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The Evaluation of Default risk: An Empirical Analysis on The White Wine Supply Chain

Jing Gu[a], Yang Yang[b*], Xiongxing Xia[a]

[a]Sichuan University, Chengdu, 610065, China
[b] Southwestern University of Finance and Economics, Chengdu, 611130, China .

Abstract

In supply chain system, due to the connected transactions among supply chain enterprises, the default risk for supply chain enterprises becomes more complicated and is difficult to evaluate. So how to evaluate the default risk for supply chain is an urgent and important task in practice and theory. In this paper, we define supply chain enterprise default risk is comprised of spontaneous default risk and contagious default risk. First, by constructing an evaluation indicator system for the supply chain enterprise default risk, we measure the spontaneous default risk using Fuzzy Preference Relations. Second, we construct a risk numerical matrix based on the degree of influence of the contagious default risk, and then analyze the cumulative effect of the contagious default risk and measure contagious default risk by matrix analysis combined with the spontaneous default risk. Finally, we provide a case study where we apply the model to measure the default risk in the supply chain in order to demonstrate its practical value.

1. Introduction

Nowadays, increasingly fierce competition forces banks to seek for some new businesses for continual profits, where the supply chain finance (SCF) is involved in. The SCF was serviced as a new financing model to deal with the problem of tough finance for the small and medium enterprises (SMEs) in China ten years ago, and now it has been a vital mode for the profiting of commercial banks. However, high risks usually go with large profit, especially default risk against the commercial banks. Generally, banks are mainly afraid of the default behaviors of enterprises due to changes in their own operating conditions, industrial environment, or some other macro-factors. The direct default against banks may be caused by these factors. In addition, once

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* Corresponding author.

E-mail: gj0901@scu.edu.cn

the connected transaction between enterprises occurring, the default behavior of enterprises become more complicated, leading to a higher probability of default risk in a contagious way, and that is given as contagious default risk related to indirect default against banks. So those two parts of risk pose huge challenges to the SCF business. It is very necessary and important for bank to understand and evaluate the default risk in complex connected transaction network.

So far, there are many literatures focusing on the default risk. From the structural models, among which KMV model proposed by McQuown [1] is the representative, then the reduced-form models based on the structural models have been widely grown and popularized. For instances, Jarrow& Turnbull [2] employed the intensity functions, Lando [3] established the Cox model for overcoming the shortcoming of a constant intensity function. Besides the two kinds of models, new measuring models based on statistics and data mining techniques are also constructed, such as the neural network model [4], the support vector machine model [5], the logistic model [6], etc. Actually, the classic Altman's Z-score model [7] and the ZETA model [8], which are important improvement based on the Z-score model, put forward a new method based on many indicators, which reflect the change of default risk.

Most research above related to the default risk of one enterprise, which is caused by its operating conditions, industrial environment, etc. In this paper, we define this sort of risk as spontaneous risk, which is means the spontaneous risk is arisen by its own factors. However, the default risk of one enterprise is usually not only depend on its managing faculty and macro-condition by itself, but also depend on other related enterprises' default risk conditions. Therefore, we define the other sort of risk, which is contagious default risk of enterprise, by which is caused partner's default, who has connected transaction with enterprise. Until now, there was few paper paying more attention to the contagious default risk caused by related transactions. Giesecke [9] proposes a model of correlated multi-firm default with incomplete information using default time copula as a consistent default correlation measure, but the model does not reflect the effect of related transaction. Yang Yang et al. [10] work on the research on credit risk of business under the perspective of related party transaction using the logistic model, and find the significant effect of related party transaction on the business groups, however, they do not specify the effect. In this paper, we emphasize the effect of related transaction on the contagious default risk, which, after all, is the determinant factor that affects the contagious degree. Besides, we quantize the degree of effect of related transaction by specifying two sorts of risk: spontaneous default risk and contagious default risk.

We find that existing literature doesn't focus on the contagious default risk, and also doesn't differ two sorts of risk until now. According to the real situation of default risk of enterprise, we think it is necessary and important to consider how to evaluate the default risk of enterprise in SCF system, in whole prospective. Evaluating the default risk of enterprise in SCF system, in overall situation, is practical and theoretical meaningful. In this paper, we try to solve the problem. We describe the path of two sort of default risk, then define and evaluate them respectively in a quantitative way combining the evaluation Indicator system and the conception of the Fuzzy Preference Relation. Last but not the least, in the evaluating process, we take the cumulative effect of default contagion into account with the matrix analysis. By constructing the evaluating model, we are qualified to provide the quantitative standard of default risk to the commercial banks and the enterprises in the supply chain for facilitating their decisions making. Our work is relevant to the classic Altman's Z-score model [7] and the ZETA model [8]. We mainly employ the evaluation Indicator system, which can exhaustively reflect the default risk of enterprise in SCF system.

This paper is one of very few literature concentrated on the default risk under the perspective of related transaction. We put forward a new model for the evaluation of default risk, among which the employment of Fuzzy Preference Relation gives strong support for its effectiveness in judgment. Besides, our model departs the default risk into two parts: spontaneous default risk and contagious default risk, which facilitate their quantization. Based on this, we introduce the method of matrix analysis and evaluate two sorts of risk respectively, which takes the cumulative effect of risk contagion into account. By constructing the evaluating