Credit Risk Management in Rural Commercial Banks in China

YANG WANG

A THESIS SUBMITTED
IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF
EDINBURGH NAPIER UNIVERSITY

FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

IN THE SCHOOL OF
ACCOUNTING, FINANCIAL SERVICES AND LAW

September 2013

Declaration

I, Yang Wang, confirm that this thesis and the work presented in it are my own achievement except where otherwise indicated.

This work has not been submitted to other institutions for a degree or other qualifications.

Edinburgh, September 2013

Yang Wang

Table of Contents

List of Tables

List of Figures

Acknowledgement

Abstract

Credit risk is one of the most general risks that exist in the financial market and a major risk faced by financial institutions. Credit risk management (CRM) is to identify, measure, monitor, and control risk arising from the possibility of default in loan repayments. The primary objective of CRM of rural commercial banks (RCBs) is to maintain risk within acceptable parameters and satisfy the regulatory requirements. CRM has long been the focus of governments, regulatory authorities and financial institutions. This thesis examines the importance of CRM for RCBs, which has been overlooked in the literature, and attempts to develop a CRM framework for RCBs. It has four specific research objectives: 1) to discuss the differences between RCBs and city based-commercial banks; 2) to examine the importance of CRM for RCBs and identify the approaches available for banks to manage credit risks; 3) to identify the key factors that have influenced the credit evaluation and assessment, as well as credit risk control in the context of China's RCBs; and 4) to propose a practicable CRM framework that suits the characteristics of Chinese RCBs.

This study adopts qualitative analysis and case study approaches to identify key factors contributing to the failure of RCBs' customers, resulting in loan defaults and banks' credit risk. The quantitative-based CRM tools available for large financial institutions do not meet the requirements of RCBs because the main customers of RCBs are small and medium-sized enterprises (SMEs) and farming households and there is a lack of financial data and credit rating relating to these customers. In addition to normal risks faced by financial institutions, RCBs in China are also exposed to risks specifically to rural commercial banking business and in particular, farming-related loans and services. This study proposes a CRM framework for RCBs in China. The framework is based on the identification of business failures of RCBs' customers and factors contributing to the failures of SMEs and farming households. The framework is divided into five steps. The first step is to distinguish business failure and closure. The second step is to identify factors contributing to the failure of customers, which should be considered from environmental, operational, financial and *guanxi* aspects. The third step is to use PCA to identify principal factors. The fourth

step is to design a credit risk analysis model with an analysis of these principal factors. The final step is to use the credit risk analysis model to manage credit risks of their portfolios and individual loans provided to SMEs and farming households. The CRM framework has been confirmed by practitioners through interviews conducted in the case bank. Interviews raise a number of issues relating to the development of a CRM model and assessment of credit risk of SMEs in China. The case study through an analysis of documents of the case bank reveals the importance of CRM and organisational structure in risk management and CRM. The case study presents evidence of lacking of practical methods in managing credit risk by RCBs in China. The proposed framework expects to address the problem.

This study has made several contributions to the literature that studies CRM in financial institutions in general and RCBs in particular. This study critically identifies the current lack of studies specifically addressing the RCBs' CRM, and proposes a CRM framework for RCBs. The framework considers financial and non-financial variables to analyse SMEs and farming household for which financial information is very limited. Using nonfinancial variables along with financial variables as predictors of business failure significantly improves credit analysis quality and accuracy. Also, this study recognises *guanxi* as risk potentials affecting the business of SMEs and farming households and includes *guanxi* risks in the framework. The consideration of *guanxi* in credit risk analysis fits well with China's business environment.

Keywords: Bank, China, Credit Risk, Credit Risk Management, Rural Commercial Bank.

List of Abbreviations

ABC	**Agricultural Bank of China**
ADBC	**Agricultural Development Bank of China**
AMC	**Asset management company**
ANN	**artificial neural network**
BIS	**Bank for International Settlements**
BOC	**Bank of China**
CAM	**China Association of Microfinance**
CBRC	**China Banking Regulatory Committee**
CCB	**China Construction Bank**
CDB	**China Development Bank**
CDS	**credit default swap**
CECJ	**county economic court judgment**
CEO	**chief executive officer**
CGS	**credit guarantee scheme**
CNY	**Chinese yuan**
CPC	**Communist Party of China**
CRM	**credit risk management**
CSFP	**credit Suisse financial products**
EDF	**expected default frequency**
EXIM	**Export-Import Bank of China**
FDI	**foreign direct investment**
GDP	**gross domestic product**
HSBC	**Hong Kong and Shanghai Banking Corporation**
ICBC	**Industrial and Commercial Bank of China**
IPO	**initial public offerings**
MDA	**multiple discriminant analysis**

MFI	**micro finance institution**
MoF	**Ministry of Finance**
NPL	**non-performing loan**
OCC	**comptroller of the currency**
OECD	**Organization for Economic Co-Operation and Development**
PCA	**principal components analysis**
PRC	**People's Bank of China**
RCB	**rural commercial bank**
RCC	**rural credit cooperative**
RMT	**risk management technology**
ROCE	**return on capital employed**
SAT	**State Administration of Taxation**
SETC	**State Economic and Trade Commission**
SME	**small and medium-sized enterprise**
SOCB	**state owned commercial bank**
UNDP	**United Nations Development Programme**
UNICEF	**United Nations Children's Fund**
VaR	**value at risk**
WTO	**World Trade Organization**
ZJGRCB	**ZhangJiaGang Rural Commercial Bank**

Chapter 1 Introduction

1.1 Background

With the developing of economy, international financial markets have made a speedy progressive move over the past three decades. The importance of financial markets and banks in an economy has been widely recognised by governments and academics (Önder and Özyıldırım, 2013). For example, Mr Wen Jiabao, the former premier of China stated that: "Finance has been the core of modern economy while bank is the core of modern finance".[1] The literature has well documented the relationship between economic development and finance. In 1912, Joseph A. Schumpeter stated that the development of financial system would prompt national income and economic development (cited from King and Levine, 1993). A recent study by Bittencourt (2012) confirms Schumpeterian theory. Bittencourt investigates the role of financial development (i.e., more widespread access to finance) in generating economic growth in four Latin American countries between 1980 and 2007. The results confirm the Schumpeterian prediction that finance directs the entrepreneur to invest in productive activities, and therefore to promote economic growth. King and Levine (1993) reveal that financial intermediate is a fine index of explaining economic development, capital accumulation and technique development. A research conducted by Goldsmith in 1969, based on data from 35 countries demonstrates that there is a positive relationship between the development of financial institutions and the progress of economy. Similar findings also appear in other studies (e.g., Andrianova, Demetriades and Shortland, 2012; Hasan, Wachtel and Zhou, 2009; Hao, 2006; Levine, 1998). A recent study of quantifying the impact of financial development on economic development by Greenwood et al. (2013) suggests that a country like Uganda could increase its output by 116 per cent if it could adopt the

---

[1] Statement was made in the Conference of Bank, Security and Insurance held in Beijing
(http://www.lnsgdb.com.cn/news/view.asp?id=3304, accessed 11 June 2010)

world's best practice in the financial sector. Banking is the backbone of a financial system.

In the banking system, commercial banks take a special position. The role of commercial banks is primarily to mediate funds between depositors and borrowers whose main business is to borrow funds from depositors to lend to others. Indeed, contemporary commercial banks have become the finance channels of the capital market in developed economies (Keeton, Schroeder and Stuart, 2003). They lead the direction of assets allocation and make the financing process more effective.

In China, the capital market is less developed and the finance channel lies mainly on commercial banks. Commercial banks have developed significantly over the past two decades along with China's economic growth. The China Banking Regulatory Commission (CBRC), the nation's banking watchdog, released its 2008 annual report for the country's banking industry, which shows that the total assets of financial institutions (mainly commercial banks) in China increased 18.6% to RMB 62.4 trillion in 2008. The increase was equivalent to 207.5% of China's 2008 GDP (CBRC, 2008). With the expansion, the banking industry has increasingly faced a number of risks. Credit risk is the most important one reflecting the risk of defaults that Chinese financial institutions face, particularly those small players are facing.

The recent tarnishing bankruptcies in the United States (such as WorldCom, Enron, HealthSouth, Tyco) and many other high-profile banks failures in Asia have forced many banks and financial institutions to realize the need for a viable credit risk management (Dyck et al., 2010; Duffie and Singleton, 2003). Presently, bank credit risk management becomes a major interest among academics and practitioners. While previous studies on bank credit risk management were mainly concerned with financial and credit risks of large commercial banks, little research has attempted to address credit risk of those small banks (for example, rural and village banks, microfinance institutions, cooperative banks and credit unions). This research attempts to fill a gap in the literature by focusing on the credit risk management issues of rural commercial banks (RCBs) in China.

1.2 The Importance of the Research Issue

Credit risk is one of the most general risks that exist in the financial market and a major risk faced by financial institutions (Duffie and Singleton, 2003). Credit risk generally refers to the risk that a borrower will default on any type of debt by failing to make payments which it is obligated to do[2]. An investigation of real risk assets allocation of banks conducted by McKinsey & Company (1997) demonstrates that credit risk exposure takes up to 60.0% of risks that banks face while market risk and operational risk take 20.0% respectively. The recognition, measurement, control and management of credit risk are, therefore, very important for banks. There is no financial institution that could avoid the above risks.

Credit risk management has long been the focus of governments, regulatory authorities and financial institutions. Contemporary economy is basically a credit economy which has been based on the trusts of different entities. By trust, the lender has the ability that based on the repayment of book value and interest in a certain time or period, to receive money, goods or service (Wu, 2002). Government bonds, enterprise loans, consumer loans, credit swaps are typical examples of credit products used under a credit economy. No doubt, a credit economy is born with risks. Default occurs when, for example, the bond issuers could not meet their promised obligations or the quality of the bonds has been changed due to other reasons in the market. Serious breach of credit contracts can lead to the loss of banks and even bankruptcy.[3] Lehman Brothers bankruptcy in 2008 was a typical example of recent failures in credit risk management by big financial institutions in a well-developed market.

---

[2] http://en.wikipedia.org/wiki/Credit_risk

[3] An article published by the BBC (http://news.bbc.co.uk/1/hi/business/7521186.stm), for instance, was headed with a striking illustration of a large American bank falling apart, with the caption "Top US lender suffers $3bn loss". On turning to the text, one learns that leading US mortgage lender Washington Mutual had posted a quarterly loss following a rise in defaults on loans. The firm made a loss of $3.3bn (￡1.6bn) in the three months to June of 2008.

In China, the fast-growth economy has led to a remarkable development in China's financial institutions and financial markets. Meanwhile, Chinese financial institutions face huge bad debts (Shan and Xu, 2012). For example, Zhao (1996) estimates that the bad debt ratio would be in between 25% to 30%, and the number accumulated by 6% annually in the 1990s. Mr. X. R. Dai, the former president of the People's Bank of China, China's central bank, indicated in the years of 1998 and 2002, that the bad debt ratios in China were 25% and 25.37% respectively.[4] In other studies conducted from outside of China, the figure goes up dramatically. Sachs et al. (2000) considered this figure to be more than 30 per cent. Standard & Poor (2002) estimated the bad debt ratio in Chinese financial system is at least 50 per cent[5]. Certainly, small banks such as RCBs could even have a higher figure in terms of bad debts. Recent studies by Lin and Zhang (2009) and Li and Ng (2013) have also recognised the seriousness of bad loans.

The Chinese government has several times attempted to address this bad loan problem. For example, in the year of 1998, fresh capital of the equivalent of USD 33 billion in the form of Renminbi (RMB) was injected into the four state-owned commercial banks (SOCBs), the operation started with a reduction in the reserve requirement which freed liquidity for the banks to acquire government papers. The government transferred again the receipts of this purchase to these banks in the form of fresh capital. This operation was followed, in 1999-2000, by transferring bad loans from the four SOCBs to the four newly founded Asset Management Companies (AMCs) for the equivalent of USD 170 billion. Further operations were conducted in the year of 2003 and 2005 (Garcia-Herrero, Gavila and Santabarbara 2006; Jiang and Yao, 2011). The bad loan ratio of Chinese commercial bank was declined to around 9% in 2005 and further dropped to 2 per cent according to the CBRC statistics in 2007.[6]

Like many financial institutions in other developing economies, China's financial institutions are also facing the problem of low level of capital adequacy. In many

[4] http://www.voanews.com/chinese/archive/2002-02/a-2002-02-19-15-1.cfm

[5] http://www.financialexpress.com/news/-chinese-banks-will-take-10-yrs-to-cut-npl-ratio-to-5-/45981/0

[6] http://www.cbrc.gov.cn/chinese/home/docViewPage/110009.html

cases, the capital adequacy of Chinese local banks did not meet the requirement of 8 per cent of the Basel Accord[7]. For example, the rate of capital adequacy of SOCBs in China decreased from 6.97% to 3.71% from 1989 to 1997. After the year of 1998, the Chinese government attempted to peel away bad debts from state-owned banks by setting up bank asset management companies and injecting investment from the state (Shan and Xu, 2012). For some reasons, the rate of capital adequacy did not go up as expected. The number went down to 5.51% in the year of 2001 from 7.01% in 1998, far from the 8% benchmark of the Basel Accord (Mundaca and Feng, 2005). In 2004, the Chinese government invested 45 billion dollars in Bank of China and Construction Bank of China, two major state-owned banks, in order to push up the capital adequacy rate over 8% (Mundaca and Feng, 2005). The results from the study by Mundaca and Feng (2005) show the unconditional bailout policy was not efficient. One of the reasons is that bailout funds went to cover bad debts, consequently encouraging more lending to risky projects.

Furthermore, the 'Mathew effect' problem relating to the banking sector in China has recently attracted huge attention among researchers and Chinese policy makers. The Matthew effect refers to the phenomenon in sociology where "the rich get richer and the poor get poorer" (https://en.wikipedia.org/wiki/The_Matthew_Effect). Over the past two decades, the Chinese banking industry has contributed to this Matthew effect. In Chinese commercial banks, loans are the major products that they provided. For the reason of safety and revenue, loans were mainly made to firms and projects in developed cities and large companies (mostly state-owned enterprise), less were provided to poor areas and smaller firms. The simplicity of the allocation of loans to developed cities and large enterprises leads to the inequality and imbalance of credit capital supply and demand, consequently, resulting in potential credit risk, let alone bad debts from those large companies. Many researches have been done attempting to identify the reasons of the Matthew effect and offer solutions (e.g., Chen et al., 2013, Önder and Özyıldırım, 2013; Bailey et al., 2011; Yao et al., 2005). Yao et al. (2005) find that three-quarters of inter-provincial income inequality can be explained by

---

[7] The Basel Accords refer to the banking supervision Accords (recommendations on banking regulations). There are three accords (i.e., Basel I, Basel II and Basel III) issued by the Basel Committee on Banking Supervision (BCBS). The accords have been widely adopted by banking supervisors across the world.

inter-rural/urban inequality in the case of China. Inter-provincial inequality explains more than half of rural inequality and less than half of urban inequality in most years. The inequality was to some extent attributed to the operational priority of China's commercial banks and the weakness of RCBs.

The magazine Economists (2006) describes China as the city of Europe and the country of Africa. To build a "harmonious society" has been a predominant developing aim for China since Mr. Hu Jingtao, the former president of China, brought it out a couple of years ago. Among many other issues, the balancing of the development between cities and rural areas has been an important issue for China to develop a harmonious society. The development of a sound banking system, particularly efficient RCBs expects to address the unbalance between urban and rural areas. This research addressing credit risk management of RCBs will offer some policy implications in this aspect.

Support for rural economic developments and less-developed regions has been given a priority by the Chinese government and many finance institutions in recent financial reforms and dealing with financial crisis. For example, China Development Bank in its 2006 annual report stated that "it actively supported the priority areas of the country that are under the most urgent need of development, and increased financial support for economic and social 'bottleneck' areas and weaknesses such as new countryside building" (China Development Bank, 2007) While RCBs have a role to play in this context, the key issue is to effectively manage credit risk and promote the active lending to rural individuals and small and medium-sized enterprises (SMEs). At the moment, many RCBs adopt the traditional risk management approaches used by large commercial banks. It is questionable if these approaches are effective in managing risks for RCBs operating in a different business and economic environment. However, research in this area, particularly credit risk management of RCBs in China, is in scarcity.

In China, RCBs were originally derived from rural credit co-operatives[8] that specifically provide services for rural population with low income. China's RCBs are different from the majority of rural credit cooperatives and commercial banks in other countries (e.g., UK's credit unions described by Ward and McKillop, 2005), whose business operation focused only on agriculture, rural areas and farmers. In the Chinese case, RCBs regard SMEs as their key customers and provide them with lending service.[9] Considering the special characteristics of RCBs in China, it is worth mentioning the literature has revealed some evidence on the relationship between SMEs and financial intermediaries. For example, Yan et al. (2009) observe that in China the bank size alone is not an important factor in determining lending to SMEs. The government policy plays an important part in influencing the lending. Bailey's et al. (2011) study finds that in China poor financial performance and high managerial expenses increase the likelihood of obtaining a bank loan. Studies show that the factors affecting the bank manager's incentives, like the linkage of wage with loan quality, the control over self-loan approval, tend to have a significant impact on SME loans. SMEs' relationship with the banks is quite important in obtaining loans and preference terms (Chen, Liu and Su, 2013; Firth, Lin, Liu and Wong, 2009; Fu and Heffernan, 2009; Yan et al., 2009). While there has been a significant increase in the number of RCBs in China since the beginning of this century, little research has been done on the credit risk management of RCBs.

1.3 Research Aims and Objectives

This project attempts to examine the importance of credit risk management for RCBs that has been overlooked in the literature and to develop a credit risk management framework for RCBs. This project will focus on the factors that affect the credit risk issues faced by RCBs by looking at environmental, operational, financial, and *guanxi* aspects affecting the failures of SMEs and farmers, the main customers of RCBs in

---

[8] Rural Credit Cooperatives (in Chinese: nóngcūn xìnyòngshè) is a People's Bank of China sanctioned cooperative or credit union of providing credit in China's rural areas.

[9] For example, in the case of Wu Jiang Rural Commercial Bank that located in Jiangsu province, the loan to SMEs counted for over 60% of the total lending service (Wu Jiang Rural Commercial Bank Annual Report 2010).

China. More specifically, this thesis has two aims. The first aim is to reveal the importance of credit risk management in improving the competition of RCBs in China; the second aim is to develop a generally applied credit risk management framework for these financial institutions. Traditional credit risk management models proposed for large financial institutions have their limitations in the context of RCBs as RCBs have their unique characteristics in their strategy, operation, financing, and customers. Along with the above aims, this project has several specific research objectives:

1. to discuss the differences between rural-based commercial banks and city based -commercial banks;

2. to examine the extent that RCBs have considered the importance of credit risk management and identify the approaches available for banks to manage credit risks;

3. to identify the key factors that have influenced the credit evaluation and assessment, as well as credit risk control for RCBs;

4. to propose a practicable credit risk management framework that suits the characteristics of RCBs in China.

The first two research objectives attempt to answer the question of the importance of credit risk management in improving the completion of RCBs in China and the rest of the objectives tend to explore the credit risk management framework for these financial institutions.

This study begins with an introduction of China's banking system and reform, and the development of China's RCBs. China's RCBs were developed under the authorities' initiatives to provide financial services to rural areas and *Sannong*[10] related business and developments. Because of this initiative, RCBs are exposed to risk associated with *Sannong*-related loans and services, in addition to normal risk faced by commercial banks. For many RCBs, their business focus is to provide high-quality financial services to SMEs in rural areas and serve the needs of *Sannong*.

---

[10] Sannong (pinyin: *sān nóng*), refers to the three rural issues relating to rural development in China. Specifically, these issues are agriculture, rural areas and peasants.

1.4 Research Methods and Summary of Research

Considering the characteristics and effectiveness of qualitative and quantitative research approaches along with the uniqueness of the research subject, this research adopts the qualitative research approaches (mainly interviews and case study) in designing the credit risk management framework. A qualitative research approach was chosen for this study because of its greater exploratory nature and therefore its applicability to this research domain This was essential in light of this study because there is very little research conducted in the area of credit risk management in RCBs in China and the unavailability of quantitative data. The researcher's aim was to fully understand, determine and describe the existing situation of credit risk management in RCBs, which goes beyond purely scientific restricting research. Eight interviews were conducted with bank managers, credit risk assessors and loan officers in a rural commercial bank to gain perceptions on the current status of credit risk management in RCBs and the key factors that affect the failure of banks' main customer - rural SMEs. The case study through an analysis of the bank's documents provides the current status of credit risk management in the RCB and reveals a serious lack of specific credit risk management methods suitable for RCBs. The interviews and case study aim to verify the applicability of proposed credit risk management framework developed in this study.

This thesis is organised as follows:

Chapter one: **An Introduction.**

In this chapter the research background, the importance of credit risk management issue, research aims and objectives, research approaches, and the organisation of the thesis are outlined. It focuses on the problems that lie in the credit risk management in RCBs and the justification for the research.

Chapter two: **China's Banking Systems and Reforms**

This chapter will introduce China's banking systems and reforms. It will provide an institutional background of the study, particularly China's rural financial systems

23

including formal and informal systems, and their contribution to and impacts on rural income-inequality. It will identify the differences between RCBs and city commercial banks, and discuss the characteristics and current problems of RCBs in China.

Chapter three: **Literature Review – Credit Risk Management**

This chapter will provide a literature review of credit risk management. It will discuss the concepts of credit and credit risk, identify the main sources of credit risk and highlight the importance of credit risk. In this chapter, the importance of credit risk management, regulatory requirement and general approaches to credit risk management will be discussed. In addition, it will explain and evaluate various methods of credit evaluation and assessment, credit risk transfer and financial derivatives in credit risk management. The review will highlight the limitations of these methods in the context of RCBs to justify the necessity of this current study.

Chapter four: **Literature Review - Rural Financial Development, SMEs, and Guanxi**

This chapter will provide a literature review of rural financial development, SMEs and guanxi, which are contextual backgrounds to this study. RCBs aim to address the income inequality problem and facilitate the development of rural finance. As the major customers of China's RCB are SMEs, this chapter will discuss the definitions of SMEs and role of SMEs in Chinese economy. Also, this chapter will provide some backgrounds of Jiangsu where the case bank is located in order to link the backgrounds with the case bank. Moreover, this chapter will explain the guanxi concept and discuss the importance of guanxi in Chinese economy. Guanxi will be included in the proposed credit risk management framework. This review attempts to reveal the development of the subject and highlight the potential contributions of this study in the area of credit risk management in China's RCBs.

Chapter five: **Research Methodology and Research Methods**

This chapter will describe research methodology and research methods underpinning the study. It will first review the concept and theory of research methodology, focusing on research methodology and strategy with a view to identifying an appropriate approach for this particular research. It will then summarise the major

research methods used in credit risk management in the literature. Prior credit risk management research has mainly adopted inductive approaches with a focus on the development/test of a credit risk valuation model. Moreover, it will describe the research method adopted in this study and explain in detail semi-structure interviews and case study used in this study. Finally, this chapter will propose a credit risk management framework for RCBs, providing the design and explanation of the credit risk management framework and linking the interview questions with the proposed framework.

Chapter six: **Analysis of Results**

This chapter will report the results of interviews and case study on the applicability of the proposed framework and provide a qualitative analysis supporting the proposed credit risk management framework for RCBs. First, it will provide an overview of the proposed credit risk management framework. Then it will present the results of interviews. Finally, it will provide the case study and highlight a lack of practical credit risk management methods in RCBs.

Chapter seven: **Summary, Contributions, Limitations and Further Research**

This chapter will conclude the study with a detailed summary of the study and findings, along with the identifications of contributions, limitations and further research. There are limited studies concerning the credit risk management of RCBs in developing countries. To our best knowledge, there is no study that has specifically focused on credit risk management of China's RCBs. Thus, this study expects to contribute to the literature that studies credit risk management in financial institutions in general and RCBs in particular.

Chapter 2 China's Banking Systems and Reforms

2.1. Introduction

This chapter provides an introduction of China's banking systems and institutions with a focus on banking reform and the development of China's rural financial institutions. As rural commercial banks (RCBs) are part of China's overall banking system, an understanding of China banking system and financial institutions can help to appreciate the development and challenges of RCBs. This chapter provides the detailed background information for the study of credit risk management of RCBs.

This chapter is organised as follows: the next section explains China's current banking systems with a focus on China's banking reform; Section three discusses China's rural financial institutions including formal and informal systems, and their contribution to and impacts on rural income inequality. Section four summaries the chapter.

2.2 Chinese Banking Systems and Reforms

Back in 1978, when Deng Xiaoping set the process of economic reform in motion, he acknowledged that he had no definitive plan of how the job would be done. The objective was clear: to create national wealth and to reverse the poverty that was crushing China. Deng's poetic commitment to cautious, flexible incrementalism has guided China's reform over the ensuing years. The banking reform was being carried out within the broader context of China's transition from a centrally planned economy to a market economy under Deng's reform plan. This account of the reform process is necessarily selective, highlighting the objectives and the major milestones followed by an assessment of performance. The key issues in the reform of the banking sector include: the three-stage evolution of the institutional structure of banking; the solution to the problem of non-performing loans; bank supervision, regulation and governance; and banking in the broader context of China's financial market development.

Prior to opening up to the rest of the world, China's banking system consisted of only one financial institution, the People's Bank of China (PBC). What eventually came to be called the "first stage" of China's bank reform took root in the early 1980s with the creation of a two-tier system. The PBC became the central bank. The Industrial and Commercial Bank of China (ICBC) was carved out of the PBC and, together with the China Construction Bank (CCB), Bank of China (BOC) and the Agricultural Bank of China (ABC), the four so-called specialized banks became the second tier of the system. The Big Four banks were 100% state-owned. In the early stage of the banking reform the specialised banks were allowed very little scope to extend commercial or consumer credit.

The second stage in developing a market-oriented banking system in China began in 1994 when the Big Four banks were relieved of their role in "policy lending" that characterised the banking regime in the era of comprehensive central planning. That function was assigned to three "policy banks" under the direct jurisdiction of the State Council (PBC, 2007). The three policy banks cover the following parts:

1) Agricultural Development Bank of China (ADBC) took over the policy lending role of the ABC. ADBC provides loans for the purchase, transport, marketing and reserves of selected agricultural products (e.g., grain, oil, cotton, meat, sugar, tobacco and wool) and loans for enterprises involved in processing. It takes deposits from publicly-owned entities and manages their international transactions.

2) China Development Bank (CDB) took over the policy lending role of the CCB and, to a lesser extent, the ICBC. The CDB is responsible for financing public-sector investment in support of national economic development and strategic structural readjustment.

3) Export-Import Bank of China (EXIM) took over the policy-lending role from the BOC, especially the trade financing function and inter-bank transactions. EXIM provides guarantees and concessional loans for firms involved in international trade and investment.

In 1995 the Commercial Bank Law of China was promulgated, recognising the status of state-owned specialised banks as commercial banks operating according to market-based banking principles of capital-adequacy, prudence, profitability, risk recognition, liquidity and responsibility for own profit and loss. Despite the law, government interventions (such as tight restrictions on banks' deposit and lending rates of interest) continued to constrain the fledgling commercial banks' discretion on business decisions (Garcia-Herrero et al., 2006; PBC, 2007; Jiang and Yao, 2011).

In 1997 the Central Committee of the Communist Party and the State Council held the first National Finance Operations Conference and introduced several important measures to accelerate the reform. First, the government issued RMB270 billion (US$33 billion) in special government bonds to recapitalise the Big Four SOCBs. Second, new regulations abolished the credit quota policy (by which the commercial banks had quotas imposed on them concerning to whom and how much they could lend) and, instead, allowed banks to adopt asset-liability management. Finally, in a dramatic and significant step that marks the transition from the second to the third stage of China's banking reform, the central government transferred RMB1.4 trillion (US$170 billion) in non-performing loans from the books of the SOCBs to new entities called asset management companies (AMCs), which were created specifically for management of poor-quality assets and non-servicing loans of state-owned enterprises and financial institutions (e.g., banks and insurance companies). Four financial asset management companies were established, one for each of the state-owned commercial banks.[11]

At that time most non-performing loans in China's banking system were a carry-over from the era of central planning. Wholly state-owned banks represented the full extent of China's financial system as stock markets were not resumed. The banks served as cashiers to the central plan determined by the central government. Overall, banks were passive conduits of finance from the central government to state-owned enterprises, to ministries/departments responsible for infrastructure and to lower-

---

[11] These four are: Great Wall for the Agricultural Bank of China; Orient for the Bank of China; Huarong for the Industrial and Commercial Bank of China; and Cinda for the China Construction Bank.

levels of governments and governmental agencies. Loans subsequently termed "non-performing" in many cases were never expected to "perform" in the first place (Li and Ng, 2013; Garcia-Herrero et al., 2006)). In central planning, banks have no commercial mandate (Jiang and Yao, 2011). Centrally funded AMCs were established to purchase the non-performing loans and deal with them in a more direct manner by selling them at a huge discount to interested financial institutions, including foreign-owned buyers.

AMCs remain under the supervision of the central bank with input from the State Securities Supervisory Committee and the Ministry of Finance. In many respects the AMCs are an arm of the state. Currently their major activity is debt-equity swaps that are selected by the State Economic and Trade Commission (SETC), not by the AMCs themselves (Li, Wang, Cheung and Jiang, 2011). In this way the AMCs are a part of the central government's overall restructuring programme for the state-owned sector. The immediate mandate of the AMCs was to recover approximately RMB1 trillion (US$121 billion) in banks' non-performing loans, the bulk of which could be attributed to inefficient state-owned enterprises. The longer-term aim of the AMCs is to rehabilitate loss-making large state-owned companies and eventually to liquidate their stakes by selling or listing the shares of the firms. The AMCs are crucial to the liberalization of the banking sector in China. By allowing the AMCs to handle the state-owned banks' debt burden that had accrued through government directed lending since the 1950s, the four banks were expected to better position themselves to adopt lending policies based on client creditworthiness. As non-performing loans were removed from the balance sheets of theses commercial banks, the central bank also strengthened their balance sheets through recapitalisation. In this stage of reform, excising bad loans and injecting new equity-blood are two fundamental features of the transition from China's old banking system to the new one.

The third stage of China's banking reform is to turn SOCBs into joint-stock commercial banks with the state as the controlling shareholder. The term "joint-stock restructuring" refers to financial restructuring, reform of corporate governance and public listing of bank shares on stock markets both at home and abroad. In 2003 the Central Committee of the Communist Party of China and the State Council selected

two SOCBs, i.e., BOC and CCB, as the pilot banks in an exercise of establishing broader ownership of banking and concomitant change in the commercial banking culture. The intention was to carry out a reform sequentially, beginning with those banks with fewer problems followed by differentiated policy packages for the others.

In late 2003 the Law on the People's Bank of China and the Commercial Banking Law were amended to establish the China Banking Regulatory Commission (CBRC) to oversee the reform of banking regulation and supervision. By this time China was addressing explicit World Trade Organization (WTO) commitments to the financial sector reform to be implemented by the end of 2006. Regulations were invoked to permit and regulate foreign investment in China's banks. According to these regulations, a foreign investor may hold a stake of up to 20% in any one of these SOCBs; total foreign ownership of any one bank was capped at 25% at the time.

Further revisions to China's banking laws took effect in 2004. Changes to the Law on the People's Bank of China have strengthened the central bank's responsibility for monetary policy and relieved it of responsibility for regulation of financial institutions. Revisions to the Administrative Measures on the Supervision of the Banking Industry assigned the newly formed CBRC responsibility for regulating all banks and other depository institutions and incorporated international norms for banking supervision to improve risk management. In addition, changes to the Commercial Banking Law have freed the Big Four from the requirement to provide loans to the State Council-approved projects and permitted them to carry out commercial banking activities, including, among other, trading government bonds, dealing in foreign exchange and offering credit card services.

Following the regulations, Chinese commercial banks have attempted to raise capital from international markets. In 2005, for example, CCB issued an IPO on the Hong Kong Stock Exchange, raising US$8 billion in share capital. At the same time, CCB was developing a strategic partnership with the Bank of America which purchased 9% of the shares for US$2.5 billion. Some 95% of IPO shares were sold to various institutions including many foreign institutions. Also in 2005, Bank of Communications had an IPO on the Hong Kong Stock Exchange. London based

HSBC acquired 2.6% of the shares of Bank of Communications. In 2006, BOC's US$9.7 billion IPO on the Hong Kong Exchange was the largest issue on international markets with great success. Shares offered to institutional investors were oversubscribed by up to 20 times. Royal Bank of Scotland, Merrill Lynch, Temasek Holdings of Singapore and a group led by Li Ka-shing of Hong Kong took minority stakes in BOC. Also in 2006, the once woefully troubled Industrial and Commercial Bank of China (ICBC) received approval for an IPO. ICBC issued more than US$14 billion in shares on international markets. The bank's capital strength was also derived from US$15 billion in recapitalization funds received from the government in 2005. Now ICBC becomes the largest commercial bank in the world.

By the year of 2010, there are three policy banks, five SOCBs, 12 joint-stock commercial banks, 147 city commercial banks, 85 RCBs in China. Table 2.1 reveals the total assets of banking institutions in China (2003 – 2011) and Table 2.2 shows the total liabilities of banking institutions in China (2003-2011)[12].

2.3 China's Rural Financial System

2.3.1 Rural Microfinance Reform

Initially, China's rural financial system operated predominately in the form of microfinance. Microfinance can be seen as an innovative financial tool. Microfinance is a form of financial services for individual entrepreneurs and small businesses lacking access to banking and related services, including the provision of microcredit to poor people. The core element is to tackle the problem of gaining credit among low-income people (Basu and Srivastava, 2005; Ahmed, 2009; He et al., 2009; Li et al., 2011). Nevertheless, the emphasis of microfinance is not only on financial

---

[12] The figures are given in normal value; the figures are affected the changes of inflation rates over the time period. Inflation Rate in China is reported by the National Bureau of Statistics of China. China Inflation Rate averaged 5.83 per cent from 1986 until 2013, reaching an all time high of 28.40 per cent in February of 1989 and a record low of -2.20 per cent in April of 1999.

services, but also social benefits e.g. alleviating poverty, community development and capacity building etc. (Zeller, 2006).

Table 2.1 Total assets of banking institutions in China (2003-2011)

Unit: RMB100 million

Institutions/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Banking institutions	276,584	315,990	374,697	439,500	531,160	631,515	795,146	953,053	1,132,873
Policy banks & the CDB	21,247	24,123	29,283	34,732	42,781	56,454	69,456	76,521	93,133
Large commercial banks	160,512	179,817	210,050	242,364	285,000	325,751	407,998	468,943	536,336
Joint-stock commercial banks	29,599	36,476	44,655	54,446	72,742	88,337	118,181	149,037	183,794
City commercial banks	14,622	17,056	20,367	25,938	33,405	41,320	56,800	78,526	99,845
Rural commercial banks	385	565	3,029	5,038	6,097	9,291	18,661	27,670	42,527
Rural cooperative banks	–	–	2,750	4,654	6,460	10,033	12,791	15,002	14,025
Urban credit cooperatives	1,468	1,787	2,033	1,831	1,312	804	272	22	30
Rural credit cooperatives	26,509	30,767	31,427	34,503	43,434	52,113	54,945	63,911	72,047
Non-bank financial institutions	9,100	8,727	10,162	10,594	9,717	11,802	15,504	20,896	26,067
Foreign banks	4,160	5,823	7,155	9,279	12,525	13,448	13,492	17,423	21,535
New-type rural financial institutions & Postal savings bank	8,984	10,850	13,787	16,122	17,687	22,163	27,045	35,101	43,536

Note: Data for 2003 to 2006 refer to the combined assets of banking institutions within China.

Data for 2007 to 2011 refer to the consolidated assets of banking institutions within and outside China.

Source: CBRC (2011), p.119

Table 2.1 Total liabilities of banking institutions in China (2003-2011)

Unit: RMB100 million

Institutions/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Banking institutions	265,945	303,253	358,070	417,106	500,763	593,614	750,706	894,731	1,060,779
Policy banks & the CDB	20,291	23,005	27,760	33,006	39,203	52,648	65,393	72,159	88,231
Large commercial banks	154,002	172,180	200,453	228,824	269,176	306,142	386,036	440,332	502,591
Joint-stock commercial banks	28,621	35,333	43,320	52,542	69,350	83,924	112,541	140,872	173,000
City commercial banks	14,123	16,473	19,540	24,723	31,521	38,651	53,213	73,703	93,203
Rural commercial banks	380	538	2,873	4,789	5,767	8,756	17,546	25,643	39,208
Rural cooperative banks	–	–	2,574	4,359	6,050	9,381	11,940	13,887	12,959
Urban credit cooperatives	1,464	1,766	2,001	1,781	1,247	757	255	21	24
Rural credit cooperatives	26,646	30,035	30,106	33,005	41,567	49,893	52,601	61,118	68,575
Non-bank financial institutions	7,683	7,745	9,126	9,424	7,961	9,492	12,649	17,063	21,310
Foreign banks	3,751	5,329	6,530	8,532	11,353	12,028	11,818	15,569	19,431
New-type rural financial institutions & Postal savings bank	8,984	10,850	13,787	16,122	17,568	21,942	26,713	34,365	42,247

Note: Data for 2003 to 2006 refer to the combined assets of banking institutions within China.

Data for 2007 to 2011 refer to the consolidated assets of banking institutions within and outside China.

Source: CBRC (2011), p.220

Microfinance possesses both functions of poverty alleviating and financial services, making microfinance inevitably becomes a component of improving and perfecting financial systems in rural areas and less-developed regions. It is a vital part of developing financial systems. Microfinance has been positively considered by many countries and encouraged to develop. There are different models of microfinance services, for example, credit unions in the UK and Grameen Banks[13] in other

---

[13] The Grameen Bank (GB) founded by Muhammad Yunus was awarded the Nobel Peace Prize for efforts against poverty in Bangladesh in 2006, which is regarded as a good example of microfinance (Hassan and Renteria-Guerrero, 2007). Since 1976 when he first lent $27 to 42 stool makers, the GB has grown to include about 7.97

countries. Traditionally, the differences between two general types of microfinance institutions (MFls) (i.e., one is for seeking profits to achieve self-development and another one is for non-profits with external capital) are distinct, but now these differences are vague because there is a trend of commercialisation among MFIs to emphasize more on self-development (Yunus, 1999). Besides, even though different countries have different models of MFIs, they all serve the same purpose—social benefits especially for poverty alleviation.

China as the largest country in terms of populations with around 26.88 million people living in poverty (China Daily, 2013) needs microfinance to reduce large gap between the rich and the poor. Actually, the Chinese government has already realised the importance of microfinance in poverty alleviation and has been actively exploring microfinance since 1993. According to Rahman and Luo (2011), China has regarded microfinance services as a government scheme for poverty alleviation since October 1993.

The period of exploring and developing microfinance in China can be divided into three main phases. The first phase can be described as an experimental phase. China adopted the Grameen Bank's model and conducted experiments in four sites including Yixian County in Hebei province, Nanzhao County in Henan province, Yucheng County in Henan province, and Danfeng County in Shaanxi province (Rahman and Luo, 2011). After that, non-governments microcredit was being launched like the United Nations Development Programme (UNDP) and the United Nations Children's Fund (UNICEF). Meanwhile, local governments have also offered microcredits to rural residents by three financial institutions i.e. the Agricultural Bank of China

---

million members with approximately BDT 498.31 billion (around USD 8.74 billion) of cumulative disbursement in total till end of 2009. There are a few features of GB. The initial one is the group lending innovation. To be specific, five people form in a group to apply for loans and accept the bank rules. If the first two applicants successfully repay loans, the next two can also receive loans after 4-6 weeks later and finally the last person can get loans in the same way i.e. "2+2+1 model". Secondly, the main focus of GB is on poor men and women. Actually, nearly 96% loans lent to women. Thirdly, repayment term is one week much shorter than the conventional term, which allows GB lend small amounts of loans and meanwhile reduce lenders' pressure. Furthermore, GB encourages clients to have three roles simultaneously i.e. savers, lenders and stockholders, which may help clients to produce strong belongingness, responsibility and also care about its development.

(ABC), the Agricultural Development Bank of China (ADBC) and Rural Credit Cooperatives (RCCs).

The second phase can be named as "the entire participation of formal financial institutions and the institutionalisation of various projects" (Rahman and Luo, 2011). Microcredit and group loan businesses were introduced by RCCs. RCCs made a great success in several provinces (e.g. Shanxi, Sichuan, Yunnan etc.). The final phase is from 2005 to date and is seen as the normalisation and institutionalisation phase of microfinance, according to Rahman and Luo (2011). In 2005, the PBC established microcredit companies in Sichuan, Guizhou, Shaanxi and Inner Mongolia Provinces, continuing to enlarge microfinance market in China (Tang, 2009). Legalisation and formalisation of micro-loan companies were widely regarded as essential in the development of microfinance in China as well as China's rural financial reform (Rahman and Luo, 2011). China Association of Microfinance (CAM) was launched in 2005, which is a self-regulation association to promote microfinance in China. After 2006, not only postal savings banks but also domestic commercial banks and rural cooperative banks have been approved by the China Banking Regulatory Commission (CBRC) to set up microcredit services and fully-owned micro-lending institutions. Moreover, CBRC now allows these institutions to raise funds from shareholders and donated funds and to borrow from banking financial institutions (CBRC, 2010).

Yet, microfinance in China is still at an experimental stage. A lot of problems exist to hinder the development of microfinance in China. Firstly, the sources of credit capital are limited. Owning to small-scale, decentralised spread and a limited scope of microfinance services, RCCs cannot attract more people to deposit money into RCCs. In this case, it has seriously hindered their sustainable development and weakened their ability of independence and risk resistance. Secondly, the problem with interest rate setting is a major problem. Higher interest rate offered by MFIs (especially those microcredit institutions with high costs of capital, which only offers loans but cannot take in savings) aims to cover costs to achieve self-development. Simply, the lower interest rate, the more customers attracted. Therefore, interest rates of microfinance products should be set as lower as possible on the basis of supporting MFls' sustainability. Such a controversy (i.e., high interest rate vs. attracting more

customers) causes more concerns about the future of developing MFIs in China. While rural people in China could accept high interest rates owing to urgent credit demands, risk control is a difficult area for MFIs. Thirdly, the asymmetric information problem faced by MFIs is more serious than commercial banks and other formal financial institutions. MFIs are usually lack of experience of screening and monitoring customers. There is a genuine shortage of professional staff in MFIs to analyse customers' credit risk. As a consequence, rural MFIs have exposed much high risk.

Another problem facing China's RCBs and MFIs is the prevailing of informal lending among rural businesses and individuals (Yan and Gao, 2012). A research from China Agricultural University conducted in 21 counties of Zhejiang, Jiangsu, Hubei, Henan and Shaanxi provinces among 365 rural households found that approximately 38.4% loans were from formal lending channels (e.g. RCC, ABC, other banks and non-banking financial institutions), 61.6% were from informal lending; e.g., cooperative funds were about 0.6%, informal lenders were 60.96% (He, 1999). After seven years, Guo and He (2005) conducted the same study and his findings show that merely 33.5% loans received by these households were from RCCs, while almost 66.5% were from informal lending, suggesting that informal channels still pose a threat to formal channels like RCCs.

The banking authorities in China had attempted to restrain informal finance through issuing of regulation and rules to ban and permit some types of microfinance institutions (Tsai, 2004). Nevertheless, clients in rural China still had more interests in informal lending. Tsai (2004) attributes the popularity of informal lending to mainly four reasons: the limited supply of formal credit, limits in state capacity to implement its policies, the political and economic segmentation of local markets, and the institutional weaknesses of many MFIs. Indeed, the existence of informal lending exacerbates formal microfinance system (Yan and Gao, 2012), thereby hindering the development of microfinance in rural China.

How to better develop formal MFIs to attract more rural people and restrain informal lending has been widely regarded as an important issue for microfinance development

in China (Yan and Gao, 2012; He et al., 2009; Sun, 2002). The development of RCBs was intended to develop and strengthen the formal financial system for China's rural areas. Although China's rural financial system has changed dramatically over the last twenty five years, rural financial reforms were lagging behind the changes in the economy and required further transitions and reforms. As in other countries moving towards a market economy, the reform of banking systems and the creation of efficient financial markets in China continue to be among the most difficult issues. Poorly regulated financial markets and inexplicit structure push rural population to rely on informal institutions as part of China's microfinance system (Yan and Gao, 2012; Feng, 2007; Tsai, 2004). The next section will specifically introduce China's RCBs.

2.3.2 China's Rural Commercial Banks (RCBs)

RCBs are the more recently developed form of formal financial institutions mainly operated in China's rural areas. Most of them were initially transformed from rural credit cooperatives (RCCs). Presently there are several formal financial institutions operating in rural areas along with MFIs located mainly in the inland and western regions of China. The most popular one is rural credit cooperatives (RCCs). RCCs used to play an important role in rural lending. As the development of the Chinese economy goes on, some of the rural regions like the southern part of China have been largely urbanised. The proportion of primary sectors in the economy has fall down with the rising of secondary and tertiary sectors. Under this circumstance, the business characteristics of RCCs have determined that they are in an inferior position to compete with large banks. Firstly, under the existing system, scattered members of RCCs are entitled to join or leave freely and every member holds one vote which creates obstacles to increase capital and business scale. Secondly, the primary goal of RCCs is not profitability. According to the government policy, no less than 50 per cent of RCCs commercial lending must go to the hands of the members and the agricultural lending to SMEs stands the second place, while in the well-developed regions, the customers with better credit mostly are large corporations. It makes RCCS hard to compete with other banks. Furthermore, some of services required by foreign or large corporations (such as financial leasing, M&A services, export finance, and pension services) are not provided by RCCs due to policy and regulations. These

policy restrictions have limited the competitive capability of RCCs. In order to meet the expansion of financial demands and to compete with other financial institutions, some RCCs changed their legal status and transferred to RCBs. Most of these establishments were set up in the rich provinces where urbanisation was well developed, like Jiangsu, Guangdong and Zhejiang provinces.

Under China's legal framework, a rural commercial bank is an independent enterprise owned by shareholders. Rural commercial bank shareholders have the right to share profits, make major decisions and have the right to choose managers, etc. They are also responsible to bear the debts owed by RCBs. Under China's law and CBRC regulations, the establishment of a rural commercial bank shall meet the following basic conditions:

1. It has to comply with 'the People's Republic of China and the National Company Law', 'the Law of the People's Republic of China on Commercial Banks', and all regulations laid by the CBRC.
2. Number of charter members is required to be at least 500.
3. Entry level registered capital equals to fifty million Yuan (about 5.4 million GBP),[14] and the capital adequacy ratio is of 8%.
4. The establishment of rural credit cooperatives in the former jurisdiction over the total assets of RMB10 million and the non-performing loan ratio is less than 15%.
5. RCBs are required to have managers with the necessary professionals with knowledge and working experience in senior management.
6. Setting up a sound organisation and management system.
7. It has to meet the requirements of certain branches, safety precautions and other business-related matters.
8. Other conditions required by the CBRC.[15]

---

[14]for details:

Http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=5&ved=0CGsQFjAE&url=http%3A%2F%2Fwww.china.com.cn%2Fchinese%2FEC-c%2F418764.htm&ei=RsHET8KcFqnS0QXksfTBCg&usg=AFQjCNHMhnmhAyhQ3NKpmfwUya9n9QWH5A

[15] http://www.xzgt.cn/read.aspx?newsno=552&newstype=10&TypeSuoShu=JiTuanYeWu

Table 2.2 provides a comparison between rural commercial banks (RCBs) and rural credit cooperatives (RCCs). RCCs were established during the rural cooperative movement in the 1950s[16], which was the People's Bank of China sanctioned cooperatives or credit unions of providing credit in the rural areas of China. RCBs are local financial institutions constructed by farmers, local entrepreneurs and large companies and other organisations and they are usually based in prosperous provinces like Jiangsu, Zhejiang, Guangdong, and Shandong Provinces. The difference reflects in the services provided, stock equity, management structure and capital adequacy requirements as listed in Table 2.2. Also, RCBs' loans to corporate customers are mainly concentrated in the SMEs sector, which account for over 70-80% of total corporate loans in most cases. The business operation of SMEs may not be as stable as the large enterprises because they are more vulnerable to adverse changes in the economic and natural environment, and most SMEs may also lack of adequate internal control or risk management systems, which could certainly increase the credit risk faced by RCBs. The focus of this thesis will be on the credit risk management of RCBs.

Apart from normal risks faced by financial institutions, RCBs are also exposed to risk inherent to rural commercial business, and in particular, *Sannong*-related loans. For many RCBs, their business objective is to provide high-quality financial services to customers in rural and county areas and serve the needs of *Sannong*. Because *Sannong* was the major area of concern in China's development, the Chinese government has called for the financial services to give priority support. China RCBs were largely formed under the government initiatives to address the need of *Sannong*. Many RCBs' Articles of Association provide that each year they shall allocate a certain percentage of newly issued loans to support the *Sannong* development, and such percentage is to be decided at the shareholders' annual general meeting in accordance with the industry structure of the relevant local areas. In general, banking business in rural and county areas has been an important component of RCBs' business. In many cases, loans to county areas account for around 50% of RCBs' total loans.

---

[16] http://www.microfinancegateway.org/gm/document-1.9.26797/76.pdf

Table 2.2 Comparison between RCBs and RCCs

	Rural commercial banks (RCBs)	*Rural credit cooperatives (RCCs)*
	The shareholders are composed of local farmers, local entrepreneurs and large companies and other organisations.	Members of RCCs consist of local farmers and other organizations.
Areas of Services	In areas with better urbanisation where less farming loan are required.	Based on the principles of rural cooperatives
Equity ownership	Share capital is divided into equal shares, with each share bearing the same right and the same benefit.	Stock equity is divided into qualification shares, investment shares. One qualification share equals one vote and an increasing certain amount of investment share brings one vote.
Management structure	The general meeting of shareholders has the overall authority. The board of directors and board of supervisors are set up to run the bank.	The committee of RCC representatives controls and runs the cooperative and the representatives of the committee are voted by RCC members.
Capital adequacy	No less than 8%	No less than 6%
Registration capital(CNY)	At least 50 million	At least 20 million

Source: adapted from http://www.askci.com/

Indeed, RCBs are very much subject to risks inherent in rural banking business, in particular the *Sannong*-related industries (such as risks caused by the decentralisation of the rural economy in the vast rural areas, low production efficiency, natural disasters, long production cycle, change in consumption pattern, and lack of insurance system available to residents in the rural areas against catastrophic events). Any of these risks may materially and adversely affect the business and financial conditions of rural area customers, which in turn affect their abilities to repay loans. In addition,

population in the county areas of China is very mobile and many of the residents in rural areas migrate to cities with their entire families. This behaviour also increases the difficulties for RCBs in loan management and loan recovery in the rural areas.

Due to the above reasons, historically, RCBs had generally presented relatively higher risk than city commercial banks. In addition, RCBs are encouraged by the CBRC to increase their *Sannong*-related loans at a rate not less than the growth of total new loans, and to keep the volume and percentage of *Sannong*-related loans to total loans higher than those in the previous year. These policy measures, while reflecting the Chinese government's commitment to promote rural area banking business, can affect the ability of RCBs to optimise their capital deployment and improve their customer mix, which in turn adversely affect their profitability and competitive advantages. The primary source of income of RCBs is interest income and their ability to generate fee and commission income is limited.

Compared to the city-based commercial banks in China, the products and services currently offered by RCBs are relatively simple. They rely heavily on deposit and loan business, and less on fee- and commission-based business and revenues from investment banking. Internet banking is less developed. As a commercial bank, customer deposits remain RCBs' primary funding source. However, there are many factors affecting the growth of deposits, such as economic and political conditions, fiscal policy, the availability of alternative investment choices and the changes of customers' perception towards savings. Due in part to the lack of alternative investment products in China, a substantial portion of short-term deposits made by customers has been rolled over upon maturity, and these deposits have represented a relatively stable source of funds for RCBs. However, as the domestic capital market in China continues to develop, RCBs face more competition for deposits from other banks. Recently, the Chinese government is considering relax existing strict rules on the savings interest rate,[17] city commercial banks may be able to offer an attractive rate due to their adequate capital resources and lower running costs.

---

[17] Up to the re-writing of this thesis in May 2013, the existing banking regulations in China set out the minimum interest rates for loans and the maximum interest rates for deposits. It is likely this is going to change in the second half of 2013.

RCBs rely on favourable government policies and agenda in respect of rural area developments and the *Sannong* reform in China. Such policies and initiatives include, among others, providing public finance to support the county and rural area developments, introducing financial products such as business start-up loans to *Sannong*-related businesses, developing insurance services in the county and rural areas in China to manage risks from catastrophic events and health and safety accidents, as well as providing subsidies to farmers for purchasing electronic products, farm equipment, vehicles and construction materials. The Chinese authorities have also provided tax incentives to RCBs. For example, according to a notice issued jointly by China's Ministry of Finance (MoF) and the State Administration of Taxation (SAT) in August 2009, financial institutions, including RCBs, were allowed to deduct from taxable income the allowance for impairment losses for loans made to qualified farming households and enterprises that have less than RMB200 million in both annual sales volume and total assets; which allowance are otherwise not deductible. On May 13, 2010, the MoF and the SAT issued another notice under which the interest income from loans to farming households with outstanding principal of less than RMB 50,000 will be exempted from the 5% business tax and only 90% of such interest income will be counted towards the taxable income for corporate income tax purposes.

2.3.3. Current Problems and Challenges of China's RCBs

The 2011 China RCBs Report[18] highlights several problems and challenges faced by China's RCBs.

1. Most shareholders are individual persons who control only a small amount of shares. The scattered stock equity results in the problem that little incentive or ability is created for the shareholders to execute their right over the banks. Without the monitoring process from the shareholders, the risk of agency problem (i.e., senior management consider their own personal interest as priority) increase. Also, the roles of board of directors and managers are implicit. Independent

---

[18] For details, see China Rural Commercial Bank Market Report, 2010-2011, http://www.researchinchina.com/Htmls/Report/2011/6137.html, accessed on 1 August 2012.

directors have restrained access towards the details of the financial information from the banks, which creates obstacles for them to monitor the managers and major stockholders. In addition, the board of supervisors is not able to implement their ability in a full range due to poor information and non-independence of some supervisors who have business interests in the bank. External independent supervisors take a small portion in the whole system which cripples the effect of independent auditing.

2. Compared to other commercial banks, RCBs are lacking of specific planning, strategy, research support, and business innovation. There are insufficient financial products available for customers to choose from. Trust funds, guarantee funds, business consultancy and financial derivatives created for modern financial services with high added value are still waiting to be developed in the case of RCBs. Taking ZhangJiaGang region as an example, the financial services provided by local branches of Industrial and Commercial Bank of China (one of the big four banks) involve deposits, loan, settlement, agency business, investment banking, asset custody, corporate pension, etc., while ZhangJiaGang Rural Commercial Bank only provides with deposit, loan settlement, bond repurchase, which makes the latter hard to compete with large banks because the products they provided are limited and cannot meet various market needs.

3. RCBs risk management capacity is insufficient. Firstly, the bank is generally lacking of modern risk management concept, awareness and culture. The bank managers tend to lay more attention on business development rather than internal control of the risk raised from the loan issuing. The implementation of "three examinations system" (i.e., inspections for credit quality before, in and after the process of issuing of loan) is less effective. Secondly, the development of the internal control systems and internal audit fall behind the schedule. Thirdly, the development of risk management support system (e.g., IT) lags behind. The effectiveness of risk recognition, valuation and precaution system are rather weak. While the bad debt ratio of RCCs is gradually improved, it still keeps at a relatively high level comparing with other commercial banks. Table 2.3 shows the level of non-performing loan (NPL) ratios of Chinese banks, revealing RCBs have the highest NPL ratio among financial institutions in the banking sector.

It is prevalent that employees of China's RCBs are less trained with lower levels of qualifications. Some employees are not familiar with the operation of computer, international finance, investment and personal financial management, which restrains the banks' ability to develop new financial products.

Table 2.3 NPL ratio of Chinese banks (2008-2010)

	2008	2009	2010
Major commercial banks	2.45%	1.59%	1.15%
Large commercial banks	2.81%	1.80%	1.31%
Joint-stock commercial banks	1.35%	0.95%	0.70%
City commercial banks	2.33%	1.30%	0.91%
Rural commercial banks	3.94%	2.76%	1.95%
Foreign banks	0.83%	0.85%	0.53%

Source: CBRC (2010)

RCBs are subject to capital adequacy guidelines set by the CBRC. These guidelines require RCBs to maintain a minimum capital adequacy ratio of 8% and a minimum core capital adequacy ratio of 4%.[19] Indeed, the ability of RCBs to satisfy the current regulatory capital adequacy requirements could be adversely affected as a result of the changes in China's financial market conditions, including an increase in the level of non-performing loans, deterioration in the quality of financial assets and decline in profitability; any of which could result in the decline of capital base. For RCBs, their ability to obtain additional capital may also be restricted by a number of factors,

---

[19] It is possible that the CBRC may increase the minimum capital adequacy requirements or change the methodology for calculating regulatory capital or capital adequacy ratios. In recent years, the CBRC has issued several regulations and guidelines governing capital adequacy requirements applicable to commercial banks in China. In February 2007, the CBRC announced a plan to start implementing Basel II by the end of 2010, or upon the CBRC's approval, no later than the end of 2013, to assess the capital adequacy of large commercial banks with operations in other jurisdictions and significant international business as well as commercial banks which elect to comply with Basel II. At the moment, many RCBs are not subject to the Basel II requirements. But this situation may change in the future.

including future business, financial condition, results of operations and cash flows, conditions prescribed by China's law and regulatory approvals, credit rating, general market conditions for capital-raising activities by commercial banks and other financial institutions, and economic, political and other conditions both within and outside China.

Moreover, as a result of weakness in internal control and internal audit system,[20] many RCBs suffered from internal control deficiencies and lapses in control processes. Financial scandals and frauds happened quite often in some RCBs. Clearly, there is a need for RCBs to implement various initiatives to improve internal control, including, for example, improving corporate governance and implementing various internal control policies and guidelines with respect to credit management, internal reporting, auditing, and information management (Liang, Xu and Jiraporn, 2013). No doubt, the growth and expansion of RCBs may affect their ability to implement and maintain stringent internal controls.

2.3.4 Credit Risk in RCBs

RCBs' main business focuses on *Sannong* and the agricultural industry that is very vulnerable to natural disasters. Every major natural disaster that causes the destruction of agricultural production creates difficulties for a large number of RCBs' borrowers to make the repayment of loans on time. Quite often those loans turn into bad debt (Shan and Xu, 2012). This kind of credit/default risk is inherited from the traditional problem of rural credit cooperatives (RCCs). Currently, the credit risk management tools adopted by RCBs are still pretty general on the one hand. On the other hand, the managers of RCBs tend to pay more attention to investigate and assess of the quality of loan applications, but neglect the monitoring process after the loan is issued.

Government interference often jeopardises the management of RCBs. Due to political reasons, some local government officers often demand loans to be channelled into infrastructure construction projects in order to boost the increase of the local GDP (Li,

---

[20] Under the CBRC Banking Financial Institution Internal Auditing Guidance, RCBs are required to have a minimum of 1% of their employees specialise in internal auditing. Many RCBs are struggling to meet this requirement. The key difficulty is to recruit experienced internal auditors.

Meng, Wang and Zhou, 2008). Less consideration is given to the feasibility of the project in the long run and risk. When these projects with endogenous high risk exceed the capacity of the government budgets or the banks provision, crisis strikes. More recently, the central government has begun the large scale of auditing of local public finance and borrowings. The likely impact on the business of RCBs expects to be huge in terms of credit risks and demand for future loans by local authorities (particularly the county and town level governments and their agencies).

Moreover, many managers in RCBs see the rapid development of China's economy as an opportunity to expand the business of RCBs. Indeed the performance of RCBs over the past decade reveals that total deposits and loan received and dished out by RCBs have increased year by year along with the rapid social and economic development of China. This motives some loan officers in lending decisions to take only the interest produced by the loan rather than principal repayment. In addition, many RCBs use loan volume as performance indicators to measure management achievement. Often the loan managers are required to complete monthly quote by making certain amount of loans to borrowers. This has increased the likelihood of potential bad loans.

RCBs have in the past suffered from certain credit-quality problems, lapses in credit approval and operational problems as a result of the weaknesses in their risk management. They do not have an integrated risk management system and a proper information system to support a centralised database and revamped risk management system, policies and procedures in an effort to improve their risk management capabilities. Due to limitations on the information, resources or tools available for RCBs, they are facing more difficulties to address various kinds of risk in their operations effectively or respond to sudden changes in a timely manner. Due to insufficient information technology (IT) support, including data support, in most RCBs their current IT system may not be able to generate sufficient data in time to allow them to effectively monitor risk. For example, they need to upgrade their corporate and individual customer information system to support their risk management function. Their risk management capabilities are very much limited by their internal resources. For example, they do not have sufficient specialised risk management personnel and current risk management personnel may not have

sufficient expertise and experience in managing credit risks of rural SMEs and farming households.

2.4 Summary

In this chapter the author firstly discusses the structure and reforming process of the Chinese banking system, which shows that the banking sector plays as a dominant force in China's financial system. It explains the stages of the banking reform in China and the weakness of China's financial system in relation to rural development (i.e., *Sannong* issues).

Also, the author presents a general situation of rural banking system in China since it is the social environment where RCBs are derived from. It introduces the background, structure, characteristics of rural financial institutions. Comparisons are also made among commercial banks in different layers in China's banking system in this section. The characteristics of RCBs are also demonstrated in a comparison with other rural financial institutions (e.g., RCCs), This chapter has also highlighted the difficulties that RCBs face in developing their businesses and dealing with credit risk management.

Overall, this chapter provides a general background about China's banking system and rural financial institutions and the problems they are facing, especially credit risk. As prior studies have already dealt with credit risk issues of city commercial banks in China (e.g., Bonin and Huang, 2001; Cui, 2008; Ferri, 2009; Fu and Heffernan, 2009), this existing study, therefore, will focus on credit risk management of RCBs, which has been overlooked in the literature.

Chapter 3 Literature Review - Credit Risk Management

3.1 Introduction

Credit risk management has attracted considerable attention over the past decade, particularly since the 1997 financial crisis. The research has been mainly concerned with credit scoring and credit control of large financial institutions from developed markets. This literature review chapter is going to discuss the qualitative and quantitative aspects of credit risk management including the definition of credit risk, the cause of credit risk, the importance of credit risk management, credit risk management models, and the current research debate in these areas. The review also attempts to reveal the development of the subject and highlight the research gap in the area of credit risk management of financial institutions.

This chapter is organised as follows: the next section discusses the concepts of credit and credit risk, identifies the main sources of credit risk and highlight the importance of credit risk. Section three is concerned with credit risk management, covering importance of credit risk management, regulatory requirement and general approaches to credit risk management. Section four concentrates on credit evaluation and assessment from the technical perspective, while Section five focuses on credit risk transfer and use of financial derivatives in credit risk management. Over the past a half contrary, academics have developed a number of credit risk management models and produced many empirical tests on the effectiveness of these models. Overall, these models can be divided into two broad categories: traditional models and modern models, including expert systems, rating systems, credit scoring systems, and artificial neural networks, credit risk transfer and financial derivatives (e.g., credit default swaps CDSs). This chapter will introduce these models and highlight their limitations in the context of RCBs to justify the necessity of this current study.

3.2 Concepts of Credit Risk and Credit Risk Management

3.2.1 Credit and Credit Risk

Credit is derived directly from borrowing and loan. Credit and debt represent flip sides of the same coin. Credit is that which is provided, debt that which is owed (Finley, 2008, p.3). Credit risk is generally defined as the potential that an institution borrower or counterparty will fail to meet its obligations in accordance with agreed terms, according to the Basel Committee on Banking Supervision (1999). In other words, credit risk in the context of banks refers to a risk that a borrower will default on a loan obligation to the bank or that the issuer of a security hold by the bank will default on its obligation. Default means a total or partial loss of any amount lent to the borrower. Large losses generated by default of borrowers or issuers of securities can lead to the insolvency and possibly even to the bankruptcy of a bank or to the banking/financial crises.

Risks faced by financial institutions are generally classified into eight categories: credit risk, market risk, interest risk, liquidity risk, operational risk, legislative risk and reputation risk (Basel Committee, 1999). Steinwand (2000) categorises the major risks faced by microfinance institutions as follows:

Table 3.1 Major risks faced by microfinance institutions

Financial risks	Operational risks	Strategic risks
Credit risk	Transaction risk	Governance risk
Transaction risk	Human resources risk	Ineffective oversight &
Portfolio risk	Information & technology risk	poor governance structure
Liquidity risk	Fraud Risk	
Market risk	Legal& Compliance risk	Reputation risk
Interest rate risk		External business risks
Foreign exchange risk		Event risks
Investment portfolio risk		

Source: Steinwand (2000)

Among these risks, credit risk is the most special one as it depends predominately on customers and the most important one for financial institutions as discussed in later sections. The 2008 global financial crisis is the typical example of the consequences of banks' credit risk (Shehzad and Haan, 2013). The knowledge and usage of appropriate methods to monitor, measure, manage, control and mitigate credit risk are essential for every commercial bank and for the banking sector as a whole.

3.2.2 Main Sources of Credit Risk

Credit risk can be caused by a variety of reasons of both internal and external sources. The main sources of credit risk recognised in the literature (e.g., Nijskens and Wagner, 2011; Breuer, Jandacka, Rheinberger and Summer, 2010; Qian and Strahan, 2007; Saunders and Allen, 2002) include, for example, poor governance and management control, inappropriate laws, limited institutional capacity, inappropriate credit policies, volatile interest rates, low capital and liquidity levels, directed lending, massive licensing of banks, poor loan underwriting, reckless lending, poor credit assessment, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank. The literature has identified these reasons that could lead to potential credit risk. The extent of credit risk incurred varies across sectors and countries.

Credit risk is often considered as a consequence of systemic risk derived from the macro perspective. Systemic risk represents the larger financial problems caused by the inability of financial market participants to meet repayment obligations on extensions of credit (e.g., Fukuda, 2012; Giesecke and Kim, 2011; Nijskens and Wagner, 2011; Wagner and Marsh, 2006). The problem is systemic because the inability of one participant to pay may lead to an inability of other participants to meet credit obligations. This domino effect played out in the market during the mortgage crisis of 2009 (Giesecke and Kim, 2011; Nijskens and Wagner, 2011). The rash of foreclosures caused by a lack of payments on mortgage loans led to mortgage companies being unable to meet financial obligations. This spread throughout the market, causing a lockup in liquidity where banks refused to lend money for fear of insurmountable financial risk.

There are also internal factors that can cause credit risk of financial institutions. For example, one of the internal factors is the financial incentives provided to the employees of a bank. Those people have a strong tendency to opportunism and moral hazards by lending to poorly performing firms and individuals with questionable credit records. The World Development Report (2012) by the World Bank shows that, in the condition of uncertainty and information asymmetry, it is hard to design an incentive system for bank employees who are in charge of credit and lending. The previous research concerning the cause of credit risk mainly concentrates on the internal management system of banks. An assumption is usually made by researchers that these employees will be responsible for what they are working for and their action perfectly reflects the interests of banks. To minimize the impacts of these factors, it is necessary for the financial system to have well-capitalised banks, service to a wide range of customers, sharing of information about borrowers, stabilization of interest rates, reduction in non-performing loans, increased bank deposits and increased credit extended to borrowers. Loan defaults and nonperforming loans need to be reduced (Louzis, Vouldis and Metaxas, 2012; Sandstorm, 2009). Corporate governance needs to be strengthened.

3.2.3 The Importance of Credit Risk

The importance of credit risk is widely recognised. The literature has revealed that the most common cause that leads the banks to bankruptcy is credit risk (Zribi and Boujelbène, 2011; Alessandri and Drehmann, 2010; Calice, Ioannidis and Williams, 2010; Altman and Sanders, 1998). The most recent case was the sub-mortgage crisis took place in America in 2008. Credit risk is among the oldest and most important financial risks (Altman and Sanders 1998). The Basel Committee on Banking Supervision (2001) documents that for most banks, loans are the largest and most obvious source of credit risk; however, other sources of credit risk exist throughout the activities of a bank, including in the banking book and in the trading book, and both on and off the balance sheet. Indeed, over the years banks are also increasingly facing credit risk (or counterparty risk[21]) in various financial instruments other than

---

[21] Counterparty risk of the financial derivatives transaction is the risk that one party has a default before the expiration of the contract.

loans, including acceptances, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transactions.

Indeed, credit risk can lead to financial crisis. Financial institutions are subject to a number of risks such as credit risk, operational risk, and liquidity risk (Foot, 2002). These risks are related to each other and it is rather difficulty to isolate one from others in practice. Although credit risk has always been of primary concern to these institutions, its importance became paramount during the recent financial crisis. The financial crisis exposed the shortcomings of existing credit risk management systems, and several firms saw significant losses resulting from failure of their counterparties to deliver on contracts. As Demirgüç-Kunt and Detragiache (1998) argued, fast financial liberalizing worsens the risk and fragility of the whole financial system. They believe that financial crisis will take place when serious credit risk occurs. Credit risk is the consequence of inappropriate connections between different parties. Research conducted by Stiglitz and Weiss (1981) and Esstrella and Mishkin (1996) illustrates that the borrower could easily obtain more information of the project they have invested than the lenders do. This, therefore, raises negative selection and moral hazards in the credit market. Information asymmetry could leads to the credit risk. In the literature, it has been well-argued that serious competition in the market could also lead to commercial banks' credit risk.

3.3. Credit Risk Management

3.3.1 Credit Risk Management: Importance and Regulatory Requirement

The management of credit risk has become a key objective for all financial institutions across the world. The goal of credit risk management is to maximise a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters (Basel Committee on Banking Supervision, 1999). Risk is also one of the key capital performance indicators proposed in various regulatory regimes. For example, Basel Capital Accord II suggests that overall capital adequacy after 2005 should be measured as: regulatory total capital = credit risk capital requirement

+ market risk capital requirement + operational risk capital requirement. Banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits or transactions. Banks should also consider the relationships between credit risk and other risks. It has been widely recognised that the effective management of credit risk is a critical component of a comprehensive approach to risk management and essential to the long-term success of any financial institutions (Nijskens and Wagner, 2011; Cebenoyan and Strahan, 2004; Basel Committee, 1999; Credit Suisse, 1997).

Most major banking problems have been either explicitly or indirectly caused by weaknesses in credit risk management (Basel Committee on Banking Supervision, 1999). Therefore, managing credit risk is a major issue faced by all financial institutions and the new regulatory guidelines proposed by various regulatory bodies recommend a more systematic approach to credit risk management using both quantitative and qualitative methods. Chavez-Demoulin, Embrechts, and Neslehova (2006) note that due to the new regulatory guidelines known as Basel II for banking and Solvency II for insurance, the financial industry is looking for qualitative approaches to and quantitative models for operational risk including credit risk.

A number of studies have examined the impact and effectiveness of the New Basel Capital Accord (Basel II) on risk management in general and credit risk management in particular of financial institutions. For instance, Wahlström (2009) believes that the New Basel Capital Accord, Basel II, promotes standards for measurement of financial and operational risk in the banking industry. However, its approach to such risk measurement has been severely criticised in the literature, inevitably raising doubts concerning the effectiveness of Basel II. Using data from 25 semi-structured interviews with banking staff in four Swedish banks, Wahlström (2009) suggests that Basel II is well established in practice, but there are significant concerns that such measurement of risk may adversely affect banks' activities. Whilst Basel II is generally supported by banking staff who work directly with risk measurement, its usefulness is questioned by banking staff in operations. According to the author, this difference between these two groups may be explained in relation to variations in their respective frames of reference. Both groups are inclined to take account of

information that meshes well with their existing frames of reference and are thus more inclined to value changes that the Accord with their own viewpoints. Indeed, the capital adequacy framework Basel II aims to promote the adoption of stronger risk management practices by the banking industry. The implementation makes validation of credit risk models more important. Lenders therefore need a validation methodology to convince their supervisors that their credit scoring models are performing well. Medema, Koning and Lensink, (2009) propose and implement a simple validation methodology that can be used by banks to validate their credit risk modelling exercise in the context of a commercial bank in the Netherlands.

3.3.2 Credit Risk Management: Approaches

Over the past century, various approaches to measure and manage credit risk have been developed. Some of the popular approaches in which financial firms manage their credit risk include credit portfolio models, internal ratings, exposure limit, and stress testing. For example, stress testing is often used by financial institutions to manage their credit risks. Stress testing is done to overcome some of the drawbacks of risk models that are overly dependent on historical data, and to test the specific risk parameters which define the model. Based on the limited inputs, these models can sometimes cause an underestimation of risk. Stress testing typically allows testing based on a combination of different scenarios including shocks and conceived scenarios, and is often applied to firm-wide portfolios to capture the complete risk along different lines of business. Stress testing is now a regulatory requirement in certain countries since it helps ensure that companies maintain adequate capital levels.

Most financial institutions have their own internal credit models that they use for risk management. Credit portfolio models differentiate credit risk based on different parameters such as industry, geography, credit grade, etc. A numerical simulation is run to generate a large number of scenarios, simulating various states of the economy and the resulting impact of each on the credit portfolio value. With this analysis, portfolio managers can make decisions on what should be the ideal composition of the portfolio, based on their risk appetite and performance targets. Crouhy, Galai and Mark (2000) provide a comparative analysis of current credit risk models and they particularly review the current proposed industry sponsored Credit Value-at-Risk

methodologies. In the analysis, the authors made several comments on recent methods. Firstly, the credit migration approach, as proposed by JP Morgan with Credit Metrics, is based on the probability of moving from one credit quality to another, including default, within a given time horizon. Secondly, the option pricing, or structural approach, as initiated by KMV and which is based on the asset value model originally proposed by Merton (1974). In this model the default process is endogenous and relates to the capital structure of the firm. Default occurs when the value of the firm's assets falls below some critical levels. Third, the actuarial approach proposed by Credit Suisse Financial Products (CSFP) with CreditRisk+ only focuses on default. Defaults for individual bonds or loans are assumed to follow an exogenous Poisson process. Finally, McKinsey & Company (1997) propose CreditPortfolioView which is a discrete time multi-period model where default probabilities are conditional on the macro-variables like unemployment, the level of interest rates, the growth rate in the economy, which to a large extent drive the credit cycle in the economy.

The effective management of credit risk is a critical component of risk management and indispensable for the long-term success of any financial institution. The goal of credit risk management is to maximise the bank's risk-adjusted rate of return by maintaining credit risk exposure within the acceptable limits (Cui, 2008). In addition to measuring and controlling it, firms also need to try mitigating their credit risk. A variety of approaches can be adopted by a financial institution to mitigate its credit risk. They include, among others,

- Risk-based pricing: This is a tool which firms use to calculate the interest rates on loans given based on the probability of default, or the risk on the loan.
- Covenants: Firms incorporate very strict covenants in their deal contracts. Such covenants generally require the debtor to meet certain conditions such as maintaining a required capital level, or prohibit him from carrying out certain actions.
- Credit insurance: Credit insurance covers any losses that may result from unpaid receivables. It also covers bankruptcies as well as late payments.
- Credit derivatives: These derivative instruments provide protection against the credit risk of the underlying asset of the derivative.

- Collaterals: The counterparty bearing the credit risk in a deal asks the opposite counterparty for collateral, which the party at risk holds till the deal is completed

- Engaging in credit guarantee scheme (CGS): Credit risk mitigation can either take the form of funded or unfunded protection. Guarantees are one form of unfunded credit risk mitigation. Because the protection is unfunded it relies exclusively on the creditworthiness of the guarantor. Consequently, the most creditworthy guarantees are likely to be those provided by government. Hway-Boon, Muzafar, Alias and Azali. (2003) carry out a research about credit guarantee agency in developing countries and find that banks are reluctant to lend to SMEs due to the high credit risk involved. Their study evaluates the efficiency of a CGS, which provides help to SMEs to secure loans from financial institutions, for example, in Malaysia via non-parametric analysis. They conclude that CGS is found to be operating at a relatively low level of overall technical efficiency which is constituted slightly more by pure technical inefficiency than scale inefficiency. This result is corresponding to the studies conducted by other researchers taking place in both Taiwan and Japan (Uesugi, Sakai and Yamashiro, 2006). In other countries various mechanisms have been adopted by financial institutions to assist SMEs financing and manage credit risks. For instance, the financial institutions in Japan have adopted a lending method based on the partnership model that promises security and reduces the risk of blocking of funds (Fukuda, 2012). Korea has one of the largest credit guarantee companies in the world (Beck, Demirguc-Kunt and Martinez-Peria, 2011) with nine other provincial guarantee corporations with a central re-guarantee organisation. Malaysia has a unique institution that combines the roles of a credit institution, a venture capital company, a credit rating agency and a guarantee company (Beck et al., 2011).

3.4. Credit Evaluation and Assessment

3.4.1 Overview of the Literature on Credit Evaluation and Assessment

In the next section, the current research in developing credit risk analysis models will be highlighted with a view to justifying the proposed framework of combing qualitative and quantitative, financial and non-financial variables in our proposed

credit risk management framework. As many factors can be related to business failures and credit risks, in practice it would be essential to identify major factors and RCBs should focus on these key factors. The approach recommended to identify these major factors is principal components analysis (PCA).

Previous sections have provided a general review of the literature and credit risk management models used in large financial institutions. As noted in the introduction chapter, the credit risk management models used by large financial institutions are difficult to apply to small financial institutions (such as RCBs), particularly these institutions from the emerging economies. The obvious reasons include the unavailability of information and data, and a lack of expertise in applying these models and technologies. RCBs in many developing economies are facing the difficulty to recruit experienced risk management personnel and have resources to train their existing staff to understand and operate these models.

Indeed, building credit risk models as the basis for evaluating default exposures remains a fundamental issue, although the literature on default prediction methodologies is substantial. Over the last few decades many authors have examined several possible models to predict client default or business failure. The seminal works in this field include Beaver (1967) and Altman (1968), who developed univariate and multivariate models to predict business failures using a set of financial ratios. Beaver (1967) used a dichotomous classification test to determine the error rates that a potential creditor would experience if it classified firms on the basis of individual financial ratios as failed or non-failed. He used a matched sample consisting of 158 firms (79 failed and 79 non-failed) and analysed 14 financial ratios. Altman (1968) used a multiple discriminant analysis (MDA) technique to solve the ambiguity problem linked to Beaver's univariate analysis and to assess a more complete financial profile of firms. Altman examined 22 potentially helpful financial ratios and selects five that provide, when combined, the best overall prediction of corporate bankruptcy. The variables were classified into five standard ratio categories: liquidity, profitability, leverage, solvency, and activity ratios.

Theoretical research continues to shed wisdom on the qualitative nature of credit spreads and their dependencies on essential features of the defaultable contract such as credit rating of the participating parties and firm-specific/systematic default characteristics. While theoretical advances have been made in interpreting credit risk and in parameterising the price of credit-sensitive securities, there is a relative paucity of empirical studies that investigate the relevance of leverage, distance-to-default, and other systematic/firm-specific factors in the surprise stopping time default approach. Which characteristics capture variations in default risk? Which credit risk model is suitable for marking-to-market defaultable securities? Which model performs the best in hedging dynamic credit exposures? Are single-name valuation errors correlated, and, if so, what is the possible source of this co-variation? For many years, MDA was the prevalent statistical technique applied to the default prediction models. It was widely used in the literature (e.g., Deakin, 1972; Edmister, 1972; Blum, 1974; Eisenbeis, 1977; Taffler and Tisshaw, 1977; Altman, Haldeman and Narayanan, 1977, 1995; Gombola, Haskins, Ketz and Williams, 1987; Lussier and Corman, 1995). However, in most of these studies, authors pointed out two basic assumptions of MDA are often violated when applied to the default prediction problems. MDA is based on two restrictive assumptions: that the independent variables included in the model are multivariate normally distributed; and that the group dispersion matrices (or variance–covariance matrices) are equal across the failing and the non-failing group (Karels and Prakash, 1987; McLeay and Omar, 2000). Moreover, in MDA models the standardized coefficients cannot be interpreted like the slopes of a regression equation and hence do not indicate the relative importance of the different variables.

Considering these problems with MDA, Ohlson (1980) applied for the first time the conditional logit model to the default prediction study. The practical benefits of the logit methodology are that it does not require the restrictive assumptions of MDA and that it allows working with disproportional samples. From a statistical point of view, logit regression seems to fit well with the characteristics of the default prediction problem, where the dependant variable is binary (default/non-default) and where the groups are discrete, non-overlapping and identifiable. The logit model yields a score between 0 and 1, which conveniently gives the client's probability of default. Lastly, the estimated coefficients can be interpreted separately as the importance or

significance of each of the independent variables in the explanation of the estimated probability of default. After Ohlson (1980), most of the academic literature (e.g., Gentry, Newbold and Whitford, 1985; Keasey and Watson, 1987; Aziz, Emanuel and Lawson, 1988; Platt and Platt, 1990; Joos, Bourdeaudhuij and Ooghe, 1995; Mossman, Bell, Swartz and Turtle, 1998) used logit models to predict business default. Despite the theoretical differences between MDA and logit analysis, empirical results of some studies (e.g., Lennox, 1999; Lo, 1986) show that are quite similar in terms of classification accuracy. Altman and Sabato (2007) estimate a model for US SMEs using five financial ratios reflecting dimensions of company profitability, leverage, liquidity, coverage and activity. The final specification, estimated using logistic regression, is reported in Table 3.2 below. In the table, the first column shows the financial index that was taken into account. The regression coefficient is presented in the second column (EBITDA stands for earnings before tax, interest and depreciation).

Table 3.2 Altman and Sabato's (2007) variables and coefficients

Variable	*Coefficient*
Cash/total assets	0.02
EBITDA/total assets	0.18
EBITDA/interest paid	0.19
Retained earnings/total assets	0.08
Short-term debt/equity	-0.01
Constant	4.28

Source: Altman and Sabato (2007)

Empirical investigations of credit risk models attempting to analytically capture patterns of structural dependencies on theoretically interpretable grounds have become even more desirable in light of Basle Committee recommendations on managing default risk. In recognition of the paucity of data available for many non-listed firms, Westgaard, Hol and Wijst (2007) analyse the incremental benefit of employing macroeconomic data to predict bankruptcy on a sample of Norwegian unlisted firms. Other studies focus on specifying alternative outcome definitions. For instance, Peel and Wilson (1989) use a multi-logit approach to modelling financial

distress in preference to the usual binary outcome, and identify "distressed acquisitions" as an important outcome from bankruptcy situations. Fantazzini, Figini and Giudici (2008) propose a non-parametric approach based on a random survival forest and compare its performance with a standard logit model. The literature has also highlighted the benefits of including variables such as age and type of business, industrial sector, etc., in combination with financial ratios (Grunert, Jorden and Weber, 2004).

To measure credit risk is the key to manage credit risks. The credit rating assessment forms an important part of credit risk assessment, involving risk parameters such as financial, business, industry and management areas (Jade et al. 2003). Over the past few years, the credit risk evaluation of micro-, small- and medium-scaled enterprises by banks and financial institutions has been an active area of research under the pressure of both regulators and shareholders. The following subsections provide an introduction of the main assessment methods proposed in the literature.

3.4.2 Credit Rating

Credit ratings provide an estimate of the creditworthiness of a borrower, and are generally a reflection on a borrower's ability to repay loans and interests. In addition to the standard ratings provided by credit-rating agencies, banks often also make use of internal ratings that they calculate themselves. Each bank might have its own unique methodology for calculating internal ratings (Bank for International Settlements, 2000). A bank could have internal ratings for various borrowers and complex products which may not have an external rating. Internal credit risk rating systems are becoming an increasingly important element of large commercial banks' measurement and management of credit risk of both individual exposures and portfolios. Treacy and Carey (2000) explain the internal rating systems presently in use at the 50 largest US banking organisations. The authors use the diversity of current practice to illuminate the relationships between uses of ratings, different options for rating system design, and the effectiveness of internal rating systems and show that growing stresses on rating systems make an understanding of such relationships important for both banks and regulators.

One of the oldest rating systems for loans was developed by the U.S. Office of the Comptroller of the Currency (OCC). The rating systems can be operated both internally by the banks and externally by independent rating agencies and authorities. Insurance companies' internal ratings, as examined by Carey (2001) for private placements, are highly consistent with the external regulatory ratings. They agree in 76.1 per cent of the cases and vary by one grade or less in 95.7 per cent of the cases. Moreover, internal ratings of debt (bonds) are highly consistent across insurance companies. There is complete agreement in 64.2 per cent of the cases and variation by one grade or less in 90.5 per cent of the cases. However, Carey (2001) finds less consistency across insurance company internal ratings of below-investment-grade debt; that is when one insurance company rates an obligation as BB or lower, other insurance companies holding the loan assign the same rating in only 37 per cent of the cases. This inconsistency is potentially damaging to the case for internal rating models at banks because, whereas only 13 per cent of the private placements at insurance companies were below investment grade by the end of 1997 (Treacy and Carey, 2000). It is estimated that approximately 60 per cent of U.S. bank holding companies have developed internal rating systems for loans on a 1 to 9 or 1 to 10 scale, including the top 50 financial institutions in the United States (Treacy and Carey, 2000). The BIS' (2000) survey of 30 financial institutions across the G-10 countries discovers that internal ratings were used for 96 per cent of all large and medium market loans, but for only 71 per cent of small corporate loans, and 54 per cent of retail customers' obligations.

3.4.3 Credit Scoring

Credit scoring systems can be found in virtually all kinds of credit analysis, ranging from individual consumer credit to giant company commercial loans. The idea across different categories is literally the same: Pre-define certain key factors that determine probability of default (or repayment), and combine or weight them into a quantitative score. Some score can be interpreted as a probability of default, and others can be used as a classification system.

Beaver (1967) first utilised several financial ratios to investigate corporate default. The cut-off point of default companies and non-default companies was derived out of

the historic sample. Then the financial ratios were calculated to compare with the cut-off point in order to differentiate the corporate bankruptcy. Based on previous study, Altman (1968) constructed the classical Z-score model to predict the possibility that a firm would go bankruptcy. In this study, 22 variables were taken from the financial reports of a matched sample of 66 companies, divided into two groups, 33 each. The 22 variables were categorised into five explanatory indices by multiple discriminant analysis. The model assumed that the sample data were normally distributed and the covariance remained the same. The best fitting scoring model for commercial loans was a linear combination of five usual business ratios, weighted by estimated coefficients and took the form as below:

$$Z = 1 \cdot 2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \tag{1}$$

where:

X_1 = Working capital/total assets ratio. It measures liquid assets in relation to the size of the company;

X_2 = Retained earnings/total assets ratio. It measures profitability that reflects the company's age and earning power;

X_3 = Earnings before interest and taxes/total assets ratio. It measures operating efficiency apart from tax and leveraging factors;

X_4 = Market value of equity/book value of total liabilities ratio. It adds market dimension that can show up security price fluctuation as a possible red flag;

X_5 = Sales/total assets ratio. It is a standard measure for sales turnover.

The score was calculated based on the formula above. A critical point was applied to determine the risk level of corporate loan in a certain period of time. The higher the score was, the "healthier" the company was. The option of the best critical might change due to economic conditions. When the economy is expected to go down, the critical point would be raised to compensate. This will reduce the model's Type 1 Error (lending to customers with bad credit), but lead to the increases of Type 2 Error (customers with good credit will be denied).

The above model has been amended and expanded over time and the ZETA model was developed later on[22] (Altman et al., 1977). The major evolution of ZETA model from Z-score is that five variables are extended into seven. There are at least five solid reasons why ZETA model can improve and extend upon those statistical methods, as described by Altman (2000):

(1) The change in the size, and perhaps the financial profile, of business failures. The average size of bankrupt firms had increased dramatically with the consequent greater visibility and concern from financial institutions, regulatory agencies and the public at large. Most of the past studies used relatively small firms in their samples with the exception of Altman's (1973) railroad study and the commercial bank studies. Any new model should be as relevant as possible to the population to which it will eventually be applied. Altman's study utilises a bankrupt firm sample where the average asset size over two annual reporting periods prior to failure was approximately $100 million. No firm had less than $20 million in assets.

(2) A new model should be introduced in line with the current data nature.

(3) Past failure models concentrated either on the broad classification of manufacturers or on specific industries. The author feels that with the appropriate analytical adjustments, retailing companies, a particularly vulnerable group, could be analysed on an equal basis with manufacturers.

(4) An important feature of the ZETA model is that the data and footnotes to financial statements have been scrupulously analysed to include the most recent changes in

---

[22] A mathematical formula developed in the 1960s by NYU Professor Edward Altman that attempts to express the chances of a public company going bankrupt within a two-year time period. The number produced by the model is referred to as the company's Z-score, which is a reasonably accurate predictor of future bankruptcy. The model is specified as:

Z = 1.2A + 1.4B + 3.3C +0.6D + 1.0E

Where:

Z = Score;

A = Working Capital/Total Assets;

B = Retained Earnings/Total Assets;

C = Earnings Before Interest & Tax/Total Assets;

D = Market Value of Equity/Total Liabilities;

E = Sales/Total Assets.

Source: http://www.investopedia.com/terms/z/zeta_model.asp#ixzz1yyCwIfig

financial reporting standards and accepted accounting practices. Indeed, in at least one instance, a change which was scheduled to be implemented in a very short time was applied. The purpose of these modifications was to make the model not only relevant to past failures, but to the data that will appear in the future.

The accuracy of two models were compared by Caouette, Altman and Narayanan (1998) with the conclusion that the ZETA model presents more precise result than its ancestor because of improvement of the variables chosen and better stability of new variables. The explanatory variables are raised to seven (Altman, 2000). Table 3.3 shows the test result of each model.

Table 3.3 The test results of credit score models by Caouette et al. (1998)

Prediction before bankruptcy	ZETA		Z-score		Use Z-score to test sample constructing Zeta		Use Zeta to test sample constructing Z-score	
Years	Bankruptcy (%)	Non (%)	Bankruptcy (%)	Non (%)	Bankruptcy (%)	Non (%)	Bankruptcy (%)	Non (%)
1	96.2	89.7	93.9	97.0	86.8	82.4	92.5	84.5
2	84.9	93.1	71.9	93.9	83.0	89.3	83.0	86.2
3	74.5	91.4	48.3	NA	70.6	91.4	72.7	89.7
4	68.1	89.5	28.6	Na	61.7	86.0	67.5	87.0
5	69.8	82.1	36.0	Na	55.8	86.2	59.2	82.7

Source: Caouette, Altman, Narayanan (1998, pp128).

The Z-score model is widely adopted in the literature because it is straightforward to operate and simple to accommodate into different economic environments. When fitted in the 1970s, the Z-score model did quite a decent job of predicting default even two or three years prior to bankruptcy in Brazil (Altman, Baidya and Dias, 1979). Pille and Paradi (2002) take the Z-score model in predicting the failure of Credit Unions in Ontario, Canada. Altman (2005) revises the Z-score model for emerging market corporate bonds rating in Mexico. Unlike the original model, the adjusted new approach can be used in non-manufacturing companies.

However, there are certain defects of Z-score model. First, the model assumes that the explanatory factors are linear while in the real business world, an amount of firm defaults is not following the same path. Second, both Z-score and Zeta models rely on

accounting data taken from financial reports. In most countries, accounting ratios are recorded at discrete intervals and based on book value principles and both models cannot calculate off-balance sheet credit risk. There was evidence that the model performed less satisfactory (Sanvicente and Bader, 1998). Mester (1997) reports that 56 per cent of the 33 banks that used credit scoring as a way of approving credit card applications failed to predict loan quality problems. However, nonlinear analysis especially the adoption of neural networks, has, to some extent, boosted the effects of Z-Model (Coats and Fant, 1993). There are other credit scoring models like the O score model by Ohlson (1980) and the Zmijewski (1984) model.[23]

3.4.4 Expert Systems

An expert system for credits is a computer programme that contains the knowledge and analytical skills of human experts, related to credit assessment. For example, loan departments of a bank are interested in expert systems for loans because of the growing cost of labour which makes the handling and acceptance of relatively small loans less profitable. They also see in the application of expert systems a possibility for standardised and efficient handling of loans. In an expert system, the credit decision is based on the lending officer or relationship manager's personal expertise, subjective judgment, and weighing of key factors. One of the most common expert systems is the five "Cs" of credit - character, capital, capacity, collateral, cycle (Caouette et al., 1998). In addition to the five "Cs," an expert might consider the level of interest rates. Elmer and Borowski (1988) compare the bankruptcy predictions of an expert system to several credit scoring models and find out that the expert system predicted over 60 per cent of the failures 7 to 18 months before bankruptcy, while the credit scoring models predicted only 48 per cent and 33 per cent. Similarly, Messier and Hansen (1988) show that the expert system outperformed credit scoring models.

3.4.5 Artificial Neural Networks

An Artificial Neural Network (ANN), usually called neural network, is a mathematical model or computational model that is inspired by the structure and/or

---

[23] Detailed reviews of the traditional approach to credit scoring systems can be found in Caouette et al. (1998) and Saunders and Allen (2002). The worldwide application of credit-scoring models can be found in Altman and Narayannan (1997).

functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Modern neural networks are non-linear statistical data modelling tools. They are usually used to model complex relationships between inputs and outputs or to find patterns in data. ANNs have been used in credit risk assessment.

Cho et al. (2009) and Kim and Scott (1991) use a supervised artificial neural network to predict bankruptcy. In Kim and Scott's study of a sample of 190 Compustat firms the system performs well (87 per cent prediction rate) during the year of bankruptcy, but its accuracy declines remarkably over time, showing only a 75 per cent, 59 per cent, and 47 per cent prediction accuracy one year, two years and three years prior to bankruptcy respectively. Altman et al. (1994) examine 1,000 Italian industrial firms from 1982 to 1992 and find that neural networks have about the same level of accuracy as the credit scoring models. Podding (1994), investigating data from 300 French firms collected over three years, claims that neural networks outperform credit scoring models in bankruptcy prediction. The author, however, finds that not all artificial neural systems are equal, realizing that the multilayer perception (or back propagation) network is best suited for bankruptcy prediction.

Khashman (2010) describes a credit risk evaluation system that uses supervised neural network models based on the back propagation learning algorithm. The author implements three neural networks to decide whether to approve or to reject a credit application. In Khashman's study, the neural networks are trained using real world credit application cases from the German credit approval datasets which has 1000 cases; each case with 24 numerical attributes. Based on which application is accepted or rejected, nine learning schemes with different training-to-validation data ratios have been investigated, and a comparison between their implementation results has been provided. Experimental results suggest which neural network model, and under which learning scheme, can the proposed credit risk evaluation system deliver optimum performance; where it may be used efficiently, and quickly in automatic

processing of credit applications. Several other studies have also provided useful insights on the applications of neural network analysis in credit risk evaluation (e.g., Shin and Kilic, 2006; Yang, Platt and Platt, 1990; Altman, 1994; Podding, 1994; Coats and Fant, 1993; Kim and Scott, 1991)

3.4.6 Loan as Options - the KMV and Moody's Models

The idea of applying option pricing theory to the valuation of loans and bonds has been in the literature since the publication of Merton's work in 1974. The idea has been expanded in many directions. One example is the generation of credit risk prediction models by KMV and Moody's. KMV model that was developed by KMV Corporation in US to estimate the probability of default method of borrowers is based on the idea that the credit risk of loan is given by the market value of the assets of the debtor determined. Firstly, it uses Black-Scholes option pricing formula, according to the market value of assets, asset value volatility, maturity, risk-free borrowing rate and the estimated book value of liabilities of the enterprise's equity market value and volatility. Secondly, according to the company's liabilities to calculate the company's default implementation of the point (default exercise point, the following year for the enterprise value of short-term debt outstanding long-term debt plus the book value of the half), calculate the distance of the borrower's default. Finally, according to the company's default, expected default distance and the correspondence between the two to find the company's expected default frequency.

The advantage of the KMV model is that it changes the bank's lending problem around and treats the loan repayment incentive problem from the angle of the borrowing company's equity holders. However, there are several issues with the KMV model. For example, Jarrow (1999) tests a Merton-type model using bond quotes for one bank over the period of January 1986 to August 1993, and finds considerable instability in implied default probabilities. This may, to some extent, be due to the adoption of bond quotes rather than transaction prices. A further potential problem with KMV-type models is the implication for the probability of credit spreads as the time to default or the maturity of debt shrinks (Leland, 1994).

3.4.7 Credit Metrics

Credit Metrics™ is a framework for quantifying credit risk in portfolios of traditional credit products (e.g., loans, commitments to lend, financial letters of credit), fixed income instruments, and market-driven instruments subject to counterparty default (swaps, forwards, etc.). Credit Metrics is based on the risk measurement methodology developed by J.P. Morgan for the measurement, management, and control of credit risk in its trading, arbitrage, and investment account activities. It is the first readily available portfolio model for evaluating credit risk. The Credit Metrics approach enables a company to consolidate credit risk across its entire organisation, and provides a statement of value-at-risk (VaR) due to credit caused by upgrade, downgrades and defaults (Embrechts, Hoing and Juri, 2003; J.P. Morgan, 1997).

Credit Metrics and KMV models are the most popular international financial credit risk management models. Both are for banks and other financial institutions conducting credit business loans and other objects to measure credit risk faced, in order to prevent concentration of credit, and thus to achieve investment diversification and specific quantitative credit decision-making. They have more scientific basis comparing with the subjective and artistic characteristics of the traditional credit analysis. However, the two models are largely based on the same basic ideas in modelling but have considerable differences in the following areas. First, KMV credit risk model measures business expected default frequency (EDF) mainly from changes in stock market prices of the enterprises in the data analysis, and Credit Metrics model for the measurement of corporate credit risk from changes in the corporate credit rating and its probability using historical data analysis. This is one of the most fundamental differences between the two.

Second, the KMV model uses the price of the stock market analysis company, which makes the model at any time according to the company's stock market price changes to update the model input data, obtained in a timely manner reflecting market expectations and business conditions change. Therefore, the KVM model is considered a dynamic model that can quickly reflect changes in the level of credit risk. However, Credit Metrics uses a corporate credit rating index analysis. Corporate credit rating, whether internal or external ratings are not the same as the price of the

stock market that is dynamic, but for a long period of time to maintain the static characteristics. This may make the model results cannot be timely to reflect changes in corporate credit conditions.

Third, the KMV model is more accurate because it provides indicators of stock market prices from the analysis of real-time quotes. Real-time quotes from stock markets not only reflect the history of the enterprises and the current state of development, more importantly, they reflect the market and investors' expectations about the future development of the integrated enterprise. Therefore, the model is considered to be a forward-looking (forward-looking) method. In contrast, the Credit Metrics model which assesses credit considering backward-looking historical data changes is a backwards-looking model. KMV models with a focus on forward-looking analysis to some extent overcome the reliance on historical data backward-looking model of mathematical statistics used in the literature.

Fourth, the Credit Metrics model uses a portfolio method of analysis, focusing on a direct analysis of inter-firm correlation between changes in credit conditions, and thus it is more in line with modern portfolio management theory. The KMV credit measurement model is based on a single enterprise in the stock market, focusing on an analysis of the business itself, reflected in the stock price change information in their credit status. It is generally lacking of sufficient correlation analysis among the firm and the market.

3.4.8 Portfolio Theory Applied to Credit Analysis
Applying modern portfolio theory to non-traded bonds and loans has been very commonly adopted by most mutual funds and pension fund managers. It has also been applied with some success to publicly traded junk bonds when their returns have tended to be more equity like than bond like and when historical returns are available. With respect to most loans and bonds, however, there are problems with normal returns, unobservable turns and unobservable correlations. First, in non-normal returns, loans and bonds tend to have relatively fixed upside returns and long tailed downside risks. Therefore, returns on these assets tend to exhibit a strong negative skew and kurtosis. Modern portfolio theory is built around a model in which only two

attributes (i.e., the mean and variance) are required to describe the whole distribution of returns. Secondly, a further problem relates to the fact that most loans and corporate bonds are not traded or are traded over the counter at very uneven intervals with little historical price or volume data. This makes it difficult to compute mean returns and the variance of returns using historic time series. Finally, about unobservable correlations, if price and return data are unavailable, calculating the covariance or correlation among asset returns also becomes difficult. In general, modern portfolio theory is a very useful framework for a loan portfolio manager considering risk return trade-offs. Unfortunately, there are a number of problems in applying modern portfolio theory to loans. In particular, the non-normality of loan returns and the un-observable nature of market based loan returns as a result of the fact that most loans are non-traded.

3.4.9 Comparisons of Models

Over the past decades, the literature has proposed various models for financial institutions to manage their credit risks. Saunders and Allen (2002) summarise them as shown in Table 3.4. Each model has its own advantages and problems. Certainly, differing applying conditions require when a particular model is chosen. Overall, these models were developed based on the circumstances of larger financial institutions. As a result, they have practical limitations when applying to the smaller financial firms, including RCBs.

Table 3.4 A comparison of credit risk management models

Models	Merits	Flaws
Z-score model, ZETA model	• The model is designed to category loan risks by discretion technology from statistics. • Operational advantage and adaptability, • One of the solutions to analyse enterprise default or bankruptcy	• The result predicted by financial reports is lack of timeliness and reliability due to information asymmetry • A more sophisticated recognition of default and default risk is needed in this model. • The assumption of existence of linear relationship in explanatory variable does not interpret the fact

Credit Metrics Model	• The introduction of VAR (Value at Risk) quantifies credit risk • Credit risk is classified by expectation of market value and standard deviation • Marginal risk, which provides evidence for the management and decision of investment portfolio, is involved. A quantitative verification is shown which facilitates commercial banks to avoid credit risk	• The assumption of irrelevant between default rate and macro-economical status is not corresponded to the real economical facts. • The model is failed to detect alteration in credit quality of debtors timely. • Complexity of calculation
Credit Risk+ Model	• The calculation process is simplified and speeded by Poisson Process • The model concentrates on default risk，which means variables from each portfolio are not necessary, apart from default rate and risk position • The closely solution of loss ratio calculated from loan portfolio is attractive	• The model focuses on loss ratio rather than the fluctuation of loan price, which makes it a default ratio model rather than a mark-to-market model • The swinging of credit risk grade is neglected • Market risk is not taken into account. It does not manage non-linear financial product. • The model ignores risk transition while none of the risks is solid with one particular client in the real existence
KMV Model	• The model is designed upon modern corporate finance and option pricing theory • Sufficient information from capital market is employed to analyse and forecast credit risk of entirely listed companies. • Information from the capital market provides the effectiveness, timeliness, and accuracy of predicting current credit status of companies	• Companies' assets price, expectation and deviation of ROC will not be captured. These figures are reflected on inaccurate and estimated basis • The types of long term liabilities are not distinguished • The model is limited to the boundary of listed companies in stock market
Credit portfolio View Model	• General conceptions which affect default rate and credit rating transition are involved into the system • The perception of VAR is adopted • The model is based on a multi-factor and multi-period discrete time series • econometrics and Monte Carlo simulation are utilized and current macro-economic environment is taken into account	• The model relies on credible data and default stats in every industry in a country, which is difficult to catch • Adjusted credit rating transition matrix is applied to the model. The adjustment is on the basis of experience and subjectivity of loan departments in financial intermediaries.

Source: Saunders, A. and Allen, L., (2002)

In general, default models differ from credit scoring models in two ways: Credit scoring is usually applied to smaller credits—individuals or small businesses. Small financial institutions prefer the use of credit scoring in their credit analysis. Default models are applied more to larger credits—corporation or sovereigns. Credit scoring models are largely statistical, regressing instances of default against various risk indicators, such as an obligor's income, home renter/owner status, etc. Default models directly model the default process, and are typically calibrated to market variables, such as the obligor's stock price or the credit spread on its bonds. Credit Metrics is a mark-to-market model. Credit risk plus and KMV are essentially default mode models. Credit portfolio view can be used as either a mark to market or default mode model.

Most of the methods of credit risk measurement focus on estimating the probability of default, rather than on the magnitude of potential losses in the event of default. These models typically specify "failure" to be bankruptcy filing, default, or liquidation, thereby ignoring consideration of the downgrades and upgrades in credit quality that are measured in mark to market models. Models which calculate VaR based on change in the market value of loans are mark to market models which are distinguish between models that concentrate on predicting default losses as the default mode models. The mark-to-market models allow for credit upgrades and downgrades as well as defaults in calculating loan value losses and gains and hence capital reserves. The default mode models consider only default and no-default as two states of the world. The key difference between the mark-to-market and default mode approaches is the inclusion of credit migration risk in mark-to-market models. This is often referred to as spread risk. However, spread risk also includes the risk of changes in credit spreads for any given rating classification. Therefore, changes in valuation may result from three aspects: default, changes in credit quality, and changes in credit spreads that are not caused opponents of valuation changes. In contrast, default market models measure changes in valuations resulting from default only. Not surprisingly, if models measure different things, they are likely to produce different results.

In credit portfolio view, the risk drivers are macroeconomic factors such as the unemployment rate, inflation, interest rate changes (Louzis et al., 2012); and in credit risk plus model, it is the credit spreads obtained from risky debt yields. Yet, if couched in terms multifactor models, all these models can be viewed as having similar roots. Specially, the variability of a firm's asset returns in Credit Metrics is modelled as being directly linked to the variability in a firm's stock returns. To the extent that multifactor asset pricing models drive all risky security prices, the credit spreads of reduced form models are driven by the same risk factors. In return, in calculating correlations among firms' asset return, the equities of individual firms are viewed as being driven by a set of systematic risk factor and unsystematic risk factors. The systematic risk factors, along with correlations among systematic risk factors, drive the asset returns of individual firms and the default correlations among firms.

The risk drivers in credit portfolio view have origins similar to those of Credit Metrics. In particular, systematic countrywide macroeconomic factors (Louzis et al., 2012), such as inflation, GDP, governmental borrowing, and unsystematic macroeconomic shocks (e.g., natural disaster) drive the default risk and the correlations of default risk among borrowers. The key risk driver in credit risk is the variable mean default rate in the economy. This mean default rate can be viewed as being linked systematically to the "state of the macro economy"; when the macro economy deteriorates, the mean default rate is likely to rise, and default losses. An improvement in economic conditions has the opposite effect. Thus the risk drivers and correlations in all these models can be viewed as being linked to some degree, to a set of macroeconomic and systematic risk factors that describe the evolution of economy wide conditions.

In volatility of credit events, the key difference among the models is in the modelling of the one year default probability or the probability of default distribution function. In Credit Metrics, the probability of default frequencies vary as new information is impounded in stock prices. Changes in stock prices and the volatility of stock prices underlie empirical expected default frequencies scores. In credit portfolio view, the probability of default is a logistic function of a set of macroeconomic factors and shocks that are normally distributed; thus, as the macroeconomic evolves so will the

probability of default and the cells, or probabilities, in the rest of the transition matrix. In correlation of credit events, the similarity of the determinants of credit risk correlations has already been discussed in the context of risk drivers.

Empirical evidence suggests that default severities and recoveries are quite volatile over time (Altman et al, 1977; Crouhy et al., 2000; Jacobs 2012). Further, building in a volatile recovery rate is likely to increase the VaR or unexpected loss rate. Credit Metrics, in the context of its VaR calculation allows for recoveries to be variable. In the normal distribution version of the model, the estimated standard deviation of recoveries is built in to the VaR calculation (Rosen and Saunders, 2012). In the actual distribution version which recognises a skew in the tail of the loan value loss distribution function recoveries are assumed to follow distribution, and the VaR of loans is calculated via a Monte Carlo simulation. In KMV's simplest model, recoveries are viewed as a constant. In an extended version of the model, recoveries are allowed to follow a beta distribution as well. In a credit portfolio view, recoveries are also estimated via a Monte Carlo simulation approach and severities are drawn from a beta distribution (Giesecke and Kim, 2011). By contrast, under credit risk plus, loss severities are rounded and banded into sub portfolios, and the loss severity in any sub portfolio is viewed as a constant. In reduced form models, the recovery rate is estimated from debt and equity prices, and either follows a stochastic process or else is assumed to be constant.

In numerical approach to estimation of VaRs, or unexpected losses, models are also very different from each other. A VaR, at both the individual loan level and the portfolio of loans level, can be calculated analytically under Credit Metrics, but this approach becomes increasingly intractable as the number of loans in the portfolio increases. As a result, for large loan portfolios, Monte Carlo simulation techniques are used to generate an approximate aggregate distribution of portfolio loan values and hence a VaR (Saunders and Allen, 2002). Similarly, credit portfolio view uses repeated Monte Carlo simulations to generate macro shocks and the distribution of losses on a loan portfolio. By comparison, credit risk plus, based on its convenient distributional assumptions, allows an analytic of closed form solution to be generated for the probability density function of losses. KMV also allows an analytic solution to

the loss function as well as a Monte Carlo simulation solution. Moody's combines the analytic and econometric approaches. Finally, the reduced form models utilize a closed form, econometric approach to solve for the form of the intensity process.

In risk classification, loan portfolio will have particular difficulty in implementation. Because most of the obligations are untraded, which means there is no external risk classification of loans for the most part, whereas rating systems and credit spreads are available for risky debt securities. In all, after comparing these similarity and differences of those models, it can conclude that to construct a consensus model of credit risk measurement, the data inputs and fundamental model assumptions have to be consensus as well, which would be rather difficult, particularly in smaller financial institutions (e.g., RCBs). However, on the other hand, market risk models did not have to overcome these hurdles and therefore proceeded more rapidly in their theoretical and model development.

A recent study by Alessandri and Drehmann (2010) develops an economic capital model integrating credit and interest rate risk in the banking book. It argues that banks often measure credit and interest rate risk in the banking book separately and then add the risk measures to determine economic capital. Breuer et al. (2010) also note such problem in their study. They indicate that there is a tradition in the banking industry of dividing risk into market risk and credit risk. Both categories are treated independently in the calculation of risk capital. But many financial positions depend simultaneously on both market risk and credit risk factors. In this case, an approximation of the portfolio value function separating value changes into a pure market risk plus pure credit risk component can result not only in an overestimation, but also in an underestimation of risk. Both studies of Alessandri and Drehmann (2010) and Breuer et al. (2010) argue that this approach misses complex interactions between the two risk types. Alessandri and Drehmann (2010) develop a framework where these risks are analysed jointly. Since banking book positions are generally not marked to market, the proposed model by Alessandri and Drehmann is based on book value accounting. Their simulations show that interactions matter, and that ignoring them leads to risk overstatement. The magnitude of the errors depends on the structure of the balance sheet and on the re-pricing characteristics of assets and liabilities. The

75

criticism of the above models provides a justification for this current study. The proposed credit risk management framework explained in Chapter 5 has considered the integration of credit risk with other risks.

3.5 Credit Risk Transfer and Financial Derivatives

3.5.1 Credit Risk Transfer

In the last two decades credit risk transfer instruments became a vital way to transfer credit risk for large organisations and improve the diversification of risk in the financial markets. Commercial banks have adopted this approach as part of their overall credit risk management. The use of credit transfer activities such as credit derivatives and securitisation have increased. Firms found that financial risk management is desirable because it plays a key role in creating new markets, can improve the allocation of firm's resources, can reduce the effect of market downturns, and can enhance firm competition opportunities (Nijskens and Wagner, 2011; Horcher, 2005).

Credit derivatives are bilateral financial contracts with payoffs linked to a credit related event such as a default, credit downgrade or bankruptcy. A bank can use a credit derivative to transfer some or all of the credit risk of a loan to another party or to take additional risks. In principle, credit derivatives are tools that enable banks to manage their portfolio of credit risks more efficiently. The promise of these instruments has not escaped regulators and policymakers. In various speeches, Alan Greenspan concludes that credit derivatives and other complex financial instruments have contributed "to the development of a far more flexible, efficient, and hence resilient financial system than existed just a quarter-century ago" (Greenspan, 2004). He further states in the same speech that: "The new instruments of risk dispersion have enabled the largest and most sophisticated banks in their credit-granting role to divest themselves of much credit risk by passing it to institutions with far less leverage." Statistics from the Bank for International Settlements (BIS) show that the market for credit derivatives had grown dramatically prior to the financial crisis of 2009. The largest sector of the credit derivatives market is the credit default swap

market where the most liquid names on which credit derivatives are written are large US investment grade firms, foreign banks, and large multinational firms (Fitch Ratings, 2006).

Banks also can manage the credit risk of their loans by selling loans directly or through loan securitisation. Banks that securitize loans or sell loans are more likely to be net buyers of credit protection. Consequently, the various tools banks can use to reduce their credit risk appear to be complements rather than substitutes. Larger bank-holding companies are more likely to have exposures to larger investment grade US firms, foreign banks and foreign multinational firms and are more likely to be net buyers of credit protection than are small bank-holding companies. A bank choosing to manage credit risk exposures with credit derivatives must consider liquidity costs, transactions costs, and basis risk. Such an advantage for larger banks is not available for smaller banks.

Indeed, banks face more or less the same problems as industrial firms in terms of using/misusing credit risk transfer instrument. Minton et al. (2009) use the credit risk transfer instrument to investigate the use of credit derivatives by US bank holding companies. They find that the gross notional amount of credit derivatives held by banks exceeded the amount of loans on their books in 2005. Also, most of their derivatives positions were held for dealer activities rather than for hedging of loans and credit risks. As a result, the use of credit derivatives by banks to hedge loans and risk is limited because of adverse selection and moral hazard problems and because of the inability of banks to use hedge accounting when hedging with credit derivatives.

Credit risk transfer has existed for many years, but recent innovations have increased the amount that it occurs. However, the use of all types of credit risk transfer has increased virtually (Allen and Carletti, 2006). The growing literature in credit risk transfer generally and in credit default swap in particular argues about the role of the this instruments in serving as a channel for contagion in the last financial crisis. For example, Daglish (2009) uses a real option approach to examine a subprime borrower to default. He believes that the spread of the default was related to the increase in interest rates. He mentions that the contagion channels are to be found in the

structured product market, or through the trading of credit derivatives. Another study by Allen and Carletti (2006) shows that financial innovation in the form of new credit risk transfer instruments can lead to beneficial diversification in some circumstances but to a fall in welfare through the creation of contagion in others. This argument is developed in a context of banking and insurance sectors. They consider that the effect of credit risk transfer can be beneficial to banks in case of regular demand for idiosyncratic liquidity. But if the banks hedge liquidity risk, then credit risk transfer can lead to contagion between the two sectors. They claim that the need of liquidity is the most important factor for contagion between the two sectors. In contrast to Allen and Carletti's study, Wagner and Marsh (2006) provide a similar approach but a different result. They develop a model with banking and non-banking sectors and show that the transfer of risk out of the fragile banking sector to nonbank financial institutions leads to an increase in the stability of the financial sector.

However, after the last financial crisis many researchers have claimed that the credit transfer instruments such as credit derivatives, CDSs, collateralized debt obligations, and securitization are the heart of this crisis. Furthermore, Others go beyond by blaming those risk transfer instruments have worsen the effects of this crisis and increased the instability of our financial system.

3.5.2   Credit Default Swaps (CDSs)

One of the most recent credit transfer instruments is credit default swaps (CDSs). Researchers have shown a substantial increase in the use of CDSs by financial and nonfinancial institutions (Calice et al., 2010). However CDSs are considered as powerful force in the current world markets which can become a useful way to transfer credit default risk. This instrument was designed to provide liquidity and limit the risk of debt by transferring the credit exposure to other party. In other words CDSs are financial instruments that provide insurance against a credit event destroying value in an entity's debt. The buyer of the credit risk is paid a premium over a fixed time period to provide the insurance against credit risk event. If the credit event occurs, the insurer compensates the seller of credit risk for the loss in the debt's value (Berndt, Douglas, Duffie, Ferguson and Schranz, 2005).

The use of CDSs creates many choices for managers to improve liquidity, allocate risks, and provide new investment opportunities. In addition, CDSs are an efficient way to free up the firm's capital by shedding the risk from balance sheet (Hakenes and Schnabel, 2010). The CDSs market was without doubt one of the distinct new markets of the past decade (Das, Kalimipalli and Nayak, 2011). According to the International Swaps and Derivatives Association, the CDSs market had increased dramatically in the past two decades to over than 45 trillion dollars by 2007 prior to the financial crisis in 2008. At that time the value of U.S stock market was less than 23 trillion dollars. In other words it is twice the size of the stock market. In addition, it had exceeded the size of mortgage market and treasuries market (Berndt et al., 2005).

It is often argued that CDSs, the most common type of credit derivatives, played a conspicuous role in the last financial crisis (Minton, Stulz and Williamson, 2009). In the media, CDSs were considered as the worst Wall Street financial invention. Others called to stop trading in CDSs (Stulz, 2009) because derivatives are financial 'weapons of mass destruction', carrying dangers that, while now latent, are potentially lethal (Topham, 2010). Recently, CDSs became the hot financial issue in the financial market[24] and attracted a lot of attention. Several studies on the impact of new financial innovations in credit risk management and transfer indicate that CDSs can affect the stability of the global banking system. They support the argument that CDS markets are not effectively functioning as a mechanism to reduce credit risk, as a result, leads to destabilise the financial system (Calice et al., 2010). Others find the impact of trading CDSs on the firm is negative and lead to less liquid equity and less efficient stock prices (Boehmer, Huszar and Jordan, 2010). However, Stulz (2009) argues that CDSs did not cause credit crisis, since over the counter CDS market worked well during much of the first year of the credit crisis, and exchange trading has advantages and costs compared to over the counter trading. Therefore eliminating over the counter trading of credit default swaps could reduce social welfare. Some argue that CDSs provide tax benefits because there is no need to pay for the underlying security where credit derivatives are off balance sheet activity (Wignall and Atkinson, 2009). Wagner and Marsh (2006) believe that the motive for banks to

---

[24] http://www.thedailybeast.com/newsweek/2008/09/26/the-monster-that-ate-wall-street.html

use credit risk transfer is consistent with the regulatory objective of increasing stability and agree that such transfer will increase the banks stability if banks are more fragile than non-banks. This argument started before the last financial crisis. It really grabbed the attention of academics, economists and regulators. There are some incentives to use CDSs to hedge risk (Guettler and Adam, 2010) and improve the firm stability (Wagner and Marsh, 2006; Calice et al., 2010).

A recent study by Das et al. (2011) finds that the introduction of CDSs was negatively affected bond markets and lead to less efficient, greater pricing errors, and lower liquidity. Examining credit risk transfer and bank competition, Hakenes and Schnabel (2010) argue that higher competition increases welfare in the presence of credit risk transfer with public information. In contrast, welfare eventually decreases for high levels of competition in the presence of such transfer with private information due to the expansion of unprofitable loans. They emphasise the harmful effects of banking competition on financial stability in the presence of credit risk transfer. Wignall and Atkinson (2009) investigate the causes of the global financial crisis focusing on mortgage-backed securities and credit default swaps. They point out that many of the conditioning factors in the crisis do not explain the very sudden avalanche of activity in bank securitization and the use of CDSs from 2004.

After the collapse of some giant companies in the financial market such as Bear Stearns and Lehman Brothers, a number of studies attempted to find out the possible links between the crisis and CDSs. Calice et al. (2010) discuss the impact of credit derivatives in general and in particular CDSs in default of large and complex institutions. They explain the direct links between the global banking system and the CDS index market with the evolution of the two standardised CDS indices. They suggest that presence of a market for credit derivatives would tend to increase the spread of shocks. Moreover, they find a substantial detrimental volatility spill-over from the credit derivatives market to bank equity, undermining the stability of the banking system in both the USA and Europe. Ashcraft and Santos (2009) employ a range of methodologies for studying if the CDS market lower the cost of firm debt but they fail to find evidence that the onset of CDS trading lowers the cost of debt financing for the average borrower and the average borrower with a CDS has not

benefited from a reduction in the cost of bond or loan funding. Furthermore, they claim that firms appear to have been adversely affected by the CDS market.

Nijskens and Wagner (2011) find that the market considers banks using credit risk transfer to be substantially riskier. While banks individually look less risky, risk transfer banks unexpectedly pose more risk but the market seems to have been aware of the greater risk these banks are posing. Danielsson (2008) shows that as the financial system faces huge developments in the last decades, the need to estimate the firm systemic risk and the financial stability before making any investment decision becomes more significant. The author comments that the existing risk models, particularly after the last crunch, provide inconsistent results and the financial institutions that survived in the last crunch with are those with best management not those who relied on the models to do management's job.

To hedge credit risk has been considered as a motivation to use CDSs. For example, Ashcraft and Santos (2009) argue that CDSs are new and less expensive way to hedge or lay off risk exposures. The recent huge growth of CDS is due to the fact that CDS provides an essential tool for hedging credit risk in financial markets (Berndt, Jarrow, and Kang, 2007). However, other studies did not show such a motivation. For example, Guettler and Adam (2010) study the use of CDSs by the top 100 U.S. corporate bond funds and they find that managers use CDS to take on credit risk rather than to hedge credit risk. Aretz and Bartram (2010) use credit derivatives to discuss the relationship between hedging and shareholders' value. They believe that hedging can create shareholder value at the firm level in presence of capital market imperfection. They provide some evidence but they find maxed result. They suggest that this could be related to other factors not well motivated by existing risk management theory such as speculating and industry competition which could provide better result. However, their result is consistent with derivatives use being just one part of broader financial strategy. They believe that tax incentive to hedge is small compared to other positive rationales. They also argue that the growth opportunities imply strong motives for corporate hedging, but they are also associated with fewer free-cash-flow problems, which reduce the incentives to hedge. The complexities of these relations, various hedging tools and limited accounting disclosure make it

difficult to estimate firm financial policy and strategy. However, most studies focus only on derivatives use at the firm level and classified firm into hedge or non-hedge without allowing switch between the two choices over the time. The cases used in these studies are predominantly large financial institutions and multinational corporations. It is questionable whether CDSs and other credit risk transfer instruments can be effectively applied in the cases of small financial institutions such as RCBs. There is no evidence that Chinese RCBs have used CDSs and other instruments to manage their credit risk.

3.5.3 Risk Management Technology

In credit risk management, risk management technology (RMT) and information system are also important for the designing and applying of a credit risk evaluation and management system. Bansal, Kauffman, Mark, and Peters (1993) observe that methods for sound RMT are of increasing interest among Wall Street investment banking and brokerage firms in the aftermath of the October 1987 crash of the stock market. As the knowledge of advanced technology applications in risk management increases, commercial banks are finding innovative ways to use them practically, in order to insulate themselves. The recent development in models, the software and hardware, and the market data to track risk are all considered advances in RMT. These advances have affected all three stages of credit risk management: the identification, the measurement, and the formulation of strategies to control credit risk.

Bansal et al. (1993) identify the advances made in five areas of RMT, including communication software, object-oriented programming, parallel processing, neural nets and artificial intelligence. Systems based on any of these areas may be used to add value to the business of a bank/firm with regard to risk control and credit risk management. The authors show the utility of advanced systems can be measured to justify their costs. Cebenoyan and Strahan (2004) test how active management of bank credit risk exposure through the loan sales market affects capital structure, lending, profits, and risk. They find that banks that rebalance their loan portfolio exposures by both buying and selling loans - that is, banks that use the loan sales market for risk management purposes rather than to alter their holdings of loans - hold less capital than other banks; they also make more risky loans (loans to businesses) as

a percentage of total assets than other banks. Holding size, leverage and lending activities constant, banks active in the loan sales market have lower risk and higher profits than other banks. Their results suggest that banks that improve their ability to manage credit risk may operate with greater leverage and may lend more of their assets to risky borrowers. Thus, the benefits of advances in risk management in banking may be greater credit availability, rather than reduced risk in the banking system. Following the financial crisis, banks and financial institutions have realised that the conventional methods of managing their credit risk, although important, may not always be sufficient. RMT can have a role to play to overcome the insufficiency. In addition to traditional credit risk methods, they are now looking at more adaptive and innovative approaches through advances of information technology to managing risk.

Moreover, there is a focus on understanding the interdependencies between credit risk and all other types of risk as banks look for an integrated organisation-wide risk management system. No doubt, to manage credit risks requires an effective approach and system. Credit risk management methods and systems are still developing. The pace of development and innovation in credit risk management may be especially high due to the rapid rate of recent change in the discipline of credit risk measurement and management, as well as to current regulatory initiatives like the Basel II framework. It is vital important for banks to adopt integrated risk management (IRM) to address various aspects of risk management issues. Unfortunately, small banks and RCBs do not have much resource to advance their RMT and IT system. Most of them reply on traditional approaches and people personal experience to evaluate and manage banks' credit risk. The results of interviews and case study of this study reported in Chapter 6 also reveal the above problem. Therefore, it is important for RCBs to develop a different approach that fits their own needs and characteristics. This study aims to make a contribution by developing a credit risk management framework specifically for RCBs in China.

3.6 Summary

This chapter has provided a literature review on credit risk management. It presents some general concepts on credit, credit risk and credit risk management approaches, and credit evaluation and assessment models. The review provides a profile of the current literature and debates on the applicability and effectiveness of these approaches and models. In most cases, the findings of the previous studies are still not inclusive.

This chapter discusses the basic concepts of credit risks and the importance of credit risk management. Among various risks faced by financial institutions, credit risk plays a vital role in the whole portfolio of risks, influencing the survival of financial institutions and the financial markets (Njanike, 2009). However, the causes of credit risks which are subject to a variety of factors and influence can only be identified and explained in a particular context, and through detailed analysis. Credit risk management methods and systems are still developing. In addition to measuring and controlling it, banks also try mitigating their credit risk. A variety of approaches have been adopted by a financial institution to mitigate its credit risks, including, for example, risk-based pricing, covenants, credit insurance, credit derivatives, collaterals, engaging in credit guarantee scheme. Some of the popular ways in which banks manage their credit risk include credit portfolio models, credit ratings (including internal ratings), exposure limit, and stress testing. Most financial institutions have their own internal credit assessing models that they use for risk evaluation and management. The recent development in credit risk management has been rapid mainly due to the advance of IT, the imposition of corporate governance, as well as to current regulatory initiatives like the Basel II Framework. Financial institutions need to adopt integrated risk management to address various aspects of credit risk management.

From the literature reviewed, it shows that most of the existing literatures on credit risk management were based on the cases and data from western developed economies where financial systems and risk management practices have been well established. China as an emergent economy started its economic reform in 1978 and

the Shanghai stock exchange was opened in late 1989. China's banking system is still in the stage of transformation and internationalisation. Risk management in the banking sector has begun to attract some attentions recently. A number of researches have been carried out with a view to identifying the appropriate technical approach to manage operation and financial risks in general (e.g., Liu and Saleh, 2009), and credit risk in particular. The contemporary credit risk measurement instruments are efficient and explicit while they are bearing the problem of difficult to calculate and apply in real cases, particularly for small financial institutions. These processes are time and labour consuming which requires huge resources to maintain it. For the small and medium sized banks like RCBs, which are largely based on relationship lending and non-economic factors, these measurement instruments are not applicable. The current study attempts to overcome this problem by specifically considering Chinese characteristics and institutional contexts for managing credit risk and developing a credit risk management framework for RCBs in China. The next chapter will focus on the Chinese characteristics and RCBs' institutional context.

Chapter 4 Literature Review: Rural Financial Development, SMEs, and *Guanxi*

4.1 Introduction

Credit risk management is important for all financial institutions. Banks are increasingly facing the challenges to effectively manage their credit risk. The current credit risk management approaches and models are mainly developed for larger banks in a well-developed financial system. It is questionable whether these models and approaches can be effectively applied in the case of China's RCBs because of Chinese characteristics and different business environments and backgrounds of RCBs. This chapter addresses the characteristics and business environments of China's RCBs.

This chapter starts by discussing rural financial development and income inequality, which was the business environment for the development of RCBs in China. RCBs aim to address the income inequality problem and facilitate the development of rural finance. As the major customers of China's RCB are SMEs, this chapter also provides a discussion of SMEs covering the definitions of SMEs and role of SMEs in Chinese economy.

Moreover, this chapter provides some backgrounds of Jiangsu where the case bank is located in order to link the backgrounds with the case bank. In addition, this chapter considers the *guanxi* concept and discusses the importance of *guanxi* in Chinese economy. *Guanxi* is a typical Chinese characteristic and becomes a core success factor for doing businesses in China. *Guanxi* will be included in the proposed credit risk management framework. Finally, this chapter presents a general review of credit risk management in China's RCBs.

4.2 Rural Financial Development and Income Inequality

4.2.1. Agricultural Loans and Rural Informal Finance

Rural financial development has underpinned the development of RCBs in China and considered an essential financial facilitator to resolve the income inequality problem (Liang, 2005). Although there were many types of formal and informal rural finance organisations in China, for strong demand for financial support to rural areas and rural economic growth, the formal supply of financial resources and capital is by far insufficient. Across the whole country, for example, the proportions of the agriculture loan and the township enterprise loan provided by commercial banks are pretty low. According to China Statistical Yearbook (various years), before China's reform and opening-up policy, the proportion of financial institutions' agriculture loan in all loans maintained about 13%, but after 1978, it was below 10% and only 2.86% in 1994. Such a low level of financial support to agriculture prevented the basic development of China's agriculture and Sannong related sectors. Since 1995 the proportion of agriculture-related loans has increased gradually, but it hovered at about 5%. For loans to township enterprises, from 1997 to 2000, it maintained at about 6%. In recent years, it dropped to 4% continually. In 2004, China's agriculture's GDP accounted for 15.2% for the total figure, but by the end of 2004, among various financial loans, the agriculture loan only accounted for 5.52% which is not proportionate to its GDP share.

In 2009, domestic agriculture loan was only 1943 billion RMB Yuan, which accounted for 5.91% of the entire loan of 22,534.72 billion RMB Yuan. By the end of 2009, the sum of agriculture loan and the township enterprise loan only accounted for 8.62% of total bank loans. Sannong's loan was extremely low and the input of financial institutions in rural finance did not match with the rural sector's contribution to the economy. Since 1994, although the proportion of agriculture output in GDP showed a downward trend, the overall proportion remained between 15% and 20%, while proportion of the agricultural loans from formal rural finance system was only about 3%-5%, which indicates that there is a large gap between agriculture's contribution to the GDP and the loans provided to the agricultural sector. At the same time, township enterprises loan ratio is 5% - 6% of total loan. The proportion of

China's agricultural added value in GDP was 11.8 per cent in 2009, while agriculture loans in the entire financial institutions was less than 6%; the proportion of the added value of township enterprises in GDP was 27.5 per cent, and township enterprises loan ratio was only 2.76 per cent.

The survey conducted by the Central Policy Research Centre[25] of more than 20,000 peasant households in 31 provinces and cities shows that since 1986 loan per household in rural areas has been risen; the loans increased from 193.11 RMB Yuan in 1986 to 1045.2 RMB Yuan in 2003 with the annual average growth rate of around 16%. The increasing loan of the peasant households was mainly depending on informal finance[26], which suggests that the informal lending in rural areas became the main pillar of China's economic development.

Evidence from other studies also shows that the scale of informal rural finance was substantial (e.g., Yan and Gao, 2012; Feng, 2007; Zhou, 2011; Tsai, 2004). For example, in 2004, average per household loan through informal finance channels was 1414.25 RMB Yuan. If there were 240 million farmer households in China at the time, then the total value of rural loans through such an informal system was 339.42 billion RMB Yuan. At the same time loans from banks and the credit associations provided to rural households and enterprises were only 88.572 billion RMB Yuan (Zhou, 2011; Feng, 2007; Zhao, 1999).

4.2.2. Rural Income Inequality

Along with the economy development, China's rural per capita income has been increasing, but at the same time, the gap between the rich and the poor in rural areas was also simultaneously getting bigger and bigger. Since the reform and opening-up policy in 1978, rural income inequality has experienced the process that first

---

[25] http://blog.sina.com.cn/s/blog_4b53b3200100ci3y.html

[26] Informal finance is defined as contracts or agreements conducted without reference or recourse to the legal system to get loan in the present for promises of cash paid back in the future. It normally carries high interest rate in the case of China.

expanding, then reducing gradually, and expanding again. The rural Gini[27] coefficient increased from 0.212 in 1978 to 0.342 in 1995, it expanded at a speed of 0.8 per cent annually. In 1996, it dropped to 0.323, after that, it started to increase gradually, in 2009, it got to 0.375 (China Statistical Yearbook, various years). As the income gap between the rich and the poor in the rural areas is increasingly becoming remarkable, for this phenomenon, the literature has started to investigate the rural inequality from different perspectives.

The academic researches on financial development and income inequality started from the 1970s (Greenwood and Jovanvoic, 1990) and became the focus of attention very quickly with more researches carried out in the 2000s (Liang, 2005). For example, McKinnon (1973) studies the prevention of unfair distribution between sectors because of human-caused income growth and argues that the financial development will gradually be advantageous to the reduction of income gap. Beck, Demirguc-Kunt and Maksimovic (2004) believe that along with the economic growth the financial development can reduce the gap between the rich and the poor. The authors argue that the financial development enables low-income people to make the earnings grow faster than the growth rate of per unit GDP.

In recent years, Chinese scholars (e.g., Guo and Liu, 2010; Xie, 2008; Liang, 2005) have paid attention to the issue and began to study financial development in rural areas and the role of RCBs in narrowing down rural income inequality. For example, Xie (2008) carries out an empirical analysis of the rural credit and the farmer average net income per person from 1980 to 2005, and shows that agricultural loans is in fact channelled into the non-agricultural industry, and reduce agricultural loans has led to reduced investment in agriculture, resulting in the continuous low income for the farmers' family. In order to prevent this from happening, the government should supervise and intensify the investigation of the distribution of agricultural lending process in order to assure that the agricultural loans are used in the hand of the agricultural industry and Sannong projects. Using co-integration analysis and error

---

[27] The Gini coefficient (also known as the Gini index or Gini ratio) is a measure of statistical dispersion developed by the Italian statistician and sociologist Corrado Gini and published in his 1912 paper "Variability and Mutability" (Italian: *Variabilità e mutabilità*).

correction model respectively, Guo and Liu (2010) research the expending of rural income gap from the perspective of rural finance development and find an intrinsic link between rural income inequality, rural finance development and rural employment structure. Unfortunately, the existing studies did not give much attention to the role of RCBs in addressing the income inequality and facilitating the reduction of such an inequality.

From the background information explained in Chapter 2, RCBs in China were largely developed with a view to addressing the inequality problem. The government and local authorities have encouraged the expansion of formal finance channels through the development of commercial banks in China's rural and county areas. To serve *Sannong* and rural SMEs has become the core of the business among RCBs.

4.3 China's SMEs and its Classifications

While China has been one of top fast growing economies in the world since 1980s, sustainability of China's continuing growth both economically and environmentally is undoubtedly a critical issue today. The main drivers of economic activity in China are SMEs.

The definition of SMEs in China is different from that in other countries (Li and Matlay, 2006). According to the Law of the People's Republic of China on the Promotion of Small and Medium-sized Enterprises (2002)[28], small and medium-sized enterprises refer to the different forms of enterprises under different ownerships that are established within the territory of the People's Republic of China according to law, that help to meet the social needs and create more job opportunities, that comply with the industrial policies of the State and that are small and medium-sized in production and business operation (Article 2). Small and medium sized enterprises are quantified by their turnovers, total employees or total assets by the industry that the enterprises are operated in China as shown in Table 4.1. The European Union defines this kind of

---

[28] http://www.most.gov.cn/fggw/fl/200710/t20071025_56666.htm

company as that employing fewer than 250 persons and with an annual turnover not exceeding €50 million and/or an annual balance sheet total not exceeding €43 million (European Commission, 20031) and the United States considers SMEs to include firms with fewer than 500 employees (OECD, 2011).

Table 4.1 Classification of SMEs in China

Sector	Measurement	Unit	Large Firms	Medium Firms	Small Firms	Micro Firms
Farming, Forestry, Animal Husbandry, and Fishery	Revenue (Y)	RMB10,000	Y≥20000	500≤Y＜20000	50≤Y＜500	Y＜50
Industry	Employee No.(X)	Person	X≥1000	300≤X＜1000	20≤X＜300	X＜20
	Revenue (Y)	RMB10,000	Y≥40000	2000≤Y＜40000	300≤Y＜2000	Y＜300
Construction	Revenue (Y)	RMB10,000	Y≥80000	6000≤Y＜80000	300≤Y＜6000	Y＜300
	Total Assets (Z)	RMB10,000	Z≥80000	5000≤Z＜80000	300≤Z＜5000	Z＜300
Wholesalers	Employee No.(X)	Person	X≥200	20≤X＜200	5≤X＜20	X＜5
	Revenue (Y)	RMB10,000	Y≥40000	5000≤Y＜40000	1000≤Y＜5000	Y＜1000
Retailers	Employee No.(X)	Person	X≥300	50≤X＜300	10≤X＜50	X＜10
	Revenue (Y)	RMB10,000	Y≥20000	500≤Y＜20000	100≤Y＜500	Y＜100
Transportation	Employee No.(X)	Person	X≥1000	300≤X＜1000	20≤X＜300	X＜20
	Revenue (Y)	RMB10,000	Y≥30000	3000≤Y＜30000	200≤Y＜3000	Y＜200
Warehousing	Employee No.(X)	Person	X≥200	100≤X＜200	20≤X＜100	X＜20
	Revenue (Y)	RMB10,000	Y≥30000	1000≤Y＜30000	100≤Y＜1000	Y＜100
Postal services	Employee No.(X)	person	X≥1000	300≤X＜1000	20≤X＜300	X＜20
	Revenue (Y)	RMB10,000	Y≥30000	2000≤Y＜30000	100≤Y＜2000	Y＜100
Hotel and accommodation	Employee No.(X)	Person	X≥300	100≤X＜300	10≤X＜100	X＜10
	Revenue(Y)	RMB10,000	Y≥10000	2000≤Y＜10000	100≤Y＜2000	Y＜100
Foods and Restaurants	Employee No.(X)	Person	X≥300	100≤X＜300	10≤X＜100	X＜10
	Revenue (Y)	RMB10,000	Y≥10000	2000≤Y＜10000	100≤Y＜2000	Y＜100
Information Transmission Services	Employee No.(X)	person	X≥2000	100≤X＜2000	10≤X＜100	X＜10
	Revenue (Y)	RMB10,000	Y≥100000	1000≤Y＜100000	100≤Y＜1000	Y＜100
Software and IT servicing	Employee No.(X)	Person	X≥300	100≤X＜300	10≤X＜100	X＜10

	Revenue (Y)	RMB10,000	Y≥10000	1000≤Y＜10000	50≤Y＜1000	Y＜50
Real Estates	Revenue(Y)	RMB10,000	Y≥200000	1000≤Y＜200000	100≤Y＜1000	Y＜100
	Total Assets (Z)	RMB10,000	Z≥10000	5000≤Z＜10000	2000≤Z＜5000	Z＜2000
Property Management	Employee No.(X)	Person	X≥1000	300≤X＜1000	100≤X＜300	X＜100
	Revenue (Y)	RMB10,000	Y≥5000	1000≤Y＜5000	500≤Y＜1000	Y＜500
Leasing and Commerce Servicing	Employee No.(X)	Person	X≥300	100≤X＜300	10≤X＜100	X＜10
	Total Assets (Z)	RMB10,000	Z≥120000	8000≤Z＜120000	100≤Z＜8000	Z＜100
Other sectors	Employee No. (X)	Person	X≥300	100≤X＜300	10≤X＜100	X＜10

The mixture use of these three characteristics (total revenue, employee number and total assets) makes research on Chinese SMEs challenging (Li and Matlay, 2006). This equally applied to the analysis of credit of these SMEs. In China, the industry category is the key determinants of criterions to classify SMEs. Different industries use different criterions (i.e., revenue, employee numbers, total assets) to quantify the size of an enterprise.

Also, the diverse development patterns pursued by different regions in China can cause some problems in classifying SMEs as firms in well-developed regions can easily achieve the benchmark (e.g., sales revenue, total assets), while firms in western poor regions can be very difficult to reach the measures. Finally, the differences in the definition of SMEs and quantifications make it more difficult to compare findings across SMEs in different regions as well as hampering the possibility of doing cross-regional studies. The regional differences among SMEs in China have been well recognised (Yang and Xu, 2006). Therefore, a case study based on one region can be more useful than a cross-region analysis given the classification adopted in China. This study will use a single case study to reveal the credit risk management experience and issues of a RCB.

SMEs are the most important economic components in China's economy because they account for 98.9 per cent of the total number of businesses and 65.6 per cent of China's industrial output value (Cao, Hartung, Forrest and Shen, 2011; Singh, Garg and Deshmukh, 2010). Many SMEs in China are family-based businesses. The founders do not possess management skills, and they lack an understanding of basic

financial products and financial risk management, which limit the further development of SMEs (Lu and Tao, 2010; Cunningham and Rowley, 2007; Chen 2006; Hussain, Millman and Matlay, 2006).

On the other hand, globalisation has created opportunities for Chinese SMEs to actively enter and participate in the global markets (Hall, 2007; Li and Matlay, 2006). China is increasingly a dominant player in the globalisation of manufacturing. The patterns of SMEs' development inside China have been diverse. This is mainly because most of the country's vibrant expansion and much of its growth is driven by local initiatives rather than by directives from the central government (Zhiming, 2010). The fact that local governments have beaten the central government's growth targets every year in the last three decades, that provinces have more ambitious plans for the expansion (for example, of their rail networks or clean energy) than those stipulated by national targets, and that SMEs represent the most important part of the country's economic activity, provide evidence of the importance of SMEs and the different local environment.

The local empowerment that began with the decentralisation in 1979 has continued until today. It has created different patterns of development of the business environments inside China (Yang and Xu, 2006). Jiangsu, where the case bank locates is an example of well-developed in the SMEs sector and rural urbanisation. A good example of illustrating these differences in regions is a contrast between the villages of Huaxi (Jiangsu province, around 30 km to ZhangJiaGang where the case bank headquarter locates) and Nanjie (Henan province) and their township and village enterprises. Huaxi is China's richest village where every family has had a net worth of more than RMB one million since 2005 as many of the former village farmers are large shareholders of the village enterprise, Jiangsu Huaxicun Co Ltd, listed since 1999 on the Shenzhen Stock Exchange with a current market capitalization of more US$1.1bn. However, in Nanjie, communism is alive, and the "works of Chairman Mao" are still revered. The village and its enterprise run on a long-forgotten salary plus supply or need system (instead of a cash bonus), where basic resources such as food, property, schools and healthcare are first allocated on a "needs basis" (Zhiming, 2010). The difference between these regions makes an assessment of SMEs far more

difficult in terms of credit, business failure and potential risk. In this way, I argue it is unrealistic to design a comprehensive credit risk management model that can fit all; instead it should use a framework to be guiding basis for each individual RCB to design an appropriate credit risk management model themself. This is the general idea of this project, i.e., to develop a framework it needs to consider the characteristics of SMEs and unique features of China and the local economy. The next section describes Jiangsu province and its uniqueness.

4.4 Jiangsu Province

This section provides some general backgrounds about Jiangsu province where the case bank locates. Figure 4.1 presents a map of China indicating the location of Jiangsu. Jiangsu Province in the East coast of China as shown in the map is situated in the lower reaches of the Yangtze River and bounded by the provinces of Shandong, Zhejiang, Anhui and Shanghai City. Jiangsu is a province with wide alluvial plain. There is an intricate network of waterways and a large number of lakes. The well-known Grand Canal runs through the entire province from north to south.

Jiangsu is one of the smaller provinces in China with area of just over 100,000 km^2, but with a high population density. By the end of 2011, Jiangsu had of a population of 78.99 million (The Statistical Yearbook of Jiangsu Province 2012). Jiangsu has a long history and a rich cultural heritage. The province is also famous for its traditional light industrial products and handicrafts, such as embroidery and straw woven articles in Suzhou, purple pottery in Yixing, clay figure in Wuxi, lacquer ware in Yangzhou, sandalwood fan and jasmine tea in Suzhou and so on. These products are mainly produced by local SMEs and most of them were exported to European, US and Asian markets.

Figure 4.1 A map of China and Jiangsu location

As one of the earliest opening-up provinces in China, Jiangsu has achieved fast economic development ever since the opening up and reform. Jiangsu is one of the rich provinces with well-developed SMEs. In year 2009, the GDP of Jiangsu totalled RMB 3.4 trillion (about US $ 500 billion), accounting for 10% of the national GDP; GDP per capita of 2009 hit RMB 44,232 (about US$ 6,475), both of which ranked the second in the country. In 2010, the total import and export volume of Jiangsu reached US$466 billion, accounting for 15.7% of the national total, being the second largest for years. In 2010, the paid-in foreign investment in Jiangsu reached US$28.5 billion. Jiangsu had been ranked the first in foreign direct investment (FDI) utilisation for eight consecutive years. By the end of 2010, over 2,035 overseas projects, in 127 countries (regions), had been invested by Jiangsu enterprises, together with a contract investment of US$5.2 billion from Jiangsu. The investment has been mainly in manufacturing industry, wholesale, business service, mining and PV. Jiangsu also

ranks among the best in overseas investment. Also, Jiangsu Province is the home of the widely known China-Singapore Suzhou Industrial Park.

Economic radiation from Shanghai is another location advantage of Jiangsu Province. Shanghai is the most developed and international city in China, while commerce cost increasing, some outsourcing demand will shift from Shanghai to its nearby cities, such as Suzhou, Wuxi, Nanjing, Zhangjiagang and so on, which are all in Jiangsu Province. According to the Ministry of Commerce of the People's Republic of China, even in the shadow of global finance crisis, the contract value of service outsourcing achieved USD 20.01 billion in 2009, up by 185.6%, and the contract value of offshore service outsourcing amounted to USD 14.77 billion, up by 153.9%. In Jiangsu Province, the corresponding value achieved USD 3.72 billion in 2009, up by 145%, and it take a share of 18.6% to the whole country.

Jiangsu has well-developed agriculture and industry sectors, largely due to the contribution made by SMEs. With merely 4.7% of the national arable land, Jiangsu produces 7% of grains, 12% of cotton, 7% of oilseeds and 8% of meat of China. The principal food crops are rice and wheat, supplemented by barley, maize, soybean and potatoes; the major cash crops consist primarily of cotton and rape seeds, as well as sesame and tobacco. There are also vegetables, gourds and fruits etc. The provincial production of silks, fishery products, livestock also plays an important role in China. The above provides SMEs with much of materials for the processing of agricultural products, which many SMEs are engaged. For industry, Jiangsu has four pillar industries (i.e. machinery, electronic, chemicals and automobile). These industries have enjoyed large markets and high market share in China, underpinned by tens of thousands of local SMEs.

In 2008, the total number of SMEs increased to 45,459 compared to 43,916 in 2007 and 99.2% of them were industrial enterprises. Most of the SMEs were labour-intensive manufacturers and aimed at overseas markets. Over the past decade, the import and export of these SMEs have boosted the major economic development of Jiangsu. However, the change of macro economy in China has brought great impact on the import-and-export-oriented SMEs. In Jiangsu Province, the change of macro

economy over the past few years was reflected in two aspects, which were high inflation and RMB appreciation. Figure 4.2 shows the CPI and inflation rate in Jiangsu Province from 2006 to 2010. Appreciation of RMB has decreased the profits of import-and-export-oriented SMEs, and many of them have quitted the market (Filatotchev, Liu, Buck and Wright, 2009).

Figure 4.2 the CPI and inflation rate in Jiangsu Province from 2006~2010
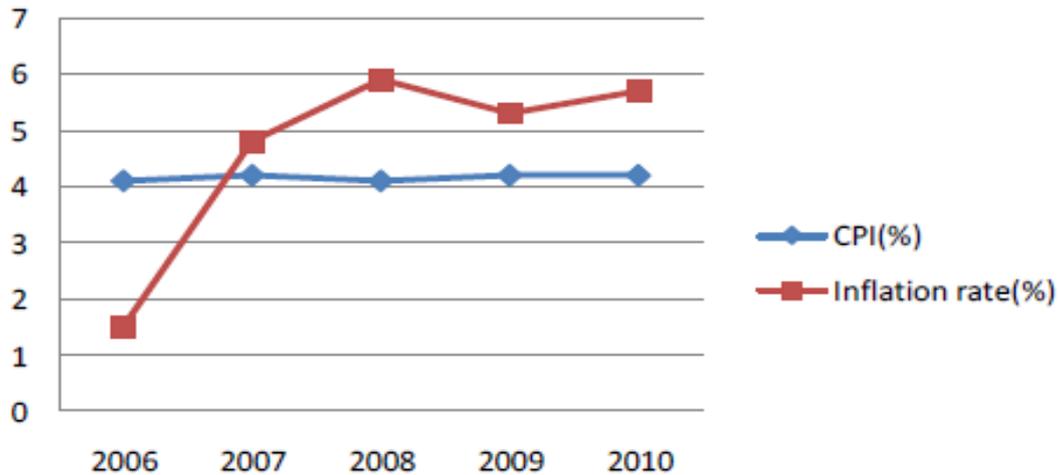
In terms of industrial structure, most of the import-and-export-oriented SMEs adopt the labour-intensive model in Jiangsu Province. This model boosted the economy rapidly in the last century. Since China's entry into WTO, this traditional model has been criticised for being short term focus and less value-added, which effect the sustainable development of the industry, especially the import and export industry, and SMEs in Jiangsu Province. The model has the lowest requirement for companies in technology and capital investment, and it emphasises the low labour-cost in business activities. The non-tech or low-tech jobs occupy a high percentage of the production elements, such as the textile industry and handcraft industry. This labour-intensive model has increased the risk of bankruptcy once the competition increases due to cheap labour from other neighbouring countries (such as India, Bangladesh).

The local government has given much emphasis to the development of SMEs. SMEs support was one of the priorities at various governments in Jiangsu. For example, the preferential tax policies introduced by the local taxation bureau of Jiangsu in 1999 have brought real benefits to many SMEs. SMEs which qualify as small low-profit

97

operations are eligible for income tax at a reduced rate of 20%, a much bigger concession than that granted to SMEs before the implementation of the new enterprise income tax law. Among the preferential tax policies, it is clearly stipulated that industrial enterprises paying an annual tax of less than RMB 300,000 Yuan, employing less than 100 people and having total assets worth less than RMB 30 million Yuan are entitled to the new concession. Before this, only those enterprises paying less than RMB 100,000 Yuan in income tax are eligible for the preferential tax rate. As for property tax, the old policy stipulated that property used for operational purposes are levied tax at the rate of 1.2% after a 30% discount on the value of the business premises. Under the new policy, all SMEs with difficulty paying tax may apply for tax exemption and reduction. This policy which touches on a wide scope of SMEs is aimed at encouraging technological innovations, protecting the environment, and promoting exports. For example, high-tech innovation service centres, university science parks, software parks, overseas returnees venture parks and other scientific and technological incubators are temporarily exempted from business tax, property tax and urban land use tax from the day they were recognised. R&D expenses incurred by SMEs in the development of new technologies, products and technological processes, if not yet booked as intangible assets in the current year balance sheet, are given an additional deduction at 50% of the actual amount incurred; if these expenses are booked as assets, they are deductible at 150% of the actual cost of the intangible asset. Under the new policies, income derived from recycling is taxed at 90% of the taxable revenue, which means that enterprises will actually be paying less tax. The income of SMEs engaged in qualified environmental protection, energy- and water-saving projects is exempt from income tax from the first to third years and is eligible for a 50% tax reduction from the fourth to sixth years. SMEs in the animation industry that developed and produced products taxable under the business tax are eligible for business tax payment at a reduced rate of 3% for the time being.

Since the beginning of 2011, the financial system in Jiangsu province has actively adapted to the changes of national macro-control policy orientation against the background of a prudent monetary policy, vigorously adjusted the operating strategy, optimised the credit structure and the social financing structure, and increased

supports to real economy, thus ensuring stable financial operations. In the first quarter of 2011, the newly increased RMB loans and foreign currency loans in the financial institutions in Jiangsu Province amounted to RMB 168.6 billion Yuan and $2.3 billion respectively. The IPO (Initial Public Offering) and refinancing of listed companies in Jiangsu province reached RMB 20.7 billion Yuan, and varied bonds issued by enterprises added up to RMB 25.1 billion Yuan[29]. Jiangsu province has devoted greater efforts to deepen the comprehensive rural reform process and to establish a public finance system covering both urban and rural areas. In 2011, the province granted the village-level enterprises and organisations with working capital of RMB 2.63 billion Yuan, averaging RMB 15.2 million Yuan per village[30].

However, many SMEs in Jiangsu are recently facing financing difficulty due to the tightening up of credits and government finance. As noted in the literature, SMEs from Jiangsu tend to internationalise their business activities in order to overcome the competitive disadvantages associated with limited access to financial resources in the home markets (Cardoza, Fornes and Xu, 2012; Cardoza and Fornes, 2011). Overall, Jiangsu province is a well-developed region in China in both agriculture and industry with the strong growth of SMEs. This has provided a base for the case bank to focus on SMEs and *Sannong*.

4.5 Guanxi in Chinese Business Context

In the proposed framework discussed later, guanxi is included as a major cluster of factors in credit analysis. Guanxi is an indigenous Chinese construct describing an informal connection between two or more individuals or groups involving shared social experience, the exchange of favours and trust (Hwang and Staley, 2005; Lou, 1997a; Lou, 1997b; Wei, Liu, Chen and Wu., 2010). Guanxi has dominated all

---

[29] This is based on the report of the Analysis Conference on the Economic and Financial Situation of Jiangsu Province's Financial System in the First Quarter of 2011, held in Nanjing.
http://www.js.gov.cn/JSGOVEN08/windowsofjiangsu/ViceGovernorliyunfeng/201106/t20110621_607323.html
[30] http://www.sourcejuice.com/1511663/2012/10/11/Jiangsu-focused-building-public-finance-system-covering-both-urban/

business and social activities that occur throughout China (Hwang and Staley, 2005; Lovett, Simmons and Kali, 1999; Taormina and Gao, 2010; Wei et al., 2010). For more than 2,500 years – since the time of Confucius – guanxi has been critically important to Chinese society (Hwang and Staley, 2005). Like that of familial relationships, guanxi works on the basic, unspoken principle of reciprocity and equity (Hwang and Staley, 2005; Lou, 1997a; 1997b).

Guanxi is frequently translated in English as 'relationships', but "the concepts differ in that relationships can be positive or negative, while guanxi can be only strong or weak" (Wei et al., 2010: 438). Also, the concept goes beyond the friendly cooperation often found in Western business relationships because it has deep Chinese historical and cultural roots. Indeed, modern Chinese societies remain very much guanxi-oriented (Chen and Chen, 2004) and SME business operations and success in China are largely dependent on guanxi since it provides assurance of success in business operations (Seligman, 1999). Seligman (1999) finds that one of the few rules in China that leads to business success is the establishment of the right guanxi. Advantage in guanxi networks can lead an individual or organisation to succeed (Islam and Kantor, 2005). This is ever more important for the case of SMEs and farming households.

The literature shows that as the parties in a guanxi relationship consent to reciprocal favours, an understanding of the incentive structure surrounding the relationship (assurance), rather than relying on inferences of the personal integrity of the individual (trust) (e.g., Standifird and Marshall, 2000; Fock and Woo, 1998) is a key to business success, and that the cultivation, development and expansion of guanxi have become a priority of many Chinese business people (Wei et al., 2010; Hwang and Staley, 2005). This is even more critical for SMEs where guanxi is generally the foundation for business.

Yeung and Tung (1996) research the critical factors that contribute to business success in China by asking managers of 19 diverse international companies to rank 11 key factors and find that guanxi was the only item consistently chosen as a key success factor. Lou (1997a, b) finds a direct correlation between a corporation's level of guanxi connections and its domestic (China) sales growth. Islam and Kantor (2005)

100

believe guanxi, a strong networking party, plays a shadow role in the form of a principal-agent-agent (sub-agent) in the decision-making processes and success of a firm. Guanxi is strengthened through the process of give-and-take of guanxi favours in transactions, and yet there is no formal written agreement or clear understanding of future obligations. Obviously, what these guanxi relationships create is some form of contingency that is "off-the-balance-sheet" (Hwang and Staley, 2005). Because it is "off-the-balance-sheet", accounting data cannot reveal any information on guanxi that is a major business success/failure factor. The proposed credit risk management framework will incorporate guanxi impact and put quanxi as a major category for credit analysis.

4.6 Credit Risk Management in China's Rural Commercial Banks

The financial services sector (including RCBs) has developed rapidly in China over the last 10 year, making credit available for many rural enterprises (e.g., SMEs) and farming households. However, the system has not been inadequate to provide finance to address the rural poverty. With regard to lending activities, RCBs generally have the following characteristics: 1) loans are made quite often to quanxi of the banks; 2) loans are relatively small and generally unsecured; 3) most of the assets and liabilities of RCBs are owned jointly by the limited members;[31] 4) internal monitoring, political and social sanctions are often used to enforce RCB loan contracts. Also, though the cooperative nature of RCBs greatly reduces asymmetric information problems, due to low understanding of the operations of finance and lending system, the users did not have much role to play in the process and risk management. Unlike larger lenders, it is very difficult for RCBs to diversify its narrow business. This leaves MFIs highly vulnerable to correlated risk exposure from events such as natural disasters, the failure of an industrial sector, and the consequence of foreign exchange risk. For instance, in the wake of a major natural disaster, many borrowers may default on their loans. Recognising this vulnerability, RCBs need to build financial reserves in the years

---

[31] Some are financed by local governments and equity invested by other large financial institutions (mainly state-owned banks and insurance companies).

when natural disasters do not occur. But in a credit-constrained environment, like China over the past few years, the opportunity cost of building reserves (by providing fewer loans than would otherwise be provided) is quite high. Moreover, due to the magnitude and correlated nature of the risk, very large reserves will be required to assure the long-term sustainability of RCBs; this undoubtedly has a major impact on the capital capacity of RCBs. It is also possible that a natural disaster could occur before sufficient financial reserves have been accumulated. Thus, natural disasters can be a major constraint to the emergence of RCBs activity in some areas, as most of the main customers of RCBs are engaging in the agriculture and *Sannong*-related business.

Most RCBs measure and manage the quality of credit risk-bearing assets based on the Guideline for Loan Credit Risk Classification issued by the CBRC, which requires classify loans into the five category loan classification: normal, special mention, substandard, doubtful and loss[32]. Loans classified in the substandard, doubtful and loss categories are regarded as non-performing loans. The main factors considered in loan impairment assessment include probability of loan repayment and recoverability of principal and interest, which relates to borrowers' repayment ability, credit record, repayment intention, projected profitability, guarantees or collateral and legal responsibility of repayment. The allowances for impairment losses are assessed collectively or individually as appropriate. Banks assess the impairment for loans and advances to customers at the end of reporting period in accordance with Chinese

---

[32] The five category loan classification are as follows:

• Normal: Borrowers can honour the terms of their loans. There is no reason to doubt their ability to repay principal and interest in full on a timely basis.

• Special mention: Borrowers are able to service their loans currently, although repayment may be adversely affected by specific factors.

• Substandard: Borrowers' ability to service their loans is in question and they cannot rely entirely on normal operational revenues to repay principal and interest. Losses may ensue even when collateral or guarantees are invoked.

• Doubtful: Borrowers cannot repay principal and interest in full and significant losses will need to be recognised even when collateral or guarantees are invoked.

• Loss: Only a small portion or none of principal and interest can be recovered after taking all possible measures and exhausting all legal remedies.

accounting standards. In addition, analysis based on the contractual amounts of the loans and advances to customers at the end of reporting period are provided internally to management for the purpose of assessing financial risks.

Overall, credit risk management has received an increasing attention in Chinese banks since 1990s as credit risk has significantly affected Chinese banks' profitability (Matthews, 2013; García-Herrero, Gavilá and Santabárbara, 2009). Accordingly, academics have started to investigate the problems of China's credit risk, particularly large financial institutions and stated-owned enterprises. Limited studies have examined the credit risk situation in China from macroeconomic and policy perspectives. For example, Shih, Zhang and Liu (2007) investigate the performance of China's state banks, joint-stock banks, and city commercial banks, and conclude that in China, unlike in other developing countries, the size of the bank is not correlated with their performance in terms of credit risks. Middle-sized national joint-stock banks perform considerably better than the Big Four (state owned) and smaller city commercial banks in managing credit risks. This study also presents regional and geographical analysis of these banks, showing that the Northeast suffers from the legacy of central planning, although north-western China for some reason hosts some of the healthiest banks in China. Unfortunately, little study has specifically carried out on credit risk management in rural commercial banks.

4.7 Summary

This chapter has focused on China's characteristics relating to RCBs and credit risk management. It has provided an introduction to China's rural financial development and income inequality problem, which are the necessities for the development of RCBs in China. RCBs were developed with the aim to tackle the income inequality problem and accelerate the development of rural finance. As the major customers of China's RCB are SMEs, this chapter has also provided a discussion of SMEs covering the classifications of SMEs and role of SMEs in Chinese economy. Moreover, this chapter has provided a description of Jiangsu province where the case bank is located in order to associate the case bank with the local context. In addition, this chapter has

discussed the *guanxi* concept and emphasised the importance of *guanxi* in Chinese economy. *Guanxi* will be included in the proposed credit risk management framework.

China as the fastest developing economy has also paid attention to credit risk management. Various regulations and guidance have been issued by the regulatory bodies. Academics have investigated various issues faced by large financial institutions (e.g., state-owned banks) in credit and credit risk management. However, most previous research did not consider credit risk management of RCBs. Clearly there is a research gap as RCBs are different from large city commercial banks due to their business nature, services, expectations and locations among other characteristics. This study expects to make a contribution by filling in this gap by developing a credit risk management framework for RCBs.

Chapter 5 Research Methodology and Research Methods

5.1 Introduction

This chapter describes the research methodology and research methods underpinning the study. This chapter is divided into further four sections.

The next section reviews the concept and theory of research methodology, focusing on research methodology and strategy with a view to identifying an appropriate research method for this research. The strengths and weakness of qualitative and quantitative approaches and their appropriateness in certain situations are discussed with a focus on the qualitative approaches (e.g., case study). Also, the given issues of the validity and reliability of research methods are included.

The third section summarises the major research methods used in credit risk management in the literature. Prior credit risk management research has mainly adopted inductive approaches with a focus on the development/test of a credit risk valuation model. The data of the analysis was predominately quantitative and market-based. In this section, three models are specifically reviewed including discriminant function analysis, logistic regression analysis and principal components analysis.

The fourth section describes the research method adopted in this study. First it provides justifications for the research methods selected for this study. Then it presents the research design of this study. Further it explains in detail semi-structure interviews and case study used in this study.

The fifth section introduces the proposed credit risk management framework, providing the design and explanation of the credit risk management framework proposed by the researcher, and linking the development of interview questions with the proposed framework.

5.2 An Overview of Research Methodology

5.2.1 Research Methodology

Research refers to a search for knowledge. It is a scientific and systematic search for pertinent information on a specific topic. Research is a careful investigation or inquiry especially through search for new facts in any branch of knowledge. Research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organising and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis. It is the manipulation of things, concepts or symbols for the purpose of generalising to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art.

In an academic context, research is an original contribution to the existing body of knowledge making for its advancement. The search for knowledge through objective and systematic method of finding solutions to a problem is research. Overall, "research is a cyclical process of steps that typically begins with identifying the problem or issue of the study. It then consists of reviewing the literature, specifying a purpose for the study, and forming an interpretation of the information. This process culminates in a report disseminated to the audience that is evaluated and used …" (Creswell, 1998).

Research methodology is a means to systematically solve research problems. It reveals the various steps that are generally adopted by a researcher in studying her/his research problem along with the logic behind them. For the researcher it is essential to know not only the research methods/techniques but also the methodology. In empirical researches, for example, researchers not only need to know how to develop certain indices or tests, how to calculate the mean, the mode, the median or the standard deviation or chi-square, how to apply particular research techniques, but they also need to know which of these methods or techniques, are relevant and which are not, and what would they mean and indicate and why (Gill and Johnson, 2010). Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques

and procedures will be applicable to certain problems and others will not. All this means that it is necessary for the researcher to design his methodology for her/his problem.

5.2.2 Quantitative and Qualitative Research

Broadly, research can be categorised into quantitative approaches and qualitative approaches. Much of the debates on the choice of research tend to revolve on the choice between quantitative and qualitative methods (Liamputtong, 2009). Qualitative and quantitative methods refer to commitments to different styles of research, different epistemologies and different forms of representation (Denzin and Lincoln, 2000). However, the decision between quantitative or qualitative method depends on three main criteria namely (1) the purpose of the study (2) how the variables are measured (3) how the information is analysed (Kumar, 1999). The former involves the generation of data in the quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion.

Quantitative research can be further sub-classified into inferential, experimental and simulation approaches to research. The purpose of inferential approach to research is to form a data base from which to infer characteristics or relationships of population. This usually means survey research where a sample of population is studied (questioned or observed) to determine its characteristics, and it is then inferred that the population has the same characteristics. Experimental approach is characterised by much greater control over the research environment and in this case some variables are manipulated to observe their effect on other variables. Simulation approach involves the construction of an artificial environment within which relevant information and data can be generated. This permits an observation of the dynamic behaviour of a system (or its sub-system) under controlled conditions. The term 'simulation' in the context of business applications refers to "the operation of a numerical model that represents the structure of a dynamic process. Given the values of initial conditions, parameters and exogenous variables, a simulation is run to represent the behaviour of the process over time (Daniel and Sam, 2012, p.8). Simulation approach can also be useful in building models for understanding future conditions.

Qualitative approach to research is usually concerned with subjective assessment of attitudes, opinions and behaviour. Research in such a situation is a function of the researcher's insights and impressions. Such an approach to research generates results either in non-quantitative form or in the form which are not subjected to rigorous quantitative analysis.

The previous credit risk management research has mainly adopted quantitative approaches. The quantitative research usually concentrates on measurements and numbers. It aims to study the association between variables in the population. It relates generally to research that emphasises "the measurement and analysis of causal relationships between variables with inquiry ... purported to be within a value-free framework" (Denzin and Lincoln, 2000, p. 8). Quantitative methods entail "the use of standardized measures so that the varying perspectives and experiences of people can be fit into a limited number of predetermined response categories to which numbers are assigned" (Patton, 2002, p.14). However, with standard quantitative designs "there is an effort to limit the role of personal interpretation for that period between the time the research design is set and the time the data are collected and analysed statistically sometimes thought of as a 'value free' period" (Stake, 1995, p.41). Such research strategy emphasizes the quantification in the collection and analysis of data; it therefore generates numerical data or data which could be converted to figures while the researchers remain distant and independent. Quantitative methods are more useful when trying to test hypotheses. In this case, the development of relevant and logic hypotheses is essential to validity of a research.

5.2.3 Case Study Research

Case study is one of the popular research methods in business disciplines (Silverman, 2011). Yin (1994, p.13) defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident. An important strength of case studies is the ability to undertake an investigation into a phenomenon in its context (Silverman, 2005). Thus case studies are a valuable way of looking at the world around us. Case study research can be based on any mix of quantitative and

qualitative approaches. Typically, it can use multiple data sources including two or more of: direct detailed observations, interviews, and documents.

Case study as a research method is to seek to undertake a modest scale research project based on the researcher's workplace, a single organisation or the comparison of a limited number of organisations (Silverman, 2011). Case study as a research method offers insights that might not be achieved with other approaches which require a large amount of data and observations. It has often been viewed as a useful tool for the preliminary, exploratory stage of a research project, as a basis for the development of the 'more structured' tools that are necessary in surveys and experiments. Eisenhardt (1989) argues that case studies are particularly well suited to new research areas or research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal larger data-based quantitative researches. The former is useful in early stages of research on a topic or when a fresh perspective is needed, whilst the latter is useful in later stages of knowledge. Case study research is also good for contemporary events when the relevant behaviour cannot be manipulated.

Case studies emphasise on societal, political, historical, and/or business contexts and attempt to reach a full explanation of a phenomenon within a unit of analysis (Silverman, 2011). It can be used to interpret events, uncovering processes and relationships (e.g. guanxi). Case studies typically try to answer 'how' and 'why' questions (Silverman, 2005). Case studies can be a single case or multiple cases. Single case study research is applicable when the case is critical or unique or where the researcher is able to access a previously remote phenomenon; critical for testing a well formulated theory; an exploratory study or pilot study; shown to be representative of a large population (Yin, 1989). Multiple case studies provide a purposive sample and the potential for generalizability of findings (Miles and Huberman 1994, Patton, 2002). Additionally, including multiple sites increases the scope of the investigation and the degrees of freedom (Miles and Huberman 1994, Patton, 2002). Multiple case studies provide a more rigorous and complete approach than single case study research due to the triangulation of evidence (Bonoma 1985; Eisenhardt 1989; Tsoukas 1989; Yin 1993; Yin 1994; Stake 1995).

The limitations of case studies have well documented in the textbooks (Silverman, 2011 & 2005; Yin, 1994). Because a case study focuses on a single unit, a single instance, the issue of generalizability appears larger than other types of qualitative research (Liamputtong, 2009). Case studies are also limited by the sensitivity and integrity of the investigator as the researcher is the primary instrument of data collection and analysis. Further limitations of case studies involve the issues of validity and reliability.

5.2.4 Validity of the Research

A research needs to be judged by its validity. There are two dimensions to validity: internal and external validity. The former refers to the degree of certainty that observed effects in an experiment are actually the result of the experimental condition or cause, rather than intervening, extraneous, or confounding variables. In other words, it can be concluded that whether the independent variable produces the differences observed (Dixon-Woods, Sha, Agarwal and Sutton, 2002). A research study also has internal validity if the research design sustains the causal conclusions that the researcher claims for it. Internal validity is the extent to which the structure of a study instrument enables the researcher to draw clear conclusions from the results (De Vaus, 2002). Therefore, the more the structure of a study eliminates alternative interpretations for findings, the strong its internal validity.

External validity is concerned with the degree to which research findings can be applied to the real world, beyond the controlled setting of the research. In this study, the real world is rural commercial banks in China, the largest developing country in the world where the capital market and financial institutions are in the stage of development and transformation. As noted in previous chapter, RCBs have different characteristics from other city large commercial banks and they operate in an environment that is different from the ones where large city commercial banks operate. The development of credit risk management framework for RCBs will take into account these environments.

The application of the research findings to a wider context is the issue of generalisability. There are two types of generalisation: statistical and theoretical (De Vaus, 2002). Statistical generalisation can be obtained by using representative random samples and its results can be applied to a wider population. Theoretical generalisation involves generalising from a study to a theory, rather than to a population. It relies on the logic of replication. The logic of replication lies at the heart of experimental and case study research. Cohen and Manion (1980) indicated that an experiment cannot be externally valid without internal validity, but an internally valid experiment may or may not have external validity. In other words, a study may have good internal validity but its results may not apply to other groups, setting and situations.

According to De Vaus (2002), there are three basic ways to assess validity: criterion validity, content validity, and construct validity. Criterion validity is built when the way people rate the new measure is consistent with established measure. However, criterion validity has two limitations: first, the established benchmark has to be valid, and second, there are no established measures for many social science and business concepts. Content validity assesses how well the measures tap the different aspects of the concept as defined. However, it is difficult to develop measures that have agreed validity given the disagreement about the content of many social science and business concepts. In this research, the author is also facing this difficulty. Many variables (such as relations, *guanxi*, expectations) identified cannot be measured. Construct validity refers to how well the result obtained from the use of the measure fit with the theoretical expectations. Nevertheless, the approach relies on the correctness of the expectations. In fact, there is no ideal way of testing validity and the validity of a measure depends on how a researcher defines the concept that is to be measured. In practice, the measurements often include errors; people can define a variable one way one day and provide a different definition the next day, which calls into question the reliability of the measurement used. If the same result can be obtained on repeated occasions, that is a reliable measurement.

5.3 Research Methods Used in Credit Risk Analysis

In prior studies, the credit risk management research has mainly employed quantitative research with the utilisation of statistical analysis (Matthews, 2013). A number of methods have been used to develop credit risk management models, including, for example, discriminant function analysis, regression analysis, principal component analysis and factor analysis.

5.3.1 Discriminant Function Analysis

Discriminant function analysis is a statistical analysis to predict a categorical dependent variable (called a grouping variable) by one or more continuous or binary independent variables (called predictor variables). It is a multivariate analysis which is more used for classifying certain observations into various categories. Discriminant function analysis is used to determine which variables discriminate between two or more naturally occurring groups. Discriminant function analysis undertakes the same task as a multiple linear regression by predicting an outcome. However, a multiple linear regression is limited to cases where the dependent variable is an interval variable so that the combination of predictors will through the regression equation produce estimated mean population numerical values. But many interesting variables are categorical, such as membership of a political party, default or not, taking risk or not, which customers are likely to buy a product or not buy, whether a SME is in a high credit risk or not, etc. Discriminant function analysis is used when: the dependent is categorical at interval level such as age, income, attitudes, perceptions, and years of experience, although dummy variables can be used as predictors as in multiple regressions. Given the characteristics of data and availability for credit risk assessment by RCBs, the discriminant function analysis cannot be applied.

5.3.2 Logistic Regression Analysis

The word "regression" was first introduced by British biologist F. Galton in the 19th century in a genetic thesis. The theory then was proved by statistician K. Pearson. Since the 1960s, the approach of default probability has been well developed in the calculation and valuation of credit risk. Credit rating based on the modelling of financial report index (explanatory variable) became the mainstream in both academic

and practical fields. The idea of regression analysis is to estimate or predict the scores of one dependent variable from one or more independent variables, It can be used to determine the minimum number of a set of independent variables which is most strongly related to the dependent variable and also to estimate the percentage of variance in the dependent variable explained by those independent variables. However, there are some problems with regression models. For example, a fundamental problem of regression analysis is that one needs to have a pretty clear idea of the independent variables used in the analysis. If independent variables used are highly correlated, the issue of multicollinearity could occur and it may impair the statistical significance of variable independent variables.

Since the 1980s, logistic regression analysis gradually replaced the traditional discriminant analysis which was used by Altman to build up the Z-score model in the 1970s. Logistic regression method is not only convenient and flexible, but also many of its assumptions are more in line with realities and the distribution of financial data. For instance, it does not require a model with a linear relationship between the variables, does not require variables to obey the same covariance matrix and residuals follow a normal distribution, etc., which makes the results more objective analysis of the model. A large number of empirical studies have shown that logistic model estimation results and the actual data fit better. Several previous studies have used logistic regression model in credit risk analysis. For example, Martin (1977) set up logistic regression model to predict the default of companies and the default rate. Madalla (1983) adopted the same approach to discrete default and nor default loan applications.

5.3.3 Principal Components Analysis

Principal components analysis (PCA) is one of the best known and most used multivariate exploratory analysis technique. PCA is a mathematical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. PCA is a method of data reduction. Suppose that there are a dozen variables that are correlated. A researcher might use PCA to reduce these 12 measures to a few principal components. The researcher may be most interested in

obtaining the component scores (which are variables that are added to the data set) and/or to look at the dimensionality of the data. For example, if two components are extracted and those two components account for 72% of the total variance, then two dimensions in the component space account for 72% of the variance. Unlike factor analysis, PCA is not usually used to identify underlying latent variables. Hence, the loadings onto the components are not interpreted as factors in a factor analysis would be. Nevertheless, PCA, like factor analysis, can be performed on raw data or on a correlation or a covariance matrix (Shih et al., 2007; Hotelling, 1933). If raw data is used, the procedure will create the original correlation matrix or covariance matrix, as specified by the user. If the correlation matrix is used, the variables are standardised and the total variance will equal the number of variables used in the analysis (because each standardized variable has a variance equal to 1). If the covariance matrix is used, the variables will remain in their original metric. Unlike factor analysis, which analyses the common variance, the original matrix in a PCA analyses the total variance. Also, PCA assumes that each original measure is collected without measurement error (Shin and Kilic, 2006). Appendix I provides the details of procedure of PCA.

The key issue to address in applying PCA is to determine the sample size.[33] PCA is a technique that requires a large sample size. PCA is based on the correlation matrix of the variables involved, and correlations usually need a large sample size before they stabilise. A variety of rules have been recommended for the choice of sample size required to construct a sound solution when performing component analysis. The most popular rules suggest that sample size be determined as a function of the number of variables. These rules, however, lack both empirical support and a theoretical

---

[33] Unfortunately, there are few sample size guidelines for researchers using PCA, and many of these have minimal empirical evidence (e.g., Guadagnoli and Velicer, 1988). This is problematic because statistical procedures that create optimized linear combinations of variables (such as multiple regression, canonical correlation, and PCA) tend to "over-fit" the data. This means that these procedures optimise the fit of the model for the given data; yet no sample is perfectly reflective of the population. Thus, this over-fitting can result in erroneous conclusions if models fit to one data set are applied to others. In multiple regression this manifests itself as inflated R^2 (shrinkage) and mis-estimated variable regression coefficients (Cohen and Cohen, 2002). In PCA this "over-fitting" can result in erroneous conclusions in several ways, including the extraction of erroneous factors or mis-assignment of items to factors (e.g., Tabachnick and Fidell, 2001, p. 588).

rationale.[34] In multiple regression texts, some authors (e.g., Pedhazur, 1997, p.207) suggest subject to variable ratios of 15:1 or 30:1 when generalization is critical. But there are few explicit guidelines for principal components analysis (Baggaley, 1983). Two different approaches have been taken: suggesting a minimum total sample size, or examining the ratio of subjects to variables, as in multiple regressions. As a rule of thumb, to obtain reliable results, the minimal number of subjects providing usable data for the analysis should be the larger of 100 subjects or five times the number of variables being analysed. Also, a bare minimum of 10 observations per variable is necessary to avoid computational difficulties. Nevertheless, larger samples are better than smaller samples (all other things being equal) because larger samples tend to minimise the probability of errors, maximise the accuracy of population estimates and increase the generalizability of the results.

5.4 Research Methods of This Study

5.4.1 Research Methods Justification for This study

Considering the characteristics and effectiveness of qualitative and quantitative research approaches along with the uniqueness of the research subject, this research adopts the qualitative research approaches in designing the credit risk management framework. A qualitative research approach was chosen for this study because of its greater exploratory nature and therefore its applicability to this research domain because it focuses "on gaining familiarity with the subject area" and gains "insights for more rigorous investigation at a later stage" (Collis and Hussey, 2003). This was essential in light of this study because there is very little research conducted in the area of credit risk management in RCBs in China and the unavailability of

---

[34] Guadagnoli and Velicer (1988) performed a Monte Carlo simulation to systematically vary sample size, number of variables, number of components, and component saturation (i.e., the magnitude of the correlation between the observed variables and the components) in order to examine the conditions under which a sample component pattern becomes stable relative to the population pattern. The test results demonstrated that, opposite to the popular opinions, sample size as a function of the number of variables was not an important factor in determining stability. The absolute sample size and component saturation were the most important factors. To a lesser degree, the number of variables per component was also important, with variables per component producing more stable results.

quantitative data. The researcher's aim was to fully understand, determine and describe the existing situation of credit risk management in RCBs, which goes beyond purely scientific restricting research.

As described previously, RCBs operate in a different environment and as a sector in China it is still at its infancy without much available data. Typically the customers of RCBs are rural SMEs and farming businesses operating in socio-cultural environments that are predominantly different to the western context that the literature has concentrated on. Limited information about their business failures and variables influencing their operations is available. For rural SMEs and farming businesses in China, reliable financial reports are not expected (Sun and Fan, 2012; Zhou, 2011; Feng, 2007). Also, as rural credit risk management is quite new in China, little is known about the current status of credit risk management and applying methods adopted by RCBs because there is a paucity of evidence and data in this area. Moreover, many related issues in rural credit risk management are non-quantitative and non-financial nature (Tsai, 2004). For example, RCBs rely to some extent on *guanxi* to get access to information and obtain the repayment of loans. Guanxi is a non-quantified factor involving networking of variables parties in a very complicated context (Su and Littlefield, 2001; Fock and Woo, 1998; Lou, 1997b). Therefore, research methods chosen for this study expects to be different from the predominant methodology and methods in this field (such as quantitative-based approached explained in the previous section).

The traditional approach to conclude bankruptcies of large corporate customers is to find the listed companies that disappeared from previous year in the disclosed financial report issued by stock exchanges. This approach has two major limitations when applying in the case of RCBs. First, it fails to distinguish company failure and company closure. As noted before, many SMEs are closed for other reasons, instead of being a failure. Second, the majority of SMEs are not listed companies and no information is available as to the publications of annual reports of SMEs from the stock exchanges.

The previous researches that adopt the quantitative methods have used at least 10 years data to meet the robustness of statistical model requirement. For example, Altman (1968) investigates the failures of 33 companies during the period from 1946-1965; a data series of 20 years was collected. Other studies (such as Frecknall-Hughes, Simpson and Padmore, 2007; Cudd and Duggal, 2000; Mcleay and Omar, 2000; Ohlson, 980; Edmister, 1972; Beaver, 1967) of predicting company bankruptcies were all based on at least 10-year data to meet the robustness of statistical model requirements. RCBs, however, began very recently in China. The first rural commercial bank (the case bank - Zhangjiagang Rural Commercial Bank) was found in 2001. In many cases, the financial data and credit risk information of SMEs are not readily available. Many RCBs have the difficulty to collect accurate data for their credit analysis at the moment.

Applying the three criterions recommended by Kumar (1999) (i.e., 1) the purpose of the study, 2) how the variables are measured, and 3) how the information is analysed) and taking into account the characteristics of RCBs in China, this study is going to adopt qualitative research methodology. More specifically, it will use interviews and case study as research methods to generate qualitative data for analysis.

5.4.2 Research Design

Apart from literature review and document analysis, overall there are two elements of research design for this research in general: firstly, credit risk valuation models are introduced and analysed with a view to identifying if the models can be applied in China's RCBs. This is accomplished through the literature review and interviews. Secondly, the construction of credit risk management framework for RCBs will be based on the analysis of various risk factors affecting the failure of the major customers of RCBs. The development of credit risk management framework for RCBs is initially based on the literature review and re-confirmed through interviews and a case study. These risk factors that are included in the framework are categorised into four clusters: environmental, financial, operational, and guanxi risk. These factors reflect the perceptions of the various stakeholders involved in credit risk management through the case study. Different from the previous literature, this

dissertation considers both financial data and non-financial data in analysing credit risk. It recognises the importance of non-quantitative variables in the analysis.

As the aim was to understand what has been adopted by RCBs to manage their credit risks and what are the factors will be required to be analysed, a qualitative interview seem to be most promising. To send out questionnaires to RCB managers engaged in SMEs credit evaluation and lending was not expected to be expedient. This is due to the factor in China questionnaires are very difficult to conduct and low response is expected. Questionnaires have rarely been answered by the persons researchers have addressed. However, it was considered to be very important to get in contact to those persons in RCBs that are involved in making credit evaluation and assessment decisions and that have closest contacts with rural SMEs. Therefore, a qualitative interview approach has been chosen.

5.4.3 Interviews

There were a variety of options available for collecting research information. However, due to the fact that there was little pre-existing theory on the phenomena being studied and as the researcher needed to focus on a qualitative methodology, the data collection technique needs to "emphasise meanings and experiences related to the phenomena" under investigation (Collis and Hussey, 2003). To obtain a more comprehensive picture about the credit risk management in China's RCBs, it is necessary to learn from the professionals about the bank's use and motivation for the use of existing credit risk management approaches and factors that they consider when they evaluate credit of a client. This can best be done by conducting semi-structured interviews. This is underlined by Saunders, Lewis and Thornhill (2009, p.324), "Where it is necessary for you to understand the reasons for the decision that your research participants have taken, or to understand the reasons for their attitudes and opinions, you are likely to need to conduct a qualitative interview."

Semi-structured interviews are non-standardised and allow to directly reacting to the answers given. Even if a guideline with subjects and questions that have to be covered exists, the interviewer is free to change the order of questions asked, broach a subject again, and add or omit questions depending on the interview situation (Saunders et al.

2009; Bryman and Bell 2007). The interviews were carefully prepared. After an appointment was fixed, every participant received a short list of the main interview subjects as well as a short description of the research aim. This was something most participants expressly asked for when they were invited for an interview. The short description gave the participants the opportunity to prepare for the interview and collect useful information in advance if necessary. An interview guide was prepared to facilitate the interview for the interviewer and to reduce the risk of forgetting subjects. The interview guide followed a logical order beginning with general questions that were considered to be easy to answer. Nevertheless, it was not considered as mandatory order to ask these questions. The order of subjects discussed with the participants varies according to the individual process of every interview. The translated interview questions of this research project are attached in Appendix II.

To save the interviewee's time and costs, the interviews are conducted in their own offices. This is where they feel the most comfortable and where they may have access to every data needed. A central aim within the first few minutes is to establish the researchers credibility and to gain the interviewee's confidence (Saunders et al. 2009; Bryman and Bell 2007). Therefore, every interview starts with a short explanation of the research aim and an introduction of the interviewer. This is intended to signal the existing knowledge of the researcher and his background including the current study at Edinburgh Napier University. The aim is to ensure to the interviewees that technical terms can be used and will be understood by the researcher. It also illustrates the researcher's awareness of the sensibility of information given and the existence of the bank security. It was explicitly emphasised that all information will be treated absolutely confidentially (Saunders et al. 2009; Daniel and Sam, 2012). As interviewees are not comfortable with the use of an audio-recorder, the researcher takes individual notes during the interviews. The importance of the participant's knowledge for the research is also underlined by finishing every interview with asking the interviewee other important issues. This is also aimed to make sure that no important points were missing (Harvey 2011). After the interview, any further clarifications are conducted only through subsequent e-mail and telephone conversations because the researcher was based in the UK.

According to semi-structured interviews data quality is an important issue. Data quality on qualitative research is especially related to reliability and validity (Liamputtong, 2009; Saunders et al. 2009). Reliability in semi-structured interviews is concerned with whether two or more interviewers would receive identical responses from one interviewee. Since the particular advantage of semi-structured interviews is the opportunity to react flexible on special circumstances and interview situations, the attempt to ensure reliability is not really feasible. In semi-structured interviews, reliability is always related to issues of bias (Saunders et al. 2009). There are two types of bias that might occur when conducting semi-structured interviews: interviewer bias and interviewee or response bias. The interviewer might create bias in the way of interpreting responses of interviewees as well as in the way of asking questions. To reduce this type of bias, the interviewer has always tried to avoid enforcing his own beliefs and thought about the research topic when asking questions. Moreover, it was considered to be important to prevent influencing answers by the sound of the voice, comments or non-verbal behaviour. As opposed to interviewer bias, response bias is not necessarily related to the interviewer. Interviewees may "govern" their responses (Saunders et al. 2009). They might endeavour to throw a positive light on their bank and department/section, their credit risk management practices, and therefore depict their risk management and risk management method in a more positive way. Due to the bank secrecy, they also might withhold some information considered as being sensitive. To reduce this risk to a minimum, the creation of a relationship of trust between the interviewer and the participants as well as the proof of the interviewer´s credibility and the assurance of confidentiality has been considered as essential in the present research. Nevertheless, response bias cannot be eliminated with absolute certainty.

Following Saunders et al (2009), in qualitative research, validity refers to the extent to which the researcher gains access to their interviewees' knowledge and experience, and is able to infer a meaning that the interviewee intended from the language that was used by this person. The opportunity to probe questions, discuss and clarify responses in semi-structured interviews leads to a high degree of validity of this type of research. Therefore, validity of semi-structured interviews is not really an issue when they are conducted carefully (Saunders et al. 2009).

The researcher approached the case bank through a connection with one of the non-executive directors. The non-executive director recommended a number of potential interviewees. Initially 15 individuals were recommended of involving in different sections of the bank with experience and knowledge in credit risk management. Due to the time constraint and availability, only eight individuals were interviewed over the period of four days when the researcher visited the bank in August 2010. All these eight interviewees occupy senior positions in the bank with at least seven years of working experience in the banking sector as shown in Table 5.1. All the interviewees who were from different departments/sectors in the case bank were considered in a right position to provide reliable responses to the interview questions.[35]

All interviews have been conducted in Chinese as this is the primary language of all interviewees. The transcription and the analysing of the data has also been conducted in Chinese to avoid the time consuming translation in English as well as to avoid distortions of the data (Bryman and Bell, 2007). For writing up the research, those sentences that are directly cited have been translated into English language from Chinese. Each interview lasted approximately one hour and was conducted in the bank offices. The researcher felt that in choosing this approach it ensured maximum quality and reliability of data and therefore allowed for subsequent accurate analysis of the data. The semi-structured interviews ensured that the researcher maintained control over each interview, without discouraging the discussion of any valuable, additional information. The details of the interviewees and the interview dates are given in Table 5.1.

Table 5.1 The details of interviewees

	Gender	Year of Work Experience in Banks	ZJGRCB Organisation or Department	Interview Date and Time
Interviewee 1	M	8	SMEs department	August 24, 2010 (15.00- 16.00)
Interviewee 2	M	7	Operating	August 25, 2010

---

[35] The representatives of the interviewees in the case bank are shown in Figure 5.1.

			department	(9:30 – 10:20)
Interviewee 3	F	12	Credit approval department	August 25, 2010 (11.15- 12.05)
Interviewee 4	M	8	Risk management committee	August 25, 2010 (13:00 – 14:50)
Interviewee 5	M	15	Board of directors	August 25, 2010 (15:00 – 16:00)
Interviewee 6	M	18	Board of directors	August 26, 2010 (10:00 – 10:55)
Interviewee 7	M	8	Loan approval committee	August 26, 2010 (11:00 – 12:00)
Interviewee 8	F	7	Loan office	August 26, 2010 (14:30 – 15:45)

5.4.4 Documentary Analysis

The research also uses the case study approach to investigate the credit risk management issues faced by RCBs. The case study is to provide empirical evidence through document analysis to support the argument of this study and to gain perceptions of key players with regard to the appropriateness of the proposed credit risk management framework.

The literature has well documented the advantages and limitations of case study approach and their applying conditions (Yin, 1994). Single case studies have been justified as an appropriate method for theory development (Eisenhardt, 1989; Stuart et al., 2002) and it fits well with the circumstance of this research project.[36] Document analysis is a social research method and is an important research method, involves reading and analysing lots of written material (e.g., contents analysis). In this case study, documents that were analysed include the case bank's audit committee reports, risk management committee reports, risk management manuals, and annual reports. Content analysis was predominately adopted in document analysis. Content analysis is one of the most commonly used research methods in business discipline and it is a research technique for making replicable and valid inferences from data to their

---

[36] It is quite difficult to get access to commercial banks for research due to the nature of the business. Due to connections with the senior manager of this case bank, the research has obtained a permission to gain access to the bank for interviews and using the bank's documents and reports.

context (Krippendorff, 1980). The details of content analysis and its advantages and disadvantages have been well discussed in research method textbooks (e.g., Daniel and Sam, 2012; Bryman and Bell, 2007; Neuendorf, 2002; Weber, 1990; Krippendorff, 1980). As the researcher was not familiar with any computer system that can conduct content analysis for Chinese language documents, all the contents analyses in this study are carried out manually.

The case bank is ZhangJiaGang Rural Commercial Bank (ZJGRCB) that was founded on the 27th of November 2001 in Jiangsu province. It was also the first rural commercial bank established by the credit cooperatives. It is a local joint-stock commercial bank. The government does not hold shares in ZJGRCB. All shares are held by local private enterprises, individual businessmen, bank staff and farmers.[37] It now has 36 branches, one operation centre, and 55 sub-branches and offices. It also has established branches and offices beyond ZhangJiaGang city. By the end of 2012, total assets of the bank reached RMB 70.2 billion Yuan. The total balance of deposits in the bank was RMB 43.1 billion Yuan and the total amount of loans to the public and local businesses was RMB 30.1 billion Yuan. The focus of the Bank's main business and services is on supporting prime SME customers and "*Sannong*" business. The organisational structure of ZJGRCB is presented in Figure 5.1.

ZJGRCB's corporate governance structure fully reflects the principles of the decentralisation of share ownership, the separation of property rights from managerial rights, and the responsibilities and risks assumed by the corporate body and the shareholders. The operating mechanisms of ZJGRCB are more flexible with strong competitiveness on the local financial markets. Appendix III provides a summary of the financial statements of ZJGRCB over the years of 2006-2011.

---

[37] The corporate shareholders of the bank are all private enterprises. For example, the main corporate shareholder of ZJGRCB is Jiangsu Guo Tai Guoji Group Ltd., which is a provincial-level foreign trading enterprise and one of the 23 key provincial enterprises. Its exports account for nearly one-half of the city's total.

Figure 5.1 The organisational structure of ZJGRCB (and the representatives of interviewees)
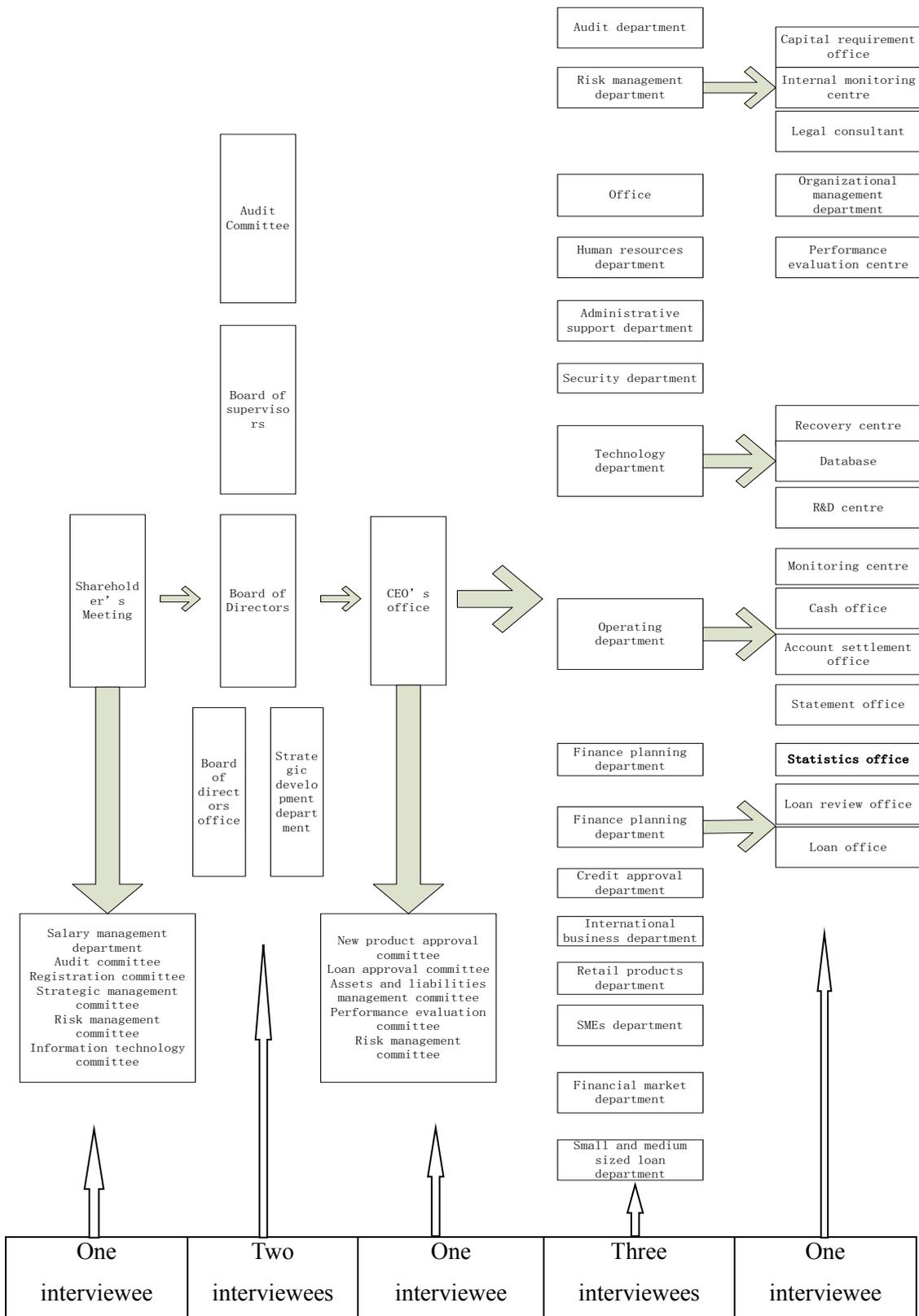
Over the past few years, ZJGRCB has actively expanded their business and supported those private SMEs that are profitable and have growth potential. Meanwhile it has also taken positive steps to develop intermediary business and nurture new sources of profit growth. The Bank has a risk management committee under the board of directors. Risk management committee is responsible for setting the overall risk management and internal control strategies of the Bank, monitoring credit risk, market risk, liquidity risk and operation risk, periodically assessing the overall risk position, risk acceptance and management capabilities, and making recommendations and suggestions on risk management and internal control of the Bank.

5.5 The Proposed Credit Risk Management Framework

5.5.1 Proposed Credit Risk Management Framework

Figure 5.2 provides the proposed credit risk management framework for China's RCBs. The design of this framework is mainly based on the following considerations.[38]

Figure 5.2 Proposed credit risk management framework for RCBs.

---

[38] In the next Chapter, more detailed analysis and supporting evidence from practitioners will be presented.

```
┌─────────────────────────────┐
│        Step one:            │
│  Distinguish business failure│
│       and closure           │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│        Step two:            │
│  Identify factors influencing│
│          failure            │
└─────────────────────────────┘
```

Environmental	Operational	Financial	Guanxi

```
┌─────────────────────────────┐
│        Step three:          │
│  Apply PCA to measure the   │
│    influence of variables   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│        Step four:           │
│   Identifying principal     │
│  factors/variables and credit│
│        risk model           │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│        Step five:           │
│  Based on the model, measure │
│   and manage credit risk    │
└─────────────────────────────┘
```
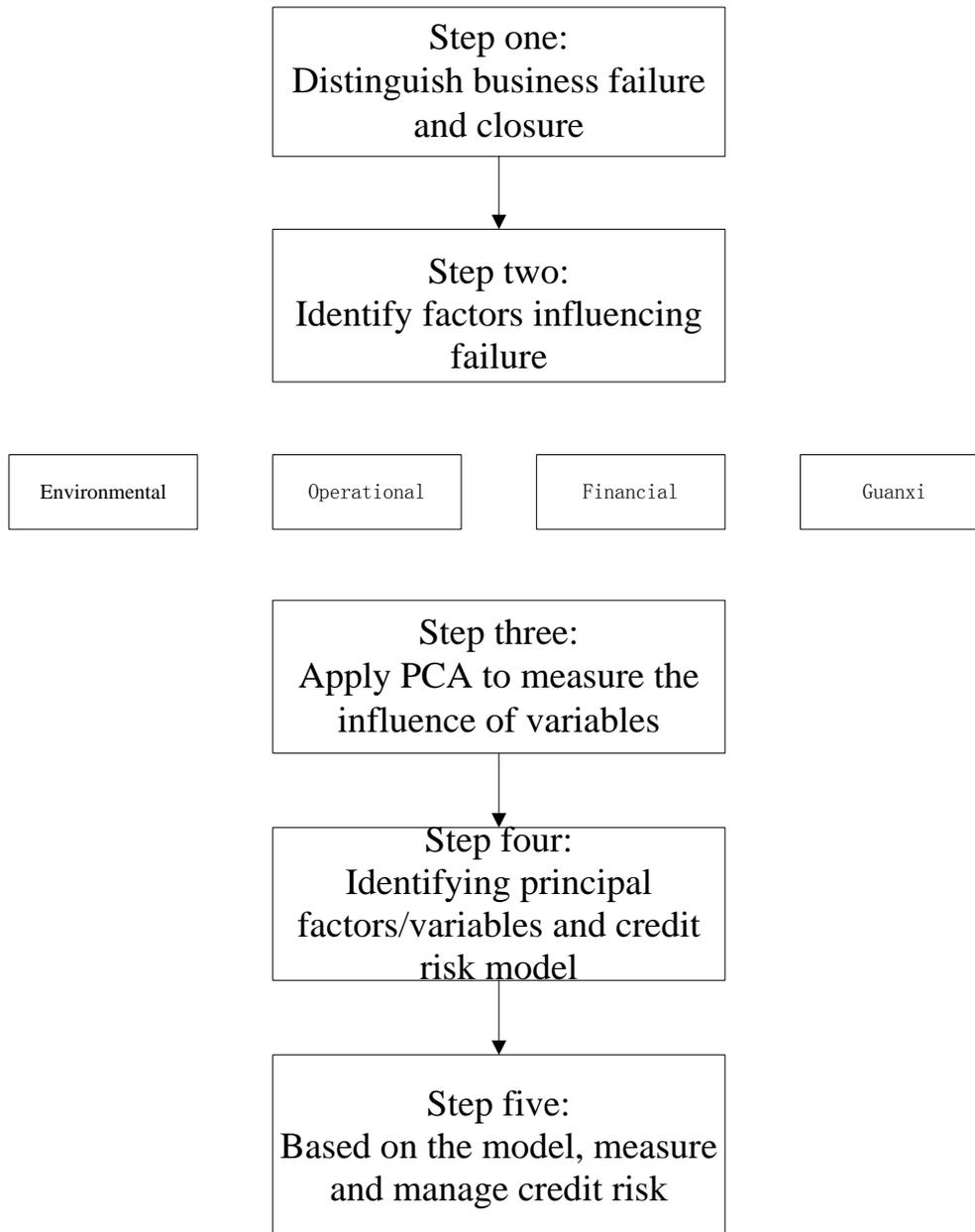
First, the distinguishing of business failures from closure is made in the framework
model. In analysing the failure of rural SMEs and farming businesses it is extremely
important to separate failures from closures. Watson and Everett (1993 & 1998)
observe that closing firms could have been financially successful but closed for other
reasons: the sale of the firm or a personal decision by the owner to accept

employment with another firm, to retire or the like. To define failure they create five categories: ceasing to exist (discontinuance for any reason); closing, or a change in ownership; filing for bankruptcy; closing to limit losses; and failing to reach financial goals. Headd (2003) finds that only one-third of new businesses closed under circumstances that owners considered unsuccessful. In the proposed framework, it is essential for RCBs to carry out this kind of analysis before starting to develop a default prediction model on their SMEs and farmer clients. Indeed, separating the cases of closure from the ones of failure improves the quality of the available information and of the prediction power of the model, thereby helping to exclude possible outliers from the sample and avoiding biases. In the credit analysis, RCBs should take into account only business firms and farmer clients that entered into liquidation, administration or receivership. In credit risk analysis, the focus should be on the cases of failure. As noted before, there are so many business closures of SMEs and farming households due to various reasons. Business closure does not mean the failure.

Second, non-financial data is important for RCBs to assess the credit risk of SMEs and farming household. The literature has well recognised the importance of non-financial factors in assessing the creditability and performance of small firms (e.g., Frecknall-Hughes et al., 2007; Berger and Udell, 2002; Keasey and Watson, 1987; Edmister, 1972). For many traditional quantitative models, the accuracy of credit analysis is mainly depending on the amount and quantity of financial information. In the case of the SMEs, the lack of financial information is a significant limiting factor in applying traditional quantitative-based models (Frecknall-Hughes et al., 2007). Given the poor quality of financial information from rural SMEs, in the development of credit risk management model it is vital to consider non-financial factors.

Third, the key characteristics of SMEs doing business in China need to be incorporated into the framework model. As explained in previous chapter, Guanxi has been identified as a key feature of doing business in China (Seligman, 1999; Lou, 1997a); this is even more important for SMEs. The success of a business depends to a large extent on the network of relationships (or guanxi) (Fock and Woo, 1998; Yeung

and Tung, 1996). Therefore, in the proposed framework model, guanxi is considered an important part of the factors that influence the failure of a SME business.

Fourth, it is important to identify the key factors in applying the framework as there are many factors and their interactions, which can cause difficulty to gain a true picture of the performance of SMEs (Liu and Saleh, 2009). Although there are many ways to choose key factors, principal components analysis (PCA) has been widely known as a useful tool to select key factors (Shin and Kilic, 2006; Hotelling, 1933). In this proposed framework model, PCA is suggested to be used. Meanwhile the limitations of PCA should be recognised and it is possible for RCBs to use other alternatives in the process of choosing key factors in the analysis.

Following the above consideration, the proposed credit risk management framework is profiled as Figure 5.2 involving five steps. The first step is to differentiate business failure from closures. The second step is to identify factors contributing to the failures, which are mainly related to environmental, operational, financial and guanxi aspects. Some factor may appear in one case, but not in other cases. RCBs should be able to identify the principal factors by using PCA or other methods. This is the third step. Based on the key factors, RCBs should design credit risk analysis models with a focus on the analysis of these factors (step four). The final step is to use the credit risk analysis model to manage credit risks of their portfolios and individual loans.

The key to the effectiveness of any model is the quality and quantity of information. The literature has highlighted the utility of qualitative variables in risk analysis. Many authors complemented the traditional statistic models based only on financial ratios adding some qualitative factors of firms and their owners into the MDA and logistic analysis. For instance, Von Stein and Ziegler (1984) examine the impact of managerial behaviour on business failure. Cooper, Gimeno-Gascon and Woo (1991) find that educational levels of managers, experience, capital gained were all the cooperation's resource, which can influence the business failure. Lussier and Pfeifer (2001) argue that the capital, managerial level, the cycle of economy and production, owner's age should be considered in the predicting models of business failure. It is necessary to combine the age, type of business and industrial sector etc. with financial

ratios (Grunert et al, 2004). However, the above studies did not focus on SMEs clients and a very limited amount of qualitative information was analysed and used for modelling purposes.

There is a large number of possible candidate ratios identified in the literature as useful to predict firms' default. The literature (e.g. Lehmann, 2003; Grunert et al., 2004) recognises that quantitative variables are not sufficient to predict SME default and qualitative variables (e.g., the number of employees, the legal form of the business, the region where the main business is carried out, the industry type, etc.) should be considered along with quantitative variables in predicting the failures of SMEs.

5.5.2 The Development of Interview Questions.

Once the model is designed, this study seeks the views from practitioners to confirm the applicability of the model and justify the key factors adopted in the model. As explained in the earlier section of this chapter, interviews are used along with the case study as the empirical part of this project. There are eight interview questions which cover broad issues of the key elements of the framework model. The interview questions were mainly developed following the literature review, the research objectives of this study and the proposed framework as explained in the previous section. It was the intention of the researcher that interview questions should not be too specific; as this would leave room for the interviewees to raise new questions and discuss other relevant and important issues, which can be used to refine the model. The eight questions can be categorised into six groupings matching the key aspects of the proposed framework model. In the interviews, the order of these questions was often adjusted to suit the flow of conversations. The wording of these questions was also changed in accordance with the interviewee's responses to the previous question. For example, an interviewee considered business environment was very important for predicting business failure. Then the question could be formed as "you just mentioned the importance of business environment, can you please identify some of the key factors or risks relating to business environments?" (Question 3). Table 5.2 shows the connections between the key aspects of the framework and the interview questions.

Table 5.2 Connections between the framework and interview questions

Key Aspects of the Framework Model	*Interview Questions*
• The general weakness of the existing quantitative credit risk management model and major areas to consider for RCBs in assessing clients' credit risks	1. In your view, what are the major weaknesses of the existing credit risk management models? 2. For rural commercial banks, like yours, what would be the major areas to be considered to assess your client's credit risk?
• Business environment aspects	3. Can you identify some of the risks in this area (business environment)?
• Operating aspects relating to SMEs	4. Can you identify some of the risks in this area (operation)?
• Financing aspects relating to SMEs	5. Can you identify some of the risks in this area (financing)?
• Chinese characteristics	6. Can you identify some of the risks in this area (more specifically relating to Chinese characteristics)?
• Expectation and other general issues for credit risk management framework	7. What would you expect for a credit risk management framework for RCBs? 8. Any other issues

In this study a framework for RCBs to manage credit risk analysis is proposed. The framework is profiled in Figure 5.2. The framework is divided into five steps as explained in the research methods chapter. Taking into account the features of SMEs in China (Lu and Tao, 2010; Li and Matlay, 2006), the variables addressed in this study of environmental, operational, financial and guanxi clusters will use both the quantitative and qualitative indicators in order to provide a more sophisticated measurement towards the failures of SMEs and farming household clients. The qualitative indicators adopted are based on both previous literatures mentioned and the availability under the accounting and disclosure regulation imposed by the Chinese authorities. The qualitative indicators are designed to better portray the characters of SMEs and farming household clients. Some variables (these in the quanxi cluster, for examples) are difficult to be quantified and in the PCA analysis they should be considered as dummy variables or assumed scores. The scores need to be based on survey data (e.g., questionnaires and interviews) and experience.

Information from local newspapers and press is also an important source in gathering some of guanxi and operational variables about SMEs.

Our proposed approach has the advantage that it does not rely solely on firm-specific accounting data which are at best noisy and at worst biased due to the information asymmetries between SMEs and RCBs. Local business administrations and trade associations are likely to have access to private information about the firm's past performance and its current management, in addition to public information from balance sheets and company reports, in arriving at their firm-specific credit assessment and evaluation. Moreover, basing the analysis strictly on accounting data would make it difficult to harmonize information across firms adopting different accounting rules and practices. This is even more serious for rural SMEs and farming households as they usually do not adopt the same accounting method. In the proposed framework the business failure is driven by firms' four categories of risk exposures, which determine their creditability and the ability of SMEs and farming households to repay loan principals and interests on time. The four categories can be summarized as: environmental risk, operational risk, financial risk and guanxi risk. Details will be explained in section 6.3.

These four risk clusters and their variables/factors are the key aspects to be considered for SMEs credit analysis. For example, operational risk of SMEs and farming households has been considered one of the major risk clusters to be considered for RCBs with regard to the assessment of credit risk of an individual loan and a portfolio of loans. Due to the nature of SMEs and lacking of data, SME failure rates are very often difficult to track properly, despite in the past decades, considerable research (see, for example, Phillips and Kirchhoff, 1989; Watson and Everett, 1993 & 1998; Headd, 2003) has been conducted to determine the rates and causation of such failures. The proposed framework model reflects the difficulties. The interview results reported below also illustrate the practical difficulties in quantifying some of the factors.

5.6 Summary

This chapter has provided a detailed description of the research methodology of this study. It first explains the research methodology and research method, outlines the difference between qualitative and quantitative approaches, and discusses the validity and reliability of research methods. It then reviews the major research methods used in credit risk management in the literature. Prior credit risk management research has mainly adopted inductive approaches with a focus on the development/test of a credit risk valuation model. The data of the analysis was mainly quantitative and market-based. This chapter further describes the research method of this study with justifications and provides the details of interviews and case study adopted for this study. It finally provides the design of a credit risk management framework with a discussion of key considerations in developing the framework. Following the proposed framework, the interview questions are developed with a view to seeking the perceptions from credit risk management professionals and managers on the applicability of the framework proposed in this study. The next chapter will report on the results of interviews and case study and validate the applicability of the proposed framework.

Chapter 6 Analysis of Results

6.1. Introduction

The previous chapter has provided a description of the research method for this study. Although there are many publications on credit risk management in general, little research can be found on credit risk management for RCBs. The existing literature has largely focused on the design and test of quantitative models for credit analysis, using market-based data from large financial institutions. This quantitative approach is not applicable to RCBs in China due to unavailability of data and lack of credit records. Therefore, an alternative approach should be considered for this study. This study adopts a qualitative approach to develop a credit risk management framework for RCBs presented in the last chapter.

The framework was mainly based on the literature and the consideration of characteristics of RCBs in China. Logically following the proposal of the framework it requires an acceptance and a confirmation from the professionals in RCBs with regard to the applicability of the proposed framework. For this purpose, interviews and case study are conducted to seek views from credit risk management professionals and managers working in RCBs on the applicability of the framework and particularity of credit risk management. This chapter reports the results of interviews and case study on the applicability of the framework and provides a qualitative analysis supporting the proposed credit risk management framework for RCBs.

6.2. A Review of the Proposed Credit Risk Management Framework

The recent financial crises have provided renewed impetus for RCBs to develop effective failure prediction models for all of the corporate and retail sectors of their lending portfolios. The literature on the modelling of credit risk for large listed companies is extensive and gravitates toward either of two approaches: the Z score approach of using historical accounting data to predict insolvency (see, for example, Altman, 1968); and models that rely on securities market information (see, for example, Merton, 1974). In city commercial banks, risk modelling can be undertaken using very large samples of high-frequency corporate data and combinations of in-house portfolio data (e.g., payment history) and data from the credit reference agencies to develop proprietary models (Stever, 2007; Wagner and Marsh, 2006; Treacy and Carey, 2000). RCBs are increasingly realising that their clients (mainly SMEs and farming households) are a distinct kind of clients with specific needs and peculiarities that require credit risk management tools and methodologies specifically developed for them. The problem of obtaining accurate information about the health of SMEs, while not new, is particularly relevant for modelling firms' bankruptcy or default.

Techniques for modelling business failure have long been applied as a means of assessing and quantifying the risk of public listed companies, and the research into failure rate prediction has focused almost exclusively on public listed companies and large firms (e.g., Shin and Kilic, 2006; Canbas, Cabuk and Kilic, 2005; Altman, 1968, 1993; Altman et al., 1977). Early research into corporate failure prediction involved determining which accounting ratios best predict failure, primarily employing multiple discriminant analysis (MDA) or logit/probit models. In most of these accounting ratio-based studies, ratios are calculated at a predetermined time before bankruptcy (usually one year) and as such these models are often referred to as static models.

Altman and Sabato (2007) apply a distress prediction model estimated specifically for the US SMEs based on a set of financial ratios derived from accounting data. They

demonstrate that banks should not only apply different procedures (in the application and behavioural process) to manage SME clients as compared with large corporate firms, but these organisations should also use scoring and rating systems specifically addressed to the SME portfolio. The lack of any non-financial and compliance information about the companies in the sample is a significant limiting factor, forcing them to exclude a relevant portion of small companies without accounting data. Other studies focus on the use of data other than accounting data. For example, von Stein and Ziegler (1984) examine the impact of managerial behaviour on failure.

6.3. Interview Results

Eight interviews were conducted with senior managers and credit risk management professionals at ZhangJiagGang Rural Commercial Banks. During the interviews, most interviewees expressed interest in this topic as they believed credit risk management is vital for the surviving of RCBs and over the past few years they were also exploring the best ways to assess and manage credit risk of their dominant customers - rural SMEs. They also felt credit risk management was a very difficult topic as it involved both technical and non-technical issues. The key difficulty is the lack of useful and reliable information and the existing models were initially not designed to be applied to the cases of customers and clients of small rural commercial banks. The interviewees were asked eight questions. Below are the results of the interviews of these questions.

1.   In your view, what are the major weaknesses of the existing credit risk management models?
The interviewees were firstly asked the major weaknesses of the existing credit risk management models. Most of the interviewees commented on the complications of the quantitative models and a large amount of data required for the models as the major obstacles for RCBs to apply the existing models. For example, a loan officer has made the following comments:

"When I attended trainings provided by university professors on credit risk management, we learned many quantitative evaluation models such as logistic

regression model, ZETA model. They look very good in theory, but when we try to apply them to real cases, we have so many problems. We don't have data to satisfy these models. Our customers are mainly small firms and some are very new – only two to three years old. They cannot give us any information that we believe longer enough to be useful. Also, these firms are quite subjected to non-financial factors. All the models we learned require use financial data. Clearly, the existing models cannot work effectively in our case" (Interviewee 3)

The same view of lacking of reliable financial data from SMEs and customers was also shared by other interviewees. Another difficulty mentioned is the complication of the existing models, which most employees in RCBs are not familiar with.

"In my view, the existing models are too complicated to be used. I have about 20 members of staff. Only 6 are university graduates. Most of us don't have a general knowledge of these models. We attended some training, but that wasn't enough for a good understanding of the models. Many of us came from 'wen-ke'[39] background – we are not good at mathematics and quantitative models. When we were introduced these models, we always abandoned them one week later" (Interviewee 8).

The problems identified have been referred by the academic researchers as reported in the literature review. Given the problems of complications and lacking of data, RCBs are expected to develop their own credit risk management system and model. This is the motivation for this study to look at the credit risk management framework for RCBs, which has been commended by the interviewees as an interesting and useful research for them. Interviewees also commented on the problem of existing models that was mainly based on the data from an advanced market economy exclusive of localities in a particular economy like China where capital market is still in the development stage and the government domination in the economy is strong. The existing model does not take into account macro-economic policy from the top level government. One interviewee criticised: "The existing models are too micro- and market-focused and they ignore the policy impact from the central authorities in our

---

[39] In China, high school students are normally categorised into two groups – 'wen-ke' students refer to those students focusing on social science and they intend to study social science related subject once they go to university; and 'li-ke' students are those students studying science related subjects.

case" (Interviewee 5). Following the first question, the second question was asked about the areas to be included in the assessment of credit risk of rural commercial banks' customers.

2.   For rural commercial banks, like yours, what would be the major areas to be considered to assess your client's credit risk?

Interviewees were asked about the major areas to be considered to assess their client's risk. For this open and very general question, interviewees provided wide views on these key areas, from political influence, to employees training, from product design to the usage of electricity. More generally, these areas can be categorised into four narrowed aspects relating to business environment, operation, financing and *guanxi* (reflecting one of the most important Chinese characteristics). Figure 6.1 shows the areas mentioned by the number of interviewees. Operation aspects were considered by the highest number of interviewees, followed by business environment and *guanxi* aspects. Two interviewees mentioned political influence which was categorised into business environment cluster.

> "One of the key areas, in my view, is the political influence. In China, the government dominates in our economy and the government has frequently changed its policy such as credit policy, financing policy for *Sannong*, rural development, housing policy and so on. When those policies change, many SMEs have to bear the consequences of these changes; some gains and some losses. This is going to affect the credit of our clients" (Interviewee 7).

Figure 6.1 Key areas identified by the interviewees

(Vertical xis represents the number of interviewees)
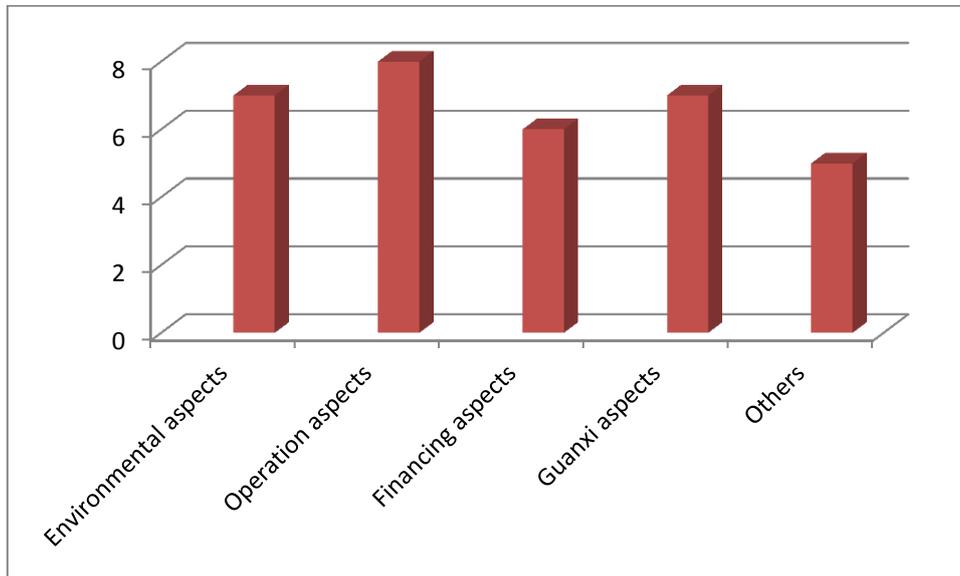
Natural environment that affects Sannong was also raised by three interviewees as key areas to be considered in assessing rural SMEs' credit. In many part of China, rural SMEs depend on natural environment and their business is heavily affected nature disasters (e.g., fishing, agriculture producers, foods and restaurants businesses). Therefore, it was suggested by these interviewees that SMEs need to be divided by the nature of their business in evaluating potential business failure and risk.

> "The clients that I am responsible for are mostly agricultural producers. The business of these firms depends largely on weather. Weather decides their product costs and output as well as the quality of their products. It would be far more useful if credit risk management model can include this factor; but we cannot predict accurately weather, how can we?" (Interviewee 1).

Because of the unpredictability of nature environments, the proposed framework does not include these factors. It is important in decision-making to consider the potential impact of these factors in evaluating the customer's business and risk (Huang, 2009).

3   Can you identify some of the specific risks in business environmental area?
The interviewees were further asked more specific risk relating to business environment aspects. The interviewees particularly stressed the importance of macro-

economic environments and their impact on SMEs in their business and financing. GDP was referred by all interviewees as the key external factors affecting the success of many rural SMEs. However, several interviewees raised the issue that GDP needs to be looked at in more depth as local GDP may not be the best indicator measuring the performance of local economy and local firms. Many local firms sell their products to other regions outside their own province. The case bank also carries out business beyond the local city. Other factors mentioned include globalisation, foreign exchange risk, interest rate, technology and licensing, governmental monetary and credit policy among others. Table 6.1 provides a list of these items mentioned by the interviewees.

Table 6.1 a list of risk items relating to the environmental aspect

Risk factors	No.	Risk factors	No.
GDP growth	8	Major economic, political and social	4
Interest rate	7	events,	
Foreign exchange rates	7	Customer expectations,	4
Monetary & government credit policy	6	Changing demographics	4
Export and local market	6	Supplier requirements,	4
Globalization	5	Increasing competition,	3
Alliances & partnerships	5	Organizational growth,	3
Technological advances	5	Fluctuations in business cycles	2
Licensing/franchising	5	Nature environment – weather etc.	2
Government laws and regulations	5	Attracting and retaining skilled workers	2
Distribution channels	5	Lack of risk management programme	2

((No. represents the number of interviewees who have mentioned listed risk factors)

The main external environmental triggers include, among others, government laws and regulations, globalisation of markets and the internationalisation of business, major economic, political and social events, technological advancements, customer expectations, supplier requirements, increasing competition, organisational growth, and fluctuations in business cycles. The changing demographics (e.g., due to the consequence of China's one-child family policy) and the challenges to SMEs in attracting and retaining skilled workers were also identified as one of the major challenges. The recruitment and retention challenge is complex for small business and

it is expected to continue over the long term. Demographic changes (e.g., only child in a family), specifically the aging workforce and the declining entrant pool, are occurring in China and SMEs are currently countering some of the impacts.

> "I knew a few clients having the difficulty to retain staff. Because we are not in a big city, many young graduates do not want to move over here to work. They come here, because they could not find job in big cities or they just want to gain some working experience. I was told last week by one of SME owners that he lost five key people over the past three months; he had to cancel some orders, because other stuff have difficulty to understand the technical side of the orders. This seems to be a major issue for many SMEs" (Interviewee 2).

SMEs and farming firms are facing the challenges raised from globalisation, increased customer expectations, technological advances, and increased competition.

> "Many SMEs in our region are export-oriented, depending on overseas markets. The foreign exchange rate has major impact on some of these firms, because they have very low margins. So foreign exchange rate is an important factor influencing the success of these firms. When we analyse our client's credit risk, we have to take into account the changes of foreign exchange rate" (Interviewee 4).

A lack of effective risk management programme in SMEs is also a major factor contributing the failure of many SMEs. One overriding factor that contributes to ineffective risk management in SMEs is a lack of infrastructure, risk management skills, human capital and adequate management knowledge and training (Alquiler and Tignol, 2006). Gao et al. (2013) acknowledge the limited risk management capability building in SMEs and SMEs are found to differ in technology, learning and training (Bryan, 2006). Lack of adequate education and qualification, higher staff turnover and negative attitudes of both owner-managers and employees towards the use of technology, learning and training seem to form important potential drawbacks to risk management capability building in SMEs in China (Gao et al., 2013). One interviewee commented:

> "Many SMEs in our region have no experience and expertise to manage risks – they don't have resources and capability to manage and trade-off risks. This is also one of the reasons causing failure of many SMEs. They don't have IT

support and adequate information system – how can they meet the challenges of innovation and technological advancement?" (Interviewee 5).

4   Can you identify some of the risks in this area (operation)?

The next question was asked about the specific areas in operation aspects. Operation aspects were considered by all the interviewees as the most important element in the evaluation of the client's credit. Table 6.2 list factors mentioned by the interviewees. One of the factors mentioned by all interviewees is the age and history of the firm.

Table 6.2 Factors relating to operation aspects identified by the interviewees

Factors	No.	Factors	No.
age of firm	8	legal form of the business	2
trade credit facilities	2	area where the main business is carried	
adequateness of business planning	3	out	4
compliance	6	the industry type	6
court case	6	company brands	1
late filing days	6	information systems & processes	2
auditor opinion	5	new product development	2
switching auditors	5	intellectual property	1
educational & work-related qualifications		type of contracts	2
of managers and employees	6	R&D	2
Leadership & top management quality	6	customer satisfaction	1
number of employees and diversity	2	employee satisfaction	1

(No. represents the number of interviewees)

"We consider the history and the age of a client as a key factor in assessing their creditability. The long the history, the better the business and we have more faith in them. If a small firm can survive more than 5 years from its initial establishment. It is likely this firm will have a period of stability and even growth in the next few years. We should give them more support if they meet our other requirements for loans" (Interviewee 3).

"For rural SMEs, it is important to check their history. Most of small firms in our region only survive two to three years. Once they have used their own resources and market does not recognise their services and products, they are

141

facing the risk of closures. So, we will not lend to these firms, unless they are in

the high technology sector or with strong government support" (Interviewee 2).

This is in line with the literature as often argued that newly established firms are likely to be less stress in the earlier stage of the business development. For example, Hudson (1987) suggests that a newly formed company is most likely to have a "honeymoon period" before being at real risk of failure as it takes time to build up problems and for creditors to get organised into formal insolvency proceedings. His main finding suggests that young companies form the majority of the liquidated companies and that a company needs at least nine years to be regarded as established (i.e., lower the default risk of a start-up). However, he also finds evidence that a newly formed company is most likely to have a "honeymoon period" of around two years.

Two interviewees recognise the importance of trade credit as an indicator of operation risks. If a firm has used substantially trade credit to support their cash flow; this type of firms is increasing facing the financial difficulties once the suppliers withdraw credit facilities (Petersen and Rajan, 1997). Indeed, SMEs often rely heavily on trade finance from suppliers when bank finance is not available to them. Moreover, small companies extend trade credit to customers as a means of gaining and retaining customers. The use and extension of trade credit makes the business vulnerable to cash flow difficulties.

"I often look at the figure of trade credit, but from both sides. One is the use of

trade credit provided by suppliers; the other is the grant of trade credit to

customers. A higher figure in any side can be some indication of potential risks

in business operation or/and financing" (Interviewee 1).

A potentially powerful addition to financial variables available on SMEs is the occurrence of "event" data, such as evidence of a company defaulting on credit agreements and/or trade credit payments or variables representing operational risk, and regulatory compliance, such as whether the firm is late to file its financial statements. CEOs have personal affairs and family problems which affect the normal operations of a business. In the case of China, personal affairs have been regarded as a serious ethical problem and often the person who is involved will be dismissed from

their position. Some of these "default events" are available on a monthly basis from a government agency and should be used to adjust risk scores more frequently than is possible with annual accounting data. The number of court cases against the firm is also a key indicator of potential failures. For example, a county economic court judgment (CECJ), which arises from a claim made to the court following the non-payment of unsecured debt, usually trade debt, can be a potential factor. Where the creditor's claim is upheld by the court, a CECJ is issued. This is an order from the court stating that the debt must be settled. After being issued, either a CECJ is satisfied or it remains outstanding. The accumulation of CECJs and/or CECJs against companies that are already showing signs of financial distress is likely to be an effective predictor of insolvency. Therefore, CECJs are better predictors of the likelihood of failure for SMEs than for very large companies. This may be due to the fact that certain companies often "abuse" their bargaining power and are slow payers, forcing creditors to apply to the courts. This is particularly the case when it is relatively easy to dispute invoices arising from trade credit agreements that are "incomplete contracts". County economic court judgments for firms that have adequate cash flow and liquidity may proxy "operational risk". Nonetheless, individual creditor claims via the court do not represent a bankruptcy risk for very companies.

Other examples of compliance information that employed in the analysis relates to the timeliness of the filing of accounts. This is represented, for example, by the late filing days. The late filing days is the number of days following the deadline of filing documents to certain authorities and relates to non-compliance with regulation. In most of the cases the late filing of accounts is likely to be an indicator of financial distress. A number of reasons, usually quite negative, can cause these delays. The late filing of accounts may be, for example, a deliberate action to delay the publication of unfavourable information in the event that companies face financial difficulties; a by-product of the financial difficulties a firm faces; or a result of the auditors and directors having disagreements regarding a firm's "true" financial position. The late filing of tax returns is likely to be an indicator of some problems in corporate tax disputes and uncertainties.

In audited accounts the auditor may document an opinion regarding the financial position of the company. The information contained in unaudited accounts is expected to be less reliable than information in audited accounts. Moreover, auditors are likely to be vigilant in identifying likely insolvency and in preventing "technically insolvent" companies from continuing to trade. Another potential variable is evidence of companies switching auditors. This may be indicative of disputes and disagreements with current auditors in relation to the financial health of the company. For detailed modelling purposes, RCBs should identify whether the accounts of a SME are audited and, if so, whether the auditor has expressed an opinion about the company in the audit report (i.e., an audit qualification). The above variables can be incorporated into the credit assessment model.

5.   *Can you identify some of the risks in this area (financing)?*

Interviewees were asked to identify risk indicators relating to financing aspects. This question is rather specific to accounting and finance and therefore most of interviewees provide very general comments. A number of indicators raised in the literature were not mentioned by the interviewees. Most interviewees consider working capital and cash flows as the key indicators of SMEs financing risks. For example,

> "… no doubt, working capital should be given the first priority in assessing the
> potential financial risk of a firm. In my experience, a firm shorting of working
> capital over three months can be in a danger position; okay if it is a few days or
> weeks; but any shortage continues for more than three months - this would be a
> very bad signal" (Interviewee 3).

Factors relating financing aspects are often measured with accounting ratios. For SMEs, working capital plays a key role in their business survive and success. Most of the interviewees stressed working capital as a key indicator of the credit worth of a client. It was also recognised by three interviewees that working capital is related to the types of firms and it would be wrong to have a benchmark level to fit all the cases. Depending on the nature of businesses, RCBs need to analyse the working capital level and future demand for working capital of a client to decide whether a loan should be granted.

Financing factors need to reflect the importance of working capital for the survival of SMEs firms and farming households (Ma, Wang and Gui, 2010). For example, trade creditors over trade debtors ratio is a very useful indicator of working capital level (Petersen and Rajan, 1997). The literature on trade credit suggests that smaller firms both extend more credit to customers and take extended credit from suppliers when facing decline and financial stress. Hudson (1986) argues that trade credit forms a large proportion of a firm's liabilities, especially for small firms. He proposes that small-firm bankruptcy is mainly influenced by trade creditors rather than bondholders. Therefore, the trade creditors' decision to force bankruptcy would depend on its customers' cash position (i.e., the difference between cash assets and the amount trade creditors are owed), its current indebtedness to the bank, its expected future profits, its liquidation value and interest rates.

Return on Capital Employed (ROCE) was widely used as an indicator of performance in large firms; however it can be limited in the case of small firms. Frecknall-Hughes et al. (2007) note that ROCE is a particularly poor indicator of performance in SMEs as it may be defined in many different ways giving rise to widely differing values of ROCE.

Working capital is considered as one of the most important variables in the financing cluster. A number of variables reflect a firm's working capital. The quick assets/current assets variable determines the extent to which current assets consist of liquid assets. The cash/total assets variable expresses cash as a proportion of total assets. The net cash/net worth variable measures net cash as a proportion of net worth. Many firms fail due to a lack of liquid assets and financially distressed firms would therefore be expected to have lower values for these variables. Other variables reflecting the working capital cycle are total liabilities/quick assets, trade debtors/total assets, trade creditors/trade debtors, trade creditors/total liabilities and inventories/working capital. Retained profit/total assets is a measure of the cumulative profitability of the firm, its leverage and the age of the company. Firms that are unable to accumulate profit from sales will have lower values of this variable. Short-term debt/net worth measures the changes in net worth and retained profit/total assets year on year. Beaver (1967) concludes that the cash flow to debt ratio was the best single

ratio predictor. Financially distressed firms are more likely to have a declining and/or negative net worth (Jacobs, 2012). The inclusion of these variables allows control for both the level and the direction of net worth and profit of a firm.

Apparently, there is a large degree of overlap between the operational and financial risks of a firm being captured by some of these variables. With respect to leverage variables, a firm's capital employed/total liabilities includes shareholders' funds plus long-term liabilities divided by long-term liabilities and represents the book value of the capital structure of the company. Financially distressed firms would be expected to have larger liabilities relative to shareholders' funds and will therefore have lower values for this variable than healthier entities would. Financial variables have been widely used in analysing a firm's creditability and failure. For example, Altman (2000) uses 28 variables from balance sheet and income statement in building credit risk models. However, previous study mentioned the list of all variables but did not clearly mention the detail computation steps to obtain the variables. Income statement demonstrates a summary of revenue and expenses of a business entity for a specific period of time, such as a year. On the other hand, balance sheet demonstrates a list of the assets liabilities and owner's equity of a business entity as of a specific date, usually at the close of the last day of a fiscal year. Therefore, the statements cannot be compared or calculated directly. In this way, the limitation of using accounting ratios should be recognised in analysing credit risks (Frecknall-Hughes et al., 2007; Cudd and Duggal, 2000; Mcleay and Omar, 2000; Baggaley, 1983; Edmister, 1972).

6.   Can you identify some of the risks in this area (more specifically relating to Chinese characteristics)?
The interviewees were also asked to identify relevant risk factors relating to Chinese characteristics. Most interviewees stressed guanxi as the most important factor in gaining business and making business success. This is very much in confirmation with the findings of the literature (e.g., Lovett et al., 1999; Fock and Woo, 1998; Yeung and Tung, 1996). Guanxi variables can be represented in a number of relations, including: government relations, community relations, customer relations, industrial relations, supplier relations, relations with the Chinese communist party (CPC), relations with the local trade association and professional bodies, and the social

relations of individual employees within the society in general. Strong relations with these stakeholders provide a potential for business to win contracts, gain favourable treatments and receive support from them once the firm has difficulty. For example, one interviewee commented:

"... guanxi is the key to SMEs' success. This is the well-known fact. Most of my clients have strong connections with local authorities and with state-owned enterprise managers. Because of having strong connections, they can get inside information and are given the outsourced jobs/projects at a pretty good discounted price. Or they can easily sell their products to these firms at a good margin. These firms will survive when they have difficulty as they can get help from their guanxi" (interviewee 5).

In consequence, firms with strong relations with these stakeholders are less likely to fail comparing with firms with no relations or weak-relations with these stakeholders. In the analysis, it should be aware that in the case of China, quite often the owners of SMEs and township firms when they do well in their firm are asked to take a government official job (i.e., promotion), which can lead to the closure of a business. It is well known that people with strong guanxi with governmental officials have a better chance to get promoted, develop business and win contracts. Guanxi relation is even more important for firms in rural areas as people know each other well and relatives have strong connections. Several interviewees raised the question of how to measure and quantify guanxi in credit evaluation. Also, interviewees had some concerns about how to know these quanxi and relationship as they are usually hidden and dynamic. Old quanxi may not provide any more favourable if the provider does not see much returns. It is also to develop a good relation in a short period of time through family links. For example, parents-in-laws can have a very important relationship once two young people get married. Connections and guanxi with one side can be easily passed on to other side. Such a network is extremely difficult to identify and quantify (Li et al., 2008). One interviewee commented:

"In our region, guanxi is very important. This is tradition. Friends and guanxi are the basis of doing business in China; this is even far more important for SMEs. We need to know the guanxi network of a client in assessing credits. I have not found any model to consider guanxi. But I believe this should be

incorporated into any form of credit evaluation relating to Chinese firms"
(Interviewee 6).

7.   What would you expect for a credit risk management framework for RCBs?
Interviewees were also asked the question of "what would you expect for a credit risk
management framework for RCB?" A number of expectations have been raised by
the interviewees as showed in Figure 6.2. The interviewees identified eight major
expectations for a sound credit risk management framework, including comparable,
integrated with other risk management models, based on existing and available data,
practical-based, quantitative and qualitative combined, easy to use, adaptable to
changes and simple and straightforward.

Figure 6.2 Expectations raised by the interviewees for a good framework
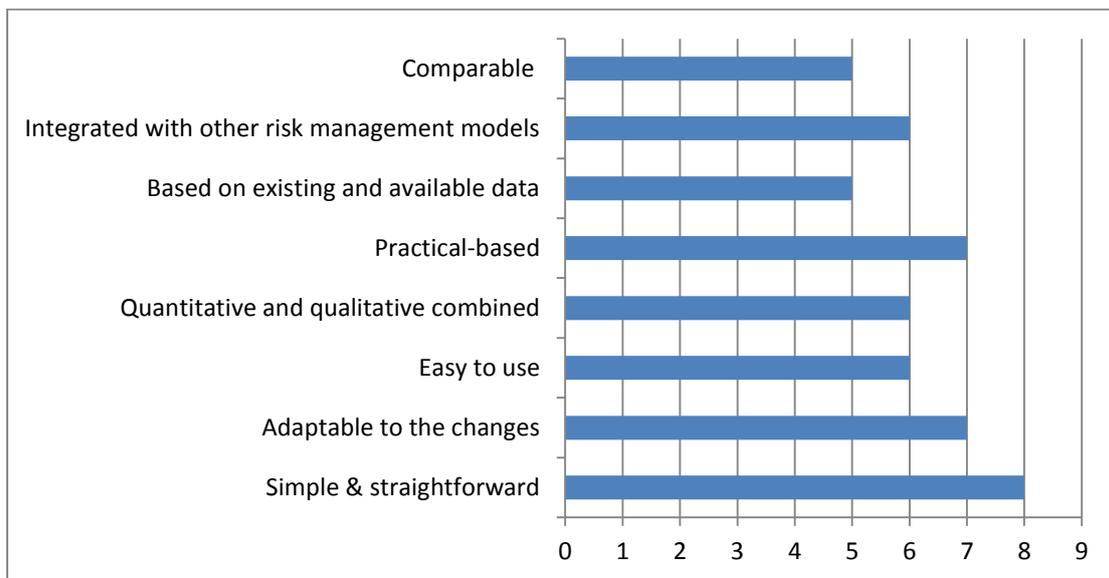
(Horizontal axis represents the number of interviewees)

"For this question, I think we need to know the limitations of current models
and then to develop a model that fits our needs. Our needs, in my view as a
practitioner, are simple, practical, adaptable and close to reality. Also, it needs to
combine quantitative and qualitative variables. I don't know how to combine;
but believe this is the major thing we want from any useful model" (Interviewee
2).

"I think it would be very useful if the model can be integrated with other models/systems we are using for other risk management. In our bank, we have a number of systems and procedures in managing operation risk, financing and governance risks. When we have many of these systems, it is essential to integrate them" (Interviewee 4).

In practice, the building of credit risk models for SMEs, farming households and their lending portfolios is largely limited by data availability (Armstrong, Davis, Liadze and Rienzo, 2013). In the case of China, market data is not available for these small firms and farming entities. Also, many unlisted firms are granted concessions regarding the amount of financial statement data they are required to file, meaning that data required calculate some of the accounting ratios employed in assessment of the failure of listed companies is not available in these cases. On the one hand, research on SMEs credit risk prediction is still in the early stage in China. On the other hand, it should be aware that the situation in China is quite different from that of developed countries, especially in accounting and audit regulations and standards for SMEs, due diligence, equity structure, and the factors that affect the performance of firms. Most Chinese small firms are not required to disclose cash flow information that is very important for the classification of failed and non-failed firms, which restricted the use of quantitative information in credit evaluation. Meanwhile, Unlike Moody's or Standard & Poor's databases, which have tens of thousands of healthy and unhealthy firms over the past 30 years, data about Chinese firms is very limited, especially the distressed firms. In the case of SMEs, cash transactions (even with a large amount of cash) are very common, which makes difficult to get information about the firms from their banks and tax authorities on the amount of real transactions. The above problem has caused the difficulty to develop a model that can avoid all these problems. From the above perspective, it would be essential for the framework to give some considerations to the characteristics of Chinese SMEs and incorporate non-quantified information.

As commended by the interviewees, easy to use, simple and straightforward are very important for the framework to be working. The model needs to focus on the existing and available data, rather relying on new sources of data. These practical issues have

to be considered by the framework and in designing of credit risk management models and policies.

8.   Any other issues
The final question was to ask interviewees if they have any other related issues. Other issues mentioned by the interviewees include, government regulations on credit risk management; support from local governments and business administrative authorities with business information; co-operations and information-sharing among local commercial banks; more training opportunities available for young employees.

In sum, all the interviewees think credit risk management is the most important issue faced by all banks in China at the moment. RCBs are even more facing the challenges in managing credit risk. In the past few years, credit risk reached a high level due to expansion of credits and banking competition. Each RCB has set up loan target as performance indicators, loan officers had to lend money to those firms with low credit record in order to reach their target. Consequently, this has increased the amount of non-performing loans. Among the interviewees, five of them considered the framework proposed in this study a good way for RCBs to design credit risk analysis model. It has been emphasised that the fundamental goal of a credit risk management model is to accurately estimate the credit risk of a specific customer, transaction or portfolio of transactions/assets. The "ultimate goal" is to measure the expected and unexpected loss from investing in a firm and an asset and the capital required to support it. A broad-based framework will help a bank to develop its own credit risk management model. This approach is better than a prescribed credit risk management model, which cannot be suitable for all RCBs. The interviewees raise the question about next step: what can an individual rural commercial bank do to develop its own credit risk management and integrate it into the whole risk management system. This is clearly an area for future research.

6.4   Results of Documentary Analysis

This section will report on findings of the documentary analysis. The analysis of is mainly based on the bank's documents and published information. Documents include the case bank's audit committee internal reports, risk management committee internal reports, risk management manuals, and annual reports. All the documents are written in Chinese. In previous chapter, the case bank was described in detail. The analysis of case study is also linked with the results of interviews presented in the previous section. Indeed, commercial banks participating in lending process, even having the best credit policy cannot ensure lack of credit losses. A bank's reputation can be seriously undermined by the increasing of bad loans or non-performing loan, which in turn may seriously affect the bank's position in the market. Therefore, credit risk management is always an important part of a bank's overall risk management policy and strategy. In the case of China, most banks have set up credit risk management procedures. The case bank under this study also has detailed manuals regarding credit risk management control and procedures with an integrated credit risk management system.

ZHGRCB is the first rural commercial bank established in Jiangsu Province, in east China. The bank has well established a risk management system including credit risk control and performance-related accountability and responsibility. Main credit risk indicators measure adequacy of the formed risk fund for the coverage of possible losses from the non-performing loans. In the case Bank, planning of the bank's credit risk indicators and establishing of the risk norms is made by the senior managers at the board level. Annual plans of the bank's activity determine absolute and relative indicators of capital risk norms, considering risk assets (such as securities, credit indebtedness, and interest receivable), aggregated normative capital (exclusive of net fixed assets), ratio of the aggregated normative capital, exclusive of risk weighted assets, to risk assets; indicator of capital adequacy with risk weighted assets; and Investment limits (which is determined by the ratio of the investment volume to the aggregated normative capital and the ratio of the investments to the long-term tangible assets to the aggregated normative capital), according to the Bank's credit risk management manual.

In the case bank, "interest rate risk management focuses on stabilization of interest income and expense, and follows systematic increase of the bank's net interest margin" (the Risk Management Committee's Internal Report 2010[40], p.6). Management of such kind of risk is controlled by "a certain number of methods" (ibid, p.6). However, there are no details given on specific methods. Bank's net interest income and its net interest margin serve the key indicators for evaluation of such type of risk impact. The bank may manage interest rate risk by changing terms of placement and attraction of its assets and liabilities, profitability level on assets sensible to the interest rate changes, and diapason of interest rates changeability. Strategic planning of this type of risk management is carried out under the direction of the risk management Committee, which not only identify strategy for manage the interest rate risk, but also make short- and long term business and financing plans, develop protection measures against non-liquidity risk and organise control over quality of issued credits (the Risk Management Committee's Internal Report 2010). Credit risk management is also part of the responsibility of the risk management committee. For credit risk management and assessment, the case bank has suggested to adopt the system of using qualitative and qualitative indicators. However, there has been little written in the credit risk management manual on the qualitative indicators.

The Bank had further improved its risk management system in 2010. Guided by the New Basel Capital Accord and in compliance with the requirements of CBRC's "Guidelines for the Establishment of the Risk Management System of Small and Medium-sized Rural Financial Institutions", the Bank refined various policy guidelines and procedures of risk management as well as expedited the development and application of risk management instruments, with an aim to ensure the capital adequacy, propping up its asset quality and strengthening the comprehensive risk management capability gradually[41].

---

[40] Due to confidentiality, the report is not available publicly under the request of the interviewee.

[41] Information was provided by Interviewee 4 who is a member of the risk management committee at the case bank.

As part of the risk management system, ZJGRCB has established a formal internal control system (the Audit Committee Inernal Report 2010[42]). Following the analysis and evaluation of previous internal control conditions, the Bank categorised operation, governance, financing and other activities into six levels and over hundred activity items (the Audit Committee Report 2009). As presented in the Audit Committee Report (2010), the case bank developed a systematic and hierarchical "internal control system framework" covering more than hundreds internal control documents under five levels, namely the "internal control management outline", "policies/basic policies", "management approaches/ management regulations", "operation instructions/rules" and "workplace documents". In 2009 ZJGRCB set up a comprehensive risk management system, which was featured by "centralised management, matrix distribution, all round coverage and full participation" (The Annual Report 2010). Such system included the decision-making body comprising the Board, risk management committee, senior management and specialised operation units/committees, comprising the risk undertaking and risk management departments, and the supervisory body comprising the supervisory committee and the internal audit department.

With the comprehensive risk management system, the senior management is responsible for the organisation, supervision and inspection of implementing the risk management policies and rules determined by the Board (The Annual Report 2010). Two decision-making specialised committees, namely the credit approval committee and asset and liability management committee, were established under the direct management of bank's CEO (The Annual Report 2010).

> "Under the supervision of senior management, the risk management department coordinates the bank-wide risk management work, which involves taking the lead in coordination of the establishment and refinement of the bank-wide risk management system, facilitating the construction of the fundamental environment for risk management and the research and application of risk management tactics, as well as reporting to the risk management committee and senior management on the monitoring and measurement of various risks and the

---

[42] Due to confidentiality, the audit committee internal report is not available publicly under the request of the interviewee.

handling of risk incidents in coordination with relevant departments (the Risk Management Committee's Internal Report, 2010, p.4).

In addition, operation and management departments fulfilled their responsibilities regarding risk management such as setting up risk management departments in all the branches and taking charge of the implementation of risk management regulations and relevant reporting work.

Backed by a "comprehensive, intensive and matrix" risk management structure, ZJGRCB established its credit risk management system, which boasted clear division of responsibilities, "two-line" reporting mechanism and "four frontiers" in business operation departments, line management departments, risk management departments and internal audit departments, thus the entire procedures of credit operations, i.e. customer investigation, credit rating, loan appraisal, loan review and approval, loan distribution, post-loan monitoring and recovery of bad assets, were under credit risk control (The Annual Report 2011).

> "The risk analysis of loan and customers should be largely based on the requirement to have detailed analysis of various factors including quantitative measures and non-quantitative analysis of a loan or a particular customer" (Risk Management Manuals, p.11).

The list of the factors in the manual was largely within the factors identified in the literature and in the proposed framework of this study[43].

Recently, the Bank refined its credit policies and systems. On the strength of internal control system construction and the implementation of new policies issued by regulatory authorities, the bank revised and refined the procedures and rules of fixed asset loans, working capital loans, group customer credit line and associated transaction management, drafted the handbook of credit services and the guidebook of the core business in SMEs business loans. The bank endeavoured to renovate the credit approval system with tightened control on the approval authority over the

---

[43] However, two interviewees stressed the importance of relationship and policy lending for the bank and the difficulties of credit risk analysis of these loans involved when they refer to the manuals during the interviews.

issuance of corporate loans to SMEs. ZJGRCB also set up full-time approval teams and designated full-time loan approval positions at branches, so as to promote the new approval mode featuring expert loan approval of the loans for large and medium-sized enterprises and specialized loan approval of loans for small enterprises and farming household loans and regulate the loan distribution and withdrawal. Meanwhile, ZJGRCB enhanced post-loan management. For the purpose of early risk detection and control, the Bank supervised and instructed on the duly implementation of post-loan management rules, strict post-loan regular inspection and long-term tracking (Risk Management Manual). The Bank set up monitoring ledgers for large-amount loans, which gave warnings on a quarterly basis (Risk Management Committee Internal Report 2010). It also enhanced risk tracking of interested loans through risk investigation on real estate loans and loans for government financing.

Although the bank has widely used qualitative measures in assessing client's (mainly SMEs) credit risk, the Bank promoted the use of quantitative instruments of credit risk management. It established a differentiated rating system for segmented customer groups (e.g., rural SMEs, IT-sector SMEs etc.). In addition, it designed a loan-to-loan migration model to dynamically reflect the loan's quality migration, maturity and recovery on a loan-to-loan basis. Each loan officer has specific responsibility for the performance of a loan and their pay is related to the level of NPL and losses. The bank also carries out pressure testing periodically by virtue of improved pressure testing scheme and the establishment of pressure testing teams. During past two years, the Bank conducted two pressure tests regarding loans to local construction and agriculture industries, which served as a significant reference for the management's decision-making and a more proactive measure in credit risk management. The bank acknowledged the difficulties in quantitative analysis due to lack of data and information, particular for new customers and farming households.

Overall, various documents and internal reports from the case bank have confirmed that a credit risk management system has been established in the bank with a clear organisational structure and responsibility. To some extent, the practice is broadly in line with the proposed framework covering four areas of business environment, operation, financing and guanxi. Although it is unclear as to the specific credit risk

assessment methods, the system has required the use of both quantitative and qualitative methods/indicators to assess the potential risks faced by its clients. Moreover, the requirement is rather too general, lacking of detailed procedure as to how to use these indicators and what are the methods to adopt.

6.5 Summary

This chapter has presented an analysis of results including interviews and case study. From the results of interviews, it suggests that the framework approach was well received and interviewees supported the approach of developing a broad-based credit risk management framework for RCBs, which is different from the existing quantitative-based assess models. The inclusive of four categories of components in the framework of the environment, operation, financing and guanxi risks is in line with the views of interviewees. Various risk factors under each of these categories/clusters were raised by the interviewees and most of them were referred in the literature and included in the framework (as shown in Table 6.3). The case study provides an example of risk management and credit risk management in practice from a RCB in Jiangsu province. The case shows that credit risk management has been paid attention and the bank has taken proactive approaches to manage the risk. However, it is rather vague in terms of specific credit assessment and management approaches adopted by the case bank. This probably suggests there was lacking of practical and useful methods suitable for RCBs.

As SMEs and farming households constitute the majority of obligors of RCBs in China, the credit risk management framework is mainly designed by analysing factors contributing to the failure of SMEs and farming households. The analysis of the failure of SMEs and farming entities is complicated and difficult for several reasons. First, these companies are not rated either because their financial information is not readily available or because it is provided on an inconsistent basis across companies. Second, there are many non-quantified variables contributing to the success and failure of SMEs and farming businesses. It is suggested that non-financial information reflecting company characteristics and aspects of operational risk, such as guanxi,

relations, financial reporting compliance, auditor opinion, trade credit relationships, should be added as predictive variables of SMEs' failure (e.g., Grunert et al., 2004; Headd, 2003; Yeung and Tung, 1996; Keasey and Watson, 1987). Models that can utilise available financial data enhanced with non-financial data could provide a useful tool for credit risk management of RCBs. This study builds upon the previous research in credit risk management, which demonstrated that banks should separate SMEs from large corporates when setting their credit risk systems and strategies. The key risk factors are identified for SME firms and farming households, including four categories: environmental, operational, financial, and guanxi risks.

Table 6.3 The details of risk categories.

Environmental Variables	Operational Variables	Financial Variables	Guanxi Variables
• GDP growth • Interest rate • Foreign exchange rates • Monetary and government credit policy • Export and local market • Alliances & partnerships • Technological advances • Licensing/franchising • Distribution channels • Government laws and regulations, • Globalization of markets and the internationalization of business, • Major economic, political and social events, • Customer expectations, • Supplier requirements, • Increasing competition, • Organizational	• Age of firm • Trade credit facilities • Adequateness of business planning • Compliance • Court case • Late filing days • Auditor opinion • Switching auditors • Educational & work-related qualifications of managers and employees • Leadership & top management quality • Number of employees and diversity • Legal form of the business • Area where the main business is carried out • The industry type • Company brands • Information systems & processes • New product development • Intellectual property • Type of contracts • R&D	• ROA • Capital employed/total liabilities • Quick assets/current assets • Current assets/current liabilities • Total liabilities/quick assets • Trade creditors/trade debtors • Trade creditors/total liabilities • Trade debtors/total assets • Inventory/working capital • Cash/total assets • Cash flow to debt • Net cash/net worth • Retained profit/total assets • Short term	• Government relations • Community relations • Customer relations • Industrial relations • Supplier relations • The role of senior managers in the communist party of China (CPC) • Senior managers as representatives of people's congress of China • The number of CPC members • Relations with the media and press • Number of professional bodies and associations • Number of local sponsorships • Family members in the firm • The number of employees who are relatives and members of local officers

growth, • Fluctuations in business cycles • Changing demographics • Risk management capability	• Customer satisfaction • Employee satisfaction	debt/net worth • Interest expenses • Capital structure • Dividends	

Chapter 7 Summary, Contributions, Limitations and Further Research

7.1 Introduction

Bank risk management in general and credit risk analysis in particular has been the focus of extensive research in the past several years (Matthews, 2013; Njanike, 2009; Cui, 2008; Cebenoyan and Strahan, 2004; Duffie and Singleton, 2003; Foot, 2002; Crouhy et al., 2000; Steinwand, 2000). Principally, the credit risk of a bank is the possibility of loss arising from non-repayment of interest and the principle, or both, or non-realisation of securities on the loans. Credit extended to borrowers may be at the risk of default such that whereas banks extend credit on the understanding that borrowers will repay their loans, some borrowers usually default and as a result, banks income decrease due to the need to provision for the loans. Where commercial banks do not have an indication of what proportion of their borrowers will default, earnings will vary thus exposing the banks to an additional risk of variability of their profits. Every financial institution bears a degree of risk when the institution lends to business and consumers and hence experiences some loan losses when certain borrowers fail to repay their loans as agreed.

Credit risk is one of the most general risks that exist in the financial market and a major risk faced by financial institutions. Credit risk is the subject of strict regulatory oversight (Greinke, 2005) and policy debate across the world. For example, the recent proposal by the Bank for International Settlements (BIS) to reform the regulation of bank capital for credit risk (known as the New Basel Accord) has initiated debates on a number of issues in the literature. The implications of the New Basel Accord to rural commercial banks (RCBs) have not received much attention. Given the limited research in this area, this thesis has achieved two research aims _ 1) the importance of credit risk management. 2) to develop a credit risk management framework for RCBs with a focus on the identification of factors that affect the credit risk faced by RCBs _ based on the exploration of research objectives which are discussed in 7.2.

Credit risk management is a process of identifying, measuring, monitoring and controlling of risk arising from the possibility of default in loan repayments. Previous studies have well documented the importance of credit risk management in financial institutions (e.g., Nijskens and Wagner, 2011; Khashman, 2010; Minton et al., 2009; Njanike, 2009; Firth et al., 2009; Duffie and Singleton, 2003) and recommended the use of quantitative analysis of credit risk. Several studied have proposed quantitative-based credit risk management models (e.g., Alessandri and Drehmann, 2010; Ali and Daly, 2010; Breuer et al., 2010; Altman, 2005; Altman and Sanders, 1998). However, these credit risk management models are mainly developed for large financial institutions (Wesley, 1993) and their applicability for RCBs is very limited.

Considering the characteristics of RCBs, this research attempts to propose a credit risk management framework for RCBs to apply in designing their risk assessment models. More specifically, there are four research objectives in this project:

1. to discuss the differences between rural-based commercial banks and city based -commercial banks;
2. to examine the extent that RCBs have considered the importance of credit risk management and identify the approaches available for banks to manage credit risks;
3. to identify the key factors that have influenced the credit evaluation and assessment, as well as credit risk control for RCBs;
4. to propose a practicable credit risk management framework that suits the characteristics of RCBs in China.

The primary credit risk management of RCBs is to maintain risk within acceptable parameters and satisfy the regulatory requirements. RCBs should design risk management policies and set up risk controls to identify, analyse, monitor and report risks by means of relevant and up-to-date information systems. At the same time, RCBs need regularly to review its credit risk management policies and systems to address changes in markets, products and emerging best practice. They need to manage and monitor these exposures to ensure appropriate measures are implemented on a timely and effective manner. This study attempts to address this under-researched

issue and provides some recommendations for policy makers and credit risk management practitioners.

7.2. Summary of the Study and Research Findings

This study firstly introduces China's financial system and banking reform and explains the development of China's rural commercial banks (RCBs). China's RCBs were developed following the government initiatives to provide financial services support to rural areas and Sannong related business and developments. Because of this, RCBs are exposed to risks inherent to specific rural commercial banking business, and in particular, Sannong-related loans and services, in addition to normal risks faced by financial institutions (Sun and Fan, 2012). For many RCBs, their business focus is to provide high-quality financial services to SMEs in rural and county areas and serve the needs of Sannong.

RCBs had generally presented relatively higher risks than city commercial banks, partially because their primary source of income is interest income and their ability to generate fee and commission income is limited. Chapter 2 provides a comparison between RCBs and city commercial banks. This has addressed the first research objective. The difference reflects in a variety of areas and services provided. For example, the products and services currently offered by RCBs are relatively simple (Sun and Fan, 2012). They rely heavily on deposit and loan business, and less on fee- and commission-based business and treasury operations (Tang, 2009). Internet banking is not well developed. RCBs' loans to corporate customers are concentrated to SMEs, which account for over 70-80% of total corporate loans in most cases (Sun and Fan, 2012). The business operation of the SMEs may not be as stable as the large enterprises as they are more vulnerable to adverse changes in the economic environment, and the SMEs may lack certain internal control or risk management systems, which expect to increase the credit risk faced by RCBs. As the main business of RCBs focuses on Sannong and the agricultural industry that is very much vulnerability to natural disasters (Zhou, 2011), every major natural disaster has caused the destruction of agricultural production and created difficulties for a large number of

borrowers make the repayment on time. Consequently, many loans that lend to Sannong and the agricultural industry after major natural disaster often turn into bad debt. Moreover, the credit risk management tools adopted by RCBs are still pretty general. RCBs are overall lacking specific planning, strategy, research support, and business innovation (Zhou, 2011; Feng, 2007). Risk management capacity of RCBs is limited with a lack of comprehensive risk management concept, awareness and culture. RCBs pay more attention to business development rather than internal control of the risk arising from the loan issuing.

The literature review chapter provides an understanding of credit risk and credit risk management. Credit risk is mainly losses from the refusal or inability of credit customers to pay what is owed in full and on time. The management of credit risk has become a key objective for all financial institutions across the world. The goal of credit risk management is to maximise a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters. The main sources of credit risk can be summarised to include, limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital and liquidity levels, directed lending, massive licensing of banks, poor loan underwriting, reckless lending, poor credit assessment, no non-executive directors, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank. The major credit risk of a bank comes from loans and advances to customers and other on-balance sheet and off-balance sheet credit risk exposures. In practice, the causes of credit risks which are subject to a variety of factors and influence can only be identified and explained in a particular context, and through detailed analysis.

The second research objective of this study is concerned with the importance of credit risk management in RCBs. This study has found that the importance of credit risk management in improving the competition of RCBs in China has been recognised and the empirical evidence of this study through the interviews and case study has shown that RCBs have paid much attention to credit risk management. Among various risks faced by RCBs, credit risk plays a vital role in the whole portfolio of the bank' risks affecting the survival of the banks. However, the causes of credit risks which are

subject to a variety of factors and influence can only be identified and explained in a particular context, and through detailed analysis. In the case of RCBs studied, much of the credit risk is associated with the Sannong and rural SMEs' failure.

China as the fastest developing economy has also paid attention to credit risk management. Various regulations and guidance have been issued by the regulatory bodies. Most RCBs measure and manage the quality of credit risk-bearing assets based on the Guideline for Loan Credit Risk Classification issued by the CBRC, which requires classify loans into the five category loan classification: normal, special mention, substandard, doubtful and loss. Loans classified in the substandard, doubtful and loss categories are regarded as non-performing loans. The main factors considered in loan impairment assessment include probability of loan repayment and recoverability of principal and interest, which relates to borrowers' repayment ability, credit record, repayment intention, projected profitability, guarantees or collateral and legal responsibility of repayment. The allowances for impairment losses are assessed collectively or individually as appropriate. Banks assess the impairment for loans and advances to customers at the end of reporting period in accordance with Chinese accounting standards. In addition, analysis based on the contractual amounts of the loans and advances to customers at the end of reporting period are provided internally to management for the purpose of assessing financial risks.

Credit risk management methods and systems are still developing. The recent development in credit risk management has been rapid mainly due to the imposition of corporate governance, as well as to current regulatory initiatives like the Basel II framework. Financial institutions need to adopt integrated risk management to address various aspects of risk management. In addition to measuring and controlling it, firms also try mitigating their credit risk. A variety of approaches have been adopted by a financial institution to mitigate its credit risks, including, for example, Risk-based pricing, Covenants, Credit insurance, Credit derivatives, Collaterals, Engaging in credit guarantee scheme. Some of the popular ways in which banks manage their credit risk include credit portfolio models, credit ratings (including internal ratings), exposure limit, and stress testing. Most financial institutions have their own internal credit models that they use for risk management.

Academics have developed a number of credit risk management models and produced many empirical tests on the effectiveness of these models since 1950s. Overall, these models can be divided into two broad categories: traditional models and modern models. Traditional credit risk management models consist of expert systems, rating systems, credit scoring Systems, and artificial neural networks. Some contemporary approaches to credit risk management include loan as options (the KMV and Moody's models), credit metrics, and financial derivatives (e.g., credit default swaps). Each model has its own advantages and problems. Certainly, differing applying conditions require when a particular model is chosen. Overall, these models were developed based on the circumstances of larger financial institutions. RCBs are different from large city commercial banks due to their nature, services, expectations and locations among other characteristics. For RCBs, which are largely based on relationship lending, these models are not practically applicable. Clearly there is a research gap. This study attempts to make a contribution by filling in this gap. It intends to develop a credit risk management framework for RCBs.

This study has identified the key factors that have influenced the credit evaluation and assessment, as well as credit risk control for RCBs (presented in Table 6.1) and proposed a credit risk management framework (Figure 5.2) that suits the characteristics of RCBs in China; this has shown research objectives three and four of this study have been achieved. The framework is based on the identification of business failures of rural commercial banks' main customers and factors contributing the failures of SMEs and farming households. It is recommended to use principal components analysis to find out the principal variables. Credit risk analysis should be focused on these principal variables, which can be different across the firms and regions. It is not the intention of this study to prescribe a specific model with defined variables. Rather, this study outlines the procedure that RCBs should follow to develop its own credit risk analysis model in accordance with their portfolios of loans and the characteristics of their clients. We propose a framework for RCBs to develop credit risk analysis. The framework is divided into five steps. The first step is to distinguish business failure and closure. In credit risk analysis, the focus should be on the failure. There are so many business closures of SMEs and farming households due

to various reasons. Business closure does not mean the failure. The second step is to identify factors contributing the failures, which should be considered from business environmental, operational, financial, and guanxi aspects. Some factor may appear in one case, but not in other cases. RCBs need to identify the principal factors by using PCA or other methods. This is the third step. Considering the key factors, RCBs should design credit risk analysis models with a focus on the analysis of these factors (step four). The final step is to use the credit risk analysis model to manage credit risks of their portfolios and individual loans. The key to the effectiveness of any model is the quality and quantity of financial and non-financial information (Zribi and Boujelbène, 2011; Saunders and Allen, 2002; Wesley, 1993).

Because, SMEs constitute the majority of obligors of RCBs in China, the proposed framework is mainly based on the analysis of factors contributing to the failure of SMEs. The analysis of the failure of SMEs is complicated and difficult for several reasons. First, these companies are not rated either because their financial information is not readily available or because it is provided on an inconsistent basis across companies. Second, there are many non-quantified variables contributing to the success and failure of SMEs. It is suggested that non-financial information reflecting company characteristics and aspects of operational risk, such as guanxi, relations, financial reporting compliance, auditor opinion, trade credit relationships, should be added as predictive variables of client failure. Models that can utilize available financial data enhanced with non-financial data could provide a useful tool for credit risk management of RCBs. This study builds upon the previous research in credit risk management (e.g., Nijskens and Wagner, 2011; Khashman, 2010; Cui, 2008; Grunert et al., 2004; Lehmann, 2003) and argues that banks should separate SMEs from large corporates when setting their credit risk systems and strategies (Armstrong et al., 2013; Liu and Saleh, 2009; Altman and Sabato, 2007). The key risk factors are identified for SME firms and farming household clients, including four categories: environmental, operational, financial, and guanxi risks (as shown in Table 6.1).

7.3   Contributions

While the extensive literatures have widely discussed credit risk management in large financial institutions in developed economies, there are limited numbers of studies to examine the credit risk management of RCBs in developing countries (Ali and Daly, 2010; Altman and Sanders, 1998). Yet, to our knowledge, no study has specifically focused on credit risk management in RCBs from China, the largest developing economy. Thus, this study has contributed to the growing body of literature that studies credit risk management in financial institutions in general, and RCBs in particular.

The contributions of this study to the literature can be explained from several aspects. First, this study critically identifies the current lack of studies specifically addressing the RCBs and their credit risk management. Previous studies were predominantly related to large city commercial banks (e.g., Sun, Harimaya and Yamori, 2013; Berger, Hasan and Zhou, 2010; Ariff and Can, 2008; Li, 2004; Bonin and Huang, 2001). This study argues that the current prevailing credit risk management models that were based on large financial institutions have limited applicability to RCBs whose customers are primarily SMEs and farming households with poor or no credit record and information.

Secondly, this study proposes a credit risk management framework for RCBs, which is supported by interviewees and case study. This is the first framework of its kind proposed for RCBs. No other framework can be found in the literature. The framework is proposed following the extensive review of the literature and consideration of the characteristics of RCBs and their customers. The model considers financial and non-financial variables and recommends the use of qualitative methods to analyse the credit risk of major clients of RCBs, i.e., SMEs, for which financial information is very limited. To the best of the author's knowledge, in the existing literature solutions to address RCBs' credit risk management for these clients have never been provided. Using non-financial variables along with financial variables as predictors of client failure significantly improves the credit analysis quality and accuracy. I believe that this approach is even more important for RCBs considering

the lack of formal ratings and financial information of SME clients. Moreover, non-financial information can be updated frequently, allowing RCBs to correct their credit decisions in a timely manner.

Thirdly, this study recognises guanxi (a concept widely adopted in China) as risk potentials affecting the business of SMEs and farming households, the main clients of RCBs and is the first study of its kind to include guanxi risks in the proposed credit risk management framework. Guanxi plays an important role in conducting business in China, particularly for SMEs and individuals. Using guanxi variables as indicators of business failures bring in an additional dimension to credit risk analysis. The consideration of guanxi in credit risk analysis fits well with China's business environment. While guanxi is a popular concept in China, the fundamental phenomenon involved that reflect relationships can also apply in other countries.

7.4   Research Limitations and Areas for Further Research

Like other research, this study is also subject to a number of limitations and there is much scope for further research as follows:

- This study has adopted qualitative approaches. The inherent limitations of qualitative approaches remain. Given the lack of available data, this study focuses on the development of credit risk management framework, instead of credit analysis models. The application of the framework is largely subject to a variety of practicalities which are not discussed in detail in this study. Future research should pay more attention to those practicalities and address the possible conditions and difficulties in applying the framework.

- Although the interviews in the case company show positive comments on the proposed framework, this proposed credit risk management framework for ECBs remains however to be validated by other researchers and practitioners working in other contexts. Different contexts may pose additional factors, even risk dimensions. Future research needs to add more empirical evidence from RCBs in other regions and developing economies.

- This proposed framework has recommended the use of principal components analysis approach to identify the key variables. It is possible that other quantitative models can be used more effectively in achieving the same objectives as PCA. There is a need for further research to develop an appropriate model (particularly easily-operating models) to identify key factors influencing credit risks of SMEs and farming households. There is also a need to examine the extent to which credit risk management is facilitated by other models.

- While considerable research has proven the suitability of financial factors to predict credit risks, the role of non-financial factors remains ambiguous. Although consideration of non-financial factors such as management quality, *guanxi* is beyond controversy, there is a lack of quantitative research on this issue. This research inherits the similar problem that quantitative research is limited largely due to the lack of data from SMEs and farming households.

- Given the diversity with which credit risks are analysed across organisations, a large-scale quantitative study may identify more generalisable factors contributing to the failures of SMEs and farming households.

- A final potential area for further research may be a comparison between the existing status quo of credit risk management in RCBs and city commercial banks and other financial institutions over a longer period of time. This form of research may produce interesting findings in relation to the uniqueness of credit risk management of RCBs and its development over time.

7.5. Concluding Remarks

RCBs may not possess the necessary experience, risk management tools and qualified personnel to successfully compete with city commercial banks and other financial institutions (e.g., foreign banks) in credit risk management. The proper functioning of financial control, risk management, accounting, Internet banking, credit card service, customer service and other data processing systems, together with the communication networks between various branches and outlets and main data processing centres, is critical to RCBs' business and their ability to manage credit risk and maintain

competitiveness. The key principles in credit risk management are establishment of a clear structure, allocation of responsibility and accountability, processes have to be prioritized and disciplined, responsibilities should be clearly communicated and accountability assigned thereto. Organising and managing the lending function in a highly professional manner and doing so pro-actively can minimize whatever the degree of risk assumed losses. Banks can tap increasingly sophisticated measuring techniques in approaching risk management issues with the advancements of technology. Technological developments, particularly the increasing availability of low cost computing power and communications, have played and will continue to play an important supporting role in facilitating the adoption of more rigorous credit risk analysis of RCBs. The likely acceleration of change in credit risk management in RCBs should be viewed as an inevitable response to an environment where competition in the provision of financial services to rural areas is increasing and, thus, need for RCBs to identify new and profitable business opportunities and properly measure the associated risks, is growing. To achieve this, banks need to gather adequate information about potential customers to be able to calibrate the credit risk exposure. The information gathered will guide the bank in assessing the probability of borrower default and price their products accordingly.

Indeed, the banking industry in China is becoming increasingly competitive. At present, RCBs face intense competition from large commercial banks, other joint stock commercial banks and city commercial banks. Joint stock commercial banks and city commercial banks are under fast development and market expansion. RCBs also compete with foreign financial institutions which have started to focus on county area banking and have opened county area banking branches. For example, in recent years, a number of foreign banks (e.g., HSBC, Citibank) opened their first county area banking branch in the county area of China in order to develop its rural area banking business in the PRC. While these banks have limited geographical presence, they have significant know-how and marketing expertise which can challenge Chinese RCBs market position. The PRC banking industry is highly regulated and RCBs business could be directly affected by changes in the policies, laws and regulations relating to the banking industry in China. The bank regulatory regime in China has been undergoing significant changes. Since its establishment in 2003, the CBRC has

promulgated a series of banking regulations and guidelines aimed at improving the operations and credit risk management of the commercial banks. For example, since 2008, the CBRC has undertaken several regulatory measures in response to the global financial crisis, including requirement on the banking industry to enhance credit analysis and reporting methods and strengthen information disclosure. It is likely that RCBs in the future will face more regulatory challenges and expose much sophisticated credit exposures. The proposed credit risk management framework expects to be useful for the managers of RCBs to develop a practical credit risk management model.

In conclusion, RCBs operate in a different business environment and expose some unique risks, which require adopting a different credit risk management approach concerning both quantitative and qualitative variables. Credit risk management in RCBs needs to focus on the analysis of environmental, operational, financial and *guanxi* (relation) risks of their SMEs and farming household customers.

Bibliography

Ahmed, S. (2009), "Microfinance institutions in Bangladesh: achievements and challenges", *Managerial Finance*, Vol. 35, No. 12, pp. 999-1010.

Alessandri, P. and Drehmann, M. (2010), "An economic capital model integrating credit and interest rate risk in banking book", *Journal of Banking & Finance*, Vol. 34, No. 4, pp. 730-742.

Ali, A. and Daly, K. (2010), "Macroeconomic determinants of credit risk: recent evidence from a cross country study", *International Review of Financial Analysis,* Vol. 19, pp.165–171.

Allen, F. and Carletti, E. (2006), "Credit transfer and contagion", *Journal of Monetary Economics*, Vol. 53, No.1, pp. 89-111.

Alquiler, A. M. B. and Tignol, M. H. L. (2006), "Risk management in small- and medium-sized enterprises", *Production Planning & Control: The Management of Operations*, Vol. 17, No. 3, pp.273-282.

Altman, E. I. (1968), "Financial rations, discriminant analysis and the prediction of corporate bankruptcy", *Journal of Finance*, Vol. 23, No. 4, pp. 589-609.

Altman, E. I. (1973), "Predicting railroad bankruptcies in America", *The Bell Journal of Economics and Management Science*, Vol. 4, No. 1, pp. 184-211.

Altman, E.I. (1994), "Corporate distress diagnosis: comparisons using linear discriminant analysis and neural networks", *Journal of Banking & Finance*, Vol. 18, No. 3, pp. 505-529.

Altman, E. I., (2000), "Predicting financial distress of companies: revisiting the Z-score and ZETA models", *http://pages.stern.nyu.edu/~ealtman/Zscores.pdf*

Altman, E.I., (2005), "An emerging market credit scoring system for corporate bonds", *Emerging Markets Review*, Vol. 6, No. 4, pp. 311-323.

Altman, E. I., Baidya. T. K. N., and Dias, L. M. R. (1979), "Assessing potential financial problems for firms in Brazil", *Journal of International Business Studies*, Vol. 10, No. 2, pp.9-24.

Altman, E. I., Haldeman, R. G. and Narayanan, P. (1977), "ZETA analysis: a new model to identify bankruptcy risk of corporations", *Journal of Banking and Finance*, Vol. 1, No. 1, pp. 29-54.

Altman, E. I., Marco, G., and Varetto, F., (1994), "Corporate distress diagnosis: Comparisons using linear discriminant analysis and neural networks (the Italian experience)", *Journal of Banking and Finance*, Vol. 18, No. 3, pp.505-529.

Altman, E. I. and Narayanan, P. (1997), "An international survey of business failure classification models", *Financial Markets, Institutions & Instruments*, Vol. 6, pp.1–57.

Altman, E. I. and Sabato, G. (2007), "Modelling credit risk from SMEs: evidence from the U. S. Market", *General & Introductory Accounting*, Vol. 43, No. 3, pp. 332-357.

Altman, E. I. and Sanders, A. (1998), "Credit risk measurement: Developments over the last 20 years", *Journal of Finance*, Vol. 21, No. 11-12, pp. 1721-1742.

Andrianova, S., Demetriades, P. and Shortland, A. (2012), "Government ownership of banks, institutions and economic growth", *Economica*, Vol. 79, No. 315, pp. 449–469.

Aretz, K. and Bartram, S. M. (2010), "Corporate hedging and shareholder value", *Journal of Financial Research*, Vol. 33, No. 4, pp. 317-371.

Ariff, M. and Can, L. (2008), "Cost and profit efficiency of Chinese banks: A non-parametric analysis", *China Economic Review*, Vol. 19, No. 2, pp. 260-273.

Armstrong, A., Davis, E. P., Liadze, I. and Rienzo, C. (2013), "An assessment of bank lending to UK SMEs in the wake of the crisis", *National Institute Economic Review*, Vol. 225, No. 1, pp.39-51.

Ashcraft, A. B. and Santos, J. A. C. (2009), "Has the CDS market lowered the cost of corporate debt?", *Journal of Monetary Economics*, Vol. 56, No. 4, pp. 514-523.

Aziz, A., Emanuel, D. C., and Lawson, G. H. (1988), "Bankruptcy prediction- An investigation of cash flow based models", *Journal of Management Studies*, Vol. 25, No. 5, pp. 419-437.

Baggaley, A. R. (1983), "Deciding on the ratio of number of subjects to number of variables in factor analysis", *Multivariate Experimental Clinical Research*, Vol. 6, No. 2, pp. 81-85.

Bailey, W., Huang, W., and Yang, Z. (2011), "Bank loans with Chinese characteristics: Some evidence on inside debt in a state-controlled banking system", *Journal of Financial and Quantitative Analysis*, Vol. 46, pp.1795-1830.

Bank for International Settlements, (2000), *Range of Practice in Banks' Internal Ratings Systems*, Basel Committee on Banking Supervision, Document No. 66.

Bansal, A., Kauffman, R. J., Mark, R. M., and Peters, E. (1993), "Financial risk and financial risk management technology (RMT): Issues and advances", *Information & Management*, Vol. 24, No. 5, pp. 267-281.

Basel Committee (1999), Principles for the Management of Credit Risks, *Consultative paper issued by the Basel Committee on Banking Supervision.*

Basel committee on banking supervision (2001b), "The standardized approach to credit risk", *Consultative paper issued by the Basel Committee on Banking Supervision.*

Basu, P. and Srivastava, P. (2005), "Scaling-up microfinance for India's rural poor", *World Bank Policy Research Working Paper* No. 3646, The World Bank, Washington, DC.

Beaver, W. (1967), "Financial ratio as predictors of failure, empirical research in accounting: Selected studies 1966", *Journal of Accounting Research,* supplement to vol. 5, pp.71-111.

Beck, T., Demirguc-Kunt, A. and Maksimovic, V. (2004), "Bank competition and access to finance: International evidence", *Journal of Money, Credit and Banking*, Vol. 36, No. 3, pp. 627-648.

Beck,T., Demirguc-Kunt,A., and Martinez-Peria, M.S. (2011), "Bank financing for SMEs: evidence across countries and bank ownership types", *Journal of Financial Services Research,* Vol. 39, pp. 35–54.

Berger, A.N., Hasan, I. and Zhou, M., (2010), "The effects of focus versus diversification on bank performance: Evidence from Chinese banks", *Journal of Banking and Finance* Vol. 34, No. 7, pp. 1417–1435.

Berger, A.N. and Udell, G.F. (2002), "Small business credit availability and relationship lending: The importance of bank organizational structure", *Economic Journal*, Vol. 112, No. 477, pp. 32-53.

Berndt, A., Douglas, R., Duffie, D., Ferguson, M., and Schranz, D. (2005), "Measuring default risk premia from default swap rates and EDFs", *BIS Working Papers*, no 173.

Berndt, A., Jarrow, R. A., and Kang, C. O. (2007), "Restructuring risk in credit default swaps: an empirical analysis", *Stochastic Processes and Their Applications*, Vol. 117, No. 11, pp. 1724-1749.

BIS (2000), *Range of Practice in Banks' Internal Ratings Systems*, Basel Committee on Banking Supervision, Document No. 66.

Bittencourt, M. (2012), "Financial development and economic growth in Latin America: Is Schumpeter right?", *Journal of Policy Modeling*, Vol. 34, No. 3, pp. 341-355.

Blum, M. P. (1974), "Failing company discriminant analysis", *Journal of Accounting Research*, Vol. 12, No. 1, pp. 1-25.

Boehmer, E., Huszar, Z. R. and Jordan, B. D. (2010), "The good news in short interest", *Journal of Financial Economics*, Vol. 96, No.1 pp. 80-97.

Bonin, J. and Huang, Y. P. (2001), "Dealing with the bad loans of the Chinese banks", *Journal of Asian Economies*, Vol. 12, No. 2, pp.197–214.

Bonoma, T. (1985), "Case research in marketing: opportunities, problems, and a process", *Journal of Marketing Research*, Vol. 12, pp. 199-208.

Breuer, T., Jandacka, M., Rheinberger, K., and Summer, M. (2010), "Does adding up of economic capital for market-and credit risk amount to conservative risk assessment", *Journal of Banking & Finance*, Vol. 34, No. 4, pp. 703-712.

Bryan, J. (2006), "Training and performance in small firms", *International Small Business Journal*, Vol. 24, No. 6, pp. 635-660.

Bryman, A., and Bell, E. (2007), *Business Research Methods* (2nd edition), Oxford: Oxford University Press.

Calice, G., Ioannidis, C., and Williams, J. (2010), "Credit Derivatives and the Default Risk of Large Complex Financial Institutions", http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1773491

Canbas, S., Cabuk, A., and Kilic, S. B. (2005), "Prediction of commercial bank failure via multivariate statistical analysis of financial structures: The Turkish case", *European Journal of Operational Research*, Vol. 166, No. 2, pp.528-546.

Cao, Y., Hartung, D., Forrest, E., and Shen, Z. (2011), "Building blocks for Chinese SMEs to enter the global market: The roles of upstream knowledge and downstream channel infrastructure", *International Journal of Business and Management*, Vol. 6, No. 7, pp.77-85.

Caouette, J. B., Altman, E. I., and Narayanan, P. (1998), *Managing Credit Risk: The Next Great Financial Challenge*, New York: John Wiley & Sons.

Cardoza, G. and Fornes, G. (2011), "National and international expansion of Chinese SMEs: A different story?", in X. Fu and W. Wu (Eds.), *China's Role in Global Economic Recovery*. London: Routledge, Chapter 10.

Cardoza, G., Fornes, G. and Xu, N. (2012), "Institutional determinants of Chinese SMEs' internationalization: The case of Jiangsu Province", *Working Paper No. 04-12*, School of Sociology, Politics and International Studies, University of Bristol.

Carey, M. (2001), "Consistency of internal versus external credit ratings and insurance and bank regulatory capital requirements", *Working Paper, US Federal Reserve Board.*

CBRC (2008), *CBRC Annual Report 2008*, Beijing: the China Banking Regulatory Commission (www.cbrc.gov.cn).

CBRC (2010), NPL ratio of Chinese banks, *http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CF8QFjAB&url=http%3A%2F%2Fzhuanti.cbrc.gov.cn%2Fsubject%2Fsubject%2Fnianbao2010%2F2010zwzz.pdf&ei=L7_ET8jBJuKH0AX8h7DaCg&usg=AFQjCNHDD7aWopFL_FN42dfZc761GsfhLg*

CBRC (2011), CBRC Annual Report 2011, Beijing: the China Banking Regulatory Commission (www.cbrc.gov.cn).

Cebenoyan, A. S. and Strahan, P. E. (2004), "Risk management, capital structure and lending at banks", *Journal of Banking & Finance*, Vol. 28, No. 1, pp. 19-43.

Chavez-Demoulin, V., Embrechts, P. and Neslehova, J. (2006), "Quantitative models for operational risk: Extremes, dependence and aggregation", *Journal of Banking & Finance*, Vol. 30, No. 10, pp. 2635-2658.

Chen, J. (2006), "Development of Chinese small and medium-sized enterprises", *Journal of Small Business and Enterprise Development*, Vol.13, No. 2, pp.140-147.

Chen, X. P. and Chen, C. C. (2004), "On the intricacies of the Chinese guanxi: A process model of guanxi development", *Asia Pacific Journal of Management*, Vol. 21, No. 3, pp. 305-324.

Chen, Y., Liu, M., and Su, J. (2013), "Greasing the wheels of bank lending: Evidence from private firms in China", *Journal of Banking & Finance*, Vol. 37, No. 7, pp. 2533–2545.

China Daily (2013), "Goodbye, poverty", *China Daily*, 2013-May-20, http://www.chinatoday.com.cn/english/report/2013-05/20/content_543703_2.htm

China Development Bank, (2007), The Annual Report 2006, http://www.cdb.com.cn/english/NewsInfo.asp?NewsId=415

China Statistical Yearbook (various years), State Statistical Bureau. China Statistical Publishing House, China Statistical Information and Consultancy Center, Beijing.

Cho, S., Kim, J. and Bae, J.K. (2009), "An integrative model with subject weight based on neural network learning for bankruptcy prediction", *Expert Systems with Applications*, Vol. 36, No. 1, pp. 403–410.

Coats, P. K. and Fant, L. F. (1993), "Recognizing financial distress patterns using a neural network tool", *Financial Management*, Vol. 22, No. 3, pp. 142-155.

Cohen, J. and Cohen, P. (2002), *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences (3rd Edition)*, London: Routledge

Cohen, L. and Manion, L. (1980), *Research Methods in Education*, London: Croom Helm.

Collis, J. and Hussey, R. (2003), *Business Research: A Practical Guide for Undergraduate and Postgraduate Students* (2nd edition), Plagrave Macmillan.

Cooper, A. C., Gimeno-Gascon, F. J., and Woo, C. Y. (1991), *A Resource-Based Prediction of New Venture Survival and Growth*, Institute for Research in the Behavioral, Economic, and Management Sciences, Krannert Graduate School of Management, Purdue University.

Credit Suisse (1997), *CreditRisk +: A Credit Risk Management Framework,* Credit Suisse Financial Products.

Creswell, J. W. (1998), *Qualitative Inquiry and Research Design: Choosing among Five Traditions* (1st edition), Sage Publications.

Crouhy, M., Galai, D. and Mark, R., (2000), "A comparative analysis of current credit risk models", *Journal of Banking & Finance*, Vol. 24, No. 1-2, pp. 59-117.

Cudd, M. and Duggal, R. (2000), "Industry distributional characteristics of financial ratios: An acquisition theory application", *The Financial Review*, Vol. 35, No. 1, pp. 105-120

Cui, H. (2008), "Managing banking risks in Australian and Chinese banking system: credit risk management", *http://www.apec.org.au/docs/08_ALA_RT/S5_Cui.pdf*

Cunningham, L.X. and Rowley, C. (2007), 'Human resource management in Chinese small and medium enterprises', *Personnel Review*, Vol. 36, No. 3, pp. 415-439.

Daglish, T. (2009), "What motivates a subprime borrower to default?", *Journal of Banking & Finance*, Vol. 33, No. 4, pp. 681-693.

Daniel, P. S. and Sam, A. G. (2012), *Research Methodology*, Kalpaz Publications.

Danielsson, J. (2008), "Blame the models", *Journal of Financial Stability*, Vol. 4, No. 4, pp. 312-328.

Das, R. S., Kalimipalli, M. and Nayak, S. (2011), *Did CDS Trading Improve The Market For Corporate Bonds*? Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1782298.

De Vaus, D. A. (2002), *Surveys in Social Research* (5th edition), Allen & Unwin, Crows Nest.

Deakin, E. B. (1972), "A discriminant analysis of predictors of business failure", *Journal of Accounting Research*, Vol. 1, No. 10, pp. 167-179.

Demirgüç-Kunt, A. and Detragiache, E. (1998), *Financial Liberalization and Financial Fragility*, IMF working paper, No.98/83

Denzin, N. K. and Lincoln, Y. S. (2000), *The Sage Handbook of Qualitative Research* (2nd edition), *Sage Publications.*

Dixon-Woods, M., Sha, R. L., Agarwal, S., and Sutton, J. A. (2004), "The problem of appraising qualitative research", *Quality & Safety in Healthcare*, Vol. 13, No. 3, pp.223–225.

Duffie, D. and Singleton, K. J., (2003), *Credit Risk: Pricing, Measurement and Management*. Oxford: Princeton University Press.

Edmister, R. (1972), "An empirical test of financial ratio analysis for small business failure prediction", *Journal of Financial and Quantitative Analysis*, Vol. 7, No. 2, pp. 1477-1493.

Eisenbeis, R. (1977), "Pitfalls in the application of discriminant analysis in business, finance and economics", *The Journal of Finance,* Vol. 32, No.3, pp. 875-900.

Eisenhardt, K. M. (1989), "Building theories from case study research", *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.

Elmer, P. J. and Borowski, D. M. (1988), "An expert system approach to financial analysis: the case of S&L bankruptcy", *Financial Management*, Vol. 17, No. 3, pp. 66-76.

Embrechts, P., Hoing, A. and Juri, A. (2003), "Using Copulae to bound the Value-at-Risk for functions of dependent risks", *Finance and Stochastics*, Vol. 7, No. 2, pp. 145-167.

Esstrella, A. and Mishkin, F. S. (1996), "The yield curve as a predictor of U. S. recessions", *Current Issues in Economics and Finance*, Vol. 2, No. 7, pp.1-5

European Commission (2003), *The New SME Definition User Guide and Model Declaration*. Enterprise and Industry Publications, European Commission http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide _en.pdf

Fantazzini, D., Figini, S., and Giudici, P. (2008), "Longitudinal predictive models for SMEs", *2007 Intermediate Conference – Risk and Prediction – SIS Venezia*. pp. 545-546.

Feng, X. Y. (2007), "The strategic choice of rural finance in the view of informal finance", *The Chinese Banker*, No. 8, pp. 100-103.

Ferri, G., (2009), "Are new tigers supplanting old mammoths in China's banking system? Evidence from a sample of city commercial banks", *Journal of Banking and Finance,* Vol. 33, No. 1, pp.131–140.

Filatotchev, Liu, X.H., Buck, T. and Wright, M. (2009), "The export orientation and export performance of high-technology SMEs in emerging markets: The effects of knowledge transfer by returnee entrepreneurs", *Journal of International Business Studies*, Vol. 40, No. 6, pp. 1-22.

Finley, S. (2008), *The Management Of Consumer Credit*, Palgrave Macmillan

Firth, M., Lin, C., Liu, P., and Wong, S. (2009), "Inside the black box: bank credit allocation in China's private sector", *Journal of Banking and Finance,* Vol. 33, No.6, pp.1144–1155.

Fitch Ratings (2006), *Global Credit Derivatives Survey: Indices Dominate Growth as Banks' Risk Position Shift,* http://www.securitization.net/pdf/Fitch/Derivatives_21Sept06.pdf

Fock, H. and Woo, K. (1998), "The China market: strategic implications of guanxi", *Business Strategy Review*, Vol. 74, No. 4, pp. 33-44.

Foot, M. (2002), "Operational risk management for financial institutions", *Journal of Financial Regulation and Compliance*, Vol.10, No. 4, pp.313-316.

Frecknall-Hughes, J., Simpson, M. and Padmore, J. (2007), "Inherent limitations in using financial ratio analysis to assess small and medium sized company performance", *Working Paper,* Sheffield University, *https://sheffield.ac.uk/content/1/c6/06/89/64/2007-01.pdf*

Fu, X. and Heffernan, S. (2009), "The effects of reform on China's bank structure and performance", *Journal of Banking and Finance,* Vol. 33, No.1, pp.39–52.

Fukuda, S. (2012), "Market-specific and currency-specific risk during the global financial crisis: evidence from the interbank markets in Tokyo and London", *Journal of Banking and Finance*, Vol. 36, No. 12, pp.3185–3196.

Gao, S., Sung, M. C., and Zhang, J. (2013), "Risk management capability building in SMEs: A social capital perspective", *International Small Business Journal*, Vol. 31, No. 6, pp. 677–700.

Garcia-Herrero, A., Gavila, S., and Santabarbara, D. (2006), "China's banking reform: an assessment of its evolution and possible impact", *Economic Studies*, Vol. 52, No. 2, pp. 304-363.

García-Herrero, A., Gavilá, S. and Santabárbara, D. (2009), "What explains the low profitability of Chinese banks?", *Journal of Banking and Finance,* Vol. 33, No.11, pp. 2080–2092.

Gentry, J. A., Newbold. P., and Whitford, D. T. (1985), "Classifying bankrupt firms with funds flow components", *Journal of Accounting Research*, Vol. 23, No.1, pp. 146-160.

Giesecke, K. and Kim, B. (2011), "Systemic risk: What defaults are telling us", *Management Science*, Vol. 57, No. 8, pp. 1387-1405.

Gill, J., and Johnson, P. (2010), *Research Methods for Managers* (4th edition), London: SAGE Publications Ltd.

Gnanadesikan, R. (1977), *Methods for Statistical Data Analysis of Multivariate Observations*, New York: John Wiley & Sons.

Goldsmith, R. W. (1969), *Financial Structure and Development.* New Haven, CT: Yale University Press.

Gombola, M. J., Haskins, M. E., Ketz, E., and Williams, D. D. (1987), "Cash flow in bankruptcy prediction", *Financial Management*, Vol. 16, No. 4, pp. 55-65.

Greenspan, A. (2004), "Economic flexibility", Before the HM Treasury Enterprise Conference, London, http://www.federalreserve.gov/boarddocs/speeches/2004/20040126/default.htm

Greenwood, J. and Jovanvoic, B. (1990), "Financial development, growth and the distribution of income", *Journal of Political Economy*, Vol. 98, No. 5, pp. 1076-1107.

Greenwood, J. Sanchez, J.M., and Wang, C. (2013), "Quantifying the impact of financial development on economic development", *Review of Economic Dynamics*, Vol. 16, No. 1, pp. 194–215.

Greinke, A. (2005), "Imposing capital controls on credit unions: An analysis of regulatory intervention in Australia", *Annals of Public & Cooperative Economics*, Vol. 76, No. 3, pp. 437-460.

Grunert, J., Jorden, L., and Weber, M. (2004), "The role of non-financial factors in internal credit ratings", J*ournal of Banking and Finance*, Vol. 29, No. 2, pp.509-531.

Guadagnoli, E. and Velicer, W. F. (1988), "Relation of sample size to the stability of component patterns", *Psychological Bulletin*, Vol. 103, No. 2, pp. 265-275.

Guettler, A. and Adam, T. (2010), "The use of credit default swaps by U.S. fixed-income mutual funds", *FDIC Working Paper*, No. 2011-01.

Guo, L. and Liu, Y. H. (2010), "The investment incline and the income gap between urban and rural areas", *Journal of Shandong Agricultural University (Social Science Edition),* No. 4, pp.38-44.

Guo, P and He, G. (2005), "Estimation on the aggregate of China's rural informal finance", *Research Paper, Center for Rural Finance and Investment Research*, China Agricultural University.

Hakenes, H. and Schnabel, I. (2010), "Bank bonuses and bail-out guarantees", Working paper, *http://www.fmt.uni-hannover.de/fileadmin/fmt/Bonus.pdf*

Hall, C. (2007), 'When the dragon awakes: Internationalisation of SMEs in China and Implications for Europe'*, CESifo forum*, Vol. 8, No. 2, pp.29-34.

Hao, C. (2006), "Development of financial intermediation and economic growth: The Chinese experience", *China Economic Review*, Vol. 17, pp. 347-62.

Harvey, W. S. (2011), "Strategies for conducting elite interviews", *Qualitative Research*, Vol. 11, No. 4, pp.431 - 441.

Hasan, I., Wachtel, P. and Zhou, M. (2009), ''Institutional development, financial deepening and economic growth: evidence from China'', *Journal of Banking and Finance*, Vol. 33, No. 1, pp. 157-70.

Hassan, M.K. and Renteria-Guerrero, L. (2007), "The experience of the Grameen Bank of Bangladesh in community development", *International Journal of Social Economics*, Vol. 24, No. 12, pp.1488-1523.

He, G. (1999), "Rural financial constraint and financial deepening based on the financing behavior of rural residents", *China Agricultural Economy*, Vol.10, pp.1-8.

He, G., Du, X., B. C. and Li, Z. (2009), *China Microfinance Industry Assessment Report*, Beijing: China Association of Microfinance.

Headd, B. (2003), "Redefining business success: distinguishing between closure and failure", *Small Business Economics,* Vol. 21, No. 1, pp. 51-61.

Horcher, K. A., (2005), *Essentials of Financial Risk Management*, Hoboken: John Wiley & Sons, Inc.

Hotelling, H. (1933), "Analysis of a complex of statistical variables into principal components", *Journal of Educational Psychology*, Vol. 24, No. 6, pp. 417-441.

Huang, X. (2009), "Strategic decision making in Chinese SMEs", *Chinese Management Studies*, Vol. 3, No. 2, pp. 87-101.

Hudson, J. (1986), "An analysis of company liquidations", *Applied Economics*, Vol. 18, No. 2, pp. 219-235.

Hudson, J. (1987), "The age, regional and industrial structure of company liquidations", *Journal of Business Finance & Accounting*, Vol. 14, No. 2, pp. 199-213.

Hussain, J., Millman, C. and Matlay, H. (2006), "SME financing in the UK and in China: a comparative perspective", *Journal of Small Business and Enterprise Development*, Vol. 13, No. 4, pp.584-599.

Hwang, D. B.K. and Staley, A. B. (2005), ''An analysis of recent accounting and auditing failures in the United States on US accounting and auditing in China'', *Managerial Auditing Journal*, Vol. 20, No. 3, pp. 227-234.

Hway-Boon, O.. Muzafar, S.H., Alias, R. and Azali. M. (2003), "Evaluating a credit guarantee agency in a developing economy: a non-parametric approach", *International Journal of Social Economics*, Vol. 30, No. 1-2, pp.143-152.

Islam, M. and Kantor, J. (2005), "The development of quality management accounting practices in China", *Managerial Auditing Journal*, Vol. 20, No. 7, pp. 707-724.

J.P. Morgan (1997), *Introduction to Credit Metrics, http://homepages.rpi.edu/~guptaa/MGMT4370.10/Data/CreditMetricsIntro.pdf*

Jacobs, M. Jr. (2012), "An empirical study of the returns on defaulted debt", *Applied Financial Economics*, Vol. 22, No. 7, pp. 563-579.

Jade, A. M., Srikanth, B., Jayaraman, V. K. and Kulkkarni, B. D. (2003), "Feature extraction and denoising using kernel PCA", *Chemical Engineering Science*, Vol. 58, No. 19, pp. 4441-4448.

Jarrow, R. A. (1999), "In honor of the Nobel Laureates Robert C. Merton and Myron S. Scholes: a partial differential equation that changed the world", *The Journal of Economic Perspectives*, Vol. 13, No. 4, pp. 229-248.

Jiang, C. X. and Yao, S. J. (2011), "Banking reform and efficiency in China: 1995-2008", *Research Paper 2010/11*, The University of Nottingham.

Joos, P., Bourdeaudhuij, C. D. and Ooghe, H. (1995), "Financial distress models in Belgium: The results of a decade of empirical research", *The International Journal of Accounting*, Vol. 30, No. 3, pp. 245-274.

Karels, G. V. and Prakash, A. J. (1987), "Multivariate normality and forecasting of business bankruptcy", *Journal of Business Finance & Accounting*, Vol. 14, No.4, pp.573-593.

Keasey, K. and Watson, R. (1987), "Non-financial symptoms and the prediction of small company failure: A test of Argenti's hypothesis", *Journal of Business Finance & Accounting*, Vol. 14, No. 3, pp. 335-354.

Keeton, W., Schroeder, L. and Stuart, W. (2003), "The role of community banks in the U.S. Economy", *Economic Review*, Vol. 2003, No. 2, pp. 15-43.

Khashman, A. (2010), "Neural networks for credit risk evaluation: Investigation of different neural models and learning schemes", *Expert Systems with Applications*, Vol. 37, No. 9, pp. 6233-6239.

Kim, K. S. and Scott, J. R. (1991), "Prediction of corporate failure: An artificial neural network approach", *Working Paper, Southwest Missouri State University.*

King, R.G. and Levine, R. (1993), "Finance and growth: Schumpeter might be right", *Quarterly Journal of Economics*, Vol. 108, No. 3, pp.717-738.

Krippendorff, K. (1980), *Content Analysis: An Introduction to Its Methodology,* Newbury Park, California: Sage Publications.

Kshirsagar, A. M. (1972), *Multivariate Analysis*, New York: Marcel Dekker

Kumar, R. (1994), *Research Methodology: A Step-By-Step Guide for Beginners*, Sage publications.

Lehmann, B. (2003), "Is it worth the while? The relevance of qualitative information in credit rating", *EFMA 2003 Helinski Meetings.*

Leland, H. E. (1994), "Corporate debt value, bond covenants and optimal capital structure", *Journal of Finance*, Vol. 49, No. 4, pp. 1213-1252.

Lennox, C. (1999), "Identifying failing companies: A re-evaluation of the Logit, Probit and DA approaches", *Journal of Economics and Business*, Vol. 51, No. 4, pp. 347-364.

Levine, R. (1998), "The legal environment, banks, and long-run economic growth", *Journal of Money, Credit, and Banking*, Vol. 30, No. 3, pp. 596-613.

Li, D. (2004), "Approaches of dealing with bad debt in Chinese banks", *Journal of Financial Research* (in Chinese), Vol. 2004, No. 3, pp. 28-36.

Li, H., Meng, L., Wang, Q. and Zhou, L.A. (2008), "Political connections, financing and firm performance: Evidence from Chinese private firms", *Journal of Development Economics*, Vol. 87, No. 2, pp. 283-299.

Li, H. and Sun, J. (2011), "Predicting business failure using an RSF-based reasoning ensemble forecasting method", *Journal of Forecasting,* Vol. 32, No. 2, pp. 180–192

Li, J. and Matlay, H. (2006), "Chinese entrepreneurship and small business development: an overview and research agenda", *Journal of Small Business and Enterprise Development*, Vol. 13, No. 2, pp. 248-262.

Li, J.T. and Ng, C.K. (2013), "The normalization of deviant organizational practices: the non-performing loans problem in China", *Journal of Business Ethics,* Vol. 114, No. 4, pp. 643-653.

Li, K., Wang, T. Cheung, Y-L, and Jiang, P. (2011), "Privatization and risk sharing: evidence from the split share structure reform in China", *Review of Financial Studies*, Vol. 24, No. 7, pp.2499-2525.

Li, X., Gan, C. and Hu, B. (2011), "Accessibility to microcredit by Chinese rural households", *Journal of Asian Economics*, Vol. 22, No. 3, pp. 235–246.

Liamputtong, P. (2009), *Qualitative Research Methods* (3rd edition), Oxford: Oxford University Press.

Liang, Q, Xu, P. and Jiraporn, P. (2013), "Board characteristics and Chinese bank performance", *Journal of Banking & Finance*, Vol. 37, No. 8, pp.2953–2968.

Liang, Z. (2005), "Financial development, market deregulation and growth: evidence from China", *Journal of Chinese Economic and Business Studies*, Vol. 3 No. 3, pp. 247-62.

Lin, X. and Zhang, Y. (2009), "Bank ownership reform and bank performance in China", *Journal of Banking & Finance*, Vol. 36, No. 1, pp. 20–29.

Liu, H and Saleh, A.S. (2009), "The development of a financial index to examine the financial performance of SMEs in China", *Asian-Pacific Journal of Economics and Business*, Vol. 13, No. 1, pp.57-75.

Lo, A. W. (1986), "Logit versus discriminant analysis: A specification test and application to corporate bankruptcies", *Journal of Econometrics*, Vol. 31, No. 2, pp. 151–178.

Lou, Y. (1997a), "Guanxi and performance of foreign-invested enterprises in China: an empirical inquiry", *Management International Review*, Vol. 37, No. 1, pp. 51-70.

Lou, Y. (1997b), "Guanxi: principles, philosophies, and implications", *Human Systems Management*, Vol. 16, No. 1, pp. 43-51.

Louzis, D., Vouldis, A. and Metaxas, V. (2012), "Macroeconomic and bank-specific determinants of nonperforming loans in Greece: A comparative study of mortgage, business and consumer loan portfolios", *Journal of Banking and Finance*, Vol. 36, No. 4, pp.1012–1027.

Lovett, S., Simmons, L.C, and Kali, R. (1999), "Guanxi versus the market: ethics and efficiency", *Journal of International Business Studies*, Vol. 30, No. 2, pp. 231-247.

Lu, J. and Tao, Z. (2010), "Determinants of entrepreneurial activities in China", *Journal of Business Venturing*, Vol. 25, No. 3, pp.261-273.

Lussier, R. N. and Corman, J. (1995), "There are few differences between successful and failed small businesses", http://sbaer.uca.edu/research/sbida/1995/pdf/01.pdf

Lussier, R.N. and Pfeifer, S (2001), "A cross national prediction model for business success", *Journal of Small Business Management,* Vol.39, No. 3, pp.228-239.

Ma, J., Wang, S., and Gui, J. (2010), "A study on the influences of financing on technological innovation in small and medium-sized enterprises", *International Journal of Business and Management*, Vol. 5, No. 2, pp. 209-212.

Maddala, G. S. (1983), *Limited-Dependent and Qualitative Variables in Econometrics,* Cambridge University Press.

Mardia, K. V., Kent, J. T. and Bibby, J. M. (1979), *Multivariate Analysis*, Academic Press.

Martin, D. (1977), "Early warnings of bank failure: A logit regression approach", *Journal of Banking and Finance*, Vol. 1, No. 3, pp. 249-276.

Matthews, K. (2013), "Risk management and managerial efficiency in Chinese banks: A network DEA framework", Omega, Vol. 41, No.2, pp.207–215.

McKinnon, R. I. (1973), "Money and capital in economic development", *World Development*, Vol. 2, No. 3, pp. 87-88.

McKinsey & Company (1997), *Credit Portfolio View*. New York, Mckinsey Inc.

Mcleay, S. and Omar, A. (2000), "The sensitivity of prediction models to the normality of bounded and unbounded financial ratios", *The British Accounting Review*, Vol. 32, No. 2, pp. 213-230.

Medema, L., Koning, R. H., and Lensink, R. (2009), "A practical approach to validating a PD model", *Journal of Banking & Finance*, Vol. 33, No. 4, pp. 701-708.

Merton, R. C. (1974), "On the pricing of corporate debt: The risk structure of interest rates", *Journal of Finance*, Vol. 29, No.2, pp. 449-470.

Messier, W. F., and Hansen, J. V. (1988), "Inducing rules for expert system development: An example using default and bankruptcy data", *Management Science,* Vol. 34, no. 12, pp. 1403-1415.

Mester, L. (1997), "What's the point of credit scoring?", *Business Review, Federal Reserve Bank of Philadelphia*, September/October, pp. 3-16.

Miles, M.B. and A.M. Huberman, (994), *Qualitative data analysis: An Expanded Sourcebook of New Methods* (2nd ed.), Sage, Thousand Oaks.

Minton B. A., Stulz, R., and Williamson, R. (2009), "How much do banks use credit derivatives to hedge loans?", *Journal of Financial Services Research*, Vol. 35, No.1, pp.1-31.

Mossman, C. E., Bell, G. G., Swartz, L. M., and Turtle, H. (1998), "An empirical comparison of bankruptcy models", *Financial Review*, Vol.33, No. 2, pp. 35-54.

Mundaca, G. and Feng, Q.Q., (2005), "Bailout policy in the Chinese banking system", (March 12). Available at SSRN (http://ssrn.com)

Neuendorf, K.A. (2002), *The Content Analysis Guidebook*, Sage Publications.

Njanike, K. (2009), "The impact of effective credit risk management on bank survival", *Annals of the University of Petrosani, Economics,* Vol. 9, No. 2, pp. 173-184.

Nijskens, R. and Wagner, W. (2011), "Credit risk transfer activities and systemic risk: how banks became less risky individually but posed greater risks to the financial system at the same time", *Journal of Banking & Finance*, Vol. 35, No. 6, pp. 1391-1398.

OECD (2011), *Globalisation of Economic Activities and the Development of SMEs*, OECD, Geneva.

Ohlson, J. (1980), "Financial ratios and the probabilistic prediction of bankruptcy", *Journal of Accounting Research,* Vol. 18, No. 1, pp. 109-131.

Önder, Z. and Özyıldırım, S. (2013), "Role of bank credit on local growth: Do politics and crisis matter?", *Journal of Financial Stability*, Vol. 9, No.1, pp.13–25.

Patton, M. Q. (2002), *Qualitative Research and Evaluation Methods* (3rd edition), Thousand Oaks, Calif.: Sage Publication.

Pedhazur, E. J. (1997), *Multiple Regression in Behavioral Research* (3rd edition), Wadsworth Publishing.

Peel, M. J. and Wilson, N. (1989), "Some evidence on discriminating between failing and distressed acquired firms", *Managerial and Decision Economics*, Vol. 10, pp. 209-220.

People's Bank of China (2007), Annual Report 2007, http://www.pbc.gov.cn/diaochatongji/tongjishuju/gofile.asp?file=2007S03b.htm

Petersen, M. and Rajan, R. (1997), "Trade credit: theories and evidence", *Review of Financial Studies*, Vol. 10, No. 3, pp. 661-691.

Phillips, B. and Kirchhoff, B. (1989), "Formation, growth and survival: small firm dynamics in the US economy", *Small Business Economics*, Vol. 1, No. 1, pp. 65-74.

Pille, P. and Paradi, J. C. (2002), "Financial performance analysis of Ontario (Canada) Credit Unions: An application of DEA in the regulatory environment", *European Journal of Operating Research*, Vol. 139, No. 2, pp. 339-350.

Platt, H. D. and Platt, M. B. (1990), "Development of a class of stable predictive variables: The case of bankruptcy prediction ", *Journal of Business Finance & Accouting*, Vol. 17, No. 1, pp.31-51.

Podding, T. (1994), "Bankruptcy prediction: A comparison with discriminant analysis", in A.P. Refenes (ed.), *Neural Networks in Capital Markets,* New York: wiley, pp. 311-323

Qian, J. and Strahan, P.E. (2007), ''How laws and institutions shape financial contracts: the case of bank loans'', *The Journal of Finance*, Vol. 62, No. 6, pp. 2803-2834.

Rahman, M. W. and Luo, J. C. (2011), "Sustainability of NGO-type microfinance service provider in Shaanxi, China: Peer with Grameen bank, Bangladesh", *African Journal of Business Management*, Vol. 6, No. 15, pp. 5319-5327.

Rosen, D. and Saunders, D. (2012), "CVA the wrong way", *Journal of Risk Management in Financial Institutions*, Vol. 5, No.3, pp. 252-272.

Sachs, J., Woo, W. T. and Yang, X. K. (2000), "Economic reforms and constitutional transition", *Annals of Economics and Finance,* Vol 1, pp.423-479.

Sandstorm A. (2009), *Political Risk in Credit Evaluation*, World Bank Group, *https://helda.helsinki.fi/bitstream/handle/10227/287/184-978-952-232-002-5.pdf?sequence=1*

Sanvicente, A. Z. and Bader, F.L.C., (1998), "Filing for financial reorganization in Brazil: event prediction with accounting and financial variables and the information content of the filing announcement", *Working Paper*, Sao Paulo University.

Saunders, A. and Allen, L. (2002), *Credit Risk Measurement: New Approaches to Value at Risk and Other Paradigms*, Published by John Wiley &Sons, Inc., New York.

Saunders, M., P. Lewis, and Thornhill, A. (2009), *Research Methods for Business Students*. London: Pearson Edition.

Schumpeter, J. A. (1912), *The Theory of Economic Development*, Cambridge, Massachusetts.

Seligman, S.D. (1999), "Guanxi: grease for the wheels of China", *The China Business Review*, Vol. 26, No. 5, pp. 34-38.

Shan, Y. G. and Xu, L. (2012), "Bad debt provisions of financial institutions: Dilemma of China's corporate governance regime", *International Journal of Managerial Finance*, Vol. 8, No. 4, pp.344 – 364.

Shehzad, C. T. and Haan, J. (2013), "Was the 2007 crisis really a global banking crisis?", *The North American Journal of Economics and Finance*, Vol. 24, pp.113–124.

Shih, v., Zhang, Q., and Liu, M.X., (2007), "Comparing the performance of Chinese banks: a principal component approach", *China Economic Review,* Vol. 18, No. 1, pp. 15-34.

Shin, S. W. and Kilic, S. B. (2006), "Using PCA-based neural network committee model for early warning of bank failure", *Advances in Natural Computation*, Vol. 4221, pp. 289-292.

Silverman, D. (2005), *Doing Qualitative Research: A Practical Handbook*, Sage Publication.

Silverman, D. (2011), *Interpreting Qualitative Data: A Guide to the Principles of Qualitative Research* (4th edition), London: SAGE.

Singh, R. K., Garg, S.K. and Deshmukh, G. (2010), "The competitiveness of SMEs in a globalized economy; Observations from China and India", *Management Research Review*, Vol. 33, No. 1, pp.54-65.

Stake, R. (1995), *The Art of Case Study Research*, Thousand Oacks, CA: Sage Publication.

Standifird, S. and Marshall, R.S. (2000), "The transaction cost advantage of guanxi-based business practices", *Journal of World Business*, Vol. 35, No. 1, pp. 21-42.

Statistical Yearbook of Jiangsu Province (2012), China Statistics Press.

Steinwand, D. (2000), "A risk management framework for microfinance institutions", *Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH Postfach 5180, 65726* Eschborn Internet: http://www.gtz.de

Stever, R. (2007), "Bank size, credit and the sources of bank market risk", *BIS Working Paper*, No. 238.

Stiglitz, J. E. and Weiss, A. (1981), "Credit rationing in markets with imperfect information", *the American Economic Review*, Vol. 71, No. 3, pp.393-410.

Stuart, F. I., McCutcheon, D. M., Handfield, R. B., McLachlin, R., and Samson, D. (2002), "Effective case research in operations management: a process perspective", *Journal of Operations Management*, Vol. 20, No. 5, pp. 419-433.

Stulz, R. M. (2009), "Credit default swaps and the credit crisis", *Charles A. Dice Centre Working Paper*, No. 2009-16.

Su, C. and Littlefield, J.E. (2001), "Entering guanxi: a business ethical dilemma in mainland China?" *Journal of Business Ethics*, Vol. 33, No. 3, pp. 199-210.

Sun, J. Harimaya, K. and Yamori, N. (2013), "Regional economic development, strategic investors, and efficiency of Chinese city commercial banks", *Journal of Banking & Finance,* Vol. 37, pp.1602–1611.

Sun, L. and Fan, Y. (2012), "SWOT analysis on the development of the rural banks in Heilongjiang Province", http://www.ipedr.com/vol49/009-A0066RE0312.pdf

Sun, R. (2002), *The Development of Microfinance in China*, Rural Development Institute, Chinese Academy of Social Sciences.

Tabachnick, B. G. and Fidell, L. S. (2001), *Using Multivariate Statistics (4th edition)*, London: Pearson.

Taffler, R. J. and Tisshaw, H. J. (1977), "Going, going, gone, four factors which predict", *Accountancy*, Vol. 88, No. 1003, pp. 50-54.

Tang, L. (2009), "Study on China's sustainable development of rural micro-credit", *International Journal of Business and Management*, Vol. 4, No. 8, pp.128-131.

Taormina, R.J. and Gao, J. H. (2010), "A research model for guanxi behavior: antecedents, measures, and outcomes of Chinese social networking", *Social Science Research,* Vol. 39, No. 6, pp. 1195-1212.

Topham, W. S. (2010), "Re-regulating 'financial weapons of mass destruction,' observations on repealing the commodity futures modernization act and future derivative regulation", *Willamette Law Review*, Fall, pp.133-143

Treacy, W.F. and Carey, M. S. (2000), "Credit risk rating systems at Large U.S. Banks", *Journal of Banking and Finance*, Vol. 24, No. 1-2, pp. 167-201.

Tsai, K. S. (2004), "Imperfect substitutes: The local political economy of informal finance and microfinance in rural China and India", *World Development*, Vol. 32, No. 9, pp. 1487-1507.

Tsoukas, H. (1989), "The validity of ideograph research explanations", *Academy of Management Review*, Vol. 14, No. 4, pp. 551-561.

Uesugi, I., Sakai, K. and Yamashiro, G.M. (2006), "Effectiveness of credit guarantees in the Japanese loan market", *RIETI Discussion Paper Series 06-E-004.*

Von Stein, J. H. and Ziegler, W. (1984), "The prognosis and surveillance of risks from commercial credit borrowers", *Journal of Banking & Finance*, Vol. 8, No. 2, pp. 249-268.

Wagner, W. and Marsh, I. W. (2006), "Credit risk transfer and financial sector stability", *Journal of Financial Stability*, Vol. 2, No. 2, pp. 173-193.

Wahlström, G. (2009), "Risk management versus operational action: Basel II in a Swedish context", *Management Accounting Research*, Vol. 20, No. 1, pp. 53-68.

Ward, A.M. and McKillop, D. G. (2005), "An investigation into the link between UK Credit Union characteristics, location and their success", *Annals of Public & Cooperative Economics*, Vol. 76, No. 3, pp. 461-489.

Watson, J. and Everett, J. (1993), "Defining small business failure", *International Small Business Journal*, Vol. 11, No. 3, pp. 35-48.

Watson, J. and Everett, J. (1998), "Small business failure and external risk factors", *Small Business Economics*, Vol. 11, No. 4, pp.371-390.

Weber, R. P. (1990), *Basic Content Analysis*, Sage University Paper Series on Quantitative Applications in the Social Sciences, Series No, 07-049, London: Sage, Beverly Hills.

Wei, L. Q., Liu, J., Chen, Y. Y. and Wu, L. Z. (2010), "Political skill, supervisor–subordinate guanxi and career prospects in Chinese firms", *Journal of Management Studies*, Vol. 47, No. 3, pp. 437-454.

Wesley, D. H. (1993), "Credit risk management: lessons for success", *Journal of Commercial Lending*, Vol. 75, No. 1, pp. 32-38.

Westgaard, S., Hol, S. and Wijst, N. V. D. (2007), "Capital structure, business risk, and default probability", *Working Paper*, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=975302

Wignall, A. B. and Atkinson, P. (2009), "Origins of the financial crisis and requirements for reform", *Journal of Asian Economics*, Vol. 20, No. 5, pp. 536-548.

World Bank (2012), *World Development Report (2012)*, http://www.scribd.com/WorldBankPublications/d/66643754-World-Development-Report-2012

Wu, J. M. (2002), *Modern Conception of Credit*, Beijing, China Financial Publishing House (in Chinese).

Wu Jiang Rural Commercial Bank (2010), *The Bank Annual Report (2010)*, Jiangsu: Wu Jiang Rural Commercial Bank.

Xie, R. (2008), "The analysis of the cause of ineffective agricultural loaning rate", *Consume Guide (In Chinese)*, No. 13, pp. 55-59.

Yan, S., Minggao, S., Zhong, X. and Ying, B. (2009), "Bank size and small- and medium-sized enterprise (SME) lending: Evidence from China", *World Development*, Vol. 37, No. 4, pp. 800-811.

Yan, Y. and Gao, P. (2012), "Farmers' financial choices and informal credit markets in China", *China Agricultural Economic Review*, Vol. 4, No. 2, pp.216–232.

Yang, K. and Xu, Y. (2006), "Regional differences in the development of Chinese small and medium-sized enterprises", *Journal of Small Business and Enterprise Development*, Vol. 13, No. 2, pp.174-184.

Yang, Z. R., Platt, M. B. and Platt, H. D. (1999), "Probabilistic neural networks in bankruptcy prediction", *Journal of Business Research,* Vol. 44, No. 2, pp. 67-74.

Yao, S.J., Zhang, Z.Y., and Feng, G.F. (2005), "Rural-urban and regional inequality in output, income and consumption in China under economic reforms", *Journal of Economic Studies*, Vol. 32 No. 1, pp. 4-24.

Yeung, I.Y.M. and Tung, R.L. (1996), "Achieving business success in Confucian societies: the importance of guanxi (connections)", *Organizational Dynamics*, Vol. 25, No. 2, pp. 54-65.

Yin, R.K. (1989), *Case Study Research Design and Methods*, Sage, Newbury Park.

Yin, R.K. (1993), *Applications of Case Study Research*, Sage, Newbury Park.

Yin, R. K. (1994), *Case Study Research: Design and Methods* (2nd edition), Sage, Newbury Park.

Yunus, M. (1999), *Banker to the Poor: Micro Lending and the Battle against World Poverty,* NY: Public Affairs New York.

Zeller, M. (2006), "A comparative review of major types of rural microfinance institutions in developing countries", *Agricultural Finance Review*, Vol. 66, No. 2, pp.195−214.

Zhao, X., J. (1996), *Commercial Bank Loan Management*, Shanghai University of Finance & Economics Press Co., LTD.

Zhao, Y. (1999), "Labor migration and earnings differences: the case of rural China", *Economic Development and Cultural Change*, Vol. 47, pp. 767–782.

Zhiming, Z. (2010), *Inside the Growth Engine. A Guide to China's Regions, Provinces, and Cities*, Hong Kong: HSBC.

Zhou, J. (2011), "An empirical study of China's rural formal financial development and rural income in equality", *Innovation*, Vol. 1, pp. 68-71.

Zmijewski, M. E. (1984), "Methodological issues related to the estimation of financial distress prediction models", *Journal of Accounting Research,* Vol. 22, pp. 59-82.

Zribi, N. and Boujelbène, Y. (2011), "The factors influencing bank credit risk: the case of Tunisia", *Journal of Accounting and Taxation,* Vol. 3, No. 4, 70–78.

Appendix I: Principal Components Analysis (PCA)

PCA is a multivariate technique for examining relationships among several quantitative variables. PCA was first adopted by Pearson in 1901, and further developed by Gnanadesikan (1977), Kshirsagar (1972) and Mardia, Kent and Bibby (1979).

The number of principal components is less than or equal to the number of original variables. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component in turn has the highest variance possible under the constraint that it be orthogonal to (i.e., uncorrelated with) the preceding components.

PCA is appropriate when we have obtained measures on a number of observed variables and wish to develop a smaller number of artificial variables (called principal components) that will account for most of the variances in the observed variables. PCA is also a variable reduction procedure, which is particularly useful to reduce the number of variables from a large number of variables as there could be some redundancy in those variables. In the statistical term, redundancy refers to that some of the variables are correlated each other, possibly because they are measuring the same construct. Technically, a principal component can be defined as a linear combination of optimally-weighted observed variables. In the course of performing a principal component analysis, it is possible to calculate a score for each subject on a given principal component. The following illustrates the procedure of PCA development.

The Procedure of PCA is given as follows: Assuming that there are n samples from the corporate loans, each sample were described by indices $X_1, X_2, \ldots X_p$.

$$X = \begin{pmatrix} x_{11}x_{12} & \cdots & x_{1p} \\ x_{21}x_{22} & & x_{2p} \\ \vdots & \ddots & \vdots \\ x_{n1}x_{n2} & \cdots & x_{np} \end{pmatrix} = (X_1, X_2, \ldots X_p,)$$

Standardisation of original data is processed by Z-score function. The standardized index matrix is V.

$$v_{ij} = \frac{\text{xij} - \text{xj}}{sj}$$

$$x_j = 1/n \sum_{i=1}^{\mu} \text{xij} \cdot Sj = \sqrt{\frac{1}{n} \sum_{i=1}^{\mu} (xij - xj)^2}$$

Then, the next step is to identify the covariance matric. The covariance matrix equals correlation efficient matrix after standardization. R (R= (r$_{ij}$)) S_{jj}

$$r_{ij} = \frac{sij}{\sqrt{sjj}\sqrt{sii}}$$

R represents a real symmetrical matrix ($r_{ij} = r_{ji}$), and only the top half of the matrix or the bottom part of the matrix needs to be calculated.

To solve the eigenequation $|l - R| = 0$, eigenvalue i = 1,2, …, p), and the matrix R is positive definite, therefore, all the eigenvalues are positive and ranked as $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_i \geq \lambda_p$. The eigenvalues represent the co-variances of principal components and the size of eigenvalue describes the significance among different principal components.

The eigenvectors matrix U can be withdraw from the function $|l - R|U = 0$

Let $F = U^T V$

$$FF^T = \begin{pmatrix} \lambda 1 & 0 \\ 0 & \lambda p \end{pmatrix}$$

Following steps are to calculate the principal component contribution rate and cumulative contribution rate respectively.

$$a_m = \frac{\lambda_i}{\sum_{i=1}^{P} \lambda_i}$$

The cumulated contribution rate of principal components $Y_1, Y_2,\ldots,Y_m$

$$a(m) = \frac{\sum_{j=1}^{m} \lambda j}{\sum_{i=1}^{p} \lambda_i}$$

The variance contribution rate (a_m) of Y_m indicates the weight of principal component Y_m out of sample. Therefore, the larger the (a_m) is, the more information detained by $Y_1, Y_2, \ldots Y_m.$

The objective of PCA is to transform a group of number in a smaller group of indices and keeps the raw information as much as possible, in order to simplify the calculation process. The procedure of selection of principal component requires r as small as possible and a_m as large as possible. The cumulative variance contribution rate should be no less than 85%.

$Y_1, Y_2,\ldots,Y_m$ divided the matrix U into two parts:

$$U_{p \times p} = \left(U_{p \times m}^{(1)}, U_{p \times (p-m)}^{(2)} \right)$$

Therefore,

$$V = UF = \left(U^{(1)}, U^{(2)} \right) \left(F^{(1)}, F^{(2)} \right)^r = U_{p \times m}^{(1)} F_{m \times n}^{(1)} + U_{p \times (p-m)}^{(2)} F_{(p-m) \times n}^{(2)}$$

The financial index V_i is

$$V_1 = U_{i1} F_1 + U_{i2} F_2 + \cdots + U_{im} F_m$$

PCA approach has been used in a number of previous studies related to business failures. In a recent study, for example, Li and Sun (2011) conducts an ensemble model of CBR (case-based reasoning) in which the author terms the principal component CBR ensemble in order to improve the predictive ability of CBR in business failure prediction by integrating the feature selection methods. Some other multivariate statistical methods were also compared in this paper. Shin and Kilic (2006) uses the data absorbed from the central bank to derive four measures of a bank's ability to perform the core task of financial intermediation based on the PCA model. The author reveals that a mix of geographical and historical legacies drives the substantial variation in city commercial banks. Canbas, Cabuk and Kilic (2005) propose a methodological framework for constructing the integrated early warning system that can be adopted as a supervision tool for the banks which are experiencing serious problems. The previous applications of PCA were predominately based on large firms and city commercial banks.

Appendix II   The translated interview questions.

Part 1: A brief introduction

A brief introduction: myself, the project, the research objectives of the study, interview process, and guarantee the anonymity.

Part 2: Interview questions (the order can be changed in the process, depending on the reply of an individual interviewee)

1. In your view, what are the major weaknesses of the existing credit risk management models?
2. 2. For rural commercial banks, like yours, what would be the major areas to be considered to assess your client's credit risk?
3. Can you identify some of the risks in this area (business environment)?
4. Can you identify some of the risks in this area (operation)?
5. Can you identify some of the risks in this area (financing)?
6. Can you identify some of the risks in this area (more specifically relating to Chinese characteristics)?
7. What would you expect for a credit risk management framework for RCBs?
8. Are there any other issues you would like to raise?

Part 3: Closing

Thanks the interviewees for their time, views and information.

Appendix III Summary of the financial statements of ZJGRCB (2006-2011)

a) Summary of Income Statement

Expressed in RMB million, otherwise stated	2011	2010	2009	2008	2007	2006
Net Interest income	1,621.4	1,184.9	884.3	892.2	769.7	591.7
Interest income	3,235.5	1,895.5	1,594.4	1,590.9	1,335.5	1,001
Interest expense	1,614.1	710.6	710.1	698.7	565.8	409.3
Net fee and commission income	41.8	35.5	22.1	13.6	9.5	9.5
Fee and commission income	43.3	36.6	23	14.3	10.5	10.1
Fee and commission expense	1.5	1.1	0.9	0.7	1	0.6
Net trading loss/gain	39.4	65.9	53.6	9.6	1.4	9.91
Other operating income	58	20	8.5	15.7	7.6	5.2
Operating income	1,048.7	806.9	596.4	590.7	553.1	373.8
Operating expenses	721,7	508.3	371	348.96	242.66	247.5
Impairment reversals	155	108.1	53.8	73.5	19.3	39.4
Profit before tax	1,053	807.8	597	594.1	556.5	368.1
Income tax expense	167.7	138.6	78.7	91.2	88.6	55.8
Profit for the year	885.3	669.2	518.3	502.9	467.9	312.3
Basic earnings per share (RMB)	0.84	1.25	0.96	0.93	1.00	0.81
Total dividends	890.4	653.7	538.9	N/A	N/A	171.6

b) Summary of balance sheet

Expressed in RMB million, otherwise stated	2011	2010	2009	2008	2007	2006
Loans and advances to customers	25,634.2	21.445.9	17,301.6	12,954.2	11,074.5	9,696.2
Cash and balances with central bank	9,908.6	7,375.9	4,430.2	2,991.6	2,893.0	1,715.9
Deposits with banks and other financial institutions	13,136.2	3,949.6	2,194.0	3,157.5	3117.5	762.2
Placements with other financial institutions	324.5	N/A	N/A	N/A	N/A	N/A
Financial assets held under resale agreements	7,230.3	7,685.2	N/A	N/A	593.1	N/A
Fixed assets	286.1	273.5	260.7	257.6	253.8	225.1
Intangible assets	96.3	96.9	96.4	94.97	100.6	14.134
Other assets	54.7	34.2	33.7	42.4	53.7	65.9
Total assets	69,069.9	51,945.0	32,144.2	26,756.6	24,543.1	17,170.3
Deposits	43,236.1	35,618.3	25,862.0	20,561.7	18,053.04	14,864.02
Deposits from banks and other financial institutions	15,301.9	7,904.1	331.1	43.4	N/A	N/A
Financial assets sold for repurchase	6,266.7	4,250.0	2,350.0	2,920	3,746.9	900
Interest payable	502.0	302.1	263.7	283..02	180.03	133.8
Other liabilities	62.3	44.2	45.0	38.2	41.9	19.3
Total liabilities	64,644.7	48,250.6	28,937.9	23,926.3	22,086.5	16,084.7
Capital paid-up	1,084.5	542.3	542.3	542.3	542.3	386.6
Capital reserve	330.3	867.4	882.9	864.5	858.6	25.7
Surplus reserve	1,428.8	1,030.4	729.2	496.04	269.8	176.2
General risk provision	673.2	540.4	440.1	360.2	284.4	272.4
Undistributed profit	908.3	716.9	611.9	567.2	501.7	224.8
Total equity	4,425.2	3,697.5	3,206.4	2,830.3	2,456.7	1,085.6
Total equity and liabilities	69,069.9	51,948.1	32,144.2	26,756.6	24,543.1	17,170.3