past three months. In terms of asset allocation, the combination of long-term allocation(SAA)and short-term asset allocation(TAA) is mainly adopted; In terms of stock investment, the proportion of its investment in growth companies is not less than 80% of its holdings of stock assets; In terms of bond investment, it implements interest rate forecasting strategies, yield curve simulation strategies, yield premium strategies, individual bond valuation strategies and risk-free arbitrage strategies; In terms of warrant investment, it mainly uses value discovery and spread strategy. In recent years, NOHAIN Growth Hybrid Fund has performed outstandingly in terms of performance. Compared with the performance trend of the "Shanghai Stock Exchange" index, its excess return is about 85%.Its volatility trend is more stable than other funds, and the objectivity of the predicted results is lower. Therefore, this article chooses NOHAIN Growth Hybrid Fund and uses it as an example for research.

3.2 Research data

3.2.1 Data sources

The research object is the unit net value of NOHAIN Growth Hybrid Fund. The online data collection is used to find the research object that fits this time-NOHAIN Growth Hybrid Fund on the official website, and the historical net value section is found on its homepage. The sample data selects the daily unit net value data of NOHAIN Growth Hybrid Fund from March 10, 2020 to March 9, 2021, and the net unit value data for a total of 243 days after deducting non-trading days.

3.2.2 Descriptive Statistics

According to the purpose of the research, this paper sets up 2 variables, among which the unit net value is the dependent variable and the date is the independent variable. This paper uses stata software to plot the unit net value and descriptive statistical analysis. The descriptive statistics are as follows:

Table 1 Descriptive statistics of the unit net value of fund

Variable	Obs	Mean	Std. Dev .	Min	Max
Unit net worth	243	1.68	0.20	1.01	2.24

It can be seen from the table that the mean value of the variable unit net value is 1.68, and the standard deviation is 0.2.The minimum value is 1.01, which is formed on the 62nd day, June 9, 2020; the maximum value is 2.24, which is formed on the 85th day, July 14, 2020.
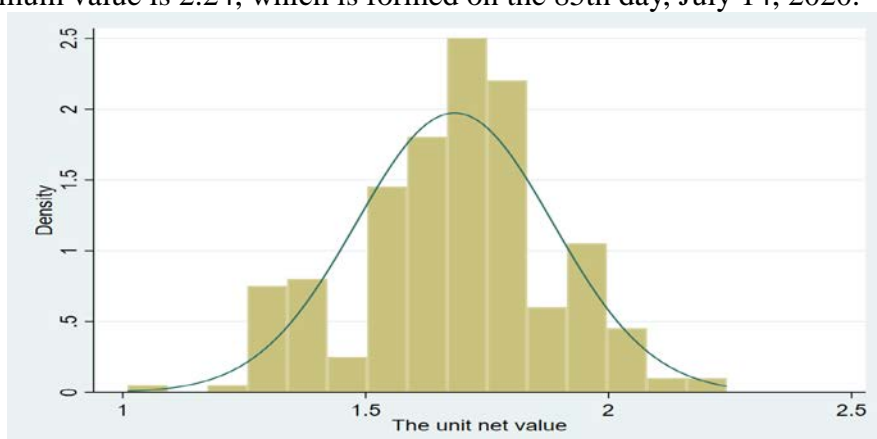

Figure 1 Histogram of Unit Net Value Distribution of NOHAIN Growth Hybrid Fund

4. Empirical analysis of fund forecast

4.1 The short-term and long-term trends of the unit net value of fund based on the H-P filtering method

Using the daily unit net value data of NOHAIN Growth Hybrid Fund from March 10, 2020 to March 9, 2021, the H-P filtering method is used for analysis.

Since the data selected in this article are annual data, so take $\lambda = 100$, and the obtained H-P filter diagram of the net unit value of fund is shown in Figure 2.
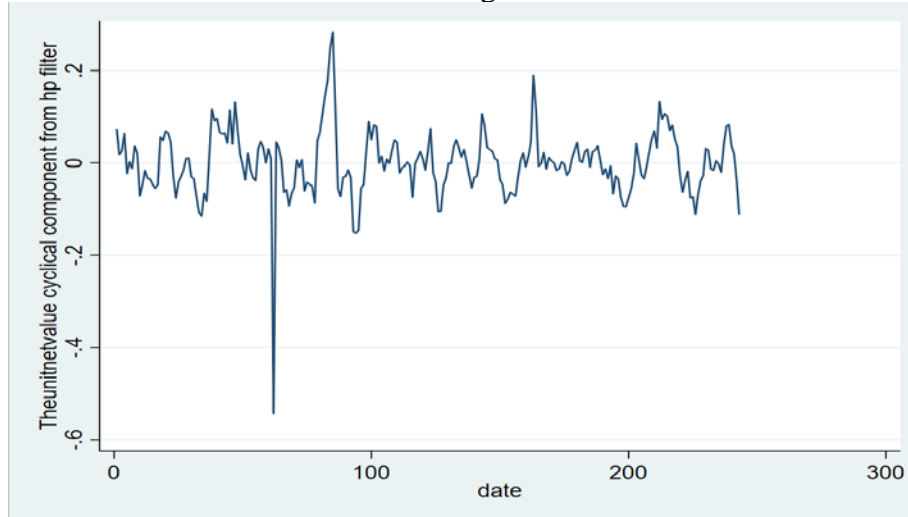

Figure 2 H-P filter diagram of the unit net value of fund from March 10, 2020 to March 9, 2021

It can be seen from the figure that the net value of NOHAIN Growth Hybrid Fund has always fluctuated up and down, and fluctuated greatly at certain points. There is a lowest point in the 50-100 cycle, and its value is 1.01.At the same time there is also a highest point in this period, and its value is 2.243.The relative gap between peak and trough unit net value is relatively large. The average unit net value of fund this year is 1.683.From the perspective of daily unit net value, NOHAIN Growth Hybrid Fund has obvious characteristics of date changes. The unit net value sequence is decomposed into dates. Long-term trend, short-term fluctuations, to explore the specific characteristics of changes in the unit net value of fund. From 0-50 days, there is little difference in the trend of the peak-valley drop; Within 50-100 days, the peak-valley gap showed a slight shrinking trend at the beginning, and then the gap began to increase sharply. As the date changed, the peak-valley gap showed a shrinking trend for a short period of time, and then suddenly increased sharply; within 100-150 days, the peak-valley drop shows a relatively gentle trend; within 150-200 days, the peak-to-valley drop first showed an expanding trend, and then tended to flatten; within 200-243 days, the peak-valley gap gradually narrowed after a brief period of expansion, and then showed a brief expansion trend again, oscillating between the expansion trend and the contraction trend.

4.2 Prediction model of the unit net value of fund: based on OLS regression and Tobit regression

4.2.1 OLS regression model and Tobit regression model

The independent variable is selected from March 10, 2020 to March 9, 2021, a total of 243 periods. The constructed daily unit net value regression model of NOHAIN Growth Hybrid Fund is shown in formula (1):

$$V = a_0 t + a_1 + \xi_t \qquad (1)$$

Where V represents the unit net value,a_0 is the coefficient of the independent variable t, a_1 is the constant term in the fitting equation, and ξ_t is the error term.

4.2.2 Model estimation and result analysis

1) Regression model

Assuming that the model built and ξ_t satisfy various classical assumptions, the location parameters can be estimated by the OLS method. The estimation results are shown in the following table:

Table 2 OLS regression results

Long-term trend Coef.		std. Err.	t	P>|t|	[95% conf.	Interval]
date	$1.58*10^{-3}$	$1.32*10^{-4}$	11.97	0.000	$1.32*10^{-3}$	$1.84*10^{-3}$
-cons	1.49	$1.86*10^{-2}$	80.09	0.000	1.45	1.53

After the regression model is estimated and tested, the coefficient is significant from the t test, the coefficient of determination R2 is 0.3729,and its goodness of fit is relatively high. The constant term is 1.49,and the coefficient is 1.58*10-3;the significance level is 0.000,which is significant above 1%.The date has a significant impact on the unit net value of fund, and the confidence interval is [1.32*10-3,1.84*10 -3],the fitting equation is obtained as shown in formula (2):

$$V = 0.00158t + 1.49 + \xi_t \quad (2)$$

Since the OLS model does not allow multiple variables or output variables, and the multicollinearity between predictors may affect the accuracy of the results, the Tobit model is used for robustness test on the basis of OLS regression. The estimated results are as follows:

Table 3 Tobit regression results

Long-term trend Coef.		std. Err.	t	P>|t|	[95% conf.	Interval]
date	$1.58*10^{-3}$	$1.54*10^{-4}$	10.27	0.000	$1.28*10^{-3}$	$1.89*10^{-3}$
-cons	1.49	$2.17*10^{-2}$	68.71	0.000	1.45	1.53

Tobit regression results show that the constant term is 1.49, and the coefficient is 1.58*10-3;the significance level is 0.000,which is significant above 1%.The date has a significant impact on the unit net value of fund, and the confidence interval is [1.28*10- 3,1.89*10-3],the fitting equation is shown in formula (3):

$$V = 0.00158t + 1.49 + \xi_t \quad (3)$$

4.3 Empirical prediction of the unit net value of fund

On the basis of the fitting equation, this article will extend another date by 1 day (March 10,2021),7 days(March 18,2021),15 days(March 30,2021),and 30 days(April 21,2021)later. The fitting equations obtained by OLS regression and Tobit regression are respectively used to predict the corresponding net value of fund units.

1) Extending the original period by 1 day, the resulting equation is as follows:

$V = 0.00158*244 + 1.49 + \xi_t$ Get V=1.8755

2) Extending the original period by 7 days, the resulting equation is as follows:

$V = 0.00158*250 + 1.49 + \xi_t$ Get V=1.8850

3) Extending the original period by 15 days, the resulting equation is as follows:

$V = 0.00158*258 + 1.49 + \xi_t$ Get V=1.8976

4) Extending the original period by 30 days, the resulting equation is as follows:

$V = 0.00158*274 + 1.49 + \xi_t$ Get V=1.9229

In the above study, it can be clearly observed that the fitting equations of OLS regression and Tobit regression are the same, and there is no difference in the prediction results when the error is ignored. It can be seen that the model used in this article has a good robustness.

Table 4 Prediction results of the unit net value of NOHAIN Growth Hybrid Fund

t\Regression method	OLS regression	Tobit regression
1 day extension	1.8755	1.8755
7 days extension	1.8850	1.8850
15days extension	1.8976	1.8976
30days extension	1.9229	1.9229

5. Research results and prospects

After performing H-P filtering analysis, OLS regression prediction and Tobit regression predictionon on NOHAIN Growth Hybrid Fund, This article obtained the postponement of the fund date by 1 day(March 10,2021),7 days(March 18,2021),15 days (March 30,2021),and 30 days(April 21,2021) Unit net value.

This article still has some shortcomings, mainly in the aspect of research data. Only one year's the unit net value of fund was selected, and the data of the past few years was not unified for research, and the unit net value of fund will be affected by many uncontrollable factors. Only one year's data may have greater objectivity. It is hoped that future research can integrate the data of recent years to make more accurate predictions of the unit net value of fund.

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