



Research Article

ISSN : 0975-7384  
CODEN(USA) : JCPRC5

## Theoretical mechanism and empirical analysis about the impact on insurance intervene SME financing

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### ABSTRACT

Insurance, guarantees, banks and other financial institutions are important parts of building the financing system of SMEs. This article from the perspective of the insurance talked the necessity of insurance involved in SME financing. In order to study the influence of insurance intervene SME financing, by selecting the industrial SME data and credit guarantee insurance data of 31 provinces, autonomous regions and municipalities from 2005 to 2011, build individual fixed effect panel data model, use insurance this factor as the explanatory variable, to consider the impact on insurance intervene SME financing. The results show that the involvement of insurance has a positive role on SME financing, then build a bidirectional fixed effect panel data model. The innovation point of this paper is quantization of insurance factors. Finally, put forward several policy suggestions to solve the SMEs financing.

**Keywords:** Insurance intervene; SME financing; Cluster Robust standard error; Hausman test

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### INTRODUCTION

#### 1.The Situation of SME Financing in China

For more than 30 years of reform and opening, the number of SME has rapid increased, Chinese private investment is also by leaps and bounds, a small part of SME such as Haier, Lenovo, Midea, Wahaha have developed into well-known domestic brands. By the end of 2012, China has 13.666 million enterprises, registered capital 82.54 trillion yuan, including more than 40 million individual businesses, which are mostly small and medium enterprises. According to the new standard of SME and the second economic census data, now the micro, small and medium enterprises accounted for 99.7% of the total national enterprises, SME and non-public economy has maintained high-speed growth. Industrial output accounted for 60% of total output, exports accounted for 68% of total exports, contribution GDP accounted for more than 60% of GDP in China and provide 80% employment opportunities annually[1], at the same time, technological innovation is also impressive.

However, SME are facing serious financing problems when they make great contributions to China. According to the data issued by the Central Bank, in China, among the currently financing way of SME, SME choose to use its own funds accounted for the largest ratio, is about 48.41%, select through bank credit to expand production scale account for 38.89%, and choose other forms of financing is less than 13%, among those SME, only 2.38% prefer financing by issuing shares and bonds.

Table1: China SME financing sources

SME financing sources	enterprise itself	bank credit	capital market	others
ratio	48.41%	38.89%	2.38%	10.32%

## 2. Effects of Insurance Intervene on SME Financing

### 2.1. Enhance the financing ability of SME.

To insure the enterprise property insurance, the insurance company will through the means of supervising the implementation of disaster prevention and mitigation measures to encourage SME to establish a perfect system of safety production and quality control, active use new technologies, new processes, strengthen personnel training to further improve the quality of their products and services. Meanwhile, the insurance company provides risk management consulting services, SME through the purchase of the related products to improve their risk management capability, to further improve business conditions and the ability of profit growth, so as to enhance the enterprise's internal circulation function.

### 2.2. Increase the security of bank loan funds

Firstly, the insurance company as a third party involved in SME financing can provide more reliable information to both sides, reduce the problem of information asymmetry between enterprises and banks. Secondly, after the insurance company receives insurance premiums of lenders and borrowers, increase the supervision and control of moral risk and operational risk about insurance company lending to SME, to make the bank's credit risk and management costs relatively lower. Finally, the loan's credit rating is increased which intervene credit insurance, banks can improve the accuracy and competitiveness of other investment decisions, and then improve their profitability and competitiveness.

### 2.3. Expand the insurance business

On the one hand, after joining the WTO, more and more foreign insurance companies enter the Chinese market, especially in recent years, the number of Sino-foreign joint insurance company substantial growth every year, the pressure of competition force insurance company must develop new insurance market, explore new customers and business areas to remain the invincible position in the competition. On the other hand, insurance company can explore new types of insurance and develop new product in the long-term cooperation and development relationship with SME. Under the insurance protection, SME can have healthy and stable development to further promote economic development, and in return economic development will stimulate the insurance demand of each economic entity including SME steady growth, for a long time it must form a good economic cycle.

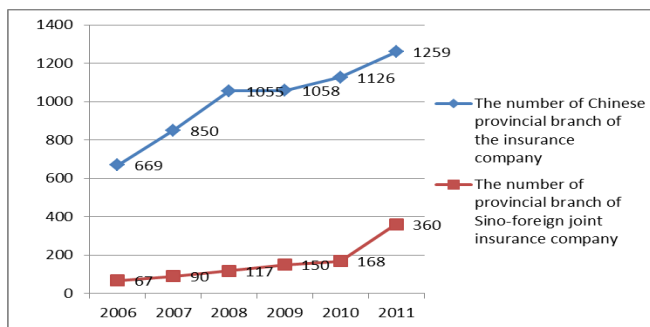


Fig.1:2006-2011 The number of Chinese-funded, Sino-foreign joint insurance company.

### 2.4. Improve the credit guarantee system

Insurance intervene SME financing have the same purpose as guarantees—Improve SME credit and solve SME financing problem. At the present stage China's credit guarantees system has not fully mature, to introduce insurance is the supplement and intensification of the credit guarantee system. Not only for guarantee agencies, but for the entire credit system, insurance intervene SME financing can make banks and other financial institutions resolve and transfer risk, improve the enthusiasm of credit extension to SME. In this way, the involvement of insurance is a "win-win" strategy for financial institutions, insurance company and SME.

### 2.5.Reduce the Audit failure

In many traditional SME credit guarantee system, generally involving SME credit guarantee companies, financial institutions and external auditors four relationships. SME applies lending program, review by its external auditors hired, issue a special audit opinions. Credit Guarantee Corporation provides security through a review of its audit opinions with reference, the cost of the SME guarantee is its guarantee fees paid. When audit comes to credit procedures, credit guarantee company insurances guaranty insurance and pay the relevant insurance premiums, the insurance company hired external audit specifically for SMEs to conduct credit checks audit. Thus, the benefits line is direct cut between SMEs and audit bodies under the traditional credit guarantee system, avoid collusion between SMEs and external audit agencies to make financial institutions suffered losses of moral hazard.

## METHODOLOGY AND MODEL

### 3. Model and Variable Description

Assume I: The intervention of insurance have a significant impact on SME financing, and the effect is positive.

In this paper, we study on SME financing situation in different regions, according to common sense, because different areas are affected by different level of economic development, degree of social civilization, local government policies and other different factors, there should be differences between individuals, so assume II: build individual fixed effects panel data model. Basic econometric model is set as follows:

$$y_{it} = \alpha_0 + \alpha_1 \cdot P_{it} + \alpha_2 \cdot T_{it} + \sum_{k=1}^K \beta_k x_{kit} + u_i + \varepsilon_{it} \quad (1)$$

The specific situation of each variable is as shown in TABLE 2[2].

Table 2 :Selection of Variables

Variable	Index	Expression	Calculation Formulas, Meaning
Explained Variable	Corporate finance index	AD	Total liabilities / Total assets
Explanatory Variable	Insurance index	PREMIUM	Credit guarantee insurance premium income / Total property insurance premium income
	Tax index	TAX	( Main business tax and surcharges + value added tax payable ) / Total assets
Control Variable	Profitability index	ROA	Net profits / Total assets
	Liquidity index	CR	Current assets / Current liabilities
		QR	Quick assets / Quick liabilities = ( Current assets - Inventory ) / Quick liabilities

Among them, Insurance index  $P_{it}$  ( Premium ), expressed by premium income/ total property insurance premium income, in order to finance enterprises major to insure credit insurance and guarantee insurance with insurance company, the majority of policyholder and insurant of these two types of insurance are also constituted by the stakeholders of SME, here we use these two types of insurance premiums sum to take the place of premium income, on behalf of the enterprise's contribution rate to the insurance premium income, namely insure willingness of SME, this is from the perspective of the insurance company to explain the support of corporate financing [3].

Besides,  $u_i$  is an unobserved area effect, designed to control provinces' fixed effects,  $\varepsilon_{it}$  is a random disturbance.  $i=1, 2, \dots, 31$ , represent Beijing, Tianjin, Hebei, Shan xi..... Xinjiang Uygur Autonomous Region 31 regions;  $t=2005, 2006, \dots, 2011$ , represent 7 years;  $k$  is the number of control variables.

## 4. Regression Results

### 4.1.Stability test

First, descriptive statistics with the data, statistical results are as follows [4]:

**Table3: Results of Descriptive Statistics**

Descriptive Statistical Indicator	Explained Variable	Explanatory Variable		Control Variable		
	AD	PREMIUM	TAX	ROA	CR	QR
Mean value	0.57998	0.01091	0.04876	0.05116	1.05741	0.77256
Median	0.58946	0.00643	0.04654	0.04439	1.03206	0.74631
Maximum	0.70098	0.12661	0.11928	0.16086	1.96648	1.63409
Minimum	0.24371	-0.00029	0.01539	0.00897	0.79621	0.54854
Std. Error	0.07545	0.01384	0.01716	0.02734	0.17291	0.15761

We can see that the error between selected samples and overall is small from the descriptive statistics results of each variable.

Then, take stability test on each index, stability test is actually the unit root test, the most commonly used methods are LLC and IPS. Here, we use the two methods to take unit root test on influence of insurance intervene SME financing, test results are as follows:

**Table4: Results of Unit Root Test**

Test Method	Statistic	Probability
H <sub>0</sub> : Each section has an identical unit root Levin, Lin & Chu t	-1.5e+020	0.0000
H <sub>0</sub> : Each section has different unit root Im-Pesaran-Shin	-2.1071	0.0176

We can see from TABLE IV, all variables have passed the unit root test by the LLC and IPS methods, they are all stationary series.

#### 4.2. Model selection

From the explanatory variable AD data we can see that there are obvious differences between the individuals, preliminary judge the model should be individual fixed effect model.

1) Mixed effect model: First to estimate the mixed effect model, the estimation results are as follows.

**Table5: Regression Results of Mixed Effect Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.998155***	0.025925	38.50	0.000
PREMIUM	0.647040***	0.224506	2.88	0.004
TAX	-0.352513	0.245689	-1.43	0.153
ROA	-0.269194	0.164617	-1.64	0.103
CR	-0.425770***	0.077954	-5.46	0.000
QR	0.072404	0.087580	0.83	0.409
R-squared	0.6955	F-Statistic		96.38
Adjusted R-squared	0.6883	Probability		0.0000
S.E. of regression	0.0421	Residual sum of squares		0.3745
Explained sum of squares	0.8552	Total sum of squares		1.2297

Notice: \*, \*\*, \*\*\* represent it's significant in 10%, 5%, 1% significance level

Regression results of the mixed effect model show that, constant coefficient C, insurance index PREMIUM and liquidity index CR is significant in 1% significance level, tax index TAX, profitability index ROA and liquidity index QR is not significant, R-squared and adjusted R-squared are both less than 0.7.

Since this paper select 31 regional panel data for 7 years, it belongs to the short panel data, so we need to consider whether there are heteroscedasticity and autocorrelation. In order to verify and resolve this problem, we take the province as the cluster variable, use the method of cluster-robust standard error to regression analysis, namely it is a robust standard error that when disturbance of different periods exists autocorrelation the regression equation is also right. The method only change the estimate of the standard error, does not change the estimate of regression coefficients[5].

Table 6: Regression Results

Variable	Coefficient	Robust Std. Error	t-Statistic	Prob.
C	0.998155***	0.045846	21.77	0.000
PREMIUM	0.647040***	0.168200	3.85	0.001
TAX	-0.352513	0.530599	-0.66	0.512
ROA	-0.269194	0.190713	-1.41	0.168
CR	-0.425770**	0.158157	-2.69	0.012
QR	0.072404	0.166191	0.44	0.666
R-squared	0.6955	F-Statistic		96.38
Adjusted R-squared	0.6883	Probability		0.0000
S.E. of regression	0.0421	Residual sum of squares		0.3745
Explained sum of squares	0.8552	Total sum of squares		1.2297

The regression results exist obvious difference between the method of cluster-robust standard error and the ordinary method, standard error, t-Statistic and Probability have changed, because the same province's disturbance of different period is generally exists autocorrelation, the ordinary method assumes that the disturbance is independent identically distributed, so the estimate of ordinary standard error is not accurate, we should use the method of cluster-robust standard error to estimate, later in this paper the individual fixed effect regression and random effect regression are also adopt this method to validate. In this case, it will not produce new significant index, the significance of original liquidity index CR is also weakened, from 1% significance level to 5% significance levels.

2) Fixed effect model: Similarly we take the province as the cluster variable, use the method of cluster-robust standard error to correct autocorrelation and heteroscedasticity under the fixed effect model. The fixed effect of cluster-robust standard error is unbiased no matter it is permanent or temporary, and it could generate accurate confidence intervals [6].

Table 7: Regression Results

Variable	Coefficient	Robust Std. Error	t-Statistic	Prob.
C	0.798267***	0.022349	35.72	0.000
PREMIUM	0.597565*	0.306497	1.95	0.061
TAX	-0.597911*	0.341273	-1.75	0.090
ROA	-0.694834***	0.210569	-3.30	0.003
CR	-0.345707***	0.118874	-2.91	0.007
QR	0.265931	0.158496	1.68	0.104
Within-group R-squared	0.4706	F-Statistic		44.86
Inter-group R-squared	0.4161	Probability		0.0000
Entirety R-squared	0.4011	Individual effect variance estimate $\hat{\sigma}_u^2$		0.0561
$\hat{\sigma}_u^2$ and $\hat{\sigma}_e^2$ correlation coefficient (rho)	0.8300	Random disturbance variance estimate $\hat{\sigma}_e^2$		0.0254

After correcting standard error the model's significant level has declined compared with the original, but it still meet most variables are significant in 10% significance level. So the individual fixed effect model specification is basic right, verify the assume II, and under robust standard error the coefficient of each variable does not change, so each area's intercept term also have no change. At the same time, take the F-test, F-statistic is 13, corresponding probability is 0, refuse the original assumption of the mixed regression model, consider that the individual fixed effect is obviously better than the mixed effect, each individual should have its own intercept.

Bidirectional fixed effect model: On the basis of the cross-section individual differences we consider to plus the difference of time to take regression of the bidirectional fixed effect model, at this time for 2005-2011 seven years remove 2005, assume dummy variables for 6 years ( YEAR2006- YEAR2011 ), then directly take the regression under the method of cluster-robust standard error, regression results are as follows.

Table8: Regression Results

Variable	Coefficient	Robust Std. Error	t-Statistic	Prob.
C	0.801295***	0.028246	28.37	0.000
PREMIUM	0.589447*	0.323255	1.82	0.078
TAX	-0.479060	0.384886	-1.24	0.223
ROA	-1.028208***	0.279174	-3.68	0.001
CR	-0.360602***	0.117210	-3.08	0.004
QR	0.278338*	0.150377	1.85	0.074
YEAR2006	0.009758*	0.005534	1.76	0.088
YEAR2007	0.017066**	0.007093	2.41	0.022
YEAR2008	0.019696**	0.009605	2.05	0.049
YEAR2009	0.008589	0.00879	0.98	0.336
YEAR2010	0.018766**	0.008802	2.13	0.041
YEAR2011	0.027521**	0.010783	2.55	0.016
Within-group R-squared	0.5076	F-Statistic		42.48
Inter-group R-squared	0.3915	Probability		0.0000
Entirety R-squared	0.4034	Individual effect variance estimate $\hat{\sigma}_u^2$		0.0554
$\hat{\sigma}_u^2$ and $\hat{\sigma}_e^2$ correlation coefficient (rho)	0.8319	Random disturbance variance estimate $\hat{\sigma}_e^2$		0.0249

Under the bidirectional fixed effect model, explanatory variable and control variable are all significant except tax index TAX. Constant term index, profitability index ROA and liquidity index CR are significant in 1% level, verify the assume I, the intervention of insurance have a significant impact on SME financing, and the effect is positive. Time variable, except 2009, the rest of years are significant in 10% level, and each time have different intercept, we consider that there is also fixed effect on time variable.

3) Random effect model: In addition to fixed effect, the model also has the possibility of random effect, we carry individual random effect model to the regression analysis under the robust standard error.

Table 9: Regression Results

Variable	Coefficient	Robust Std. Error	z-Statistic	Prob.
C	0.859386***	0.034273	25.07	0.000
PREMIUM	0.627992**	0.278878	2.25	0.024
TAX	-0.457226	0.485645	-0.94	0.346
ROA	-0.477776**	0.207636	-2.30	0.021
CR	-0.329992**	0.146099	-2.26	0.024
QR	0.141625	0.170231	0.83	0.405
Within-group R-squared	0.4338	$\chi^2$ -Statistic		408.94
Inter-group R-squared	0.7677	Probability		0.0000
Entirety R-squared	0.6380	Individual effect variance estimate $\hat{\sigma}_u^2$		0.02781
$\hat{\sigma}_u^2$ and $\hat{\sigma}_e^2$ correlation coefficient (rho)	0.5452	Random disturbance variance estimate $\hat{\sigma}_e^2$		0.02540

Under the random effect model, tax index TAX and liquidity index QR are not significant, other index are all significant in 5% level.

Whether choose individual random effect model or mixed model, we need to take the LM -test. LM statistic obey the  $\chi^2$ -distribution, the degrees of freedom is 1, through the test, here the  $\chi^2$ -distribution statistic is 96.29, corresponding probability is 0, so refuse the original assumption of the mixed model, accept the random effect model.

4) Hausman test and auxiliary regression: Ultimately select individual fixed effect model or individual random effect model require further examination, need to take the Hausman test.

Table 10: Results of Hausman Test

Test result	$\chi^2$ statistic	$\chi^2$ degree of freedom	Prob.
Cross-section random	63.28	5	0.0000
Variable	Fixed effect	Random effect	Variance
PREMIUM	0.597565	0.627992	0.002964
TAX	-0.597911	-0.457226	0.011984
ROA	-0.694834	-0.477776	0.005102
CR	-0.345707	-0.329992	0.001886
QR	0.265931	0.141625	0.003181

From the test results of TABLE X we can see,  $\chi^2$ -statistic is 63.28, corresponding probability is 0, so refuse the original assumption of the random effect, the true model should be the individual fixed effect model. But there is a theoretical paradox, namely the premise of Hausman test is the error terms are independent identically distributed, if the difference between robust standard error and general standard error is large, the traditional Hausman test will not applicable, and in this paper the value of robust standard error can at most twice as general standard error, so the Hausman test requires further validation.

Here we use auxiliary regression to solve this problem[7], auxiliary regression means use cluster-robust standard error to test the original assumption, the probability of the test result is 0, so refuse the original assumption of the random effect, accept the fixed effect. Here is completely confirmed the accuracy of the model.

### 5. Model Optimization and Results

Through the comparison of each regression result, we can see that the bidirectional fixed effect model is the most accurate and comprehensive model that reflect various regions, different period the influence of insurance intervene SME financing on corporate financing scale in China, so on the basis of the original hypothesis model to join the time fixed effect to optimize the model.

$$y_{it} = \alpha_0 + \alpha_1 \cdot P_{it} + \alpha_2 \cdot T_{it} + \sum_{k=1}^K \beta_k x_{kit} + u_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Formula (2) is the optimized bidirectional fixed effect model,  $\lambda_t$  is the unobserved time effect, it's a variable that does not vary with the different provinces, and it explains all the time-related effects which not included in the model.

We can see from the regression results of bidirectional fixed effect, insurance index PREMIUM has significant effect on the enterprise financing scale in 10% level, and regression coefficient is positive, it illustrates enterprises purchase credit guarantee insurance have a great influence on enterprise financing and it is a positive role, indicating the correctness of the Assume I.

## CONCLUSION

Insurance index PREMIUM, tax index TAX and each control variable index all have significant effect on SME financing, this paper put forward several policy suggestions for the promotion of SME financing from several aspects.

### 6.1. Mode selection: policy combined with commercialization

The accumulation ability of China's financial capital is weak, the government's investment ability is limited. Therefore, on the choice of mode China can not make the government take full responsibility like Japan and South Korea. So we need the hybrid operation mode which combination of policy and commercialization to make insurance support SME financing flexibly.

### 6.2. Build local insurance company and systems, establish reinsurance mechanism, form a complete chain of insurance

Each region's influence degree of the insurance intervene SME financing are not identical, general use unified insurance system, jurisdiction of insurance is not conducive to long-term development of the various regions, must establish insurance system or small insurance agency in accordance with local characteristics, dedicated to help and support SME financing.

### 6.3. Train compound talents with Insurance Actuary and Credit ability

Currently, the market is very lack of professional insurance personnel, not to mention not only understands Insurance Actuary but also credit talent, so while the insurance involved in SME financing, training complex talent with insurance and credit is imminent. Only under the circumstances of complete personnel assurance, accurately identify SME credit ability, the underwriting risk and the control risk means. Quickly identify the appropriate rates, improve operational efficiency and accuracy of insurance mechanisms, it is irreplaceable in the long-term development of the insurance business involved in SME financing.

### 6.4. SMEs should improve their own operations

SME should strive to improve their operations, use scientific management methods and hire professional management personnel, clear division of labor, avoid chaotic management, enhance their profitability and solvency, improve their credit, keep good operating efficiency and credit records can get bank loans more easily.

### 6.5. Set up specialized SME credit rating agency

The establishment of SME credit rating agencies could lead by the People's Bank, bring together commercial banks, guarantees, insurance, commerce, trade, taxation, justice and other departments. SME which needs financing require to backup information in the agency, to solve the financing problem of 'moral hazard' and 'adverse selection' caused by information asymmetry. It can also reduce transaction costs and the costs of review and supervision of commercial bank loan, gradually establish good credit order and environment of SME.

### 6.6. Construct the related legal system

The government should improve relevant laws and regulations system about promoting the development of SME and credit guarantee insurance. And through the fiscal levy to reduce the financial burden on SME. Government establish the compensation fund of risk loss, the premium subsidies, deepening reinsurance and other aspects improve SME financing and the credit guarantee insurance compensation mechanism, and the tax on finance-related insurance should be supported and deals.

### 6.7. Accelerate the development of specific operational details

Although many places have been carried out the pilot work of mortgage insurance like credit guarantee insurance, the mortgage insurance are not completely universal, and the specific operational details are not elaborated, the government should accelerate to formulate the specific implementation details of relevant insurance on insurance involved in SME financing according to different provinces. For example, the relevant provisions in underwriting conditions, the proportion of insurance, insurance rates, deductibles and other aspects of setting should be introduced as soon as possible.

## Acknowledgment

This paper is the phased objective of Wenzhou financial research institutes and Wenzhou university's bidding project 'Research on the construction of SME financing system in China—a case study of Wenzhou' (project NO. ZB12110) and 2013 Zhejiang province university students' science and technology innovation project 'From the perspective of financial reform in Wenzhou to discuss the construction of Zhejiang province SME financing insurance and guarantee integration win-win mode' (project NO. 2013R414039).

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