Study on Risk Management of Commercial Banks' Financial Product Innovation-Taking "Crude Oil Treasure" as an Example

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***Abstract*—With the continuous development and changes in the financial market, commercial bank financial product innovation has become an important part of the financial industry. However, financial product innovation is also accompanied by certain risks, especially when it involves complex financial instruments and products with high market volatility. Taking "Crude Oil Treasure" as an example, this paper discusses the risk management problems in the operation process of financial products through four aspects, namely, market risk, compliance risk, operation risk and reputation risk, with a view to providing financial institutions with effective risk management strategies and methods and guaranteeing the sound development of financial product innovation.**

***Keywords*—financial product innovation, risk management, crude oil treasure**

I. Introduction

In today's highly competitive financial market, commercial banks face increasingly complex and diverse risk challenges. With the rapid development of financial technology and the constant changes in the financial market, commercial banks have to innovate their financial products in order to maintain their competitive advantages and satisfy customers' needs. However, with the rapid development of the financial market and the increasing complexity of financial products, risk management and supervision have become more difficult, and the process of financial product innovation by commercial banks is often accompanied by huge risks.

For example, the high-risk subprime mortgage products introduced by commercial banks were the cause of the real estate market crash and the global financial crisis in 2008. Similarly, the Libor manipulation scandal erupted in 2012, triggering a serious crisis of confidence and lawsuits, and the Wells Fargo fraudulent account incident in 2016 triggered a reputational and legal crisis. The proliferation of such incidents has exposed many risk management problems in the innovation of financial products by banks, including serious problems in the design of the products themselves, supervision of employee behavior, internal control and compliance management by commercial banks. Therefore, risk management is an important issue that commercial banks cannot ignore in financial innovation.

This paper will analyze the "Crude Oil Treasure" incident that broke out in Bank of China, and specifically explain the possible risks of commercial banks in the process of financial product innovation. In order to provide financial institutions with effective risk management strategies and methods to ensure the sound development of financial product innovation.

II. Literature Review

The outbreak of this incident reflects the many deficiencies that still exist in the risk management of banks. There have been many studies on banks' risk management of financial innovations, and the literature on financial innovations in commercial banks will be discussed from three perspectives: purpose and form, risk transmission process, and risk management approach.

A. Purpose and Format

With the acceleration of interest rate marketization and financial disintermediation process, the traditional profit model of commercial banks is facing challenges (Ruan and Zhen, 2015). Nyamekye *et al*. (2023) found through empirical research that financial innovation can effectively improve the operational performance of banks. Therefore, financial innovation is also regarded as an effective way to broaden the sources of income and ensure the stability and growth of profitability. This includes creating new types of financial products, using financial big data, blockchain and other technologies to improve traditional business processes, and innovating business models (Zhang and Jiang, 2018). Wang and Zhang (2016) found through their research that banks operate in multiple businesses, the proportion of non-interest income has gradually increased, and the sources of income of banks have increased extensively. Wang and Feng (2019) found through empirical analysis that financial derivatives are significantly positively correlated with bank performance, and both foreign exchange and interest rate derivatives can significantly promote bank performance, and banks can use financial derivatives can regulate cash flow fluctuations and thus improve performance.

B. Risk Transmission Process

At present, the overall level of robustness of Chinese commercial banks is high and is still improving (Ding, 2015). When Wu *et al*. (2023) explored the relationship between financial innovation and bank systemic risk, they found that financial innovation and bank systemic risk showed an inverted "U" shape relationship, moderate financial innovation is conducive to reducing bank systemic risk, while excessive financial innovation will increase bank systemic risk. The introduction of new financial products and environment, such as increasing the volatility of interest rates, exchange rates and stock prices. This increased volatility may

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lead to fluctuations and potential losses in the value of bank assets, posing a threat to the sound operation of banks (Xu, 2014). Moreover, financial innovations have introduced new sources of credit risk. New financial activities, such as complex derivatives trading and Internet financial lending, may increase the risk in the process of bank operations if risk management is not properly managed (Khan *et al*., 2021). In addition, with technological advances and the complexity of business processes, the possibility of operational risks such as system failures, data leaks, and fraudulent behavior has increased (Lan and Deng, 2016). Finally, financial innovations also lead to liquidity risk. Dinger and Kaat (2020) through their study, cross-border capital flows significantly enhance the systemic risk of commercial banks.

C. Risk Management Approach

Banks can financial innovation to achieve risk transfer (Boyd and Hakenes, 2014), but when it is alienated into regulatory arbitrage, it will produce a large negative spillover effect, which will bring huge losses to commercial banks themselves (Liang, 2016). Therefore, it is necessary to establish an effective risk management system to enhance the ability to identify, assess and control risks (Deng *et al*.,2017). In the process of risk management, strengthening risk measurement and model development is the key to improve the accuracy of risk management. In addition, Liu and Wang (2022) found that the development of digital finance can significantly enhance the risk-taking of Chinese commercial banks, and commercial banks can utilize these technologies to enhance the ability of risk monitoring and early warning, and to identify and respond to potential risks in a timely manner. And, Al-dmour *et al*. (2022) found that financial knowledge of marketers can promote commercial financial innovation ability. However, Xu and Lu (2022) studied the annual report information of commercial banks and found that the data statistics of many commercial banks are still manual, while the risk management link has low digitization, and insufficient data governance.

The current research on commercial bank financial innovation in risk management is mainly focused on the macro level, but less research on risk management of banks in specific financial product innovation. In the next section, we will introduce the incident of “crude oil treasure” and analyze the market risk, compliance risk, operation risk and default risk faced by this product in the process of innovation, and put forward suggestions on related risk management issues.

III. Event Review

On the evening of April 20, 2020 Beijing time, the price of the WTI May crude oil futures contract plummeted. The first wave of decline in oil prices began at 19:00 that night, dropping from \$13/barrel to near \$11/barrel. A second wave of declines began in the early hours of the following morning, falling from \$11/bbl to near \$0/bbl. At 2:08, the price of crude oil fell below \$0, and in the following 22 minutes, the price was still falling, and the lowest price even reached −40.32 dollars / barrel.

According to the rules of the Chicago Mercantile Exchange (CME), the delivery price of the WTI 2005 crude oil contract should be settled according to the average price during the three minutes from 2:28 to 2:30 on April 21, 2020, in the United States. As a result, the final official settlement price was −\$37.63 per barrel, which was the first time in history that WTI crude oil futures settled at a negative price.

On April 22nd, Bank of China announced that “Crude Oil Treasure” would follow the official settlement price of WTI May futures contract to settle or move positions at −37.63 USD/bbl. The negative settlement price means that these customers will not only lose all their capital, but also owe the bank a huge amount of money.

Between April 24 and May 15, the BOC issued announcements in response to investor questions and negotiated compensation with investors.

The incident came to an end on December 5, when the CBRC issued a punitive decision against the bank.

IV. Case Studies

A. Market Risk and Analysis

Market risk is the risk of decline or loss in the value of an asset due to fluctuations in market prices. The outbreak of the Crude Oil Bowl incident was caused by extreme market conditions and the product was not adequately stress-tested for extreme market conditions, thus triggering a liquidity crisis.

1)Extreme market conditions

At the end of 2019, the outbreak of the New Crown epidemic led to a decrease in the use of transportation, production limitations in enterprises and factories, and an increase in the number of unemployed people. All these conditions led to a sharp drop in demand for oil in the first and second quarters of 2020. And as global demand for oil plummets, the oil market enters a bear market, while OPEC's major oil producers and Russia continue to produce large quantities of oil, further exacerbating the resultant oversupply. In addition, according to the U.S. Energy Information Administration, as of September 30, 2019, the effective storage capacity at Cushing, the delivery point for WTI crude oil, was 76 million barrels. In contrast, as of April 17, 2020, inventories had risen to nearly 60 million barrels and were nearly 80% utilized. Based on the average weekly inventory increase of more than 5 million barrels since April, the inventory is expected to reach full capacity in mid-May of that year, and the storage space for oil is in emergency. This ultimately resulted in a serious imbalance between supply and demand in the oil market and a sharp decline in oil prices.

2)Lack of stress tests

Stress testing is a method of assessing the performance of financial institutions’ assets and liabilities under different market scenarios, which can help financial institutions identify potential risks and vulnerabilities so that they can take appropriate measures to mitigate them. BOC should have conducted adequate stress tests on the “Crude Oil Bao” product before releasing a product with derivative properties that also involves cross-border capital flows. However, in the “Crude Oil Treasure” incident, it was found that BOC had failed to adequately assess the possible liquidity pressure and insufficient capital reserve in the event of severe price fluctuations in the crude oil market, and the stress test was obviously inadequate. This resulted in the bank’s inability to effectively handle investors’ redemption requests when crude oil prices plummeted.

3)Liquidity risk

In this incident, the liquidity risk problem was mainly reflected in the liquidity pressure caused by the massive redemption of crude oil treasure products by investors. When international crude oil prices plummeted, resulting in investors redeeming crude oil treasure products, Bank of China was faced with a large number of redemption requests, and the characteristics of "crude oil treasure" products determined that they could not be quickly realized within a short period of time, which led to the exposure of liquidity risk and plunged Bank of China into a liquidity crisis.

B. Compliance Risk and Analysis

Compliance risk refers to the risk of financial institutions failing to comply with relevant laws, regulations and supervisory requirements in their business operations, thereby facing fines, lawsuits or reputational damage. In this incident, the "Crude Oil Treasure" product itself involved many irregularities, and in the process of launching and selling the product, Bank of China did not disclose sufficient information about the product and failed to fulfill its obligations of investor education and protection (Huang, 2021).

1) Regulatory gaps

The "Crude Oil Treasure" product launched by the Bank of China was not adequately supervised by the CBIRC due to information asymmetry between the CBIRC and the Bank of China. CIRC regulates "Crude Oil Treasure" as a financial management business, not a futures business, and the SEC also does not include it in its jurisdiction. Therefore, "Crude Oil Treasure" is in a regulatory vacuum. As a financial derivative linked to futures, "Crude Oil Treasure" is inherently high in potential risk, but the regulation it receives does not match the risk, and there are regulatory loopholes.

2) Publicity violations

Bank of China in the actual promotion of the "crude oil treasure" product, in order to attract a large number of investors to buy the product, played a line after line of exaggerated propaganda, for example: a branch of the Bank of China tweeted "crude oil is cheaper than water", the Bank of China micro-banking a tweet titled "four simple steps to teach you to play crude oil treasure" and so on many exaggerated propaganda. Bank of China, a tweet titled "four simple steps to teach you to play crude oil treasure" and many other exaggerated publicity rhetoric. In fact, "crude oil treasure" products have a certain complexity and risk, investors' investment experience should be fully considered and evaluated. But according to the surging news survey shows that in fact know "shift position" shift position investors have 77%, know "crude oil treasure" and futures linked investors only 36%, even half a Cheng less than, and know that the CEM modified trading rules investors surprisingly only 3% of the investors were aware of the changes in the trading rules made by Chiba, which means that most of the investors had no relevant experience. The publicity process of BOC seriously violated the principle of protecting investors' interests, and failed to fulfill its obligation to inform investors during the sales process.

C. Operational Risk and Analysis

Operational risk refers to the risk of loss due to internal processes, human error or system failure. In the "Crude Oil Treasure" incident, there were many problems from the beginning of the design of the product, to the operation process of the product, and then to the response announcement issued by the Bank of China after the outbreak of the incident.

1) Product design

In the "Crude Oil Treasure" incident, there are many problems with the "Crude Oil Treasure" product, among which the main problems are the late position transfer point, unreasonable margin setting and mismatch between the product positioning and investors (Deng and Zhou, 2020).

The first point is the problem of the time of position transfer. The "late position transfer" is the selling point of BOC "Crude Oil Treasure", when other banks close trading long before the expiration of the contract, only BOC "Crude Oil Treasure" can still be traded, in order to attract investors. This is to attract investors. Usually, in order to prevent the risk of irrational fluctuations on the last trading day of the futures contract, the last trading date is generally set at about 7 to 10 days before the expiration of the contract. In this round of market, other banks are mostly in April 14 to 17 to move positions, only the Bank of China delayed until the end, resulting in huge losses.

The second point is that the margin setting is unreasonable. Bank of China commodities crude oil treasure trading interface is clearly written, "margin adequacy rate of less than 20%, the system will be in accordance with the single loss ratio from large to small order of the principle of open positions on the contract products forcibly closed one by one". Bank of China customer service response, but said that the Bank of China "Crude Oil Treasure" if the contract for the last trading day, the trading time for 8:00–22:00, more than 22:00 bank will not be forced to close the position operation, and margin is in the day after ten o'clock in the evening fell to less than 20%.

The third point, product positioning and investor mismatch. Bank of China "Crude Oil Treasure" products, although not with leverage, but in fact the huge fluctuations in the price of crude oil, has exceeded the bank's risk level requirements of customers, but the bank will be positioned as a "R3 level" medium-risk products, and financial products mixed together with the sales, which involves to the non-professionals. However, banks have positioned these products as "R3" medium-risk products and mixed them with financial products, which involves opening up the sale and purchase of financial products to customers who do not meet the risk level requirements.

2)Lack of internal controls

Throughout the course of the incident, there were serious deficiencies in BOC's internal controls.

First, it is worth noting that the ChiNext changed its trading rules as early as April 15 to address the possible risk of negative oil prices, and the BOC failed to note the potential risk issues associated with the change in trading rules and failed to provide appropriate settlement risk alerts.

Second, there were equally obvious problems with BOC's decision-making. In fact, ICBC and CCB launched similar products, but they were more prudent in the timing of their position moves to avoid the dilemma faced by BOC. ICBC and CCB moved their positions on the book-entry crude oil WTI05 contract on April 14, a time when the closeout price was around $21–20 per barrel. BOC, on the other hand, only moved its position on April 20, and April 21 was already the last trading day for the WTI05 contract. With such unstable price movements, BOC did not close its position in time for the change of month, and was unable to fully hedge its risk, which ultimately resulted in the "Crude Oil Treasure" position being breached.

Finally, after the outbreak of the incident, BOC's public transparency was also insufficient. Although BOC issued several announcements to explain the situation to investors, it failed to provide the public and customers with relevant explanations and compensation programs in a timely manner, which led to insufficient understanding and knowledge of the incident, and intensified customers' mistrust and negative emotions.

D. Reputational Risk and Analysis

Reputational risk refers to the risk that a financial institution's reputation will be negatively impacted by the public due to negative events or misconduct. After the outbreak of the BOC "Crude Oil Treasure" incident, major media and social media platforms reported on the incident, and the joint appeals of investors and social repercussions caused regulatory agencies to intervene and investigate, resulting in the damage of investor trust in BOC, and the Bank of China was caught in a serious reputational risk.

1) Damage to public trust

In this incident, according to a survey by Caixin News, more than 60,000 investors participated in Bank of China's "Crude Oil Treasure" business, losing all of their $4.2 billion in margin, and owing more than $5.8 billion in margin to Bank of China. Despite the fact that some investors closed their positions early, the Bank of China's long position in this product amounted to 24,000 to 25,000 lots per month, resulting in a loss of nearly RMB 9 billion.

Table 1. Distribution of customer loss amounts

Loss Amount(yuan)	< 10,000	10,000–50,000	>50,000
Number of customers	20,000	20,000	20,000

Source: Caixin News

The investors believed that they had suffered losses from their investment in the product because the Bank of China had failed to adequately fulfill its responsibility to disclose information and warn of risks, which had an impact on the Bank of China's public reputation.

2)Regulatory penalties

Afterwards, the Bank of China responded to the investors' questions, but its response was not acceptable to the majority of investors, who still insisted on suing the Bank of China. The regulator asked Bank of China to do a good job of self-correction and provide a report. The CBRC also set up a joint investigation team of relevant departments to investigate the problems in the incident. On December 5, 2020, the CIRC's punishment for the "Crude Oil Bao" incident came to an end: a fine of 50.5 million yuan was imposed on Bank of China and its branches, of which both general managers of Bank of China's Global Markets Department were given a warning and fined 500,000 yuan, and both deputy general managers and senior traders of Bank of China's Global Markets Department were given a warning and fined 400,000 yuan. Two deputy general managers and senior traders of Bank of China's Global Markets Department were given warnings and fined 400,000 yuan. This penalty further aggravated the damage to Bank of China's credibility.

V. Response Strategy

In recent years, cases of huge losses caused by high-risk derivatives in the financial market have continued to emerge. Although the Bank of China's "Crude Oil Treasure" incident is only a case of bank financial products, it has sounded the alarm for domestic financial product innovation. This incident has triggered a rethinking of the banking industry's professional capabilities in financial product design, risk control, sales channels, etc. It has also prompted regulators to re-examine the review and supervision of new financial products, risk education, and a rethinking of investors' attitudes toward investment in financial products. The risk management of commercial banks in the innovation of financial products should be dealt with from various aspects to ensure the smooth development of the financial market.

First, banks need to strike a balance between innovation and risk control. With increased competition and pressure for declining profits, some banks have to launch riskier financial products to attract customers, but may lack the appropriate experience and ability to design and control the risks of these products. Moreover, banks need to improve the sales mechanism for financial products. Currently, the interests of banks' frontline sales staff are directly related to product sales, which may lead them to ignore risk warnings. Therefore, in order to ensure the sustainable development of banks, banks need to optimize their risk control strategies, focus on protecting the interests of their customers, and improve the professionalism and risk-controllability of their financial products.

Second, regulation needs to protect the legitimate interests of investors. It is crucial for regulators to protect the legitimate rights and interests of investors. In response to the crude oil treasure incident, regulators acted swiftly after the incident and adopted a series of strict regulatory measures to ensure that similar incidents would not happen again. After the occurrence of the Crude Oil Bao incident, on April 30, 2020, the China Banking Regulatory Commission (CBRC) expressed great concern about this risky event, and at the first time required Bank of China to solve the problem in accordance with the law, negotiate with customers on an equal footing, respond to concerns in a timely manner, and effectively safeguard the legitimate rights and interests of investors. In response to such incidents, regulators need to strengthen the review and supervision of financial products, ensure product transparency and compliance, and provide more comprehensive risk education and investor protection measures.

Finally, investors need to effectively enhance their risk awareness, strengthen their financial knowledge and improve their financial literacy. Individual investors can follow the following principles when participating in financial products:

(1) Try to choose products that are simple and straightforward. Complex products often involve more mechanisms and rules, and it is difficult to make a correct decision when lacking the corresponding knowledge.
(2) Fully understand the rules and trading mechanism of the product. By carefully reading the product manual, FAQs and other related information, you can understand the basic situation of the product, the rights and interests and the risks assumed.
(3) Be cautious about investing in products with leverage. Leverage is a double-edged sword, which can expand investment returns but also increase the risk of investment.
(4) Read the product contract carefully. The contract is the most basic inherent protection of investment products, fully understand the mode of return, risk tips, liability agreements.

Conflict of Interest

All the authors declare no conflict of interest.

Author Contributions

Zhou Ling was in charge of thesis writing; Zhai Suting was in charge of the preliminary data search and revision of the thesis; both authors had approved the final version.

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