

Analysis on the credit risk prevention mechanism of personal consumption credit based on interest game and risk control

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Abstract: With the rapid development of personal consumption credit business of commercial banks in China, personal consumption credit default events occur from time to time. Therefore, the risk assessment technology and management ability of personal consumption credit of commercial banks need to be improved. In this case, it has important theoretical value and practical significance to comprehensively and systematically study the personal consumption credit risk theory and personal consumption credit evaluation. This paper studies the credit risk management of personal consumption credit from the stages of identification, evaluation, early warning and control of the credit risk management process of personal consumption credit. This paper combines theoretical discussion with data analysis, and takes "risk identification-risk evaluation-risk control" as the main line to carry out research. First of all, starting from the concept of personal credit business and credit risk, this paper analyzes the causes of personal consumption credit risk of China Construction Bank, And summarizes the general methods and specific analysis points of credit risk identification of China Construction Bank. Finally, this paper puts forward some corresponding suggestions on the prevention and control of personal consumption credit risk.

1. Introduction

The interest game era is obviously not a sudden occurrence in our social life. In recent years, several important events have been heralding the arrival of the interest game era. In recent years, with the sustained development of China's economy and the continuous improvement of people's living standards, the demand for personal consumption credit is strong, the market space of personal consumption credit of commercial banks is constantly expanding, and businesses such as housing credit, automobile credit, durable consumer goods credit and student credit are developing rapidly^[1-2]. Personal consumption loans have a good momentum of development, and the asset quality is also very good. The ratio of non-performing assets is far lower than that of corporate credit business.

The development of personal consumption credit is bound to be accompanied by the accumulation of credit risks. Credit risk is the main risk of commercial banks and the common challenge of the global banking industry^[3]. With the development of personal consumption credit, all commercial banks regard personal consumption credit as the focus of personal business. On the one hand, people's credit consciousness is weak; On the other hand, due to the immaturity of China's personal credit system, there is a lack of perfect supporting system^[4]. From the perspective of the characteristics of individual consumption credit, as the issuing object is individuals, the repayment sources are mainly wages, bonuses, investment income, and production and operation income, etc. these sources are vulnerable to various external factors, including macroeconomic changes, business conditions of the enterprise, personal health and accidents, etc. Moreover, compared with enterprises, the liquidity and uncertainty of individuals are higher, and the repayment behavior of borrowers is vulnerable to individual ideas Under the influence of subjective factors such as attitude and behavior habits, once the credit risk is exposed, it is easier to form losses. Since China's consumer credit business has only a history of more than ten years, and it is

still in the exploratory stage, the personal credit system has not yet been established, and it faces many uncertain credit risks. Therefore, financial institutions should strengthen the research on credit risk prevention mechanism of consumer credit while vigorously developing consumer credit business^[5].

According to the general process of risk management, this paper first identifies the credit risk of logistics finance, then analyzes the personal consumption credit risk of banks by using the game model, and makes an empirical analysis with CCB. Finally, it puts forward some practical credit risk control suggestions. This paper is also of great theoretical and practical significance to effectively manage the credit risk of logistics finance, realize the win-win situation of logistics finance participants and promote the development of logistics finance^[6]. And the consumer credit risk of other industries is studied and analyzed.

2. Prevention of credit risk of personal consumption credit

2.1. The concept and theory of personal consumption credit

Personal consumption credit refers to that consumers guarantee commercial banks with their future income. When commercial banks think that consumers can pay in the future, they can issue loans to consumers for the purpose of purchasing consumer goods or paying for consumption. Mainly to stimulate consumers' consumption desire. At a certain time, when consumers have the desire to consume, but do not have the corresponding income capacity as a guarantee, commercial banks can provide loans to their consumers by mortgage, credit and other means, so that consumers can realize their current consumption activities. China's personal consumption credit business started late, and originated in 1980s. With the reform of China's housing system, the acceleration of the commercialization of urban housing and the reform of the financial system, in order to meet the individual housing consumption needs of residents, commercial banks have successively started individual housing loan business in China. In 1997, affected by the financial crisis in Southeast Asia, China's economy began to face a serious shortage of domestic demand and a decline in exports. In 1998, in order to promote economic growth, the state issued a series of macro-control policies to expand domestic demand, including the People's Bank of China's personal consumption credit business, which actively encouraged, guided and supported residents to expand their personal consumption^[6]. It can be said that China's personal consumption credit business began in 1998. After 1998, China's personal consumption credit has made a large-scale development. Especially after the subprime mortgage crisis in the United States in 2008, in order to expand domestic demand, especially consumer demand, and stimulate domestic economic growth, the state relaxed the restrictions on consumer credit business of banking financial institutions. In recent years, China's consumer credit has made rapid development.

Generally speaking, personal consumption credit refers to a kind of credit business provided by banking financial institutions for natural persons to help the borrower pay for personal or family purchases of consumer goods or other expenses related to personal consumption, and the borrower repay the principal and interest when due. Consumption purposes include: house purchase, car purchase, medical treatment, education, decoration, tourism, purchase of durable consumer goods, etc.

Since the end of the last century, the United States has pursued the economic policy of high consumption to promote high economic growth. In order to stimulate the national economic growth, the U.S. government has reduced its intervention in the financial market. Under the liberal economic market, the financial instruments in the United States are constantly innovating, and the government encourages ordinary people to spend ahead of time^[7]. Those with poor credit rating or low income can also get subprime mortgage loans by raising loan interest rates. Subprime mortgage loans have high returns but also hidden high risks. Of course, the starting point of the subprime mortgage business itself is good. However, in this process, due to the lack of financial supervision system of the US government, investors exploited the loopholes of the financial system, had the

opportunity to speculate in the market, and the credit leverage ratio was constantly enlarged, which eventually led to the outbreak of the financial crisis.

Our country can also gain a lot of experience and lessons from the financial crisis in the United States. First, financial instruments are excessively innovated, especially the excessive securitization of subprime credit assets. Second, inflation. In order to stimulate the economy, the Federal Reserve lowered the federal funds rate from 6.5% to 1% after 13 interest rate cuts, and kept it until June 30, 2004. Later, in order to prevent inflation, the Federal Reserve first raised the interest rate 17 times, raising the interest rate from 1% to 5.25% at the beginning of 2006.

2.2. Current situation of credit risk prevention of personal consumption credit of banks

In recent years, with the continuous improvement of domestic personal credit environment. On the one hand, the state has introduced policies to increase support for consumer finance, and a large number of consumer finance companies and Internet platforms have sprung up and achieved rapid profits; On the other hand, the consumption level of residents has been greatly improved with the income growth, and the consumption concept has also driven the demand for personal credit business^[8]. In order to cope with the fierce market competition, traditional commercial banks also constantly expand the field of personal loans and seize the market share.

2.3. Risk situation of automobile consumption credit

It has been less than 10 years since the theoretical discussion and preliminary practice of China's automobile consumption credit began, but "risk" has always been the most frequently used word in the theoretical research and business practice of China's automobile credit! While full of hope for China, the world's largest automobile consumer credit market, it is also plagued by risks in the field of automobile consumer credit.

At present, the main risks and causes of automobile consumer loans are as follows: First, the lack of personal credit system. China has not yet established a sound personal credit evaluation system and a personal income and property declaration system. The personal information data established by relevant departments (such as public security, taxation and courts) are difficult to realize resource sharing due to division of departments, and the sharing of personal information data among major commercial banks has not yet been achieved. Second, the automobile consumption credit system needs to be improved. The interest rate and threshold of bank car loans are relatively high, the procedures are cumbersome, and there are many miscellaneous fees. Third, pay attention to the credit fund risk caused by changes in external economic environment factors.

3. Research ideas and methods

3.1. Research Based on Benefit Game

It is the process in which the participants in the game, under certain rules, simultaneously or successively, once or many times, choose and implement the actions or strategies that they are allowed to choose, and obtain the corresponding result payment function. Game theory, also known as "game theory", means to study the decision-making when the behaviors of decision-making subjects directly interact with each other and the equilibrium problem of this decision-making, that is, the decision-making problem and equilibrium problem when a subject's choice is influenced by the choice of others and other enterprises, which in turn affects the choice of the other party^[9].

The research angle of game theory can be divided into three aspects: the first angle is the sequence of participants' actions. The second angle is participants' knowledge of the characteristics, strategic space and payment function of other participants. The third angle is whether the participants cooperate.

The research focus of game theory lies in the interaction between behaviors or decisions in various aspects of economic activities, and in the mutual restriction and interdependence among

individual strategies, which is precisely the part neglected by traditional economics. Because the role and reaction of the other party in the game were neglected in the past credit risk control of logistics finance, this paper tries to use the game theory to study the credit risk management of logistics finance. And the game tree of this game is established, as shown in Figure 1.

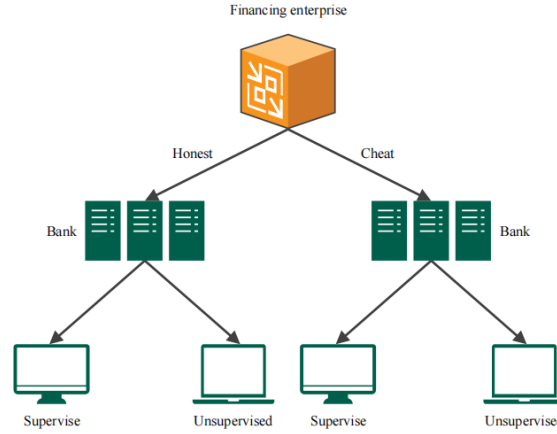


Figure 1 Game tree between banks and financing enterprises

Establishing payment matrix to calculate income function

(1) The income functions of honest and fraudulent financing are as follows:

$$R_f^1 = p_1 R + (1 - p_1) R \quad (1)$$

$$R_f^2 = p_1 (R - C_2 - C_3) + (1 - p_1) (R + \Delta R - C_2) \quad (2)$$

(2) The income functions of bank supervision and unsupervised are:

$$R_b^1 = p_2 (r - C) + (1 - p_2) (r - C - a) \quad (3)$$

$$R_b^2 = p_2 r + (1 - p_2) (-A - C_1) \quad (4)$$

The symbols are agreed as follows: A represents principal, r represents bank loan interest, C represents the cost of bank supervision, Q represents bank supervision reward, C_1 represents penalty for unsupervised banking, R represents normal income from financing enterprise loans, ΔR represents additional income from default of financing enterprises, C_2 represents cost of whitewashing of financing enterprises, C_3 represents penalty for breach of contract by financing enterprises.

3.2. Establishment of basic thinking framework

This paper mainly studies the credit risk management of logistics finance based on game theory and develops a complete research framework, as shown in Figure 2.

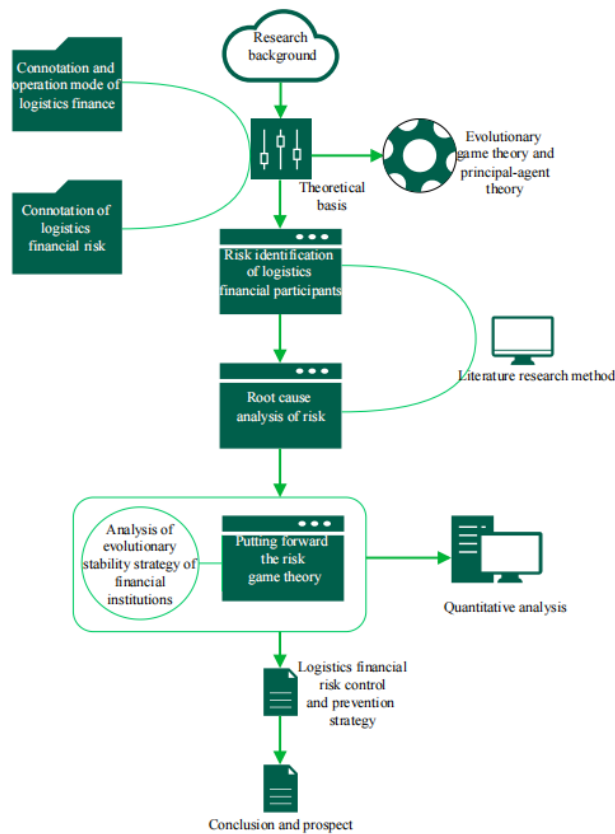


Figure 2 Research framework of logistics finance credit risk

In terms of the content of personal consumption credit risk management, Huang Dayu and Wang Yudong divided the personal consumption credit score into three levels: first, scoring the economic and environmental factors, which mainly considered the risks brought by the macro-economic development; The second is the personal behavior scoring system, which mainly considers the evaluation of the changes in the profitability of banks caused by personal consumption credit; The third is the personal behavior scoring system, which mainly evaluates the borrower's debt paying ability, salary income and other personal objective factors.

Then, through the analysis and Research on the personal consumption credit risk of CCB, we draw a conclusion and sort out the "risk identification-risk assessment-risk prevention and control" venation chart. The main frame diagram is shown in Figure 3.

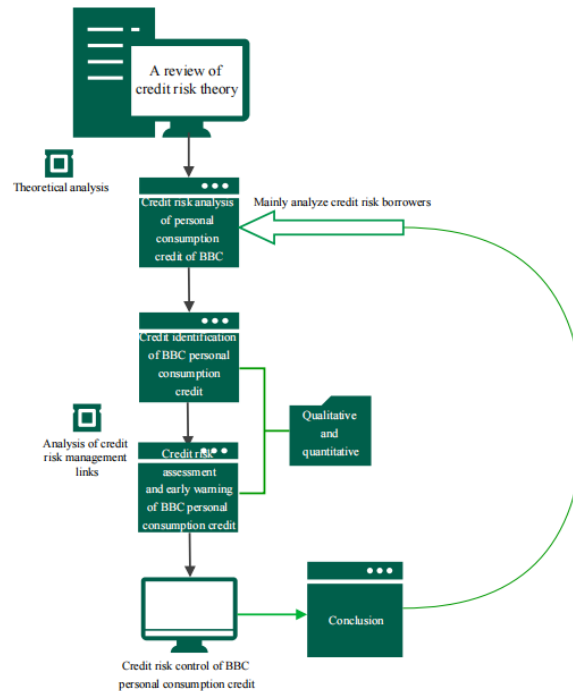


Figure 3 Research framework of personal consumption credit risk of CCB

In view of the research purpose of this paper, and the strong practicality and operability of personal consumption credit, this paper focuses on the interest game, and tries to provide a strategic choice path for credit risk management of personal consumption credit by covering the theory. The current situation of credit risk management of personal consumption credit in CCB is the basis of this paper. By discussing the characteristics of credit risk of personal consumption credit, and focusing on the analysis of the most critical factor-"borrower", this paper refines and summarizes the regular characteristics of borrowers with credit risk on the basis of empirical analysis^[10].

4. Result Analysis and Discussion

Various types of credit of CCB's personal consumption credit business mainly include: personal consumption loans, personal business assistance loans, credit card loans and other loans based on personal housing loans. As shown in Figure 4, personal housing loans have been increasing year by year since 2012, and by the beginning of 2018, they had accounted for 82.65% of the credit business of CCB. With the improvement of residents' living standards, personal consumption loans also began to increase after a short decline in 2015, from 1.73% in 2016 to 3.71% in 2017, with an increase rate of 53.37%.

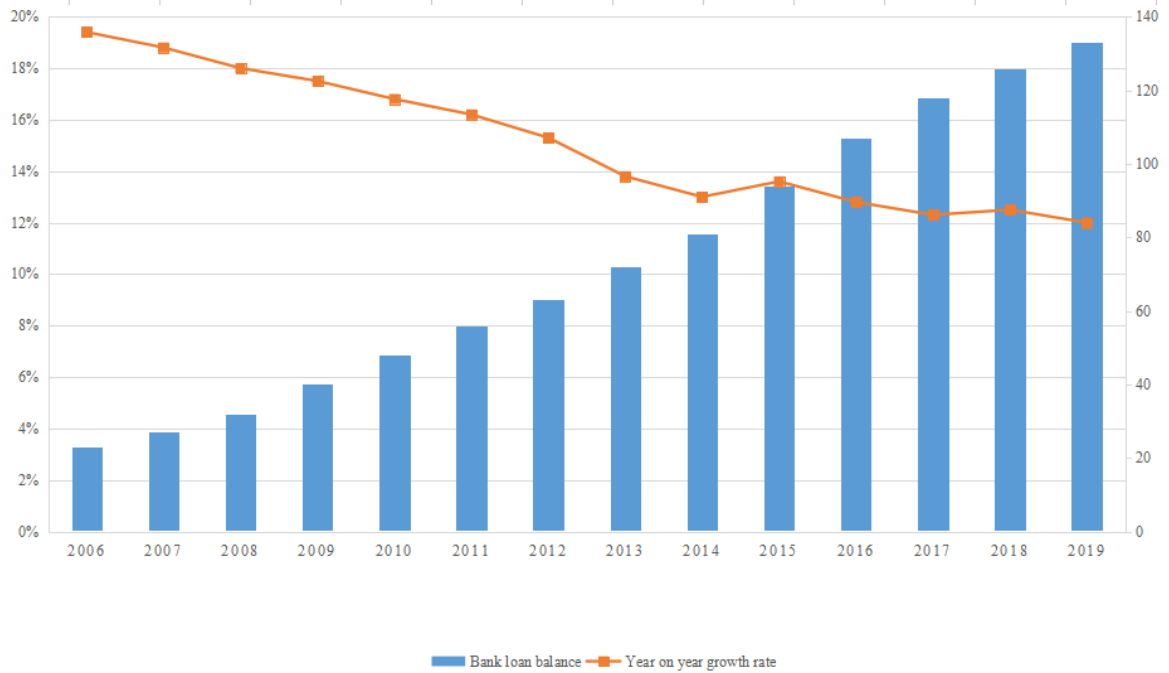


Figure 4 Proportion of credit structure of CCB's personal consumption credit business

Through the above research on the current situation of the prevention and control of the personal consumption credit risk of CCB, the personal consumption credit led by the housing credit business is an important component of the personal credit business of CCB, and the problems in the personal consumption credit risk prevention also directly affect the fluctuation of the non-performing loans of CCB. Figure 5 shows the fluctuation of non-performing loan rate of CCB.

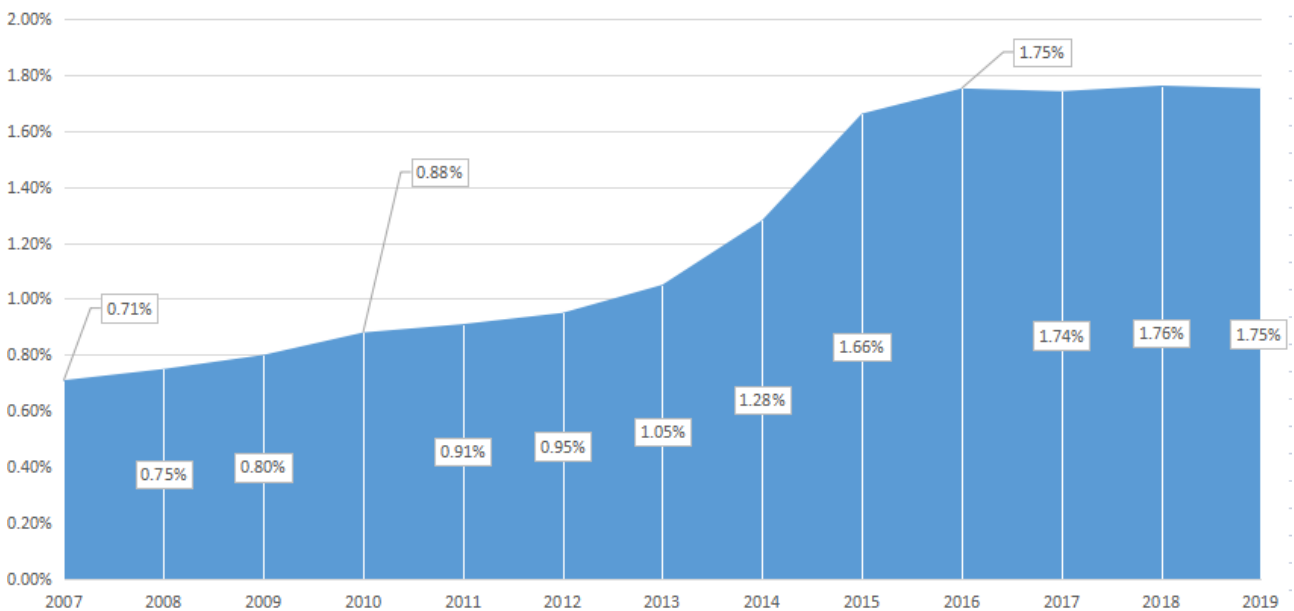


Figure 5 Fluctuation of non-performing loan rate of CCB

To sum up, for personal consumption credit, the most critical factor to determine credit risk is the borrower. It is more practical for credit risk management to know and master some regular characteristics of the borrower's credit risk.

Then the model of game theory is analyzed, and the results are as follows:

When equilibrium is reached, the probability of bank supervision is:

$$p_1 = \frac{\Delta R - C_2}{\Delta R + C_3} \quad (5)$$

When equilibrium is reached, the probability of honesty of financing enterprises is:

$$p_2 = 1 - \frac{C}{r + a + A + C_1} \quad (6)$$

Through the analysis of the results, the conclusions of this paper can not only improve the level of personal consumption credit risk management of banks, but also provide some reference for commercial banks to improve the personal consumption credit risk management system. However, the research mainly starts from the credit risk in the credit risk, and does not conduct a detailed study on other risks in the credit risk, which has certain limitations.

5. Conclusions

With the development of economy and the deepening of reform and opening up, consumer credit has developed vigorously in China, and has gradually become the profit growth point of commercial banks. At the same time, commercial banks are overwhelmed by the losses caused by loan default. At present, a large number of foreign banks with advanced credit risk assessment technology are pouring in, and our traditional consumer credit is facing fierce competition and severe challenges.

This paper takes CCB as the research object to explore the personal consumption credit risk of banks. First of all, the personal credit theory and its risk management status are described, then the personal consumption credit business risk of CCB is identified. From the current situation of the personal consumption credit business of CCB, the existing problems in the risk prevention of the personal consumption credit business of CCB are analyzed; Then it evaluates the comprehensive risk in the personal consumption credit business of CCB, and finds out the main factors that affect the personal consumption credit risk of CCB; Finally, combined with the interest game theory, this paper puts forward feasible countermeasures and suggestions for the prevention of personal consumption credit risk of CCB. Based on the game tree and the research context of "risk identification-risk assessment-risk prevention and control", this paper draws the following conclusions:

(1) When studying the causes of the personal consumption credit risk of CCB, this paper concludes that the personal consumption credit risk of the bank mainly comes from three aspects, namely, the borrower's own factors, the lending bank's own factors and the external environment factors, among which the main risk source is the borrower's own factors.

(2) Credit risk is the first risk to be faced in development. In the past, the focus of risk control was mainly on the evaluation and measurement of objective credit risk, but in practical application, it is more and more difficult to control subjective credit risk.

(3) Using the game tree and the research thread of "risk identification-risk assessment-risk prevention and control" to study the current credit risk prevention mechanism of personal consumption credit.

And put forward the following suggestions on the credit risk prevention mechanism of bank personal consumption credit: first, in terms of the control of loan methods and objects, on the basis of the preliminary evaluation of the borrower's credit, the borrower's category is divided and the loan method is determined. Second, improve the internal mechanism, set up credit risk review posts, establish a unified credit risk management culture and concept, reasonably use advanced credit risk management tools, and establish a credit risk early warning system. Third, improve the external environment and establish a personal credit system and personal credit network system in the whole society. The relevant conclusions and suggestions in this paper can not only provide reference for the decision-making level of banks and improve the risk management level of personal consumption credit business, but also provide reference for other commercial banks in China to improve the risk management system of personal consumption credit business.

References

- [1] Godlewski C J, Sanditov B. Financial institution network and the certification value of bank loans. *Financial Management*, 2017, 47(2):253-283.
- [2] Karim M, Chan S G, Hassan S. Bank Efficiency and Non-Performing Loans: Evidence from Malaysia and Singapore. *Prague Economic Papers*, 2010, 2010(2):118-132.
- [3] Huang Z. The research on interest game of Qingkou village tourism development. *Journal of Advanced Oxidation Technologies*, 2017, 28(3):2593-2597.
- [4] Kus, B. "Consumption and Redistributive Politics: The Effect of Credit and China.". *International Journal of Comparative Sociology*, 2013, 54(3):187-204.
- [5] Leth-Petersen S. Intertemporal Consumption and Credit Constraints: Does Total Expenditure Respond to an Exogenous Shock to Credit?. *American Economic Review*, 2010, 100(3):1080-1103.
- [6] Fook L A, Mcneill L. Click to Buy: The Impact of Retail Credit on Over-Consumption in the Online Environment. *Sustainability*, 2020, 12(18):7322.
- [7] Brady R R. Structural Breaks and Consumer Credit: Is Consumption Smoothing Finally a Reality?. *Departmental Working Papers*, 2006, 30(3):1246-1268.
- [8] Yeh J Y. Credit Default Swap Spreads, Fair Value Spreads, and Interest Rate Dynamics. *Journal of Credit Risk*, 2015, 8(4):53-129.
- [9] Fong W M, Valente G, Fung J. Covered interest arbitrage profits: The role of liquidity and credit risk. *Journal of Banking & Finance*, 2010, 34(5):1098-1107.
- [10] Fields L P, Fraser D R, Subrahmanyam A. Board quality and the cost of debt capital: The case of bank loans. *Journal of Banking & Finance*, 2012, 36(5):1536-1547.