

Research on The Financing Mode of Small and Medium-sized Enterprises

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Abstract—Looking back at the history of the growth and development of SMEs, regardless of how changes in domestic and international economic environment, and regardless of how domestic economic policy adjustment, the difficult problem of SME financing has been more prominent. Economic situation can lead to SME capital chain rupture, leading to small and medium enterprises into pieces spread throughout the country and even collapse. This paper tries to stand in the point of view of the global supply chain, with special economic region core enterprise supply chain members of the upstream capital demand as the starting point, the thorough specific problems, and use of medium and small-sized enterprises in the supply chain and the core enterprise has the stable business, trade funds and other advantages, combined with the chattel mortgage and the transfer of the creditor's rights mode, study the special economic area small and medium-sized enterprise supply chain operation mode of financing mechanism, participate in the risk and benefit main body.

Keywords—Supply chain finance; SMEs; Financing model.

I. INTRODUCTION

Currently, the development trend of world economic globalization, regional economic integration has spread rapidly. China has already won the reputation as the world's manufacturing center, but as a great power of modern manufacturing, we must clearly realize that China has a lot of enterprises, especially SMEs, are always at the end of the global industrial chain and value chain. While export-oriented economic development model is hit by the U.S. debt and European debt crisis, and continued downturn of global economy and the sharp decline in trade has severely affected the unsustainable demand.

SME financing has always been the focus of the whole society. As the most important resource, how to guide it flow to the SMEs that in disadvantaged position in the industrial chain and supply chain is the problem that must be solved for a country's overall economic development, while supply chain financing can extend the good credit capacity of core enterprises to the upstream and downstream firms of supply chain after China becoming world manufacturer and global production outsourcing base and on the basis of domestic supply chain management having been prevalent, making up the financing gap existing extensively in SMEs, to relieve SME financing pressure.

II. SUMMARY OF SUPPLY CHAIN FINANCING

The early supply chain considers that supply chain as an interior problem of the manufacturer. It refers to a process that transmitting the outsourcing raw material and parts to retailers and users through the activities of transformation and sales and so on. The traditional supply chain concept is restricted to enterprises' interior operational level, focusing on enterprise private resource utilization goal. Later, there's some progress focusing on the relationship with other enterprises and the outer environment of supply chain enterprises, considering it is a "process that transforms the raw material into products and transmits them to end users through manufacturing, assembling and retail processes of different manufacturers in the chain", which is a wider and more systematic definition. But up to now, the supply chain concept take more concern on the network chain relationship around core enterprises, such as the relationship of core enterprises and suppliers, suppliers' suppliers, even all the forward relationships, core enterprises and users, users and users, as well as all the successive relationship, when strategic partnership issues are emphasized more.

Supply chain is a system, the objective reality of human production activities and the whole economic activities. Various products in human activities all belong to the process from raw material production, processing, assembling, distribution and retailing to the final consumption. With the society developing, returned logistics was also incorporated to the system.

III. THE MAIN MODES OF SUPPLY CHAIN FINANCING AND MODES ANALYSIS

A. The main modes of supply chain financing

As the most important part of the supply chain, the safety of SMEs and their upstream and downstream will affect the operation of whole supply chain. Therefore, how to transform financing mode, improve finance service quality for SMEs, and decrease finance costs of the whole supply chain is the key to solve sustainable development problems of supporting the stability of supply chain.

Currently, there are SME financing models taking accounts receivable, prepayments and inventory as collateral depending on the collateral types; therefore, supply chain financing model has three common types: accounts receivable financing, confirming storage financing and chattel mortgage financing. These three

modes make all the SMEs in the supply chain choose their own mode of financing based on the upstream and downstream trade relations and their own characteristics.

1) Accounts receivable financing mode

For many SMEs on the stage of development, they have no strong bargaining power. The large enterprises (core enterprises) of their downstream often purchase production material with credit buying; because they have limited capital and cannot reach bank credit standard, their working capital limitation restricts the enterprises' further development. Accounts receivable financing mode is created under such conditions, which is just the customized product for SMEs' accounts receivable. The main process includes the SMEs on the upstream of core enterprises apply for financing from banks with undue receivables (core enterprises).

2) Confirming storage financing mode

Confirming storage financing mode is generated under the conditions that the SMEs lying at downstream of the supply chain core enterprises purchase goods to prepare new production activities, but at this time the companies do not have sufficient cash flow; Therefore, in order to solve the problem of capital shortage and make them produce, the specific processes includes downstream SMEs pay a certain amount of security deposit to financing banks and the bank will open corresponding acceptance draft in accordance with the enterprises conditions, and the financing bank will accept the draft, the beneficiary is the core enterprise on the upstream of financing enterprise. After receiving the draft, the upstream enterprises will start to deliver goods to the bank designated warehouse of the third-party logistics company, the goods will be transformed into pledge by warehouse receipts after arriving at the warehouse, while downstream SMEs apply for financing business on the condition that the core enterprise can control its goods collection right.

3) Chattel mortgage financing mode

In a specific period, too much inventory of SMEs will occupy a lot of capital, but the enterprises also need to buy raw material, so SMEs can take the bank recognized goods as pledge to apply for financing, which is chattel mortgage financing, also called "inventory financing". The chattel mortgage financing can support many kinds of financing methods, including loan, opening bank acceptance draft, letter of credit and so on. The enterprises can choose suitable financing method according to their own conditions. The specific application process is that the SMEs need to deliver their own legal and accessed

inventory to the designated third party logistic company of the bank for supervision without ownership. Inventory financing mode is more flexible and convenient, given that the inventory is recognized by the bank, they can be served as the pledge. This mode allows the enterprise not only get the financing, but without affecting normal production and operation, so it is easy to promote and apply in actual operation.

B. Model building and analysis of three financing modes

We remove some unnecessary disturbance in building models to establish more ideal math models suitable for various models; so we make the following assumptions: (1) the involved people and enterprises and organizations of these three models are rational men, so the signed agreements in financing-transportation and warehouse financing mode, cargo value assessment, acceptance and related work all conform to objective conditions. In confirming storage financing mode, core enterprises cooperate with the bank actively to assess and approve their credit and sign repurchase agreement, and the third party logistic company will also sign storage supervision agreement. In account receivable mode, the core enterprises conform to the requirements completely and can remit to designated account. (2) Financing enterprise and the bank grasp completely symmetric information and strategy.

1) Chattel mortgage financing mode

both parties game model assumption

Given the possibility of bank lending as P_1 , then the possibility without lending of bank is $1 - P_1$; given the pledge total amount of SMEs in the market is T_1 , the loan scale in the market is about G

Given the capital rate of return of SMEs is α , loan interest rate is r , loan time is d , the final total value of bank estimated pledge is T_1 ; the payment for the third party logistics by the bank as f

The penalty and reputation loss of repayment not on time for the enterprise is L

2) The SMEs repayment probability is P_{21} , U_n means the bank lend to enterprises, but they default repayment or even violate the agreement without repayment.

TABLE I BANK AND SMES GAMING MODEL

	SMEs	Bank
Repay on time	$G\alpha - Grd$	$Grd - f$
Default no repayment	$G(1+\alpha+rd) - T_2 - L$	$T_2 - f - G(1+rd)$

from the prospect of SMEs to analyze their value of expectation

$$M_Z = P_1 (G\alpha - Grd)$$

$$M_n = P_1 [G(1+\alpha+rd) - T_2 - L]$$

Let $M_Z = M_n$ and get:

$$r = \frac{T_2 + L - G}{2Gd}$$

So the higher of final value of the pledge of bank lending is higher, the higher of lending interest rate, the more possibility of bank lending; under this assumption, final value of the pledge is the important considering factor of bank loading.

from the prospect of banks to analyze their value of expectation

$$U_d = P_{21}(Grd - f)$$

$$U_n = (1 - P_{21}) - T_2 - f - G(1 + rd)$$

Let $U_d = U_n$ is: Let $U_d = U_n$, and get:

$$P_{21} = \frac{1 - \frac{Grd - f}{T_2 - 2f - G}}$$

Because $P_{21} > 0$, so $Grd - f > 0$, $T_2 - 2f - G > 0$.

$$\text{when } P_{21} > 1 - \frac{Grd - f}{T_2 - 2f - G}, \quad \frac{\partial P_{21}}{\partial r} = -\frac{Gd}{T_2 - 2f - G} < 0$$

When $P_{21} > 1 - \frac{Grd - f}{T_2 - 2f - G}$, the bank will lend,

unless won't. Through further calculation, the

$$\text{derivation is: } \frac{\partial P_{21}}{\partial r} = -\frac{Gd}{T_2 - 2f - G} < 0$$

So the load paying rate of the borrowing enterprise is in inverse proportion to lending rate. If the final total value of the pledge is higher, the load paying rate is higher.

3) *Confirming storage financing mode*
both parties game model assumption

Given the possibility of bank lending as P_1 , then the possibility without lending of bank is $1 - P_1$; the loan scale in the market is about G_2

Given the capital rate of return of SMEs is α , loan interest rate is r , loan time is d , the penalty for core enterprises resulted from borrowing enterprises default is Z ; the security cost paid by borrowing enterprises to the third

party logistics is f_2 , and the penalty for their guarantee enterprises made by the third party logistic enterprises is K

The penalty and reputation loss of repayment not on time for the enterprise is L

Loan paying probability of SMEs is P_{22}

TABLE II CONFIRMING STORAGE FINANCING MODE BANK AND SMES GAMING MODEL

	SMEs	Bank
Repay on time	$G_2 \alpha - G_2 rd - f_2$	$G_2 rd$
Default no repayment	$G_2(1 + \alpha + rd) - f_2 - K - L$	$Z - G_2(1 + rd)$

from the prospect of SMEs to analyze their

value of expectation

$$M_z = P_1(G_2 \alpha - G_2 rd - f_2)$$

$$M_n = P_1[G_2(1 + \alpha + rd) - f_2 - K - L]$$

Let $M_z = M_n$, and get:

$$\frac{L + K - G_2}{2dG_2} = r$$

So the higher of the penalty amount K from the guarantor enterprise paying the third party logistic enterprise for their default, the higher of lending interest rate, the more possibility of bank lending; under this

assumption, the penalty amount for financing enterprise is the important considering factor of bank loading.

from the prospect of banks to analyze their value of expectation

$$U_d = P_2 G_2 rd$$

$$U_n = (1 - P_{22})[Z - G_2(1 + rd)]$$

Let $U_d = U_n$, and get:

$$P_{22} = 1 - \frac{rd G_2}{Z - G_2}$$

$$1 \geq P_{22} > 0, \quad Z > G_2(1 + rd)$$

Because $1 \geq P_{22} > 0$, $Z > G_2(1 + rd)$

$$\text{when } P_{22} > 1 - \frac{rd G_2}{Z - G_2}, U_d = U_n, \\ \frac{\partial P_{22}}{\partial r} = - \frac{d G_2}{Z - G_2}$$

$$\text{When } P_{22} > 1 - \frac{rd G_2}{Z - G_2}, U_d = U_n \text{ the bank will} \\ \text{lend, unless won't. Through further calculation, the} \\ \frac{\partial P_{22}}{\partial r} = - \frac{d G_2}{Z - G_2} \\ \text{derivation is:}$$

When $G_2 < Z$, the load paying rate of the borrowing enterprise is in inverse proportion to interest rate, then the core enterprise has to bear the risk by themselves. So under confirming storage financing mode, increasing the penalty for core enterprises and controlling interest rate can

increase the possibility of paying the loan by financing enterprises.

Accounts receivable financing mode
both parties game model assumption

Given the possibility of bank lending is P_1 , the total amount of account receivable is Q , and the lending rate that the bank determines according to its own situations and analysis of market prospect is β .

Given the SMEs capital rate of return is α , loan interest rate is r , borrowing time is d , the generated cost from the bank lending to financing enterprise is j .

The penalty and reputation loss of repayment not on time for the enterprise is L

Loan paying probability of SMEs is P_{23}

TABLE III ACCOUNT RECEIVABLE FINANCING MODE BANK AND SMES GAMING MODEL

	SMEs	Bank
Repay on time	$Q\alpha\beta - Q\beta rd$	$Q\beta rd - j$
Default no repayment	$Q\beta(1 + rd + \alpha) - Q - L$	$Q - Q\beta(rd + 1) - j$

from the prospect of SMEs to analyze

$$M_Z = P_1(Q\beta\alpha - Q\beta rd)$$

$$M_n = P_1[Q\beta(1 + rd + \alpha) - Q - L]$$

let $M_n = M_Z$ is: Let $M_n = M_Z$, and get:

$$\frac{1}{2d\beta} - \frac{1}{2d} + \frac{L}{2dQ\beta} = r$$

Under the account receivable financing mode, loan rate β , total account receivable Q , the penalty and reputation loss of repayment not on time for the enterprise L all will affect the loan interest rate of bank.

from the prospect of banks to analyze

$$U_d = P_{23}(Q\beta rd - j)$$

$$U_n = (1 - P_{23})[Q - Q\beta(rd + 1) - j]$$

Let $U_d = U_n$, and get:

$$P_{23} = 1 - \frac{Q\beta rd - j}{Q - Q\beta - 2j}$$

$$0 < P_2 < 1, \quad Q\beta rd - j > 0,$$

$$\text{when } P_{23} = 1 - \frac{Q\beta rd - j}{Q - Q\beta - 2j}$$

$$\frac{\partial P_{23}}{\partial r} = \frac{Q\beta}{Q - Q\beta - 2j}$$

Because $0 < P_2 < 1$, then $Q\beta rd - j > 0$,

$P_{23} = 1 - \frac{Q\beta rd - j}{Q - Q\beta - 2j}$, $U_d = U_n$ the bank will
when lend, unless won't. Through further calculation, the

$$\frac{\partial P_{23}}{\partial r} = \frac{Q\beta}{Q - Q\beta - 2j}$$

derivation is:

From the actual conditions, we can see

$$f < \frac{Q - Q\beta}{2}$$

that, that is, the loan paying probability of financing enterprises is in inverse proportion to interest rate. Similarly, loan rate β and total account receivable Q will all affect the repayment of enterprises.

It is well known that timely repayment probability of financing enterprises depends on the bank loan interest rate r , they are in direct proportion, that is, if the bank loan interest rate r is higher, repayment probability of borrowing enterprises will be higher; if the probability of keep faith is lower, the bank will require more pledge value T , default amount of claim z and pledge account receivable amount Q .

C. Comparison of three models results

Next we will compare the repayment probability of borrowing enterprises under three models P_{21} P_{22} P_{23} .

$$P_{21} \text{ and } P_{22} : \text{ when } Z - G_2 > 0, \\ T_2 - 2f - G > 0, \text{ and } \frac{rdG(T_2 - G)}{2rdG_2 + G_2 - Z} > 0, \\ P_{21} > P_{22},$$

Comparing P_{21} with P_{22} :
when $Z - G_2 > 0$, $T_2 - 2f - G > 0$
and $\frac{rdG(T_2 - G)}{2rdG_2 + G_2 - Z} > 0$, $P_{21} > P_{22}$, then the
repayment probability of finance-transportation and
warehouse financing model is higher than confirming
storage financing model.

$$P_{22} \text{ and } P_{23} \text{ compare with :} \\ Q - Q\beta - 2j > 0, \text{ and } \frac{Qrd[G_2 - \beta Z]}{2drG_2 - Z + G_2} > j, \\ P_{22} < P_{23}, j < \frac{Qrd[G_2 - \beta Z]}{2drG_2 - Z + G_2}, \\ \text{Comparing } P_{22} \text{ and } P_{23} : \text{ when } Q - Q\beta - 2j > 0 \\ \text{and } \frac{Qrd[G_2 - \beta Z]}{2drG_2 - Z + G_2} > j, P_{22} < P_{23}, \text{ that is, when} \\ \frac{Qrd[G_2 - \beta Z]}{2drG_2 - Z + G_2}$$

bank's loan cost j is less than $\frac{Qrd[G_2 - \beta Z]}{2drG_2 - Z + G_2}$, the
repayment probability of pledge of accounts receivable for
SMEs is higher than the probability of keep faith of
confirming storage financing.

paring P_{21} with P_{23} : these two financing modes have
pledge issues. Under these two conditions, the bank will
consider on the premise to use the pledge to make up its
loss. We compare them in two ways: (1) given that the
payment f for the third party logistic and storage enterprise
under financing-transportation and warehouse mode is the
same with the bank's loan cost j under account receivable
financing mode, we can get: with the same loan scale, the
pledge value should be changed with repayment
probability. Actually, the bank can grasp the value of
pledge to avoid the loan risks under different financing
modes.

In conclusion, when the bank spends inviting the third
party logistics, it's better not to use confirming storage
financing, because the default rate will be the highest, and
financing-transportation and warehouse mode and account
receivable financing mode default rate will be lower.

IV. CONCLUSION

The paper starts from supply chain financing prospect,
analyzing and solving the financing difficulties of SMEs
and proposes corresponding suggestions. Also, it deepens
to research the situations of SMEs financing difficulties,
analyzes the limitations and establishes models to analyze
the differences of these three models. At last, the paper
proposes some advice and effective ways to help SMEs
walk out from the financing difficulty.

The practice has proved that supply chain financing is
an effective way to solve SMEs financing and opens up a
new way of financing. With economic globalization deeper,
in the next decades, the process that Chinese enterprises
entering global economic supply chain will not change. It's
undoubted that supply chain financing will increase with
higher speed. But with the business development, we also
need to see the existing problems of various models or the
points that need to be improved. These problems need the
effort of enterprises, financing organizations, government
and many parties to solve. We should keep researching and
exploration, making supply chain finance can play more
important role in solving SMEs financing and effective
financing issues.

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