Research on Countermeasures and Financing Risk of Small and Medium-Sized Enterprises in China

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Abstract

SMEs have played an important role in deepening of construction of socialist market economy in China. Their contribution rate to our country's economy is rising continuously, they also stimulate technical innovation. However, because of their small scale, credit margin and other factors and imperfect market mechanism, SMEs are facing a severe situation in the process of financing, the huge financing risk has become the core problem restricting the development of SMEs. This paper employed the KMV model to make an empirical analysis. Then, the author puts forward corresponding suggestions for the financing of SMEs in the future.

Keyword: small and medium-sized enterprises, financing risk, KMV model

1. Introduction

According to the in-depth market research and investment strategy research and analysis report of China's enterprise business project industry from 2017 to 2022, there are 40 million small and medium-sized enterprises in China, accounting for 99% of the total number of enterprises, contributing 60% of China's GDP, 50% of taxes and 80% of urban employment. Small and medium-sized enterprises play an important role in promoting economic prosperity, promoting reform and innovation, increasing export employment, etc., and play an important role in economic and social development. However, SMEs have to face the difficult problem of financing. There are many reasons for the financing difficulties of small and medium-sized enterprises, among which the financing risk is the key factor restricting the financing of small and medium-sized enterprises. Due to the small assets, low credit, high failure rate and default rate of small and medium-sized enterprises, banks are often reluctant to provide loans to them, and some other financing channels are difficult to meet the huge capital needs of enterprises, or need to pay huge interest. Therefore, it is of practical significance to study the financing risk of small and medium-sized enterprises. This paper lists the main financing risks faced by small and medium-sized enterprises, and with the help of KMV model, taking listed enterprises in Zhejiang Province as samples, analyzes the default risks of small and medium-sized enterprises, and puts forward corresponding suggestions, hoping to help find countermeasures to reduce the financing risks of small and medium-sized enterprises.

2. Literature

Scholars at home and abroad have made profound explorations on the financing risks of small and medium-sized enterprises: Li Suhong, Chen Liwen and Wang Shuqiang (2013) found that the policy and legal risks faced by enterprises are the largest, followed by financial risks; Fang Xianming and Su Xiaojun (2015) divided the main financing risks of Science and technology enterprises into market risks, environmental risks and production risks On this basis, it subdivides various levels and establishes a clear financing risk evaluation system. When studying the financing risk of Listed Companies in strategic emerging industries, Tian JuanJuan (2016) empirically concludes that the extreme risk loss of gem is the largest, and it is more vulnerable to environmental factors, and gem is usually the main way for small and medium-sized enterprises to list. Wang Cheng Li and Xu Jiuping (2003) found that the risk of private enterprises listed on the gem is relatively high after their risk evaluation. Yang Kaiyu (2015) measured the credit risk of companies listed on the gem, and found that the overall credit level of companies listed on the gem is lower than that of small and medium-sized enterprises, that

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is to say, their default risk is much higher than that of companies listed on the SME board.

Zhang Peng and Cao Yang (2012) use KMV model to calculate the default distance and default probability of sample listed companies. The empirical results show that the default distance can better identify the credit risk of listed companies. Chen Xiaohong, Zhang Zejing et al. (2009) used KMV model to conduct a more specific study on the credit risk of China's small and medium-sized listed companies in 2006, and found that compared with large enterprises, the default risk of small and medium-sized companies had an increasing trend in 2006, and set two credit warning lines to monitor the credit crisis of small and medium-sized listed companies; Peng Wei (2012) selected 1 Taking 11 ST companies and non ST companies as the research objects, this paper uses the improved KMV model to calculate their average default distance from 2008 to 2011, and considers that the KMV model can well measure and distinguish the credit risk of Listed SMEs. The research results of many scholars show that the traditional KMV model can reflect the level of default risk, and has high sensitivity to default risk. To sum up, this paper selects KMV model to evaluate the default risk of Listed SMEs.

3. Model Construction and Data Sources

3.1 Model construction

(1) Calculate the market value and volatility of assets

According to the above analysis, KMV model can be derived from BSM option pricing formula:

$$V_E = V_A N(d_1) - De^{-rf\tau} N(d_2)$$

By deriving the two sides of the formula and then calculating the expectation, we can get the following results:

$$\sigma_E = \frac{V_A N(d_1)}{V_E} \sigma_A$$

Among, $d_1 = \dfrac{\ln(V_A/D) + (r_f + 0.5\sigma^2{}_A)\tau}{\sigma_A \sqrt{\tau}}$, $\quad d_2 = d_1 - \sigma_A \sqrt{\tau}$

Where is the equity value of the company, is the market value of the company's assets, is the standard normal cumulative distribution function, D is the book value of the company's liabilities, is the risk-free interest rate, is the debt maturity, is the volatility of the company's equity value, is the volatility of the company's assets market value. The equity value and its volatility of the company's assets can be observed and calculated in the stock market. Therefore, the market value and volatility of the company's assets can be calculated by combining the above four equations.

(2) Calculate the default point DP and default distance DD of the company

Theoretically, the point where the asset value and liability value of listed companies are equal is

the point of default. However, a large number of scholars have found that most enterprises tend to use long-term liabilities to repay short-term liabilities. KMV company has calculated through a large number of empirical tests that the empirical point of default is generally half of the book value of short-term debt and long-term debt, that is, the default point is the default point of short-term debt plus long-term debt among them, SD is short-term debt and LD is long-term debt.

The default distance DD refers to the multiple of the product of the distance between the market

value of the company's assets and the default point, the market value of the company's assets and its volatility:

$$DD = \frac{V_A - DP}{V_A \times \sigma_A}$$

(3) Calculate EDF

Assuming that the asset value of a company obeys normal distribution, the default distance reflects the standard deviation of the company from default:

$$EDF = N(\text{-DD})$$

3.2 Data Sources

This paper selects Zhejiang small and medium-sized enterprises listed on the SME and gem as samples. The basis of selection is that the operating income in 2017 is less than 400million yuan, excluding ST, ST listed enterprises, financial, insurance listed enterprises and enterprises with incomplete or abnormal data, and finally leaving 25 SMEs. The research period is from January 1, 2017 to December 31, 2017. The original data is from the national Tai'an database. According to the calculation method and steps of KMV model above, the data of 25 selected enterprises are calculated by Excel, and the equity value, volatility and default point of the selected enterprises are calculated; Matlab 2016a is used The statistical software program the parameters in KMV model, and through iterations to find the market value and volatility of enterprise assets, and finally obtain the default distance and expected default probability of 25 enterprises in 2017.

4. Empirical Results and Analysis

4.1 Calculate the Volatility of Equity Value

the First, the daily return of the stock is calculated according to the formula $u_i = \ln(\frac{P_i}{P_{i-1}})$, and then the daily

volatility of stock return $\sigma_o = \sqrt{\frac{1}{n-1}\sum_{i=1}(u_i - \overline{u_i})^2}$ is calculated. Finally, the annual volatility of the stock price

$\sigma_E = \sigma_o \times \sqrt{244}$ is calculated according to the trading day of the stock market in 2017. According to the formula:

V_E = number of circulating shares $\times$ closing price at the end of the year + number of non tradable shares $\times$ net assets per share at the end of the year

The equity value of each enterprise is obtained. The calculation results are as follows:

Table 1. Stock price volatility and equity value of enterprises

Security code	Number of shares in circulation	net asset value per share	Number of non tradable shares	Closing price at the end of the year	Equity value V_E	Annual volatility of stock price
002095	251602512	4.216248	1117488	34.86	8775575175	0.364047146
002199	215529580	1.891131	27912783	15.35	3361165782	0.389373264
002214	354589814	2.172004	104076852	7.96	3048590258	0.397450517
002515	609279051	2.115794	369034229	8.27	5819538159	0.576063727
002569	139696350	3.509515	313650	36.27	5067887374	0.233495769
002625	251188983	5.936547	1016322744	28.07	13084322490	0.294088548
002633	149100000	3.471768	900000	11.62	1735666591	0.439987827
002767	37500000	4.633952	112500000	20.59	1293444600	0.455106227
002860	15200000	8.746938	60778680	42.68	1180363346	0.499434657
300069	92397572	4.584036	24602428	33.74	3230272495	0.289858881
300076	368234486	2.336314	55765514	6.17	2402292530	0.437390707
300234	152351762	3.479552	137182826	9.11	1865259328	0.404876205
300314	189052698	2.702432	98947302	13.25	2772346604	0.319964
300357	140949015	4.958279	20650985	49.21	7038494373	0.276174688
300488	25008000	8.370405	80178774	31.11	1449127691	0.604935894
300519	98800000	4.411309	61200000	19.75	2221272111	0.811905181
300548	34110000	7.475742	48560000	49.9	2065111032	0.479639012
300550	29270000	6.431559	50730000	31.26	1241253188	0.448233504
300553	15137427	6.757876	32862573	41.09	844078068.8	0.42525578
300587	26000000	8.353849	78000000	23.2	1254800222	0.519953048
300604	19050000	5.3736	58976000	62	1498013434	0.597440773
300643	50000000	2.066241	150000000	13.29	974436150	0.551716842
300649	32000000	2.452471	96000000	37.5	1435437216	0.980660439
300669	21050000	5.259957	63150000	24.42	846207284.6	0.39021186
300698	33500000	2.832278	100500000	26.61	1176078939	0.535130814

4.2 Calculation of Default Point and Total Liabilities

Connecting with practice, short-term debt is selected as current liability in financial report, and long-term debt is replaced by non current liability. Then the formula is adjusted as follows:

Default point DP = current liability + 0.5 * non current liability, total liability d = current liability + non current liability

The calculation results are as follows:

Table 2. Total liabilities and default points of enterprises

Security code	current liabilities	Non current liabilities	Total liabilities D	Default point DP
002095	226614027.9	2587016.69	229201044.6	227907536.3
002199	121901907.4	927716.69	122829624.1	122365765.8
002214	347299175.4	83934441.65	431233617	389266396.2
002515	208855012.2	26421441.03	235276453.2	222065732.7
002569	221104337.6	0	221104337.6	221104337.6
002625	525865142.7	244214163.7	770079306.4	647972224.5
002633	72049355.52	20290554.19	92339909.71	82194632.62
002767	117747404.2	2728619.59	120476023.8	119111714
002860	147067906.5	737681.57	147805588.1	147436747.3
300069	361556249.9	5347815.31	366904065.2	364230157.6
300076	119412595.6	12142611.29	131555206.9	125483901.3
300234	200140975.5	11677053.25	211818028.8	205979502.1
300314	85672383.26	3349016.79	89021400.05	87346891.66
300357	42200071.04	4853200	47053271.04	44626671.04
300488	129191271.4	40663251.06	169854522.5	149522896.9
300519	57908489.39	11329603.66	69238093.05	63573291.22
300548	63511946.36	5663775.32	69175721.68	66343834.02
300550	177298816.1	1097104.79	178395920.9	177847368.5
300553	30942155.05	0	30942155.05	30942155.05
300587	113905531.3	6594544.52	120500075.8	117202803.5
300604	117110161.6	3114355.78	120224517.4	118667339.5
300643	63238935.54	2528538.44	65767473.98	64503204.76
300649	48565537.34	1945905.49	50511442.83	49538490.09
300669	43406896.63	0	43406896.63	43406896.63
300698	189048322	0	189048322	189048322

4.3 Calculate Asset Volatility, Asset Value, Default Distance and Default Probability

Simultaneous formula:

$$V_E = V_A N(d_1) - De^{-rf\tau} N(d_2)$$

$$\sigma_E = \frac{V_A N(d_1)}{V_E} \sigma_A$$

$$d_1 = \frac{\ln(V_A/D) + (r_f + 0.5\sigma^2{}_A)\tau}{\sigma_A \sqrt{\tau}}$$

$$d_2 = d_1 - \sigma_A \sqrt{\tau}$$

The asset value and the volatility of asset value are obtained，among: $\tau = 1$, r=1.5%. Again according to

$DD = \frac{V_A - DP}{V_A \times \sigma_A}$, $EDF = N(-DD)$，The default distance and default probability are obtained. This step is solved

by MATLAB 2016a statistical software. The calculation results are as follows:

Table 3. Asset value, asset volatility, default distance and default probability of enterprises

Security code	asset value	Asset value volatility	Default distance	Probability of default
002095	9.00E+09	0.35491476	2.74623906	0.003014141
002199	3.48E+09	0.375843031	2.567186892	0.005126367
002214	3.47E+09	0.348840474	2.545373817	0.00545804
002515	6.05E+09	0.553999687	1.738814841	0.041033669
002569	5.29E+09	0.223873902	4.279951027	9.35E-06
002625	1.38E+10	0.277972041	3.42908994	3.03E-04
002633	1.83E+09	0.418076701	2.284274811	0.011177693
002767	1.41E+09	0.416856773	2.196559839	0.014025949
002860	1.33E+09	0.444591615	1.999156572	0.022795708
300069	3.59E+09	0.260689786	3.446976443	2.83E-04
300076	2.53E+09	0.415002542	2.290199529	0.011004876
300234	2.07E+09	0.364140244	2.473446076	0.00669085
300314	2.86E+09	0.310153105	3.125745212	8.87E-04
300357	7.08E+09	0.27436781	3.621784606	1.46E-04
300488	1.62E+09	0.54231908	1.673367935	0.047127443
300519	2.29E+09	0.787717627	1.234239768	0.108556786
300548	2.13E+09	0.464317182	2.086720565	0.018456701
300550	1.42E+09	0.392642181	2.227192207	0.012967215
300553	8.75E+08	0.410434116	2.350242563	0.00938059
300587	1.37E+09	0.475015828	1.925554572	0.027080008
300604	1.62E+09	0.553667406	1.673545493	0.047109979
300643	1.04E+09	0.517321189	1.813054293	0.034911724
300649	1.49E+09	0.94783457	1.019845631	0.153900839
300669	8.89E+08	0.371442101	2.560753291	0.005222275
300698	1.36E+09	0.461977668	1.864223924	0.031145133

From the above data, it can be seen that among the 25 listed SMEs in Zhejiang Province, the default probability of 5 enterprises is less than 0.3%, and that of 14 enterprises is 1%, the largest of which is 15.39% (securities code 300649), indicating that SMEs are still facing a high default risk. The reference interval of default probability given by the internationally famous Moody's company using KMV model is [0.02%, 20%] (Han, 2018). Therefore, the expected default rate calculated in this paper has a high degree of credibility, which also proves that KMV model has a certain applicability in China's market, and can more accurately measure the default risk of listed enterprises.

4.4 Regression Analysis of the Model

The default distance is set as the dependent variable, with equity value, equity value volatility, default point, asset value and asset value volatility as the independent variables respectively. The regression analysis is carried out by SPSS software, and it is found that the annual volatility of equity value and default distance have the highest fitting degree，the results are as follows:

Model summary				
Model	R	R square	R square after adjustment	Error in standard estimation
1	.899[a]	0.808	0.8	0.339997913

a forecast variables: (constant), annual volatility of stock price

ANOVA[a]						
Model		Sum of squares	freedom	mean square	F	Significance
	regression	11.194	1	11.194	96.838	.000[b]
1	residual	2.659	23	0.116		
	Sum	13.853	24			

a dependent variable: default distance; b Forecast variables: (constant), annual volatility of stock price

Coefficient[a]						
Model		Non standardized coefficient		standardized coefficient	t	Significance
		B	Standard error	Beta		
1	(constant)	4.305	0.208		20.663	0
	Annual volatility of equity	-4.133	0.42	-0.899	-9.841	0
a Dependent variable: default distance						

According to the results, the fitting degree is 0.899, close to 1, indicating that the model has a high degree of fitting; the significance of F value is 0, indicating that the volatility of equity value has a significant impact on the default distance; the significance of t test is 0, indicating that the volatility of equity value has a significant impact on the default distance.

5. Research Conclusions and Recommendations

Based on KMV model, this paper makes an empirical analysis of small and medium-sized listed enterprises in Zhejiang Province. The conclusions are as follows: small and medium-sized enterprises in China are faced with high default risk, and their default probability is mainly positively correlated with the volatility of equity value, that is, the greater the annual volatility of stock price is, the greater the default probability is. The following countermeasures and suggestions are put forward:

(1) Strengthen credit management and improve business reputation. While implementing credit management for the company's internal business and employees, we should also pay attention to risk prevention, establish customer credit files, strengthen customer credit management, update and modify the information in time, and optimize the enterprise credit management mechanism (Wang & Li, 2007). (2) Broaden financing channels and disperse financing risks. (3) To improve the financing risk prevention mechanism, enterprises can establish a special risk management department and form a complete risk prevention system according to their own development and internal resources. (4) We should strengthen the prediction of interest rate and reasonably determine the financing mode, financing period and financing time. Small and medium-sized enterprises should strive for policy financing as far as possible. Policy financing is the product of the combination of financial means and government policies. It is a financing business and behavior based on policy basis and guidance [13]. (5) Moderate debt management, enhance the strength of enterprises. Debt operation is a double-edged sword. From a positive analysis, it can quickly raise funds, strengthen operation and management, reduce tax burden, and avoid dispersing the controlling power of enterprises (Han, 2018).

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