

# Research on the Risk Control Theory Based on the Matching Scale of Credit Guarantee Companies and the Significance of Guarantee Enterprise Groupization

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## Abstract

One of the effective ways in solving difficulties to raise capital for Medium and Small Enterprises (SEMs) is to provide credit guaranty in today's world. This paper analyzes the defect of risk control in single credit guarantee companies, based on the analysis of the business operations of guarantee companies and the features of credit guarantee. Meanwhile, this paper does mathematical analysis on theory of risk control of guarantee companies with matching scale by using the law of large numbers, and on this basis, elaborates the necessity and significance of enterprise group.

**Key words:** Credit guarantee; Risk control; Groupization; Law of large numbers

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## INTRODUCTION

Over 90% of the enterprises in China are SEMs. And 55% of the GDP, 76.3% of the Industrial Added Value, 77% of the Social Retail Sales, 50% of the Tax Revenue, 62% of the Export Sales and 80% of the Employment was provided or made by the SEMs. However, the development of SEMs faces a serious of problems and difficulties that could not be solved by themselves, and among them, financing difficulty has been a particular one. Yet the financial crisis happened two years ago, moreover, add difficulties for SEMs to raise capital. To solve this problem, it is a universal practice to provide credit guarantee work to support finance (LIU, 2009). The business circumstances of guarantee companies, therefore, serve as a catalyst to abate the pressure of financing difficulty. Hence, China has strengthened the construction of credit guarantee system to SMEs, and has determined to encourage local governments to increase support for credit Guarantee Company through capital injection and risk compensation. Moreover, the China government has established a multi-leveled guarantee fund and guarantors to give service to SEMs by rising up the proportion of related loans, as well as the administration of taxation on the exemption for eligible SEMs and so on. The central budget which supported the guarantee companies to provide loans for SEMs has added 1.6 billion RMB since

2009. Moreover, the Credit Scale which the bank provided to SEMs has opened up. This explains the increasing need for guarantee agency in Banking Industry and SEMs.

First, this paper use normative analysis to analyze the operation of guarantee business and feature of guarantee products. Then from the point of probability distribution of credit risk, as well as the point of guarantee risk control, this paper indicates the necessity of enterprise groupization and the significance that the enterprise group provided to the guarantee industry.

## 1. THE ANALYSIS OF GUARANTEE INDUSTRY AND FEATURE OF ENTERPRISE OPERATION

It is generally acknowledged that the guarantee industry is a high-risk industry, and the features such as it is high risk and is an emerging industry will surely influence the management and operation of guarantee enterprise. Yet the particularities of guarantee enterprise are bound to follow the particular rules of the operation itself.

(1) The high risk of the guarantee industry. Credit guarantee service is similar to the insurance industry. If the volume of business of guarantee enterprise is large enough, then according to the law of large numbers, we could make up the losses of the small fail part by the most part of successful service. WANG Chuan-dong (2006), a domestic scholar, supported this point of view. She indicates that the more risks accepted by the unit of risk, the less the probability bias will be, and vice versa. The high incidence and high loss rate of risks requires a large enough number of risk units that centralized by the guarantee programs (WANG, 2006). On the other hand, from the practical operation experience provided by the guarantee company we know that, generally speaking, every time here comes a fail guarantee case, we have to waste more than ten times of the profitable projects to make up the losses. Hence, as long as there is a mishandling in any link of the business operation process, risks are easy to happen and may even lead to bankruptcy in Guarantee Company.

(2) The unbalance of the guarantee risk distribution. The distribution of guarantee risk is not an even distribution in guarantee service projects. It is likely that the risk of guarantee service in some domain has a rather high rate of occurring possibility, while the possibility of other domains may be fairly low. On the other hand, as there are significant differences in the possibility that a risk will materialize, SEMs with a poor state of operation are likely to compensate on their behalf, while a well-run company will hardly face this problem.

(3) The regionality of the guarantee business operation. The product of guarantee companies is to provide guarantee service to SEMs, rather than provide tangible products to the society. Thus the type of guarantee service

provided by the guarantee company depends on the development of economy in its region. The difference in factors and technological capabilities lead to the different requirement for guarantee service. The kind of service suitable only for some certain region may not be spread to other regions.

(4) The individuality of guarantee product. As there is regional limit in providing service for guarantee company, as well as the different factors and requirement of each guarantee service, it is important to design and manage each service individually and provide special service manager for each process for it. The managers, of course, need to be in charge of the whole course from the handling of service till its end.

(5) The high expertise of guarantee work. The developing of guarantee service makes higher demands on the quality and ability of business managers. Various knowledge and abilities including financing, banking, psychology and marketing are needed for the business managers to carry out guarantee businesses. So can they make a objective judgment about whether they could accept the guarantee. Meanwhile, the ability of observation, analyzing, communicating, coordinating and organizing are also necessary for business managers. Only in this way could they solve all kinds of problems properly and remove guarantee successfully.

## 2. THE MALPRACTICE ANALYSIS OF SINGLE GUARANTEE COMPANY'S RISK CONTROL

### 2.1 The Problem of Weak Capital Strength

The development of guarantee agency is so fast and is excessively used in some regions of China. The number of credit guarantee agency for SEMs in 2004 was only 1000, and number was about four times as much in just five years. Moreover, most of the agencies have a smaller scale and weaker economic strength; with an average registered capital scale of 20 to 30 million Yuan. Till the end of 2008, there are only 59 agencies has a registered capital of 100 million Yuan in 3700 credit guarantee companies of China, and most of them were government guarantee companies invested by the local ministry of finance. What's more, some of the registered capital is transferred property rather than paid-in investment. And the low registered capital leads to the poor anti-risk ability of guarantee companies.

### 2.2 The Low Controllability of Credit Risk

From the guarantee market, we could see that because of the high risk of guarantee industry, the unbalance distribution of risks and the limitation of management itself, the scale of guarantee industry is restricted to expend. In order to make up for the losses of some risks, the guarantee company has to earn a large amount of

guarantee premium income through a great number of guarantee services. Therefore, the guarantee fund would neither be small nor disperse. Only if the fund achieves a certain scale can the guarantee company guard against risks (YU, 2006). The risk control system of China is not sound enough that the compensation happens constantly and seriously. Due to the poor compensation ability of guarantee companies, it is fairly hard to handle risks.

### 2.3 The Weak Compensation Ability of Credit Risks

The guarantee fund enlargement factor provided by the single guarantee company is low. Related law stipulated that the amount guaranteed should be 8 to 10 times as much as the capital, but actually, there is only 2.5 times. And the guarantee rate, as is ruled, could be 45% of the loan interest rate in the corresponding period, but in fact, the rate is only 2-3%. In addition, most guarantee services of developed countries are government guarantee without the purpose of making profits. However, as the limitation of China's government financial capability, local government won't have enough ability to transfer money to compensate risks, and thus the private-owned enterprises become the main source of risk compensation. According to the data, the private-owned single commercial guarantee company dominates 70% of the entire guarantee enterprise of China. But as the scales of commercial guarantee company are always small, their abilities of anti-risk are usually weak.

## 3. THE PROBABILITY DISTRIBUTION OF CREDIT DEFAULT RISK AND RISK CONTROL PRINCIPLE OF GUARANTEE ENTERPRISE BASED ON SIZE-MATCHED

Research of the probability distribution includes classical and modern credit risk research all around world. Representative classical credit risk research is Z-Score Model and ZETA-Score Model. In which Z-Score Model was put forward by American professor Edward I. Altman based on the summary of Beaver (1967)'s research in 1968. In 1977, professor Altman, Haldeman and Narayanan improved the Z-Score Model greatly and presented the ZETA credit risk model. The modern credit risk research was represented by the Credit Risk Model (1996) based on the KMV Model of option valuation. And J.P Morgan, based on the VaR, presented the Credit Metrics Model in 1997.

### 3.1 The Probability Distribution of Credit Default Risk

Many foreign studies show that the probability distribution submits to a asymmetrical distribution as "leptokurtosis and fat-tail" (Javier Mencia and Gabriel Jiménez, 2007;

M. Hashem Pesaran, Samuel Gregory Hanson & Til Schuermann, 2005). Besides, the Swiss Bank Corporation (SBC) also did such research in 1997, which showed that the credit default rate and credit loss rate tend to approach "a fatter tail" (WANG, 2006). The distribution was shown in Figure.1. From Figure.1 we could see that the credit risk is not uniformly distributed, that the credit risk scope of some region is far more than other regions.

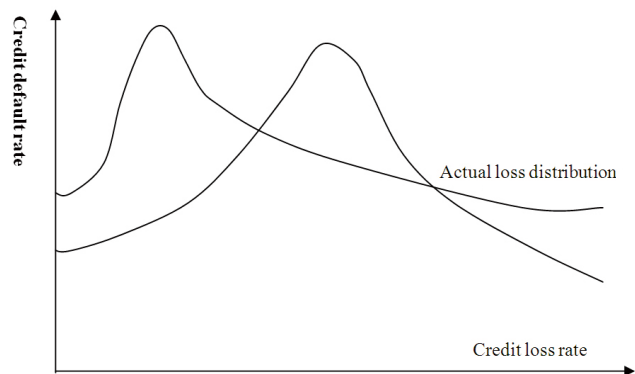


Figure 1  
The Lost Function Curve

### 3.2 The Risk Control Principle of Guarantee Enterprise Based on Size-Matched

The probability theory defines that the law of large numbers means a almost certain convergent quantifier rule, based on the large numbers of random phenomena happened contingently and compensate each other. This mathematical law shows that with the increase of the sample size, the frequency of uncertainty tend to approach a stable probability. Scholars find that the occurrence of business with certain volume and value is submitted to "the law of large numbers". From the integration with practice of guarantee risks we can see that as the volume of guarantee service is large enough, the real risk and business risk amount error will be very small. For example, under certain examine standard as well as the satisfaction of the law of large numbers, 3 of 100 services would be guaranteed without risks among all guarantee services. However, the happen of service risks are not distributed symmetrically and evenly in guarantee companies. Then in order to guarantee that the probability of risks is lower than 3%, we have to raise the examining standard of guarantee service, which will lead to the decline of the pass rate of regional service. This conversely caused the unsatisfactory of the large numbers law, which means that the service volume is not big enough to meet the need of the law. For that reason, this vicious cycle will enhance the danger of risks. Thus, to verify that the risk level is lower than what we assumed before, the service volume has to reach a certain "large number". Next, we will calculate the mathematical formula of this "large number" from the view of mathematical statistics.

The number of risk incidence  $X$  follows the binomial distribution, which means that the risk may either take place or not. And that  $X \sim B(n, p)$ , in which  $n$  is stand for the number of guarantee services, and we assume that in each service we need a compensation, the rate of that compensation is  $p$ . Thus, we use  $X_1, X_2 \dots X_n$  to represent the random variables of the service which need compensation, and  $X_i \sim B(n, p)$ . From the law of large numbers and the central limit theorem we can see that when  $n$  is very large, the average compensate number is  $\bar{x} \sim N(p, \frac{p(1-p)}{n})$ , and we get the confidence interval  $[p - z_{1-\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}, p + z_{1-\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}]$  and the confidence interval length  $z_{1-\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$  when the confidence level is  $1-\alpha$ . When  $1-\alpha=95\%$ ,  $z_{1-\frac{\alpha}{2}}=1.96$ , and now the confidence interval length is  $z_{1-\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$ . When the confidence interval length requires a minor  $\varepsilon$ , we can work out the equation  $z_{1-\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}} = \varepsilon$  and get the “large number” (the volume of guarantee service). Thus, we can get the formula

$$n = \frac{4Z^2_{1-\frac{\alpha}{2}} P(1-P)}{\varepsilon^2} \quad (1)$$

**The formula here indicates the functional relation between two indexes, one is the volume of guarantee service and the estimation of risk incidence, the other is the actual risk incidence and the anticipate risk incidence is less than expectation.**

Next the paper will give a further illustration through two calculation examples.

**Ex 1:** A guarantee company provides guarantee services for SEMs. According to guarantee practical experiences, the risk incidence of these guarantee services is about 0.1 per year. The guarantee company expected to have a confidence level of 95%. This is to ensure that the difference between actual risk incidence (the number of incident risk divide the volume of service) and the expected risk incidence is less than 3%. Then how many guarantee services do they need at least to meet this requirement.

According to the example,  $p=0.1$ ,  $1-\alpha=0.95$ , we can get  $Z_{1-\alpha/2}=1.96$  after looking up the normal distribution table. As the difference between actual risk incidences (the numbers of incident risk divide the volume of service) and the expected risk incidence is less than 3%, that is  $\varepsilon/2=0.03$ , then  $\varepsilon=0.06$ . With the values above we can get value as follow:

$$n = \frac{4Z^2_{1-\frac{\alpha}{2}} P(1-P)}{\varepsilon^2} = \frac{4 \times 1.96^2 \times 0.1 \times 0.9}{0.06^2} = 384.16$$

To round the result, we can get that  $n=384$ .

The economic implication of this result is as follow: there must be at least 384 guarantee services to guarantee the changing frequency of compensation, which is

$384 \times 0.03 \approx 11$  times. If the compensation time is normal, then the average will be  $0.1 \times 384 \approx 38$ , and the standard deviation is  $\sqrt{384 \times 0.1 \times 0.9} \approx 6$

**Ex 2:** Based on the Ex.1, if we require that the expected and actual compensation rates are less than 1%, that is  $\varepsilon/2=0.01$ ,  $\varepsilon=0.02$ . Then

$$n = \frac{4Z^2_{1-\frac{\alpha}{2}} P(1-P)}{\varepsilon^2} = \frac{4 \times 1.96^2 \times 0.1 \times 0.9}{0.02^2} = 3457.44$$

To round the result, we can get that  $n=3458$ .

Therefore, under a constant confidence level, if we need to triple the accuracy, then the guarantee service has to improve almost tenfold. The economic implication of this result is as follow: we need at least 3458 services to guarantee that the compensation time is less than  $3458 \times 0.01 \approx 34$ . If the compensation time is normal, then the average will be  $0.1 \times 3458 \approx 346$ , and the standard deviation is  $\sqrt{3458 \times 0.1 \times 0.9} \approx 17.64$ .

According to the process and result of the mathematical analysis, the theory of risk control based of the business scale can be described as follow: as the risk incidence of services that company guaranteed are not uniformly distributed, the risk incidence of some part of the guarantee service might be higher than the average level. Then to guarantee that the total incidence of risks is lower than the companies expected, they have to raise the auditing standard or conditions of regional guarantee services. This, on the contrary, may lead to the decline of service’s passing rate, and therefore the service number maybe not large enough to satisfy the “large number” in the “law of large numbers”. Hence, the companies could only satisfy the “large number” through expanding the number of guarantee services, and then control the incidence of probable risks.

### 3.3 The Risk Control Principle Based on the Matching Service Scale and Organization Scale

As noted above, under the certain condition of single guarantee organization scale, we must set the standard of risk incidence higher than the average according to the guarantee condition of some region of the service. Then part of the services may not pass the auditing progress due to the rise of auditing standard, and then decrease the efficiency of service. This contradiction cannot be totally solved in single guarantee enterprise.

Secondly, because of the limitation of organization scale, the restriction of staffs’ working ability and such negative factors as the dramatic increase of administration cost and coordinating workload which is due to the enlargement of organizational scale, this paper indicates that the actual service scale that China’s single guarantee company provided cannot reach the requirement of “law of large numbers”. For this reason, the enlargement of service scale is seriously restricted by the limitation of single guarantee company’s organization scale, and then



the limitation cannot control the guarantee risk effectively. Finally, it becomes the bottleneck of the development in guarantee enterprise. In other words, the guarantee service scale and developing scale of an organization must be matched. The size of organization scale determines the size of guarantee service scale.

Since the organization scale of guarantee enterprise limits the increase of service scale, and the limiting scale of single guarantee company undermines the control of risks, it is necessary to take a new organizational pattern to solve the problem. To collectivize the guarantee companies is one of the effective measures. In group enterprises, the guarantee service scale increases as the number of subsidiary companies adds which equals to the enlargement of organization scale. Then the large numbers of services provided by the subsidiary companies satisfied what the "law of large numbers" requires. Thus, from the view of the whole group, the volume of services meets the demand of the "law of large numbers". That is to say, the guarantee service scale provided by all the subsidiary companies in a group matches and corresponds with the organization scale. As the pattern of enterprise group acts special function in controlling risks, this pattern has been gradually adopted by the guarantee industry of China.

#### 4. THE NECESSITY ANALYSIS ON ENTERPRISE GROUPING BASED ON THE THEORY OF GUARANTEE RISK CONTROL

Firstly, from the actual condition of guarantee industry, as single guarantee companies has limitation in its volume of business and it is far from the requirement of the "law of large numbers". Even the largest commercial guarantee enterprise in China, the Credit Orientwise Group, subsidiary companies of which has its performance appraisal independently within the group, cannot guarantee that their volume of business reach the basic requirement about "large number" of the law of large numbers. However, many people consider the law of large numbers as the risk characteristic without any preconditions now. This misunderstanding may influence the risk control pattern and furthermore, influence the development pattern of the guarantee enterprise.

Secondly, the guarantee service provided by single guarantee company is collateral and/or pledge, which cannot cover part of the risk exposure entirely. The guarantee service needs some "soft assets and/or soft measures" (such as to mortgage and supervise current assets, to pledge accounts receivable, to pledge intangible assets, to pledge stock rights, to determine the unlimited personal liability and so on) to cover the risk exposure. And once the guarantee company suffers a poor state of operation and the first source of repayment failed, the

value of soft assets and/or soft measures in their second source of repayment will be discounted, or even has no actual compensatory value. Thus, the part of risk exposure is the general risks that an enterprise undertakes. To protect the company from risk exposure to the max, guarantee companies has to take more attention on the reliability of the first source of repayment than the bank does, optimize the "soft assets and/or soft measures" in the second source of repayment, and control the process strictly. By contrast, the bank has a similarly group pattern of controlling by the head office and managing by the subsidiary banks. The risk of credit operation's characteristics of bank is accord with the "law of large numbers". The risk control is one of the options of "large numbers" probability. The bank emphasizes to use the compensation of a company's "hard assets" to cover all the risks, and take the hard factor of the collateral as the source of second repayment. The full value and floating requirement of the dispose of "hard assets" will suppress the generation of bad loan assets, and therefore decline the credit risk. This, in a dynamic environment, will take the risk of not having repaid on time of the first source.

Finally, guarantee industry is a high-risk industry and the guarantee risk is not a proportional distribution. It is hard to give consideration to increase the standard of single guarantee company and increase the number of services. The control of guarantee service is still hard even when the quantity of guarantee service is large enough, because the business manager and risk control manager has limit ability in developing operations and the ability of second-line manager is limited, too. Thus it is hard to control risks as well as increase the working efficiency, and the difficulty in controlling risks adds. Therefore, from the view of controlling risks, it is quite limited to protect risks from single guarantee companies.

Above all, this paper argues that although the single guarantee companies cannot reach the condition of "large number" in the law of large numbers, these companies could form a guarantee group to reach the standard in the view of a entire group. Moreover, the risks in some operations of single guarantee companies can be defused and compensated by the profit of other services inside the group. And in this way, the risk defuses and risk defenses will be formed inside the group, and then solve the contradiction between risk defense and service development effectively.

#### REFERENCES

- Javier Mencia and Gabriel Jiménez (2007). Modelling the Distribution of Credit Losses with Observable and Latent Factors. *Working Paper*, 2.
- LIU Zhirong (2009). Research on the Financing Guarantee Problem of SEMs in China. *Finance Teaching and Research*, 1, 28.

M. Hashem Pesaran, Samuel Gregory Hanson & Til Schuermann  
(2005). Firm Heterogeneity and Credit Risk Diversification.  
*Working Paper*; 8.  
WANG Chuandong (2006). *Research on the Credit Guarantee*

*Problems of SEMs*. Shandong Agricultural University, Tai-  
an.  
YU Fuyu (2006). *Research on the Credit Guarantee System of  
SEMs in China*. Shandong University, Jinan.