

# Derivatives and Personal Finance: Structured Financial Products

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**Abstract:** In recent years, with the gradual development of interest rate liberalization, our country gradually entered the era of low interest rate. The income of all kinds of financial products can not meet investors' expectations gradually. And structured financial products as a new financial product, relies on its structural model by combining the basic financial instruments and derivative financial instruments, with its characteristics of both fixed income securities relatively safe and financial derivatives to hedge risk, the benefits of asymmetric characteristics, has become popular with investors in our financial markets products. This paper introduces the background and concept of structured financial products, in-depth analysis of the internal structure of structured financial products and product applications, and the future development prospects of this kind of financial products.

**Keywords:** Spread options, Shark fin option, Structured product.

## 1. Background and Concept of Structured Products

On April 27, 2018, the People's Bank of China, the Banking and Insurance Regulatory Commission, the Securities Regulatory Commission and the State Administration of Foreign Exchange jointly promulgated the Guidance on Regulating the Asset management Business of Financial Institutions. Among them, the regulatory authorities explicitly required banks not to issue "capital guaranteed income" wealth management products, and required the cancellation of rigid payment rules for wealth management products. In this context, with the gradual development of interest rate liberalization, the yield rate and the issued quantity of all kinds of financial products began to decline. As a result, on the one hand, financial institutions are in urgent need of innovative design of new financial products to stabilize returns and expand the market. On the other hand, investors are in urgent need of new financial products to give themselves more possibilities of asset allocation in the face of the reality that investment returns cannot meet their expectations. In this context, in order to meet the needs of both issuers and investors, structured financial products come into being. Structured wealth management products are the organic combination of fixed income securities and financial derivatives. Their yields are presented in the form of floating ranges. The lower end of the range comes from the fixed-income part, and the floating part comes from some kind of financial derivative instrument. Structured financial products have both the security characteristics of fixed income securities and the income characteristics of financial derivatives with small leverage, which gives investors more diverse choice space.

## 2. Classification of Structured Products

According to different products linked to the target can be divided into linked interest rates, linked exchange rates, linked stocks, linked precious metals, linked credit structured financial products.

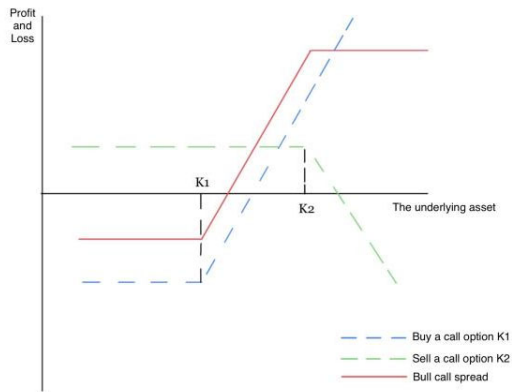
According to the risk of products, they can be divided into capital protected financial products and non-capital protected financial products. Capital preservation financial products refer to the purchase of related derivative products with gains from bond investment. The purchased products have the characteristics of limited losses and unlimited profits, which can protect the income of capital preservation financial products. This kind of products not only meet the expectation of capital preservation of risk-averse investors, but also give investors the possibility of increasing profits. However, non-capital protection financial products have the possibility of limited profit and unlimited loss in the floating return part, and investors need to bear the higher risk behind the profit.

More complex structured financial products include the underlying asset from a single to multiple, set up a single or double barrier price, and the yield of the product is related to the price changes of the underlying asset, under different barrier prices can trigger different rates of return, etc.

## 3. Theory of Structured Products

### 3.1. Option Spread Structure

Option spread trading refers to when an investor buys a call or put option at one strike price and sells a call or put option of the same type at another strike price. A spread portfolio locks in the range of returns over the entire price range. There are four basic options spread strategies, bull call spread, bull put spread, bear call spread, bear put spread. The first two options spread structures predict that the price of the underlying asset will rise, while the last two predict that the price will fall. The option spread strategy is usually applied in the process of market adjustment, such as a rebound in a decline or a pullback in a rise. If the rally is just a rally correction, rather than a strong uptrend, buying a call option will be of limited benefit. So investors can sell calls with higher strike prices in tandem to increase their income. The bull call option spread structure is thus formed. This paper will take bull call option spread as an example to introduce the spread structure of the bull call option, which is shown in Figure 1.



**Figure 1.** The spread structure of a bull call option

For example, if the underlying asset is a stock, the bull market spread strategy is to buy the underlying asset with a strike price of  $K_1$  At the same time as the call option, the sell strike price is  $K_2$ . A call option with the same expiration date and a strike price of  $K_1 < K_2$ . Assume a strike price of  $K_1$  And  $K_2$ . The initial price, or premium, of the option is  $C_1$  And  $C_2$ , for call options, the lower the strike price, the higher the option value,  $C_1 > C_2$ . Then the return to maturity for a bull spread option investor, shown in Figure 1, can be roughly expressed as a formula. When the underlying price  $ST < K_1$ . When, the long payoff of the call option is  $-C_1$ , while the short position yield is  $C_2$ . The overall payoff is  $C_2 - C_1$ . When the underlying price  $K_1 < ST < K_2$ . When, the long payoff of the call option is  $ST - K_1 - C_1$ , while the short position yield is  $C_2$ . The overall payoff is  $ST - K_1 - C_1 + C_2$ . When the underlying price  $ST > K_2$ . When, the long yield of the call option is  $ST - K_1 - C_1$ , while the short position yield is  $-(ST - K_2) + C_2$ , the overall payoff is  $K_2 - K_1 + C_2 - C_1$ . The overall earnings trend can be shown by the red line in Figure 1.

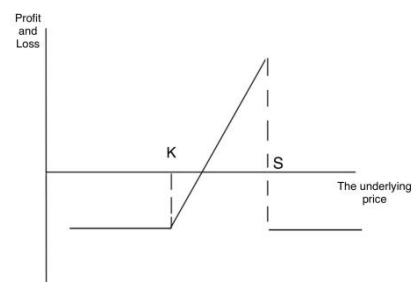
The gains and losses of this spread portfolio strategy are locked in a certain range, which limits investors from capturing the gains of future stock gains and also limits investors from "paying" for losses caused by stock price declines. Although the potential gains of the bull market are limited, compared with just buying call options, the bull market spread strategy can be described as "advance can attack, retreat can defend", which can resist the contraction of the time value of the option and lock in the risk of the stock price continuing to fall.

### 3.2. Shark-fin Options

Shark fin option, also known as knock-out option, is a type of barrier option, which is named because its return structure looks like the fin of a shark. As the name implies, taking the seller of a call option as an example, the higher the underlying price rises, the larger the seller's loss will be. The significance of the barrier option is that when the underlying asset price rises to a certain extent, the option will be automatically knocked out of effect, which is undoubtedly beneficial to the option without the seller. Barrier option wealth management products have emerged. Shark-fin options set a price range for the underlying asset, and if the underlying asset jumps out of that range, the option is automatically tapped out. If the price of the underlying asset stays within the specified price range for the duration of the option, a shark-fin option is a normal call or put option. This option imposes a limit range, also known as a barrier price, which allows the issuer to limit the

investor's payoff. Shark fin options can be divided into two categories: up and down, long and short, depending on whether the strike price is higher or lower than the initial price. This article introduces the reader to the example of a shark-fin upstroke call option.

The profit and loss structure of the shark fin option is shown in Figure 2, which can roughly describe the profit and loss of the option. As shown in Figure 2, in the upstroke call option,  $K$  is the strike price of the option, and  $S$  is the artificially set knock-out barrier price. If the underlying price of the asset is higher than  $S$  during the life of the option contract, then the option will be knocked out automatically. Moreover, the barrier price  $S$  of the option cannot be set lower than the exercise price  $K$  of the option, because the option can be exercised only when  $S > K$ , otherwise the option will not be exercised and has no value at all. Assume that the initial price of the option is  $C$ , and the price of the underlying asset at the expiration of the contract is  $ST$ . If the underlying asset price never rises to the barrier price  $S$  during the term of the contract, and the underlying asset price is below the option strike price  $K$  at the option expiration date, that is,  $ST < K$ , at which point the option holder will forfeit the exercise with a payoff of  $-C$ ;  $K < S$  if the price of the underlying asset never exceeds the barrier price  $S$  during the term of the contract and the underlying asset price is above the strike price  $K$  at the expiration of the option  $ST < S$ , at which point the option holder chooses to exercise the option and the payoff is  $ST - K - C$ . If the price of the underlying asset rises above the barrier price  $S$  during the term of the option contract, the option will be knocked out automatically with a payoff of  $-C$ .



**Figure 2.** Shark-fin option gain and loss structure

The option structures discussed above are in standard form. In practice, many shark-fin options are designed to have a segment-yield form that does not have a negative payoff in mind of investor demand. When the asset price is inside the yield range, the payoff is up to. When the barrier level is reached, the option is automatically struck, and it will give the investor a certain strike yield. The following take China Merchants Bank real financial products as an example, will be more detailed to understand.

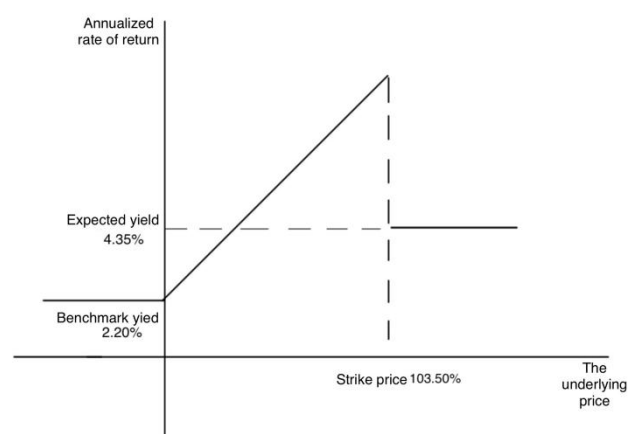
## 4. Examples of Bank Structured Financial Products with Embedded Options

At present, spread options and shark-fin options are widely used in structured financial products. This paper takes "Shanghai and Shenzhen 300 bullish shark-fin structure non-break-even financial plan (product code: 119836)" as an example to bring readers a more intuitive understanding of the charm of structured financial products, and then theory

combined with practice to better grasp the structured financial products. The following is part of the important terms of the product, as shown in Table 1.

**Table 1.** CSI 300 Call Shark Fin Structure non-break-even Financial Plan

Product overview	Basic terms
The name of the	China Merchants Bank focus linkage series of stock index performance linkage (CSI 300 index bullish shark fin structure) non-break-even financial plan (product code: 119645)
Financial currency	The yuan
Hook mark	CSI 300 Index (000300.SH)
founding	Dec 4, 2019, the financial plan calculates earnings from the date of establishment
The balance sheet date	January 14, 2020
Maturity date	January 16, 2020
Participation rate	150%
The fixing price	The closing price of the CSI 300 index released by China Securities Index Co
Initial price	The fixing price on the establishment date
The final price	The fixing price on the settlement date
Executive price	100.00% of the opening price (accurate to two decimal places according to rounding method)
Obstacles to the price	103.50% of the opening price (accurate to two decimal places according to rounding method)
Benefits that	<p>(1) If the fixed price of CSI 300 index is ever higher than the barrier price during the observation period, the wealth management yield is 4.35% (annualized).</p> <p>(2) If the fixing price of CSI 300 index is not higher than the barrier price during the observation period, and the ending price of CSI 300 index is higher than or equal to the strike price, the wealth management yield (annualized) is: Wealth management yield (annualized) = 2.20% + participation rate × minimum value (3.50%, performance of CSI 300 index) Where, performance of CSI 300 index = (ending price - strike price) ÷ initial price × 100%</p> <p>(3) If the fixing price of CSI 300 index is not higher than the barrier price during the observation period, and the closing price of CSI 300 index is lower than the strike price, the wealth management yield is 2.20% (annualized).</p>



**Figure 3.** Profit and loss chart of CSI 300 bullish shark fin structure

The initial asset price of the winning bid for this structured product is the strike price, and the barrier price is 103.50% of the initial price. The rate of return is presented in segments as shown in Figure 3. The knock-out yield is 4.35%, and the lowest yield is 2.20%. The lowest yield means the product would normally earn at least 2.20% (annualized), the equivalent of buying a fixed security. It also compares the closing price of the CSI 300 index at maturity with whether the index has hit the barrier price over the life of the product and the strike price to determine what portion of the return investors will get. The floating part comes from tapping up the call option against the underlying price. According to the contract terms in Table 1, the closing price of CSI 300 index is 3849.82 points on December 4, 2019, the starting date of the wealth management product, and the closing price of CSI 300 index is 4149.04 points on January 16, 2020, the maturity date of the wealth management product, so the ending underlying price is higher than the strike price. And higher than the set barrier price of 3984.56 points, so it is automatically knocked out, so the final yield of the financial product obtained by investors is 4.35% (annualized).

## 5. Future Outlook of Structured Wealth Management Products

The innovation of structured financial products lies in the effective combination of the advantages of basic financial instruments and financial derivatives, both the relatively safe characteristics of fixed income securities and the characteristics of financial derivatives can hedge risks, small and broad income, better meet the needs of product issuers and investors. The subprime mortgage crisis in 2008 still has a warning significance for the innovation of financial products. It is necessary to keep the alarm bells ringing and take good risk management measures.

Most investors are risk averse. According to the prospect effect in behavioural economics, risk-averse people tend to choose certainty over "taking a gamble". For structured wealth management products, the certainty return is similar to the fixed bond part, while the "gamble" is the floating return part. Structured wealth management products can be well compatible and combine the two, giving investors the opportunity to earn floating returns in addition to guaranteed returns. It is for this reason that structured wealth management products are popular. However, the probability that the product will eventually reach the upper limit of the

return rate of structured financial products is low. Therefore, investors should rationally realize that the expected annualized return rate is not equal to the real annualized return rate, and should not overestimate the small probability events. The structured financial products that investors usually buy are products linked to the underlying assets of related assets, such as linked stock options, which can get the opportunity to invest in stocks within the scope of controllable risk, and significantly reduce the risk compared with directly participating in the stock market. However, financial management is not a deposit, the product has risks, investment should be cautious. As an investor, we should always be clear about our own risk tolerance. Before investing, we should fully read the risk disclosure book to avoid blindly following the trend of investment and suffering losses like "crude oil treasure" of the Bank of China.

For the financial institutions of product issuers, with the help of the influence of investor psychology, they have absorbed more funds at a lower cost through financial products. However, financial institutions are often a key part of systemic financial risk. Risk control should be strengthened during product innovation, so as to be prepared, especially for products involving derivatives plus leverage and high risk characteristics. First of all, the design of the product should be highly reasonable, and the risk rating of the product should be controlled and matched with the customer's

risk tolerance. Secondly, marketing should be objective and rigorous description of the product, so as not to cause blind with romantic. Finally, the organization should inform the investors of the risk disclosure book, and give the product to those who have the corresponding risk bearing ability. In addition, financial institutions also need to strengthen their internal control mechanism, control risks at the front end, constantly improve the transaction related infrastructure, avoid the occurrence of downtime, and provide a good environment for trading.

## References

- [1] Q.m.chen. Analysis of structured financial products [J]. China Business Theory,2019(11):47-48.
- [2] B.y.wang. Analysis of the returns of structured financial products [J]. The Banker,2014(03):116-119.
- [3] X.l.lu,X.xiong,Y.m.yan,K.w.xu. "Stability" or "Disturbance" : An empirical analysis based on Shanghai 50ETF options [J]. Management science,2020,33(04):149-157.
- [4] F.j.zhu. Analysis of structured financial products of Chinese commercial banks: A case study of M Bank products.], 2015 (44) : 167.
- [5] J.z.wang. Derivative Financial Instruments [M]. Beijing: China Renmin University Press, 2014.234-317.