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RESILIENCE MEASUREMENT OF THE FINANCIAL SYSTEM CONSIDERING RECOVERY SOLUTIONS

Song Mingying

The University of Hong Kong
Pokfulam Road
Hong Kong, 999077, HONG KONG

ABSTRACT

Resilience is a property of the system, which focuses on the recovery ability of the system after a shock to the system. Financial system plays a key role in our society by performing its functions like risk sharing and information transferring etc. Therefore, resilience is especially important for the financial system. In this study, we present a modified novel simulation model for the risk contagion process of the financial system considering both the network effect and the market liquidity effect. In addition, we put forward several preventive policies as well as some recovery solutions. Based on these recovery solutions, present a measure for resilience in the context of the financial system. A case study considering shocks of different levels is given to illustrate the whole risk contagion and resilience measurement process.

1 INTRODUCTION

Over the last few decades, more and more concerns have been given to the banks failure problem in the financial system. As those past disastrous financial crises show, the financial system generally vulnerable to its credit and liquidity risks. Therefore, it is necessary for us to model the financial system in order to understand how this system work and what can be done when there are some shocks into the system. When it talks about modelling the financial system, most of the current models are static which can't reflect the shock spread process very well. Most of the publications agrees on that generally there are mainly two channels for the risk contagion process. One is the interbank liability relationship among financial institutions. These financial institutions hold liabilities with each other and the loss caused by one default will transmitted to the others immediately. The other channel it the same kind of assets hold by these institutions, which can be said that they are indirectly connected by the financial market. Under specific difficult economic conditions, some financial institutions will perform a fire sale action of their assets for the purpose of raising fund, which will drive down the asset price sharply. Such price decline will further deteriorate the financial conditions of the other financial institutions that hold the similar kind of assets with the defaulted one.

Most of current models describing the financial contagion focus only on the first channel. However, this channel only contributes a small part of the whole risk spreading process in fact. This work presents a novel dynamic model which takes both these two channels into consideration. We use the interbank liability metric to capture the first channel, also we define a dynamic asset price change function to reveal how the financial market channel play in this process. Another contribution is the definition and measurement of resilience in the financial system. Resilience is a property of the system, which is related to the recovery ability after the damage to the system. We summarize and put forward several types of recovery solutions during financial crises in the history, they are banks merging, capital injection and "leave it alone". We also define a new resilience index for the system for the purpose of measurement. Then based on the simulation

results of the system performance with consideration of recovery solutions, we can evaluate whether the system is resilient or not.

2 METHODOLOGY

We use a model which is similar to Eisenberg and Neo (2001) to present the financial contagion process. In our model, we consider a financial system with n banks which are labeled with {1, 2, …, n}, they are represented by nodes in a network. Each bank in the system has liability relationship with other banks. We use a liability matrix to represent the liability relationship between these banks.

The financial system in our model can be viewed as a structured network, banks are represented as nodes and links between nodes reflect liability relationships. The network is directed with incoming links representing assets such as monies owed to an entity by a counterparty and outgoing links representing liabilities. Figure 2 presents the typical simplified balance sheet of a bank in our model financial system.

3 CASE STUDY

Here we take the comparison of system performance with shocks to one bank before and after banks merging action for an example to illustrate the effectiveness of our recovery solutions.

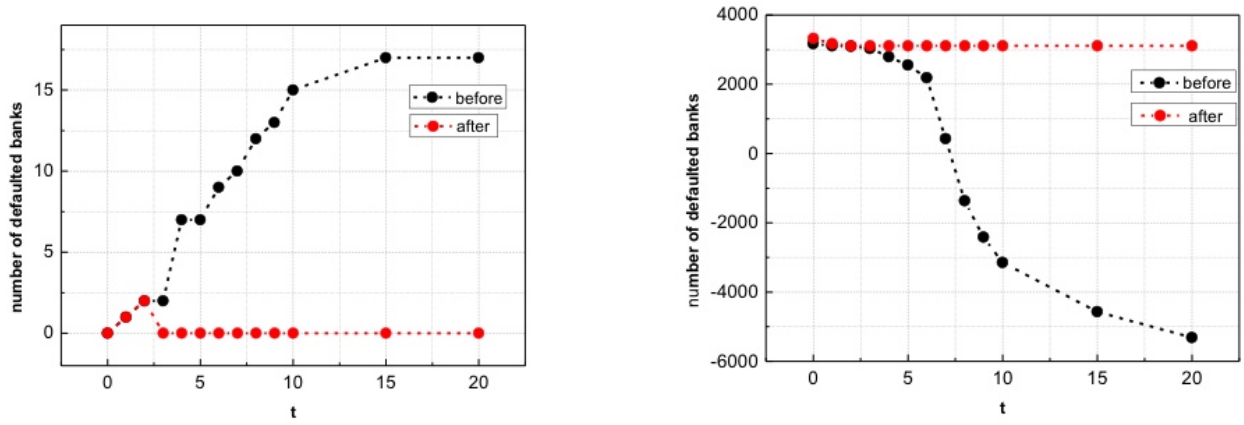

Figure 1: Comparison of system performance with shocks to one bank before and after banks merging.

4 CONCLUSIONS

This work develops a modified novel dynamic model for the financial contagion process. On the basis of the resilience definition and financial crises in the history, we summarize and put forward several types of recovery solutions. A resilience index is defined to measure the resilience in the financial system.. According to the system performance comparison before and after the shock, we can judge whether the system is resilient or not. Considering the nature that each financial institution has its own features and shocks with different levels, it is necessary to perform the optimal recovery solution for the purpose of cost saving when there is a shock into the system. Then given the characteristics of each financial institution inside the system as well as the shock level, we create a criterion to choose the optimal one among these recovery solutions. This criterion can provide be useful for the financial system regulation.

REFERENCES

Eisenberg, L. and Noe, T. 2001. Systemic Risk in Financial Systems. *Management Science*, 47, 236-249.