

# Research on Risk Analysis of Supply Chain Finance

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**Abstract:** China's market economy is gradually maturing, with the support of national policies, the development speed of small and medium-sized enterprises (SMEs) is increasing, which greatly promotes the development of the national economy. The existence of SMEs not only injects strong driving force into the country's economic development but also effectively alleviates the increasingly prominent problem of employment pressure in recent years. However, financing difficulties are still the main problem restricting the development of SMEs <sup>[1]</sup>. In this context, supply chain finance has emerged. This financing model is highly compatible with the characteristics of SMEs and can effectively meet the financing needs of small and medium-sized enterprises <sup>[2]</sup>. Therefore, a further in-depth analysis of the supply chain financing methods for SMEs is of great practical significance. Traditional financing models can no longer meet the financing needs of SMEs. Supply chain finance has many advantages, such as providing a way for smaller-scale enterprises to obtain loans. However, we find that supply chain finance may still involve risks through the establishment of risk models. To address this issue, it is necessary for banks and companies at the core of the supply chain to establish a new type of cooperative relationship and actively leverage their strengths to promote the better development of this new financing model. This paper first elaborates on the basic concept of supply chain finance. Then, it analyzes several problems currently existing in supply chain finance and establishes relevant game models to explain these problems, such as moral hazard. Finally, this paper suggests that banks and core companies in the supply chain need to establish a new type of collaborative relationship to promote the development of supply chain finance <sup>[3]</sup>.

**Keywords:** Supply Chain Finance; Risk Model; Financing Model

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## Introduction

Supply chain finance is a new financing mode in which banks closely connect large enterprises at the core of a supply chain with upstream and downstream enterprises related to them, providing them with financial services and products. Supply chain finance can effectively solve the financing difficulties of some SMEs, and extend the depth of banking services.

Under the supply chain finance model, the relationship between banks and companies within the supply chain has also undergone significant changes. Firstly, banks view these companies as a whole and establish some business connections with them, avoiding multiple business relationships between these companies and banks or financial institutions, thereby simplifying the relationship between these companies and banks. Secondly, banks can further understand the situations of various companies related to the core enterprise in the supply chain through the core enterprise. <sup>[4]</sup>

Although this new financing model has many advantages, it still involve risks. For example, when there is information asymmetry between banks and companies, their financing behavior can evolve into a game, leading to moral hazards. This risk not only causes losses to all parties but also hinders the future development of supply chain finance. Therefore, in this paper, we focus on studying and analyzing the risks of supply chain finance.

## 1. Reasons for the Generation of Supply Chain Finance Risks

Supply chain finance more or less solves the problem of information asymmetry between banks and companies, such as the difficulty of financing for SMEs, there is a game between banks and companies in the financing process under this new financing

model, since the sequence of strategy selection between these two entities in the financing process has a certain order. Generally, the process of obtaining a loan by a company starts with the company submitting an application to the bank, then the bank makes judgments and decides whether to lend to the company, finally, the company obtains the funds and decides whether to repay the principal and interest as agreed. At this point, the company has two choices: one is to repay the principal and interest as scheduled, ending the game between the company and the bank; the other is to default on the repayment and refuse to repay the principal and interest on time. In this case, the game between the two parties will continue, and the outcome of the game can be random, which may lead to unpredictable results without proper control [5].

In the above game process, there is information asymmetry between the two parties, and the company generally has more information than the bank. It may take advantage of this advantage to do things that are more beneficial to itself, thereby maximizing its own interests. The bank cannot obtain sufficient information to observe the company's behavior and make correct judgments, thus facing potential losses. This is the "moral hazard" of the company. Its existence not only causes losses to the bank but also hinders the development of this model.

## 2. Risk Model Analysis of Supply Chain Finance

This paper analyzes the risk of supply chain finance using accounts receivable financing as an example. Suppose there is a company B and a core enterprise C in the supply chain. Company B has formed accounts receivable of 5 million RMB from its economic transactions with Company C, and it has also borrowed 3 million RMB from the bank, guaranteed by Company C, with a promise to repay after one year. After receiving the loan, Company B can either use the funds for investment or continue using them in production. Let's assume: Company C owes Company B money, which is the accounts receivable amount  $L$ , and the loan-to-value ratio is  $\beta$ , which is the ratio between the loan amount of Company B and the accounts receivable. Therefore, the financing amount of Company B is  $L \cdot \beta$ . At this time, the annual interest rate is  $r$ , and the bank's cost of monitoring the company's behavior is  $C$ . The bank's income can be expressed as:

$$E_a = (r_1 \times \beta \times L) / C - 1$$

If the company exhibits "moral hazard," it may change the use of the loan for the purpose of pursuing greater benefits. Suppose the company can make two choices regarding the use of the funds: one is to continue using them in production to provide products and services to Company C, with a return of  $R_L$ ; the other is to invest the funds in other projects, with a return of  $R_H$  if successful and a return of 0 if failed. Let's assume that the company has a probability  $P_1$  of successful investment. The company's return is:

$$E_b = R_L \times (1 - P_1) + R_H \times P_1$$

The core enterprise C in the supply chain owes Company B a payment. In this model, the bank can help SMEs obtain better financing and provide C enterprise with sufficient time for repayment, reducing its financial pressure. At the same time, it also reduces C enterprise's willingness to repay on time, and C enterprise naturally hopes to extend the repayment time as much as possible. Suppose the repayment time is extended by  $t$  months, assuming the minimum required rate of return is  $r_f$ , which is risk-free rate, and the probability of repayment is  $P_2$ . Then the return for C enterprise is:  $E_c = (1 - P_2) \times L \times r_f + P_2 \times L \times (1 + r_f)^t$ . The game is shown in Figure 1:

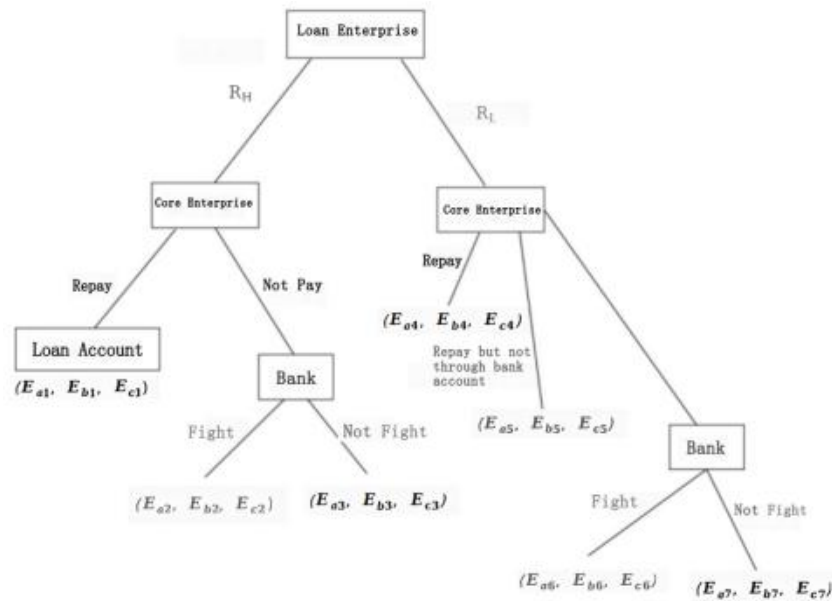


Figure 1: Moral Hazard Model in Accounts Receivable Financing

Next, we will discuss several situations that arise in Figure 1: (1) Company B, after receiving the loan, uses the funds for purposes other than specified in the contract and invests in high-risk projects. If the investment is successful, it is beneficial for all parties. However, if the investment fails and the return rate is lower than the financing cost, the relative return for B will be negative. Even if Company C pays all the owed payment to Company B, it cannot continue to purchase raw materials and sustain its operations as planned, which can lead to the interruption of the supply chain.

When Company C learns through some channel that Company B has invested in high-risk projects, Company C may choose not to repay as a way of retaliation against Company B. In this case, the bank has two options: one is to fight, but will incur costs such as lawyer fees, litigation fees, notary fees, etc. Additionally, the bank will lose some creditworthy customers in the supply chain, resulting in opportunity losses. The moral hazard generated by the actions of Company B increases the potential losses for the bank and also increases the default risk for Company C. In this case, the returns for Bank A, Company B, and Company C are represented as:  $E_{a2}$ ,  $E_{b2}$ ,  $E_{c2}$

(1) The other option is not to fight. In this case, whether the bank can recover the loan depends on the debt repayment ability of Company B. For Company B, overdue interest and default penalties will weaken its cash flow and debt repayment ability. For the bank, it will incur additional time costs and credit risks. The returns for Bank A, Company B, and Company C are represented as:  $E_{a3}$ ,  $E_{b3}$ ,  $E_{c3}$

(2) If Company B's high-risk investment project is successful, and  $R_H$  is greater than  $r_1 \times \beta \times L$ , the bank can recover the loan smoothly, and there is no additional risk in the business process. The returns for Bank A, Company B, and Company C are as follows:  $E_{a1}$ ,  $E_{b1}$ ,  $E_{c1}$

(3) If Company B uses the funds as specified in the contract and Company C pays the owed payment through a special account set up by the bank, there is no risk for the bank loan. The returns are as follows:  $E_{a4}$ ,  $E_{b4}$ ,  $E_{c4}$

(4) If Company B uses the funds as specified in the contract, but Company C does not pay the owed payment through the special account and chooses another channel, and the bank does not receive the repayment, the bank faces credit risk and operational risk. If the bank chooses to fight, it will require the parties to the loan agreement to bear the default risk and pay corresponding overdue interest. However, the bank will also incur additional costs in handling legal disputes, for the bank, the worst-case scenario is bad debt. Company C also need to pay an equivalent default penalty, but the financial impact on Company B is relatively low. In this case, the returns for Bank A, Company B, and Company C are as follows:  $E_{a5}$ ,  $E_{b5}$ ,  $E_{c5}$ , If the bank chooses not to fight, the bank's risk exposure increases.

(5) If Company B uses the funds as specified in contract, but Company C does not pay the owed payment on time, the bank faces

a significant risk of not being able to recover the loan. The bank can still take two measures: fighting or not fighting. If the bank chooses to fight, costs will increase, and Company C also need to pay an equivalent default penalty and overdue interest. In this case, the returns for Bank A, Company B, and Company C are as follows:  $E_{a6}$ ,  $E_{b6}$ ,  $E_{c6}$

Based on the analysis of above model, we can conclude that for bank to recover the loan in a timely manner, it must pay attention to the stability of the supply chain, the repayment willingness of the core enterprise, smooth business management and supervision between the borrowing company and the core enterprise, and the relationship between the bank and the core enterprise.

## Conclusion

Although supply chain finance provides a way for SMEs to obtain loans, it also involves certain risks. Through risk modeling, we found that the foundation of supply chain finance is that core enterprises bear the guarantee role when SMEs borrow. Therefore, for the bank to receive timely repayment, it depends on whether the core enterprise is willing to assume the guarantee in the supply chain and the responsibility of information communication, while helping the bank avoid risks.

Therefore, to reduce or even eliminate the risks of this model, it is necessary to change the traditional relationship between core enterprises and banks, establish new types of cooperative relationships, and effectively leverage their strengths to promote the development of this new financing model.

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