Research on Order Financing System Dynamics in the Chain Finance Model

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Abstract

Supply chain finance is an efficient method to solve SME's financing problem. A core issue is to simulate the supply chain finance system's real operations. Especially small and medium-sized enterprise financing and development are difficult, so that the supply chain financial innovation is imminent. To solve the problem of shortage of funds for the development of enterprises, the most effective way is to have a good financial way. With the rapid development of the global supply chain finance, order financing emerges as the times require, but in our country, the research is under studying. This paper will use the method of system dynamics, base on the small and medium-sized enterprise order financing, building order financing system system dynamics model and simulation in Vensim ple, to explore the effect of order financing mode on the benefit of small and medium sized enterprises and supply chain.

Key words: Supply chain finance; Small and medium sized enterprises; System dynamics; Order financing; Chain finance model

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INTRODUCTION

The small and medium-sized enterprise creation about 60% of GDP of import and export. It is the basis of economic status in our country, plays an important role in stable employment and expand domestic demand and so on. Because of small and medium-sized enterprises in China started late, slow development, many small and medium-sized enterprises are still in the growth stage of enterprise, facing every kind of bottleneck. Especially the problem of shortage of funds, resulting in their corporate restructuring and other aspects is very passive, no money to introduce advanced science and technology, which lead to bankruptcy. The commercial banks to evaluate them in, see the low scale, small and medium-sized enterprises of low strength, low credit situation, more reluctant give them a loan, or loan interest rate is very high. China is not specifically for the financing of small and medium-sized enterprises in mature capital market. So the small and medium-sized enterprises in the process of these difficult development. All in all, the small and medium-sized enterprise financing difficult reason mainly has two, one is itself is not reliable, cautious bank lending psychology. Small and medium-sized enterprises because they do not have the competitive advantage, and in the negotiations with the core enterprise in supply chain lack the right to speak, therefore, they cannot get the favorable credit policies, a lot of liquidity is receivable, prepayments and the occupation of inventory. So they face the problem is insufficient cash flow everyday.

This paper will analyze the growth of the economic benefits of small and medium enterprises under the mode of order financing. Purchase order financing is refers to the enterprise by good credit the buyer product orders, in the technology is mature, production capacity and security conditions, by the banks to provide loans to special, for businesses to buy materials production organization,

the enterprise after payment is received immediately for the repayment of a loan business. Order financing business loans to the small and medium enterprises whose product has the market and benefits, but lack of cash flow. Domestic and foreign industry has many experts of the supply chain who makes a corresponding financial research, analysis the principle and function of the supply chain of small and medium enterprises inventory financing. Krass et al. studied several important aspects of using environmental taxes to motivate the choice of innovative and "green" emissions-reducing technologies as well as the role of fixed cost subsidies and consumer rebates in this process. Fairchild (2005) does a certain research on the integration efficiency of the financial supply chain with intelligent matching. Silvestro and Lustrato (2014) analysis in the supply chain finance in the supply chain in the integration of financial and physical supply chain. Hartley-Urquhart (2006) researches on the global supply chain finance outsourcing and logistics.

This paper will use system dynamics to simulate the situation of small and medium enterprises in order financing. System dynamics are not only a complete modeling tool, but also a complete methodology and thinking mode. It is a combination of qualitative and quantitative simulation research. System dynamics often use computer technology to simulate and analyze, predict the future behavior.

System dynamics can solve a wide variety of complex social problems, and in the case of insufficient data, it can still be modeled. At present, the experts in the supply chain finance order financing research mainly concentrated in the optimal operation strategy, and analysis of bank risk limit of suppliers and distributors optimal decision-making influence, impact on the overall benefits of the research on supply chain upstream and downstream enterprises and small and medium-sized enterprises are few. Therefore, this paper attempts to use system dynamics model for the overall benefit of the supply chain are studied in simulation software vensimPLE.

1. MODEL BUILDING

1.1 Process of Model

a) Supplier and distributor to sign the purchase and sale agreement.

b) The supplier depends on the purchase and sale agreement to apply for financing to the bank.

c) Bank has an examine and verify on the effectiveness of the border agreement. And bank assesses the financial situation of the enterprise to confirm the line of credit.

d) Supplier and bank sign a financing contract, as well as the relevant guarantee contract.

e) Bank loans to supplier, while supplier must be used in the appropriate loan purposes.

f) Dealer should be payment by instalments to the bank account of supplier, the bank deducted from the account corresponding to the loan.

1.2 Basic Assumptions

a) In consisting of a supplier and a dealer of two single cycle supply chain systems, suppliers and distributors are risk neutral. The supplier is what we refer to small and medium-sized enterprises, is also behind the model of producers.

b) Suppliers are small and medium enterprises financing needs of smes.

c) Suppliers and distributors signed a purchase and sale contract, the two sides will not exist default behavior, the two sides want to maximize the benefits.

d) Banks, suppliers and distributors of information equality, there is no information asymmetry and other credit problems. Bank credit risk is very small, that is, the bank is willing to provide order financing.

e) The article mentioned in the purchase order financing order is refers to the dealers in the enterprise are not put into operation before orders, that this part of the purchase order financing funds, bank can recover, but if banks lend out excess this part of the funds, it is possible there is a certain risk. The risk in this paper is not considered temporary.

f) This article will supply chain benefit equivalent to the supplier and the dealer benefit. The dealer benefit only considers the dealer sales profit, other factors are not considered.

g) Due to the existence of the bullwhip effect, dealers will be in accordance with market demand increase in proportion to the reservation. In this paper, we assume that percent increase.

1.3 Causal Loop Diagram of the Model

Circuit diagram is to constitute the system basis, establish the causal loop diagrams such as Figure 1. Producers rely on financing order of financing increased, increasing the amount of cash producers, the expansion of the scale of production increases, added to increase the production investment, expand the scale of production, increase production capacity, enterprises operating income increased. Increase the amount of cash producers has. This is a positive feedback structure. When enterprises operating income increased, will improve the profitability of enterprises, the enterprises to increase the scale and enterprise scale upgrade will allow banks to be more recognized and can obtain more financing.

When the manufacturer's cash flow increased, the largest increase in production scale, investment increased, so that the amount of cash to the manufacturer to reduce the need to increase the interest of the bank's interest in corporate cash flow, resulting in a reduction in corporate cash flow.

On Supply Chain Revenue loop: Enterprises operating income increased, making the benefit of the enterprise (Supplier) increased will increase the efficiency of supply chain; when meet the enterprise orders increased, dealer sales volume will increase, dealer income will increase, improve dealer benefit, increase the efficiency of the supply chain.

Figure 1
Order Financing Causal Loop Diagram

1.4 Dynamic Flow Diagram

Enterprise purchase order financing can increase the cash inflows from suppliers, supplier order financing amount is jointly decided by the finances of the business demand and production of food processing enterprises of raw materials, also by banks to set a proportion of the financing effect. Producers must time repayment. The relevant mathematical relationship is as follows:

Table 1
Relational Mathematical Relation

Mathematical relation	Number
Supply chain effect = supplier benefit + dealer benefit	(1)
Supplier benefit = enterprise cash flow	(2)
Dealer benefit = dealer sales profit	(3)
Dealer sales profit = dealer sales revenue - dealer sales cost	(4)
Dealer sales revenue = market demand * sales price	(5)
Dealer sales cost = predetermined amount * dealer purchase price + operating cost	(6)
Scheduled volume =1.1 * market demand	(7)
Amount of financing = (scheduled volume*unit output investment) * financing ratio	(8)
Production loan =INTEG (new financing - repayment of borrowings)	(9)
New financing=IF THEN ELSE(TIME<1, Financing amount, 0)	(10)
Repayment of loan	(11)
=IF THEN ELSE(TIME>=1,IF THEN ELSE(TIME< Term of loan+1, Financing amount/ Term of loan,0),0)	
Interest = production loan * interest rate	(12)
Cash inflow = new financing + operating cash inflows	(13)
Cash inflow from operating activities = Cash income + Withdraw cash credit	(14)
Cash outflow = Production costs and other costs + additional production investment + repayment of borrowings + Interest	(15)
Corporate cash flow =INTEG (Cash inflow - cash outflow)	(16)
New production investment =IF THEN ELSE （Financing ratio >=1，Financing amount * （Financing ratio -1），0)	(17)
Withdraw cash credit = Accounts receivable / receivable collection period	(18)
Cash income= Dealer purchase price * Predetermined amount * （1- The proportion of credit)	(19)

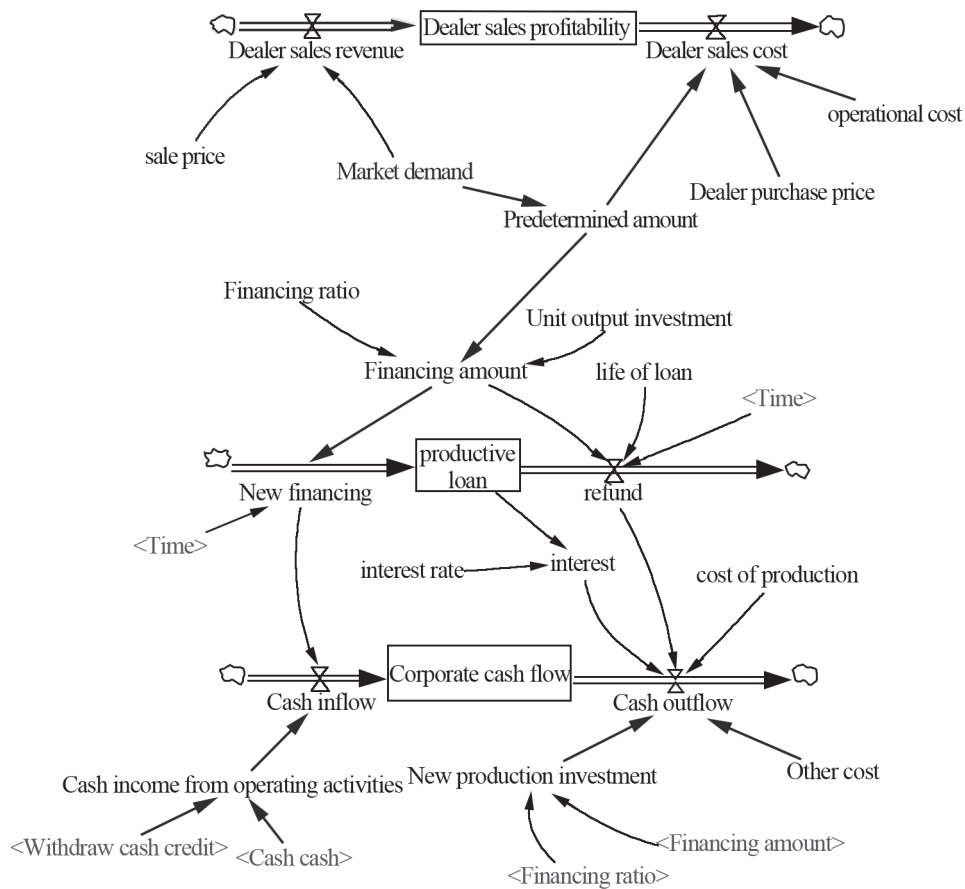Related system dynamics flow diagram is as follows:

Figure 2
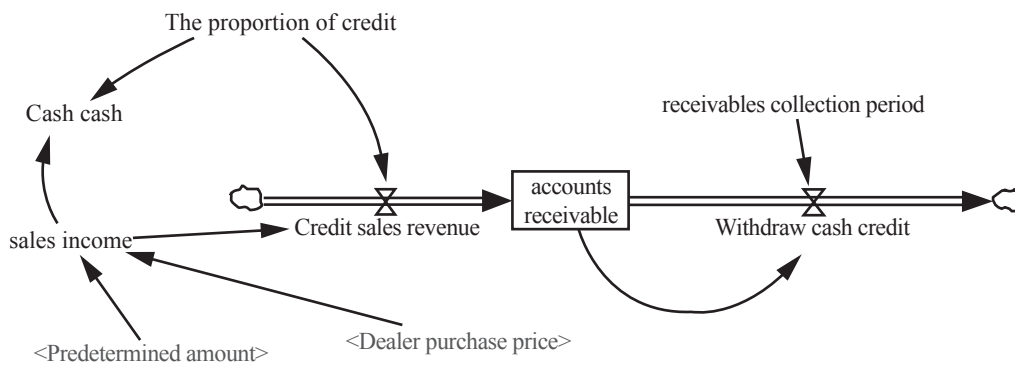**Supply Chain Cash Flow Diagram Under Order Financing**

Figure 3
Order Financing Under the Supplier Accounts Receivable Funds Flow Chart
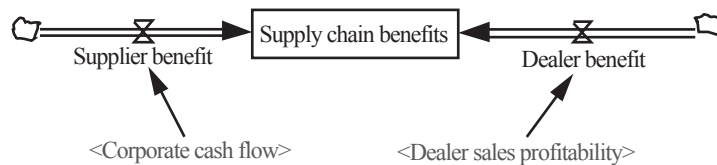
Figure 4
Supply Chain Efficiency Flow Chart Under Order Financing

2. MODEL SIMULATION AND CAUSE AND EFFECT ANALYSIS

2.1 Simulation Parameter Settings

According to the general characteristics of small and medium enterprises, this paper will be related to the variables and parameters of the numerical value of Table 1. Because the simulation process is mainly qualitative analysis, the specific numerical changes do not affect the conclusions of this paper.

Table 2
Simulation Related Variables and Parameters of Order Financing

Variables and parameters	Numerical value	Variables and parameters	Numerical value
Sale price	800	Unit output investment	200
Dealer purchase price	500	Term of loan	6 month
Market demand	5,000	Interest rate	0.5%
Production costs	5,000	Initial value of enterprise cash flow	100,000
Other costs	2,000		

2.2 Simulation Results and Conclusions

In this paper, the Vensim PLE system dynamics software platform for the simulation of the supply chain system, through changing the proportion of financing to the order financing model of small and medium enterprises cash flow and supply chain efficiency, and so on.

2.2.1 Comparison of Cash Flow of Enterprises Under Different Financing Ratio

Through the simulation, we can draw, in 6 different financing proportion, the cash flow of the enterprises is different, in financing, financing proportion is 30%, 50%, 80%, 100% and 130% in the six cases enterprise cash flow increasing, because the financing amount issued in the first month, so in January, the cash flow of the enterprises is the largest. From the figure can see, the higher the proportion of financing, the cash flow of the enterprises bigger. Simulation results show that financing ratio can affect the cash flow of the enterprise.
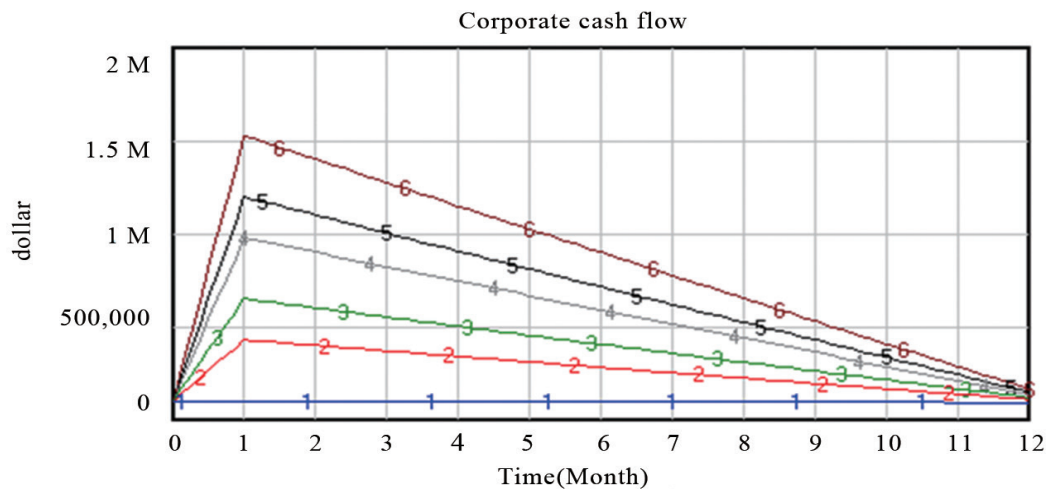

Figure 5
Comparison of Corporate Cash Flow Under Different Financing Ratio

2.2.2 Comparison of Supply Chain Benefits Under Different Financing Ratio

For supply chain efficiency, obtained through the simulation of system dynamics, financing proportion in financing, 30%, 50%, 80%, 100% and 130% in the six cases, followed by increased supply chain efficiency. Efficiency of the supply chain is a with time grows monotonically as a function of, when raising the proportion of financing, benefit chain will increase. Therefore, financing proportion of efficiency of the supply chain impact, and the proportion of the financing raise can increase the efficiency of the supply chain.
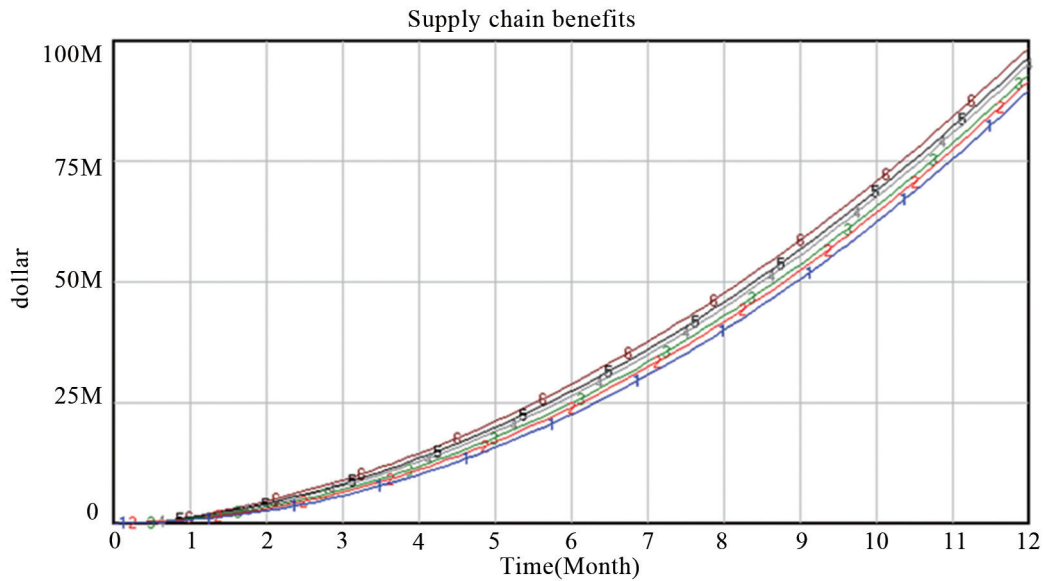
Figure 6
Simulation of Supply Chain Efficiency Under Different Financing Ratio

CONCLUSION

In this paper, we build a model based on system dynamics of the purchase order financing, for supply chain enterprise's cash flow and efficiency of the supply chain simulation under different financing proportion of comparative analysis, revealed in purchase order financing mode on enterprise's cash flow changes and to supply overall operational efficiency of the chain. At the same time, this paper believes that continue to explore and improve the financing mode of small and medium-sized enterprises orders, is conducive to the development of the social economy.

The implementation of the purchase order financing mode, and can effectively solve the problem of financing difficulties of small and medium-sized enterprises, improve enterprise's cash flow, and can enhance the efficiency of the whole supply chain, the supply chain operation is more stable. At the same time, this paper studies are still inadequate, variables in the model assumption is ideal, and index selection is simple, failed to further reflect the purchase order financing mode under different conditions change risk influence trend, next step will carry out in-depth research.

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