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ANALYSIS OF THE COST AND BENEFIT OF THE COMBINATION PRODUCT OF CHATTEL FINANCING AND FACTORING

Strictly as per the compliance and regulations of:



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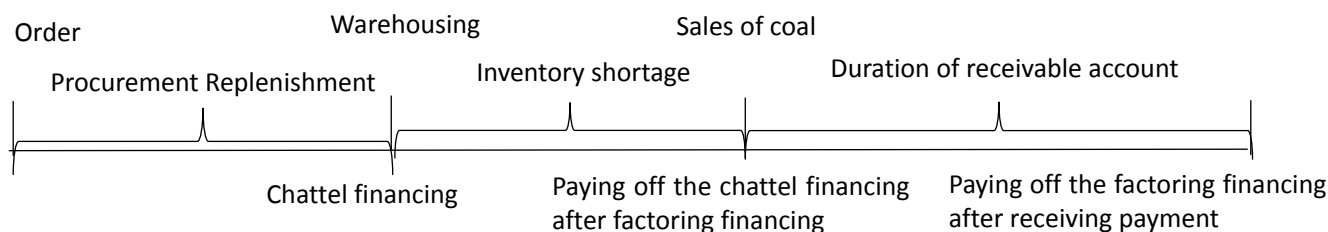
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I. INTRODUCTION

a) Combined Products Defined

Chattel financing and factoring financing mix is a chain finance portfolio business, to provide chattel mortgage financing for borrowers, dealing

Borrower's funding gap:



c) Advantages

The product use factoring financing to replace previous chattel financing, so the borrower's business chain get combined, in line with the borrowing enterprise business needs, while echoing the former to achieve closed financing as well as reducing the pressure on the credit risk of its own funds and enterprises. For banks, due to multiple financing, loan fees can be increased, and the rate of return improved.

For most SMEs, they need to rely on high-speed turnover of inventory profit, while banks in the

with factoring financing after the sale of goods to the downstream core business, paying off the chattel financing with the money of factoring financing, finally returning the money to a factoring financing supply.

b) Agent Analysis for Demand

To carry out the need-analysis, let's take Huaneng Power Plant, a coal dealer for example. Due to the coal dealer inventory of goods sent to the downstream power plant, and the inventory can be reduced, if there's not a certain amount of safety stock, goodwill will decline because of shortages, so the partnerships with downstream customers greatly reduced. Thus it's necessary to utilize own movable chattel to apply the bank for mortgage, getting some advance procurement funds for replenishment needs. When the borrower get the receivable accounts after sending goods to the downstream power plant in North China, due to the need to repay the loan, borrowers have to the needs for factoring financing.

mortgage business inventories often set rigid regulations that companies must pick up after filling the funding gap with their own funds, which bring SME dealers a certain amount of pressure on cash flow. Once the cash flow risk appears, they will not be able to complete delivery. The combination of chattel financing and factoring financing provides a good solution to this problem.

d) Suitable Users

For dealers having a certain amount inventory as well as requiring safe stock, they're more suitable for use in combination chattel financing and factoring financing. At the same time, these stocks are easy to preserve and cash with a stable price. In reality, such

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combination products are often used in the coal power industry chain of coal dealers, steel trade enterprises of steel construction industry chain, tire dealers of rubber automobile industry chain, and dealers of oil, iron and other industries.

II. INTRODUCTION TO THE BUSINESS PROCESS OF THE COMBINATION PRODUCT OF FACTORING FINANCING AND CHATTEL FINANCING

There are three kinds of typical supply chain financial product portfolio. And the cost-benefit model of purchase order financing and factoring portfolio

construction is close to chattel financing and factoring combination, this is due to the proximity of the purchase order financing and stock financing objective, that is, to purchase; the bank loan amount are similar, namely as a percentage of the price of the goods; factoring financing purpose are borrower to return previously. So in order to simplify the research, as well as focus on the point and avoid repeated exposition, also because the reality real estate financing are more and more common, order financing requirements is relatively high, so we only study on estate financing and factoring product portfolio, confirming warehouse and factoring product portfolio.

The figure of inventory financing and factoring process (see figure 1):

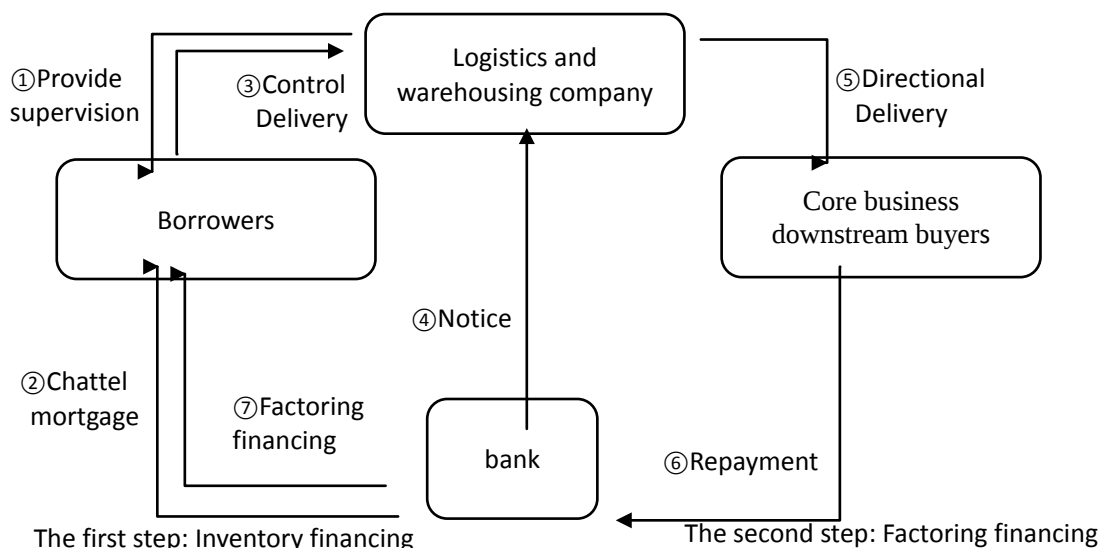


Figure 1 : Inventory financing and factoring process

Dealer (SME supply chain system) first chattel mortgage by way of its own stock pledged to the banks financing after the sale of goods to the core business, factoring financing for loans to return chattel mortgage, and finally downstream core businesses will be paid to play dedicated factoring into the bank account, ending combination product financing.

Operation of the process is described as follows: logistics, warehousing regulated firm and the borrower and the bank signed a tripartite cooperation agreement, the borrower to the warehousing company issued a notice quality, storage company sent a double-site supervision goods, logistics and warehousing company issued a quality notification letter to the bank stating goods already regulated, and completed the quality procedures, banks provide financing to the borrower. Submitted by the borrower from the bank downstream from the list prepared statement available to downstream buyers, accounts receivable factoring financing chattel mortgage repayment of bank financing, the requirements of the goods, the bank internal downstream buyers approved line of credit, to logistics

and warehousing the company issued a regulatory directive shipment, after the company received regulatory warehouse delivery instruction bank to release the goods to the borrower, the borrower submits invoices and contracts and other materials to the bank, the bank borrowers issuing factoring financing: Bank closed transfer insurance factoring financing, inventory financing for early return until the downstream core businesses will be paid into the bank account factoring, the bank principal and interest after deducting factoring financing, the remaining funds returned to the borrower to complete the combination of financing.

III. COSTS AND BENEFITS MODEL OF THE COMBINATION PRODUCT OF CHATTEL FINANCING AND FACTORING FINANCING

There are several hypothetical model of inventory financing and factoring financing mix, in reality, due to the vastly different enterprise's own situation and the difference of supply chain financial products of each

bank, there exist different assumptions. Based on theoretical assumptions underlying premise, what the author studies has more reality and operability.

a) *Model Assumptions and Parameters Meaning*

i. *Assumptions of the Model*

- Inventory banks pledge a one-time payment in accordance with the number of contracts downstream core buyers.

- Business inventories sales rate is constant.

According to the model assumptions, the sales pace is constant, with the time change, inventory change over time. (see figure 2).

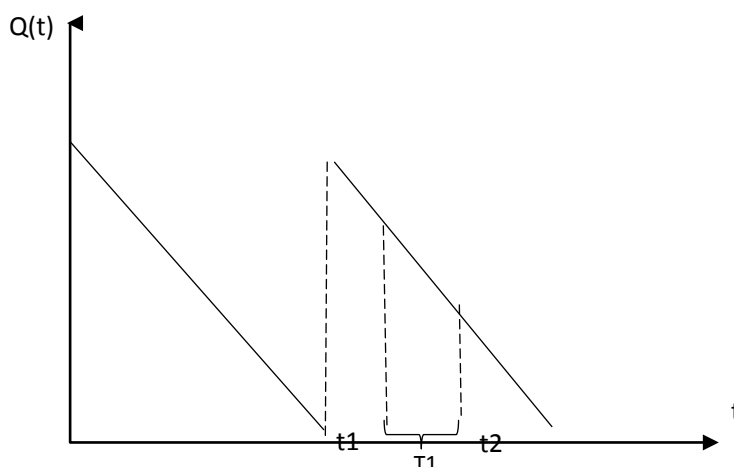


Figure 2 : Inventory change over time

(3) Not to consider any risks (including market and credit risk).

ii. *The Definition of the Parameters*

Parameters and their meanings shown in Table 2.

Table 1 : Parameters and their Meanings

Parameters	Meanings
$Q(t)$	Change in inventory over time
D	Slope of inventory over time(positive value)
P_1	Purchasing price(yuan/ton)
P_2	Sales price(yuan/ton)
λ_1	Inventory pledge rate
T_1	Time for inventory financing(year)
β	Insurance rates
R_0	Bank average cost(interest paid to customers)
R_1	Inventory financing rates
T_2	Time for factoring financing(year)
C	Storage costs and others
R_2	Factoring financing rates
λ_2	Factoring financing ratio
F	Opportunity cost of shortage
π_1	Net profits of the bank
π_2	Net profits of the borrower's enterprise

b) *Bank Cost-Benefit Analysis*

In the combination of business financing inventory financing and factoring, the earnings is interest

in both periods, the cost is the interest paid to depositors of two cycles. It follows that the bank's net income is:(see equation 1)

$$\pi_B = P_2 \cdot \int_1^2 Ddt * \lambda_1 (R_1 - R_0) T_1 + P_2 * \int_1^2 Ddt * \lambda_2 (R_2 - R_0) T_2 \quad (1)$$

We can clearly see, the more spread of the borrower sale of goods is, the higher the income is. And the main business is just the cost of borrowing the

bank's earnings, so companies want to lower borrowing and lending rates, as well as to compress financing time.

i. *Borrower cost-benefit analysis*

In the combining products of chattel financing mixed by factoring financing, the costs of SMEs are mainly paid to the bank's interest, premiums paid to the

insurance company and the costs of logistics and warehousing company. Benefits are spread from sales of goods, then we get net income derived there from for SMEs as:

$$\pi_c = (P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \beta - P_2 \cdot \int_1^2 Ddt (\lambda_1 \cdot R_1 \cdot T_1 + \lambda_2 \cdot R_2 \cdot T_2) \quad (2)$$

We can clearly see, the more spread loan companies traded goods, the higher the income. And the main business is just the cost of borrowing the bank's earnings, so companies want to lower borrowing and lending rates, as well as financing time.

c) *Bank-enterprise game analysis based on chattel and factoring portfolio of products and a single product selection*i. *Differences between different financing models*

The contrast between the movable part of the financing and factoring financing portfolio of products, a

single supply chain financing product differentiation, and supply and demand sides of costs and benefits are discussed in this section. Because earnings of simple inventory financing are difficult to quantify, and upstream supply chain enterprises generally adopt factoring financing, the comparison with the single factoring financing has a greater value.

a. *Comparison of bank net income*

According equation 1, when chattel financing and factoring financing combine, the net income of the bank is:

$$\pi_B(\text{combine}) = P_2 \cdot \int_1^2 Ddt * \lambda_1(R_1 - R_0)T_1 + P_2 * \int_1^2 Ddt * \lambda_2(R_2 - R_0)T_2$$

bank net income of single factoring financing is, see equation 3 :

$$\pi_B(\text{single}) = P_2 * \int_1^2 Ddt * \lambda_2(R_2 - R_0)T_2 \quad (3)$$

$$\pi_B(\text{combined}) - \pi_B(\text{single}) = \Delta\pi_B = P_2 \cdot \int_1^2 Ddt * \lambda_1(R_1 - R_0)T_1 > 0$$

The difference is the interest paid by chattel financing required. So from the bank point of view ,the profits of combining products of chattel financing mixed by factoring financing is higher than a single factoring financing.

b. *Borrower's ROE comparison*

Since in the chattel financing and factoring financing mix, the borrower can get the money first by chattel financing, to purchase, through the goods or of the production, so that no costs associated with the loss is out. In single factoring financing, only when all the goods is delivered, borrowers can obtain factoring

financing, so there bring out the out-of-stock loss F compared to a combination of chattel financing and factoring financing. In the auto supply chain system once appeared out of stock, the loss is generally not brought low, because companies will lose the trust of the downstream core enterprise, and core downstream businesses will actively look for other suppliers, so as for the dealers, the costs F can not be underestimated.

According to equation 2 when chattel financing and factoring financing is combined, the net income for borrowing businesses is:

$$\pi_c(\text{combined}) = (P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \beta - P_2 \cdot \int_1^2 Ddt (\lambda_1 \cdot R_1 \cdot T_1 + \lambda_2 \cdot R_2 \cdot T_2)$$

Both make the difference, then we get, see equation 4:

$$\pi_c(\text{single}) = (P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \lambda_2 \cdot R_2 \cdot T_2 - F \quad (4)$$

To make the difference, then we get:

$$\Delta\pi = F - P_2 \cdot \int_1^2 Ddt \cdot (\lambda_1 \cdot R_1 \cdot T_1 + \beta) \quad (5)$$

The difference between income borrower is the opportunity loss due to lack of inventory resulting subtracted from the interest in chattel financing period.

ii. Dynamic Bank-Enterprise Game Analysis

a. Model Assumptions

- In the model, because the supply chain financial products are put into the credit of core business, the default risk is extremely low. It is assumed that the game model is completely symmetric information, while irrespective of credit risk.
- This model is a dynamic model. Since corporate loan demand is first proposed by the borrower to choose a single factoring financing or combining

products of chattel financing mixed by factoring financing, then the bank decided to loan or not.

b. Analysis of Model

This model is a dynamic game with complete information. First, the decision is made by the borrower in the first step to choose the combination of factoring financing or mixed-products financing; the second step is to select the bank, whether it is a single factoring financing or combining products of chattel financing mixed by factoring financing, banks can decide to loan or not according to the profits. Then we can build tree-like figure of bank-enterprise dynamic game loan process (see Figure 3).

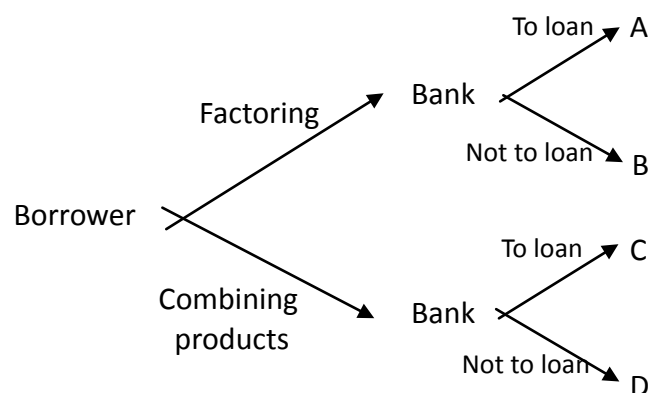


Figure 3 : Tree-like figure of bank-enterprise dynamic game loan process

In this game, the borrower has two options, one is single factoring financing, the other is movable property financing combined with factoring financing. The bank also has two options, one is to carry out

lending, the other is not to loan. Thus produced four possible outcomes A, B, C, D. Now four possible results are shown below, borrowers earnings are following by bank earnings.

$$A = [(P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \lambda_2 \cdot R_2 \cdot T_2 - F, P_2 \cdot \int_1^2 Ddt \cdot \lambda_2 (R_2 - R_0) T_2]$$

$$B = (0, 0)$$

$$\pi_C(\text{combined}) = [(P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \beta - P_2 \cdot \int_1^2 Ddt (\lambda_1 \cdot R_1 \cdot T_1 + \lambda_2 \cdot R_2 \cdot T_2),$$

$$P_2 \cdot \int_1^2 Ddt \cdot \lambda_1 (R_1 - R_0) T_1 + P_2 \cdot \int_1^2 Ddt \cdot \lambda_2 (R_2 - R_0) T_2]$$

$$D = (0, 0)$$

According to backward induction deduction, let's start the analysis from the bank. In factoring cooperation with the supply chain member companies, credit risk of bank loans due to the core business of the endorsement has been well controlled, and the risk of default is very low and negligible. Therefore, in the decision to loan or not, credit risk is not considered, but banks need to compare with other loan yield issues. Yields factoring financing is not low in bank lending products, on the one hand for small business loans, interest rates are higher; on the other hand, to establish a cooperative relationship with the core business of the bank financing in the supply chain, upstream and

downstream supply chain enterprises will become potential customers, in the long run, comprehensive income is higher, and the bank would be happy to participate, so the banks will choose to loan lending companies factoring financing. In the process of combining inventory financing with factoring financing, absolute returns of banks are higher than single factoring financing, and the difference is the interest of chattel financing. So the banks will loan to combining products of chattel financing mixed by factoring financing.

Shall we select a single borrower in the end supply chain financing or a combination of movable and

factoring financing? The key is to look at the opportunity cost F arose by shortages. If out of costly business losses resulting potential loss is large, that is, F cost more than the sum of chattel financing and insurance expenses, that is:

$F > P_2 \cdot \int_1^2 Ddt \cdot (\lambda_1 \cdot R_1 \cdot T_1 + \beta)$, the borrower can choose a combination of financing, at this time the dynamic equilibrium is point C. If the shortage cost F is less than the sum of chattel financing costs and insurance cost, that is:

$F < P_2 \cdot \int_1^2 Ddt \cdot (\lambda_1 \cdot R_1 \cdot T_1 + \beta)$, the borrower would choose a single factoring financing, then the dynamic equilibrium is point A.

IV. EMPIRICAL ANALYSIS

a) Case Background

i. Introduction

Let's take enterprise X for example, a coal dealer in Huaian City, Jiangsu Province. X was established in July 2001, the registered capital is 300 million yu an, and the legal representative invested 2 million yu an accounting for 67% while other individual shareholders accounted for 33 percent. It is a limited liability company. The company's main business is coal operation in Huaian, as well as transportation of deputy battalion coal and other commodities. There are 30 employees.

ii. Enterprise production and management

Enterprise X has run business in Huai'an area for many years. It acquired a good reputation in the market and produced a relatively high quality coal, and has become one of the major coal Huaian local dealer. Its annual average sales are 90 million, and average annual net profit is 5 million, with the assets debt ratio of 65%, below the lower level of traders. The financial risk is relatively controllable, as well as the inventory turnover rate is faster than their peers accounts, and receivable payment is guaranteed. The company's management has a wealth of management experience, hoping to forge ahead and expand high-quality market, but they are more sensitive to market risk.

Enterprise X on downstream customers is relatively stable, long-term cooperation with the upstream Zaozhuang Coal Co., Ltd. Wang Chao. Wang Chao Coal is one of the largest coal mine in Zaozhuang Tengzhou City, with more than 1,800 employees, up to 80 million tons of coal reserves, more of which is 5500 kcal high-quality coal. Since Huai'an and Zaozhuang are similar cities along the Beijing-Hangzhou Grand Canal, the cost for coal to arrive at Huaian by sea is low. The two sides have much cooperation and high degree of mutual trust.

Enterprise X's downstream major customers is local power plant in Huaian, such as Huaneng Huaiyin

Power Plant, Plant Huai'an, Huai'an biomass power plant, as well as a small amount of coal supplied to the needs of enterprises and institutions. Most of downstream customers have a fairly good comprehensive strength, and the repayment of accounts receivable is timely and stable with good reputation. In addition, the enthusiasm of cooperation is high.

iii. Introduction of bank-enterprise cooperation

Bank S is the national joint-stock commercial bank which entered into Huai'an early. Compared to state-owned banks, the customer acceptance is lower in third-tier cities, so bank S actively runs characteristic business, which mainly targets SMEs. With a supply chain financial services to open the market, SMEs favour bank S most. Enterprise X and bank S began factoring financing cooperation in 2012 and achieved win-win cooperation, and in 2014 they started to carry out a combination of business personal property financing and factoring financing, so the recognition between the two parties is high.

b) Enterprise X's Application of Chattel Financing and Factoring Financing

i. Interpretation of contract between enterprise X and upstream or downstream companies

On May 1 2014, Enterprise X and Huaneng Huaiyin Power Plant signed a supply contract, which required supply 18,000 tons standard coal of 5,500 kcal or more to prepare for the summer peak before June 1, 2014. The two sides agreed on a purchase price for P2 (550 yuan / ton), and an account period for T2 (about three months).

Enterprise X has Q (O) (20,000) tons of inventory in the Zaozhuang Grand Canal Dock (purchase price P_i is 500 yuan / ton) to provide for the downstream buyers. Because Wang Chao coal mine is relatively strong, Enterprise X is required to pay the bill in advance in each purchase, and it takes 1-2 weeks before freight arrives at Zaozhuang Grand Canal Dock. At the same time due to the slow shipping from Zaozhuang to Huai'an, which takes a week and a half, Enterprise X needs long time to stock and transport.

Enterprise X needs five days to complete transporting 18,000 tons of coal, and the daily transportation is D (3600 tons). The average transport is 600 tons per vessel in the Beijing-Hangzhou Grand Canal, which needs six ships a day. The price is 25 yuan per ton from Zaozhuang to Huai'an, and logistics costs 450,000 and warehousing costs 10,000 yuan. So the total is C (46 million). Inventory changes (see Figure 4).

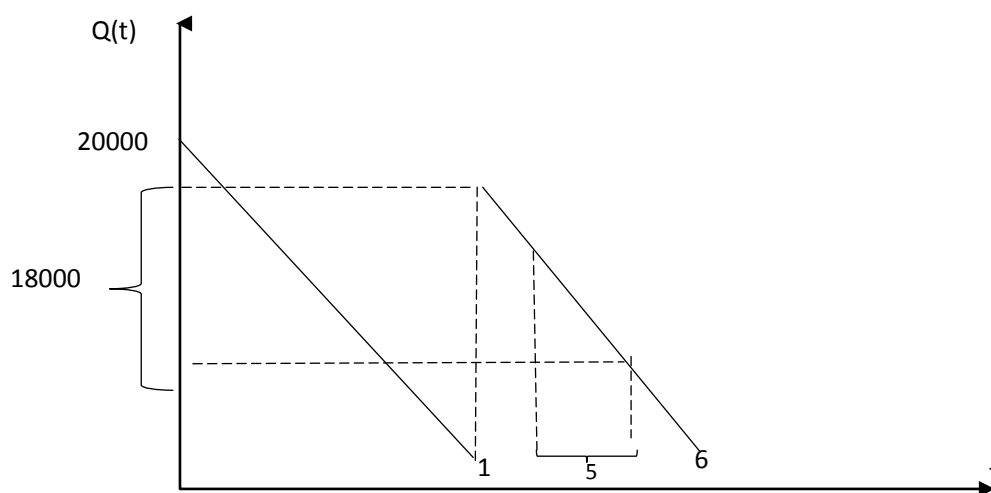


Figure 4 : Inventory change over time

ii. Enterprise X signed a financing contract with the bank

- *Signing a chattel financing contract*

Enterprise X is using trade finance with stronger competence, at the same time, it carries out direct marketing to the downstream plant, and its repayment ability is guaranteed with low risk, so the bank S agreed to give X corporate chattel financing. On May 1, 2014, Enterprise X and bank S signed a chattel financing agreement. The chattel financing ratio can not exceed 70% of the value of freight, and the loan interest rate is RI (9%), and the period TI is no more than three months. In the period from the date of the application of the borrower to the sales to power plant, the first beneficiary of property ownership is bank S, Enterprise X assume joint responsibility to protect individuals, and must apply for property insurance. The first beneficiary is bank S.

- *Signing factoring financing contract*

Huaneng Huaiyin Power Plant is an important branch of business of Huaneng Group, and is the largest thermal power plant in Northern regions. The total installed capacity is 1.8 million kilowatts with strong profitability, so the plant is the core customer of bank S. The bank agreed to grant factoring financing.

Enterprise X and bank S signed the factoring financing contract. The contract stipulates factoring financing ratio does not exceed 70% of the accounts receivable, and the loan interest rate is R2 (8%), and the financing terms T2 does not exceed six months.

c) *Parameter Assignment*

Parameters and their meanings, values shown in Table 2:

Table 2 : Parameters and Meanings

Parameters	Meanings	Values
$Q(t)$	Change in inventory over time	
Q_0	Initial inventory	20000
D	Slope of inventory over time(positive value)	3600
P_1	Purchasing price(yuan/ton)	500
P_2	Sales price(yuan/ton)	550
λ_1	Inventory pledge rate	0.7
T_1	Time for inventory financing(year)	1/12
β	Insurance rates	0.3%
R_0	Bank average cost(interest paid to customers)	2.9%
R_1	Inventory financing rates	9%
T_2	Time for factoring financing(year)	1/4
C	Storage costs and others	46
R_2	Factoring financing rates	8%
λ_2	Factoring financing ratio	0.7
F	Opportunity cost of shortage	15

i. *Calculation of bank-enterprise costs and benefits*

- *Calculation of bank S's costs and benefits*

According to equation 1 we can obtain the net benefit of the bank: see equation 6.

$$\pi_B = P_2 \cdot \int_1^2 Ddt * \lambda_1(R_1 - R_0)T_1 + P_2 * \int_1^2 Ddt * \lambda_2(R_2 - R_0)T_2 \quad (6)$$

$$\begin{aligned} \pi_B &= 550 \cdot \int_1^6 3600dt * 0.65(9\% - 2.9\%) \frac{1}{12} + 550 * \int_1^6 3600dt * 0.7(8\% - 2.9\%) \frac{1}{4} \\ &= 121,100\text{yuan} \end{aligned}$$

ii. *Calculation of enterprise X's costs and benefits*

According to equation 1 we can obtain the net benefit of the bank: see equation 7.

$$\pi_C = (P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \beta - P_2 \cdot \int_1^2 Ddt (\lambda_1 \cdot R_1 \cdot T_1 + \lambda_2 \cdot R_2 \cdot T_2) \quad (7)$$

$$\begin{aligned} \pi_C &= (550 - 500) \cdot \int_1^6 3600dt - 460000 - 550 \cdot \int_1^6 3600dt \cdot 0.3\% - 550 \cdot \int_1^6 3600dt (0.65 \cdot 9\% \cdot \frac{1}{12} + 0.7 \cdot 8\% \cdot \frac{1}{4}) \\ &= 223,400\text{yuan} \end{aligned}$$

iii. *Bank-enterprise game analysis of equilibrium*

• *Spreads contrast of bank S*

Bank S obtained conventional income of single factoring financing interest.

According to equation 3, we can calculate the net benefit of the bank in single factoring financing from equation 8: see equation 8.

$$\pi_B(\text{single}) = P_2 * \int_1^2 Ddt * \lambda_2(R_2 - R_0)T_2 \quad (8)$$

$$\pi_B(\text{single}) = 550 * \int_1^6 3600dt * 0.7(8\% - 2.9\%) \frac{1}{4} = 88,360\text{yuan}$$

Obviously, now bank S's earnings in combined financing is higher than the previous single factoring financing.

Previously what enterprise X applied to the bank is factoring financing, according to equation 4, we can

• *ROE comparison of enterprise X*

$$\pi_C(\text{single}) = (P_2 - P_1) \cdot \int_1^2 Ddt - C - P_2 \cdot \int_1^2 Ddt \cdot \lambda_2 \cdot R_2 \cdot T_2 - F \quad (9)$$

$$\pi_C(\text{single}) = (550 - 500) \cdot \int_1^6 3600dt - 460000 - 550 \cdot \int_1^6 3600dt \cdot 0.7 \cdot 8\% \cdot \frac{1}{4} - 150000 = 15,040\text{yuan}$$

In the research process, the corporation highly recognized compared to single factoring financing, chattel financing and factoring financing can advance a certain period to get liquidity as well as pre-arranged purchasing stocking. Wang Chao coal mine requires getting money 1-2 weeks before delivery, and transportation by ship from Zaozhuang to Huai'an also needs about 1-2 weeks, so the two cycles equal to nearly a month, and this is just X's chattel financing business cycle. So compared to the original one, single factoring financing is able to solve the problem of

pressure on the stock, and to meet the urgent needs of power plant orders.

Based on past experience, there will be many plants suddenly asking enterprise X for goods in the year, and their inventory can not only meet a one-time large orders, but also is difficult to guarantee delivery plant at a predetermined time. Power thus considers X having insufficient strength, and may turn to dealers of other coal purchased next time. Years of hard business enterprise market share of X will decline. Profits on the account will suffer an annual loss of \$ 150,000, not

including losses resulting goodwill. F therefore is more than 15 million.

d) Dynamic game analysis

According to the analysis of models and assumptions of dynamic game model with complete

information in 1.3.2, we obtained bank-enterprise tree-like figure as follows (corporate in the front, the bank in the post), (see Figure 5).

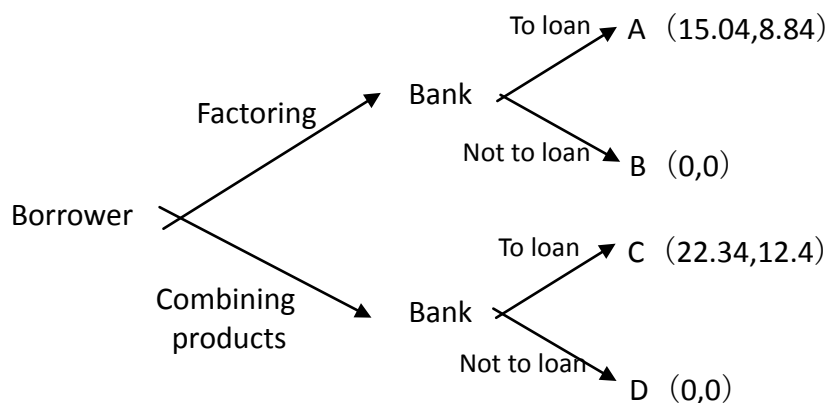


Figure 5 : Tree-like figure of bank-enterprise dynamic game loan process

According to backward induction deduction, let's begin to analyze from bank S. Bank's selection to loan or not is based on the comparison of other loan products, if other comprehensive income products are high, bank S may not give supply chain financial products loans. Because supply chain finance has a core business of credit repayment guarantee to do, the bank's risk is lower compared to other products, while banks can greatly expand the core business as a link to the upstream and downstream industry customers. In this process the bank can also provide consulting, financial and other intermediary services for related enterprises. Therefore bank S will choose to lend.

The borrower enterprise X choose combining products of chattel financing mixed by factoring financing or single factoring financing? It depends on which situations has higher returns for enterprise X. Compared to single factoring financing, combining products costs higher in two parts, one is the cost of insurance, and the second is interest generated in chattel financing period. And compared to single factoring financing, combining products have a shortage cost F, according to X's own situation, F strikes \$150,000, more than two parts of cost of a single product. Therefore, enterprise X will choose the combining products, and the equilibrium point at this time is C.

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