

Research on the Operational Risk of E-commerce Security of Commercial Banks in China

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Abstract—In this paper, I has analyzed China's commercial banks risk situation of e-commerce security; established a commercial bank's e-banking risk management framework; measured the commercial banks operating in the electronic banking risk by extreme value theory. It provided a theoretical basis for Commercial banks to against operational risk. However downturn in the macroeconomic cycle, medium and small banks are more prone to risk spillover cause systemic risk. Therefore, policy recommendations are that the banking supervisory authority focuses on not only the traditional sizeable international banks asset, but also concerned about the medium and small banks of excessive business growth.

Keywords—*E-commerce; E-banking; Operational risk; Extreme value theory*

I. INTRODUCTION

E-commerce is a new generation of transaction mode developed on the Internet. The State Council promulgated "Some Opinions on Promoting Information Consumption and Expanding Domestic Demand" in 2013, specifically pointed out that broadening the development space of E-commerce and fostering information consumption demand are the necessary means to accelerate the development of E-commerce.

Over the past ten years since e-commerce entered China, the network market in China has shown a trend of rapid development. In September 2017, according to the Research Report on China's Online Shopping Market published by China Internet Information Center, the number of online shopping users in China reached 361 million by December 2016, an increase of 44.26 million compared with the end of 2015, with a growth rate of 21.5%. The proportion of online shopping users in China increased from 32.7% to 51.1%. It shows that online shopping has become an indispensable part of people's life. Internet is no longer a platform for providing information, but an indispensable tool for social life and work.

II. RELATED LITERATURE

The British Bankers Association (BBA) has initially defined operational risk in terms of internal procedures, personnel and systems. It holds that operational risk is the risk

caused by the perfection of internal procedures, personnel and systems or the direct or indirect effect of external events.

JP Morgan believes that the risk factors derived from the company's business characteristics and support activities should be taken into account. These risks mainly include various forms of activity errors, interruptions and stops, which will bring different degrees of losses to the company.

Embrechts has carried out in-depth research on the modeling of extreme events in financial organizations, and used extreme value theory to build the measurement model.

Demouli believes that considering the non-stationarity and correlation of extreme methods can better measure operational risk. Ba Shusong subdivides the operational risk. The establishment process of operational risk management framework is also analyzed. Chen Qian's Application of Extreme Value Theory

On Measuring Operational Risk and Considering the Accuracy of Assessment as long as Real Data is the Guide. Chen Baodong had applied extreme value theory in the case of insufficient data. It effectively solves the problem of how to measure operational risk.

Operational risk of e-banking business usually occurs in the case of extreme events. Malicious attack of network and equipment interruption caused by natural disasters is the causes of operational risk. Therefore, extreme value theory is very suitable as a specific tool to manage operational risk.

III. OPERATIONAL RISK MANAGEMENT STRATEGY PROCESS

A. The Major Sources of Risk by Commercial Banks

In 2003, Basel Committee on Banking Supervision and Administration Commission introduced Electronic banking risk management principles. In 2006, the China Banking Regulatory Commission promulgated the electronic banking business management approach. These principles and the introduction of regulations, to guide the commercial banks and orderly development of electronic banking, standardize the

electronic banking business processes protect the electronic banking payment system to normal operation. According to Management principles, Mainly exposed to credit risk in commercial banks engaged in electronic banking business management principles, also known as default risk refers to the counterparty fails to comply with the agreed contract obligations resulting from the risk of economic loss, that is to believe that a man is unable to perform debt service responsibility for leaving the credit of the expected return and expected return to the possibility of deviation from the normal. Market risk refers to changes in stock prices, interest rates, exchange rates and lead to the potential risk of loss in value is not expected to. Liquidity risk is the lack of willing counterparty to the transaction resulted in the failure at the ideal point in time to complete the transaction and the potential risk of loss due to insufficient or market turnover. Legal risk is the risk that does not comply with the law or outside legal events leading to the possibility of the risk of loss due to operating activities.

This paper studies the commercial banks electronic banking operational risk. The Basel Committee on Banking Supervision defined operational risk due to inappropriate or failure of treatment, the risk of direct or indirect loss caused by the incomplete internal processes, people and systems or failure, or due to external events. In accordance with the frequency of occurrence and loss size, operational risk is divided into seven categories. a) Internal fraud, staff involved in fraud, misappropriation of assets, in violation of the rules and regulations of the law and the company's behavior. b) Behavior of external fraud, third-party fraud, misappropriation of assets, against the law. c) Employment contracts and working conditions of the risks of events, claims does not fulfill the contract, or does not meet the labor health and safety regulations. d) Customers, products and events caused by the commercial behavior, intentional or unintentional, cannot meet the specific needs of a customer, or due to the nature of the product design problems caused by mistakes. e) Damage or loss of tangible assets caused by the loss of tangible assets due to catastrophic events or other events f) Business disruption and system error, the aging of the software or hardware errors,

communication problems and equipment g) Involved in the execution, delivery and transaction process transactions failed, and partners failed transaction data entry errors, incomplete legal documents, unauthorized access to customer accounts, and vendor disputes etc.

Operational risk relative to credit risk and market risk and other risks are very different, has its own characteristics. First, the low probability of occurrence of the general operational risk in the event of the harm and it's serious and cause great losses to the bank, even a great threat to the survival of the bank. The collapse of Barings Bank in 1995 is the most typical due to the illegal operations of the bank's internal personnel, leading to Barings Bank incurring substantial losses, and finally closed down due to insolvency. Second, the operational risk may occur in the various departments of the bank covers the business scope of the bank. Finally, operational risk is different from credit and market risks, the risks and benefits are not high-risk and high return, low risk and low return this correlation. Individual operational risk loss of view, it is a single operational risk factors does not exist a significant number of relationships, this also increases the difficulty to quantify operational risk.

B. Operational Risk Management Strategy Framework

Commercial banks e-banking operational risk management, the use of the strategic thinking of the risk management. E-commerce operational risk management system as an open adaptive system, Elements of the system influence each other, combine to make the risk management of all aspects of the formation of the spiral of the system. Commercial banks to build electronic banking operational risk management strategy system. Commercial banks from the risk management preparation, risk management identification and risk management in the implementation of the three dimensions of the seven links of e-banking business, monitor thereby reducing the risk of losses caused by the risk down to a manageable.

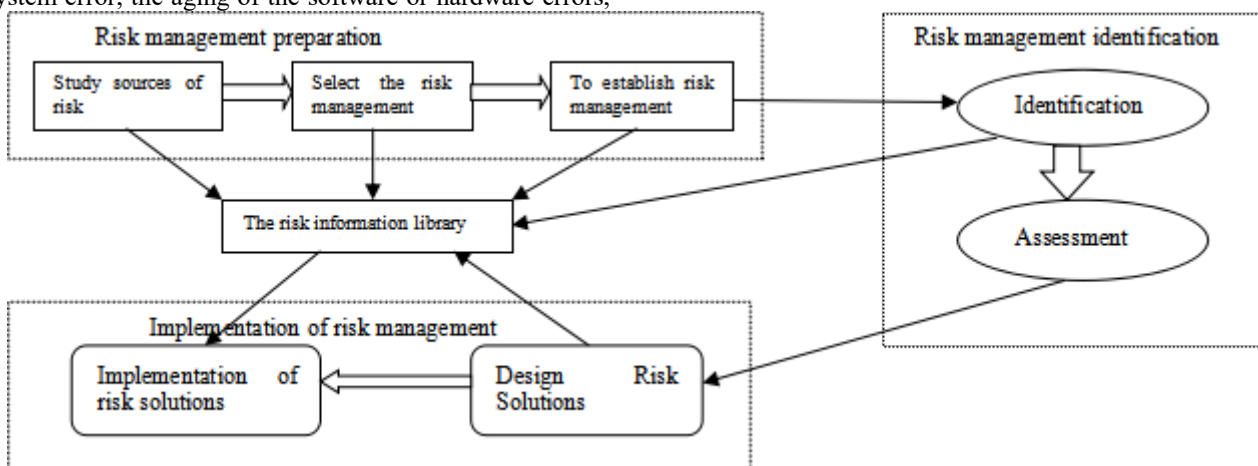


Fig. 1. The seven links of e-banking business

Commercial banks e-banking operational risk management is mainly conducted in three stages. First, preparation of risk

management, to examine operational risk from the risk information library of the seven categories of risk from the

definition of the Basel Committee on Banking Supervision which category or categories, in order to select the risk management measurement model in order to build a risk management strategy. Second, the risk identification stage, the commercial banks operational risk losses combined with the risk information library to identify the size and risk level of operational risk, used risk measurement methods and tools to conduct a comprehensive assessment of operational risk. Finally, the implementation of risk management, according to the source and extent of the risk, designed risk mitigation and program put into implementation, the implementation of the effect of feedback to continuously improve risk mitigation program. To effectively prevent the possibility of operational risk occurred, to minimize the loss of commercial banks.

Commercial banks to implement a comprehensive risk management strategy important step is a measure of operational risk, appropriately econometric model is particularly important.

The main contribution of this paper is: the main research context of systemic risk, on the basis of the existing research literature on the empirical further systematic research on the risk status of our country commercial bank system using CoVaR model and quantile regression method. The Risk Spillover Effect of a single bank crisis is analyzed, and the systemic risk accumulation in the banking system is caused by the liquidity variable acting on a single bank. Empirical research draws new conclusions: it is true that systemically important banks contribute more to systemic risk, but non-systemically important banks are more likely to lead to systemic risk in the reversal of macroeconomic cycles. Moreover, large banks with large asset size face higher liquidity risks than small ones, and scale diseconomy appears.

IV. OPERATIONAL RISK MANAGEMENT MODEL

The frequency of occurrence of the electronic banking operational risk is usually low, but once the losses caused is enormous, and its loss distribution has a significant fat-tail. Extreme value theory is precisely the concern that extreme events, consider the tail of the distribution. Deal directly with the tail of the loss distribution in the overall distribution of the unknown. The tail of the distribution reflects the significant loss of potential unexpected events lead to the commercial banks. Therefore, the extreme value theory applied to bank operational risk to quantify certain confidence level value at risk. Commercial banks electronic banking operational risk can be measured.

Extreme value theory is a branch of mathematical statistics. Includes two models one is the traditional Block the Maxima Model (BMM) of extreme value model. Block the Maxima model is used to check the equal time segment in the sample maxima behavior. The other is Peak over Threshold Model (POT), which is establishes a data model to the observed value exceeds a certain threshold. POT takes into account extreme events, and effective use of a limited number of extreme observations, more effective in practice.

A. Peak over Threshold Model

Suppose X is a random variable represents the operating loss, the accumulated distribution function F . u represent a high threshold. We verify that F_u can be written in terms of F :

$$F_u(x) = P(X-u \leq x \mid X > u) = \frac{F(u+x) - F(u)}{1 - F(u)} \quad (1)$$

Pickands theorem known for a sufficiently large threshold u , $F_u(x)$ be represented by generalized Pareto distribution (GPD), where GPD is the accumulation of the distribution function:

$$G(x) = \begin{cases} 1 - (1 + \xi \frac{x-\mu}{\beta})^{-\frac{1}{\xi}} & \xi \neq 0 \\ 1 - e^{-\frac{x-\mu}{\beta}} & \xi = 0 \end{cases}$$

$$x \geq \mu \quad \xi \geq 0$$

$$\mu \leq x \leq \mu - \frac{\beta}{\xi} \quad \xi < 0 \quad (2)$$

Where x is the extreme observations exceeding some high threshold, μ is a location parameter, β is a scale parameter, ξ is a shape parameter. $\xi > 0$ to the fat tail distribution, $\xi = 0$ to the exponential distribution, $\xi = -1$ to the uniform distribution. (1) And (2) we can obtain the distribution function of the estimated:

$$F(x) = (1 - F(u))G(x) + F(u)$$

$$= \begin{cases} 1 - \frac{N_u}{n} (1 + \xi \frac{x-\mu}{\beta})^{-\frac{1}{\xi}} & \xi \neq 0 \\ 1 - \frac{N_u}{n} e^{-\frac{x-\mu}{\beta}} & \xi = 0 \end{cases} \quad (3)$$

Where N_u is number of exceeding the threshold, n is number of loss events in one year.

B. Value at risk under POT model:

For the selection of the threshold, we use the average excess function to select. The average excess function is the mean of greater than the difference of the data values u and μ :

$$e(\mu) = E(x - \mu \mid X > \mu) = \frac{\beta}{1 - \xi} + \frac{\xi}{1 - \xi} \mu \quad (4)$$

$e(\mu)$ is a linear of function of μ . Therefore, in determining u , a μ value of an average over the figure, when $e(\mu)$ is linear, the μ is the selected threshold.

After determining u , in POT model, we can use the function of GDP and the average excess function obtain the value at risk at the confidence level $1-\alpha$:

$$VaR_{1-\alpha} = F^{-1}(\alpha) = \mu - \frac{\beta}{\xi} (1 - (\frac{N_u}{n(1-\alpha)})^\xi) \quad (5)$$

Commercial bank gets the value at risk in electronic banking operational risk. Commercial banks can accurately obtain the banks' capital requirements, timely provision of risk reserve to guard against the adverse effects of the occurrence of operational risk losses.

C. Evaluation

Commercial banks have a lot of advantages to the use of extreme value theory analysis of operational risk. First of all, The Model he EVT provides the theoretical basis of the limiting distribution of extreme events. It provides direct skills for beyond the threshold. Secondly, the tail of the loss distribution of a prior functional form of theoretical and computational tools is available. Finally, the non-parametric estimator of the shape parameters, such as: Hill, the estimated amount has a good progressive.

Disadvantages: First, in the POT model, explain and estimates of the parameters are based on small samples. Estimator does not meet the bias requirements, is also very sensitive to the choice of a higher threshold. Second, in the POT model, choose a higher threshold is mainly based on direct observation of the average excess plans, which with certain subjectivity will have some error. We need further study scientific approach. Third, the extreme value theory to consider the distribution of extreme losses in a low degree of loss of data is not included in the scope of the study.

V. CONCLUSION

From the development of electronic commerce, accepted by the majority of businesses and customers the convenience of its trading is also a source of economic growth driven by a few years later. Commercial banks as one of the e-commerce payment link, how to protect the security in the

transaction process is the commercial banks engaged in e-banking is facing enormous challenges.

According to the Committee of the Basel regulatory risk management guiding principles for electronic banking operational risk faced by commercial banks to engage in, the use of statistical extreme value theory to measure the risk. Promote the stability of the commercial banks, and more conducive to the healthy development of China's e-commerce.

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