

Research of Risk Identify of Accounts Receivable Financing Based on System Dynamics

Aimin Deng, Lihui Du

Abstract—Based on the analysis of operational mechanism and risk causes, this paper analyzes the financing risk, supply chain operation risk, financing operation risk, legal risk, macro system risk and market risk in six dimensions of SME accounts receivable financing in supply chain. This paper systematically studies the risk characteristics of SME accounts receivable financing, and build SD model of SME accounts receivable financing through the VENSIM simulation software to carry out risk identification, it could identify the risk dimension and risk boundary effectively, and it could dynamic identify the incentive of financing risk through feedback loops analysis of financing process, provides technical support for the further risk measurement and risk prevention of SME accounts receivable financing in supply chain.

Index Terms—Supply chain finance; SME; Accounts receivable financing; Risk identify; System dynamics.

I. INTRODUCTION

On the one hand, SCF enable more SME to enter into the scope of services of financial institutions and with help to the development of supply chain. On the other hand, financial institutions can further transfer and reduce the risk of its commitment effectively^[1]. At present, both international and domestic banks are all actively developing accounts receivable financing business of SMEs in the supply chain, which is the preferred choice for SMEs to solve the financing problem^[2]. Risk identification and assessment of financing is an important part of bank and other financial institutions to work on loans, and risk identification method of single enterprise with real estate has been relatively mature^[3]. However, accounts receivable financing in the supply chain is different. It includes SME

Aimin Deng, the School of Economics and Trade, Hunan University, Changsha, China

Lihui Du, the School of Economics and Trade, Hunan University, Changsha, China

(the main) +SME accounts receivable (movable) +supply chain that SME participated (debt), the lack of movable property of SME make up by supply chain. So, the risk of accounts receivable financing is influenced by multi-dimensional factors in supply chain, it is in the complex risk system of supply chain^[4]. System dynamics view the complex problem as a boundary system to conduct analysis from the perspective of system thinking^[5], which has significant advantages on researching complex system problems, it is considered to be effective.

method of risk identification on social and political, economic and natural^[6]. Facing complex system problems, system dynamics analyze deeply and debugging repeatedly by building SD model, identify risks and analyze the main risk in the financing process^[7].

Based on the mode of SME accounts receivable financing, under the background of real transaction process in the supply chain. This paper systematically studies the risk types of SME accounts receivable financing, establish the feedback relationship between the risk factors through the VENSIM simulation software to build SD model of SME accounts receivable financing, to identify the main factors that may trigger different risks, and the different consequences that the risk may lead to.

II. Risk Analysis of SME Accounts Receivable Financing in Supply Chain

A. The Operation Mechanism of SME Accounts Receivable Financing in Supply Chain

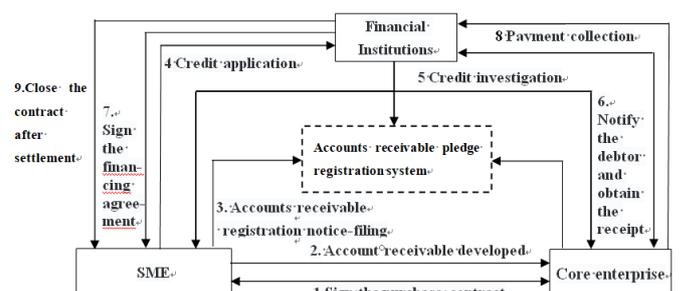


Figure 1 Flow chart of account receivable financing

The specific operation process of SME Accounts Receivable Financing in Supply Chain as follows:

- 1) SME signs a real transaction contract with core enterprise;
- 2) SME gets accounts receivable documents from core enterprises after invoicing, then SME become the supply chain creditors and core enterprise as the debtor;
- 3) SME registers and publicizes accounts receivable in People's Bank of China receivables pledge registration system;
- 4) SME issues accounts receivables pledge application to financial institutions;
- 5) Financial institutions accept and carry out pre-loan investigation to credit applicants, debtors and accounts receivable;
- 6) Financial institutions and SME send "receivables payment notice" to the core enterprise and promise to repay within the time and get the receipt;
- 7) Financial institutions loan to SME after determine pledge rate and sign financing agreement, then SME become debtor in accounts receivable financing, the repayment comes from the accounts receivable that pledged;
- 8) Core enterprise will pay accounts receivable back to the special account designated by the financial institution when credit expires;
- 9) Financial institutions carry out credit settlement, deduct the principal and interest of credit and close the contract.

B. Analysis on Risk Factors of SME Accounts Receivable in Supply Chain

Banks and other financial institutions carry out credit business with SME based on comprehensive strength of core enterprises and its overall management of supply chain, it reduce credit risk and information asymmetry between banks and enterprises, then weakened self credit risk of SME through mechanism design^[8]. However, SME accounts receivable financing mode is complex, there exist principal-agent relationships among financial institutions, core enterprises and SME, the risk of financing have feature of conductivity, complexity, dynamics, transferability and so on^[9].

After analysis, we divided SME accounts receivable financing risk into six dimensions as follows:

- 1) Financing credit risk
SME accounts receivable financing Credit risk is defined as SME and core business due to various reasons in supply chain, unable or unwilling to repay the loan, then leads to the possibility of banks and other financial institutions suffered losses.
- 2) Supply chain operation risk
The repayment of accounts receivable financing in supply chain comes from the sales income in the supply chain, and the fundamental of self compensation is the real transaction under the trade. The precondition is the design of value, the realization of value and the transmission of value can form a complete and circular closed system in the operation of supply chain. Once a link fails, the risk will also spread to the entire supply chain, causing loss of supply chain operations directly. Thus, the loan can't repay in time, it will cause great risks in implementing SME supply chain accounts receivables financing.
- 3) Operation risks of financing
Operation risks of SME accounts receivable in supply chain refers to the risk of indirect or direct losses of the financing entity that due to the imperfect or the operation process, system, personnel, technology or external events and other factors during the process of providing financing services.
- 4) Market risks
According to the definition of new Basel agreement, the market risk refers to the risk for adverse changes in the market price and the company's internal and external business losses, it exists in the company's trading and non trading business, market risk, interest rate risk, exchange rate risk, including stock price risk (including stocks, derivatives, etc.) commodity price risk.
- 5) Macro system risks
Macro system risks refer to the loss of enterprise profits caused by the fluctuation of economic activity and price level, which is affected by the economic trend and macroeconomic policies.

Because of the mode of SME accounts receivable financing has the characteristic of short-term financing, influences of macro systemic risks has no direct effect on the financing behavior, but through the impact of supply chain and the market, the transitivity of the supply chain, then affects the safety of financing.

6) Legal risks

Because of accounts receivable is based on contract of monetary claims, according to the relevant provisions of the "contract law", there exist contract rights revocation, modification, offset, subrogation and the limitation of action period and other legal risks under the basic contract of accounts receivable financing. There still exist defects on the relevant legal effect and the level of judgment, and there are also legal efficiency conflicts. In these cases, there is a risk of failure of repayment.

III. Identification of risk of SME accounts receivable in supply chain financing based on system dynamics

According to the feedback principle of system dynamics,

we build system dynamics risk identification and causality feedback model of SME accounts receivable financing supply chain by system dynamics simulation software of VENSIM, as shown in figure 2.

SD model could describe the internal structure of the feedback system of risk, and it reflects all the impact of risk factors and the relationship between principal parts also reflects the correlation of various risk factors^[10]. In the model, "+" represents a positive correlation between two variables and "-" represents a negative correlation between two variables. Due to the article limited in length, this paper selects financing credit risk to carry out risk identification in detail, which is the most representative, and other types of risk identification process is similar.

Select "Credit Risk" variable in the table and click the toolbar button "Causes Tree" analysis, then get causes-tree of accounts receivable financing credit risks showed as Figure 3. In order to find the boundary that affects the credit risk, it is necessary to analyze the end of the causal tree use the same approach, and then we can get all the risk factors.

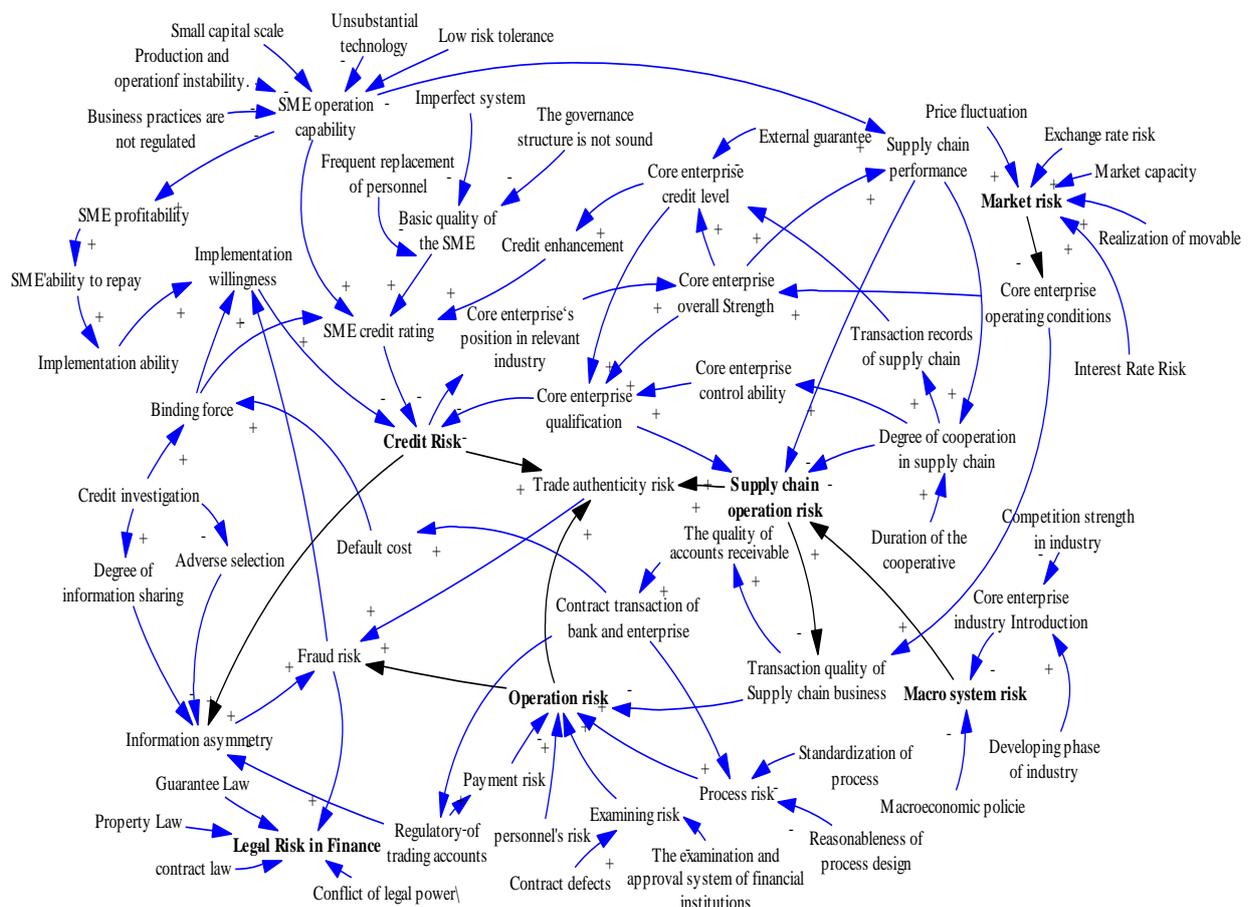


Figure 2 Financing risk identification model of SME accounts receivable financing in supply chain

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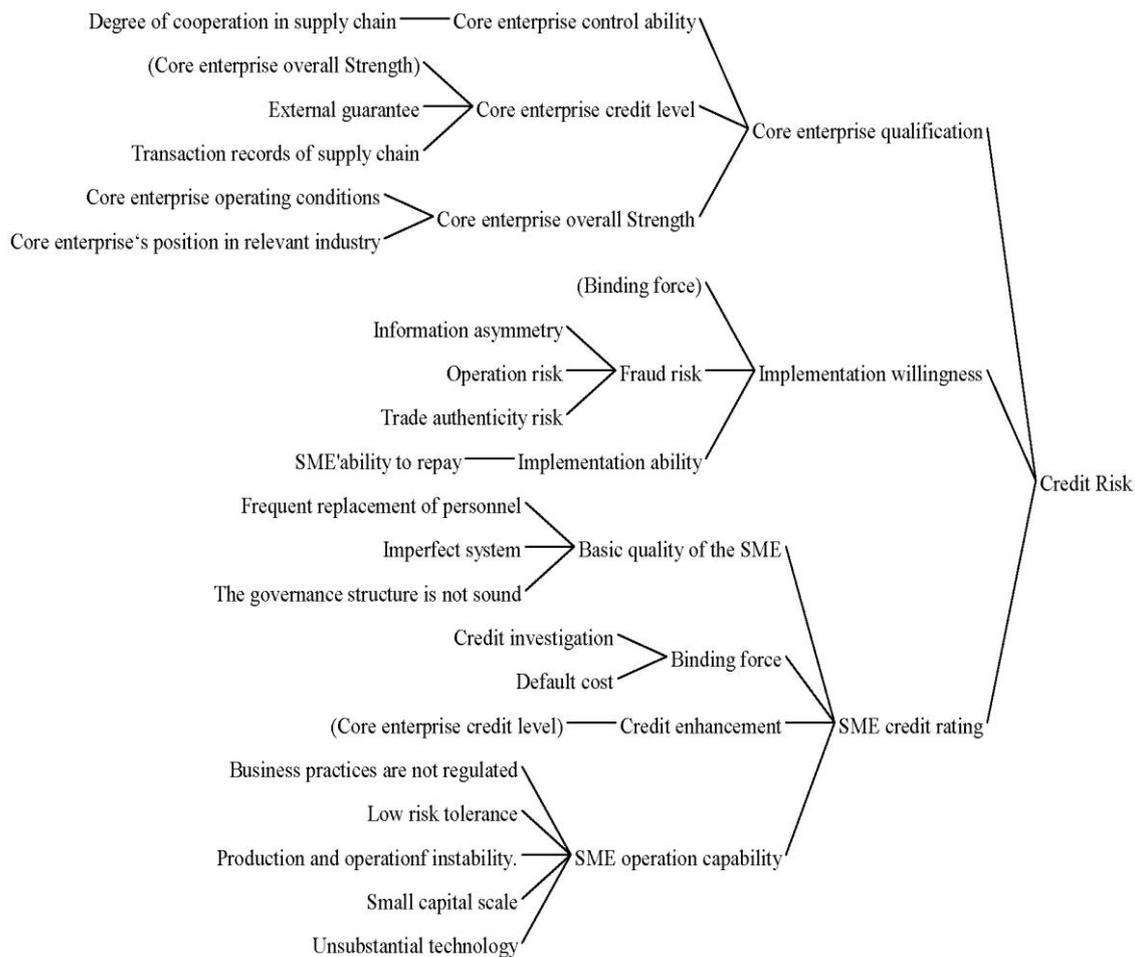


Figure 3 Credit risk causes-tree

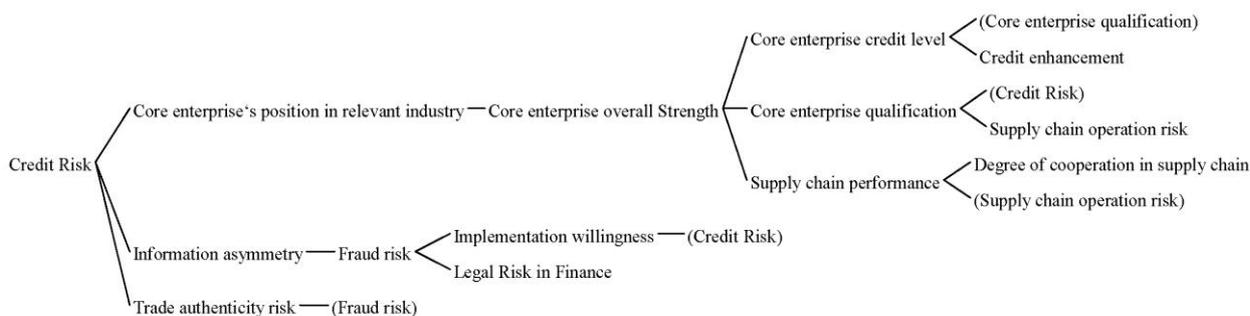


Figure 4 Credit risks uses-tree

Select financing "Credit Risk" variable in the table and click the toolbar button "Uses Tree" analysis, then get Uses- tree of financing credit risks showed as figure 4. Continue analyze the end of the uses tree use the same approach, and then we can get all the consequences.

Select "Credit Risk" variable in the table and click the toolbar button "Loops" analysis, as showed that there is a total of 68 feedback loops under financing credit risks. Through the judgment of polarity for all the loops, then get 58 positive feedback loops and 10 negative feedback loops.

According to the principle of system dynamics, positive feedback has a self reinforcing effect and negative feedback has a self regulatory effect.

We can get all the risk factors for the other five risk dimensions in the same way, also the corresponding feedback loops and the loop path of risk, so that the system boundary point of risk analysis could be identified.

IV. Conclusions

Through analysis of cause-consequence tree and feedback loops, we can identify all the risk factors for credit risk, and we have some conclusions as follows:

- 1) The more factors, the greater likelihood of the risk will occur, the longer of the chain, the more difficult to identify potential risks.
- 2) If more consequences caused by a risk factor, the possibility of loss will more likely to happen after the risk occurred, and the longer of the chain, the wider of impact scope and range.
- 3) The risk will give rise to new risk of the next level, and then lead to take measures to control these risks, so as to reduce possible risks. Also, risk reduce may lead to reduction of controls, and then result in risk increase ultimately.
- 4) After the risk occurs, it will be gradually reduced through self strengthening of positive feedback loops and self-regulation of negative feedback loops. Thus, it is necessary to implement supply chain financial regulatory mechanism.

It will identify the risk dimension and risk boundary effectively with the help of system dynamics to carry out risk identification for SME accounts receivable financing in supply chain, and it could dynamic identify the incentive of financing risk through feedback loops analysis of financing process. Based on Analysis of characteristics, status and severity of various risks, we could develop corresponding measures and path to deal with all types of risks. Thus, risk Identify of accounts receivable financing based on system dynamics is feasible and effective, it also provides technical support for the further risk measurement and risk prevention of SME accounts receivable financing in supply chain.

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Dr. Aimin Deng is a full time professor and doctoral supervisor at the School of Economics and Trade of Hunan University; the founder and Director of the Institute of transport and logistics (www.tl-hnu.cn, 2006) ; the founder and Director of Sino-German Center for transportation and logistics of Hunan University (www.tl-cnede.org, 2008).Research areas: logistics and supply chain management (including finance) systems, transportation systems, e-commerce and IOT systems. She studied in Germany, has a certificate of advanced English to study abroad by the Ministry of Education in China, and was the head of E-Commerce and Logistics Management Department and Information

Management and Information System. She has a wide range of exchanges and cooperation with national and international enterprises, institutions and Governments, and social and academic positions; hosted and completed nearly more than 40 domestic and international projects, published more than 100papers and guide more than 100 graduate students.



Lihui Du is now studying in the School of Economics and Trade of Hunan University, majoring in Applied Econometrics. His major research direction is logistics and supply chain finance under the guidance of tutor Professor Aimin Deng.

After two years studying, he has gotten the basic research quality and understanding of his research field. In addition, he have several years of experiences in project logistics and international logistics industry, which can be of great service to him in academic research and the unity of knowledge and action. In a word, he is a doctoral student who has a lot of energy, innovation and research ability.