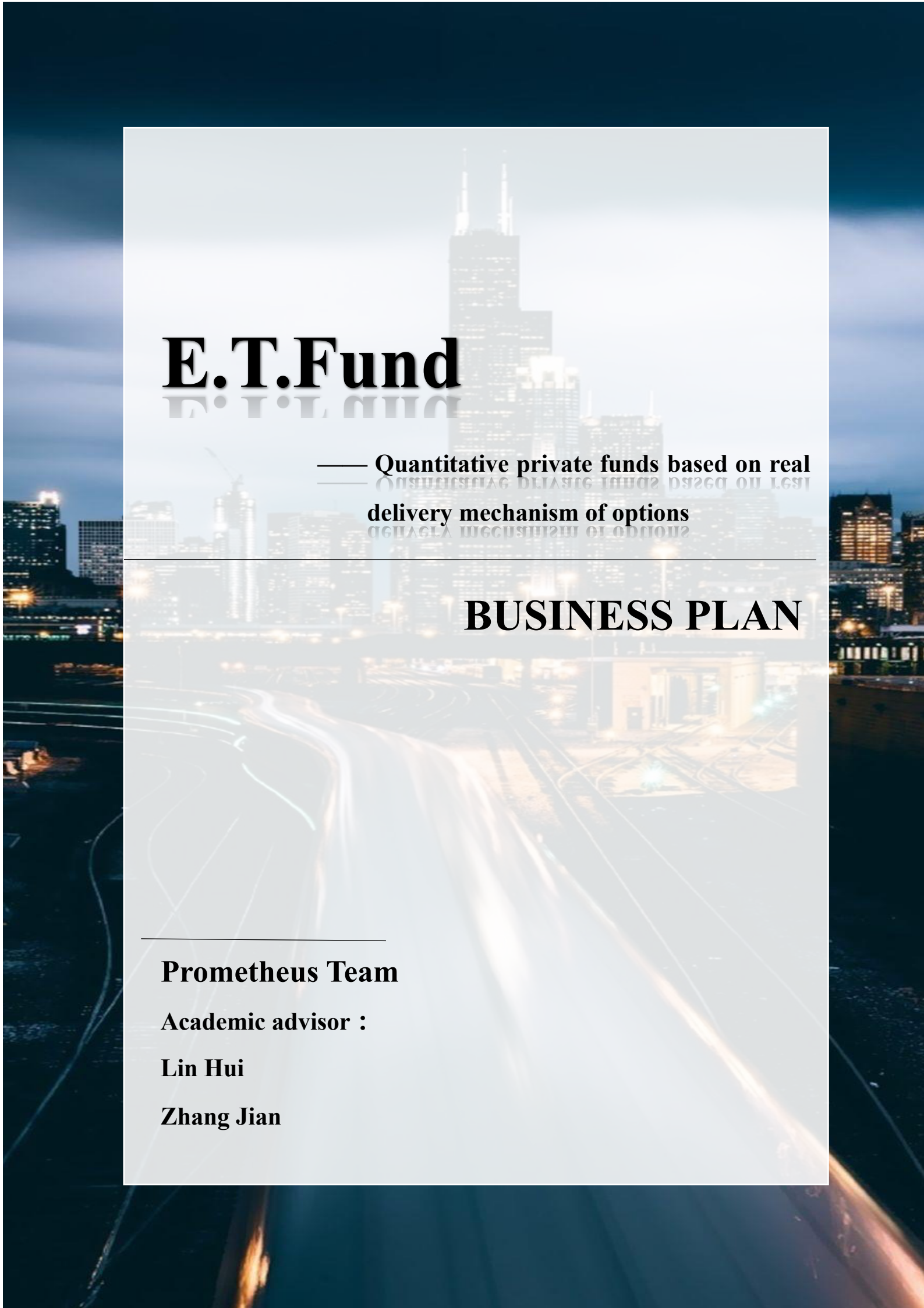

E.T.Fund

—— Quantitative private funds based on real delivery mechanism of options

BUSINESS PLAN

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E. T. Fund: a quantitative private equity fund based on option delivery mechanism

abstract

The project is a quantitative private equity fund based on the real delivery mechanism of China's options market. The product selects Shanghai Stock Exchange 50ETF options as the investment target, combines the short-term quantitative strategy of zero risk with the middle line financial management of robust asset allocation, aiming to provide investors with low-risk and high return investment returns.

The income mechanism of this product is "fixed income + short-term floating arbitrage". In order to offset the systematic risk brought by beta earnings, we use the self height liquidity to buy and exercise Shanghai Stock Exchange 50ETF options with negative time value, so as to earn alpha returns and realize risk-free arbitrage. The strategy is only implemented on the 50ETF exercise date of each month, which has a short time of capital occupation and high annualized yield. At other times, we choose other investment targets with low risk and good liquidity to allocate assets to ensure the overall risk of the fund is low and the fixed income is stable. Through data back testing and simulation measurement, the

annualized yield of the fund can reach 6.02%, in which the return of arbitrage transaction is 76.65%, which means that the risk is low and the return is high.

China's option market is in the ascendant, and the market efficiency is not mature, which also provides a good opportunity for the alpha strategy to earn excess returns. Our strategy is based on the "cheap sell effect" caused by the fact that retail investors are not inclined to exercise their options in China's option market. On the exercise date of Shanghai Stock Exchange 50ETF options, we capture the options with negative time value through the transaction management system to find investment opportunities, and then realize the optimal allocation of funds through reasonable warehouse division, discretionary mechanism, machine learning (or other) means In order to reduce the risk exposure, we use the purchase of hedging options as hedging to realize the delta neutrality of the portfolio, so as to avoid the risk.

In the future, we will deeply polish the products, optimize the strategy parameters and asset allocation with better mathematical model, and then optimize the algorithm and front-end interface of the technology side, so as to launch a mature and complete quantitative private equity fund for high net worth customers.

Product introduction

1. Product overview

Product name	E.T.Fund Private Equity
Product type	Mixed closed-end private equity funds
Volume	150 million
Portfolio type	Mixed portfolio
Portfolio opening frequency	Above 1 year
Risk-return characteristics	The expected risk level is between the currency market portfolio and the mixed portfolio, and the expected return rate is between the medium and long-term debt portfolio and the stock portfolio

2. Investment objective

By effective risk control, this portfolio obtains principal-guaranteed income through proactive investment management, and obtains excess income in addition to basic income through option arbitrage, striving to achieve long-term stable investment returns for high-net-worth clients and institutional investors.

3. Investment strategy

The asset allocation strategy of this portfolio is divided into two levels: general asset allocation and arbitrage investment strategy.

3.1 General asset allocation

This portfolio uses qualitative and quantitative analysis methods to determine the stage of the macroeconomic cycle based on full research on macroeconomic factors. Based on economic cycle theory, combined with the assessment of systemic risks to the market and the risk and expected rate of return of similar assets in the future, we designate the allocation ratio and adjustment principle of the portfolio among the major types of assets, in order to achieve absolute returns. Specifically, our investment strategy is divided into bank deposit investment, bond investment and bond fund investment.

3.1.1 Bank deposit investment

Based on judgments on the development trend of the macro economy, the operating environment of the micro economy, and the flow of funds in the money market, we will cooperate with commercial banks that meet the credit rating requirements and select more liquid assets for allocation in order to obtain stable income.

3.1.2 Bond investment

This portfolio includes bonds that are mainly liquid treasury bonds, local government bonds, financial bonds, central bank bills, financial bonds,

corporate bonds, corporate bonds, short-term financing bonds and medium-term notes. In terms of bond investment, this portfolio aims to achieve absolute returns and will mainly conduct investment management through two levels of category allocation and bond selection.

(1) Category allocation: In terms of category allocation, we will take a comprehensive analysis of factors such as macroeconomics, market interest rates, supply and demand changes. The category assets will be regularly optimized and adjusted to determine the optimal weight of the category assets according to the risk-return characteristics of the category assets in the exchange market and the inter-bank market.

(2) Bond selection: In terms of bond selection, the portfolio is based on the analysis of short-term interest rate trends. We will rationally use investment management strategies to implement proactive bond investment management through the analysis of the macroeconomic background, monetary policy, and the yield level of different bond types, liquidity and credit risks.

On the one hand, the portfolio adopts an interest rate expectation strategy. First, based on the forecast of domestic and foreign economic situations, we will analyze the changing trend of the market investment environment, focusing on changes in interest rate trends. Secondly, when judging the trend of interest rate changes, we will focus on money supply expectations, inflation and Fisher effects, and changes in capital flows, and

comprehensively analyze factors such as macroeconomics, monetary and fiscal policies, bond market policy trends, and price level changes. In this way, we can have reasonable expectations of interest rate trends.

On the other hand, this portfolio adopts valuation strategies to predict the yield curves of different varieties and determine the trend of the price center. We will also construct an investment portfolio based on the yield, liquidity, risk allocation principles, and bond valuation principles, reasonably select bonds with investment value in different markets, and make adjustments according to changes in the investment environment.

With the in-depth development and structural changes of the domestic bond market, more new bond varieties and trading forms will increase bond investment profit models. The portfolio will closely follow market dynamics and select appropriate intervention opportunities to seek higher stable returns.

3.1.3 Bond fund investment

The bond fund investment of this portfolio will be mainly open-end funds that can be purchased and redeemed freely, fully relying on the existing industry's comprehensive scoring results for fund companies and fund products, and choosing the best products with a stable investment style and stable performance growth. We will also dynamically adjust positions and allocation types based on the valuation level and variety rotation of the bond market.

3.1.4 Other investment strategies

The portfolio will also invest in commercial bank wealth management products, special asset management plans and other products. Based on a comprehensive comparative analysis of risk and return, the portfolio will follow the principle of reducing fluctuations in the portfolio's net value and obtaining long-term stable returns, and select the best allocation.

3.2 Arbitrage investment strategy

This part is a short-term arbitrage strategy based on the physical delivery mechanism of China's SSE 50ETF options. To get more details, see the third part of the report (detailed investment strategy).

4. Investment scope and asset allocation

In terms of asset allocation, all assets will be used for arbitrage investment on the expiry date and the day after the monthly 50ETF option to obtain excess returns. In the rest of the time, investments will be made in accordance with major asset allocation strategies to obtain capital preservation benefits. The specific asset allocation is as follows:

Assets	Scope	Allocation ratio
Bank deposits	Cash, bank demand deposits, etc.	10-80%
Bond	Government bonds with a remaining	0-90%

	maturity not exceeding one year, quasi-government bonds, financial corporate (corporate) bonds, non-financial corporate (corporate) bonds, etc.	
Fund and other products	Money market funds, bond funds, money market insurance asset management products, etc.	0-70%
50ETF option arbitrage	50ETF call/put options and 50ETF arbitrage combination	0-100%

5. Target investor

The investor of this product should have the corresponding risk identification ability and risk bearing ability, who can invest more than 1 million yuan in a single private equity fund, and also meet the following requirements:

Institutions	Net assets not less than 10 million yuan
Individual	Financial assets not less than 3 million yuan or with an average annual personal income of not less than 500,000 yuan in the last three years

Note: Financial assets include bank deposits, stocks, claims, fund shares, asset management plans, bank wealth management products, trust plans, insurance products, futures rights, etc.

6. Income and fee

6.1 Income and allocation

The income of this product is divided into capital preservation income (investment income of major asset allocation) and excess income (arbitrage investment strategy income)

Investment type	Estimated rate of return (annualized)	Investor's rate of return
General asset allocation	3%-4%	Investors get all income
Arbitrage investment strategy	76.65% (On the closing date only)	Investors get all income
Total	5.52%-6.52%	

6.2 Fee

This product will deduct relevant expenses from the fund assets at a certain annual rate, including management fees (0.15%), custody fees (0.05%) and sales service fees (0.15%), a total of 0.35% fee rate.

7. Risks

7.1 Risk recognition

(1) Bond investment risk

This fund is a mixed type, with a certain proportion of assets invested in bonds, so it needs to bear the interest rate risk caused by market interest rate fluctuations and the credit risk caused by the changes in the credit qualifications of bond issuers, especially corporate bonds and corporate bonds. It's also under the risk of credit default caused by insolvency. If there is an overall decline in the bond market or the industry being invested deteriorate, systemic risks in the bond market will not be avoided.

(2) Interest rate risk

The fluctuation of interest rates in the financial market will directly lead to changes in the price and yield of the bond market. It will also affect the supply and demand of funds in the securities market, as well as the financing cost and yield level of the proposed investment bonds. The above changes will directly affect the price of securities and the Fund's income.

(3) Reinvestment risk

The decline in market interest rates will affect the reinvestment yield of fixed-income securities interest income, which will increase and decrease with the price risk brought by rising interest rates.

7.2 Risk control (in terms of bond investment)

Risk type	Risk control method
Interest rate risk	Establish a term structure model of interest rates, and capture the changes in short- and medium-term interest rates in a timely manner by grasping the trend of macroeconomic development
Credit risk	Only invest in bonds that meet the credit rating requirements of this product with credit fans above investment grade; establish a credit risk spread analysis model to conduct a reasonable assessment of credit risk
Market risk	McLaughlin duration, modified duration, key duration, convexity, DVBP, VaR, etc.
Liquidity risk	Portfolio level-bond holding concentration, N-day liquidity, turnover rate, unilateral turnover rate; Individual bond level-average trading volume, realization loss rate, average realization days, circulation ratio

Theoretical background

1. Option theory background

1.1 The basic concept of options

An option is a type of contract that gives the holder the right to purchase or sell an asset at a fixed price on a specific date or any time before that

date.

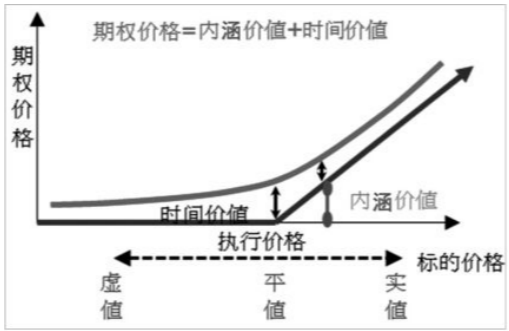
Options are classified into call options (call options) and put options (put options) according to the purpose of the transaction. The buyer of a call option has the right to buy the underlying asset at a certain price at a certain time in the future; the buyer of a put option has the right to sell the underlying asset at a certain price at a certain time in the future.

According to the relationship between the strike price and the underlying price, options can also be divided into real-value options (options with intrinsic value), at-value options (options with the largest time value), and out-of-value options (options without intrinsic value). Among them, the intrinsic value is the actual value produced by the commodity of the indicator as expected, that is, the value of the option when it is immediately exercised.

	underlying price VS exercise price		
	in-the-money options	at-the-money options	Out-of-the-money options
Call option	>	=	<
Put option	<	=	>

1.2 The time value of options

The value of an option is composed of intrinsic value and time value. Among them, the time value of an option represents the possibility that changes in the price of the underlying stock will benefit the option holder during the remaining validity period of the option. The longer the expiration date of the option contract, the higher the time value of the option. Because investors are willing to pay higher prices and wait for the stock to change in a direction that is beneficial to their contract. The closer to the expiration date, the less and less time value. At the expiration date, theoretically, the time value should be 0, and the value of the option is only the intrinsic value. This process is also called the time loss of option value. The time value of an option not only reflects the time risk during the option trading period, but also reflects the risk of the degree of market price changes.



The formula for calculating the intrinsic value and time value of options is as follows:

Time value of call option = option price-max (underlying asset price-option strike price, 0)

Time value of put option = option price-max (option exercise price-underlying asset price, 0)

Intrinsic value of call option = max (underlying asset price-option strike price, 0)

The intrinsic value of the put option = max (option exercise price-underlying asset price, 0)

Time value is mainly affected by three factors: the actual movement of the underlying price, implied volatility and time.

(1) The closer the target price moves to the exercise price, the greater the time value; the farther the target price moves from the exercise price, the smaller the time value. That is to say, the time value near the average option is the largest, while the time value of the deep virtual and deep real options is smaller.

(2) If the implied volatility increases, the time value increases; if the implied volatility decreases, the time value decreases.

(3) The longer the maturity period, the greater the time value; the shorter the maturity period, the smaller the time value.

1.3 Option pricing model

The most important thing in option trading is the premium price. The process of option pricing is a process of analyzing and simulating the market changes of option prices through appropriate mathematical models based on factors that affect option prices, and finally obtaining a reasonable theoretical price.

Through the pricing model, the risk indicators of option prices can be given,

which can be used to control investment risks. The option pricing model is mainly based on the theory of no-arbitrage equilibrium pricing. The basic idea is that if there are risk-free arbitrage opportunities in the market, then the market is in an unbalanced state, and the power of arbitrage will drive the market to rebalance, and the equilibrium price after the arbitrage opportunities are eliminated That is the real price in the market.

The main parameters required by the option pricing model are the price of the subject matter, the exercise price, the volatility of the subject matter price, the expiration time of the option contract, and the risk-free interest rate.

1.3.1 Implied volatility of options

The implied volatility of an option can usually be seen through the T-type quotation table. It is the volatility obtained by substituting the option market price into the BS formula, which is the "implicit" expected volatility of the underlying asset in the option market price Value, including a large amount of forward-looking information in the market, reflects the market’s expectations for the future volatility of the underlying asset, and therefore plays a very important role in option pricing, underlying asset market forecasts and strategic trading. We can also consider the implied volatility It can also be understood as the expectation of actual market volatility.

Example: Take the above 50ETF option as an example. When the SSE

50ETF option price is 2.3 yuan/unit, the price of the call option that expires one month later and the strike price is 2.3 yuan/unit is 0.058 yuan/unit. The implied fluctuation is reversed. The rate is 20%. After analysis, under other conditions unchanged, for every 5% increase in implied volatility, the option price will increase by approximately 22.4%. It can be seen that the implied volatility has an expected effect on option prices. (Calculation formula: new option price = original option price + vega * implied volatility)

The greater the volatility, the higher the theoretical price of the option; conversely, the smaller the volatility, the lower the theoretical price of the option. The positive impact of volatility on option prices can be understood as:

For the buyer of an option, since the cost of buying the option has been determined, the greater the volatility of the underlying asset, the greater the possibility that the price of the underlying asset will deviate from the execution price, and the greater the possible benefits, so the buyer is willing to pay more The premium purchase option;

For option sellers, because the greater the volatility of the underlying asset, the greater the price risk they will bear, and therefore they need to charge a higher premium.

On the contrary, the lower the volatility of the underlying asset, the smaller the income that the buyer of the option may receive, and the smaller the

risk that the seller of the option bears, and therefore the lower the price of the option. (Source: Everbright Futures)

1.3.2 Binomial Tree Option Pricing Model

The binomial tree option pricing model is one of the commonly used option pricing models, which was proposed by John Cox, Ross and Mark Rubinstein in 1979.

The binomial option pricing model assumes that the stock price fluctuates only in two directions, upward and downward, and it is assumed that the probability and amplitude of each upward (or downward) fluctuation of the stock price remain unchanged during the entire period of the investigation. The model divides the duration of the investigation into several stages. According to the historical volatility of the stock price, it simulates all possible development paths of the underlying stock during the entire duration, and calculates the warrant exercise income and discounts for each node on each path. The price of the warrant calculated by the method.

This model can be used to price typical European options that do not pay dividends, or to price American options and dividend-paying options after the model is modified.

Assumptions: transaction costs and taxes are zero; investors can borrow or lend funds at risk-free interest rates; market risk-free interest rates are constant; the volatility of stocks is constant; no stock dividends are paid.

1.3.3 Black-Scholes model

In the binomial tree option pricing model, if the possibility of the ending price of the underlying security increases infinitely, the tree structure of its price will extend indefinitely, and the time from each node to the next node (up or down) will continue Shorten, if the price adjustment range is gradually reduced with the shortening of the time period, in the extreme case, the binomial tree model's pricing of European warrants will evolve into a classic model of warrant pricing theory: the B-S model.

The basic assumptions of the Black-Scholes model are as follows:

(1) During the life of the option, the underlying stock of the buy-back option will not pay dividends or make other distributions;

(2) There is no transaction cost for the trading of stocks or options;

(3) The short-term risk-free interest rate is known and remains unchanged during the lifetime;

(4) Any securities purchaser can borrow any amount of funds at a short-term risk-free interest rate;

(5) Short-selling is allowed, and the short-seller will immediately get the funds at the price of the short-sold stock on the day;

(6) The options are European-style options and can only be executed on the expiry date;

(7) All securities transactions take place continuously, and the stock price walks randomly.

(8) The stock price obeys the lognormal distribution.

Based on assumptions and mathematical inferences, the formula for calculating the price of European call options is:

$$C = S * N(d1) - Le^{-rT}N(d2)$$

among them:

$$d1 = \frac{\ln\frac{S}{L} + (r + 0.5\sigma^2)T}{\sigma\sqrt{T}}$$

$$d2 = \frac{\ln\frac{S}{L} + (r - 0.5\sigma^2)T}{\sigma\sqrt{T}} = d1 - \sigma\sqrt{T}$$

C——the current value of the call option;

L——the strike price of the option;

S——The current price of the underlying stock;

T——the time before the option expiration date (years);

r——annual risk-free interest rate continuously compounded;

N(d)——The probability that the deviation in the standard normal distribution is less than d;

e——The base of natural logarithm, approximately equal to 2.7183

1.4 The basic theory of option hedging

1.4.1 The principle of hedging

The futures price trend of the same commodity is basically the same as the spot price trend, which rises and falls at the same time. When the expiration date is approaching, the futures price will usually return relative to the spot price. On this basis, transactions are conducted according to the operating

principles of opposite directions, equal quantities, and the same or similar months. Under normal circumstances, the hedging of futures shows a loss in one market and a profit in the other, so as to achieve the purpose of avoiding risks and locking in costs.

As for the option hedging transaction, the operation is also carried out by using the principle of correlation between the option price and the spot and futures prices. The price change will also cause one position to be profitable and one position to lose.

In order to avoid the risk of rising prices, the hedger can buy call options or sell put options; in order to avoid the risk of falling prices, the hedger can buy put options or sell call options. If the price of the underlying asset changes in the unfavorable direction of the original futures or spot position as expected, the gains from the option part can offset the loss caused by the spot or futures part.

1.4.2 Advantages of option hedging

(1) Less capital occupation. Both options and futures are leveraged transactions, which have an amplifying effect on less capital and can cover huge spot positions.

(2) While avoiding risks, it can retain the ability to obtain profits when prices change favorably.

(3) The risk of margin call is relatively low. For the protective buyer of options, no margin is required. For the cover seller of options, there is a

risk of margin call. Both buyers and sellers of futures need to pay margin.

(4) The basis risk (the risk caused by the unsynchronized price fluctuation between the value-preserving instrument and the value-preserved commodity) is avoided, and the value-preserving effect is more certain.

(5) The value-preserving strategies are rich and diverse, and strategies can be flexibly designed according to the needs of investors.

(6) Transaction fees are lower.

1.4.3 Disadvantages of option hedging

(1) The use of options to maintain value, due to its excessively magnified leverage, once the price changes in an unfavorable direction, the premium will be completely lost, and the risk is greater.

(2) For over-the-counter options, the transparency is low, information is asymmetry or the contract terms are unfair, resulting in some over-the-counter options that often infringe the interests of investors.

(3) The cost of a single protective hedging strategy is relatively high, especially the premium paid by in-the-money options sometimes exceeds the price of the underlying.

(4) A single compensatory strategy, while obtaining generous premiums, requires market judgments and quasi-options, and risk exposure is not completely locked.

(5) Implied volatility is difficult to determine. It is difficult for ordinary investors to determine whether option prices are high or low. Investors

need to have more professional knowledge.

1.4.4 Compound hedging strategy-delta neutral hedging strategy

The so-called Delta is used to measure the percentage of the price change of the option when the price of the underlying asset of the option changes. For an overall investment portfolio, Delta represents the sensitivity analysis of the portfolio to changes in the underlying asset price, volatility, and interest rates. The definition of Delta is as follows:

$$\boldsymbol{Delta = Option\ price\ changes / Price\ change\ of\ underlying\ asset}$$

This formula is the definition of delta. In the actual operation of options, the calculation of delta cannot be directly calculated based on this, but the option pricing model measures the delta of the option. For example, in the B-S pricing model, we use the following formula to measure the delta of an option:

$$\boldsymbol{Call\ option\ delta = N(d1)}$$

$$\boldsymbol{Put\ option\ delta = 1 - N(d1)}$$

$$\boldsymbol{d1 = \frac{\ln \frac{S}{L} + (r + 0.5\sigma^2)T}{\sigma\sqrt{T}}}$$

Where L is the exercise price of the option; S is the current price of the underlying stock; T is the time before the expiry date (years); R is the annual risk-free interest rate continuously compounded; N(d) is the deviation in the standard normal distribution Probability less than d.

The delta neutral strategy refers to a neutral hedging strategy that keeps the Delta of the portfolio at 0, so that the portfolio value is not affected by

changes in the underlying asset price. The Delta value of the combination is equal to the sum of the Delta values of each position in the combination. The call option Delta is positive, the put option Delta is negative, and the underlying asset Delta is 1. By reasonably configuring the underlying assets and options in the portfolio, the Delta of the portfolio can be adjusted to 0.

There are two purposes for achieving Delta neutrality, which are called Delta Neutral Trading and Delta Neutral Hedging.

(1) Delta neutral transaction —— for profit

Delta neutral trading can be profitable while shielding directional risks, that is to say, when the stock price stagnates or fluctuates greatly, Delta neutral trading can be profitable. Specifically, there are 4 strategies:

① Using the option bid-ask spread, that is, buying an option at the buying price and selling an option at the selling price at the same time, the transaction achieves zero delta, and you can profit from the bid-ask spread without having to bear directional risk. This is also called " Scalping strategy".

② Using time recession (referring to the decline in the price of the option contract as the expiration date approaches), the position of zero Delta is not affected by small changes in stock price, but the option premium is still affected by the time recession effect. As time goes on, the right Gold is decreasing.

③ Using volatility, a Delta neutral position can profit from changes in volatility.

④ Using the construction of explosive options trading strategy, although Delta's neutral position is not affected by small changes in stock prices, it can make profits from large fluctuations in stock prices.

(2) Delta neutral hedge-for the purpose of protecting positions

Delta neutral hedging is an option trading technique used to protect positions from short-term stock price fluctuations. It is very useful for long-term stock holdings or long-term options investment strategies. Delta neutral hedging can not only protect the position from small price fluctuations, such as when the stock reaches a resistance price or a support price, but it can make the position continue to profit in subsequent price fluctuations.

2. China's SSE 50ETF options market status and trading mechanism

2.1 Introduction to 50ETF Options

SSE 50ETF options have been listed on February 9, 2015. As of August 25, 2020, a total of 2416 contracts have been issued, including 1,208 call options and 1,208 put options. As of August 25, 2020, there are 65 due delivery days, all of which are the fourth Wednesday of the month.

The basic information is as follows:

Object	China SSE 50ETF Options	Minimum offer	0.0001
Contract type	Call options and put options	Reporting unit	1 sheet or its integer multiple
Exercise method	European options	Delivery method	**Physical assets**
Contract unit	10000	transaction hour	Each trading day is 9:15-9:25 in the morning, 9:30-11:30 (9:15-9:25 is the opening call auction time), 13:00-15:00 in the afternoon (14:57-15 :00 is the closing call auction time)
Expiry month	Current month, next month and two consecutive quarter months	expiry date	The fourth Wednesday of the expiry month (postponed on legal holidays)
Exercise date	On the expiry date of the same contract, the exercise order submission time is 9:15-9:25, 9:30-11:30, 13:00-15:30	Exercise settlement date	The trading day following the exercise date
Exercise price		9 (1 fair value contract, 4 virtual value contracts, 4 real value contracts) 0.05 yuan for 3 yuan or less, 0.1 yuan for 3 to 5 yuan (inclusive), and 5 to 10 yuan (inclusive) for 0.25 yuan, 10 to 20 yuan (inclusive) is 0.5 yuan, 20 to 50 yuan (inclusive) is 1 yuan, 50 to 100 yuan (inclusive) is 2.5 yuan, and more than 100 yuan is 5 yuan	
Price limit		The maximum increase of the call option=max{contract target previous closing price×0.5%, min [(2×contract target previous closing price-exercise price), contract target previous closing price]×10%} Maximum drawdown of call options = previous closing price of the underlying contract × 10% The maximum increase of put option=max{exercise price×0.5%, min [(2×exercise price-previous closing price of contract target), previous closing price of contract target]×10%} Maximum drop of put option = previous closing price of contract target × 10%	

Note: European-style options must be delivered on the exercise date, and

cannot be delivered before the exercise date.

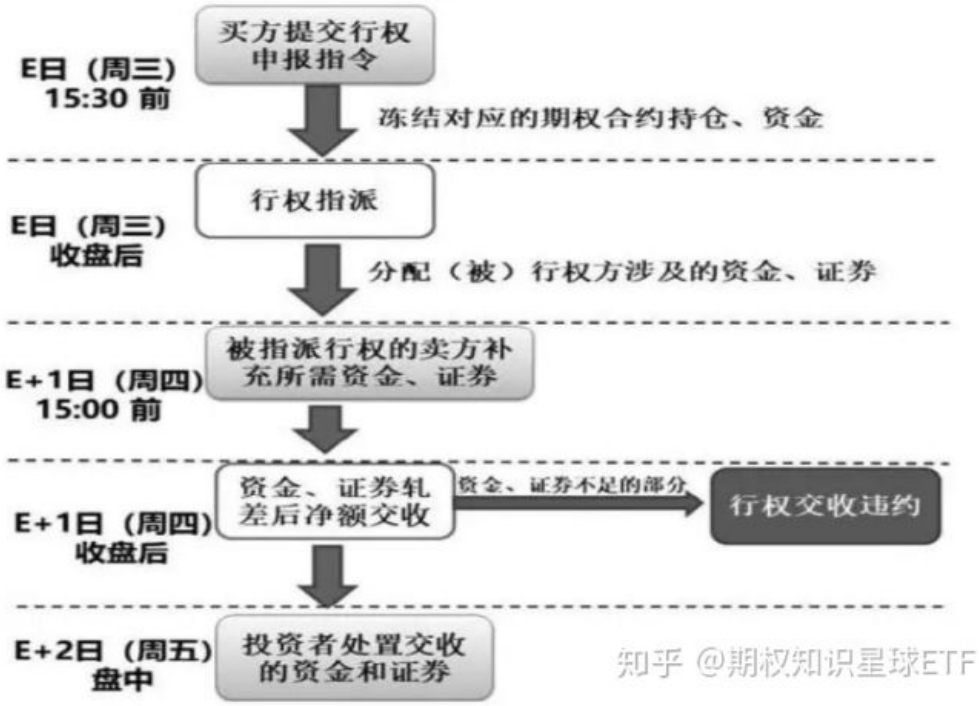
2.2 50 ETF options delivery process

(1) The buyer of an option must decide whether to exercise the option and make an exercise statement on the exercise date (the expiry date of the option contract, 15:30 pm. The seller will know the result of the assignment before the end of the day.

(2) Be prepared to exercise your rights. Basically, the buyer and seller should be ready to pay and deliver. As far as call options are concerned, the buyer should prepare the funds on the exercise day, and the seller should prepare the vouchers on the next trading day based on the distribution results. On the other hand, put options require the buyer to prepare coupons on the exercise date, and the seller prepares funds on the specified next trading day, which is the expiry date.

(3) On the next trading day, China Settlement will conduct cash and bond delivery.

The following figure shows the detailed process:



When 50ETF options are exercised, there are still some issues that need to be paid attention to, mainly as follows:

(1) Exercise time

50ETF options are European-style options, which can only be submitted for exercise on the exercise date (also the last trading day, that is, the fourth Wednesday of the contract expiration month, which will be postponed on legal holidays). The exercise instruction declaration time is 9 am on the exercise day : 30-11:30, 13:00-15:30 in the afternoon.

(2) Exercise assignment

Exercise assignment means that the exchange and China Clearing Group pair the effective exercise declarations of all option right parties (buyers) with the obligatory parties (sellers).

In order to ensure fairness, the exchange assigns the option obligor to

deliver the underlying securities or funds in proportion, and the assigned obligor must prepare a sufficient amount of the underlying securities or funds to complete the exercise and settlement.

(3) Exercise settlement

Exercise settlement means that on the exercise settlement date, China Clearing will transfer the underlying securities and funds of the assigned obligor to the right party of the option.

The 50ETF option adopts the physical delivery method, that is, when the option is exercised, both parties carry out the settlement of cash and the underlying securities. For call options, the right party delivers the corresponding funds to the obligor based on the execution price, and the obligor delivers the underlying securities to the obligatory; for put options, the obligatory party delivers the underlying securities to the obligor, and the obligor The corresponding funds are given to the right party.

3. Overview of the sale effect

In theory, people use the BS model to price options and believe that option pricing is equal to intrinsic value plus time value. Traditional option pricing research is based on the rational person hypothesis. The rational person hypothesis is that under the established risk appetite, investors aim to maximize the expected utility and accurately adjust investment decisions based on the new information obtained. However, in the empirical research,

a series of option price anomalies that violate the expected utility theory have been discovered. Behavioral finance, which has developed rapidly since the 1970s, has put forward new perspectives on the traditional theoretical "rational man" hypothesis, and opened up a new path for us to study financial markets. Behavioral finance focuses on exploring the influence of psychological factors on investment decision-making, assuming that investors have psychological deviations such as cognition and emotion, and behavior patterns and risk preferences are bounded and rational. The cognitive bias and emotional bias of investors will affect the attitude of investors, which in turn makes individual investors have decision-making deviations. The market decision-making deviations formed by the aggregation of individual deviations make option prices deviate from the intrinsic value.

The prospect theory proposed by Kahneman and Tversky (1979) is an important part of behavioral finance, and it has made important improvements to the expected utility theory. The outlook theory believes that investors are not completely rational, and that investors' risk preferences are inconsistent under different income and loss states. Therefore, a value function is proposed to measure the psychological value of investors when facing risk choices. It also addresses the uncertainty in the expectation effect theory. The probabilistic weighting of possible results has also been improved, and the function of decision-making power

is introduced to measure the value of various uncertain results. The outlook theory believes that investors over-emphasize events with low probability. In addition, investors are prone to risk appetite when facing returns and risk aversion when facing risks. According to the results of the questionnaire, Kahneman and Tversky believe that when faced with definite results and risky decisions, actors generally choose to avoid uncertain results. This phenomenon is called the deterministic effect and is one of the theoretical foundations of the outlook theory.

Based on the outlook theory, Miller and Shapira (2004) studied how investors measure the value of call options and put options. Through a questionnaire, they found that both buyers and sellers of options price options lower than their expected value. Lien and Wang (2006) found that in reality the option market is often biased, and disappointment and aversion at this time make investors more conservative.

My country's SSE 50ETF options take the form of physical delivery, which is not convenient. Therefore, on the expiry date, most 50ETF options investors will choose to close their positions to prevent the delivery of physical assets at maturity. Moreover, physical delivery is actually a T+2 form, and there is uncertainty about the price fluctuation of the underlying asset on the delivery date and the two days when the underlying asset is obtained. According to related researches based on outlook theory, it is not difficult to understand that 50ETF option holders will amplify risks and

therefore tend to close their positions before, leading to a general decline in option contract prices.

Based on the minute-level data of the wind database, this article counts the positive and negative time value of all 50ETF call and put options issued in 18, 19 and January to August 20 from the opening to the closing on the expiry day. Details are as follows:

A total of 198 50ETF call options and 202 50ETF put options were issued throughout the year. Regardless of the fact that the trading volume per minute is 0, the number of times that the time value of the call option is less than 0.001 per minute on the expiration date is 43342 times, and the number of times less than 0 is 16924 times, accounting for 90.35% and 35.32% respectively. On the expiration date of the put option, there were 40772 times that the time value was less than 0.001 per minute, and 18,928 times that were less than 0, accounting for 83.41% and 38.72% respectively.

There were a total of 242 50ETF call options and 242 50ETF put options issued throughout the year. Regardless of the fact that the trading volume per minute is 0, the number of times that the time value of the call option is less than 0.001 per minute on the expiration date is 52,505, and the number of times less than 0 is 30,397, accounting for 89.65% and 51.90%, respectively. On the expiration date of the put option, the number of times that the time value is less than 0.001 per minute is 53,240, and the number of times less than 0 is 13,710, accounting for 90.91% and 23.41%,

respectively.

There are a total of 164 50ETF call options from January to August 20, and a total of 164 50ETF put options. Regardless of the fact that the trading volume per minute is 0, the number of times that the time value of the call option is less than 0.001 per minute on the expiry date is 35,734, and the number of times less than 0 is 16,455, accounting for 90.03% and 41.46% respectively. On the expiration date of the put option, the number of times that the time value is less than 0.001 per minute is 33,463, and the number of times less than 0 is 12,706, accounting for 84.32% and 32.01% respectively.

From the above statistics, it can be seen that 50ETF call and put options do have a significant time value drop or even negative situation on the expiry date.

After counting the probability that the time value of the 50ETF option is negative on the expiration date, this article regresses the market trend characteristics on the expiration date. This part has a certain impact on the model optimization.

This paper takes the percentage p1 of the negative time value of the monthly call option expiration date and the percentage p2 of the negative time value of the call option expiration date as the explanatory variables. The historical volatility ***hv*** and the average daily return rate ***r*** of the seven days before the expiry date, the average daily volume ***vol*** and the turnover

rate ***to*** on the expiry date are used as explanatory variables. Among many liquidity indicators, turnover rate is often used as an indirect indicator to describe investor sentiment. Therefore, this empirical process uses turnover rate to measure market sentiment. The final result is as follows (the model has passed the 95% confidence test):

p1 = 0.521 + 2.25*10-9 vol + 5.333r – 1.109hv – 4.637to
p2 = 0.301 -1.98*10-9 vol – 7.484r + 0.342hv +3.607to

Regression analysis results show that the negative time value of call options on expiry date is positively correlated with trading volume and average daily yield, and negatively correlated with historical volatility and market sentiment, while put options are just the opposite.

Detailed quantitative investment strategy

The income of this fund product will consist of two parts. One part is similar to other asset management products on the market. It uses low-risk assets such as xxx to provide GP with a fixed income mid-line investment strategy; on the other hand, it is based on the China SSE 50ETF The short-term arbitrage strategy of the option physical delivery mechanism has low risk, high return, low capital occupation cost, and extremely strong application value. The combination of "fixed income" and "floating arbitrage" constitutes the investment strategy of the Fund.

In this section, we will focus on the differentiated content of products-risk-free arbitrage strategies based on the time value of options.

We divide this strategy into four functional modules: α strategy (earning excess returns), risk strategy, discretionary decision mechanism and model optimization mechanism. The principles and specific operations are introduced respectively, and then a complete arbitrage strategy is presented.

1. α strategy details and specific operations

Alpha strategy is a professional term in the field of quantitative trading. Generally speaking, Alpha refers to the rate of return on investment after deducting the market benchmark return. It can be understood as the income only brought by the investment strategy, represented by the Greek letter α. The rate of return due to the market itself, that is, the part of the return that has nothing to do with the investor's investment strategy, is called the beta return and is represented by the Greek letter β. Therefore, the Alpha model is a series of techniques and strategies used in the investment process to increase the income of Alpha.

In short, the Alpha strategy aims to speculate on the future trends and profitability of the financial products considered by quantified traders.

The basic idea of this strategy is that the above-mentioned low sale effect and the physical delivery mechanism of SSE 50ETF options have caused a large number of retail investors to choose to abandon the exercise and choose to close their positions on the day of the exercise, and under this premise they will When the time value of an option is negative, we refer to it as "sale option" for short. At this time, if you buy the parallel option with

the smallest time value, based on the formula of the option time value, theoretically we can get the return of |time value|. The proof is as follows:

$$\boldsymbol{Time\ value\ of\ call\ option\ =\ C-max\ (K-S,0)}\quad \textbf{formula 1-1}$$

$$\boldsymbol{Time\ value\ of\ put\ option\ =\ C-max(K-S,0)}\quad \textbf{formula 1-2}$$

Among them, C is the low-selling option price, S is the underlying asset price, and K is the option exercise price.

Our income and expenditure are as follows:

Call option		Put option	
Income	Expenditure	Income	Expenditure
ETF selling price S	Option price C	Strike Price K	Option price C
	Strike Price K		ETF purchase price S

In addition, if the time value is <0, the intrinsic value of the option is proved to be >0, so the original formula is sorted out:

$$\boldsymbol{S-K-C=-Time\ value\ of\ call\ option}\quad \textbf{formula 1-3}$$

$$\boldsymbol{K-S-C=-Time\ value\ of\ put\ option}\quad \textbf{formula 1-4}$$

In both cases, the income we get is (-time value), because the time value is <0, the income is >0, and the proof is complete.

The specific operations of this part of the strategy are:

Call options: 1) On the expiration date of the option contract, traverse all the options expiring this month in the options market and select the call options whose time value is less than B (B is the set arbitrage threshold, B<0). 2) Execute the order decision, buy the option and submit the exercise instruction to reserve enough funds for the exercise. 3) The cash and bonds are delivered on T+1 day to get ETF. 4) Sell the 50ETF obtained on the

T+2 day and get income.

Put options: 1) On the expiry date of the option contract, traverse all the options expiring this month in the options market and select the call options whose time value is less than B (B is the set arbitrage threshold, B<0). 2) Execute the order decision, buy the option and submit the exercise instruction, and buy the ETF required for the exercise. 3) The cash and coupons will be delivered on T+1 day to obtain income.

2. Detailed risk strategy and its operation

The former strategy is to be carried out in an ideal market, but this is not the case in the real market. Although we have more liquidity compared to retail investors, because my country's options can only be delivered on T+1 day after the exercise date, stocks can only be traded on T+2, and the underlying 50ETF fluctuates in these two days There is a risk of uncertainty. Therefore, this strategy chooses to buy put options to achieve the neutrality of the delta risk strategy of the portfolio. Since the put option is a short-selling product, its fluctuation direction is opposite to that of the underlying asset 50 ETF. Therefore, as long as we buy a "low-sell" option and buy (-1/delta) put options while submitting an exercise order, the subsequent fluctuations of the 50 ETF can be hedged, thus locking in the α strategy The theoretical gains in, complete hedging. The proof is as follows:

$$\boldsymbol{Delta = \frac{\Delta Option\ Price}{\Delta ETF\ Price}} \qquad \textbf{formula 1-5}$$

After buying 1 (-1/delta) put option, the portfolio is (1 50ETF, (-1/delta) put option). The delta value of this combination is calculated as follows:

$$\boldsymbol{Delta1 = 1 * 1 + m * \ (-1/m) \ = 0}$$

Among them, delta1 is the delta value of the portfolio, m is the delta value of the put option. As the underlying asset, ETF's delta is equal to 1.

At this time, the combination is delta risk neutral, which can be obtained:

$$\boldsymbol{S2 - S0 = P0 - P2} \qquad \textbf{formula 1-6}$$

Among them, S2 is the price of one 50ETF on T+2, S0 is the price of one 50ETF on T day; P2 is the price of put options on T+2 (-1/delta), and P0 is the price of T day (- 1/delta) The price of the put option.

Suppose the theoretical profit of this strategy is V, C is the price of a call option with a negative time value on T day, K is the strike price, and T is the time value of the call option, we can get:

$$\boldsymbol{V = S2 + P2 - C - P0 - K} \qquad \textbf{formula 1-7}$$

Incorporating formula 1-1 and formula 1-4, we can get:

$$\boldsymbol{V = -T + (S2 - S0) - (P2 - P0)} \qquad \textbf{formula 1-8}$$

$$\boldsymbol{V = -T} \qquad \textbf{formula 1-9}$$

Note: If the purchased "low-selling" option is a put option, there is no need to go short. You only need to buy an equal number of 50ETF at the same time as buying the "low-selling" put option, and normal delivery will be made on T+1 day. Gain can be locked in.

3. Discretionary mechanism

Through the delta risk neutral strategy of risk strategy, we avoid the risk of ETF price changes. However, our α strategy needs to have parallel rights after buying options. This faces two problems: First, after submitting an exercise order, we need to prepare funds or ETFs for exercise by α strategy, and if we buy We bought call options. We also need to buy put options for hedging until T+2. This mechanism of physical delivery takes up a lot of funds for a long time and reduces the cumulative rate of return of arbitrage; second, After the exercise is selected, this part of the funds will be locked until the end of the exercise day. On this day, the funds cannot be recycled, and the arbitrage is repeated, and the use of funds is inefficient.

Based on the above problems, we introduce a discretionary mechanism to solve this problem. First of all, the options we bought are "sale" (time value is negative), which means that the option is "undervalued" to a certain extent, and its price has a large upside.

Therefore, we can temporarily not carry out exercise and hedging operations when buying options, but hold for a period of time-defined as a discretionary window period. During the window period, we conduct real-time detection of the options held. If the price of the option has a large increase, we will not exercise the right to hedge and lock the forward income. Instead, we will directly sell the option to earn the spread and release the funds to invest again in arbitrage. ; If there is no significant

increase in the entire window period, buy the hedging option parallel right. Discretionary choice mechanism can effectively improve the efficiency of capital use, but it also gives rise to new problems: throughout the window period, options may not have the expected increase. At this time, the hedging parallel rights are purchased again, compared to the immediate exercise. On the contrary, it reduces our income level. Therefore, we introduce another discretionary condition in addition to the increase in the option price-the level of exercise income, and calculate the income expression of the exercise if the low-selling option is bought for a period of time (the following formula is for the subscription of the low-selling call option case):

Suppose the purchase price of the low-selling option is C, the price of the (-1/delta) put option purchased when exercising is P_1, the current price of the ETF when the exercise is determined is S_1, and the selling price of the (-1/delta) put option sold on T+2 is S_2, and the price of selling an ETF on T+2 is P_2; the exercise price of the low-selling option is K, and the exercise income level is V_1. The income and expenditure are shown in the following table:

Income item	value	Expenditure item	value
Low-selling option purchase price (historical price)	**C**	(-1/delta) put option purchase price	**P_1**
ETF selling price (T+2)	**S_2**	Exercise price	**K**
Put option selling price (T+2)	**P_2**		

According to formula 1-4, after buying (-1/delta) put options, the absolute value of the changes in the ETF price is equal and the sum is 0, namely:

$$S2 - S1 = P1 - P2 \qquad \textbf{formula 1-10}$$

$$V1 = C + S2 + P2 - P1 - K \qquad \textbf{formula 1-11}$$

Bring in 1-9, get

$$V1 = C + S1 - K \qquad \textbf{formula 1-12}$$

($C+S_1-K$) is the return level of the strategy's delayed exercise. Different from the time value formula, C here is the historical price when the option is purchased, not the current price.

So far, we have stipulated two conditions for decision-making in this discretionary mechanism: the increase in option price and the level of exercise income. The specific operations in the management system are as follows:

Starting from the purchase of low-selling call options, the system continuously monitors the option price and ETF price, and makes the following judgments:

Exercise income level > arbitrage threshold. In this case, if we exercise the right, we can get a satisfactory return, so we tend to hold options rather than sell them. Therefore, the critical value of increase is set at 5%. If the price of the option increases by more than 5% compared to the purchase price, the option is sold, otherwise it will continue to be held and monitored;

Exercise income level <arbitrage threshold. In this case, our exercise has

been unable to meet the requirements of our arbitrage threshold, and if we continue to hold, the possibility of continued decline in the level of income cannot be ruled out. Therefore, I tend to sell options to release funds and continue arbitrage. Lower the critical value to 3%. If the price of the option increases by more than 3% compared to the purchase price, sell the option, otherwise immediately buy the hedged put option and submit the exercise instruction , Because the system monitors the situation in real time, the data obtained should be close to continuous, so there will be no income far less than the threshold or even loss;

If during the entire discretionary window period, the two decision-making conditions always meet the decision to continue to hold, when the window period ends, buying hedging options and submitting exercise instructions can also obtain returns above the threshold.

In summary, we have effectively improved the use efficiency of funds through the discretionary mechanism, and we can earn interest differentials through increase monitoring to make another arbitrage; at the same time, we introduce the level of exercise income as a conditional variable, thereby avoiding the increase in the expected increase The risk of a decline in post-rights yields.

4. Model optimization mechanism

Our model optimization is divided into two parts: capital optimization model and arbitrage threshold optimization.

The first is the capital optimization model. When the initial capital is 150 million yuan and the arbitrage threshold is 0, there are a lot of arbitrage opportunities with positive risk-free returns in the market. In order to avoid wasting too much money on the suboptimal arbitrage opportunities, we define an index（name it 'cost_upperbound'）to control the upper limit of single expenditure, which means the upper limit of the purchase amount on all options with negative time value in each cycle. Let the price of the type i call option in this round of observation (time t) be C_{it}, the exercise price is K_i, the price of the put option with the largest absolute value of Delta for hedging is P_t, and the purchase quantity of various options is X_{it} (i.e., 10000 * X_{it} shares), so the total amount of traversal expenditure in this round is

$$\sum_{i}\left(C_{it}+K_i+\frac{P_t}{Delta_t}\right)*10000*X_{it}\leq \text{cost\_upperbound}$$

However, it is still unable to solve the problem of capital consumption too fast by limiting the capital limit only in a single traversal. Therefore, on this basis, we expand the limit object of capital expenditure limit to all arbitrage opportunities that occur every 10 seconds. In these 10 seconds, we always give priority to the option with the highest degree of depth and real value until the specified capital limit is used up (assuming that the arbitrage threshold is met) If there are enough opportunities. We make cost_ upperbound = 200000 yuan, which comes from：

$$\frac{15000}{4*60*(60/10)}*2=208,330\ (yuan)$$

In other words, if the total expenditure of funds in each 10 second period is always close to 200000 yuan, it will take at least 2 hours to use up the total funds in a trading day (4 hours trading time).

However, the current capital cap setting rules still can not guarantee that there will be available funds equivalent to the trading time in the second half of the maturity date. In order to make the allocation of funds in each period of the trading time on the maturity date as fair as possible, we divide the daily trading hours of Shanghai stock exchange 50ETF options into four periods, namely, 9:30-10:30, 10:30-11:30, 13:00-14:00, 14:00-15:00. Therefore, the upper limit of funds available for each period is 15000 / 4 = 37.5 million yuan (if the allocated funds are still not used up at the end of a certain period, the funds will be inherited by the next period).

In addition, it is noted that the frequency of arbitrage opportunities in each period of a day is not equal. Therefore, this absolute average strategy can still be optimized in detail. We determine the available fund allocation in each time period of the final sub warehouse strategy according to the proportion of arbitrage opportunities of all SSE 50ETFs from January to September 2020 in the four periods previously defined. The results are as follows:

SSE 50ETF trading period	**Total arbitrage opportunities (Times)**	**Average proportion**	**Available funds (10000 yuan)**

9:30-10:30	14607	0.229036001	3435.54
10:30-11:30	15085	0.236530983	3547.965
13:00-14:00	16567	0.259768565	3896.528
14:00-15:00	17517	0.274664451	4119.967
总计	63776	1	15000

The data in the table above reflect that arbitrage opportunities on the maturity date increase gradually as the closing time approaches, which is in line with our expectations.

In terms of sample data selection, we selected all the Shanghai Stock Exchange 50ETF call options in September 2020 as the data source of this test fund optimization model performance. According to the historical back testing, the results are as follows:

Return of the strategy	**no capital cap during the transaction**	**Add the upper limit of 200000 yuan for single expenditure**	**Expand the application scope of the limit of 200000 funds to 10 seconds**
NO sub warehouse	34011 0.0227% **8.627%**	34994 0.0233% **8.887%**	53035 0.0354% **13.772%**
Absolute average	50755 0.0338%	48930 0.0326%	79197 0.0530%

distribution	**13.143%**	**12.642%**	**21.247%**
Distributed by the proportion of arbitrage opportunity	53360 0.0356% **13.862%**	50388 0.0336% **13.042%**	81497 0.0543% **21,927%**
Data description	For each cell containing data, the first / second / third row corresponds to one-day absolute return (yuan) / single day return (%) / one-day annualized yield (%); the principal is 150 million yuan		

According to the back testing results, through horizontal comparison, it can be found that although the performance of the strategy is not significantly better than that of the situation without the upper limit of 200000 single expenditure funds, the performance of the arbitrage strategy is much better than the previous two relatively simple strategies after expanding the upper limit of 200000 funds to 10 seconds and selecting the optimal arbitrage opportunities 。

Similarly, through the vertical comparison, we can find that the performance of the strategy has been greatly improved after introducing the concept of four time periods division and dividing the total funds into absolute average positions. On this basis, the strategy of dividing positions according to arbitrage opportunity proportion is generally better than that

of absolute average.

To sum up, our capital optimization model will allocate the total funds in four time periods according to the arbitrage opportunity proportion, and apply the capital ceiling of 200000 to each 10 second observation interval to conduct transactions.

On the basis of the fund optimization model, we consider the optimization of arbitrage threshold. Because of the assumption that the arbitrage threshold is 0, we buy too many real options with low quality during the execution of the algorithm. To avoid this situation fundamentally, we need to find a suitable arbitrage threshold to optimize the return of our arbitrage strategy as much as possible.

Firstly, we define the arbitrage threshold as the minimum yield that all observed cheap put options need to meet. We use 'Threshold' to represent the arbitrage threshold. For any type I option observed at time t, the necessary conditions for its position to be constructed are as follows:

$$-\boldsymbol{Time\_Value_{it}} - \boldsymbol{Transaction\_cost_i} > \boldsymbol{Threshold}$$

Where 'Time_Value' is the single time value of the option at time, and 'Transaction_Cost' is the corresponding transaction cost (generally set as a specific constant for convenience).

Also select the data sample used in the previous section (1.4.1), under the optimal fund optimization model, we select several different arbitrage thresholds to observe the change of strategy performance. The results are

as follows:

Single option arbitrage threshold (yuan)	**0**	**0.0002**	**0.0005**	**0.001**	**0.0015**	**0.002**
Single day absolute income (yuan)	81497	83840	88963	99018	25954	13483
Single day return rate (%)	0.0543 %	0.0559 %	0.0593 %	0.0660 %	0.0173 %	0.0090 %
One day annualized rate of return	21,927 %	22.624 %	24.161 %	27.235 %	6.519%	3.335%
Data description	The principal is 150 million. According to the prior distribution of arbitrage opportunities, the total funds are allocated in four time periods (9:30-10:30, 10:30-11:30,					

	13:00-14:00, 14:00-15:00), and the upper limit of 200000 funds is applied to each 10 second observation interval for trading.

It can be found that with the increase of arbitrage threshold, the return of arbitrage strategy presents an inverted U-shaped change, that is, it increases slowly at first, then decreases rapidly, and reaches the maximum at Threshold = 0.001.

Hence, we choose Threshold = 0.001 as the arbitrage threshold of our strategy.

5. Summary and investment highlights

In summary, we first design strategies from a theoretical level: through the study of the effect of low sales, we use α strategies to capture the arbitrage opportunities driven by market sentiment; then we achieve delta neutrality through risk strategies, thus not taking systemic risks. (The risk of ETF price fluctuations), and locks in the excess returns obtained from opening positions at low option prices; in order to prevent idle funds and increase arbitrage returns, we introduce a discretionary mechanism, delay exercise, real-time monitoring of option prices, and earn profits We released funds for secondary arbitrage; Finally, we built a capital optimization model based on the classification model comparison study, and determined the optimal arbitrage threshold, and achieved the highest return in the risk-free arbitrage part.

The investment highlights of this strategy are:

1) This quantitative strategy is a hedging alpha strategy driven by market sentiment. According to the research on quantitative strategies, alpha strategies are often effective in emerging markets. The Chinese 50ETF options market we selected meets this requirement. It is feasible.

2) Our strategy takes up funds for a very short time, and the level of income has a leading advantage.

3) Unlike many quantitative strategies, we do not rely on the value research on the fundamentals of investment targets. Arbitrage opportunities have long existed in the delivery mechanism of the Chinese options market. It is an arbitrage strategy and does not rely on many factors for forecasting, simple and effective. And the probability of error is extremely low.

4) After this strategy hedges the risk of the beta position, since the option will definitely be delivered when it expires, there is no unsystematic risk, and "risk-free arbitrage" is truly realized. Combined with the following low-risk financial management strategy, the combination has broken the conventional "high income, low return" type product.

Software technical elaboration

5.1 Technical explanation

5.1.1 Overview

The system as a whole adopts a structure where the front and back ends are separated, and the front and back ends operate

independently, and communicate through RESTful API during the period. This is conducive to parallel development of the front and back ends, and improves efficiency. In the development process, Eolinker is used as the interface management platform, and gitHub is used for software hosting, which guarantees the decoupling of the front and back ends and the synchronization of the project process to the greatest extent.

5.1.2 Programming languages: Java, Python3, JavaScript

JavaScript is a scripting language belonging to the network, which has been widely used in web application development. It is often used to add various dynamic functions to web pages and provide users with smoother and beautiful browsing effects. Different from server-side scripting languages, such as PHP and ASP, JavaScript is mainly used as a client-side scripting language to run on the user's browser without the support of the server; at the same time, some special functions (such as AJAX) must rely on Javascript to be performed on the client side stand by. With the development of engines such as V8 and frameworks such as Node.js, as well as its event-driven and asynchronous IO features, JavaScript is gradually being used to write server-side programs.

Python is an object-oriented interpreted computer programming language. Python is pure free software. The source code and

interpreter CPython follow the GPL (GNU General Public License) agreement. Python syntax is concise and clear, and one of its features is to force white space as statement indentation. Python has a rich and powerful library that can easily connect various modules made in other languages (especially C/C++). The 3.0 version of Python is often referred to as Python 3000, or Py3k for short. Compared to earlier versions of Python, this is a major upgrade. In order not to bring too much cumbersomeness, Python 3.0 was not designed for backward compatibility.

Java is an object-oriented programming language that not only absorbs the various advantages of the C++ language, but also abandons the concepts of multiple inheritance and pointers that are difficult to understand in C++. Therefore, the Java language has two characteristics: powerful and easy to use. As a representative of static object-oriented programming language, Java language implements object-oriented theory very well, allowing programmers to perform complex programming with elegant thinking. Java was originally used as a language for writing consumer home electronics software, so it was designed to write highly reliable and robust software. Java eliminates certain programming errors, making it fairly easy to write reliable software. Java is a strongly typed language that allows extension

of the ability to check for potential type mismatches at compile time. Java requires explicit 80/112 method declarations, it does not support C-style implicit declarations. These strict requirements ensure that the compiler can catch call errors, which leads to more reliable programs.

5.1.3 Integrated development environment IDE: IntelijIDEA, VisualStudioCode, Pycharm, WebStrom

IDEA stands for IntelliJ IDEA, which is an integrated environment for java programming language development. IntelliJ is recognized as one of the best java development tools in the industry, especially in smart code assistants, code automatic prompts, refactoring, J2EE support, various version tools (git, svn, etc.), JUnit, CVS integration, code analysis, Features such as innovative GUI design can be said to be extraordinary.

Visual Studio Code is a cross-platform source code editor that runs on Mac OS X, Windows and Linux for writing modern web and cloud applications. Visual Studio Code provides developers with built-in support for multiple programming languages, as well as rich code completion and navigation functions for these languages. JavaScript, TypeScript, Node.js and ASP.NET 5 developers will also get additional toolsets. The editor also integrates all the features that a modern editor should have,

including syntax high lighting, customizablekeyboard bindings, bracket matching, and code snippet collection (Snippets).

PyCharm is a Python IDE with a set of tools that can help users improve their efficiency when developing in Python language, such as debugging, syntax highlighting, project management, code jump, smart prompts, automatic completion, unit testing, version control . In addition, the IDE provides some advanced features to support professional web development under the Django framework.

WebStorm is JetBrains' integrated development environment for JavaScript programming language. In addition, WebStorm supports HTML5, Node.js, Bootstrap, Angular/AngularJS, TypeScript, PhoneGap/Cordova, Dart and many other technologies, so it is mainly used for the development of web-based mobile applications. WebStorm is based on JetBrains' IntelliJ IDEA, but it is a JavaScript-specific version. WebStrom can use plug-ins to extend the range of functions, some of which are developed by JetBrains, and some are developed by the community. WebStorm includes tools for refactoring, version control, code and syntax highlighting, unit testing, and partial automatic code generation.

5.1.4 Front-end technology stack: Vue2, Element-UI, Vuex, Vue-router, axios

Vue.js is a progressive framework for building user interfaces. Unlike other heavyweight frameworks, Vue adopts a bottom-up incremental development design. Vue's core library only focuses on the view layer, and is very easy to learn, and very easy to integrate with other libraries or existing projects. On the other hand, Vue is fully capable of driving complex single-page applications developed with single-file components and libraries supported by the Vue ecosystem. The goal of Vue.js is to implement response data binding and combined view components through the simplest possible API. Vue.js itself is not an all-round framework-it only focuses on the view layer. So it is very easy to learn, very easy to integrate with other libraries or existing projects. On the other hand, when used with related tools and support libraries, Vue.js can also perfectly drive complex single-page applications. Compared with Vue1, Vue2 provides updated life cycle functions and syntax, and introduces the idea of single data flow; at the same time, Virtual DOM is introduced to effectively solve the browser performance problem, and the page refresh speed is accelerated by calculating the diff of vdom.

Element UI is a set of component libraries implemented using Vue 2.0 as the basic framework. It is geared towards enterprise-level back-end applications and can quickly build websites, greatly reducing the labor and time costs of R&D.

Vuex is a state management mode specially developed for Vue.js applications. It uses centralized storage to manage the public state of all components, and uses corresponding rules to ensure that the state changes in a predictable manner.

Vue Router is the official route manager of Vue.js. It is deeply integrated with the core of Vue.js, making it easy to build single-page applications.

5.1.5 Back-end technology stack: SpringBoot, MyBatis, Mysql, Flask

The Spring framework is very powerful, and its main function is to help us realize automatic configuration. The core of the Spring Boot framework is automatic configuration. As long as there is a corresponding jar package, Spring will automatically configure it for us. 82/112 If the default configuration cannot meet the needs, we can also replace the automatic configuration class and use our own configuration. In addition, Spring Boot also integrates embedded Web server, system monitoring and many other useful functions, allowing us to quickly build enterprises and

applications. MyBatis is an excellent persistence layer framework that supports customized SQL, stored procedures, and advanced mapping.

MyBatis avoids almost all JDBC code and manual setting of parameters and obtaining result sets. MyBatis can use simple XML or annotations to configure and map primitive types, interfaces and Java POJOs (Plain Old Java Objects) as records in the database.

MySQL is a relational database system developed by the Swedish company MySQLAB that can be used on various popular operating system platforms. It has a distributed database management system with a client/server architecture. MySQL is fully applicable to the Internet, and the database built with it can be accessed anywhere on the Internet, so you can share the database with anyone anywhere on the network. MySQL has the advantages of strong functions, simple use, convenient management, fast running speed, high reliability, and strong security and confidentiality. MySQL provides API functions for different programming languages (C, C++, JAVA, etc.); uses core threads to implement multi-threading, which can well support multiple CPUs; provides transactional and non-transactional storage mechanisms; fast thread-based memory allocation System; MySQL adopts dual licenses. Users can use

MySQL software as free software or open source software under the terms of the GNU license, or obtain a formal commercial license from MySQL AB.

Flask is considered to be the best framework for lightweight web application services. It is a lightweight framework that is free, flexible, and extensible, and has a web interface based on the system UI, which is very suitable for small websites.

5.1.6 Interface documentation tool: Eolinker

EOLINKER is a domestic enterprise-level IT R&D management solution service brand and an online API interface management service provider. It is committed to meeting the individual needs of customers in various industries for the full life cycle of R&D management in different application environments, providing API development management (AMS) , Development team collaboration, automated testing, gateway (AGW) and monitoring (AMT) services.

5.1.7 Version control tool: git

Git is an open source distributed version control system that can effectively and quickly handle version management from very small to very large projects. Git is an open source version control software developed by Linus Torvalds to help manage the development of the Linux kernel.

5.1.8 Project management tools: Maven, Npm

Maven abstracts the project model and makes full use of the object-oriented thinking. Maven can manage the construction of the project, report and document software project management tool through a short description of information. In addition to its ability to build programs, Maven also provides advanced project management tools. Simply put, Maven is a project management tool, which includes a project object model (POM: Project Object Model), a set of standard collections, a project lifecycle (Project Lifecycle), and a dependency management system (Dependency Management System). The logic used to run the plug-in target during the life cycle stage.

npm (full name Node Package Manager, namely "node package manager") is the default software package management system written in JavaScript by Node.js. npm can manage the required modules of local projects and automatically maintain dependencies, as well as manage JavaScript tools installed globally.

5.2 Architecture Design

5.2.1 Use case diagram

ID	1.1.1	Name	Show real-time low-selling options	Priority	high
Participant	Option Trading Administrator				
Triggering conditions	Option trading administrator wants to view real-time low-selling options				
Preconditions	null				
Postcondition	Display options trading in chronological order				
Normal Process	1. The option trading manager enters the real-time low-selling option display interface 2. The system receives the request and displays the transaction status of the option in chronological order (including the buyer and the seller and the transaction price), and the real-time transaction is highlighted in purple				
Expansion process	2a. If the current transaction has been cancelled, it will be marked in gray				
Business Rules					
Special needs	The real-time feedback requirements are high, and the high availability and high performance of the system are required at the same time				

ID	1.1.2	Name	Display option information	Priority	high
Participant	Option Trading Administrator				
Triggering conditions	The administrator wants to view option information				
Preconditions	null				
Postcondition	Successfully display option information				

Normal Process	1. The option trading administrator enters the real-time trading display interface 2. The option trading administrator clicks on a piece of real-time transaction information 3. The system receives the request and returns the corresponding option information, including option price, option execution price, price fluctuation curve, option details, etc.
Expansion process	1a. If there is no record on the real-time trading interface, the system will display option information based on the option price, without special color display. 2a. If the administrator does not click on the real-time trading information, the system will display option information based on the option price, without special color display.
Business Rules	
Special needs	The real-time feedback requirements are high, and the high availability and high performance of the system are required at the same time

ID	1.2	Name	Show real-time transactions or strategies	Priority	high
Participant	Option Trading Administrator				
Triggering conditions	The administrator wants to view real-time transactions or real-time strategies				
Preconditions	The automatic trading option is not empty				
Postcondition	Successfully conduct real-time automated trading or successfully calculate strategies and provide timely feedback				
Normal Process	1. The option trading administrator enters the real-time trading display interface 2. The system receives the request and judges the current automatic trading option. If it is TRUE, it will feedback the				

	current real-time transaction status in the background to the administrator in real time
Expansion process	1a. The option trading administrator can set or modify the value of the automatic trading option in advance to TRUE or FALSE 2a. If the value of the automatic trading option is FALSE, the strategy calculated in the current background in real time will be fed back to the administrator 2b. If the value is not set or is empty, the system reports an error and does not feedback anything other than the error message
Business Rules	Option trading strategy: ▾ T日买入贱卖期权 1. 公式 2. 认购期权时间价值=期权价格-max(50ETF价格-期权执行价格,0) 3. 认沽期权时间价值=期权价格-max(期权执行价格-50ETF价格,0) 4. 并行计算，挑选时间价值为负的且最小的（可考虑Spark Streaming框架），其 需要O(1+logn)尽量满足在1s之内，且尽量多，尽量一次比较完全部 5. 调用买入API，执行买入 第2步挑选中的期权 的操作 ▾ 认购期权 ▾ 买入认沽期权 1. 尽可能在挑选出认购期权的同时，挑选delta最小值（最接近-1）的认沽 2. 调用买入API，执行买入 第1步中挑选出的认沽期权 的操作，买入张数 其中m为购入的认购期权的张数 3. wind上有delta值的显示，但不清楚可不可以通过wind API得到该数据， 用公式： 4. delta = 期权价格变化/50ETF的价格变化 ▪ T+2日卖出50ETF和认沽期权 ▾ 认沽期权 ▾ 买入50ETF ▪ 行权（以认沽期权行权价卖出50ETF）
Special needs	The real-time feedback requirements are high, and the high availability and high performance of the system are required at the same time

ID	1.3	Name	Show real-time transactions or strategies	Priority	high
Participant	None (The system automatically performs in real time)				
Triggering conditions	The option trading market opens (in real time)				
Preconditions	Automatic trading option is set to TRUE				
Postcondition	Successfully conduct real-time automated trading				
Normal Process	1. If the automatic trading option is TRUE, the system calculates the most qualified low-selling options in real time according to the current option market conditions. 2. If there are eligible low-selling options, follow-up trading operations are performed according to the option trading strategy				
Expansion process	1a. If the automatic trading option is FALSE, only the current strategy will be calculated in real time. 2a. If there are no eligible low-selling options, subsequent strategies will not be calculated and subsequent transactions will not be performed in this second				
Business Rules	Option trading strategy: ▾ T日买入贱卖期权 1. 公式 2. 认购期权时间价值=期权价格-max(50ETF价格-期权执行价格,0) 3. 认沽期权时间价值=期权价格-max(期权执行价格-50ETF价格,0) 4. 并行计算，挑选时间价值为负的且最小的（可考虑Spark Streaming框架），其中程序并行数量n需要O(1+logn)尽量满足在1s之内，且尽量多，尽量一次比较完全部 5. 调用买入API，执行买入 第2步挑选中的期权 的操作 ▾ 认购期权 ▾ 买入认沽期权 1. 尽可能在挑选出认购期权的同时，挑选delta最小值（最接近-1）的认沽期权 2. 调用买入API，执行买入 第1步中挑选出的认沽期权 的操作，买入张数为 (-1/delta) * m，其中m为购入的认购期权的张数 3. wind上有delta值的显示，但不清楚可不可以通过wind API得到该数据，若不可以，则使用公式： 4. delta = 期权价格变化/50ETF的价格变化 ▪ T+2日卖出50ETF和认沽期权 ▾ 认沽期权 ▾ 买入50ETF ▪ 行权（以认沽期权行权价卖出50ETF）				
Special needs	The real-time requirements of calculation and transaction are very high, and it needs to reach the second level; it is best to use parallel computing when calculating				

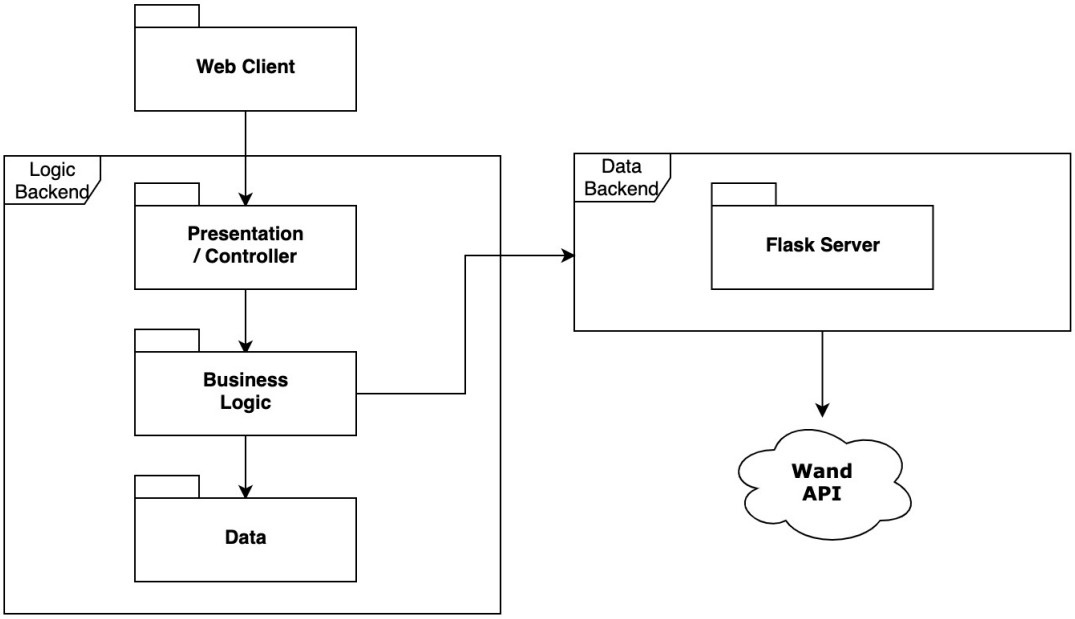
ID	1.4	Name	Show transaction	Priority	high
Participant	Option Trading Administrator				
Triggering conditions	Option trading administrator wants to view completed and ongoing transactions				
Preconditions	none				
Postcondition	Successfully display the currently completed and ongoing transactions				
Normal Process	1 Option trading administrator enters the trading display interface 2 The system receives the request, and displays the currently completed transactions according to the request type, or displays the ongoing transactions (including the low-sale options that have been bought before T+2 day, the put options that may have been hedged, etc.) 3 After the administrator selects the transaction to be viewed, the specific transaction details will be displayed				
Expansion process	3a Delete the completed transaction				
Business Rules					
Special needs	There may be a large number of completed or ongoing transactions, and the front end needs to perform virtual rolling processing to prevent stuck				

ID	1.5	Name	Show the effectiveness of the strategy model	Priority	high
Participant	Option Trading Administrator				
Triggering conditions	Option trading administrator wants to view the effect of the current strategy model				
Preconditions	none				
Postcondition	Successfully demonstrated the effect of the current strategy model				
Normal Process	1 Option trading administrator enters the strategy model effect display interface. 2 The system receives a request to display the success rate, vested interests, estimated returns and parameters of				

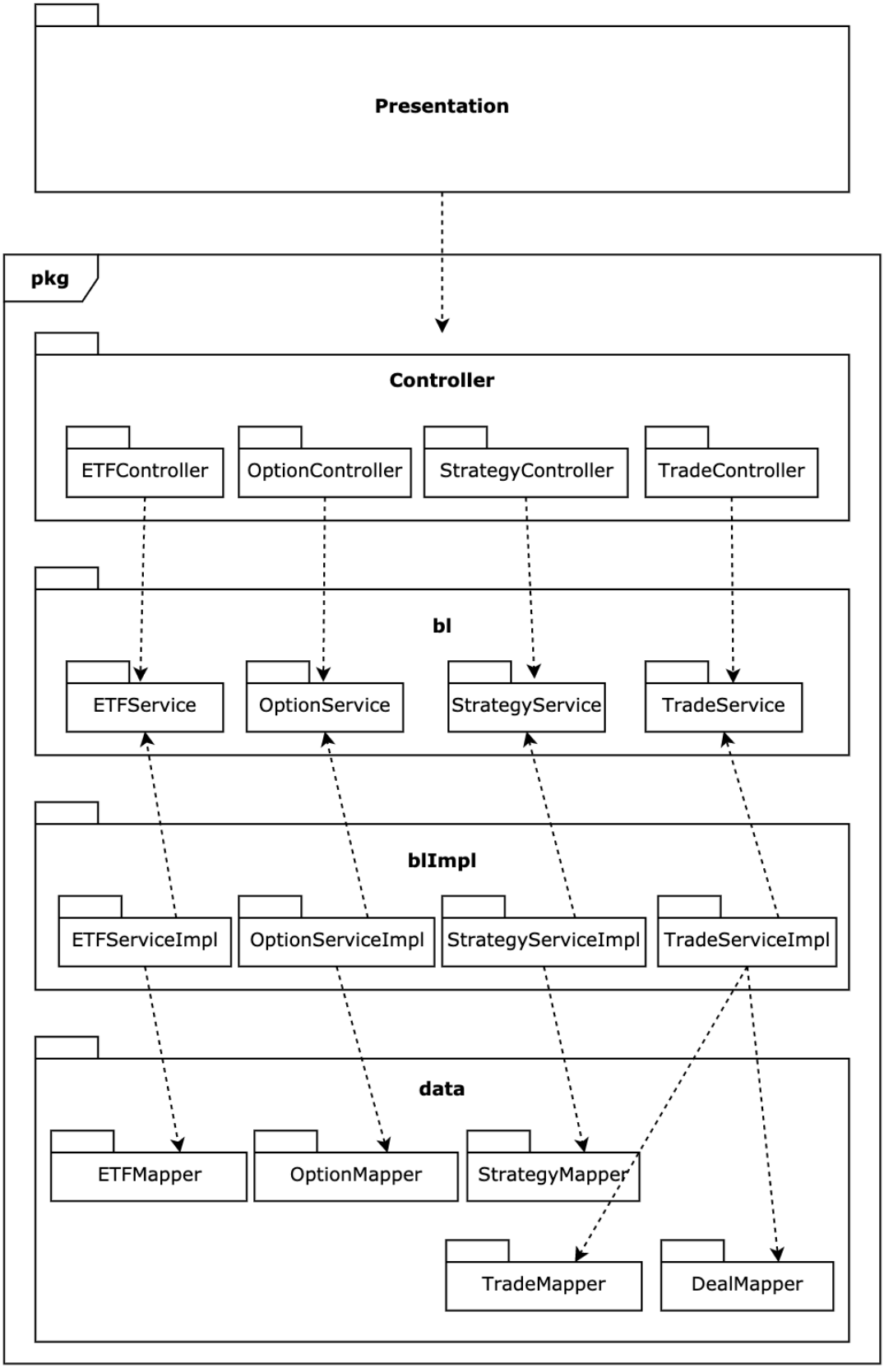
	the model performance of the current trading strategy. Use histograms to display these measurement standards
Expansion process	2a. If there is no transaction record for the current strategy, the success rate and estimated profit are all represented by null values
Business Rules	Standards for measuring model performance: 1. Average return 2. Maximum and minimum return 3. Variance of return 4. Coefficient of variation 5. Sharpe ratio 6. Skewness kurtosis
Special needs	The model effect needs to be updated in real time when a new transaction occurs, and the strategy model effect also needs to be updated regularly every 30 minutes

ID	1.6	Name	Parameter adjustment	Priority	middle
Participant	Option Trading Administrator				
Triggering conditions	Option trading administrator wants to adjust the parameters of the system				
Preconditions	The system has automatically used the empirical optimal parameters generated by algorithms such as machine learning				
Postcondition	The system successfully applies the parameters entered by the administrator in the window				
Normal Process	1 The option trading administrator enters the parameter adjustment interface. 2 The system displays the default experience optimal parameters, or the parameters adjusted by the administrator last time. 3 The administrator enters the parameters to be adjusted, and the system saves and applies them				
Expansion process	3a. When the administrator enters the parameters, the system page prompts the original default experience optimal parameters				
Business Rules					
Special needs	Experienced optimal parameters may be dynamically updated over time, and need to be updated to the front-end page in time				

5.2.2 Logical view



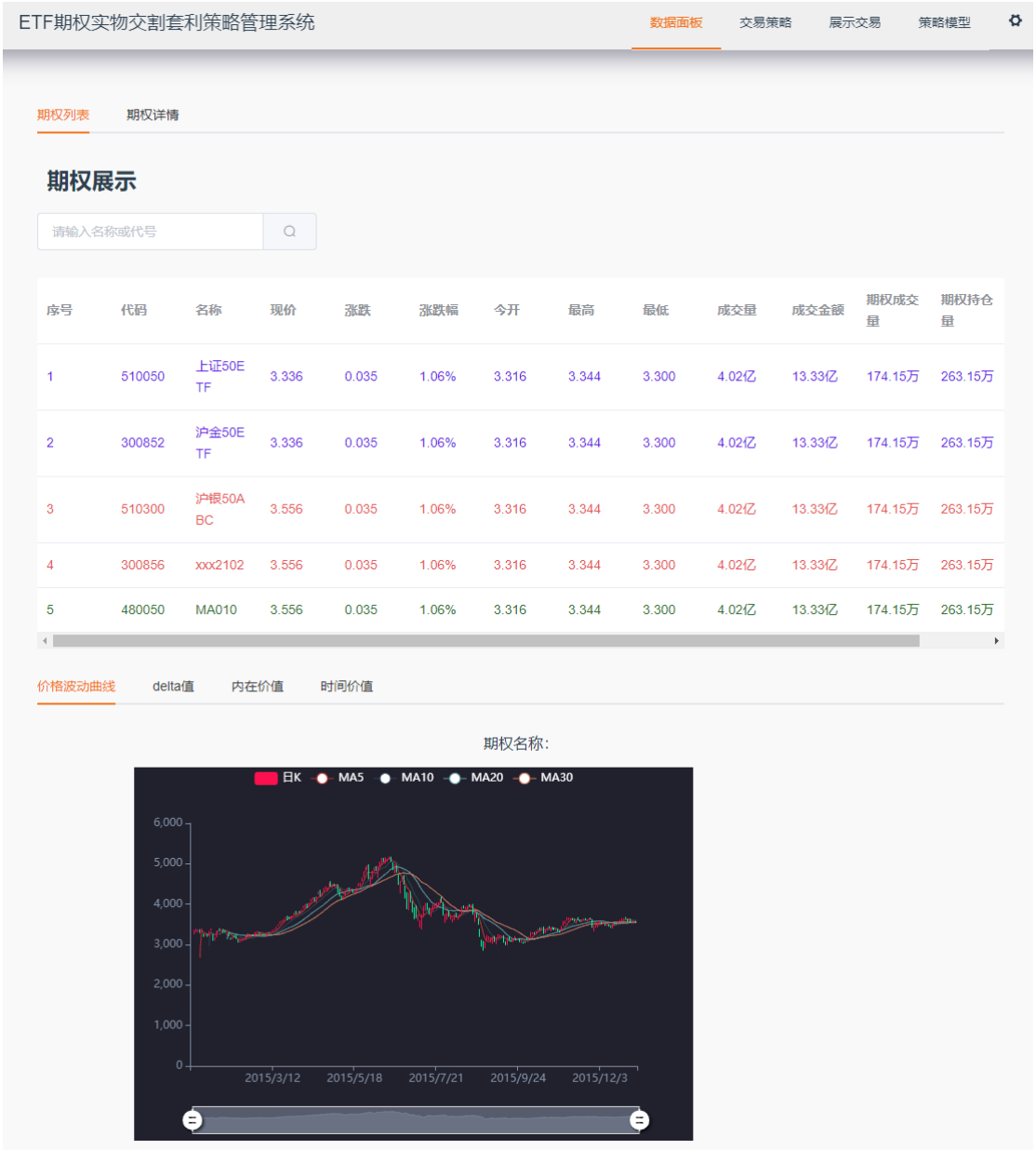
5.2.3 Development view



6.Product Description

6.1 Interface display

6.1.1 Data panel

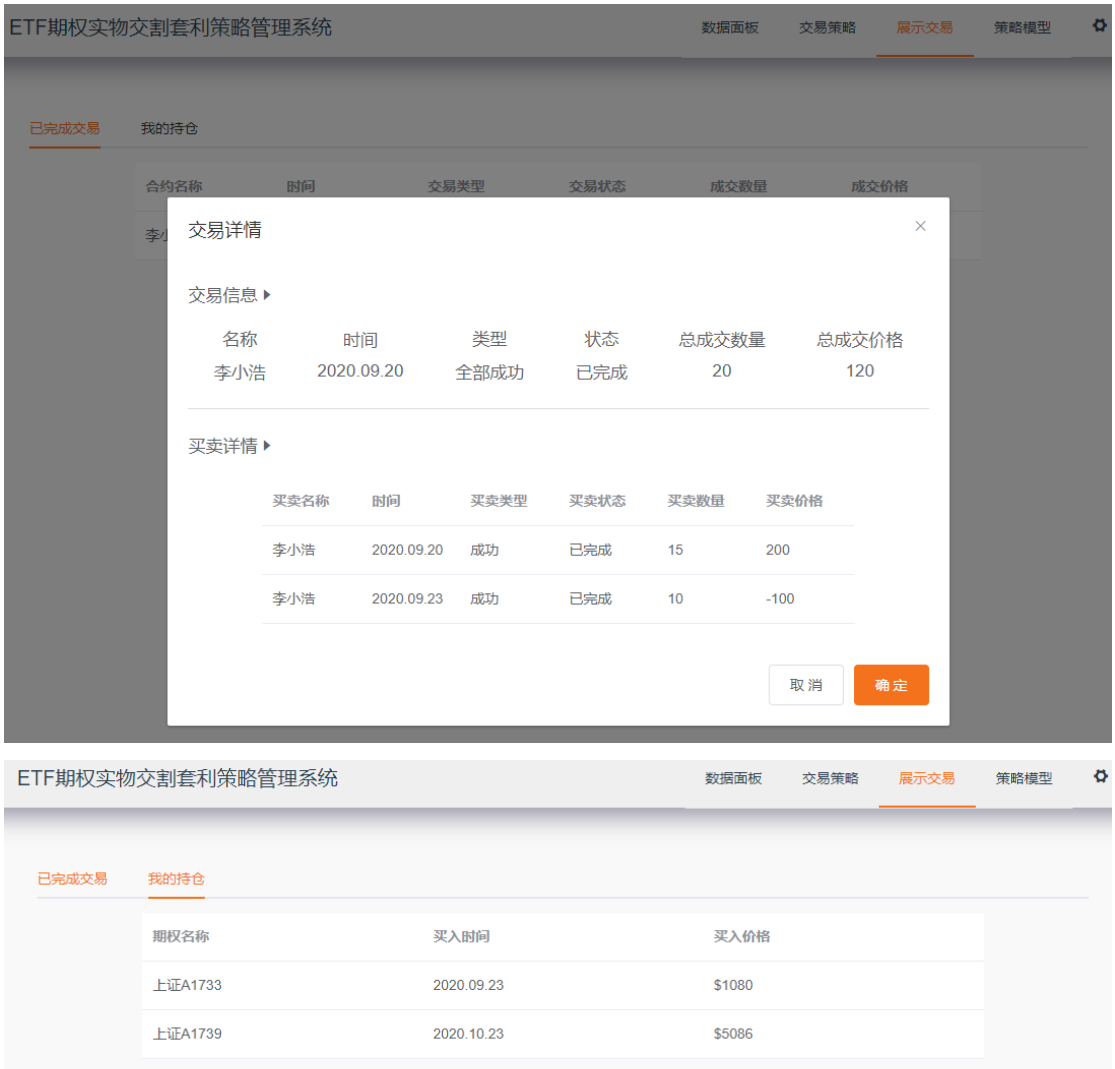


Through the list and price fluctuation curve, delta value, intrinsic value and time value graph, show the current situation of options in the market.

6.1.2 Trading straregy

Show real-time trading options.

6.1.3 Show transaction



Show details of completed transactions.

6.1.4 Strategy model

Show the benefits that the strategy model has achieved.

6.1.5 Settings page

Display the settings page, users can set whether to allow the system to conduct automatic transactions.

Market analysis

1. Market environment analysis

1.1 Political environment

On July 20, 2018 China Securities Regulatory Commission(CSRC) publicly solicited opinions on the Measures for the Management of Private Asset Management Business of Securities and Futures Operating Institutions (Draft for Comments) and the Regulations on the Operation and Management of Private Asset Management Plan of Securities and Futures Operating Institutions(Draft for Comments). The new regulations on capital management mainly regulate the private equity management business of licensed securities and futures operating institutions under the supervision system of the CSRC. For the private equity industry, the biggest impact is mainly three points:

(1) Eliminate multi-layer nesting and channel services. This has an important impact on the current mode of bank financing and proprietary funds entering into industrial funds through the nested asset management plan.

(2) Classified product design. The new regulation of capital management strictly restricts the product classification, clarifies four non-classification situations, strictly limits the leverage ratio, and prohibitions on the provision of capital guarantee and income guarantee arrangements for the

priority. If it is transferred to that one in accordance with the new capital management regulations, most of the structured products of private equity funds currently

have problems, which will also have an impact on equity investment through private equity of banks, insurance and other funds with low risk preference.

(3) break the rigid exchange. The core measure to break the firm exchange is net management. Specific implementation of this requires a certain system to provide support, which for most private equity, the choice of bank custody, brokerage PB or third party service agency estimation service is a cheaper choice. In addition, how to publicize the net worth products, especially whether the equity class and other private funds can have the expected rate of return, there are still some doubts, which will have a certain impact on the fund raising.

Through sorting out relevant laws, we can see that E.T.Fund is faced with risks in fund-raising in China. Although limited in some aspects, the overall political environment is stable and the fund-raising is more standardized, which is conducive to the healthy listing of the products in China.

1.2 Economic environment

Over the past decade and more, China's GDP has grown rapidly. By 2019 China's GDP stood at 99.0865 trillion yuan, an increase of 6.1 percent

over the previous year. Expressed at the average annual exchange rate, per capita GDP broke through the ¥ 10,000 mark and reached ¥ 10,276. The growth and concentration of personal wealth is of great significance in shaping the demand for private equity funds.

In recent years, the state will continue to push forward and deepen financial reform, improve the construction of financial legal system, and govern, regulate and maintain financial order in accordance with the law. In 2019 China's macro leverage ratio was basically stable, while the micro leverage ratio steadily declined. The outstanding local government debt was 21.3 trillion yuan at the end of November, which was within the limit approved by the NPC. Overall, fiscal and financial risks are under control.

In China, the private equity industry continues to expand, the scale of development continues to grow. According to the 2019 data released by the Asset Management Association of China (AMAC), as of the end of July, there were 24,332 registered private fund managers in China, with a month-on-month increase of 0.12 %; 78,734 existing private funds for filing, up $1.30 month-on-month; Funds under management totaled 13.42 trillion yuan, up 1.02 % from the previous quarter.

The private equity market will have a great development prospect in the future. E.T.Fund is expected to keep pace with the times and creates greater economic value in the future.

1.3 Social Environment

In the process of social development, people's understanding of private equity is becoming more and more comprehensive, the awareness of investment and financing is increasing, the demand for "medium to high yield, medium to low risk" is surging, and at the same time, the call for standardized development is also getting higher and higher. However, China's current legal system is still not perfect, many private funds still exist "underground behavior", and the connection between legal provisions is not tight. Short-term behavior and serious speculative psychology have increased the uncertainty and instability during the transition period of China's economic system.

With the continuous development of China's private equity industry, professional fund managers are not only getting younger, but also have a more international strategic vision. The ranks of fund managers have not only improved dramatically in quantity, but also in quality. Therefore, the rapid development of China's private equity fund has been on track. Under the healthy and stable environment, E.T.Fund selects the SSE 50ETF option as the investment target according to the market investment demand, and combines the risk-free short-term quantitative strategy with the medium-line financial management of stable asset allocation to provide investors with low risk and high return investment income.

1.4 Technical environment

In 2016, the victory of Alpha Go led to the rise of artificial intelligence

again. Deep learning and computing power enable machines to use huge basic data to calculate and analyze more complex conclusions and complete intelligent tasks at the same time. "Artificial intelligence" is not an independent entity, but a derivative product of scientific and technological innovation. Big data, cloud computing, sensors and CPUs will all become important supports for the development of "artificial intelligence". The rapid development of artificial intelligence has undoubtedly promoted the intelligent development of finance. Its ability to extract and analyze massive data and market information has greatly improved the efficiency of investment decision making and optimized risk management.

With the advent of the era of artificial intelligence and big data network, the channels of fund raising have been constantly expanded, from offline channels to network channels, from

domestic fund channels to international standards, highlighting the progress of technology. Private funds are increasingly diversified in the form of existence. Asset management plans of securities firms, trust assets of trust companies and limited partnership private funds emerge one after another, all of which are products that have been continuously strengthened and innovated in the development process of private funds.

In terms of technical development, E.T.Fund used machine learning to trawled and captured options with negative time value on the exercise day

of the SSE 50ETF option and found investment opportunities through the transaction management system. It realized the optimal allocation of funds through reasonable position division and camera selection mechanism, so as to effectively avoid risks.

2. Industry analysis

We use Porter's Five Forces Model to analyze the competition and intensity of E.T.Fund in the whole quantitative private equity industry.

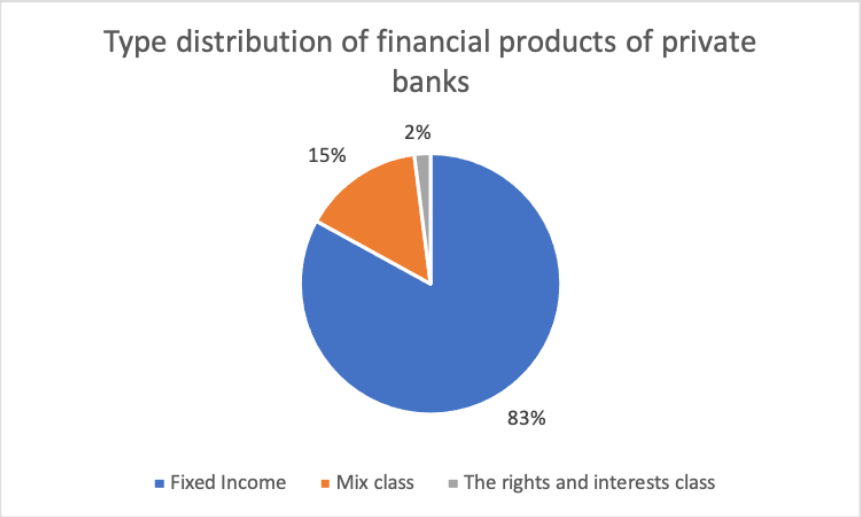
(1) The degree of competition from competitors in the same industry

Over the past two years, banks have issued more than 14,000 private wealth management products. So far this year (as of August 12, 2020), 5,915 private wealth management products have been issued. From the perspective of the types of customers offered by private financing, the number of products for retail customers is about 7 times that for private banking customers. Banks' private financing mainly target retail customers (mainly high net worth customers below 6 million).

Among the financial products issued by private banks after the new regulation, solid income products are still the core category, accounting for ¥10,870 , accounting for 83 %, and they are the main products of various banks. Although the mixed products ranked second, the circulation dropped sharply to ¥1,975 accounting for 15 %, of which the joint-stock banks issued by the mixed products accounted for 60%. Equity products ranked third, accounting for only 2 percent, and 60 percent of the products

were issued by state-owned banks. Since September 26,2018, only 11 commodities and financial derivatives products have been sold,

and all of them are operated by foreign banks. Visible, although is the private equity nature of the bank financial products, but still to the debt investment as the main strategy.



The promotional target of E.T.Fund is the high net worth clients whose net assets are no less than 10 million yuan and whose financial assets are no less than 3 million yuan or whose annual personal income in the recent three years is no less than 500,000 yuan. Selecting cross-market arbitrage as the main investment strategy can achieve precise risk-free arbitrage, low cost of capital occupation, and relatively high returns.

(2) Bargaining power of suppliers

E.T.Fund's suppliers mainly come from two industries: one is a financial data and analysis tool provider that provides big data for capturing investment opportunities; the other is a basic computing platform and cloud service company that provides conditions for software development.

Macro-data, industrial public opinion and other relevant information are open to a high degree, and there are many leading enterprises at home and abroad (such as Wind,

etc.). In the Internet era, cloud computing industry develops rapidly, and it is not difficult to achieve accurate and automated transactions. Therefore, considering the above factors, the overall bargaining power of suppliers is weak.

(3) Bargaining power of buyers

E.T. Fund's buyers include individual investors and institutions. For the high net worth individual investors whose financial assets are no less than 3 million yuan or whose average annual personal income in the recent three years is no less than 500,000 yuan, with the accumulation of wealth and the change of ideas, the investment demand increases gradually, so the individual investors have a weak bargaining power for this product. The same is true for modest investment institutions. For some institutional investors who have the role of benchmarking, they have strong bargaining power and have a strong influence on the investment behavior of other institutional investors. But in general, the bargaining power of buyers of private funds in China is not strong.

(4) New entrant threat

The domestic ETF option market has added a new variety - - Shanghai-Shenzhen 300ETF option. Many institutions have invested in the intensive

preparation to participate in the new

variety and carry out arbitrage trading and risk hedging. The volatility characteristics of CSI 300ETF options are different from those of 50ETF options, so there will be more opportunities to achieve cross-variety arbitrage in the future. And listed three varieties at the same time, the formation of arbitrage opportunities in different exchanges.

Private equity giant Tao Li assets said in the option investment field to build a relatively complete research framework and strategic system based on the first layout, by observing the turnover, liquidity changes, and gradually expand the new varieties in different product lines of the capital scale. Hai-Securities Futures has also made a long-term development plan in the product line of embedded options, focusing on the expansion of option arbitrage trading strategy and the "solid income + option" strategy system of option hedging products. At the same time, Hai-Securities Futures has also expanded the strategy composition of FOF sub-funds, explored the reserve of option sub-funds, supplemented the composition of strategic sectors, and pursued strategic diversification.

The threat of new entrants from banks' private wealth management products and private equity giants will become the main source of competitive pressure for E.T. Fund products.

(5) Threat of substitution

At present, similar to private equity funds (including the pooled funds

trust plan issued through trusts), private equity asset management products mainly include fund segregated account asset management plan and brokerage pooled asset management plan. These three types of private placement products are all raised in a private way for a few specific investors, and the raised funds are invested in the secondary market with the absolute

return as the investment target.

Unlike the above two types of products, private equity managers issue products without the risk of capital provision. So, private fund takes advantage of capital cost. Secondly, private equity funds face the least constraints in terms of investment scope, portfolio holding limits, regulatory compliance and so on. Of course, this also means that private equity products are potentially riskier. Finally, private funds have the most diversified investment strategies.

Market neutrality, managed futures, macro hedging, multi-strategy and other investment strategies make the private equity industry shine.

On the other hand, from the perspective of conversion cost, except for the set lockdown period of various products and the redemption fee that decreases over time, the cost of conversion among different categories of asset management products for customers is not high. In addition, since the main customer group of private equity management products is still high net worth group, the performance evaluation period of the products

invested by customers is still short, generally taking the year as the unit. Except for some private equity managers who have excellent customer service work, customer stickiness is harder to cultivate.

Therefore, for E.T.Fund products, how to improve customer stickiness and innovate investment strategies are the challenges facing us in the future.

2.1 Analysis of Competitive Products

There are eight major categories of domestic hedge funds: stock strategy, bond strategy, event-driven strategy, macro strategy, managed futures strategy, relative value strategy, portfolio fund strategy and compound strategy.

(1) Stock strategy: the most mainstream strategy in China

The stock strategy takes the stock as the main investment target, which is the most mainstream investment strategy in the domestic sunshine private placement industry at present, including stock Iong, stock market neutral and other strategies.

Representative Company: Gao Yi Assets, Greenwoods

(2) Bond strategy: the stable strategy with the lowest adjustment

A bond strategy is a fund that invests exclusively in bonds and seeks more stable returns. According to the China Securities Regulatory Commission's classification standards for fund

categories, more than 80 % of fund assets are invested in bond funds, and the remaining 20 % can also be invested in stocks, commodities and futures.

Representative companies: LOW-RISK, Colight Asset Management

(3) Event-driven strategy: the core is events (including private placement, mergers and acquisitions, participation in new shares, hot topics and special events)

This strategy "bets" on the difference in the impact of major events before and after. Even in a calm market, it painstakingly seeks out details, identifies companies that will have major events, and then arbitrages them.

Representative companies: Hang Tang Wealth, Galaxy Group

(4) Macro strategy: the jewel in the crown of hedging strategy

Macro strategy is the most mainstream strategy overseas. It has the characteristics of multi-asset, multi-tool and multi-market. It can not only invest in stocks, bonds, foreign exchange, interest rates, futures and options, but also invest in the whole world according to the cost performance of assets, and flexibly allocate and adjust positions.

Representative companies: Kaifeng Investment, Yongan Guofu

(5) Managed-futures strategy: the last straw in a crisis

Managed futures strategies are dominated by trend-following strategies and supplemented by reverse strategies. Trend following is a strategy to determine the future direction of a variety based on a pattern. Reverse strategy is simply a strategy to sell high and buy Iow. Managered futures rely heavily on computer programs, maintain a low correlation with traditional investments, and rely less on market fluctuations.

Representative company: Ubiquant Investment, High-flyer Qaunt

(6) Relative value strategy: market mispricing excavator

The core of this strategy is arbitrage, mainly looking for distortions in the market to asset pricing, and generally combining long and short means to achieve market neutrality. Specifically, arbitrage strategies mainly include current arbitrage, cross-market arbitrage, cross-variety arbitrage, ETF arbitrage, etc. This investment strategy requires a close combination of computer technology and financial instruments. However, more arbitrage will only accelerate the correction of the market price. With the gradual improvement of the financial market, arbitrage opportunities will also gradually narrow. Therefore, there will still be certain development pressure in the future.

Represents the company: Evolution Assets Management

(7) Portfolio fund strategy: investment fund portfolio of funds

Funds are divided into two forms: FOF (Fund of Funds) and MOM (Manager of Manager). FOF refers to the fund of funds. Private funds are usually screened by professional institutions to construct a reasonable fund portfolio, so as to realize the allocation among funds. MOM is a new portfolio fund investment strategy derived from FOF. FOF directly invests in existing fund products, while MOM can be understood as handing over funds to several excellent fund managers for position management, making it more flexible.

Representative companies: Gesafe Wealth, Perseverance Assets

(8) Compound strategy: multiple flowering, more strategies

As the name suggests, the compound strategy will be combined with a variety of investment strategies, so as to capture more investment opportunities, in order to increase profit space, such as private placement, commodity futures at the same time to absorb.

Representative Company: Enjoy Investment

(The following data are collected until the beginning of December 2020 . and the data are from "Pai Pai Net")

ranking	Fund company	Number of products	Investment strategy	Sharpe ratio	On behalf of the product
1	Chaser Asset Management	44	Equity strategy	2.93	Interesting time event driven number 1
2	Tongyuan Investment	88	Equity strategy	2.69	China Shipping Trust - No. 5 Tong Yuan
3	Shifeng Asset	88	Equity strategy	2.54	Stone Feng Asset Epee One
4	Rongkui Investment	87	Equity strategy	3.21	Melt 1 enlightenment
5	Shiva Asset	31	Equity strategy	2.63	Shiva Mavericks # 1
6	Juming Investment	27	Equity strategy	2.25	Juming Medical

					Innovation
7	Tairun Hedge Asset Management	92	Equity strategy	1.88	No. 1, Tairun Yuzhi
8	Lin investment	172	Equity strategy	2.25	Shenzhen SDIC - Lin Investment

3. Product Analysis (SWOT)

Aiming at the current competitive situation, we combined SWOT model to provide targeted strategies.

	Strengths	Weaknesses
SWOT analysis and the corresponding strategies	1. Investment management advantages: high degree of grasp of the potential investment value of enterprises 2. Advantages of operation mechanism:	1. R&D disadvantage: limited R\&D funding 2. Talent disadvantage: lack of professional investors with strong professionalism and high skills 3. Weakness of capital source: China's

	Private stock offering has fewer constraints and low costs 3. Product integrity 4. Closely integrated with market conditions	financial system is not sound, the government is too strict regulation, pension funds and other prohibited to invest in the field
Opportunities	S-O strategy	W-O strategy
1. State policies provide guidance, support and encouragement 2. The rapid development of domestic small and medium-sized enterprises, become the main customer groups 3. Citibank Cup Financial Innovation Competition	1. Seize the historical opportunity of the development of small and medium-sized enterprises and the adjustment of industrial structure 2. Use their own advantages of resources for publicity 3. Obtain venture	1. Collaborate with other institutions to lower barriers to entry and increase market share 2. Recruit talents and utilize school and social resources to attract outstanding talents

	capital through Citi Cup Financial Innovation Competition	
Threats	S-T strategy	W-T strategy
1. The team has no experience in financial market entrepreneurship 2. There are many new entrants	1. Make use of teachers' resources and keep close contact with consultants to solve problems in time 2. Enhance product innovation	1. Take the school as a platform to integrate resources and enter the market 2. Cooperate with alumni and teachers

Financial analysis

1. Overview of profit model

E.T.Fund is a quantitative private equity fund based on the physical delivery mechanism of the Chinese options market as an arbitrage strategy. This product selects SSE 50ETF options as the investment target. It combines a zero-risk short-term quantitative strategy with a stable asset allocation mid-line financial management, and aims Investors provide low-

risk, high-return investment income. We intend to achieve a maximum annualized rate of return of 6.52% for institutional customers with a net asset of more than 10 million or high-net-worth individuals with a financial asset of no less than 3 million.

mechanism	Net assets are not less than 10 million yuan
personal	Individuals with financial assets not less than 3 million yuan or with an average annual personal income of not less than 500,000 yuan in the last three years

This product will deduct relevant expenses from the fund assets at a certain annual rate, including management fees (0.15%), custody fees (0.05%) and sales service fees (0.15%), totaling 0.35% handling fees.

Comparing the average income level of customers and the average price level in the industry, the pricing of E.T.Fund is very competitive. We preliminarily plan that the total amount of funds for the first batch of products will be subscribed to 150 million yuan.

2. Financial forecasting

We refer to the historical data of fund products related to companies in China's banking industry and securities industry, as well as the industrial data of some emerging intelligent products and data from relevant evaluation agencies, combined with statistical methods and accounting theories. Finally, the relevant financial estimates are fitted and the following results are obtained.(The annual income growth ratio is averaged

according to the relevant data of similar rival products such as China Merchants Fund and Bank of China Hui Investment) Due to the excellent properties of the products and the popularity of the fund products in recent years, we deal with the outbreak period in advance at the initial stage of establishment, but do not forecast the development of the plain period five years later. At the same time, we believe that our products have high returns, low risks, scientific and stable investment strategies, high user stickiness and low user churn. In our estimation, we have lowered its influence

Revenue forecasting

	Year 1	Year 2	Year 3	Year 4	Year 5
Prime operating revenue	525000	876421	1599863	3105602	4907621

Tips：Assuming that all the products of the first phase are subscribed and have a good reputation, and since the main customers of the platform are guaranteed by sales channels and many of them are long-term investors with large amounts of funds, scale effect is easy to be generated, and the user growth rate will increase year by year. This statement does not consider non-operating income

Considering that the fund needs to use a rented cloud server and the account of the enterprise version of the commercial database, as well as the most

fixed equipment for maintenance, the total maintenance cost is estimated to be RMB 80,000 a year. At the start-up stage, we have a low estimate of staff salary, which will gradually increase after a certain number of years.

Operating cost forecasting

	Year 1	Year 2	Year 3	Year 4	Year 5
Maintenance charge	80000	80000	80000	80000	80000
Payoll	400000	460000	550000	680000	800000
Operating cost	480000	540000	630000	760000	880000

Business tax (calculated according to 5% of the operating income of finance and insurance industry) (Unit: Yuan)

	Year 1	Year 2	Year 3	Year 4	Year 5
Tax	26250	43821	79993	155280	245381

Sales Expense (Unit: Yuan) :

	Year 1	Year 2	Year 3	Year 4	Year 5
Operating expense	50000	55000	60000	65000	70000
Advertising expense	50000	52000	54000	56000	58000
Sales expense	100000	107000	114000	121000	128000

Management expenses (unit: Yuan)

	Year 1	Year 2	Year 3	Year 4	Year 5
Welfare	20000	22000	24000	26000	28000
Travel expense	12000	12000	12000	14000	14000
Depreciation expense	8000	8000	8000	8000	8000
Management expenses	40000	42000	44000	48000	50000

Note: with the expansion of the fund scale, the requirements on personnel management are also increasingly high, so in the management

The personnel salary expenditure account increases year by year.At the same time, the fixed assets are set at RMB 50,000, the straight-line depreciation method is adopted, and the estimated residual value is RMB

10,000 after five years of depreciation.

Financial expenses (unit: Yuan)

	Year 1	Year 2	Year 3	Year 4	Year 5
Financial expenses	5000	8500	15000	30900	48000

Income statement forecastinig

According to the above estimation, the profit and loss situation of the company in five years is as follows (unit: yuan)

Pre-edited income statement	(unit: Yuan)				
	Year 1	Year 2	Year 3	Year 4	Year 5
First, business income	525000	876421	1599863	3105602	4907621
Less: business cost	480000	540000	630000	760000	880000
Business tax and surcharges	26250	43821	79993	155280	245381
sales expense	100000	107000	114000	121000	128000
Management costs	40000	42000	44000	48000	50000

Financial expenses	5000	8500	15000	30900	48000
Second, operating profit (loss is marked with "-")	-126250	135100	716870	1990422	3556240
Third, the total profit	-126250	135100	716870	1990422	3556240
Less: Income tax	0	33775	179217.5	497605.5	889060
Four: net profit (the total loss is marked with "-")	-126250	101325	537652.5	1492817	2667180

Cash flow statement forecasting

The expected cash flow generated by the company's operating activities in the next five years is as follows (unit: Yuan) :

Estimated cash flow (received with "+", paid with "-")	(unit: Yuan)				
	Year 1	Year 2	Year 3	Year 4	Year 5
I. Cash flow from operating activities					

Cash received from the sale of finished goods, commodities, and services	525000	876421	1599863	3105602	4907621
Cash for the purchase of raw materials, commodities, and labor services	80000	80000	80000	80000	80000
Employee compensation paid	400000	460000	550000	680000	800000
Taxes paid	26250	43821	79993	155280	245381
Other payments related to business activities Cash	140000	149000	158000	169000	178000
Net cash flow from operating activities	-121250	143600	731870	2021322	3604240
2. Cash flow from financing activities					
Attract investors to invest the cash received	0	0	0	0	0

Attract investors to invest in cash received	0	0	0	0	0
Net cash flows from investing activities	-121250	143600	731870	2021322	3604240

Calculate on the basis of the cash flow of the previous 5 years: NPV $=\sum_{t=1}^{n} NFC/(1+K)^t$-C

and, n=5, assuming K=10%

Through calculating, NPV=¥3353499.88, above 0, therefore, the investment project is feasible (the expectation is on the premise that the whole industry is normal).

Team introduction

The Prometheus team is composed of teachers and students from Nanjing University. The instructors are Professor Lin Hui from the School of Business and Professor Zhang Jian from the School of Physics. The team members come from the Department of Finance and Insurance, Department of Economics, Department of International Economics and Trade, Department of Accounting, Department of Software Engineering, Department of Computer Science and Technology, Computer and Financial Engineering Experimental Class of the School of Software. The team has a total of 26 members, divided into a strategy group, a backtest group, a

technical group, a docking group, and a business group. The strategy group is responsible for the development of investment strategies and the design of fund products, the backtesting group is responsible for the backtesting of historical data to provide support for strategy development; the technical group is responsible for software development and the application and optimization of machine learning algorithms, and the docking group is responsible for delivering the needs and requirements of the strategy group. Feedback technical team development issues, business team is responsible for market due diligence, financial analysis, post-operation and publicity.

1. Division of Labor

instructor	Hui Lin, Jian Zhang	
Participants	Strategy group	Wuxian Jiyu (Group leader)
		Xicheng Ding
		Yixin Sun
		Shunman Ruan
	Backtest group	Dahuan Lin
		Tianyi Ouyang
		Bingjie Yang
	Technology Group	Kexiang Feng(group leader)
		Gengyang Chen
		Mingzheng Gu

		Fengyuan Shi
		XIngliang Du
		Yanze Chen
		Zehao Li (group leader)
		Jinyu Zhu. (group leader)
		Ganlin Li
		Zhiheng Xi
		Weichen Shen
		Junjie Li
		Xuyan Zhang
		Yue Li
		Yuxin Meng
	Docking group	Kaiyan Zhu
		Xianjin Zhou
	Business group	Jingye Yuan
		Yushuang Shen

2. Introduction of team members

2.1 Instructor

Professor Lin Hui: Professor of Finance Department of Nanjing University, Doctor of Management, Postdoctoral of Economics. The main research

direction is derivative asset pricing, financial asset investment strategy, corporate finance, etc. He has won the first prize of financial engineering annual conference paper, the first prize of academic conference and other awards. Presided over 2 general projects of the National Natural Science Foundation of China, 1 general project of philosophy and social science research of the Ministry of Education, participated in 1 key project, and presided over 2 research projects funded by the China Economic Reform Research Foundation. Related papers have been published in Journal of Management Science, Financial Research, Securities Market Herald, Chinese Physics Letters, PhysicalReview E, Journal of the American Society for Information Science and Technology 64, etc.

Professor Zhang Jian: Nanjing University, School of Physics, Institute of Biomedical Physics, Professor, Doctor of Science, Univ. Illinois at Chicago University Department of Bioengineering, Visiting Scholar, Nanyang Tech Univ School of Life Sciences Research Fellow. The main research areas are high-performance computing, statistical physics and biological macromolecules, and artificial intelligence algorithms. Related work has been published in JACS, RNA, JCP, PLOS Comput. Biol., and other journals. Presided over 4 National Foundation Committee Youth and General Projects, and participated in 3 key projects. In 2011, he won the first prize of Natural Science of the Ministry of Education (ranked fourth).

2.2 Participants

Sun Yixin(captain): An 2018 undergraduate majoring in financial management from the Business School of Nanjing University, with a credit score of 21/68. Served as the vice minister of the Culture Department of the Student Union of the Business School of Nanjing University, and has rich experience in organizing activities. Have done relevant internships in New Oriental Language Training Institutions. As the captain, he led the team to participate in the Huawei Financial Elite Challenge and won the school-level award, and participated in the Gordon Education ACCA Famous Enterprise Challenge and won the top ten in the East China Division. He has won the People's Scholarship, the backbone of the 2019 Excellent Student Union and other awards. Participate in the construction of the dream book bar for undergraduate entrepreneurship, and is responsible for the preparation and establishment of the business plan of the entrepreneurial project "Mengchuang Workshop".

Ding Xicheng : An 2018 undergraduate majoring in financial management at the Business School of Nanjing University, with a credit score of 2/68. He has won the Du Sha Scholarship, the 2018-2020 Nanjing University Outstanding Communist Youth League Member, Huawei Financial Elite Challenge Outstanding Individual, Outstanding Individual in Social Practice, Outstanding Volunteer and other honors. Rich experience in

business/creation competitions, won the "Internet +" University Student Innovation and Entrepreneurship Contest Provincial First Prize, Challenge Cup "College Student Entrepreneurship Plan Contest Provincial Gold Award (the team has entered the national competition), Huawei Finance Elite Challenge School third place Name and other awards. Served as a class organization committee member, a campus ambassador of a financial pre-employment education institution, and an intern in the Transportation Group of GF Securities Development Research Center.

Ji Yu Wu Xian: An 18-level undergraduate student majoring in financial engineering at the Business School of Nanjing University has ranked first in terms of credit performance for two consecutive years. He has won national scholarships, Dusha Scholarships, outstanding Communist Youth League members of Nanjing University, outstanding students of Nanjing University Business School, the 2018-2019 Nanjing University Football Cup Freshman Cup Champion, Super League runner-up, Super Cup champion and other honors. Participated in the Waiyanshe Cup National English Reading Competition and won the first place in the campus trial, and participated in the provincial competition as the only representative of Nantah. As the team leader, he led the team to participate in the American College Students Mathematical Contest in Modeling and won the H Prize. Serve as a class study committee member.

Ruan Shuman, a 2018 undergraduate student majoring in International Economics and Trade, Nanjing University Business School, with a credit score of 4.65/5.0, professional ranking: 1/43. He has internship experience in several companies such as China International Financial Securities Research Institute, Bain & Company, Guotai Junan Research Institute, etc. He has won the second prize of the Nanda Silver Star Cup and the third prize of the Nanda Basic Discipline Forum. He has participated in many case analysis competitions such as the Bain Cup. He has rich experience in writing and defending business plans. He is currently the sound minister of the school choir and a member of the school cheerleading team. He has participated in the provincial competition and won the second place. TOFEL 111, with strong English reading and writing skills. He has won many honors such as the school's outstanding social practice team, the national scholarship, and the Zhenggang Humanities and Social Sciences Scholarship.

Shen Yushuang: An 18-level undergraduate student majoring in accounting at the Business School of Nanjing University, ranked 6/36 in credit scores. He has won honorary titles such as school-level outstanding students, college-level outstanding league members, outstanding volunteers of the Southern Star Dream Project, and 83 economic scholarship winners. He has experience in Huawei Financial Elite Challenge (top ten in-school

competition), PricewaterhouseCoopers 24H, Gordon Education ACCA Famous Enterprise Challenge and other competition experience, served as a class organization committee member, and worked as an intern in Jiangsu Nanbowan Co., Ltd. The position of assistant director and head of the general department. Rich entrepreneurial experience, once independently operated a micro-shop, and participated in the construction of the college student entrepreneurial project Mengchuangshu Bar.

Yuan Jingye: Nanjing University 2017 undergraduate financial management undergraduate founder of Nanjing Dunshu E-commerce Co., Ltd., a core member of the "Blue Whale Little Bookboy" team. Rich entrepreneurial experience, once as a core member, created the "Storm Eye Student Team" and "Lang Liang" glasses shop; the founding company is now an enterprise in the Nanjing University Science Park, and cooperates with many businesses inside and outside the campus to participate in or undertake internal and external activities. For the rest of the field, the first physical maker coffee shop has been opened in the Makerspace on campus from online to offline. At the same time, it also has close cooperation with Nanjing University and related organizations of Southeast University. I have extensive personal internship experience. I have had relevant internships in Nanjing Deloitte, Huatai Securities, Guoyuan Securities, Bank of China, Toutiao, Lu'an City Finance Bureau, etc., have a relatively

in-depth understanding of business activities and business environment, and have participated in "Citi Cup", "Bain Cup", "Internet +" and other large-scale competitions have rich experience in business competitions, once won the personal "Best Style Award" in the "President X" competition of the Belt and Road strategy competition "President X" in the Uzbek macro-construction case "I also visited the work area of Thailand International Organization as a public ministry member, and gave an English speech at UNICEF.

Wang Fangzhou: Nanjing University Business School Financial Management 18 undergraduate, credit performance ranking: 16 / 68. He has won the second prize of Liu Yifeng scholarship of Nanjing University, the second prize and the third prize of people's scholarship. He is an outstanding member of the Communist Youth League of Business School of Nanjing University from 2018 to 2019 and is currently a probationary Party member. He participated in the Huawei financial elite challenge and won the campus award, participated in the construction of the dream book bar, a college student entrepreneurship project, and served as the campus manager of New Oriental. He has rich experience in Internet media operation.

Lin Dahuan is a 17-level undergraduate student majoring in economics at the Business School of Nanjing University, with a grade of 4.65 in his

junior year and a major ranking of 2/53. He has participated in the Challenge Cup, American College Student Mathematical Modeling Competition, Silver Star Cup Essay Competition and won a good ranking. Won a people's scholarship. Participated in quantitative strategy projects in a number of securities firm research institutes. Proficient in python language, responsible for data back-testing and visual analysis in the team.

Yang Bingjie: A 17-level undergraduate student in the Finance Department of the Business School of Nanjing University, with a credit score ranking 13/42. Won the Cathay Life Scholarship and the third prize of the Silver Star Cup Essay Competition. He was shortlisted in the top ten of the Jiangsu Division of the KPMG Management Case Analysis Competition. From 2017 to 2018, he worked in the Academic Department of the Student Union of the Business School of Nanjing University.

Ouyang Tianyi is a senior student in financial engineering at the Business School of Nanjing University. He has won the 2018&&2019 People's Scholarship, an outstanding student at the college level, the third prize of the KPMG Case Study Invitational Competition in Nanjing University, and an outstanding team of social practice in the 2018 "40th Anniversary of Reform and Opening-up". Internship in the Industrial and Commercial Bank of China Beijing Branch, BDA PTA and Soochow Securities

Research Institute Machinery Group, mastered Python, R language and other data analysis tools, daily interest and in-depth understanding of equity research, mainly responsible for the "cheap sale effect" in the team "the study.

Zhou Xianjing : An 18-level undergraduate student majoring in Computer and Financial Engineering, Department of Computer Science and Technology, Nanjing University, ranked 10/28 in credits. He has won the People’s Scholarship, the Elite Scholarship, and the Excellent Communist Youth League Member of Nanjing University in 2019. He has a rich campus experience. He used to be the deputy director of the Management Sub-center of the Practice and Volunteer Work Department of the Youth League Committee, and the creative secretary of the Wujin Detachment of the Rural Revitalization Work Camp. Has a relatively solid experience in programming projects, and has completed the "Supply Chain Enterprise Information Management and Financing Platform" soft engineering project, and the 2020 American College Students Mathematical Modeling Contest (won the H prize).

Zhu Kaiyan: An 18-level undergraduate student majoring in Computer and Financial Engineering at Nanjing University. He has won the first prize of professional scholarship, and the honor of outstanding Communist Youth

League of Nanjing University in 2019. The team led by the team was awarded the 2019 Summer Social Practice Excellent Team. At the same time, the book "2019 China Memorial Annual Development Report" that the team participated in was published in May 2020. Served as the vice president of Zhitian Painting and Calligraphy Club and a member of the class organization.

Feng Kexiang (Leader of the Technical Team): 2017 undergraduate of the School of Software, Nanjing University, with a credit score of 37/226. He was awarded the outstanding Communist Youth League member of Nanjing University, the outstanding Communist Youth League cadre of Nanjing University, the outstanding volunteer of Nanjing University, the outstanding student of Nanjing University Software School ; Won the People’s Scholarship in 2018, the People’s Scholarship in 2019, and the third prize of the 2019 "Nanjing University-vivo" Hackathon Development Contest; formerly the executive vice chairman of the Youth Volunteer Association of the School of Software of Nanjing University. At present, he joined the National Engineering Laboratory of Digital Video Coding and Decoding Technology of Peking University, and his main research direction is video coding and understanding.

Chen Gengyang: A 17-level undergraduate majoring in software

engineering from the School of Software, Nanjing University. He has won the 2020 Nanjing University Outstanding Student Cadre Model, Nanjing University Outstanding Communist Youth League Model, and served as the Chairman of the Student Union of the School of Software of Nanjing University. Once exchanged at the University of California, Berkeley, achieved full results, and joined the school’s entrepreneurial team to assist in the development and launch of the app. He has rich experience in projects and competitions. As a member of the software group, he won the second place in the 15th Citi Cup Financial Innovation Competition.

Gu Mingzheng: A 17-level undergraduate from the School of Software, Nanjing University, ranked 34/226 in credits, and won the first and third prizes of the People's Scholarship. The project experience is relatively rich. He has participated in the "Challenge Cup" college student entrepreneurship plan competition and various discipline projects, and has rich experience in front-end and back-end and machine learning mainstream frameworks or algorithm development.

Shi Fengyuan: A 17-level undergraduate student majoring in Computer Science and Technology at Nanjing University, with a credit score of 7/173. Won Yibao Payment Scholarship, People's Scholarship, and the National Third Prize of the 8th China Software Cup University Software Design

Competition.

Du Xingliang: 17-level undergraduate from the Department of Computer Science and Technology, Nanjing University, won the silver medal in the Harbin Station of the 2019 China College Student Programming Competition, the silver medal in the 2019 International College Student Programming Competition Shenyang Regional Competition, and the third prize of the 8th China Software Cup College Software Design Competition .

Chen Yanze: An undergraduate student in the School of Software of Nanjing University in 2018, with a credit score of 2/231. He has won the National Scholarship, Nanjing University "Soochow Securities Scholarship", Nanjing University Outstanding Communist Youth League Member, Outstanding Individual in Social Practice, University Student Union Department Star, Outstanding Student of Software School, etc. Won the third prize in the algorithm group and interactive group of the EL competition of the Software Academy, and the third prize in IDEA HACKATHON.

Li Zehao: Undergraduate of the 2018 level of the School of Software, Nanjing University, and a preliminary party member. Won the National Second Prize of the University WeChat Mini Program Application

Development Competition, the third prize of the 2019 "Nanjing University-vivo" Hackathon Development Competition, the People's Scholarship, the 2018-2019 Nanjing University Excellent Communist Youth League Member, 2019-2020 Excellent Communist Youth League Cadre, Academy The third prize in the interactive group of the EL competition, the excellence prize in the career planning competition, the third prize in the planning competition and other honors. Participated in professional competitions such as Youth Creation, Challenge Cup, and National University Student Mathematical Modeling; served as the permanent representative of the 24th Student Congress of Nanjing University, the Youth League Secretary of the 2nd Class, and the 2019 peer instructor; once led the class to win the school's excellent class style demonstration point , Jiangsu provincial advanced class collective and other honors; accumulated 172 hours of volunteer time; developed a student activity platform, a teacher-student exchange platform, a sign-in system during the epidemic period, and a new dormitory distribution system for the college.

Zhu Jinyu: An 18-level undergraduate student majoring in software engineering in the School of Software, Nanjing University, ranked 4/231 in two years. He has won the national scholarship and the first prize of the people's scholarship. The project experience is relatively rich. He has

participated in the Hackathon of Microsoft East China Eight Schools and won the National College Student Mathematical Modeling Competition and other awards.

Li Ganlin: An 18-level undergraduate student in the School of Software, Nanjing University, ranked in the top 30% of credit scores. Ability to use mainstream programming languages such as java, c++, python, and web development frameworks such as spring and vue. He has won the winner of the 2019 Citi Cup Financial Innovation Application Competition, the third prize of the 2020 China Software Cup Software Design Competition, and the third prize of the interactive group of the 2019 Nanda Soft Institute EL Competition. A member of the PASCAL research group of Nanjing University, his main research direction is the analysis and processing of java exception mechanisms in the field of static analysis.

Xi Zhiheng: An 18-level undergraduate from the School of Software, Nanjing University, with a credit score of 7/231. He has won the National Scholarship, Nanjing University Yibao Payment Scholarship, Excellent Volunteer, and the Provincial Third Prize of the National College Student Mathematical Modeling Contest. Willing to study and study, have a sense of responsibility, are willing to complete plans or tasks ahead of time, and are willing to learn new things.

Shen Yichen: An 18-level undergraduate student majoring in software engineering from the School of Software, Nanjing University, ranked 16/231 in credits. Won the first prize of the People's Scholarship, 2018~2019 Nanjing University Outstanding Communist Youth League Member, Outstanding Student Cadre of the School of Software, etc. Participate in activities such as the 2019 Tengju Weiju joint hackathon, the 2020 China University Computer Competition WeChat Mini Program Application Development Competition, and the 2020 Nanjing University Daiso Plan.

Li Junjie: An 18-level undergraduate from the School of Software, Nanjing University, with a credit score ranking of 10/231. He has won national scholarships, Yibao payment scholarships, outstanding Communist Youth League members of Nanjing University in 2018-2020, outstanding individuals in social practice, outstanding students in the School of Software and other honors. Participated in and won the third prize of China Software Cup, the winner of the 2019 Citi Cup finals, Microsoft East China hackathon, Internet + contest and other competitions.

Zhang Xuyan: Undergraduate student in Software Engineering, Nanjing University, College of Software Engineering, undergraduate, served as the

Communist Youth League Party Secretary, won the People’s Scholarship, Outstanding Student Cadre of Jiangsu Province, 3rd runner-up in the “Yunbai Environment” Cup Debate of Nanjing University, and the 6th May Fourth Debate Outstanding debater, the third prize of the Ninth Career Planning Competition of "Qingying Feifan", the third prize of the interactive group of Nanjing University El Programming Competition, and the title of Excellent Volunteer of Nanjing Innovation Week.

Li Yue: 18-level undergraduate from the School of Software, Nanjing University, with a two-year credit score of 15/231. He has won the 2019 Dong's Oriental Scholarship, the 2020 Paypal Scholarship, and the 2019 Excellent League Member. Participated in the East China hackthon.

Meng Yuxin: An undergraduate student with a degree in software engineering majoring in Software Engineering, School of Software, School of Software, Nanjing University.