Proceedings of the 2nd International Conference on Business and Policy Studies
DOI: 10.54254/2754-1169/17/20231129

Analysis and Suggestions on "Crude Oil Treasure" Event

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Abstract: Since the global COVID-19 has broken out, the international crude oil market has been turbulent and crude oil prices have hit new lows. In April 2020, the Bank of China (BOC) "Crude Oil Treasure" May 2020 contract product caused 9 billion losses. The paper discusses the case of BOC 's "Crude Oil Treasure" and it is divided into the following three parts. First, we sort out the background and process of the BOC 's "Crude Oil Treasure" and expound the operation principles of the product. Furthermore, we analyze in detail the reasons why the failure occurred. At first, we summarize the external factors under the background of the COVID-19. Then, we discuss the internal reasons for the occurrence of cross-position events. From two perspectives of product design and risk control, we try to analyze the inadequacies of Bank of China in this case. Finally, we combine the above-mentioned reason analysis and give suggestions on how to prevent such incidents from happening again from both the perspectives of both banks and investors.

Keywords: reasons of product formation, problems in product design, suggestions for the bank

1. Introduction

1.1. Overview of the "Crude Oil Treasure"

In January 2018, the Bank of China (BOC) launched the "Crude Oil Treasure" product for individual domestic customers. This product is based on the crude oil futures price in the international market, where the customers may buy the crude oil, with the price being based on the WTI crude oil futures contract and Brent crude oil futures contract.

According to the product introduction published on the official website of the BOC, although the quotation of "Crude Oil Treasure" is linked to the price of WTI crude oil futures, it is quite different from the international WTI crude oil futures trading mechanism.

First, the minimum transaction quantity of "Crude Oil Treasure" is only 1 barrel, (versus WTI futures 1,000 barrels), meaning that investors of BOC ’s "Crude Oil Treasure" could start investing the product with 500 yuan.

Second, BOC ’s "Crude Oil Treasure" requires a 100% margin, while WTI crude futures contract requires a 10% initial margin and does not require full capital deposits to hold the contract. The former has no leverage, while the latter has leverage. Leverage refers to the use of debt or borrowed funds to amplify returns from an investment or project [1]. For instance, without leverage, you can buy $100 of goods with $100 of capital. Suppose there is 20 times leverage, which means that your $100 capital can leverage $2,000 in goods. In essence, the unleveraged transaction of “Crude Oil Treasure” should be of the nature of wealth management, not futures, and there should not be a phenomenon that requires customers to repay money [2].

Third, most investors in China are speculators, without ability to hold physical commodities. On the one hand, "Crude Oil Treasure" is very attractive to investors due to its low threshold for trading. Thus, "Crude Oil Treasure" is also known as paper crude oil business. On the other, the product is also very attractive to BOC, because it can use the margin spread as interest free deposit and increase its lending business.

Investors of "Crude Oil Treasure" do not directly participate in the trading of crude oil futures in the international market; their product is linked to the international crude oil futures price. To buy the product, customers log in the system of Bank of China, open a personal "Crude Oil Treasure" account, deposit a sufficient margin to realize a two-way selection of long and short crude oil trading tools. As market makers, BOC needs to hedge by maintaining a trading account on the CME exchange. Thus, "Crude Oil Treasure" trading area is divided into internal and external parts.

Internal trading is the onshore trading between individual investors and Chinese banks. As the transaction object of individual customers, the bank is the counter-party relationship between the two sides. The bank quotes investors based on the CME 's futures contracts, combined with the daily central parity rate of the yuan against the dollar. BOC sets the offer price and bid price of "Crude Oil Treasure" products and investors can choose their own long and short positions. The transaction details between clients and banks of "Crude Oil Treasure" are automatically generated through the internal trading system. The transaction involves only both parties, and do not include the transaction settlement between banks and CME. In fact, the internal trading is a virtual trading, investors simulate investment in crude oil futures, the actual investment is done by BOC and CME in the external trading.

External trading is the trading between BOC and CME in the overseas crude oil futures market. After receiving investors' trading orders in the internal market, the bank shall summarize and calculate them daily, and carry out several operations in the external futures exchange to hedge position risks and provide liquidity for the market. If the customer buys long crude oil futures, the bank sells crude oil futures on the outside market; Instead, if client buys short crude futures, the bank buys crude oil futures on the outside market. BOC acts as market makers, whose income comes from fees and do not earn profits from market rises and falls.

1.2. Process and Result of the Case

Due to the interference of external factors such as the COVID-19 epidemic and the decrease of crude oil production reduction negotiations, crude oil prices in the international market changed greatly. CME Group revised its trading rules in 2020 for the first time on April 3 (local time), allowing crude oil futures to trade negatively from April 5 (local time).

As shown in Figure 1, on April 20, WTI crude oil futures went negative for the first time since its listing, falling to minus $40.32 USD per barrel. After the closing bell on the final settlement day, CME announced that it would settle the WTI crude oil futures May contract at minus $37.63 USD

DOI: 10.54254/2754-1169/17/20231129

/barrel. The price of minus $37.63 is the average price in three minutes before settlement. The purpose is to prevent price manipulation.

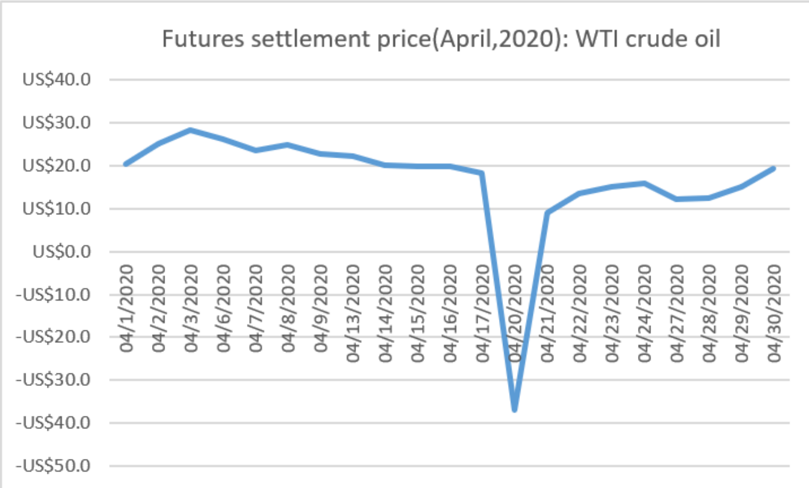

Figure 1: Futures settlement price: WTI crude oil (unit:$/barrel) [3].

More specifically, from April 16 to 20, BOC issued price changes alerts to "Crude Oil Treasure" investors online. The WTI May contract fell sharply in the days leading up to delivery, plunging into negative trading on April 20, closing at minus $37.63 a barrel; At 7 p.m. Beijing time on April 20, the price of WTI crude May contract began the first wave of collapse, falling to $11 per barrel; At 10 p.m. Beijing time, BOC stopped the trading of "Crude Oil Treasure" due to its own rules; In the early hours of April 21 Beijing time, the May WTI crude oil contract fell for the second time, from around $11 per barrel to $0 per barrel. At 2 a.m. Beijing time, the third wave of decline began, from around $0 per barrel quickly to minus $40.32 per barrel, before recovering slightly to close at minus $37.63 per barrel [4].

Figure 2: Timeline of the issue (Beijing Time).

On April 21, BOC stopped the trading of "Crude Oil Treasure" for a day; On the morning of April 22, BOC suspended the trading of new "Crude Oil Treasure" products, Repetitive announcing that the settlement price of "Crude Oil Treasure" May contract was minus $37.63 per barrel, and long investors faced huge losses. On the evening of the same day, BOC explained the business situation of "Crude Oil Treasure" to investors. First, "Crude Oil Treasure" is not a leveraged transaction. Second, BOC announced the contract settlement price. Third, BOC announced plan for forced liquidation [5]. On April 24, under public opinion and regulatory pressure, BOC again stated that it would strictly inspect product design, comprehensively control risk operations, and offer to bear corresponding legal responsibilities. However, BOC still insisted that "Crude Oil Treasure" customers pay for product losses; With the continuous fermentation of the crude oil treasure incident, under the pressure of the public, on May 11, 2020, BOC finally issued an agreement, stating that the loss of negative oil prices shall be borne by the BOC, and the money deducted from the deposit after the event will be returned, and the principal will be refunded 20%; In December 2020, the China Banking and Insurance Regulatory Commission fined BOC and its branches a total of 50.5 million yuan in response to the "Crude Oil Treasure" incident, and took corresponding regulatory measures to BOC.

2. Cause Analysis

2.1. Shifting of Trading Rules in CME

The announcement pointed out that if the WTI crude oil futures contract settlement price for any month falls to $8-11 per barrel, CME Clearing may replace the existing pricing model with the Bachelier model (*On April 8 2020, the CME Group posted the note CME Clearing Plan to Address the Potential of a Negative Underlying in Certain Energy Options Contracts, saying that after a threshold on price, it would change its standard energy options model from one based on Geometric Brownian Motion and the Black–Scholes model to the Bachelier model. On April 20, 2020, oil futures reached negative values for the first time in history, where Bachelier model took an important role in option pricing and risk management. The implied volatility under the Bachelier model can be obtained by an accurate numerical approximation*), which could allow negative prices. On April 15, CME continued to issue an announcement stating that recent market events have increased the likelihood that certain NYMEX energy futures contracts may be traded at negative or zero trading prices. If this occurs, all CME trading and clearing systems will continue to work as usual [1] [4] [6].

2.2. Problems in the Design of BOC's "Crude Oil Treasure"

2.2.1. Problems in Product Promotion

Before the "Crude Oil Treasure" product was released, China's gold and silver futures markets were relatively mature. In late 2004, Bank of China launched the personal gold investment business, the "Gold Treasure", a paper gold trading product. Other commercial banks have also successively launched similar products in following years. Data show that from 2015 to 2021, the total turnover of China's gold futures has exceeded 77.9 trillion yuan. It can be seen that the gold and other precious metal futures markets have had huge trading volumes after years of development, with the rules and systems in all aspects being relatively complete.

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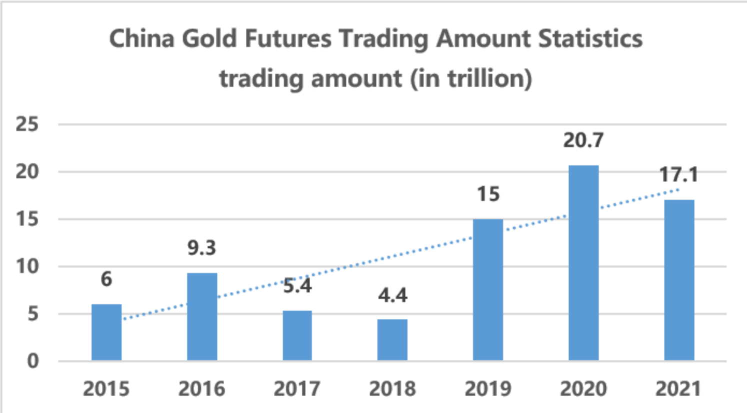

Figure 3: Yearbook of Gold in China, 2021.

Therefore, Bank of China launched crude oil treasure products in 2018, based on the previous experience of paper gold and paper silver transactions and the long-term participation of consumers. Bank of China may have overestimated the traders' understanding of such financial products, thus misjudging the risk of the product. It should be pointed out that the difference between Crude Oil Treasure and the precious metal futures trading is the presence of storage risk of crude oil. Although most products such as paper gold in China cannot be physically delivered, most banks still have the ability to store gold in their vaults. For crude oil products, only some large oil depots can be stored. Therefore, the trading risk of crude oil treasure itself is much greater.

Furthermore, in the "Crude Oil Treasure" products, the trading methods include over-the-counter trading, online banking and mobile banking, with convenient operation methods and low entry barriers. This makes it easy for investors without the relevant expertise to trade, thereby misjudging the risk. In the United States, however, relevant futures trading requires basic knowledge of stock index futures and passing relevant tests. At the same time, one must have more than 20 simulated transaction records of stock index futures for 10 trading days, or more than 10 transaction records of commodity futures in the past 3 years. In fact, compared with trading products such as paper gold, the threshold for Crude Oil Treasure is relatively low. For example, in gold futures, the underlying index of the contract is the CSI 300 index, and the contract value is 300 yuan per point. That is to say, if each contract is 1.7 million yuan, the minimum margin is 170,000 yuan. This is a high requirement for individual investors. In the "Crude Oil Treasure" product, investors could invest as little as $73 to buy only one barrel of oil. In this contrast, the number of investors for "Crude Oil Treasure" products has increased significantly, laying the uncertainties for subsequent events.

2.2.2. Time Difference in Domestic and Foreign Trading Markets

At 10:00 p.m. on April 20, the "Crude Oil Treasure" product stopped trading in China while the trading in the U.S. WTI crude oil futures market continued. For the WTI crude oil futures May 2020 contract, it was in the morning of April 20 local time when most domestic investors were banned from trading at 10 p.m. on April 20. At this time, the May 2020 contract price of WTI crude oil futures linked to this product had dropped to $11/barrel. According to the agreement signed by Bank of China and investors, the bank needs to settle after 10:00 pm. The closing time of crude oil futures market trading was 2:30 am of the next day, and the Bank of China did not directly liquidate.

The Bank of China's explanation for this was that the time when the crude oil price fell to 20% was outside the tradable time range and did not fit the initially set trading hours. Therefore, based on this standard, Bank of China did not immediately take liquidation measures.

After 10:00 pm, the price of WTI crude oil futures fell all the way. Even after 2:00 am of the next day, it fell into negative price for the first time, and the lowest fell to more than $-40/ barrel.

Besides, investors were banned from trading. Faced with the falling prices of WTI crude oil futures, they could do nothing. As a wealth management product advertised by the BOC, although"Crude Oil Treasure"is linked to the international crude oil futures price, the time difference between the two countries should be considered when the product is launched. The position of "Crude Oil Treasure" was locked at 10:00 pm while the settlement price time of WTI crude oil futures was 2:30 am of the next day. And most investors were unable to make timely adjustments to the changes of market. Unluckily, it is obvious that the daily price of futures market can make huge fluctuations. Unluckily, during the time difference of these four hours, it was highly possible for the investors to undertake the great loss if they cannot respond to the market quickly.

2.2.3. Liquidity Risk of Products on Delivery Date

According to the instructions of *Fact Sheet on "Crude Oil Treasure"* by the Bank of China [5], "Crude Oil Treasure" is linked to the price of the U.S. WTI crude oil futures contract. With reference to the official settlement price of CME, the position would be roll over or liquidate on the day before the last trading day. The delivery date of the WTI crude oil futures May 2020 contract in the international market was April 21, so the position transfer date for the May contract of "Crude Oil Treasure" was April 20. According to the normal operation of the market, the bank would need to liquidate the WTI crude oil futures May 2020 contract, which were still held in the hand on the rollover date. After that, the bank would set up a position to buy the next WTI crude oil futures June 2020 contract. Thus, on April 20, the trading volume was quite small. Unless the counter-party was given a satisfactory price, it would be difficult for the Bank of China to achieve all normal liquidation on the day.

Generally speaking, it needs to take basic consideration of product liquidity factors in the time selection of inter-period rollover date. When the number of contracts in hand is appropriate and does not affect the transaction price, futures investors will choose a suitable time to roll over futures position with the aim of reducing cost to a minimum. Therefore, experienced investors rarely wait until a few days before the actual delivery, they will roll over or liquidate when the current number of futures contracts is the most active. However, according to the "Crude Oil Treasure" trading agreement signed by Bank of China and investors, the product relocation and month-to-month operation will be carried out on the day before the last trading day of the corresponding crude oil futures, with smaller trading volume and fewer counterparties.

The setting of "Crude Oil Treasure" to move positions on the day before the delivery date does not fully consider the liquidity risk of the market. It is unreasonable for the investors who do not actively participate in the delivery. In the circumstance of extremely poor liquidity, transaction prices are often pushed down. More importantly, if the position cannot roll over before the delivery date, it will face to the physical delivery. And there is no doubt that the launch of "Crude Oil Treasure" is not for the purpose of physical delivery.

Compared to the China Construction Bank as well as the Industrial and Commercial Bank of China, which also develop paper crude oil products, they have considered relatively comprehensive on the issue of liquidity risk on the product delivery date. As shown in the table 1 below, Bank of China, China Construction Bank, the Industrial and Commercial Bank of China are the three largest banks in domestic paper crude oil trading volume. They have similar design methods for paper crude oil products, but there are still some key differences.

Table 1: The introductions of design about Paper Crude Oil in BOC, CCB and ICBC.

	BOC	CCB	ICBC
Launch time of the product	2018	2015	2013
Rollover date	One day before the final settlement date	Five days before the final settlement date	Five-seven days before the final settlement date
Time to adjust	Freeze from 10pm to 8am on the next day	Freeze from 12pm to 9am on the next day	Freeze from 12pm to 9am on the next day
Forced liquidation rules	Early warning when the margin is less than 50%, and forced liquidation when it is less than 20%	Early warning when the margin is less than 60%, and forced liquidation when it is less than 50%	Early warning when the margin is less than 50%, and forced liquidation when it is less than 20%

As can be seen from the Table 1, for the WTI crude oil futures May 2020 contract, April 14 was the date of rolling over the futures position. Both ICBC and CCB had completed the contract in advance from April 14 to 15 (5 working days in advance), by rolling over or liquidation. On the other hand, BOC had not roll over until April 20. Therefore, it was inevitable to encounter irrational liquidity risks when the rollover date was approaching the delivery date, as the open interest had reduced so that it was not easy to finish the May contracts. This kind of transaction pattern sometimes even give short sellers an opportunity.

Since investors cannot operate on the system after ten o'clock, Bank of China set up the system program to operate automatically based on consideration of cost and benefit. However, if there is no corresponding counterparty in the market at the time, the automation will trade at a lower price. It will seriously be harmful to the interests of customers. Besides, it also shows that there are drawbacks in this automated procedure, which is lack of intelligence and failure to take the most reasonable measures when the risks arise.

In this incident, Bank of China failed to balance the relationship between risk and return and paid more attention to attracting customers to increase the bank's profitability while ignoring issues such as transaction time difference, rollover date and the risk of liquidity. It is not advisable to compromise long-term strategic goals and the company's reputation for the sake of short-term performance.

2.3. Problems in the BOC 's Management of Risk

2.3.1. Unreasonable Determination of the Risk Level

Most investors do not have much trading experience, and they believe that products sold by futures companies have higher risks, while financial products purchased through banks would have relatively lower risks. When Bank of China promotes "Crude Oil Treasure", it is classified as a balanced wealth management product, and all kinds of investors can participate. The operating principle of "Crude Oil Treasure" is similar to that of futures contract trading. But due to the lack of risk hedging design, it should be classified as high-risk product.

However, after "Crude Oil Treasure" was defined as a wealth management product by the Bank of China, investors mistakenly thought it was a low-risk product because of the lack of professional information and experience in futures trading [4,7].

2.3.2. Lack of Risk Judgment

When CME announced that futures prices could be negative, Bank of China did not take corresponding urgent measures. Since the Bank of China did not roll over contracts earlier, there was a time lag between the time when BOC ended trading at 10PM and the delivery date of the product, which provided conditions for large losses. According to Bank of China Co., Ltd. Personal Account Commodity Business Transaction Agreement", it only reminds investors of the possibility of losing the primary principal, but it does not mention the loss of extra funds other than the principal. At the same time, the minimum margin requirement for forced liquidation is set at 20% in the agreement. The bank's statement is that when the margin adequacy ratio of the margin account falls below the minimum ratio of 20% (inclusive) specified by our bank, the system will follow the principle of "single loss ratio in descending order". Open contract products will be forced to liquidate one by one until the margin adequacy ratio rises to more than 20%. This gives investors the information that bank is able to monitor the margin adequacy ratio at any time. However, on April 20, the bank closed personal transactions at 10:00 pm, and investors could not close their positions on their own. At this time, the reminder of the margin adequacy ratio lost its effect.

2.3.3. Information Gap Between Investors and Bank of China

According to the self-definition of Bank of China, it provides quotations and risk management for clients in “crude oil treasure” product. However, according to the rules and requirements of CME, a market maker is the customer who is authorized to quote buyers and sellers in a given market, and its main function is to provide liquidity to the market. Bank of China is not in the CME ’s market maker directory, while its wholly-owned subsidiary BOCI Commodities Futures (USA) LLC (BOCI) is one of the directories. It can be figured out that Bank of China is not a market maker of CME but at the same time provides investors with a virtual trading platform, and then, through its subsidiary BOCI to hedge its net position as a counter-party in the "Crude Oil Treasure" product. Therefore, investors cannot directly affect the settlement price, with investment behavior aggregated in the Bank of China and netted, but the result of the final offset between longs and shorts is calculated and traded on CME. This also makes it impossible for investors to close or move positions by themselves when the delivery is approaching.

2.3.4. Increasing Risks Caused by TAS Trade Mechanism

According to CME data, the wholly-owned subsidiary of Bank of China used the Trade At Settlement (TAS) mechanism at the time of delivery, which allows the use of settlement price to trade at any time of the day without knowing the settlement price. According to CME, the delivery settlement price is the settlement price of the last trading day, while the settlement price of the last trading day is calculated according to the weighted average price of transactions from 14:28 to 14:30 in New York time. While this mechanism avoids transaction congestion, it increases the possibility of settlement prices being manipulated. Under normal circumstances, price manipulation is difficult due to the sheer volume of daily transactions. Even in the last three minutes of the trading day, the number of transactions is still large enough to prevent manipulations. When the futures contract is about to expire, however, most shorts and longs will choose to close their positions in advance and switch to trading in the next month's contract. This leads to a significant reduction in the number of traders in the current month's futures contract so that the price will be more easily manipulated. In the case of Crude Oil Treasure, it is convenient and effective to use the TAS trading mechanism under normal circumstances. Because whether long or short profit, the bank does not bear the loss. This is also the normal process performed by the operator after the investor's trading was closed at 10:00 p.m. on that day. However, due to the already mentioned factors: negative futures prices, fewer traders, etc., futures prices were easily manipulated in the last few minutes, resulting in huge losses [8,9].

3. Suggestions

Under the influence of COVID-19, the uncertainty in the market has increased and the volatility in the international financial markets has become even more dramatic. People's demand for crude oil shrank and the difficulty of storing it increased as the space for storage became smaller and smaller. In such an environment, customers who bought Crude Oil Treasure suffered huge losses. Since Crude Oil Treasure was a product launched by a bank, this incident hit the bank very hard. The following are suggestions for commercial banks in the Crude Oil Treasure incident as well as countermeasures [10].

3.1. For the BOC

3.1.1. Strengthen the Monitoring of Market Risks as Well as Early Warning

Before launching financial products, banks should fully anticipate all kinds of market risks and extreme situations that may occur. They should have high risk identification and handling ability to improve the risk control ability of such products. For financial products linked to foreign assets and not limited to such financial products, banks should always pay attention to the changes in international financial markets. In the case of Crude Oil, the CME's revised trading system announcement that allowed futures prices to appear as negative numbers was a clear warning sign. Banks should be sensitive to such information and inform investors in a timely manner.

3.1.2. Rational Design of Financial Derivative Products and Attention to Their Liquidity

Crude Oil Treasure is linked to international crude oil futures contracts, and the returns of such products are highly correlated with the price of the underlying asset. CME has introduced the volatility of its crude oil futures contracts under the influence of macroeconomic, pipeline and weather conditions. Banks should design their products with a clear understanding and assessment of the risks, market developments and trading rules of the underlying asset to which the product is linked, and use this to develop the rules of the product. In the case of Crude Oil, the bank should consider the demand for crude oil and liquidity to determine how to reduce losses for customers in the face of unforeseen circumstances and severe negative shocks.

3.1.3. Reasonable Rules and Risk Assessment

After knowing the estimated risks and response strategies of financial products, banks should formulate reasonable trading rules and agreement terms to protect the interests of investors. When marketing to customers, they should be fully informed of the potential risks of the products and the specific circumstances. It is important to determine whether the risk of the product matches the investor's ability to bear it, and investors who meet the conditions should be given timely risk warnings and information about changes in the risk of the product.

3.2. For the Investors

In addition to the bank's supervision and risk control of the product, investors should also have the appropriate investment cognition:

3.2.1. Avoid Blind Investment, Improve Risk Prevention Ability and Awareness

Investors should have a certain degree of knowledge about the products they invest in, blind speculation is not sensible. Investors should always pay attention to the market dynamics of the products they invest in, and should pay more attention to the risks of product trading, to improve risk prevention awareness to deal with extreme or unexpected situations.

3.2.2. Having Relevant Investment Knowledge and Experience

In the case of Crude Oil, the investors who did not understand the operation principle of the product, blindly followed the trend of investment but ignored the risks of the product and suffered huge losses should give a warning to most of the clients that ordinary investors without certain professional knowledge are not suitable to invest in complex financial derivative products. Investors should have a certain level of financial knowledge and investment experience in order not to blindly believe in the "speculative behavior" of the institutions selling the products. Investors should have their own investment logic. They should have a plan for when to buy and sell the product, how much to buy and sell, and how much they can afford to lose. In order to avoid losses, investors must know the trading rules of the product and the potential risks.

3.2.3. Facing the Loss of Investment Correctly

Due to the lack of professional knowledge and awareness of risk prevention, most investors are unable to accept large losses. When making investments, it is important to set acceptable loss thresholds for yourself and exit promptly when expectations are exceeded. Investors should also be conscious of the fact that the higher the return, the higher the risk, and face losses rationally when investing

4. Conclusion

To conclude, this article mainly discusses the event of the “Crude Oil Treasure” of Bank of China with its background and development. This event caused serious negative results and some causes are analyzed. This includes the shift of rules in CME, problems in product design together with BOC’s inappropriate risk management. thus we give advice for both the Bank of China and investors. The bank should strengthen the monitoring of market risks and develop the derivative product more rational. For investors, it is suggested to avoid blind investment and equip themselves with relevant knowledge fitted for investment.

Acknowledgement

YUCHENG MA, LIN SUN, MINGYANG LIU and ENTONG WANG contributed equally to this work and should be considered co-first authors.

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