

A Research Review on Pricing Influencing Factors of Supply Chain Financial Services

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Abstract— Supply chain finance, as a kind of innovative financial products, has attracted extensive attention of the industry. In the context of capital operation, it is the most important to study the supply chain finance. Adopting content analysis method, this article combs the research on factors that affect supply chain financial service pricing from six dimensions of Supply Chain Finance: risk, return, regulation, guarantee, customer relationship and macro policy, expects to provide a theoretical basis for enterprises to set the loan price, and some guidance for financing enterprises to choose appropriate products.

Index Terms— Financing interest rates, Financing service pricing, Pricing influencing factors, Research review, Supply chain finance

I. INTRODUCTION

Today, the supply chain has become the mainstream mode of industrial development. Martin (Martin, 1992), an expert on Supply Chain Management in the UK, points out that the competition in the 21st century is no longer the competition between enterprises and enterprises, but competition between supply chain and supply chain. Supply chain can make suppliers, manufacturers, distributors, retailers, even the end user together as a whole, through the information flow, logistics and cash flow.

At present, in the field of industry, Supply chain has realized the optimal allocation of physical resource, but the problem of capital flow breaking often occurs, so the society calls for a financial solution to solve the financial problems of the supply chain. In 2003, the Massachusetts institute of technology seminar, James B Rice made titled "Supply Chain Value Creation: Finance Meets Supply Chain" report, in which the financial instruments were applied in the supply chain decision-making, and he looked forward to the possibility of the combination of finance and supply chain and the potential value it brought. Hu Yuefei [1] (2009) claimed to adopt the compensation trade finance credit model while adjusting the emergence of new risk variables, by analyzing the structure of the transaction inside the supply chain, to provide relatively closed credit, settlement, financial and other comprehensive financial services business for the supply chain node enterprises. Wuttke [2], etc., (2013) studied the methods and differences of the supply chain finance innovation based on the six European business case analysis, and put forward the development framework of the supply

chain finance. Song Hua, Chen Sijie [3] (2016) argued that supply chain finance was divided into three stages: simple lending relationships between banks and enterprises, the supply chain financial services providers gradually shifting to the third party in the supply chain, the focus enterprises of supply chain finance using Internet technology to build industry ecosystem.

Capital suppliers in the supply chain financial gained the corresponding revenues and reduced the credit risk through the capital turnover, capital demanders filled the funding gap through financing to achieve the reproduction process, so as to achieve a "win-win" situation. Formulating reasonable financing service price, therefore, that can achieve the maximum of the interests of the whole supply chain and interests reasonable allocated, become the important hot topic in the field of supply chain finance service pricing.

II. SUPPLY CHAIN FINANCE SERVICE PRICE

Core enterprise in supply chain system, often defaults on upstream SMEs loans, and advances from the downstream SMEs loans by virtue of its strong influence. SMEs due to the less working capital, its financial situation is worse. However, development of supply chain financial can help to solve this dilemma. For the core enterprise, supply chain finance can reduce the financial cost of the supply chain

operation, and improve the competitiveness of the whole supply chain in the market, thus, it also has the desire to develop the financial supply chain management. In this context, financial institutions, especially the mainly commercial banks develop and innovate the integrated field to solve the problem of financial supply chain management on the basis of traditional trade financing. That eliminates the asymmetric information problems of SMEs and commercial banks by making the core enterprises and logistics enterprises as the key "middleman", at the same time enhances the credit of trade SMEs in the supply chain to obtain short-term financing at a lower price to ease the financial difficulties improve the supply chain by introducing mechanism of guarantee, so as to create a win-win situation. Because the supply chain finance is produced in order to solve the financial problems of the supply chain, various enterprises adopt different financial supply chain operation mode according to their own industry characteristics and the node of the supply chain, the involved parties and interests coordination is different, and the price is also different.

Scholars had little research on the definition and notation of financing service price, and most of them believed that supply chain finance price is the enterprise financing rate, such as Sun Zhonggang, Lu Fengjun^[4] (2015) thought that the most main price of supply chain finance was

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financing interest rates; Lekakos S D, Serrano a.^[5] 2016 maintained that service prices mainly included the financing rate and the rate of management fee in researching reverse factoring. Wang Junshou^[6] (2004) argued that loan pricing should include two levels: one was the lending interest rates, and the other was the various fees banks received for loans, including management fees, consulting fees, value, etc. As is known to all, the traditional loan price is financing rates, but compared to the traditional loans, supply chain finance pays more attention to risk sharing. Therefore, for SMEs, the total cost and risk of the supply chain finance price can be reduced compared to its direct financing. Supply chain finance is a complex system with multi participation including capital demanders (small and medium-sized enterprises on the supply chain), capital providers (financial institutions, the core enterprise or factor), guarantee enterprise, logistics enterprise, etc., each of that will directly or indirectly affect the price of the supply chain of financial services. It is the core of this paper to clarify the influence factors and the direction of the price providing the basis for setting the pricing model.

III. INFLUENCING FACTORS OF SUPPLY CHAIN FINANCIAL SERVICES PRICING

Supply chain finance is the combination of industry supply chain and financial industry. The characteristic of financial industry is the balance between risk and return while the main characteristic of supply chain is enterprise cooperation. This paper analyzes the influence factors of supply chain financial service pricing from five dimensions: the risk dimension, the return dimension and the supervision dimension of the financial industry, the guarantee dimension and customer relationship dimension of the supply chain industry, and the policy environment dimension.

A. Supply Chain Financial Risks

Some scholars have defined the finance as a methods for the allocation of resources across time in the uncertain environment, the uncertain environment is the root cause of risks. In the supply chain finance, there are a large number of uncertainties in many aspects, such as the moral consciousness and operating condition of loan enterprises, the selection of the financing operation process and the length of maturity. In view of these, the Basel Capital Accord divides the supply chain financial risk into credit risk, operational risk and market risk.

Credit risk is an important factor affecting the pricing. The New Basel Capital Accord provides two measurement methods of credit risk: the standard method and the internal rating method, and proposes that the conditional banks should conduct the internal rating method to calculate the customer's default probability by constructing historical model. Wu Qing^[7] (2007) showed that the Small Business Credit Scoring System was mainly applicable to small loans of less than \$ 250,000, and its predictive effectiveness could not be guaranteed in larger loans. The customer credit was the routine influence factor of the loan pricing, and credit rating is mainly based on the three dimensions of the company's historical credit, financial position (solvency and operating

conditions), the development prospects of the borrower to evaluate. Banking institutions needed to provide different types of credit products for customers of different credit ratings, the higher the credit rating, the greater the loan discount^[8].

In the design of loan operation mode and the control of logistics and capital flow in the supply chain, credit risk is effectively controlled by credit isolation and the control of the use direction of credit funds, but that causes a large number of post-lending operations and finally results in the transfer of capital demand side's credit risk to bank operation risk^[9]. The operational risk impact on prices tend to be overlooked, but the damage should not be underestimated. Li Changgui and Li Da^[10] believed that the amount of loss caused by operational risk was inversely proportional to the frequency of occurrence. As commercial banks' lending pricing business was generally operated by the grassroots units, it was more concealed.

The risk of cash flow break that borrowing enterprises faced was market risk, when the market uncertainty, such as sharp fluctuations in the price or demand of the collaterals, caused the market value of the collateral insufficient to offset the loan. Zou Xinyue^[11] (2005) proposed to use the VaR model to monitor loan market risk. Guo Zhanqin^[12] discovered that the changement of market risk factor had a positive contribution to the risk premium of the loan through the study of the loans pricing under the credit risk and market risk. Financing risk also includes term risk, and the maximum loan period is only one year based on supply chain less than the ordinary loan. Hu Guangnian^[13] (2014) believed that bond yields generally changed in the same direction as the length of the period and there was no upper limit theoretically. But in reality, because of the difference between the investment portfolio and the business, the profit rate will have a ceiling in reality. According to the theory of time preference, people prefer the current items, so the term structure has a great impact on the financing rate. The longer the financing period, the greater the financing rate. The longer the loan period, the more unpredictable factors, the borrower's credit situation deteriorated more likely, and interest rate risk is relatively deviated. Consequently, the longer the term of the loan, the higher the required term risk compensation.

Modern loan pricing is behaviorally part of big data management. It makes rigid control and risk prevention of authorization to parameter adjustment of loan pricing relying on a large amount of data information and complete data processing system, and then make the most reasonable decision. For example, the traditional credit risk quantification models such as KMV, Credit Risk+^[14], Credit Metrics^[15] and the modern risk assessment based on BP neural network, SVM^[16], Logistic model^[17], all can be used to measure financial credit risk of supply chain Model, and the application of these models require a lot of data collection, management and analysis. Although the risk is assessed prior to the loan, risk control during loan period is also very important.

Li Yixue, Xu Yu, et al^[18]. (2006) argued that market targeting strategy could control the price risk of collateral. Li et al.^[19] (2011) adopted the strategy of combining the risk

under side management with the pledge ratio, and concluded that the limit of loan downside risk could also meet the bank's standard for loan risk. The Downside Risk Control^[20] is composed of the maximum loss L and the tolerance β , which is willing to bear, and requires $P(\text{loss} > L) < \beta$. In addition, the syndicated loan model, the securitization of the platform loan assets and the bank-insurance cooperation mechanism all can effectively control the risk^[21].

B. Supply Chain Profit and Financial Service

In fact, supply chain provides products to the market as a whole, which reflects the value-added process of products. The revenue of the supply chain mainly refers to the total income of the retail side, but should be deducted the corresponding costs of production, financing, warehousing and logistics. Supply chain's turnover cycle τ the market demand for products and supply chain operating costs all affect the entire supply chain revenue. The higher the profitability of the supply chain, the smaller the probability of the occurrence of financial problems, repayment can also be guaranteed even if it occurs. Therefore, the higher the supply chain revenue, the lower the price of loans. The turnover cycle of supply chain includes order lead time, credit period and so on, whose influence on supply chain financial service price is indirect. The compression of order lead time not only affects the demand forecast precision of downstream distributors, but also has some influence on the production cost of upstream manufacturers^[22]. In the credit period, the seller does not receive any additional interest, the buyer can also reduce the corresponding cost by delaying payment, which can increase the order quantity and in turn make up for the seller's cost increases^[23].

Loan income is the difference between loan income and loan costs. With the emergence of third-party payments, banks are considering how to increase revenues and reduce costs to defend market position under increasing pressure. Therefore, costs and revenues are also the important factors affecting pricing. Money capital preservation point is the cost, Meng Bo^[24] thought that the raising cost bank of funds mainly consisted of three elements, namely the deposit interest rate (credit interest rate), taxes payable, wage costs. The deposit interest rate should be measured by the average deposit interest rate of the whole bank and adjusted with the adjustment of the national interest rate policy. Tax payable should be calculated in accordance with the provisions of the national tax range and proportion. Salary costs were set in full-line assets and debt ratio in accordance with their normal years. Loan cost included two aspects: explicit cost and implicit cost^[25]. The explicit cost referred to the cost that could be directly accounted for. The hidden cost referred to the cost with high uncertainty in the occurrence probability and amount.

Loan pricing should be formulated on accurate cost measurement and the initial loan pricing of Chinese banks is calculated by the cost of capital plus target income. The current pricing of third-party financing services (logistics enterprises, platforms, etc.) also use the cost (the credit interest rate from the bank) bonus pricing. Xie luoqi and Gong jihong^[26] found that the income of listed commercial banks in China mainly came from the net interest income (net interest

income comes from deposit and loan net income, financial business net interest income and other business) and settlement, agency fees and other intermediary services revenue, but the net interest income has always played a leading role in the income according to the data analysis.

C. Financial Supervision and Financial Supervision of Supply Chain

After the interest rate is marketized, the market interest rate fluctuates frequently. In the past, the relatively rigid interest rate adjustment mechanism with monetary policy adjustment is broken and the financial market environment will become more turbulent and fluctuant. Supervision becomes an increasingly important factor affecting credit. Hu Yanchao^[27] (2015) suggested that the optimizing market access mechanisms, improving the off-site monitoring system (periodic monitoring system of banking interest rates, deposit and lending spreads, foreign currency spreads fluctuation) and changing the site inspection methods (investigation, special investigation, field visit) could strengthen the interest rate market regulation. Liu Xiaofeng, et al^[28]. (2016) concluded that strict capital regulation would push up the loan price and improve the guarantee conditions by analyzing the panel data of 16 domestic listed banks from 2000 to 2015. Yang Xiaoliang, et al^[29]. (2014) studied the pricing mechanism of small-sum loan companies in Gansu by using evolutionary game analysis method, and found that the tax incentives or financial subsidies obtained by the loan companies could exceed the excess profits obtained under the high loan interest rate. Under these circumstances, pricing regulation will play a significant role.

Logistics supervision of supply chain finance requires standardization of the regulatory system and operational procedures, establishment of credit evaluation system and omni-directional multi-level routine supervision measures, effective reduction of the internal operational risk^[30]. There are two ways to implement the logistics supervision of the bank: self built logistics platform and logistics company. JP Morgan Chase Vastera integrated different platforms to achieve complementarity and improved the visibility of cargo transport information, it was called "the physical supply chain and financial supply chain marriage." Similarly, the company with the logistics can also achieve a win-win situation, "One Touch" launched a product called "SME Foreign Trade Financing Easy" in 2008 with the Bank of China strategic cooperation. The product of the maximum amount is 3 million and loan risk is shared by the Bank of China and "One Touch" averagely, the biggest attraction of that for SMEs is no needs to provide security and collateral^[31].

D. Quality guarantee, credit guarantee and insurance

SMEs through the supply chain financing is lower than the direct cost of borrowing from the bank because supply chain finance is based on real trade between the SMEs and the core enterprise, not only quality guarantee and margin assurance but also core enterprise assurance, thus reducing the bank loan interest rates.

In stock financing, the loan-to-value ratio is the core enterprise risk control indicators, it represents the guarantee degree. In practice, banks tend to rely on experience to assess collateral, such as real estate mortgage rates of 70%

commonly, automotive, steel, chemicals, grain and other loan-to-value ratio from 55% to 70%, the production equipment mortgage rates of about 50%, special equipment for mortgage rates around 10%. In accounts receivable financing, the loan-to-value ratio of accounts receivable and the transfer of the forehead also represents the security of the collateral size. According to the loan-to-value ratio set by the bank, the upper limit of the loan-to-value ratio of trade accounts receivable is 80%. Zhang Huifeng and Cao Pu^[32] referred the private small and medium sized producers could use the accounts receivable the vendor provided as a guarantee in the study of film and television industry SMEs problems. Issuing enterprise with strong strength and high credit rating, had higher accounts payable bill guarantee value, which could be used to solve the guarantee problem of bank lending of private small and medium-sized production enterprises. In prepaid account receivable financing, payment of deposit proportion is very important. Zheng Zhongliang, BaoXing, et al^[33] found that the initial (default) margin increased the default cost of the financing enterprise, reduced the credit risk, and at the same time, the bank could use it to engage in the deposit loan business. For financing enterprises, on the other hand, while increasing the initial margin could improve the loan-to-value ratio, but the financing cost was relatively high especially for the short-term capital demand big financing companies, so to burden of higher margin ratio was not a reasonable choice.

Owing to the real trade of supply chain finance, core enterprise will provide credit guarantee for SMEs. Yi xuehui, Zhou zongfang^[34] (2011) argued that the core enterprise's repurchase commitment guarantee was an option (buyback strategy is an option) to implement the new way of guarantee, which could share the risk and improve the SMEs inventory loan-to-value ratio and expected bank loan profit. Besanko and Thakor^[35] insisted that the bank could completely distinguish borrowing enterprises with different risks by different combinations of collateral and interest rates, namely high risk of borrowing enterprises selecting high interest rates and low requirements of collateral, and low risk enterprise, to the contrary.

Insurance financial companies use loan guarantee insurance, liability insurance and trade finance, to help banks diversify credit risk^[36]. Loan guarantee insurance, can make many companies get bank loans while they need not provide or less (quality) provide pledge; Guarantee agencies can also purchase liability insurance to get loan risk guarantee, and require banks to reduce margin deposit ratio and enlarge guarantee ability, so that help more enterprises finance. Due to the strength of the insurance company's capital and the relatively strong repayment ability, SMEs can not only obtain the insurance, but also get preferential interest rate to float downward. In addition, the discount effective offsets insurance premiums, also reducing the cost of financing in general.

E. Supply chain customer relationship

Close business contacts between enterprises and strong core enterprise strength, good supply chain is very popular with the financial institutions. SMEs occupy very important

position in the supply chain, so a good customer relationship also has a significant influence on supply chain financial price.

Relationship between banks and enterprises is the most important customer relationship of supply chain finance. Because of the low information transparency of financial SMEs and the severe information asymmetry problem between banks and enterprises, it is necessary to maintain a long-term and close relationship between banks and enterprises and form a special "relationship"^[37]. The way that relationship influences on loan interest rates was controversial. Some scholars believed that close partnership had a negative effect on corporate lending rates, such as Berger and Udell^[38]. Their study said the fact that the longer the relationship between banks and enterprises, the more banks understand the quality of borrowers, thus the enterprise credit availability enhanced, and loan interest rates fell. But from the bank's view, when the relationship between banks and enterprises got closer, the bank had more possibilities to raise interest rates and recover upfront specificity investment. Fama^[39] observed that relations could increase the value of the borrowing enterprise for the bank's "lock-in effect" on the enterprise, so when the relationship tightened, banks tended to charge enterprises of long-term partnership for higher borrowing rates.

Researches on the relationship between suppliers, manufacturers and retailers are as follows. Keith Goffin, Fred Lemke^[40] (2006) obtained the knowledge of the attributes of suppliers and manufacturers by using psychological techniques to test the 39 managers responsible for purchasing. The manufacturer's evaluation of the supplier includes "flexibility", "delivery performance", "quality" and "price", but not all suppliers were suitable for close relationship. Zheng Dong, Li Jianhua^[41] (2010) argued that a long-term cooperation agreement of risk sharing and profit sharing was existed between car manufacturers and suppliers. The following is the study on the relationship between manufacturers and retailers. On the one hand, from the viewpoint of principal agent, retailers were agents of manufacturers and consumers, thus non-cooperative game relationship were formed in retailers and manufacturers^[42]^[43], on the other hand, the retailer and the manufacturer were the cooperative relationship of benefit sharing^[44]^[45].

In addition, besides the trading relationship, there is a security relationship existed between the core enterprises and the financial SMEs when financing. Jiang Changyun etc.^[46] (2009) suggested that Some Guarantee corporation were committed to innovative security mode, such as the use of supply chain enterprise to guarantee way, and paid attention to SMEs providing supporting service to large enterprises when choosing customers. Bao Jinghai, Zhu Yuemei^[47] insisted that the supply chain core enterprise and SMEs could jointly fund the establishment of mutual funds consisting of UNPROFOR Enterprises, by adopting the UNPROFOR financing mode which locks logistics and cash flow, and plays the leverage role of margin.

F. Macro policies and social factors

The effects of interest rate policy, tax policy and risk compensation policy on supply chain financial pricing cannot

be ignored. The interest rate policy has a direct impact on the pricing behavior of bank loans by affecting the benchmark interest rate and interest rate. In recent years, china's bank spreads narrowed, so that the banking and financial institutions who make spread as a source of profit, have been a significant policy impact. In the case of mastering the right to speak in the credit market, the bank's willingness of passing on the capital cost and maintaining the level of profits is increased significantly through loan pricing^[48]. The loan enterprise usually transferred the tax cost of the loan to the financing enterprise, thus the financing cost of the financing enterprise was increased, and the loan interest rate was raised.

Li Hollans et al.^[49] 2010 empirically found that the lower the tax rate, the lower the interest rate on loans provided by banks. In 2005, Zhejiang province took Zhejiang branch of agricultural bank and commercial bank as a pilot unit of risk compensation policy, and the government gave the risk compensation according to the net amount of loan ratio of 0.5%-1% for risks arising from the addition of small business loans^[50]. The provincial government burdened 60%-70%; city and county governments burdened 30%-40% for the risk of commercial banks' loan losses in support of scientific and technological SMEs, while commercial banks only bore the risk of loss of interest^[51].

Table 1 Economic and social factors that influence the price of supply chain financial services

Influence factor	Author and year	Main points
Policy impact	Mishra, Montiel et al. ^[52] (2014)	Different credit structures had different responses to policy shocks
Information efficiency, operating costs and bargaining power	Dietrich ^[53] (2012)	The difference in interest rates between large and small loans is mainly the difference of information efficiency, operating cost and bargaining power
Portfolio composition hypothesis	Degryse, et al ^[54] (2012)	The difference in interest rates between foreign banks and domestic banks is mainly composed of different portfolios
Corporate transparency and quality	Daniels and Ramirez ^[55] (2008)	High quality companies adopted the internal rating method; the loan interest rate was reduced. The high-risk enterprises adopted the standard law, small banks benefited.
Social factors (social entrepreneurs, age marital status, population density)	(Neuberger and R�athke- D�oppner ^[56] 2014)(Yang Yi and Yan Bailu ^[57] 2012)	Mortgage and relationship lending than entrepreneurs have a greater role. Single entrepreneurs get cheaper than married loans. Enterprises in the peripheral area of low population density have higher interest rates than the population agglomeration area.
Consumer expertise	Legarreta ^[58] (2014)	Negative relationship (Spanish family financial survey)
Competition of financial institutions	Tokle, Fullerton et al. ^[59] (2014)	Credit Union competition depresses lending rates

IV.SUMMARY AND PROSPECT

Supply chain finance plays an important role in solving the financing difficulty of small or medium-sized enterprises, and can also provide new profit business for banks, enhance the core competitiveness of supply chain. Therefore, the development of reasonable supply chain financial services prices in the supply chain interests of coordination and financial product innovation has important significance. However, combing factors is the most basic work of pricing.

Through the above research, the following suggestions are given to the pricing companies : firstly, they should learn from well-known commercial banks interest rate control measures, establishing risk management system of comprehensive coverage, to improve the risk management ability. They also should strengthen the implementation of

effective identification, measurement and control of interest rate risk to ensure that interest rate risk loss exposed

in a reasonable range and ensure operational safety. Secondly, it is necessary to strengthen the concept of cost efficiency, develop the model and method of the cost of capital, and optimize the decision-making procedure of product pricing, to make the product price reflect the cost of capital and improve the overall profitability of the bank. Finally, they should strengthen the financial regulation and supervision to ensure that all aspects of logistics reasonable and legal, so that the supply chain finance can effectively solve the financing difficulties of SMEs, the core enterprise can give full play to the role of financial management, and the supply chain can run more smoothly.The financing enterprises should pay attention to the following questions when selecting the appropriate supply chain financial products: First of all, to estimate the value of the pledge or guarantee the risk of enterprises, and then to estimate the cost of financing according to the financial products provided by financial enterprises; at last, to select the most beneficial financial products to the enterprise.

When we summarize and analyze the relevant research results, we found some shortcomings: firstly, although the theory of risk management is mature, how to better integrate

with supply chain finance is still a problem to be solved. Secondly, China's credit environment is still poor at present, credit evaluation system has yet to be improved, Wall Street's credit evaluation system has been mature since the outbreak of the financial crisis in 2008, but these international advanced rating method does not apply to China's national conditions. Finally, Supply chain financial pricing compared with the traditional pricing of loans focused on considering the supply chain partnership, and the effect of supply chain financial participants on supply chain financial pricing needs to be quantified. In short, more in-depth research remains to be carried out, for example, how to evaluation the risk in reason, how to estimate cost-benefit and quantification guarantee relationship, and how to work out the supply chain financial service price both parties are satisfied.

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