

Credit Risk Prevention of Local Government Financing Platforms: Taking Liuzhou TK Company as an Example

Lu Qiuyan

School of Economics and Management, Guangxi Normal University, Guilin, China
lqiuyan2023@163.com

Abstract: *At the beginning of its establishment, the purpose of local government financing platform companies was to undertake some political functions for the local government, with the goal of promoting local economic development. However, with the continuous development of the local economy, the expanding debt scale of local government financing platform companies has led to a sharp increase in credit risk. Events such as the 20-year extension of Zunyi 15.6 billion urban investment bonds and the technical default of Lanzhou Urban Investment have successively occurred, and investors' "urban investment faith" has begun to waver, studying the credit risk of local government financing platforms is of great significance. This article takes Liuzhou TK Company as an example and establishes a KMV model based on the dual attributes of the company's local government financing platform and industry non-listed companies to quantitatively evaluate the company's credit risk. Finally, based on this case, this article draws universal conclusions and proposes targeted suggestions from multiple perspectives.*

Keywords: *Local government; Financing platform; Credit risk; KMV model*

1. Introduction

Local government financing platforms began to develop in the early 1980s after the reform and opening up, and began to develop after the tax sharing reform in 1994. They significantly increased after the 2008 financial crisis. Li Xia (2010) found that after the reform of the tax sharing system, local governments' financial resources were insufficient to support large-scale infrastructure construction expenditures. Therefore, local government financing platforms were used for financing and infrastructure construction, and after the project was completed, the project funds and construction fees were paid in installments^[1]. Ba Shusong (2011) believes that the financial crisis has led to a domestic economic depression, and local government officials rely on infrastructure construction to drive the economy and achieve political achievements. However, the funding budget is limited, and they can only borrow through local government financing platforms. In the 1980s, foreign scholars began to conduct systematic research on the causes of local debt formation^[2]. Borensztein et al. (2013) argue that the cause of local government debt crises is due to excessive debt scale and mismatched debt maturities, resulting in difficulty in repayment. Author found through empirical research that economic, political, and social factors all have an impact on the scale of local government debt in Spain^[3]. Mi-Can(2011) and Cao Guiquan (2014) believe that as an important financing model for local governments, local government investment and financing platforms have always played a positive role in raising funds for promoting urban infrastructure construction and public utility development.^{[4][8]}

There is also a lot of research on credit risk, as credit risk not only causes losses to financial institutions, but also impacts the real economy and hinders the development of the entire social economy. Xu Junwei, MAO Jie, Guan Xinghua(2020) believe that using a risk measurement model can effectively measure bond credit risk. In 1974, Merton launched the KMV model, which successfully predicted the collapse of Enron.^[5] Yi Xingfei.(2020) and Chen Li.(2023) found that the KMV model has good predictive performance in the field of credit risk and can effectively predict potential future risks by constructing an indicator system to evaluate the predictive effectiveness of credit risk models^{[7][9]}. Based on the particularity of the issuing entity, Lei Chengyao (2017) combined the measurement elements of two attributes, namely ordinary non-listed enterprises and urban investment properties, and used an improved KMV model to calculate the corresponding default distance for two different attributes of the same company. Then, these two variables were used as independent variables of the Logistic model together with other financial indicators for regression, and a conclusion was drawn^[10].

In recent years, Liuzhou's debt has skyrocketed, while public opinions such as land cancellation, non-standard thunderstorms, and overdue commercial invoices have been continuous. Recently, as a "internet celebrity" in the bond market, Liuzhou has become a key focus area for the market. Since 2022, negative events such as the cancellation of land use rights, downgrades of ratings, and default of bills by companies or subsidiaries have occurred on multiple platforms in Liuzhou, driving a significant upward trend in regional platform interest rate differentials.

2. Analysis of the current situation of Liuzhou TK Company

2.1. Company Properties

Liuzhou TK Group, with the approval of the Liuzhou Municipal Government in June 2021, was formed by Guangxi Liuzhou TK Co., Ltd., which was established in July 2001, and Guangxi Liuzhou BC Investment and Development Group Co., Ltd., which was established in December 2016. The registered capital is 1.931 billion yuan. It is a state-owned sole proprietorship company directly under the leadership of the Liuzhou Municipal People's Government, authorized by the Municipal People's Government to fulfill the responsibilities of investors, and established in accordance with the law. TK Group takes the expansion of horizontal and vertical industrial chains as important paths to achieve the integration of traditional and emerging industries, forming a "one axis, two wings" business development pattern with urban comprehensive development and land development and consolidation as the main axis, and industrial investment and operation, real estate development and related supporting services as the two wings. It comprehensively promotes the new urbanization of Liuzhou and builds a trillion yuan industrial strong city for Liuzhou. Make positive contributions to building a modern manufacturing city.

2.2. Problems with Liuzhou Urban Investment Platform

2.2.1. Urban investment is active in borrowing, with a high debt ratio across a wide range

The outstanding debt balance of Liuzhou is not high, with a local government debt balance of only 69.05 billion at the end of 2021. However, the relatively high urban investment debt has pushed Liuzhou's broad debt to the 48th place in the national prefecture level city. The regional financial strength is average, with a wide caliber debt ratio of 443.3% at the end of 2022, ranking 10th among prefecture level cities in China, far higher than other prefecture level cities in Guangxi Autonomous Region.

2.2.2. Land transfer fees are declining, and regional interest payment pressure is increasing

In recent years, Liuzhou has increased its development efforts in areas such as the Liudong New Area and the Northern Ecological New Area. Before 2020, real estate still provided positive support for urban construction. Since 2020, as land transfer fees have declined, the pressure on regional interest payments has gradually increased. The estimated scale of generalized debt interest payment in Liuzhou in 2022 is 17.17 billion yuan, and the interest coverage ratio of land transfer fees has decreased to 0.9 times, which is significantly lower than the national average of prefecture level cities (1.8 times) and also lower than the average of prefecture level cities in Guangxi (1.2 times).

2.2.3. A solid industrial foundation and a "stalled" economy

Liuzhou City has a high positioning in Guangxi, being the largest industrial city and a sub central city in Guangxi. In 2022, the GDP of Liuzhou City was 310.91 billion yuan, which is not as high as 60% of Nanning, the capital of Guangxi. However, with a solid industrial foundation, Liuzhou City has formed three pillar industries: automobiles, metallurgy, and machinery. Its total industrial output value ranks first in Guangxi Autonomous Region and is truly an important industrial town in southwestern China. Although Liuzhou has a high positioning, its economic growth has been sluggish in recent years, and its solid industrial foundation and weak development status constitute one and two aspects of the current Liuzhou economy. Before 2018, the economic growth rate of Liuzhou City was relatively stable and higher than the national average. However, since 2018, the GDP growth rate has shown signs of weakness, especially since 2019, it has not exceeded 2.5% for three consecutive years. In 2022, due to external environmental disturbances, it has fallen into negative growth, and the economic development level has remained stagnant for four years.

2.2.4. Insufficient sustainability of financial growth in Liuzhou City

In terms of fiscal revenue, since 2020, the general public budget revenue of Liuzhou City has started to decline, with growth rates of -21.8%, 1.1%, and -11.2% from 2020 to 2022, respectively. In 2022, the

scale of general public budget revenue has decreased to 15.12 billion yuan, only slightly higher than the level in 2016. In terms of fiscal self-sufficiency rate, Liuzhou City's fiscal self-sufficiency rate is insufficient, with a fiscal self-sufficiency rate of 41.75% in 2022, increasing its dependence on higher-level fiscal transfer payments and land transfers. With the large-scale development and construction of the region in the past few years, land transfer revenue has become an important lever for local finance. The revenue of Liuzhou government funds has shown a steady growth trend since 2017, and since 2020, the scale has exceeded the general public budget revenue.

At present, the stock of urban investment bonds in Liuzhou City is nearly 80 billion yuan, with a large scale. The debt maturity is concentrated from 2023 to 2024, with significant pressure in June, September, and December 2023. In recent years, Liuzhou's GDP has remained at 300 billion yuan, and in 2022, it achieved a GDP of 310.909 billion yuan, ranking second in Guangxi Autonomous Region. The GDP growth rate has declined since 2018, with a growth rate of 2% in 2021 and -1.00% in 2022. Compared to the average performing GDP, Liuzhou's urban investment interest bearing debt has grown rapidly in the past few years, especially in 2020 and 2021, with an overall growth rate of 29 billion and 16.5 billion respectively, far higher than the growth rate of local government debt balance. From the perspective of the scale of existing urban investment bonds, as of now, the balance of existing bonds on the Liuzhou Urban Investment Platform is about 80 billion yuan, of which Liuzhou TK and DC Group have a larger scale of existing bonds, both exceeding 15 billion yuan. As a new internet celebrity in the bond market, under the macro environment of the entire city of Liuzhou, the overall problems of Liuzhou TK Company are relatively consistent with the current situation in Liuzhou.

3. Empirical research

3.1. Model specification

In recent years, the Ministry of Finance has repeatedly proposed to break the deep binding relationship between local governments and local government financing platforms, promote the market-oriented transformation of local government financing platforms, and in the future, Liuzhou TK's main business will become more market-oriented. Therefore, it is necessary to analyze its credit risk from the perspective of the attributes of ordinary non-listed companies.

The KMV model is mainly suitable for evaluating the credit risk of listed companies, and in the application of non-listed companies, it is necessary to use other information to replace important variables in the model. The KMV model has a strong theoretical foundation and the calculated expected default probability of enterprises has strong persuasiveness. The KMV model has a low sample size requirement and can be better applied in situations with limited available data. Therefore, it can be used to model and solve default problems of government implicit debt or urban investment debt.

This article uses regression substitution method to construct a KMV model for non-listed companies, referring to Lei Chengyao et al. (2017). This involves first calculating the asset value and volatility of listed companies in the same industry, analyzing their relationship with financial indicators, and then substituting them into the financial indicators of non-listed companies to obtain the asset value and volatility of non-listed companies, thereby calculating the default distance and default probability of non-listed companies^[10].

The use of the KMV model to calculate the default probability of a company can be divided into three steps: calculating the market value and asset value volatility of the company's assets, calculating the default distance, and calculating the default probability. Step 1: Calculate the market value V and asset value volatility of enterprise assets; Step 2: Calculate the default distance DD ; The third step is to calculate the default probability (DEF).

3.2. Data Source and Indicator Selection

3.2.1. Data source

Liuzhou TK Group mainly provides resource and property rights trading services, similar to the content of companies in the commercial service industry. This article selects 15 listed companies classified by Wind as the commercial service industry as the research objects, and the data selection practice is from 2018 to 2022. The specific list is shown in Table 1.

Table 1: List of Listed Companies in the Commercial Services Industry

| Stock Code | Company Name | Stock Code | Company Name | Stock Code | Company Name |
|------------|--------------------|------------|----------------------|------------|--------------------|
| 300012.SZ | Centre Testing | 002183.SZ | Eternal Asia Supply | 603860.SH | Roadmaint |
| 002229.SZ | Hongbo | 002883.SZ | Zhongshe Group | 601515.SH | Dfp New Material |
| 002599.SZ | Shengtong Printing | 300416.SZ | Sushi Testing | 300492.SZ | Huatu Cendes |
| 600662.SH | Foreign service | 002565.SZ | Shunho New Materials | 300649.SZ | Hangzhou Landscape |
| 603300.SH | Huatie Emergency | 603060.SH | China Testing | 300284..SH | JSTI Group |

3.2.2. Indicator Selection

Referring to relevant literature, the KMV model involves five parameter calculation methods:

- ①The market value (VE) of the listed company is the sum of the market value of the tradable shares and the non-tradable shares;
- ②The market value volatility (σ_E) of listed companies is the stock price volatility;
- ③Risk-free rate of interest (r)The interest rates of one-year treasury bond from 2018 to 2022 are 1.60%, 1.80%, 1.50%, 2.35% and 2.40% respectively
- ④The debt term (t) is 1 year
- ⑤The point of default (DP) is the sum of the current liabilities and half of the non-current liabilities, All data were obtained from Wind.

3.3. Empirical Model Construction

3.3.1. Model construction

When calculating the asset value of non-listed companies, the explanatory variables selected by Zhang Lu (2010) for this article are the total assets and equity value of the company. When calculating the volatility of the asset value of non-listed companies, the explanatory variables selected are operating income, operating profit margin, asset liability level, and total asset turnover.^[6] The regression equation is as follows:

$$\ln V = \alpha + \beta_1 + \ln(\text{Asset}) + \beta_2 \ln(\text{Equity}) \quad (1)$$

$$\sigma = \alpha' + \beta'_1 \ln(\text{Income}) + \beta'_2 \text{OPR} + \beta'_3 \text{Leverage} + \beta'_4 \text{TAT} \quad (2)$$

3.3.2. Calculation of asset value and volatility of sample companies

This article exports the five parameters required for the KMV model in the Wind database, and uses the algorithm of the KMV model in Matlab software to ultimately obtain the asset value and volatility of listed companies in the commercial service industry. Based on the above two values, the default distance and default probability of the corresponding companies are calculated. Due to space limitations in this article, detailed data are not presented.

3.3.3. Calculation of Asset Value and Volatility of Liuzhou Holdings

According to formulas 1 and 2, the financial data of the 15 companies mentioned above are used as independent variables, and asset value and asset value volatility are used as dependent variables. Multiple linear regression analysis is performed on the data using Stata software, and the results are shown in Table 2.

Table 2: Asset value and volatility regression coefficient of listed companies

| | | |
|----------------|---------------------|----------------------|
| | | σ |
| α | 5.3623*** (3.02) | |
| Asset | 0.5203** (0.59) | |
| Equity | 0.127** (6.70) | |
| α' | | 0.9759*** (5.14) |
| Income | | -0.0587*** -3.33 |
| OPR | | 0.1776* 0.90 |
| Lqverage | | -0.0021** (-1.39) |
| TAT | | 0.1345** (-1.39) |
| R ² | 0.6930 | 0.5167 |

(The t-values in parentheses are significant at the 10%, 5%, and 1% levels, respectively.)

Therefore, the expressions for formulas (3) and (4) can be obtained as

$$\ln V = 5.3623 + 0.5203 \ln(\text{Asset}) + 0.127_2 \ln(\text{Equity}) \quad (3)$$

$$\sigma = 0.9759 - 0.0587 \ln(\text{Income}) + 0.1776 \text{OPR} - 0.0021 \text{Leverage} + 0.1345 \text{TAT} \quad (4)$$

Substitute the financial data of Liuzhou Investment Control Company to obtain the company's asset value and asset value volatility. The default distance and default probability can be obtained through the following two formulas.

$$\textcircled{1} \text{ Default Distance (DD)} = [E(V) - DP] / [E(V) * \sigma V]$$

$$\textcircled{2} \text{ Probability of Default (EDF)} = N(-DD)$$

Table 3: Default distance and default probability value of Liuzhou Investment Control Company

| Year | Asset value | Volatility in asset value | Default distance | Probability of default |
|------|---------------|---------------------------|------------------|------------------------|
| 2018 | 7987106.4444 | 0.2613 | 1.456649 | 0.072607 |
| 2019 | 8615290.8157 | 0.2512 | 3.070148 | 0.00107 |
| 2020 | 9132284.0013 | 0.2447 | 2.920861 | 0.001745 |
| 2021 | 10720146.1026 | 0.2427 | 2.827531 | 0.002345 |
| 2022 | 10971832.6969 | 0.2433 | 2.760343 | 0.002887 |

3.3.4. Result analysis

From Table 3, it can be seen that the default probability of Liuzhou Investment Control in the past five years has been higher than the critical value of 0.4% by Standard & Poor's, and the company's credit risk was the highest in 2018, with a default probability of 7.26%. Since 2018, the company has realized that the debt burden is too heavy, and has started to reduce investment project expenses and interest bearing debt scale, achieving certain results. In 2019, the default probability significantly decreased to 1.07%, but due to the large debt scale, the interest is rolling more and more.

From a horizontal comparison perspective, the distribution of default probabilities of 15 industry listed companies from 2018 to 2022 is shown in Figure 1. Among them, 53 samples had default probabilities ranging from 0 to 1.7%, accounting for 70.67%, while 9 samples had default probabilities ranging from 1.7% to 3.40%, accounting for 12%. Among them, 002565.SZ Shunhao Co., Ltd. had the highest default probability in 2019, at 10%. The average default probability of 75 samples of listed companies in the commercial service industry is 1.57%, while the average default probability of Liuzhou Investment Control in the past 5 years is 1.61%, slightly higher than the average probability of listed companies in the commercial service industry. This indicates that Liuzhou Investment Control has defects in its business operation and financial condition, and there is a certain probability of default.

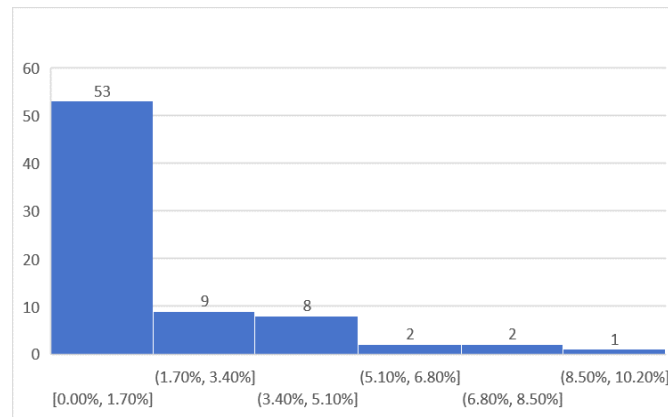


Figure 1: Distribution of default probability of listed companies

4. Countermeasures and suggestions

4.1. Optimize governance structure

The local government financing platform is responsible for the financing task of future local urban construction. It should optimize the governance structure based on internal development realities, reduce the probability of various risks, and promote the sustainable development of the local economy. In order to optimize the governance structure, local government financing platforms should reform the corporate governance structure according to the modern enterprise system. For enterprises that do not have a board of directors, a board of directors should be established as soon as possible; For enterprises that have established a board of directors but whose powers are unclear, the board of directors should be empowered to represent the state in fulfilling the rights of investors and supervising internal business management powers; For enterprises with chaotic equity structures, the equity structure should be clarified based on the internal situation. At the same time, local government financing platforms should establish a corporate governance structure for the project, leverage the advantages of government organizations and bank financing, and leverage credit construction and financing promotion to make the financing platform a market-oriented operation entity that relies on government integrity, independent operation, and complete corporate governance structure. In addition, local government financing platforms should actively negotiate with local governments to recruit professional managers, select professionals with strong management abilities and rich experience to take on the responsibilities of executives, and the executives should be responsible for managing the business forms of various departments, striving to do a good job of risk prevention through professional management.

4.2. Improve risk prevention system

Firstly, establish a job responsibility system. Local government financing platforms should, in accordance with existing legal norms and internal development situations, subdivide risk prevention steps, allocate specific risk prevention content to positions, clarify relevant job risk prevention responsibilities and work content, and require relevant personnel to complete daily work tasks according to their job responsibilities. If risk prevention problems occur in the later stage, they should trace the root cause according to the job responsibility mechanism and quickly find the responsible party. The responsible person is responsible for handling relevant risks and strives to reduce the probability of related risks through accountability. Secondly, establish a regulatory system. Local government financing platforms should divide risk prevention into three stages: pre estimation, in-process control, and post summary. They should organize dedicated personnel to supervise the risk prevention performance of each department. If any personnel are found to have non-compliant work behaviors, they should be criticized and educated by supervisory personnel, guide relevant personnel to correct bad work behaviors, and avoid risks caused by human factors. Thirdly, design a performance evaluation system. Local government financing platforms should design risk prevention assessment indicators based on risk prevention needs and job responsibilities. Assessment should be conducted based on the performance of relevant personnel in risk prevention and the quality of work completion. Performance rewards should be given to those who meet the assessment standards, and they are required to continue to take risk prevention measures in accordance with institutional requirements; Punish those who fail to meet the assessment standards to

ensure that relevant risks can be effectively prevented and controlled. Fourthly, establish a risk warning system. Local government financing platforms should design risk warning models based on various risk triggering factors, require relevant personnel to regularly use big data analysis technology to analyze financial information, investigate whether the debt ratio exceeds established indicators, summarize whether the project's economic benefits can meet the principal and interest repayment needs, and estimate whether there are potential risks based on the analysis results. If the analysis results exceed the threshold of the risk warning model, Risk mitigation measures should be developed in a timely manner, requiring relevant.

4.3. Enhancing Risk Prevention Awareness

Firstly, the leadership should attach great importance to risk prevention ideologically, recognize the importance of risk prevention, clarify the relationship between risk prevention and local government financing platforms by understanding the development situation of peers, independently correct traditional development concepts, and continuously improve risk prevention awareness. Secondly, management should deeply understand the necessity of risk prevention through reading professional books, literature, and peer communication, actively summarize new management methods according to work needs, and gradually strengthen their own risk prevention awareness. Finally, enhance the risk prevention awareness of grassroots personnel through internal promotional means. Enterprises can use modern platforms such as WeChat official account and internal website to publicize professional knowledge related to risk prevention, publicize risk prevention methods in the corporate culture, publicize the positive impact of risk prevention with posters and slogans, and effectively strengthen the risk prevention awareness of the basic staff with a variety of publicity methods, so that they can participate in risk prevention and control with a positive attitude in the later work. Local financing platform companies play a crucial role in local infrastructure construction. However, once debt defaults occur, credit will be severely damaged, the company's credit rating will decrease, financing costs in the capital market will increase, and even be abandoned by the capital market. In order to avoid debt default earlier, local governments should urge local financing platform companies to establish their own debt risk warning mechanism based on local economic conditions, aiming to ensure that the company's debt level is always controllable and reduce debt default risk.

5. Conclusions

In this paper, Liuzhou TK company, for example, thorough analysis of company credit risk causes, and combined with the local government financing platform and water industry dual properties of non-listed companies KMV model for quantitative assessment of corporate credit risk, finally from the perspective of company and local government resolve credit risk. Through the above qualitative and quantitative analysis, this paper draws the following conclusions:

First, the analysis of the causes of credit risk of local government financing platforms can start from the three aspects of macro economy, local government and corporate operation. From the macro level, the credit risk of local government financing platforms is mainly related to the economic situation and national policies. From the local level, the credit risk of local government financing platform is mainly related to the support of local economy, local finance and local government. From the perspective of companies, the credit risk of local government financing platform is related to the company's main business operation, asset quality, debt structure and scale, cash flow status, debt solvency, future investment planning, corporate governance and other aspects.

Second, when using the KMV model to quantitatively calculate the credit risk of local government financing platforms, we should not only consider the attributes of the local government financing platform, but also compare the default probability of listed companies in the same industry combined with the development of the company's main business.

Third, credit restructuring, loan extension and other methods can effectively solve the debt crisis of local government financing platforms in the short term, but enhancing the financial strength of local governments and improving the profitability of local government financing platforms is the fundamental solution to prevent the credit risks of local government financing platforms.

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