

STUDY ON VALUATION OF THE PRIORITY SUB-FUND

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ABSTRACT

Structured Funds are innovative products developed by the structured classification technique and it has been introduced to China over 10 years. Recent years, structured funds have developed rapidly, which are very eye-pleasing among all the funds. It achieved great success by designing two sub-funds for investors with different risk. Compared with the other fixed income bonds, the priority sub-fund has the advantage of higher rate of return and fewer risks. While the aggressive sub-fund has lower barriers, and with the leverage effect, it can multiply the earnings.

Firstly, the paper introduced the development course and current situation of Structured Funds then explained some essential design terms of the priority sub-fund. To make readers have a preliminary understanding of the priority share of structured fund, the author studied the valuation method specially. The principle of the cash flow discount model had been introduced, and then the Guojin CSI GM 300A was chosen as an example to study. Some related parameters were simulated and so the validation was done to it. In the end, to help the investors take better choose, the paper gave some conclusions and useful advice.

Keywords: Structured Funds, Priority sub-fund, Valuation methods

1. INTRODUCTION

Structured fund, also known as leveraged funds or structured products was first introduced into China in 2007. Nowadays, structured fund, together with LOF, ETF and closed-funds constitute the four pillars of Chinese fund industry. The fundamental characteristic of structured fund is that its fund sponsors design two kinds of sub-funds based on structuration principle, and give them different risks and benefits. That is to say, on the basis of basic share, two types of shares are derived. One is priority share featuring low risk and low income, and another one is enterprising share featuring high risk and high income.

The priority share, on the one hand, it has the characteristics of low entry threshold, small risk

and higher yields facing the same risk, and because of the existence of the pairing transformation mechanism, it also gives it the opportunity to arbitrage. On the other hand, the theorists mostly focus on pricing structured fund as a whole, and there has not yet been a systematic study of the pricing the priority share.

Therefore, the purpose of this paper is to study the pricing mechanism of Chinese structured fund products, and we'll take the common priority share of structured fund as an example. This study can be somewhat conducive to those risk averse investors when they judge the price and time of trading the priority share, the sale price. Moreover, it will help supervision authorities to ensure the healthy development of structured fund market.

2. LITERATURE REVIEW

The leveraged fund appeared in the United States in 1986 and began to develop rapidly after the 1990s. Overseas leveraged funds can be mainly classified into two categories, and one is an American style, which makes leverage through debt financing, priority or self-investment. Another one is a British style, which generates leverage through the innovation terms of the fund. Different fund products are combined to operate together, and fund income is therefore divided into different grades according to a certain proportion. Chinese structured funds are mainly applied this approach .

Before 2011, Chinese structured fund has just started, but the related research is still at the initial stage. We could only understand structured fund mainly through the characteristics of a certain new fund.

Jin Lie (2009) ^[1] compared general closed funds and structured funds, and deconstructed the design provisions of graded funds. He also pointed out the development direction of future Chinese structured fund market. Lan Libing (2010)^[2] chose a structured fund named Changsheng Tongqing, and directly decomposed its two types of shares into a combination of series zero coupon bonds and European options. Then, he calculated the theoretical price of the combination by using the B-S formula. And he finally explained the deviation between theoretical price and the actual price was reasonable considering investor sentiment. Guanghua & Ren Xuemin (2010) ^[3] turned to study the index structured fund. They still used the option deconstruction method to price the third generation structured fund called Ruihe 300, and analyzed the parameters affecting its two types shares' price and its leverage rate.

In recent years, structured funds are growing quickly both in number and type. According to the differences of investment targets, structured funds can be divided into two types, the stock index structured fund and the bond structured fund.

The literature reviews of the valuation of the stock index structured fund are as follows.

Ma Yizhou (2012) ^[4] used the B-S formula and Monte Carlo simulation method to make option pricing, and revised the two pricing methods by regression analysis. It found that the share of the enterprising share increased significantly, but the pricing of priority share was still not significant. Zhao Guijun (2014) ^[5] proposed asset price volatility didn't obey the logarithmic distribution, but a random distribution. He put forward GARCH model pricing method can be introduced in. And then the volatility in the B-S formula and the risk-free rate must relax constant requirements. The approach made the new model closer to the real market and reduced the deviation between theoretical value the market value.

The literature reviews of the valuation of the bond structured fund are as follows.

Dai Jingxia (2012) ^[6] thought discounted cash flow valuation model can be used for most of bond structured fund. Considering the specific parameters, she spilt bond structured fund's discount rate into the risk-free rate and the risk premium, fitting the risk-free interest rate by using the Shibor or China Treasury yields over the same period. And she used the total Treasury index over the same period to fit the risk premium of the preferred share. Yao Yanfeng (2013) ^[7] put forward that from the perspective of the intrinsic value of preferred share price, the main factor that affects its price is the cash flow and risk-free interest rate that the preferred share holders will get in the future. He chose structured fund "Shenwan Lingxing" as the research object, the future cash flow available can be replaced by the net value of the preferred shares.

3. AN INTRODUCTION TO THE PRODUCT OF THE STRUCTURED FUND

The Guojin general Shanghai-Shenzhen 300 Index structured fund, shorted to as " Guojin GM CSI 300 share", was issued in July 26, 2013. It represents a series of index structured funds with matching transformation mechanism on the market. This paper decided to choose Guojin GM CSI 300 index A to do research. On the one hand, because the preferred share's main earnings benchmark is the CSI 300 index, it is currently the most traded, and with the easiest and the most comprehensive research data to get. On the other hand, it meets the requirement of irregular conversion which is now generally adopted in the terms of structured fund. When the net value of basic share is not less than 1.5 yuan or the net value of enterprise share is not greater than 0.25 yuan, Guojin GM CSI 300 index will converse. Which means the equity of preferred share and enterprising share need to redistribute.

The design terms of Guojin GM CSI 300 share are as follows:

a. Leverage. Sub-shares of Guojin GM CSI 300 share are divided into preferred share and

enterprising share, respectively referred to as ‘Guojin GM CSI 300A’ and ‘Guojin GM CSI 300B’, their share proportion always keep 1:1 ratio unchanged.

b. Duration. Guojin GM CSI 300 share is open-ended fund.

c. Equity conversion mechanism. Guojin GM CSI 300 share adopt regularly and irregularly converting mechanism, and the periodic conversion period is one year. The first working day of each accounting year is the base day of fund share discount. The net value of fund of funds is one, and the two sub-funds share ratio remain unchanged. That is to say, when the referent value of Guojn GM CSI 300A exceeds1 yuan in the last day of each fiscal year, it will be converted into Guojin GM CSI 300 shares and then allocate them to the holders of Guojin GM CSI 300A.

d. Pairing transformation mechanism. The pairing transformation among the parent fund and the two sub funds includes split-off and merger. The split-off refers to the share holders can convert his two Guojin GM CSI 300 shares into one Guojn GM CSI 300A and one Guojn GM CSI 300B. The merger refers to one Guojn GM CSI 300A and one Guojn GM CSI 300B can compose two Guojin GM CSI 300 shares.

e. Priority share excess earning mechanism. The income distributions of Guojin GM CSI 300A are as follows: The annual benchmark returns on Guojin GM CSI 300A are one-year deposit interest rate of RMB in the bank for the same period (after tax) + 3.5%. In the same period, the one-year fixed deposit interest rate of RMB in the banks is based on the one-year deposit benchmark interest rate of financial institutions announced and implemented by the people's Bank of China in January 1st of that year.

4. EMPIRICAL TEST

4.1 The basic principle of cash flow discounted model

Cash flow discounted method is a method of discounting the free cash flow generated by an asset in the future periods according to a reasonable discount rate, and sum up the future net present value to get the current value of the asset. It applies to asset pricing for the future steady cash flow.

Cash flow discounted method mainly involves three variables, future cash flow, discount rate and time limit.

$$p = \sum_{i=1}^{\infty} \frac{CF_i}{(1+r)^{ti}}$$

In the formula, P is the present price. i is the conversion number, and CF_i is the cash flow of phase i. r is the discount rate, and t_i is the time for the cash flow received in phase i from the present time.

4.2 Parameter estimation of cash flow discounted model

4.2.1 the range of the discount rate

After classifying the priority share of the existing structured funds on the market, we find that their earnings are generally one-year bank deposit rate plus fixed income for the same period. This suggests that the priority share, similar to the annual coupon rate, is a perpetual bond that fluctuate with one-year bank deposit rate. For the sake of simplification, assuming that the interest rate is unchanged in the future, we calculate the cash flow of each period in the future, then discount and sum up these cash flows, and finally we 'll get the theoretical price of the priority share.

Because in cash flow discounted model, the most important thing is to determine the reasonable discount rate. In order to determine the reasonable range of the discount rate, we can judge by calculating the change of the historical discount rate of Guojin GM CSI 300A. By using the cash flow discount model and selecting multiple time nodes, the implied return rate curve of 300A can be drawn.

Following is a brief account of the calculation process of the implied return of return.

On September 10, 2015, for example, there are a total of 113 days before the next share conversion day, which are 0.31 years. The first year's the cash flow of Guojin GM CSI 300A is 0.0625 yuan, and 0.05 yuan for the second year. As the agreement annual benchmark yield of Guojin GM CSI 300A is one-year term deposit interest rate of RMB in the same period +3.5%. One-year term deposit interest rate of RMB in the same period is announced and implemented by the people's Bank of China in January 1st of that year.

The central bank interest rate was 2.75% in January 1, and then was changed to 1.5% in October 24, 2015. So the benchmark yield of Guojin GM CSI 300A in 2015 was 6.25%, and 5% in 2016 and 2017. On September 10, 2015, for example, the closing price of 300A on the same day was 0.943, which can be calculated on the day's the implied rate of return is 5.69%.

$$0.943 = \frac{0.0625 * 0.31}{(1 + r)^{0.31}} + \frac{0.05}{(1 + r)^{1.31}} + \lim_{n \rightarrow \infty} \sum_{i=2}^n \frac{0.05}{(1 + r)^{n+0.31}}$$

In 2015 and 2016, the calculating formulas for implied rate of return are as follows.

$$A = \frac{0.0625 * t}{(1 + r)^t} + \frac{0.05}{(1 + r)^{1+t}} + \lim_{n \rightarrow \infty} \sum_{i=2}^n \frac{0.05}{(1 + r)^{n+t}} = \frac{0.0625 * t * (1 + r) + 0.05}{(1 + r)^{1+t}} + \frac{0.05}{r}$$

$$A = \frac{0.05 * t}{(1 + r)^t} + \lim_{n \rightarrow \infty} \sum_{i=2}^n \frac{0.05}{(1 + r)^{n+t}} = \frac{0.05 * t}{(1 + r)^t} + \frac{0.05}{r}$$

In the formulas, A is the net daily value, and t is the next conversion time, and r is the implied rate of return.

Table 4.1: the implied return of return of Guojin GM CSI 300A at different times

time	next time of conversion t/year	Daily net A/yuan	implied rate of return r
2015/9/10	0.31	0.943	5.69%
2015/10/10	0.23	0.933	5.73%
2015/11/10	0.14	0.897	5.94%
2015/12/10	0.06	0.910	5.82%
2016/1/10	0.98	0.915	5.76%
2016/2/10	0.89	0.924	5.65%
2016/3/10	0.81	0.928	5.63%
2016/4/10	0.73	0.927	5.61%
2016/5/10	0.65	0.927	5.58%
2016/6/10	0.56	0.934	5.52%
2016/7/10	0.48	0.955	5.37%
2016/8/10	0.39	0.976	5.22%
2016/9/10	0.31	1.008	5.04%
2016/10/10	0.23	1.018	5.02%
2016/11/10	0.14	1.046	4.81%
2016/12/10	0.06	1.046	4.79%

In order to make the data more image, we use the diagrams to show as follows.

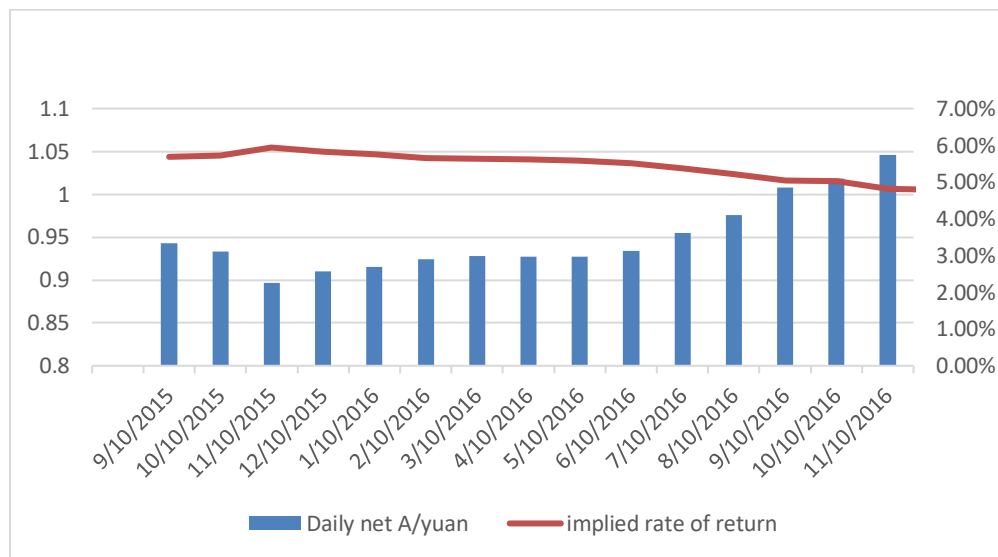


Figure 4.1: the implied rate of return and daily net of Guojin GM CSI 300A

4.2.2 Parameter estimation of discount rate

Because the market rate equals to risk-free rate plus risk premium, we can split the discount rate for a risk-free interest rate and the risk premium. By fitting the risk-free interest rate and the risk premium, finally, we can work out the discount rate.

Parameter estimation for risk-free interest rates are as follows.

There is no unified standard in China's theoretical circles for the choice of risk free interest rates. But internationally, LIBOR or Treasury Rate represents riskless interest rates. For Guojin GM CSI 300A, because it is an open fund and there is no agreed maturity date, so we regard it as a perpetual bond. Intuitively, we should choose the longer term treasury yield to fit the risk free interest rate. And the 15 - year treasury bonds have a longer term and better liquidity.

Here we use regression analysis method. When analyzing correlation coefficient between the implied return rate of 300A and the yield of national debt at different periods, we found the implicit rate of return of Guojin GM CSI 300A and 15 year yields have the highest correlation. We think this is because the 15 - year debt has a long period of time and a better liquidity.

Table 4.2: correlation coefficient between implied yield and each period treasury rates

treasury	6 months	1 year	3 year	5 year	10 year	15 year	30year
correlation coefficient	0.2376	0.27	0.529	0.686	0.764	0.777	0.722
Fitted values	0.0565	0.47	0.279	0.469	0.584	0.604	0.521

Parameter estimation for the risk premium are as follows.

Because risk premium equals to market interest rate and risk minus free interest rate, we can reduce the yield of 15 - year treasury bonds with the implicit rate of return to get the risk premium of Guojin GM CSI 300A. We believe that the risk factors of Guojin GM CSI 300A are mainly from the bond market. The main reason is the investors of priority funds are risk averse, and their investment objective is to get stable profits. When the proceeds of the bond market are bad, investors' pressure to maintain stable cash flow increases, and they will be more inclined to sell preference share, rather than illiquid bonds. Finally, the price of Guojin GM CSI 300A will fall, and its risk premium will rise correspondingly. On the other hand, when the bond market returns well, investors will buy more priority share. Finally, the price of Guojin GM CSI 300A will rise and its risk premium will fall correspondingly.

In this regard, we can establish the regression model and construct the one - time equation as follows.

$$y = a * x - b$$

In the formula, *a* and *b* are parameters, and *x* is the bond index, and *y* is the risk premium.

Using Excel for regression simulation, the regression coefficient is 0.7590, the correlation is strong, and the parameter values of *a* and *b* can be obtained.

Table 4.3: regression analysis of the risk premium

	Coefficients	Standard error	t Stat	P-value
Intercept	-0.07711	0.022375	-3.44641	0.003933
X Variable 1	0.000691	0.000158	4.361158	0.000652

So, we can get the regression equation as follows.

$$y = 0.000691x - 0.07711$$

5. CONCLUSION AND SUGGESTION

In recent years, structured funds have developed rapidly. The unique leverage mechanism can provide different fund products for investors with different risk preferences. This paper introduces the development course and current situation of the classification fund, and finds out its change and development trend in product design. Finally, we study the pricing method of priority share, which aims to provide some reference for investors.

5.1 Conclusion

Firstly, we can use cash flow discounted model to price the priority share of structured fund when its current priority share revenue model is relatively sample. The yield is mainly based on the one-year bank deposit rate plus a fixed value. Additional revenues divided under extreme conditions have exited the market gradually. However, cash flow discounted model also have shortcomings. They only consider the priority share's fixed income attributes, ignoring the inherent relation between priority share and aggressive share under the pairing transformation mechanism in the extreme situation.

Secondly, the deficiency of this paper is that when the rate of deposit rate fluctuates greatly and frequently, the fixed income will be more inclined to the floating income. When a more accurate estimate of future cash flows is needed, this can make the valuation of each cash flow more difficult. However, this paper is only assuming the return rate of the priority share will remain unchanged in the future, and that the effectiveness of the valuation will be reduced when deposit rate policy changes.

5.2 Suggestion

Although the arbitrage opportunities among parent fund and sub funds are gradually decreasing, there is still a large space for arbitrage in extreme cases. To take arbitrage operations, the first thing is to buy in the field, and avoid the purchase of over-the-counter funds to extend the arbitrage time. Next, the income of arbitrage is closely related to the rate of redemption, volatility, robustness and liquidity of the fund. We should be alert to the herd effect under the hot market situation. Therefore, when deciding whether to take arbitrage operations, investors should take into account many factors such as time, market and so on, and formulate an optimal trading plan to get the maximum return.

If we take the fixed income as the purpose and invest the preferential share, the yield of all kinds of priority shares in the market will be between 4% and 8%. The vast majority yield is greater

than 5%, which is generally higher than all kinds of financial products on the market, and they also have the advantages of low investment threshold and low risk. So, if investors want to achieve the fixed income and invest priority share, they can refer to the following criterions. Firstly, investors need to judge whether the current price of priority share is in the theoretical price range (available methods in the fourth chapter). If the price is lower than the minimum theoretical price too much, investors can not only gain a fixed interest rate of priority share, but an extra income. Secondly, investors need to estimate the expectation of the bond market. If the probability of the bond market's rising in the future is judged to be larger, priority share can be considered. In this case, the implied yield of various kinds of bonds will decrease, and the corresponding price will rise in theory.

REFERENCES

- [1] Jin Lie. Plane based on the lever design new enclosed grading fund research [J].Economic BBS, 2009, 10, 2009-135.
- [2] Lan Libing. Decomposition of the classification fund option pricing of [J]. Chinese securities futures, based on 2010, 03:26-27.
- [3] Ren Xuemin. Guanghua, An index classification fund pricing model and its leverage rate of [J]. Commercial Economy, 2010, 18:017.
- [4] Ma Yizhou. Research on the design and pricing method of China's classification fund [D]. Shanghai: Shanghai Jiao Tong University, 2012.
- [5] Zhao Guijun. Research on the pricing method of index type stock grading fund in China market [D]. Sichuan: Yunnan University of Finance and Economics, 2014.
- [6] Dai Jingxia. Research on the investment strategy of the classification fund [D]. Sichuan: Southwestern University of Finance and Economics, 2012.
- [7] Yao Yanfeng. Research on the valuation method of Shen Wan income of classification fund [D]. Shanghai: Shanghai Jiao Tong University, 2013.