

## Continual Improvement of Small and Medium Enterprises Credit Structure in Inclusive Financial System

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**Abstract**—In order to solve the financial difficulties of small and medium enterprises (SMEs) in China, the credit structures which can satisfy the demand of commercial loans are discussed in this paper. By analyzing production function, it is understandable for the basic driving force of SMEs for sustainable development and the nature of sustainable demand of funds. Take mutual guarantee loans as examples to show how the risk of joint liability loan can be affected by credit structure optimization in solving financial problem of SMEs. Empirical demonstrations show that optimized credit structure of joint liability loan can probably be a significant form for SMEs finance based on inclusive financial system and it is of importance on promoting in China.

**Keywords**—Inclusive financial sectors; credit Structures; improvement

### I. INTRODUCTION

Inclusive financial sectors, which were promoted in China during the 11th five -year development program, are a financial development concept raised by the United Nations in 2005, International Year of Microcredit. Its core content is to enable all levels of society access to a variety of financial services and it is regarded as an important mean to achieve the Millennium Development Goals. Its programmatic document was *Building Inclusive Financial Sectors for Development* [1], which aimed to help countries develop their own policies and strategies of inclusive financial sectors. After the 11th five -year development program, the basic conclusion that 'China's micro-financial system has formed' has become the initial result of promoting inclusive financial system in China [2].

Existing inclusive financial system pushed forward by China has provided more opportunities to access to financial services for SMEs, who account for over 99% in the number of enterprises, contribute to over 60% GDP, over 50% tax revenue, approximately 70% in export and 80% of employments in China [3]. Although there is a mismatch between such important role played by SMEs in national economy and the financial services shares they have in financial market, the feasible tools offered to SMEs solving the problem of shortage of funds begin to increase [4]. According to the data in annual report provided by the People's Bank of China, there is a significant improvement for SMEs' availability of bank loans and an increase in the

loan proportion from 2008 to 2010 (Table I). In this paper, depth studies of credit structure of loans in banks and small-loan companies have shown that it is possible for SMEs to alleviate the problem of scarce guarantee resources and raising funds through making continual improvement in their credit structures in inclusive financial system.

TABLE I. SMES' CHANGES IN LOAN BALANCE ( 2008 TO 2010)

Size of Loans ( in RMB)	2008	2009	2010
Total Size of Loans (bil)	3.04	4.00	4.79
Increase in Total Size(bil)	0.49	0.96	0.79
Increase Rate (%)	18.8	31.6	19.8
SMEs Size of Loans (bil)	0.81	1.14	1.47
Increase in SMEs Size (bil)	0.06	0.33	0.33
SMEs Size of Loans / Total Size of Loans	26.6	28.5	30.7
Increase in SMEs Size / Increase in Total Size	12.2	34.4	41.8

### II. NATURE OF THE SUSTAINABILITY OF FUNDING NEEDS OF SMES

In the national economy, production behaviors of enterprise plays a significant role and is the important carrier of social logistics, capital flow and information flow which includes the cycle of simple reproduction and expansion of reproduction. The production behaviors of enterprise can be summarized as the inputs of materialized resources and labors while the outputs of products with social value. Therefore, in accordance with the principles of systems analysis, any production behaviors can be abstracted as the production function [5], which describes the business process of reproduction and reflects the nature of the sustainability.

#### A. Basic Model of Production Function

The traditional concept believed 'nature is the mother of wealth and the father of labor' that laid the status of the two basic elements of production before the industrial revolution, natural resources and labor resources. Then, the industrial revolution promoted substitution and upgrade in industries. More enterprises put into more materialized labor which included natural resources element instead of traditional natural resources and they combined it with labor to create wealth. Cobb-Douglas production function, which contains

technical elements, properly reflects the abstract production behaviors. According to the principle of division factors in Cobb-Douglas production function, production factors are classified as capital factor and labor factor and then production function can be generalized as:

$$\begin{cases} y = f(u_1, u_2) = f[g_1(x_1), g_2(x_2)] \\ X = x_1 + x_2 \\ x_1, x_2, u_1, u_2 \geq 0 \end{cases} \quad (1)$$

In the formula:  $y$  is the wealth created by enterprises, profits come from the wealth they created, wealth maximization means profit maximization;

$x_1$  is money input of capital factor,  $u_1 = g_1(x_1)$  is input function of capital factor;

$x_2$  is money input of labor factor,  $u_2 = g_2(x_2)$  is input function of labor factor;

$X$  is total money input.

So,  $\partial y / \partial u_i > 0$  and  $\partial^2 y / \partial u_i^2 < 0$  ( $i = 1, 2, 3$ ), which means increasing in the effectiveness of production factors, but the diminishing its marginal utility. Elements of the labor factor include labor and production technology factors. The increase in labor factors includes the enhancement of skills of workers, increase in the total labor force, scientific and technological progress and so on.

To simplify analysis, linear input function, then  $u_1 = g_1 \bullet x_1$ ,  $u_2 = g_2 \bullet x_2$ .  $1/g_1$  is the price of capital factor;  $1/g_2$  is the price of labor factor. There is  $\partial g_2 / \partial x_2 > 0$  that the increasing function of sum labor factors  $x_2$  in each cycle. This means the efficiency of labor is the increasing function of total labor factors inputs. Therefore, the optimal solution of mathematical programming in formula (1) is:

$$\begin{cases} \max : y = f(u_1, u_2) = f(g_1 \bullet x_1, g_2 \bullet x_2) \\ X = x_1 + x_2 \\ x_1, x_2, u_1, u_2, g_1, g_2 \geq 0 \end{cases} \quad (2)$$

According to the marginal utility analysis, the optimal solution of the model (2) is:

$$\begin{cases} g_1 \frac{\partial y}{\partial u_1} = g_2 \frac{\partial y}{\partial u_2} \\ X = x_1 + x_2 \\ x_1, x_2, u_1, u_2, g_1, g_2 \geq 0 \end{cases} \quad (3)$$

#### B. Differentiation of Production Function after Change in Fund Costs

Increase in fund costs will first affect the price of capital factors that raises the price of using them. In one production cycle, when labor factors remain unchanged, there is  $g_1^* < g_1$  and  $g_2^* = g_2$ . Formula (2) turns to

$$\begin{cases} \max : y^* = f(u_1^*, u_2^*) = f(g_1^* \bullet x_1^*, g_2^* \bullet x_2^*) \\ X^* = x_1^* + x_2^* \\ x_1^*, x_2^*, u_1^*, u_2^*, g_1^*, g_2^* \geq 0 \end{cases} \quad (4)$$

The optimal solution of mathematical programming in formula (4):

$$\begin{cases} g_1^* \frac{\partial y^*}{\partial u_1^*} = g_2^* \frac{\partial y^*}{\partial u_2^*} \\ X^* = x_1^* + x_2^* \\ x_1^*, x_2^*, u_1^*, u_2^*, g_1^*, g_2^* \geq 0 \end{cases} \quad (5)$$

Comparing formula (2) with (4) and considering  $g_1^* < g_1$  and  $\partial y / \partial u_i > 0$ , there is  $y^* < y$ . When fund costs increase, total inputs of an enterprise stay the same in short term but decrease in factors inputs will cause decrease in outputs, then total wealth in the society decreases. It comes up shortage of some products.

Comparing formula (3) with (5) and considering  $g_1^* < g_1$ ,  $\partial y / \partial u_i > 0$  and  $\partial^2 y / \partial u_i^2 < 0$ , so,  $x_1^* < x_1$ ,  $x_2^* > x_2$ . When fund costs increase, there will be an adjustment of production function [6], the enterprise will increase the inputs of labor factor and reduce the inputs of capital factor.

However, considering the variety of factors prices in multi-production cycles, because of  $x_2^* > x_2$ , it can be seen that with the increasing inputs of labor factor, the factors prices go down, which means  $g_2^* > g_2$ , then  $u_2^* > u_2$ , plus  $\partial y / \partial u_i > 0$ , so  $y^* > y$ . This analysis indicates readjust production function of enterprises through increasing inputs of labor factor will cause improvement in labor skills and acceleration of technological progress. In long term, the wealth created by the enterprise will still increase which become the basic driving force for sustainable development and the sustainable demand for funds. In essence, sustainable demand of funds is beneficial for enterprises to create employments and to promote economy from 'increasing outputs-oriented' to 'increasing employments-oriented' that achieves goal of inclusive financial system.

### III. CREDIT MODELS FOR SMEs TO OBTAIN FINANCE

#### A. The Ways for SMEs to Obtain Finance

Inclusive financial system organically joins microfinance institutions, commercial banks and other formal financial institutions together and builds a multi-level, wide coverage and sustainable financial service system. This makes SMEs have more opportunities to choose financial services suitable to their own specific conditions. These kinds of services include direct and indirect financing, commercial loans, small loans and so on. At present, some solutions like being listed in SME/GEM Board and using corporate bonds have

settle financial difficulties of high quality SMEs, whereas more SMEs have to depend on loans from commercial banks or micro-credit funds from small-loan companies.

#### B. Divided Liability Loan

In commercial loans, divided liability loan model is generally applied, and creditworthiness of the borrower determine whether to lend or not and the amount of loans. Therefore, credit risk may occur during the loan transaction. Guarantee is widely used in order to control credit risk and its essence is to find out a second repayment sources apart from the first one, the borrower. It aims to reduce the lenders' risk. However, because of comparative imperfect of SMEs credit reputation in existing social credit system, when SMEs apply for commercial loans, the willingness of banks to accept the credit guarantee is not strong. Moreover, it is extremely difficult to satisfy the demand of credit guarantee for SMEs as the number of existing credit guarantee agencies is small and the size of them are not larger enough, which causes effective guarantees have become scarce resources. Even though in City Shanghai, which is trying to become one of international finance centers, there are merely 84 guarantee corporations with total registered capital 14.6 billion Yuan, only about 30 of which are running guarantee business normally and the new increasing size of financial guarantee in 2009 was 24.4 billion Yuan [7].

#### C. Joint Liability Loan

To solve the problem of scarce guarantee resources and to control loans risk, economists have designed a joint liability loan model [8-9]. As a special kind of loan, joint liability loan makes borrowers form a loan application group and all borrowers in this group are responsible for all loans created by this group. This is in fact a form of mutual guarantee. According to market-oriented theory of credit rationing, those borrowers who are comparative weak cannot be satisfied. When a borrower cannot manage to apply for loans, he will attend to a group whose members have homogenous credit risk so that they are able to obtain joint liability loan. Muhammad Yunus, the Nobel Peace Prize winner in 2006, is considered to be the funder of joint liability microfinance model, and 'Solidarity Group' system in the Grameen Bank of Bangladesh is regarded as the most successful practitioner in joint liability loan model.

### IV. ANALYSIS OF RISK OF LOANS IN DIFFERENT MODELS

In transactions, the stability of backflow of capital reflects the risk of loans [10]. The comparison in the stability of backflow of capital between joint liability loan and divided liability loan is in fact to compare the stability of backflow of capital between multiple funding sources and single funding source.

In generally, stability can be expressed by standard deviation. The smaller the standard deviation is, the more stable it will be. Therefore, suppose there are  $n$  projects and  $R_i$  is the expected rate of return of Project  $i$ , whose variance is  $D_{ii}$  and standard deviation is  $d_i$ ,

When they are calculated respectively,  $d$ , the total standard deviation of  $n$  projects, is

$$d = \sum_{i=1}^n d_i = \sqrt{w[D]w^T} \quad (6)$$

In this formula:  $w = (w_1, w_2, \dots, w_n)$ ,  $w_i = 1/n > 0$ ;  
 $D_{ij} = d_i \times d_j$ ,  $i \neq j$ ;  $w^T$  is the transpose matrix of  $w$ .

When they are calculated together,  $d'$ , the total standard deviation of  $n$  projects, is

$$d' = \sqrt{w[D']w^T} \quad (7)$$

In this formula:  $D'_{ij} = \rho_{ij} \times d_i \times d_j$ ,  $i \neq j$ ,  
 $|\rho_{ij}| \leq 1$ .  $\rho_{ij}$  is the correlation coefficient between  $R_i$  &  $R_j$ .

$$\begin{aligned} & \because D_{ij} - D'_{ij} \\ & = d_i \times d_j - \rho_{ij} \times d_i \times d_j \geq 0 \\ & \therefore w[D]w^T - w[D']w^T \\ & = w[D - D']w^T \geq 0 \\ & \therefore d > d' \end{aligned} \quad (8)$$

The formulas above indicates that the standard deviation of return is smaller when the projects are calculated together, which means the stability of backflow in joint liability loan is better and its credit risk is smaller than that in divided liability loan.

### V. CREDIT STRUCTURE OPTIMIZATION AND DEMONSTRATION

#### A. Credit Structure Optimization for Borrowers

In 1985, City Shanghai first proposed that its suburb areas got to establish 'Three centralizations' model, including industrialization, urbanization, and modernization of agriculture. This model has been implemented for more than two decades, and not only in City Shanghai has it achieved great success, but also it has become an exemplary mode of promoting agricultural modernization and urbanization in the whole country [11-12]. Putting industrial projects into industrial parks was an intrinsic motivation for SMEs to pursue being economies of scale. Moreover, industrial parks raised SMEs to a new level that improved their abilities to take risks and laid the foundation of mutual guarantee group with comparative lower risk in joint liability. It created favorable conditions for optimizing credit structure in joint liability loan.

In the practice of joint liability loan, commercial banks only choose the mutual guarantee group with comparative lower risk to be business partners, but exclude the ones with high risk. Therefore, even though in vested industrial parks,

to build 'key enterprises pool' through necessary screening in SMEs is still an important way of optimizing credit structure in joint liability loan.

#### B. Achievement in Increasing Credit Level through Management by the Governments

There are several of relevant support policies to promote the development of SMEs made by local governments. The management services in industrial parks offered by the Government provide possibility to do increasing credit. First is to use management services function to build 'key enterprises pool' which is approved by commercial banks through screening SMEs. Second is to arrange some funds to support the SMEs in 'key enterprises pool' for limited liability in joint liability loans.

#### C. Financial Guarantee Companies

To speed up the building of inclusive financial system, after pilot work on small-loan companies in 2008, China began to establish financial guarantee companies. Meanwhile, relevant departments reestablished rules and regulations including setting the maximum leverage of 10 times. This measure enlarged the effective supply of guarantee resources in financial guarantee companies. Then, these financial guarantee companies have become important tools for SMEs to make up their credit limits. Until April 2011, in Shanghai, 38 financial guarantee companies had re-registered and 9 had newly established [13].

#### D. Demonstration

In October 2010, *Mutual Guarantee Loans Business Cooperation Agreement* was signed by Shanghai Jinshan Industrial Zone Management Committee and the Shanghai branch of China Construction Bank. After one month, Shanghai Yongsheng Packing Co. Ltd. became the first beneficial borrower from this financial product. In June 2008, Shenzhen began to introduce such joint liability loan. The Government arranged 1 billion Yuan as the first phrase fund to form the platform for qualified SMEs increasing credit. Until May 2010, this kind of joint liability loan had been 7.3 billion Yuan, 30 million non-performing loans of which was repaid by 'mutual guarantee pool' and the compensation rate was merely 0.41% [14].

Mutual guarantee loans are essentially joint liability loans which contain the Government credit. There are three significant segments. Firstly, to establish 'key enterprises pool'; secondly, to raise initial funds of 'mutual guarantee pool' through the cooperation between the Government and banks; thirdly, the SMEs have to pay a annual fee, 1% of amount of loans they apply in that year, to 'mutual guarantee pool' and this cost equals to 15% of increase of benchmark interest rate. Once the 'mutual guarantee pool' is established, it will be the third-party guarantor. The larger the amount of mutual guarantee loans is, the larger the size of 'mutual guarantee pool' will be. Then, the leverage effect will be amplified. The whole procedure of participating in 'mutual guarantee pool' is as following steps. When a company applies for a loan and it is lack of effective amount of guaranteed product, it can turn to 'mutual guarantee pool' for

help. In this way, the company will probably get a higher credit line comparing to divided liability loan. If the company cannot repay the loan or its liquidation of assets cannot compensate the amount of loan, the rest part of the loan will be repaid by 'mutual guarantee pool'.

Some SMEs who cannot participate in 'key enterprises pool' because of their credit level and cannot benefit from mutual guarantee loans are able to cooperate with financial guarantee companies to apply commercial loans through paying 2% of annual premium.

Obviously, when SMEs with low credit quality experience helps in multiply periodic financial guarantee loans, they would probably become the enterprises accepted by 'key enterprises pool' or even become the entities which can apply commercial loans in divided liability loan. This improvement of credit structure is helpful to achieve the basic goal of gradually cutting down financing cost and is of importance on promoting commercial loan development under inclusive financial system.

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