

Analysis on Finance Model and Risk Control for Supply Chain Finance

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Abstract

As a new modern business model, the unique advantage was proposed for supply chain finance in proposing in small and medium enterprises and competitiveness making of industry chain. But in the risk assessment the unified perfect evaluation, standard is still lack. The finance model of supply chain is first given in this paper, through the analysis of the risk factors, the system risk evaluation system is established in fuzzy comprehensive evaluation. Through the analysis of an enterprise in non-ferrous metal pledge financing reservoir, the risk of each enterprise is quantified in the supply chain. And then the risk control platform is set up, including the finance institution, logistics enterprises and financing enterprises.

Mathematics Subject Classification: 53-02, 91

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1 Introduction

Mickle. D. Potom, the well-known company manager, who has made “The supply chain theory”, said that the task of company is to make a value. The supply chain developed basing on the company value chain. The supply chain, which is rounded by the core company, try to manage and control the logistics, information and finance, travel the product to consumers at last. So the suppliers, producers, sellers and consumers join to construct net value model. In the 21 century, the competitions between the companies must be the competitions between the supply chains. Due to the Supply chain operation

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structure, in the business model, not more the simple supply-demand relationship between companies, based on it, the strategy cooperation relationship will be built, among the companies, they must cooperate and insist each other, so that the 'win-win' will be achieved.

The supply chain is a business pattern, bases on the core company, and all-round benefits correlative. To achieve the 'win-win', the core company in the supply chain must try to develop the core competitive power, help the cooperative enterprise with raising its core competitive power, share the profit, and try to build the steadily long-time strategy-cooperative relationship. In consideration of upstream business and downstream business, at the time of reasonably using the fund, try professional management surround with the core company, keep innovating, form core soft business. But it is not when it runs, because of their strong position, most of the core companies have absolute preponderance on standard, price, dead time, stock of the products, and so on, and travel the cost and fund pressure to upstream business an downstream business. In the position of upstream business and downstream business, due to the less of fund, and the financial continuity is bad, the range of the company credit is low, it is a difficulty for their finance from the financial institution, if their financial management is out of work, the companies will be in danger. Thanks to the development of financial industry, and it keeps innovating in our country recently, 'the supply chain finance' has been put forward, so it propose new idea for the problem.

2 The Development of Supply Chain Finance Analysis

Our supply chain finance is in the type develop state, part business had perfect running model and practice, SDB (Shenzhen Development Bank) is in front of the business banks. In 2006, SDB put forward the 'supply chain finance service' formally, and the business experience of the product development and marketing were accumulated, financed from self-liquidating, from '1+N' supply chain finance to system supply chain financial services, and built the cooperation relationship with many business, such as MENGNIU, Gree Electric, etc. In 2010.7 ICBC (Industrial and Commercial Bank of China) put forward the supply chain financial services in the web, China Construction Bank, Bank of China etc put forward the supply chain financial product for the supply chain business financial demand, too. The industrial characteristic perform that most big bank offer the supply chain financial product, it develop into the new bank competitive sphere. But the supply chain product perform unsteadily, many bank proper the product from self business analysis, because the lack of the cognition in business risk control, cost project, scope of application, etc, many big banks and financial institution competitive power are out off balance in supply chain finance.

After many years development, a large number of medium-sized small enterprises financed conveniently and logistic increment from that platform, but in reality operation, logistics enterprise must pay the increment service, clear self position in the industry chain, make it norm have to further improve. It is thus clear, 'supply chain finance' has big improvement space as a basal business model, the paper will begin from the logistics enterprise, to discuss the supply chain financial business mode, keep in touch with the relative companies to do risk analysis, so to develop the finance in phase, have the logistic service protection and increment, and improve the whole industrial competitive power. The definition of supply chain emprises that, the supply chain is through the logistic, fund

and information management and controls, set the suppliers, producers, retailers and consumers together to built commercial value model. As we known in past, the logistical companies always limited in logistical service, the financial institution limited in offer funds service, and the information cannot be shared among the companies, so that the compartment established, cannot improve strength synthetically, cannot approach 'win-win'. Combine the 'finance' and 'supply chain' into one, just emphasize that the logistic and fund are in the same position in supply chain, and they mix together with each other, which benefited from the financial service perfect and logistic strength improvement recently, and the implication of informatization in logistics enterprise, product companies and retailers.

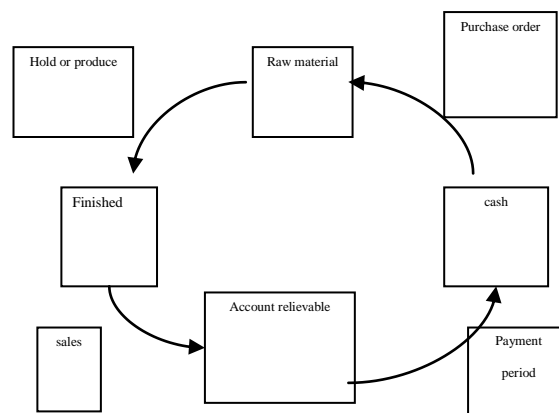


Figure 1: The process of supply chain operation

Set the product supply chain as a example, in the Figure 1, In the operation of the supply chain, supply chain companies, logistics enterprise and financial institution make a recycle among three, spur to keep the commercial operation constancy. The producers accord the production project, send upstream business the purchasing information to buy the raw materials, and the payment can be currency and monthly statement, it also can be on credit, and commissioned logistics enterprise transport and storage, etc. After the raw materials be in storage, companies keep the raw materials or produce, those are raw materials, semi-manufactures and finished product in this stage, the funds change into stock, and bear the stock price alteration risk etc. In order to shift or reduce the risk, companies will sale stocks designedly to have floating capital, within the sales program, logistics enterprise take part in the sales transport and after service etc, and it exhibited in the shape of logistic.

According the foregoing analysis, 'supply chain finance' core is that logistics enterprise and the financial institutions through the cooperation innovation, manage the companies investment and produce, purchasing the materials, sales returns, etc, in the supply chain by closed-off control, rely on funds which brought by commodity under logistics enterprise and financial institution supervising,, financial credit will be paid back. According the specific produced procedure of products, achieve the supply chain financing as follows: the imprest financing model rely on business relationship, the financing model rely on the current stocks, the financing model rely on account receivable. There into, in reality business model, buyers ask to pay in limit times, time-delay payment, to make the deal sellers serve the buyer with the advantage time of

payment, or because of the strong position of core companies in the supply chain, they cannot have the goods, just lump-sum payment, bring the account receivable as one way of the supply chain financing. Account receivable at this time is relied on the steady range and credit of the buyers and sellers in supply chain, most is applied by debtors in the supply chain core companies. In the reality operation, upstream business get the downstream business account receivable as creditors, as a result of the funds demand they apply for loan from financial institutions to produce, and recognize the debtor repayment promise as pledge. After having the sales loan debtors pay for the loan to the financial institutions immediately. The whole process is under logistics enterprise supervision in Figure 2.

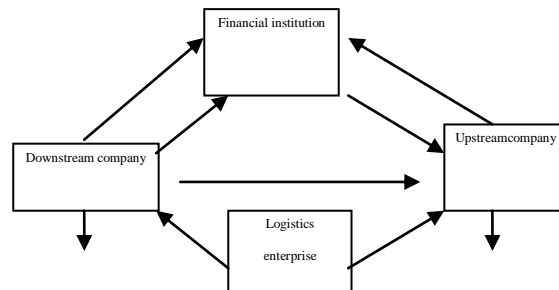


Figure2: The business model of accounts receivable finance

3 The Risk Analysis in Supply Chain Finance

Supply chain finance just is financial industry, logistic industry and product industry take part in the new business by innovation, find the new benefit increases part for all party. But the new risk follow with the new business model, how to define the risk category and specific risk link, how to value risk coefficient of all parties, and reduce the risk to keep the business by those, that is the most important task. Consider with supply chain operation model, in risk category the traditionally objective risk by subject allowance change into process risk base on approaching supply chain value. The traditional financing risk, just consider the financing company as subject, judge the risk by the financial situation, movables and estate, company credit, period of operating cycle, etc, value and control risk through the subject allowance standard. In the supply chain time, single risk judgment standard is out of work, because 'the supply chain finance' is the cooperation between financial institution and logistics enterprise, afford the settlement, finance, guarantee, etc services for consumers in the supply chain operation process, rely on the guaranty of companies transaction in supply chain, make the close-off control in the companies funds, purchasing, produce, market, etc, the logistic finance is core. Analyze 'the supply chain finance' risk in system, have to abide by comprehensiveness, scientific, impartiality, legality, operability, other principle. Because the factors influence supply chain risk are so much, the evaluation each has its own merits, the paper emphasize on risk analysis among the supply chain participants, so in the time of evaluation, risk level cannot be assured to measure and describe, specially the discontinuous risk of business among companies has fuzziness. Just using risk factors fuzzy comprehensive evaluation method, begin with traditional company financing risk, combine with supply chain financial business risk, synthetically analyze the relevant

index of financial companies, cooperation companies in supply chain, logistics enterprise, add the supply chain operation situation, make system analysis on risk, set accordance to improving all participants business cooperation, reducing risk, etc. particular process as follow.

3.1 Supply Chain Finance Risk and Select the Risk Factors to Establish Risk Assemblage

In procedure risk analysis relying on supply chain value approaching, take notice of all participant companies in supply chain following the unified standard, establish a common risk parole system, have a common comprehend on supply chain risk. According to all participant companies and business analysis, supply chain finance analysis as follows aspects: Financial companies aptitude. There are special statements in traditional financial business, including company quality, management capability, benefit capability, debt capability, development potentiality.

Cooperation company in supply chain aptitude. Including cooperation company credit range, benefit capability, debt capability, industrial characteristic. In the fore business risk model analysis, stress on financing companies and cooperation companies as basis, and the core company pay credit for it, given first place business make single credit, must evaluate each cooperation comprehensive aptitude.

Logistic company supervision aptitude. Basically including logistic cooperation company in supply chain transport capability, storage capability, information capability, logistic company credit range. Firstly logistic company capability afford for logistic service, is the key involves business succession, Besides, as the middle supervision, deputed by financial institution collect the logistic information to supervise, is the important business participant.

Business risk. Business risk is the cooperation risk and pledge risk among companies, mostly includes purchasing approach capability, market approach capability, meanwhile, includes pledge characteristic and account receivable characteristic, the two characteristics mainly reflect in different financial business. Pledge risk includes pledge price alteration, currency capability, rapid range, account receivable risk, including account period and account date, creditor default rate. Business risk is the chiefly quota in whole evaluation process, synthetically evaluates all participant companies involving business, the chiefly principle in risk analysis it is.

Supply chain operation situation. Mainly include industrial situation, cooperation range, default frequency. Point at industrial characteristic analyze supply steady degree, can induce risk analysis departure caused by company information departure.

3.2 Accord Evaluation Standard to Divide Range

Deeply research supply chain finance risk root at that step, risk mover factor, set different range for recognized risk, to mean corresponding relationship between every element and every risk size in evaluation gather.

Set risk element gather $U = \{u_1, u_2, \dots, u_{20}\}$, u_i , means risk element in “ i ”;

In supply chain finance, the three companies involve financial risk include financial companies, supply chain cooperation companies (core companies, logistics enterprise),

select risk element gather each U1, U2, U3 mean the three companies, concrete arithmetic as follows:

- a) Financial companies U1: mainly include traditional evaluation factors u1, u2, u3, u4, u5, meanwhile, considering company operation and pledge situation, add u14, u15, u20.
- b) Core company U2: mainly include u6, u7, u8, u9, and u18, u19, to reflect supply chain cooperation companies operation situation and business steady degree.
- c) Logistic company U3: mainly include u10, u11, u12, u13, u16, u17, reflect business steady range and pledge or account receivable risk factors from logistic.

According risk factors have different influence on risk range, set different weight to each factors $W = \{w_1, w_2, \dots, w_{20}\}$, $\sum_{i=1}^{20} w_i = 1$, w_i means the i as weight factor.

Set risk evaluation gathers $V = \{\text{lowest}^{v_1}, \text{lower}^{v_2}, \text{middle}^{v_3}, \text{higher}^{v_4}, \text{highest}^{v_5}\}$, take Delphi Method to have v_i , because in the all-round participant in the supply chain, financial institutions have experience in the risk analysis, but lack of business acquaintance, logistic company and supply chain company have lots of business acquaintance and commodity transportation information, but do not well know the financial business, so have to ask for all-round expert ideas and found evaluation group. Experts should come from the supply chain companies, the third supervision companies, financial institution risk evaluation, have much experience on purchasing, producing, selling, financing. By Delphi Method, count all experts evaluation results to compose region figure $[0,1]$, get all factors fuzzy vectors: u_1, u_2, \dots, u_{20} , according the fuzzy vectors combine to be a matrix, that is the fuzzy relationship matrix from U to V:

$$\Pi = \begin{Bmatrix} u_1 \\ \dots \\ u_n \end{Bmatrix} = \begin{Bmatrix} \pi_{11} \dots \pi_{15} \\ \vdots \\ \pi_{n1} \dots \pi_{n5} \end{Bmatrix} \quad (1)$$

In the formation, π_{ij} means the degree of the “ i ” factor valued range v_j , $i=1,2,\dots,20$; $j=1,2,\dots,5$; Π_i means the single evaluation of factor u_i , it is a fuzzy subaggregate on V;

Then do the fuzzy comprehensive evaluation, apply the Fuzzy Matrix Composite Method, to get the mean risk value matrix:

$$X = \Pi \cdot V^T = \begin{Bmatrix} \pi_{11} \dots \pi_{15} \\ \dots \\ \pi_{n1} \dots \pi_{n5} \end{Bmatrix} \cdot \begin{Bmatrix} v_1 \\ \dots \\ v_5 \end{Bmatrix} = \begin{Bmatrix} x_1 \\ \dots \\ x_n \end{Bmatrix} \quad (2)$$

In the formation, x_i is the mean value of the risk factor i , then multiply it with weight, have ‘the supply chain finance’ all-round risk factors ratio as:

$$f_i = w_i \cdot x_i \quad (3)$$

According to all-round supply chain companies risk factors assortment, plus all ratios, get all-round companies risk ratios, sign as F_1, F_2, F_3 .

3.3 Optimizing the Evaluation Results

Meanwhile, because the different position the supply chain finance companies are, specially reflect that transaction capability, contribution range to supply chain finance, non fungible thing in supply chain, dependence to supply chain are different, accord to this four aspects, adhibit the difference factors Δ_i mean all-round participant companies position in supply chain, specially as in Table.1.

Table 1: The assessment element of value supply company’s difference factors

Factors capability	Financing corporate	Core enterprise	Logistics enterprise	Difference factors ratio
Bargaining power	a_{11}	a_{12}	a_{13}	a_{14}
Contributions	a_{21}	a_{22}	a_{23}	a_{24}
Irreplaceability	a_{31}	a_{32}	a_{33}	a_{34}
Dependence	a_{41}	a_{42}	a_{43}	a_{44}

In the table, $\sum_{i \rightarrow n} a_{ij} = 1, j=1,2,3,4; \sum_{i \rightarrow n} b_i = 1.$

According to preamble table, refer to the modified formula:

$$\Delta_i = \sum_{i \rightarrow n} \alpha_{ij} \cdot b_j$$

get the all-round participant companies difference factors Δ_i . As it is $\Delta_1 + \Delta_2 + \Delta_3 = 1.$

Optimize the evaluation ratio by the company difference factors, get the ratio which is the modified all-round company risk ratios to risk ratio summation, then estimate influence degree of all-round companies to system risk, depend on the records to contribute the risk control position, try the specialized control to all-round steps, to reduce the risk.

4 Establish the Risk Control Platform

As the analysis of the fore case, make clear of the risk subject, even the financing corporate, core enterprise, logistics enterprise, and impressions of each. In the past analysis, it always sets foot on financial institutions, the scope is big, and borrowing venture needs the money, belong to the disadvantaged assembles, is passive in the financial business.

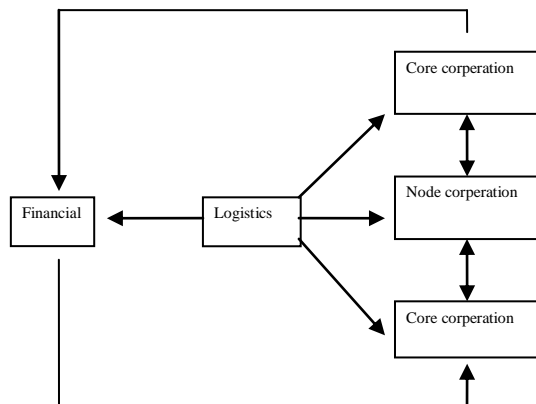


Figure 3: The Risk Control Platform for Supply Chain Finance

The financial institution offer the funds, is in the advantage position, decide most, when the third logistics enterprise break into, the situation is broken off in Figure 3 showed, it followed financial institution, afforded comprehensive supply chain information, found

the financial business breakthrough point and reduced the risk, combined borrowing corporate, under the tight supervision financial institution authorized, not only afforded logistics service, but also offered financial service as financing settlement, etc. Just is the 'win-win' for three. For the financial institution, the biggest challenge of business came from evaluating the borrowing enterprise to repay, is the business risk. Financial institution was short in commodity quality, price management, the pledge management for default loan, as the third logistics enterprise in, had the supervision, hedger, capital liquidation, transport agency, etc, in the business, via the afforded professional supply chain information, adjust the credit limit in time, was the method to face the business risk. Particularly include:

The third logistics enterprise cooperated with financial institution, firstly share the information, mainly reflected in company conventional information and commodity instant messaging. Company conventional information was corporate inner information and cooperate enterprise messaging in supply chain, as the corporate inner, besides conventional corporate loan needed enterprise estate, fund flow, financial statements, corporate benefit capability, must consider enterprise chattel scale, include raw materials, semi-finished and finished products, account receivable, warehouse, etc, comprehensively consider company operation; besides, from supply chain, referred to company operation, capital credit, the close degree among companies, generally were subject to volume of business and frequency of business.

Operate business concretely, should refer to business information, most was instant messaging. The purchasing stage included purchasing scale, cargo standard, dead time, priced alteration, transport instant situation, during the producing should consider enterprise production cycle, production capability and cost, yield, and the sales channel during sales stage, market share, stock liquidity, and customers satisfaction degree, homologue financial information needed the business messaging, aptly divided weight, would broaden business scope, reduced risk.

In specific business operation, because pledge loan had complex formalities, could not suit the timeliness demand, enhanced the cooperation between financial institution and logistics enterprise to unite the credit. Uniting the credit was that depended on long-time cooperation enterprise scale, management, operation to make credit with logistics enterprise about loan list. Logistics enterprise offered the loan according customer operation and pledged thing, made counter guarantee by cargo in supervise depot and under transport. Logistics enterprise could be out of financial institution twice supervision, neatly offered the borrowing corporate with financial service by that loan limit, not only afforded the loan service, reduced operation parts, raised logistics enterprise service, but also raised the financial institution supervision.

From traditional third logistics enterprise, financing enterprise was customer, offered logistics service at most time, got the company goal raising logistics service. Taking part in supply chain financing, the third logistics enterprise should change its role, played as 'super manager', pitched as neutral supervision corporate. The service logistics enterprise offered included storage, transport, and cargo supervision hedger in them, the risk was supply chain system risk and bank inner control risk, via tightly supervising the business and cargoes, coordinated fund flows, those risks could avoid.

5 Conclusion

Supply chain finance as a new business model, can achieve ‘win-win’ among financial institution, logistic company, supply-chain companies, include financing, factoring, settlement, insurance, etc services, from a part to a whole, analyze the supply-chain finance from supply-chain finance, have deeply discuss in many parts as follows: from the ‘win-win’ characteristic of supply chain, bring the supply-chain finance benefit out: financial institution, logistic company, debt company, and classify the supply-chain companies by core companies and node companies, define the supply-chain financial business model and development situation. Through analysis of supply-chain ‘commodity transport’ and ‘fund flood’, define the supply-chain business tactics as be on basics of informational flood, combine the commodity transport with fund flood, make system description on supply-chain business model. Make analysis on supply-chain risk judgment, define it as process risk on the basis of business. Via the fuzzy comprehensive evaluation method, list the supply-chain companies risk factors, establish the analysis model, had the demonstration analysis, make quantization to influence degree of all-round participant companies in risk analysis model, and improve the deficiency of demonstration according the conclusion. According the establishment of model and the conclusion of demonstration analysis, discuss how to establish risk control platform by single supply-chain finance company. Include that share the information between financial institution and logistics enterprise and make unite to credit and cooperation way, financial institution ask the logistics enterprise under tight supervision , financial companies and debt companies to have the closed-off credit and repayment.

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