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Research on Credit Risk Management of China's Commercial Banks

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Abstract

Firstly, the article discusses the development history of credit risk management theory, and then analyzes the current famous modern credit style from many aspects. The risk measurement model and the difference in modeling methods are found in the empirical literature, and the prediction effects are also quite different. Finally, a more objective review of these models.

Keywords

Credit risk; KM.

1. INTRODUCTION

The financial crisis triggered by the US subprime mortgage crisis in 2007 hit international banks, developed countries such as Europe and the United States. The banking industry has been hit hard, asset quality has continued to deteriorate, loan losses have continued to rise, and the capital adequacy ratio has remained constant. The risk of eroding credit has increased significantly. Then the crisis gradually swept the real economy and caused significant losses to the global economy. The root cause of the financial crisis is the loss of control over risk management. Some people lose control of credit risk management because of the risk of credit risk regulation, that is, the possibility of default after credit is ignored, and some because high risk is considered low risk. Underestimating credit risk is also because existing measures cannot be effectively dispersed. Solve and control credit risk. The crisis shows that banks have serious problems in all three aspects of credit risk management.

Although our bank has withstood the test in this crisis, in order to cope with the monetary easing policy of the crisis, the rapid growth of credit has also increased the credit risk and systemic risk of commercial banks. At the end of 2017, China has partially implemented the Basel Capital Accord III standard. By 2019, Basel Capital will be implemented. All regulatory requirements of Agreement III. The promotion of this agreement has sounded the alarm for China's banking risk management. Higher requirements are placed on the risk management level of the Chinese banking industry. Credit risk has always been the main risk faced by Chinese commercial banks. It is to strengthen the credit risk management of commercial banks in China under the complicated economic environment at home and abroad. Maintaining sustained, healthy and stable economic development is more important, necessary and urgent. The goal of this paper is to have a literature that analyzes Chinese and foreign credit risk management and measurement, and analyzes the application of differences between different measurement models and information risks.

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2. CREDIT RISK MANAGEMENT THEORY

With the rapid development of China's banking industry, domestic research on credit risk management theory has developed more and more rapidly in recent years. Xue Feng (1995) analyzed bank credit risk management from the perspective of bank property rights and institutions. It is a qualitative study. Li Zhihui (2001) mainly introduces foreign modern credit risk measurement models. ZhangZhang (2002) elaborated on the system and technical route of credit risk management in conjunction with the Basel Accord. Ba Shusong (2002) and Luo Ping (2004) discussed the technical details of the Basel Accord, the implementation conditions, and the impact and impact of the implementation agreement on the banking industry. Zhao Xianxin (2004) summarized the Basel Accord's internal rating method, which elaborated the regulatory model and internal model of commercial banks including credit risk, and introduced how to apply risk measurement results to risk pricing, quota setting, capital allocation and Performance Evaluation Liang Qi (2004) proposed a combination of principal component discriminant model and principal component logistic model for measuring corporate default risk and credit risk combination for measuring loan portfolio. Wu Jian (2005) involved in the Basel Accord Internal Ratings Act a large number of theoretical studies and technical discussions have been made on the factors of default risk such as default rate, default loss rate and unanticipated loss. Li Zhihui (2007) systematically studied the risk control theory and procedures of commercial banks from two aspects: external supervision with capital adequacy ratio as the core and internal control with comprehensive risk management as the core. Xia Hongfang (2007) used the model of credit risk measurement to conduct a detailed measurement study on the credit risk of agricultural companies. Shi Xiaojun (2007) conducted an in-depth discussion on related technologies of credit risk management. Peng JianGang (2008, 2009) conducted a series of improvement studies on the loan portfolio model. Ba Shusong, Zhang Zhang, Zhang Chunzi et al. (2010) analyzed the status quo of China's current capital adequacy ratio and the implementation of Basel Capital on the basis of introducing the Basel Capital Accord on the reform criteria of bank capital and liquidity regulatory framework. The impact of the Agreement on the future of China's banking industry points out that in order to prepare for the implementation of the new agreement, on the one hand, it is necessary to strengthen the supervision of banks. On the other hand, it is necessary to encourage banks to develop and use internal credit risk rating models, and to improve the internal model governance mechanism to make the model It can truly become a tool for banks to conduct risk prediction, risk decision-making, and implement economic capital management.

3. THE MEASUREMENT MODEL OF CREDIT RISK

The early credit risk measurement theory is mainly based on the multi-statistical analysis method with the letter of the credit rating agency. Altman (1968) is an early scholar of quantitative research on credit risk. He pioneered the use of multivariate analysis for corporate credit prediction and proposed a well-known Z-score model. Zeta then added two variables to the Altman model and revised them. The Zeta model was proposed; Pogue & Soldofsky (1969) and West (1970) established a multivariate regression model to predict the public credit rating; Pinches & Mingo (1973) proposed to reduce the number of observed variables using factor analysis to several independent The important factor is to establish a regression analysis model to predict the credit rating of securities. Ohlson (1980 proposed the use of Logit regression analysis with more relaxed assumptions to establish a credit prediction model, and confirmed that the model has good predictive power. Then scholars They have joined the cash flow, macroeconomic variables, industry the information establishment factor model such as variables classifies and predicts credit risk.

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The “incomplete information market credit rationing model” developed by Stiglitz and Weiss (1981) demonstrates that the root cause of bank credit risk lies in the adverse selection caused by information asymmetry between banks and enterprises (low Risk borrowers' exits and moral hazard-financed companies invest their money in high-risk projects). The model states that credit risk analysis is required to reduce or eliminate bank credit risk. Since then, quantitative research on credit risk has opened up new ideas.

In the 1990s, a series of new measurement models emerged, mainly based on JP.

Morgan's Creditmetrics model, KMV (Kealsho fer, McQuown, Vasicek) KMV model, Credit Suisse integrated credit risk measurement model and McKinsey credit combination of four model View models (referred to as CPV model) are mainly based on and extended research. Several major measurement models are described in more detail below.

3.1. Classic Altman Model

Altman (1968) pioneered the introduction of multivariate analysis into credit rating studies. From the initial 22 financial variables, he used the stepwise multivariate analysis to finally select the five financial variables with the most predictive ability: (current assets-current liabilities)/total assets, retained earnings assets, pre-tax profit before interest. / Total assets, equity market value / total liabilities, total sales income and assets. Each variable is given a weight to form a linear model, named Z-value model. The model has a correct discrimination rate of 95% for one year of bankruptcy and 75% for the first two years.

Based on the Altman theoretical model, the theory of classification of credit ratings based on multivariate statistical analysis has gradually developed. Zeta added two variables to the Altman model and revised them to improve the Zeta model. Zeta (1977) studied 111 companies in 1962-1975 (53 of which were bankrupt companies), and added Altman's Z-value model to the two concepts of risk concept and scale effect, and modified the zeta model. The zeta model includes seven variables: return on assets (the ratio of pre-tax income to total assets), and the stability of income (the standard deviation of the valuation of the return on assets in 5-10 years). Debt repayment is also called interest. Guarantee rate (ratio of pre-tax income to total interest repayment) Accumulated profit is measured by retained earnings (assets less liabilities total assets), current ratio capitalization rate (general equity total assets), company size (company total assets are paired) number). The classification accuracy rate of the Zeta model is as high as 93% in the year before bankruptcy and 80% in the first four years, up to 80% in the first five years, but Altman pointed out that as the environment changes, the financial crisis prediction model must also be adjusted in response to no time. A credit rating model that applies to any situation.

The Z-Score credit scoring model created by Altman is a multivariate discriminant model based on financial ratios. By calculating the financial ratio indicator of the company's customers and obtaining the Z value, it is possible to effectively distinguish between defaulting customers and non-defaulting customers that may arise in the future. When the bank uses this model to judge the default risk of the customer, that is, the customer's Z-score. When the customer's score is at the critical point, the bank needs to conduct a detailed review or reject the loan application. Through this method, the bank can more easily classify the customer through the status of the customer's relevant financial indicators, and then make a rough estimate of the customer default probability.

3.2. Logistic Model

Martin (1997) first used the Logistic model to predict the company's bankruptcy and default probability. He from 1970 by 1977, about 58 troubled banks were divided into 25 financial indicators from the Fed member banks. Eight financial indicators were selected and a Logistic regression model was established to predict the company's default probability. He also

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compared the predictive power of the Z-Score model, Zeta model and Logistic regression model, and found that the Logistic regression model is superior to the z- Score model and the Zeta model.

Mahalla (1983) used Logistic regression models to distinguish between default and non-defaulting loan applicants. The research results show that when the probability of default is P>0.551, it belongs to the risk loan when P<0.551, which belongs to non-risk loan.

3.3. KMV (Kalshofer, McQuown, Vasicek) Model

The KMV (Kealshofer, McQuown, Vasicek) model was developed and published by American companies based on MM theory, Black-Schole (1973- Merton (1974 and Hl and White (1995)). This model assumes that the company's total assets are subject to compliance. A stochastic process of continuous change triggers credit risk when the price changes to a certain trigger point. This type of model is also called a structural model. The structural model determines the company's default by the company's asset value, capital structure changes and default points. Probability provides a basic framework for credit risk measurement and lays a theoretical foundation for the development of credit risk management.

The structural models are based on the Morton model and some assumptions about the proper relaxation of the Merton model. Black and Cox (1976) introduced a more complex capital structure, and Giesk (1997) added multiple interest rate payments before maturity,Vasicek (1984) distinguishes the role of long- and short-term debts in default, and Kim (1993), Hul1 and Wite195, Longstaff, and Schwartz (1995) remove the assumption that wells that can only default at maturity introduce interest rate changes. In relation to default events, Bis and Varenne (1997) used the default trigger point as a model for stochastic processes. Zhou (2001) assumed that the company's asset value was subject to a mixed diffusion process with jumps, Eraker (2004) et al. The jump factor is important because the jump factor increases the asset volatility. Barbed & Lemgruber (2009) pointed out that the jump factor in the analysis of default

It is very important to join the risk of jumping to better reflect the impact of economic structural changes on the value of assets.

In the domestic KMV model theory research, Wang Qiong et al. (2002) studied the credit risk pricing problem from the perspective of option pricing theory, and reviewed the Merton and KMV models. Du Benfeng (2002) introduced the KMV credit evaluation model and expounded the principle of using real-value option theory to evaluate credit risk. Xue Feng, Guan Wei, Qiao Zhuo (2003) introduced the credit risk evaluation model based on stock price, and discussed the advantages and disadvantages and application prospects of using KMV model to analyze the credit risk of listed companies in China. Lu Wei, Zhao Hengxi and Liu Yuyun (2003) proposed using the fixed growth model FCFF (free cash flow) method to calculate the company value, using the GARCH model to calculate the equity value volatility, and using a two-parameter Weibull to describe the asset value volatility and equity value fluctuations. The relationship function of the rate. Zhu Xiaozong, Guan Qihai, Du Hongwen, etc. (2004) conducted a comparative analysis of various credit risk models, and pointed out their characteristics, advantages and disadvantages. Tang Chunyang, Wu Henghuang, etc. (2005) conducted a detailed review of the literature on default risk. Yu Liyong et al. (2005) summarized the basic theories and methods of credit risk management from the perspective of information set and pointed out the frontier direction of the development of credit risk model. Hou Guangming et al. (2005) introduced the credit risk structure model of single assets and analyzed the advantages and disadvantages of the enterprise value method model and the first-time time method model, and summarized the problems that need to be paid attention to in the calculation of enterprise value method parameters. Tang Chunyang and Zhang Zheng et al. (2006) analyzed the application prospects of KMV model in China and pointed out that the measurement of the equity volatility parameter is the focus of KwV model research. In this

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respect, Shi Xiaojun proposed that the ARCH model of the ARCH model can be used to estimate the volatility of the financial market more than other traditional methods. Tang Qiming and Huang Jiang (2010) proposed that they should be cited in the model.Into the jump, using market data to analyze the change in the value of assets with jumps.

In recent years, the empirical research results based on the KMV model have gradually gained fruit, mainly based on the empirical analysis of the default rate based on capital market data. Peter crodbie and Jeftbohn (2003) applied the KMV model to conduct empirical research on sampling of financial companies. It was found that EDF values can accurately and quickly detect changes in credit status before such companies have credit events or bankruptcy.

3.4. Creditrisk + Model

The creditrisk+ model was a credit portfolio credit risk measurement model introduced by Credit Suisse First Boston in 1997. The model has received extensive attention from the industry and the theoretical community due to its small amount of data required and the ability to give an explicit solution to the loss distribution.Crouhy et al. (2000) elaborated on the principle of the model and performed it with three other models.

A comprehensive comparative analysis. Cords (2000) compared with the Credit metrics model, although the two seem to be different on the surface, but the mathematical frameworks of the two models are very similar and there is a possibility of mutual conversion in mathematical reasoning. There are many scholars the model has been expanded from several aspects. In the original model, the industry risk factors are assumed to be independent of each other. Burgisser et al. (1999) proposed a one-factor model considering the correlation of industry risk factors. Giese found through numerical experiments that the single factor model all loans are only affected by one risk factor, and the risk factor is subject to the assumption of a Gamma distribution with a mean of 1. Unexpected losses that result in the model's measurement loan portfolio may result in large errors. Giese (2003) proposed a composite Gamma creditrisk+ model that assumes that the covariance of any two industry risk factors is equal. Because the hypothesis of the composite Gamma model is still quite different from the actual situation, Lyer et al. (2005) proposed a two-stage model that expresses the industry risk factor as a linear combination of system risk factors. However, the extended model ignores the inherent characteristics of the industry risk factor. Insufficient. The expansion model is still in further research.

In the original creditrisk+ model, the default loss rate is assumed to be a constant. In real life, the debtor’s default loss rate may change during the loan period. Therefore, Burgisser et al. (2001) proposed an extended model based on the creditrisk+ model considering the fluctuation of default loss rate.

In terms of domestic model theory research, domestic Peng Shujie et al. (2002) used the model with China's commercial banks.

In the domestic creditrisk+ model theory research, domestic Peng Shujie et al (2002) compared the creditrisk+ model with the loan risk method used by commercial banks in China. Liang Shidong et al. (2002) analyzed seven main reasons for the rapid development of modern credit risk measurement models, and analyzed the advantages and disadvantages of the creditrisk+ model. Cao Daosheng et al. (2006) analyzed the theoretical basis, model category, recovery rate and cash flow discount factor established by creditrisk+ model, and expounded the applicability of the model in commercial banks in China. Chi Guotai, Liu Dong, et al. (2006) used the distribution instead of the traditional normal distribution on the basis of segmentation of the loan portfolio, and determined the risk exposure distribution in each frequency band, and replaced it with a negative binomial distribution. The traditional Poisson distribution fits the distribution of default frequencies and establishes the creditrisk+ model for economic capital

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measurement. Peng Jiangang et al. (2009) discussed the methodology of the application of creditrisk+ model in commercial banks in China, and based on previous studies, proposed a multivariate system risk factor based on industry characteristics creditrisk+ model. Peng Jiangang et al. conducted a theoretical model on the original creditrisk+ model when the default loss rate was variable.

3.5. CreditMetrics Model

J.P. Morgan launched the CreditMetrics model in 1997, which together with the KMV model became the two most popular credit evaluation models in the international financial community. The CreditMetrics model uses the VaR framework to calculate the market value and the volatility of loan recovery, as well as the combination of personal loans and credit assets, using the borrower's credit rating, next year's credit rating migration matrix, credit risk spreads, defaulted loans and other data. VaR value.

The specific steps are as follows: First, establish a credit rating system from the corresponding one-year credit rating migration matrix. Second, determine the risk period. The time selection in the CreditMetrics model is usually set to one year, but when calculating the credit risk of long-term and less liquid assets, you can also choose multiple different risk periods. Third, determine the forward discount rate curve corresponding to the credit rating. In the event of a default, the value of a credit instrument can be estimated by the loan settlement rate. Finally, using the information of the previous steps to calculate the distribution of future portfolio value changes, and then use the discount method to calculate the VaR value of the portfolio.

3.6. Credit Portfolio View model (CPV Model for Short)

McKinsey & Company launched the Credit Portfolio View model in 1998. This model is based on the idea of CreditMetrics, which inputs different macroeconomic variables, such as economic growth rate, unemployment rate, interest rate, exchange rate, government expenditure, etc., to different countries. The probability of default between industries and the probability of credit rating migration are estimated. Therefore, this model links the probability of default, the probability of credit rating migration, and the macroeconomic situation: when the macro economy is depressed, customer defaults and downgrades will rise; when the economy is in a boom, the situation is reversed. The CPV model not only models the relationship between macroeconomic factors and credit rating migration probability, but also simulates the cross-time evolution of the credit rating migration probability matrix by creating a macro "impact".

4. COMPREHENSIVE EVALUATION

Different measurement models have their own advantages and disadvantages, and the applicable situations are not the same. The following is a brief review of several of the more commonly used measurement models:

The Altman model has been widely used in foreign commercial banks so far, although many experts and scholars believe that it is too simple, and advocate the adoption of more complex statistical techniques. However, statistical techniques are actually only some improvements in traditional financial ratio indicators, which are not necessarily more effective than simple financial ratio models in terms of actual application effects. Moreover, the financial ratio indicators selected by the Altman model are determined after analyzing a large number of statistical samples, with a certain degree of accuracy and stability. Therefore, banks that have not yet established an internal rating system can still be relatively simple. The Altman model.

One of the great advantages of the KMV model is that it makes full use of the price information in the stock market to quantify the credit risk of publicly listed companies. However, many of

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the bank's customers are not listed, so there is no publicly available stock price information. In this regard, KMV has adopted a compromise approach that uses non-listed companies to connect with listed companies by leveraging similarities in relevant financial indicators to leverage current market information. However, this approach relies on the financial statements of the company, and because the financial data is difficult to guarantee accuracy and timeliness, it will affect the actual application of the KMV model.

As an extension of the CreditMetrics model, the CPV model has the advantage of incorporating macroeconomic factors into the model, taking into account the impact of macroeconomic variables on customer engagement probability and credit rating migration probability. However, the successful use of this model is inseparable from complete and reliable default data, and the default information of different countries and different industries is often difficult to obtain. In addition, the adjustment of the model to the change of customer credit rating is subject to subjective factors such as subjective judgment. Therefore, after the model is adjusted, the objectivity and credibility of the model are greatly reduced.

The empirical research on the credit risk measurement model shows that the results given by different models have a certain gap with the actual situation, and the prediction effects are also quite different. Moreover, there are some unrealistic assumptions and shortcomings in the above models. The common assumption of these models is that the interest rate and risk exposure are unchanged, which is not in line with the actual situation; any credit risk measurement model has not fully considered the credit borrower. Specific circumstances, such as bank credit, credit rating migration, loan contract guarantee capability, debt maturity, and macro factors such as price, bankruptcy law, taxation, industry, economic cycle and national policy, especially without considering the borrower’s moral hazard This happened to be a relatively common phenomenon in China. These models do not fully meet the requirements of the advanced internal rating method, nor can they effectively measure the loss of a single loan. They are used to measure the loan portfolio. In addition, there is no universal method for evaluating credit risk measurement models in the world. Model evaluation still often ignores the effectiveness of modeling methods, data and test statistical methods. Therefore, we must maintain the existing models. A prudent attitude cannot be used blindly.

In China's commercial banks, credit risk quantitative management is relatively weak, basically in the management of asset and liability indicators and position matching management level, financial supervision methods are also relatively backward, lack of specialized information collection, processing and analysis systems, leading to credit risk management Relatively lagging. However, based on summarizing the shortcomings of these modern credit risk measurement models, combined with the development trend of modern credit risk models, we can establish a modern credit risk measurement model suitable for China's commercial banks.

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