

**ASSESSING CREDIT RISK MANAGEMENT PRACTICE IN PRIVATE
BANKING IN IRAQ
(AN EMPIRICAL STUDY IN PRIVATE BANKING IN IRAQ)**

A Dissertation Presented

by

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Submitted to the Swiss School of Business and Management
In partial fulfilment
Of the requirements of the degree of

**DOCTOR OF BUSINESS ADMINISTRATION
(DBA)**

June 2021

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DEDICATION

To my family members, my four adult children and lovely grandchildren.

ACKNOWLEDGEMENTS

First, I will acknowledge my family members in Norway for their support. I will acknowledge my professional colleagues. I would like to thank my advisor Dr. Jaka Vadnjal for his support, advice, motivation, and useful supervision from the start through the end of the program

ABSTRACT

ASSESSING CREDIT RISK MANAGEMENT PRACTICE

IN PRIVATE BANKING IN IRAQ

The study examines the practice of credit risk management in private banks in Iraq. The study compares the practice of credit risk management with the principles of credit risk management issued by Basel Committee on Banking Supervision (2000) and examines how these principles are effectively practiced and implemented. The author collected data by distributing 260 questionnaires to high level bank employees involved in credit risk management. The target population consists of credit staff, credit risk managers, CEO and board members. The study uses Statistical Package for the Social Sciences (SPSS) software program version 26 to analyse the data collected. The results of the data examined are descriptive statistics which include percentages, frequencies such as mean, standard deviation and variance. The study examines regression analysis, ANOVA analysis and Pearson correlation between variables.

The study finds the answers to the research questions and test hypotheses and concludes with the description of its findings. Private banks in Iraq can benefit from the findings and suggestions to improve their credit risk management. The author provides recommendations for further studies and identifies some limitations of the study.

Key words: Basel Committee for Banking Supervision, credit risk management, principles of credit risk management, credit risk strategy, written loan policy, loan portfolio, loan review, credit risk analysis, credit approving committee, risk rating, risk pricing and loan loss reserve.

Acronyms and Abbreviations

BOD = Board of Directors

BCBS = Basel Committee for Banking Supervision

CBI = Central Bank of Iraq

CSMI = Credit Scoring Methods for Individual

CR = Credit Risk

CRM = Credit Risk Management

DM= Default Model

DMP = Default Mode Paradigm

EAD = Exposure at Default

EL = Expected Loss

GAAP = Generally Accepted Accounting Principle

KYC = know Your Customer

LRM = Loan Review Mechanism

MIS = Management Information System

MMP = Market to Market paradigm

MTM = Mark to Market

NPL = Non-Performing Loan

OBS = Off Balance Sheet

PD = Probability of Default

RAROC = Risk-adjusted Return of Capital

SPSS = Statistical Package for Social Sciences

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CHAPTER 1

INTRODUCTION

In this chapter we first discuss different risks which need to be considered in bank's daily managerial operations. There is a need to give this initial setting because the banking risk is the main topic of this thesis. We continue this chapter by describing the motivation to perform this study and thesis. It is clearly revealed that the main motivation comes from the researcher's working experience in the banking sector of Iraq. Within the last decades, he has been holding some top managerial positions, the ones with the responsibility also for the appropriate risk management. It is certainly expected that the study will bring a certain contribution and new knowledge in the banking sector. We finish this chapter by putting down the research questions, establishing hypotheses and defining main objectives of the study.

1.1 Different risks in banks

Banks are facing various risks. Credit risk is recognized as a major risk that will lead to bank failure if not well managed. Basel Committee on Banking Supervision (2000) issued many principles as instructions for banks to avoid and prevent bank failures, protect depositors, and ensure financial stability. The Risk Management Group of Basel Committee at Banking Supervision (2000) issued many principles for managing credit risk in banks. These principles are recognized as both guidelines and instructions for credit risk management in banks.

Central banks (or supervisor) require banks to establish risk departments in banks' organizational structures to manage and practice credit risk management in banks to minimize risk losses. These principles for credit risk management cover various important issues related to the activities of banks. The main purpose and objective of the principles is to provide instructions and suggestions for good management of banking activities to minimize credit risk and avoid bank failures.

1.2 Motivation for the study

This study examines credit risk management practises in private banks in Iraq. The aim of the study is to investigate the effectiveness of the practise of credit risk management principles issued by Basel Committee on Banking Supervision (2000). There are three main reasons for evaluating credit risk management in private banks in Iraq. First and foremost is to analyse whether there is a good framework for applying the credit principles proposed by the Risk Management Group of Basel Committee at Banking Supervision (2000). Secondly, the credit risk environment will be examined to ensure that banks operate within a sound lending process. Thirdly, the measurement of credit risk and monitoring processes will be examined; and finally, the study will look into the role of supervisors (central banks) in preventing bank failures and ensuring financial stability and confidence.

1.3 The importance of the study for the banking industry

The study is expected to be useful for banking in Iraq as it provides suggestions for Iraqi private banks that are based on its findings. The study examines different points of practicing credit risk management and determines both strengths and weaknesses of the process credit risk management. Private banks can improve their credit risk management based on the findings of this study.

The financial system in Iraq is composed of the Central Bank of Iraq, four state-owned commercial banks and 35 private banks. There are three state-owned banks that provide real estate loans, agricultural loans, and industrial loans. The private banks can be divided into two groups: traditional banks and Islamic banks. There are also subsidiaries of some foreign banks from Turkey, Lebanon, and United Arabian Emirates. Private banks started to develop after 2005, which makes this sector quite young and still quite far from market maturity. The renewed Law on the Central Bank, adopted in 2004, allowed the establishment of private banks. The minimum

capital requirement for a private bank is USD 208.33 million. Private banks are authorized to collect deposits and offer various types of loans.

Private banks offer commercial, consumer, and real estate loans. Majority of private banks have multiple branches in different cities. Private banks are very active in installing ATMs in front of their buildings, shopping malls and airports. Majority of private banks offer Master and Visa cards to their customers. Telephone banking is not very common at the time of this study. The Central Bank of Iraq established Deposit Insurance to provide confidence and financial stability and to protect depositors' funds in the event of bank failure. The Central Bank of Iraq is active in the supervision and monitoring of private banks and requires private banks to practice risk management principles that are compliant with the Basel Committee prudential requirements. Private banks focus more on short-term loans, especially consumer loans with a maximum maturity of 36 months and commercial loans for trade financing for various businesses. There is strong competition among private banks to attract new customers. Central Bank of Iraq (CBI) provides finance through the private banks for different economic sectors such as financing loans to agriculture, industry, and real estate projects with low interest rates. CBI provides small loans to individuals for financing small business to decrease unemployment and encourage economic development.

1.4 Problem statement and research question

This study examines how private banks in Iraq practice the credit risk management principles issued by Basel Committee at Banking Supervision (2000). In order to determine whether and how the credit risk framework is in practice, the study explores the following research questions.

1. Do private banks in Iraq have effective board members?
2. Do private banks in Iraq operate within a sound lending process?

3. Do private banks in Iraq have adequate loan administration?
4. Does the regulator in Iraq play an important role for the private banks?

1.5 Hypotheses

From these questions, the following hypotheses may be formulated.

H1: Private banks in Iraq have effective members of boards of directors.

H2: Private banks in Iraq are operating under a sound credit granting process.

H3: Private banks in Iraq are maintaining a suitable credit administration.

H4: Supervision authority in Iraq has a significant role over private banks in Iraq.

1.6 Objectives

The main objective of the study is to evaluate the practice of credit risk management in Iraqi private banks. The aim of the study is to compare the practice of credit management in private banks in Iraq with the standards of the principles of credit management proposed by the Risk Management Group of Basel Committee on Banking Supervision (2000) to analyze how banks practice the principles that are beneficial for banks to avoid bank failure and protect depositors.

The study examines how credit risk principles are practiced by private banks in Iraq. The objectives of the study are:

1. To investigate different parts of the principles that have an impact on credit risk management in the bank such as: the responsibility of the board of directors, credit risk strategy, written credit policies, internal rating used by banks, credit evaluation process, credit approval committee and credit review process in the bank. The study examines weaknesses and strengths of credit risk management practices and provides suggestions to address weaknesses. The study is important for private banks in Iraq because it shows the level of effective practices for the Basel Committee group.

2. Develop a constraint classification methodology to facilitate constraint identification and modelling.
3. Review current industry practices and research regarding constraint modelling.
4. Outline a conceptual framework for overall constraint management.

The results of this study are expected to be valuable to bank managers and boards of directors in understanding the extent to which they practice credit risk management frameworks and conduct analysis of strengths, weaknesses, opportunities, and threats (SWOT).

CHAPTER 2

LITERATURE REVIEW

In this literature review chapter, we start by defining what is risk and which are the main sources of risk in the banking business. We continue by identifying different types of transactions in which the credit risk is created. To be able to understand it, the indications of the credit risk need to be underpinned. A good understanding of risk is the first step to an effective risk management. We list and discuss the necessary requirement for the effective risk management. There are several important tools that help a bank's credit risk management to assess it. We put a strong emphasis on credit rating and credit scoring. Additionally, we discuss in detail the use of the internal credit risk rating system. We close the literature review chapter by determining the concept of the bank's need for security.

2.1 Credit risk

Banking is the largest and leading financial institution that supports the development and growth of the economic transaction. Banks act as intermediaries between surplus units and deficit units. Banks collect deposits from depositors and lend to other business units as a traditional main function. Dejene (2015) argues that for most banks, loans are the largest and most obvious source of credit risk.

Banks face many risks during their operations, but credit risk is recognized as the first risk in terms of its impact on banks. Several authors (Warsame; 2016; Khalid & Amjad; 2012) defined credit risk as the probability that the debtor (or counterparty) is unable or unwilling to fulfil its contractual obligations. Other authors (Basel Committee on Banking Supervision, 2000; Joseph, 2013; Bouteille & Coogan-Pushner, 2013; Gup & Kolari, 2005) also write about that. Basel defines credit risk as the probability that the borrower (or counterparty) cannot fulfil its contractual agreement because the creditworthiness of the debtor is weakened for some reason.

Credit risk cannot be avoided but it can be minimized, therefore the objective of credit risk management in banks is to minimize credit risk in lending and to hold investments with high credit quality and diversify them. The objective of credit risk management is to maximize the risk adjusted return of a bank by keeping the credit risk exposure within acceptable parameters. Effective management of credit risk is important for the long-term success of any financial institution. Ernst & Young (2010) calculated credit risk using the following equation.

$$\text{Credit Risk} = \text{Exposure} \times \text{Probability of Default} \times (1 - \text{Recovery Rate})$$

Credit risk depends on two components, the first is the amount of exposure and the second is the probability of default. Basel Committee on Banking Supervision (2000) considers those loans to be the largest source of credit risk in banks. Other sources of credit risk are banking book and trading book. Lending is the main business of banks; it is a profitable business, but it is risky. Banks select low-risk (or creditworthy) customers for lending. Banks can check the creditworthiness of customers by analysing the five Cs of creditworthiness, which are character, capacity, capital, condition, and collateral. In addition to selecting creditworthy customers, banks should diversify their loan portfolio and investments to minimize the risk of loss.

The Basel Committee on Banking Supervision (2000) points out that the objective of credit risk management is to keep a bank's credit risk within the parameters set by the board and management. The establishment and enforcement of internal controls, operating limits and other practices help to ensure that credit risk exposure does not exceed a level acceptable to the individual bank. Such a system enables bank management to monitor compliance with established credit risk targets.

Ghosh (2012) points out that credit risk is positively related to market risk. Credit risk arises from both systematic risk and unsystematic risk. Market risk leads to the emergence of credit risk, for example, the decline in the economy usually leads to lower activity of firms. The

number of unemployed people increases. It may be unemployment or simply insufficient cash flow that leads to the borrower not being able to repay the loan instalments.

Macroeconomics affect credit risk as a good loan in times of economic growth can turn into a bad loan in times of recession. In investment cycles, there is a trade-off between risk and return when money is invested (Gitman & Joehnk, 2008; Bodie et al., 2010). That is, if the investor receives a high return, he should also bear a high risk. According to this principle, banks charge a higher interest rate to a riskier customer. In contrast, a low-risk (or creditworthy) customer pays a low interest rate because the probability of default is low for this group.

2.2 Sources of credit risk

Researchers (Ghosh, 2012; Basel Committee on Banking Supervision, 2000) point out that loans are the largest and most obvious source of credit risk that exists in all activities of a bank, including in the banking book and trading book. The trading book includes both on-balance sheet and off-balance sheet activities. Banks provide many services that can be a source of credit risk, such as loans, including acceptances, interbank transactions, trade finance, foreign exchange transactions, financial futures, swaps, bonds, equities, options, as well as in making commitments and guarantees and in settling transactions. Credit risk is in many cases a consequence of market risk, which is influenced by the downturn in the overall economic trend.

2.3 Types of transactions that create credit risk

Bouteille & Coogan-Pushner (2013) emphasize that the management of credit risk first requires the identification of all situations that may lead to counterparty default. Credit risk is present in many types of transactions. The following table lists seven common business arrangements that generate credit risk. Their main implications for banking risk are shown in table 1.

Table 2.1*Types of transactions that create credit risk*

Credit type	Losses result from	Loss type
Loaned money	Nonrepayment Slow repayment Dispute /enforcement	Face amount Time value of money Fractional costs
Lease obligation	Non-payment	Recovery of assets, remarketing costs, differences in condition
Receivable	Non-payment of goods delivered, or service performed	Face amount
Prepayment for goods and services	Non-delivery Performance on delivery not as contracted Slow delivery Dispute /enforcement	Replacement cost Incremental operating cost Time value of money Frictional costs
Deposit in another bank	Nonrepayment	Face amount
Claim or contingent claim on asset	Nonrepayment / noncollecting Slow repayment /slow collection Dispute /enforcement	Face amount Time value of money Frictional costs
Derivative	Default of third party	Replacement cost (mark to mark value)

Source: Bouteille & Coogan-Pushner (2013: 6-7)

2.4 Indication of credit risk

Ghosh (2012) suggests that volatility in market risk factors, like changes in interest rate and exchange rates, generate credit risk. Loans and advances are the largest sources of credit risk to banks, but it exists in other activities as well.

a) Credit risk management

Banks should now have a keen awareness of the need to identify, measure, monitor and control credit risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for risks incurred. Basel Committee for Banking Supervision (2000) suggested principles of a sound practice for credit management. The sound

practices set out in this document specifically address the following areas: (1) establishing an appropriate credit risk environment; (2) operating under a sound credit granting process; (3) maintaining an appropriate credit administration, measurement and monitoring process; and (4) ensuring adequate controls over credit risk. Although specific credit risk management practices may differ among banks depending upon the nature and complexity of their credit activities, a comprehensive credit risk management program addresses these four areas. These practices should also be applied in conjunction with sound practices related to the assessment of asset quality, the adequacy of provisions and reserves, and the disclosure of credit risk, all of which have been addressed in other recent Basel Committee documents.

b) Credit analyst

Author's long years' banking experience shows that credit department in the bank should have expert in credit analysis on staff. Credit analyst can evaluate loan applicant from different sides, such character, capacity, capital, condition, collateral and financial statement analysis. Ghosh (2012) and Sweeting (2012) mention that each credit proposal should be subject to careful analysis by a qualified credit analyst with expertise commensurate with the size and complexity of the transaction. An effective evaluation process establishes minimum requirements for the information on which the analysis is to be based. There should be policies in place regarding the information and documentation needed to approve new credits, renew existing credits and/or change the terms and conditions of previously approved credits. The information received is the basis for any internal evaluation or rating assigned to the credit and its accuracy and adequacy is critical to management making appropriate judgements about the acceptability of the credit.

c) Credit risk staff

Many years of author's experience in banking confirm that banks must have a high skill staff members in credit department. The bank should hire highly educated staff in credit

department and risk management. Credit risk staff officers should have experience, knowledge and a good background to exercise prudent judgment in assessing, approving and managing credit risk. A bank's credit-granting approval process should establish accountability for decisions taken and designate who has the absolute authority to approve credits or changes in credit terms. Banks typically utilize a combination of individual signature authority, dual or joint authorities, and a credit approval group or committee, depending upon the size and nature of the credit. Approval authorities should be commensurate with the expertise of the individuals involved. Banks try to improve skills for their staffs constantly through purchasing training programs in order to be familiar with update credit risk soft programs.

d) Credit risk measurement model

Banks face credit exposure from the loan provided. It is possible that borrower cannot pay back the loan obligated, thus banks face exposures. Portfolio credit loss can be defined as the differences between the portfolio current value and its future value at the end of some time horizon. According to Ghosh (2012), the development of credit risk measurement models has two dimensions. The first dimension is establishment of credit risk rating models, and the second is development of techniques for measuring potential loss on the banks total credit exposure. Basel Committee for Banking Supervision (1999) witnesses that there are benefits of credit risk models, which can be:

1. Banks credit exposure typically cut across geographical locations and product lines. Use of credit risk models offers banks a framework for examining credit risk in a timely manner, collecting data analysing marginal and absolute contributions to risk.
2. Credit risk models provide estimates of credit risk (expected loss) which reflect portfolio composition; they may provide a better reflection of concentration risk.
3. Models may offer:

- a. The incentive to improve systems and data collection efforts.
- b. More informed setting of limits and reserves.
- c. More accurate risk-performance based pricing.

e) Models for risk assessment

1. Default Mode Paradigm. Ghosh (2012) thinks that under DM paradigm, credit losses are recognized only when the counterparty commits a default in repayment obligation. The credit loss is measured as a difference between the amount of exposure outstanding in the books of the bank and the present value of future recoveries net of all expenses and cost involved in the recovery process.
2. Market to Market paradigm. Market to Market models (MTM) recognizes changes in the asset's creditworthiness and its potential impact on the banks financial position.

d) Sound credit-granting criteria

These criteria should include a clear indication of the bank's target market and a thorough understanding of the borrower or counterparty, as well as the purpose and structure of the credit, and its source of repayment. Establishing sound, well-defined credit-granting criteria is essential to approve credit in a safe and sound manner. The criteria should set out who is eligible for credit and for how much, what types of credit are available, and under what terms and conditions the credits should be granted. Banks must receive sufficient information to enable a comprehensive assessment of the true risk profile of the borrower or counterparty. Depending on the type of credit exposure and the nature of the credit relationship to date, the factors to be considered and documented in approving credits include:

e) Board of directors and credit risk strategy

Credit risk strategy should give recognition to the goals of credit quality, earnings and growth. Every bank, regardless of size, is in business to be profitable and, consequently, must determine the acceptable risk/reward trade-off for its activities, factoring in the cost of capital. A bank's board of directors should approve the bank's strategy for selecting risks and maximizing profits. The board should periodically review the financial results of the bank and based on these results, determine if changes need to be made to the strategy. The board must also determine that the bank's capital level is adequate for the risks assumed throughout the entire organization (Ghosh, 2012; Basel Committee for Banking Supervision, 2001a).

The credit risk strategy of any bank should provide continuity in approach. Therefore, the strategy needs to consider the cyclical aspects of any economy and the resulting shifts in the composition and quality of the overall credit portfolio. Although the strategy should be periodically assessed and amended, it should be viable in the long-run and through various economic cycles. The credit risk strategy and policies should be effectively communicated throughout the banking organization. All relevant personnel should clearly understand the bank's business (Rehman et al., 2019).

The board should ensure that senior management is fully capable of managing the credit activities conducted by the bank and that such activities are done within the risk strategy, policies and tolerances approved by the board. The board should also regularly (i.e., at least annually), either within the credit risk strategy or within a statement of credit policy, approve the bank's overall credit granting criteria (including general terms and conditions). In addition, it should approve the way the bank organizes its credit-granting functions, including independent review of the credit granting and management function and the overall portfolio (Rehman et al., 2019).

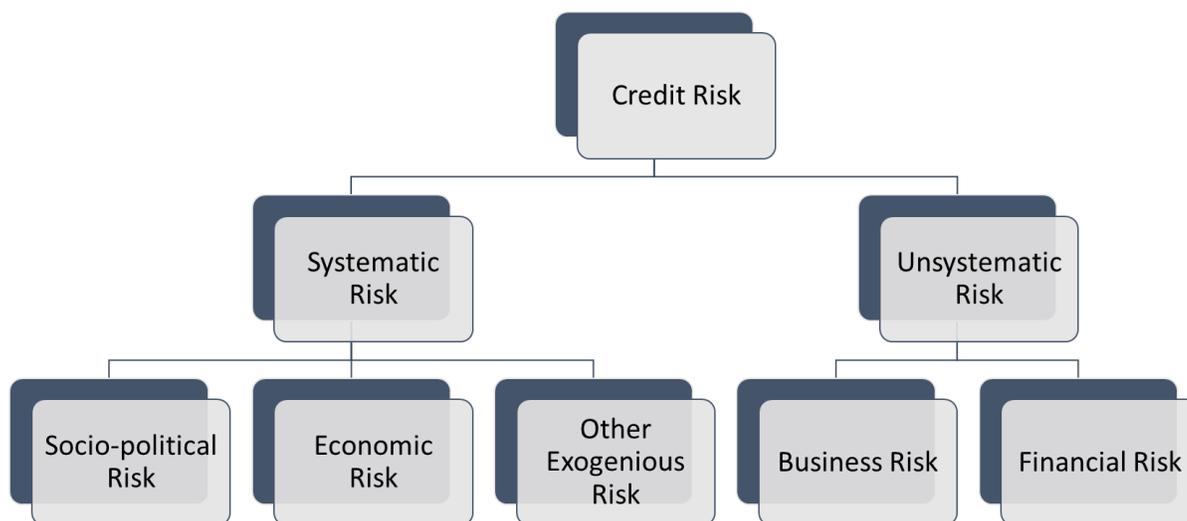
f) Indicators of credit risk

According to Rose & Hudgins (2013, 182), there are six ratios used as indicators of credit risks, they are:

- Total loans / total deposits
- Nonperforming assets /total loans and lease
- Net charge from loans / total loans and leases
- Annual provisions for loan losses /total loans and leases or relative to equity capital
- Allowance for loan losses / total loans and leases or relative to equity capital
- Nonperforming assets / equity capital

g) Causes of credit risk

Figure 2.1 *Various Causes of Credit Risk*



From: Joseph, C. (2013). *Advanced Credit Risk analysis and Management* (3rd ed.), page 16. New Jersey: Wiley & Sons.

Joseph (2013, 16) refers to a credit risk as the product of a variety of events, some controllable, other uncontrollable. Credit risks originate from several factors with international

aspects or domestic issue (changes in government policy) or company specific reasons (poor government, bad products). Figure 2.1 summarizes the various causes of credit risk.

h) How to reduce credit risk?

To reduce the lender's credit risk, the lender may perform a credit check on the prospective borrower, may require the borrower to take out appropriate insurance, such as mortgage insurance, or seek security over some assets of the borrower or a guarantee from a third party. The lender can also take out insurance against the risk or on-sell the debt to another company. In general, the higher the risk, the higher is the interest rate that the debtor is asked to pay on the debt. Credit risk mainly arises when borrowers are unable to pay due willingly or unwillingly. Banks can use a wide variety of techniques to reduce their credit risk. Some of the techniques are:

1. Avoid making high risk loans
2. Require the use of collateral. Collateral reduces the risk the lender, and the threat of loss of the collateral provides an incentive for the borrower to repay their loans.
Collateral is considered a secondary source of repayment in the event of loan default.
3. Diversify the loan portfolio. Diversification is recognized as a risk management strategy for reducing credit risk. Diversification means to mix different types of credit within portfolio. Diversification of loan portfolio means to combine many types of loans such as consumers, commercial, real estate, and agriculture. At the same time, credit should be diversified to different geographic area and into different terms.

2.5 Credit management and credit risk management

The traditional business of banks is lending. Lending is a profitable business for banks, but it is risky, so banks should minimize the risk in lending by selecting borrowers with high creditworthiness and diversifying the risk. Basel Committee on Banking Supervision (2001a)

points out that banks and their regulators should be able to learn useful lessons from past experiences as credit risk remains the major cause of problems in banks worldwide. Ghosh (2012) points out that the primary objectives of an effective credit risk management system are to maintain the quality of loan assets and prevent the production of non-performing loans and to make sound provision against possible credit losses.

The credit risk management department provides suggestions to management on how to manage credit risk. Credit risk management involves identifying, measuring, monitoring, and managing credit risk and always maintaining sufficient capital to protect depositors from credit risk. Banks are now required to identify, measure, monitor and manage credit risk and to ensure that they always hold adequate capital to protect depositors from credit risk and that they are adequately compensated for risks incurred. The Basel Committee is issuing this paper to encourage banking supervisors worldwide to promote sound credit risk management practices. Although the principles contained in this paper are most clearly applicable to lending activities, they should be applied to all activities that involve credit risk.

The Basel Committee on Banking Supervision (2000) suggests sound practices for credit risk management that should be followed by all banks worldwide, namely.

1. Creating an appropriate credit risk environment.
2. Operating under a sound lending process.
3. Maintaining an appropriate credit management, measurement, and monitoring process.
4. Ensuring adequate controls over credit risk.

2.6 Requirements of effective credit risk management in banking

The goal of the credit risk department is to minimize risk by using multiple techniques to identify and evaluate credit risk. These techniques are essentially a first step in effectively managing credit risk. Techniques for effective management of credit risk include the following.

2.6.1 Minimize credit risk

A bank manager is a risk manager. Credit risk cannot be avoided, but it can be minimized by many techniques, such as lending to creditworthy customers and diversifying the loan portfolio. The objective of minimizing credit risk is to avoid exposure to credit risk and to ensure the bank's growth and solvency in the long run.

Ernst & Young (2010) indicate that bank executives pay more attention to credit risk than any other type of risk. While 67% of respondents believe that credit risk is of the highest importance, other types of risk also receive a great deal of attention: operational risk (44%), liquidity risk (38%), market risk (33%), and reputational risk (26%).

2.6.2 Board of directors

The Board of directors is the highest authority in the bank. The number of members of board directors varies from 5 to 11. According to the law of banking no. 94 (2004) issued by the Central Bank of Iraq (CBI), the minimum members of board directors are five persons, and they should have experience in the banking industry. The central bank of Iraq suggests that the board of directors should be comprised of experts in different fields such as accounting, auditing, finance, legal, business administration and information technology. The reason is to cover different issues that may be discussed by members.

The Board of directors is responsible to approve and review periodically (at least annually) both credit risk strategy and written credit policy (Basel Committee on Banking Supervision, 2000; Brunini monetary, 2018). Hong Kong Monetary (2019) mentions that the

board of directors reviews credit strategy according to financial results, market conditions and trends and its capital resources. The board should confirm that the top management has the skills to manage credit activities that are conducted by the bank. In addition, the board of directors ensures that credit activities are undertaken within the written policy, credit strategy, risk appetite, risk-tolerance permitted by the board.

Basel Committee on Banking Supervision (2000) states that among the principles of credit risk management in banks is that board directors should regularly (at least yearly) approve general term for credit granting criteria and credit approving system. Periodically, the board should review bank's financial results and shall decide if the actual results match with budgets profit. Capital adequacy for a bank is determined according to evaluated risks in assets by the bank's board of directors.

Several sources on banking supervision (Basel Committee on Banking Supervision, 2000; Brunini monetary, 2018, Hong Kong monetary, 2019) confirm that board directors are ultimately responsible for approving credit strategy and policies and ensuring that they are appropriate to the local business. Board directors delegate all or part of its credit authority to the credit committee or senior management but remain responsible for controlling credit risk management. Hong Kong Monetary Authority (2019) states that the board of directors ensures that the practice of risk strategy matches types of approved loans. The board of directors should regularly meet (at least annually) to decide on credit risk strategy and determine types of allowed loans and their regulation. To avoid conflicts of interest, the board of directors are not allowed to involve in process of banks' loan approving and monitoring process. According to law No. 94 (in 2004) of the Central Bank of Iraq, a board of directors' members are prohibited to receive a loan from their banks, the reason is to not get benefit from their position.

2.6.3 Chief executive officer (CEO)

The title of CEO is most often used and encountered in large organizations with multiple levels of management. A CEO is an expert and professional banker at the top of a bank organization structure. CEO has authority from the board of directors to manage the bank and make effort to maximize the wealth of shareholders. He is responsible for board directors to manage the bank in a performance manner. The CEO is responsible for planning and directing the work of a group of individuals. CEO monitors their work and take corrective actions when necessary. The senior manager is responsible for planning and directing the work of a group of individuals. He monitors their work and takes corrective actions when necessary.

Basel Committee on Banking Supervision (2001a) states that senior management should have responsibility for implementing the credit risk strategy approved by the board of directors and for developing policies and procedures for identifying, measuring, monitoring, and controlling credit risk. Such policies and procedures should address credit risk in all of the bank's activities and at both the individual credit and portfolio levels.

Ghosh (2012) mentions that senior management of a bank is responsible for implementing the credit risk strategy approved by the board of directors. This includes ensuring that the bank's credit-granting activities conform to the established strategy, that written procedures are developed and implemented, and that loan approval and review responsibilities are clearly and properly assigned. Senior management must also ensure that there is a periodic independent internal assessment of the bank's credit-granting and management functions.

According to Hong Kong Monetary Authority (2019), the Senior executive officer (CEO) is responsible for the daily management of the bank and leads the credit committee for approving lending credit. CEO shall be in touch with credit lending, challenges, and review loans. He is responsible to establish a credit policy and publish a manual to be distributed to the credit

department and branches. CEO approves credit decision and monitors the process. Basel Committee on Banking Supervision (2000) states that the CEO develops policies and procedures for identifying, measuring, monitoring, and controlling credit risk. All the bank's activities are covered for both personal credit and portfolio levels. The CEO of a bank typically reports to the board of directors and is charged with maximize of revenue and market share for stockholders.

Basel Committee on Banking Supervision (2019) states that the board of directors and senior management should possess sufficient knowledge of all major business lines to ensure that appropriate policies, controls, and risk monitoring systems are effective. They should have the necessary expertise to understand the capital markets activities in which the bank is involved. Basel Committee on Banking Supervision (2006) also states that the bank's board of directors and senior management are responsible for ensuring that the banks have appropriate credit risk assessment processes.

Senior management should have responsibility for implementing the credit risk strategy approved by the board of directors and for developing policies and procedures for identifying, measuring, monitoring, and controlling credit risk. Such policies and procedures should address credit risk in all the bank's activities and at both the individual credit and portfolio levels.

2.6.4 Corporate governance

Corporate governance comprises of the principles, a system of rules, practice, ethics, values and procedure that are established in pursuance of laws and regulations to run the business on sound lines to protect the interests of depositors, shareholders. Corporate governance provides the framework for achieving companies' objectives, relation with customers, suppliers, the government and the community. It comprises action plans and internal controls to performance management and corporate disclosure (Saunders & Cornett, 2013; Ghosh, 2012).

Ghosh (2012) mentions that corporate governance in banks is comprised of principles, ethics, and values established in pursuance of laws and regulations to run the business on sound lines to protect the interest of depositors, shareholders, and stakeholders. In addition, corporate governance should ensure strategic leadership of corporation and efficient monitoring of management by the board of directors.

Corporate governance in banks has more focus on risk management activities, which involve the formulation of sound risk management policies and strategies by the board directors and their implementation and monitoring by senior management. Banks should make comprehensive disclosure about their financial position and other affairs in the annual report and the statement of account. Ghosh (2012) mentions that bank should encourage integrity, honesty, and transparency, highly discourage greed, corruption, and bias. The primary objectives of corporate governance are to promote shareholders' interest and achieve an increase in the market value of equity and improvement in the net worth of the company year after year.

Ghosh (2012) emphasizes that the primary objective of corporate governance is to promote shareholders' interests and achieve an increase in the market value of equity. To summarize, the objectives of corporate governance in banks are:

- To achieve long-term solvency
- To protect shareholders interests
- To safeguard depositors and debt holders' interests
- To promote the morale of employees
- To build up a reputation and win public confidence
- To secure easy access to the capital market

Ghosh (2012) mentions that banks should establish appropriate policies and procedures relating to the following elements to promote an effective corporate governance system:

- Transparency and accountability
- Shareholder responsibility
- Internal control efficacy
- Independence of audit system
- Disclosure standard
- Checks and balance mechanism

Corporate governance in the bank focuses on formulating sound risk management policies and strategies by a board of directors. Risk strategy and written policy are implemented and monitored by senior management. Good corporate governance leads to performance. Putra & Simanungkalit (2014) indicate that the implementation of good corporate governance has an important role in increasing the value of the company.

Corporate governance can be classified according to rating scores. A report issued by the United Nations conference on trade and development (2003) states that Standard and Poor agency established a rating system ranges, with five representing best practice and one most questionable standard rating. The categories are:

- Board structure
- Disclosure
- Right and duties of shareholders
- Absence of takeover duties

Banking laws and bank regulators define the roles and responsibilities of the board directors and senior management in banks. Finally, company's corporate governance is important

to investors since it shows the company's direction and business integrity. Good corporate governance helps companies build trust with investors and the community. As a result, corporate governance helps promote financial viability by creating a long-term investment opportunity for market participants.

2.6.5 Credit risk strategy

The credit risk strategy should give recognition to the goals of credit quality, earnings, and growth. Every bank, regardless of size, is in business to be profitable and, consequently, must determine the acceptable risk/reward trade-off for its activities, factoring in the cost of capital. A bank's board of directors should approve the bank's strategy for selecting risks and maximizing profits. The board should periodically review the financial results of the bank and based on these results, determine if changes need to be made to the strategy. The board must also determine that the bank's capital level is adequate for the risks assumed throughout the entire organization. Each bank should own a strategy for lending that includes details about acceptable types of credit, how to reduce credit risk in lending and how to manage portfolio of loans.

Every bank should have a written statement of its credit risk strategy, which determines a sound credit quality, profits, and business growth (Basel commission on Banking supervision, 2000; Hong Kong Monetary, 2019; Gup & Kolari, 2005). Credit should provide to a profitable business. The strategy should reflect the bank's tolerance for risk and the level of profitability the bank expects to achieve for incurring various credit risks. Bank determines the acceptable risk and rewards trade-off for its activity. Credit risk strategy should be consistent with its degree of risk tolerance, level of capital available, and credit management expertise. Credit risk strategy should always be reviewed considering the economy's economic cycles and their effects on the credit portfolio during different stages of economic cycles. Hong Kong Monetary Authority (2019) emphasizes that the credit risk policy should follow the principles of prudence. It should

be enforced and applied constantly. Furthermore, it should ensure that credit facilities are only granted to credit -worthy customers and avoid risk concentration. The credit risk policy should not be relaxed due to competitive pressures. Any changes to the policy should be approved by the board of directors and should not expose excessive risk.

Monetary Authority in Hong Kong (2019) states that credit risk strategy should consist of a minimum of:

1. Credit risk strategy should include a declaration of types of loans which bank is agreeing to provide for different segment of borrower's products and exposure types (consumer, manufacturing, commercial, real estate, etc.). The strategy should focus on geographical location, economic sectors, currency, and deadline maturity for loans.
2. Credit risk strategy should identify markets which are target. In addition, the bank should have a plan of loan portfolio. The bank should understand the purpose of the loan plan and sources for repayment. Loan portfolio should determine the percentage of each type of loan distributed according to economic sectors, geography and its terms. The aim of loan portfolio is to minimize loss exposures.
3. The objective of credit risk strategy is to provide a high standard of credit, earning and growth.
4. Economic cycles and their effects should be considerable in the credit risk strategy.
5. The credit risk policy should not be relaxed due to competitive pressures.
6. The credit committee or senior management should be responsible for implementing the strategy decided by the board of directors.

2.6.6 Written loan policy

The Board of directors approves a written loan policy. A written loan policy is a document and instruction that provides guidelines and principles for a bank loan policy and credit

strategy. Hong Kong Monetary (2019) states that written loan policy needs to be distributed to all relevant staff, and easy to understand. It should be applied on a consolidated basis. The loan written policy differs widely from bank to bank. The loan policy for a small bank that lends basically to the local consumer is going to be different from the policies of a large bank that lends to business companies. Loan policy comprises many parts:

1. Loan authority: This part determines who has the authority to approve providing loans, lending limits relative to capital, deposit, and process of loan approval.
 2. Loan portfolio: Banks must diversify loans to different economic sectors. The types of loans can be divided into different economic sectors, such as consumer loan, commercial loan, real estate loan, agriculture loan and manufacture loan. The purpose of diversifying is to avoid a positive correlation between risk and minimize loss exposure.
 3. Geographic limits of the bank trade area: Banks can provide loans to different cities, regions, and countries to reduce correlation and minimize risk. Banks should not lend to borrowers outside of their branch presence.
 4. Policies for determining the contractual term of the loan, fees, and interest rates.
- Written loan policy should determine the term of loans, needs for having collateral as a guarantee, fees, and different types of interest rates such as fixed or variable for real estate loans.

5. Loan review: The credit strategy should comprise evaluating lending procedure, loan review and contact customers in the case of delay of repayment of loans. Loan review refers to observing loans to make sure that borrowers are following their loan agreements and the bank is following its loan policies. Banks today use a variety of different loan review soft programs to provide banks with quick check about delinquency borrowers. Bank contacts lawbreaking borrowers to know the reason for unpaid instalments and takes actions to take over collateral as a final step to get back the remained balance of the loan.

6. Characteristics of written loan policy: Bouteille & Coogan-Pushner (2013) state that written loan policy (or guidelines) must have the following characteristics: (1) A written loan policy should be understandable, written in a clear, simple language; (2) The guidelines should be short and precise; (3) Accessible, which means that bank professional staff members should know where they can find the guidelines when they need them.

Bouteille & Coogan-Pushner (2013) mention that the chief of the risk department is responsible for maintaining guidelines constantly and the approval of guidelines must be done by the senior risk management committee.

2.6.7 Delegated credit authority

Hong Kong Monetary (2019) emphasizes that Board directors should delegate credit lending decision to the credit committee or individual credit officers. Providing authority should be equal with their credit experience and expertise. Credit authority delegate to the credit committee and each credit officer should be subject to constant evaluation to guarantee that it remains appropriate to the current market situation and the level of their performance.

2.6.8 Staff competence

Banks should have highly skilled human resources with long experience. Credit activity needs to have highly skilled and smart human resources. They should have good background in credit analysis for loan applicant and financial statement analysis. Credit department staff members should be able to determine credit risks for each loan applicant, thus, staff involved in credit activity should have adequate competence and fully understand their task, policies and tolerance of risk and limits.

Monetary Authority in Hong Kong (2019) states that staff related to a lending decision should have appropriate professional qualification, technical/managerial skills, and experience in their duties. Account officers and credit officers should have solid understanding of the credit

associated with the products. Credit risk management staff should possess enough knowledge in credit risk management. Banks improve qualification of their staff members via participating in different workshops related to credit analysis and credit risk management. Continuing credit training programs for credit department staff members are necessary to update their knowledge related to new issues and risks imposed by changing market circumstances.

2.6.9 Human resource development

The risk management environment undergoes frequent changes. Ghosh (2012) mentions that banks should develop their own models instead of acquiring models developed by other agencies because there is need to approach them frequently for review and revision. Banks require three categories of specialized personnel to effectively manage the risk management function. The first category of personnel develops, formats, templates and models for counterparty rating and risk quantification. The second category of people implement the models and techniques across the organization, and third category of people conduct validation and back-testing and suggest modification. Besides, the bank needs other personnel who have exposure to various risk management functions.

The risk management process is complicated, and specialized skills can be developed over a period within the organization to understand the process and handle the emerging risks. Banks need to recognize risk management as a specialized function, address the human resources development issue separately and make adequate provision for specialized personnel within the organization.

Ghosh (2012) emphasizes that banks should not only keep front-line people with specialized skills to manage risks but also a second line of support. Banks can constantly purchase training programs in different skills for bank staff members since sciences and soft programs are constantly updating.

2.6.10 Risk management policy

Ghosh (2012) and Lalon (2015) mention that the board of directors of the bank issues risk management policy. Risk Management policy document describes the course of risk-taking activity to minimize the losses from risks. Banks are different in their risk-bearing capacity. The policy document contains guidelines regarding risk acceptance level which is also referred to as risk appetite. Risk management policy should keep in view banks resources, expertise, strengths and weaknesses.

2.6.11 Risk management department

Banks are required by their supervision authorities (or central banks) to establish an organizational unit responsible for risk management. Furthermore, they are required to propose procedures for risk identification, measurement, and assessment. The risk management department in the bank protects from the bank's failure through using methods and techniques to minimize exposure of losses. Ghosh (2012) declares that the risk department comprises of unit's credit, market, and operation risk management.

The structure of the risk management department in the bank depends on the size and geographical spread of branches and type of business activities. Recent studies (Ghosh, 2012) suggest that a separate risk management department have better independence than risk management divisions closed to each lending activities, real estate lending, commercial lending and consumer lending.

The organizational structure of risk management is as follows: The board of directors is on the top and the risk management committee of the board and internal audit department are under the board's supervision. Three units of credit risk, market risk and operational risk are under the supervision of the risk management committee. The primary responsibility of boards of directors is to understand the nature of risks that a bank faces and prepare suitable tools and

techniques to manage each type of risk. The risks which a bank mainly bears in its operations are credit risk, liquidity risk, operational risk, interest risk, foreign exchange risk, legal risk, performance risk, settlement risk and reputation risk.

Risk management in banking requires smart and intelligent human resources with good risk management skills. Banks should use modern techniques to calculate credit risk. The risk management department provides bank regulator monthly with different reports related to banks' activities. The Bank regulator examines information in reports to evaluate how the bank is practicing instructions. Banks are charged with fees if delays occur in sending monthly reports.

Hong Kong Monetary Authority (2019) suggests that credit departments should have systems for managing their credit portfolio, including credit files, and updating files with new financial information for counterparties, transfer of fund and safekeeping of important documents. Banks are required by their supervision authorities (or central banks) to establish organizational unit to take care of risk management. Furthermore, they are required to propose procedures for risk identification, measurement, and assessment. Risk management department in the bank provides protection from bank's failure by using methods and techniques to minimize exposure of losses. Ghosh (2012) declares that risk department is comprised of unit's credit, market, and operation risk management.

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2.6.12 Credit risk management objectives

The objective of credit risk management is to ensure the soundness and steady growth of the bank through the provision of loans to high score (or creditworthy) customers and reject risky customers in addition to making quick decisions in the lending process. The major objectives of credit risk management are determined by Ghosh (2012) as follows:

- Getting benefits from possible credit opportunities
- Effective loan pricing according to the risk

- Minimizing bad loans
- Adherence to credit policies
- Maintenance of a reliable database
- Improving cash flow

2.6.13 Management information system (MIS)

Most banks own their own Management Information System (MIS). MIS is a computerized database of financial information which can provide regular reports on bank's operation for different activities. The main purpose of the MIS is to maintain all data and information and provide decision-making and technology support for balance sheet management. The MIS should provide meaningful and relevant information for taking prompt business decisions. In addition, the MIS give managers feedback about their performance, information about customers, repayment reports, etc.

Ghosh (2012) suggests that Banks should establish a customized management information system (MIS) to provide support to the risk management system. The MIS is concerned with the collection and processing of transactions details, storage and retrieval of data and information about conducting banks business and production of statements, financial reports, and analytical notes.

Basel Committee on Banking Supervision (2000) suggested that banks must own their information systems and analytical techniques that enable management to measure the credit risk inherent in all on- and off-balance sheet activities. MIS system provides adequate information about the composition of the credit portfolio, including identification of any concentrations of risk. Banks can monitor the overall composition and quality of their credit portfolio.

2.6.14 Need for credit risk analysis

Banks evaluate loan applicants before making a credit decision. The main purpose of credit analysis is to select a creditworthy loan applicant. Banks must evaluate the ability and willingness of loan applicant before approving the loan. Hong Kong Monetary Authority (2019) states that credit evaluation comprises independent evaluation of credit appraisal by the middle office in cooperation with the credit committee or the board of directors. The process of evaluating credits covers both extension of new credits and renewal of existing credits.

Ruse & Hudgins (2010) -mention that credit analysis is important and necessary for banks to avoid both providing loans to risky customers and default from few customers. Banks reevaluate existing borrowers periodically and update their evaluating according to the cash flow of their business and the impact of the macroeconomic situation. A good credit risk analysis practice ensures the financial health and growth of the bank.

Credit risk is not only present in loans that are provided by banks. Credit risk is present in different types of a bank's transactions. Joseph (2013) mentions that around 40% of balance sheet items comprise credit assets. These items on the asset side in a balance sheet include banker's acceptance, investments, letters of credit, foreign exchange, financial futures, swaps, bonds, options, commitments and guarantees, which are off-balance sheet transaction items. A slowdown of the macroeconomy leads to increased unemployment and reduced sales for many businesses and leads to increased credit risk for some types of business.

2.6.15 Elements of credit risk analysis

From the author's long years' banking experience, it is evident that banks receive many loan applications from different customers, thus banks have to determine who can receive credit, thus bank has to evaluate creditworthiness of loan applicants to minimize the probability of loan

default. Banks should focus on both ability and desire to the repayment of loans since lending of credit are the riskiest activities in banking operations.

Credit analysis is a process of evaluating available data (both quantitative and qualitative) against supposed needs, and risks that a bank is ready to take. Credit analysis is concerned with the identification, evaluation and mitigation of risk associated with an entity failing to meet financial commitments. Know your customer (KYC) is the main idea that the bank collects data about its customers, their main business, addresses and amount of their income (Joseph, 2013; Gup & Kolari, 2005; Bouteille & Coogan-Pushner, 2013).

Gup & Kolari (2005) mention that the credit department is responsible for making credit decision for daily case by case for evaluating loan applicants. Granting credit approval depends on the willingness of the creditor to lend money in the current economy and the assessment of the ability and willingness of the borrower to return the money. Banks evaluate net cash flow (cash inflow -cash outflow) to determine the ability for instalment in the future. Banks calculate different ratios using financial statements (balance sheet and income statement) for firms.

a) Character

The concept of character is related to customers' personalities such as truthfulness, seriousness, willingness to repay debt, and a strong desire to pay all obligation within the term of the contract. Several researchers on banking (Saunders & Cornett, 2006; Rose & Hudgines, 2013) suggest that a loan officer must understand the main purpose of the loan and plan of the customer to repay the loan. The loan officer must determine if the purpose is consistent with the bank's credit policy. Ghosh (2012) mentions that the purpose of the loan should be acceptable to the bank credit strategy. The loan officer must determine that the borrower has a reasonable attitude to using borrowed funds, thus the bank officer should collect information about customers character, truthfulness, borrowers' past payments, customs track score, improvement in their past,

the purpose of the loan and experience with loan applicant in the past. The loan officer should check age, health, income, job status and availability of guarantors of the proposed loans.

b) Capacity to borrow

The loan officer ensures that the loan applicant has the authority to request a loan and the legal standing to sign a binding loan agreement. Researchers (Rose & Hudgines, 2013; Ghosh, 2012) emphasize that a loan officer must make sure that the person has a legal status to obtain the loan. The loan applicant should be over 18 years old and has a good mentality to sign the contract. The bank office must make sure that the representative has proper authority from the company board of directors to negotiate a loan and sign a credit agreement binding the company. Rose & Hudgine (2013) mentions that a representative of a company can provide a resolution passed by a corporate customers board of directors, authorizing the company to borrow money.

The loan officer assesses the borrower's ability to pay his/her obligation by comparing hisher cash inflow (revenue or salary) with cash outflow (expenses).

$$\text{Net cashflow} = \text{Cash inflow} - \text{Cash outflow}$$

Net cash flow should be enough to pay monthly instalments. Ghosh (2012) thinks that the purpose of the loan and the repaying capacity (or ability) of the loan applicant are more important, and the self-liquidation character of the credit is crucial to sound credit decisions.

c) Capital

The loan officer should ensure that the loan applicant has enough asset to use if he faces a problem paying from cash flow. Capital can be calculated as the first accounting formula:

$$\text{Equity (or capital)} = \text{Total Assets} - \text{Total Liability}$$

Banks prefer to provide to a loan applicant who owns assets such as land, property, and jeweller because loan applicant can liquidate its assets to pay for the bank. Banks reduce interest rates if the borrower submits assets as a colleterial.

d) Conditions

The loan officer and credit analyst should evaluate recent trends in the borrower's business such as daily selling, quality of machines and changes in economic condition. Rose & Hudgins (2013) suggest that loan officer and credit analyst must visit the site of the customer to evaluate the quality of equipment's, lines of production, quality of products, and trend of sales. The loan officer should evaluate the trend of the economy. A loan can look very good on paper but decrease sales due high interest rate associated with inflation. Most lenders maintain files of information, newspaper clipping, magazine article and research reports.

e) Collateral

Banks demand from loan applicant to provide an asset as a guarantee for the loan. Banks use collateral guarantee as a second defence line in lending. The character of borrowers is a priority and collateral recognize as the last priority. Ghosh (2012) thinks that the need for security depends on the level of creditworthiness of the loan applicant. If creditworthiness is high and the resulting credit risk is low, the bank will not insist on any security at all. In contrast, if the degree of risk is medium or more, the bank requires extra security to guarantee repayment of loans. Rose & Hudgins (2013) emphasize that banks ask loan applicant to provide an asset as adequate support for the loan. Common types of loan collateral are account receivable, factoring, inventory, real property, personal guarantee. The loan officer is particularly sensitive to such features as the age, condition and degree of specialization of the borrowers' assets. Technology plays an important role as well because old technology has low marketability to be liquid.

Land, building, government bonds and jewellery are more acceptable collateral. The loan officer investigates the market value of the collateral. The amount of loan provided to the loan applicant should be no more than 70% of the market value for collateral. The asset which recognizes as collateral should have the following characters: (1) stability of its market value, (2)

long duration, (3) high and (4) marketability identification. Jewellery is recognizing as good collateral since it combines all these characteristics.

f) Reasons for taking collateral

Collateral is used as a second defence line for the bank after the capacity of the borrower. Gup & Kolari (2005) testify that banks try to get a pledge to make certain the borrower pays back the loan. Getting a pledge has many advantages for the bank which makes certain that borrower pays back the loan. The guarantee of collateral gives the lender the right to sell assets as loan collateral. Collateralization of loan gives the lender a physiological gain over the borrower. A borrower feels more obligated to work hard to repay his /her loan and avoid losing valuable assets.

g) Financial statement analysis

Ghosh (2012) suggests that analysis of financial statement of loan applicant are an essential technique to determine the payment ability of loan applicant and make sure that there is adequate cash flow from the operation to meet their obligation. Banks make a deep investigation for providing loan to companies. Banks require companies to provide a financial statement for the past 3-5 years and tax return. The aim of requiring financial statement is to analyse and compare the movement of different ratios for five years. The second purpose is to compare the performance of the company with the average industry. ROE and ROA are two performance ratios to be assessed and compared with other size companies in the same business.

h) Structure the credit facility

When a bank grants a loan to one of its customers, such extension of credit needs a different facility. A bank prepares the promissory note which is comprised of different parts. The structure of the loan agreement includes several issues such amount of a loan, duration of the loan, monthly payments of interest rate and commissions, collateral which is used as a guarantee

for the loan. The loan agreement includes duties and obligations for each part. A loan agreement should be signed by both parties (Ghosh, 2012; Rose & Hudgines, 2013).

2.6.16 Loan review

From the author's several years' experience in banking, it is very evident that lending credit is only the first step and the second step is constantly monitoring the loan (or loan review). Loan review is most important because it leads to the fact that banks collect their loans in an efficient method and to solving non-repayment problems in the beginning steps. A loan should be reviewed after it has landed and not forgotten until the loans fall due, and the borrowers make the final payment.

Rose & Hudgines (2013) mention that loan review refers to monitor and examine of outstanding loans and make sure that borrowers are following their loan agreement. The lending of credit is comprised of two steps, first is evaluating customers creditworthiness and making a credit decision. The first step is easy, meanwhile the second step is more important and complicated due to the probability of default for few borrowers. For this reason, all banks have established a review section in their credit department or legal department to follow up on the payment of borrowers. Loan review is a necessary process for a sound lending program. It not only helps management spot problem loans more quickly but also acts as a continuing check on whether loan officers are following the bank's loan policy.

The review section in the bank should carry out reviews of all types of loan periodically for example every 30, 60 or 90 days. New software programs with banks show details of historic payment, the balance of loan and more details. The credit department evaluates the quality and condition of any collateral pledged behind the loan and puts provisions for loan losses according to the degree of the risk related to every borrower.

Rose & Hudgins (2013) testify that many banks use a variety of different loan review procedures. Below are a few general principles are followed by banks:

1. Carrying out reviews of all types of loans periodically, for example, examine the largest loan outstanding every 30, 60 or 90 days.
2. Structuring loan review process carefully to make sure the most important features of each loan are checked, including
 - a. The record of borrower's payment.
 - b. The quality and condition of any collateral pledge behind the loan.
 - c. The completeness of loan documentation to make sure the lender has access to any collateral pledged and process the full legal authority to take action against the borrower in the courts if necessary.
 - d. An evaluation of the borrower's financial condition and forecasts have changed.
3. Conducting more frequent reviews of trouble loans especially on large amount loans since they have a significant impact on banks revenue.
4. Finally, loan review is necessary for a sound lending program, it not only helps management spot problem loans more quickly but also acts as a continuing check on whether loan officers are adhering to bank's own loan policy.

2.6.17 Challenges of credit risk analysis

Striscek (2002) mentions that every bank has a credit culture. The culture may be formally defined by senior management, or it may have evolved informally over time. The culture may be unified or diverse. Joseph (2013) concludes that many banks have collapsed due to poor selection of credit risk in their attempt to grow portfolio and improve their profit. Common reasons of bank failures were the top management, CEOs, and boards of directors, failed in their responsibility to understand the challenges of credit risk and manage it well.

There are many challenges in credit risk analysis, which are:

a) Reliability of the data

Credit department needs to have data about customers. Any data bases need to be updated in real time and this data should be available in easy way. It is the author's knowledge from several yearlong career in senior positions in banking industry, that most private banks of Iraq have not data bases of their customers. In order to conduct a credit risk study, analysis requires an extensive amount of data and information related to the general economy, industry and the borrower, financial statements are one of the major sources of data. Usually, the annual financial statement is audited.

b) Profitability and business considerations

Banks are commercial establishments and often profits are key driving factor. The management teams are also usually incentivized to aim at higher profit that results in bonuses for key executives (decision makers) and dividends for stockholders.

c) Unpredictable Future

Historical data about loan applicant are used for the future. The analyst's work involves studying the past and understanding how much it is relevant for the future.

d) Reliability of risk models

The increasing use of credit risk models to measure risk and to price assets during the late 1990s and early 2000s was heavily criticized after 2008 Global Credit Crises. Often, the reliability of models decreases with complexity and the assumptions based on which the models are developed. This does not mean that statistical techniques or modelling should not be employed in credit risk analysis, whilst they play a fundamental role in the risk management of banks.

2.6.18 Credit risk appetite

Ghosh (2012) mentions that credit risk appetite is the level of risk that a bank is prepared to accept to achieve its objectives. Banks need to set risk appetite at an appropriate level to ensure credit risks are only accepted and managed within that appetite. Appetite must be reviewed and reset in considering changing market conditions and portfolio performance.

Joseph (2013) thinks that credit risk appetite must be established as a strong foundation, which prescribes the type, amount, nature and extent of credit risk that an organization is willing to underwrite. Usually, a credit risk appetite statement is drawn up prescribing the following:

1. Target market: understanding the target market to which the credit would be offered is essential for several reasons: (1) it ensures strategies and products are developed following the market; (2) the market criteria ensure that no opportunities are missed in the identified target markets and conversely, they will screen out the market segment, where the organization has no risk appetite.

2. Minimum credit standard: credit risk appetite prescribes the minimum acceptable standard of credit risk required while building the business.

3. Sectors: Risk appetite would require the study of major sectors to identify those which are desirable. The sectors identified with good potential would be favoured while the riskier sector would be shunned. Depending upon the sector's attractiveness the risk appetite would vary as follows:

- a. No appetite /reduce - least attractive sector
- b. Growing sector with good potential
- c. Selective growth - sectors that hold reasonable potential

4. Products offered: Risk appetite would also detail the type of credit products to be developed in line with the risk appetite; while pricing the product, it would be ensured that the risk (selected based on the minimum standards) is adequately priced.

2.6.19 Credit scoring

A report prepared by Vidal & Barbon (2019) states that the credit scoring model is a statistical analysis used as a risk management tool by lenders to assess the creditworthiness of loan applicant. The credit scoring model is used in credit decision making and based on the estimated probability of default that is the consequence of historical data of the loan applicant. The credit scoring model is used by lenders to help them decide whether to provide or reject credit. A credit score is a number between 300 and 850, 850 is the highest credit rating possible. A credit score influences by five categories: payment history, types of credit, current debt, new credit and length of credit. Banks need to pay special attention to current debt and payment history.

Vidal & Barbon (2019) mention that a loan expert identifies customer characteristics that relate to defaults. Banks cannot discriminate their customers based on skin colour, ethnic background or nationality. However, banks are allowed to discriminate their customers according to the following: age, residence (own / rent), occupation, income, years in current job, previous employment, number of dependents, credit history, banking account ownership, credit outstanding, outstanding debts, the purpose of the loan and types of the loan.

Table 2.2

Borrowers' Rating Scale

Rating grade	Rating scale	Description of Risk	Level of Safety	Interpretation
1	AAA	Very low risk	Highest safety	Excellent track record, growth
2	AA	Marginal risk	Very high safety	Very good track record, growth potential

3	A	Low risk	High safety	Good track record, growth potential
4	BBB	Moderate risk	Moderate safety	Satisfactory track record, moderate growth
5	BB	Fair risk	Lower safety	Average track record, growth potential
6	B	High risk	Low safety	New or inexperienced management, low growth
7	C	Very high risk	Very low safety	Poor track record of management, very low growth
8	D	Default or nonperforming loans	Safety linked to Collateral	Debt servicing is in default, recovery procedures are due

Source: Ghosh (2012, 140)

According to Ghosh (2012) borrowers rating, scales can be classified as in table 2.2. We can observe that borrowers rating score has similarity with rating score prepared by credit rating agencies such Fitch, Moody's, Standard & Poor and Dun & Bradstreet. Fair Isaac corporation is recognized as a major analytics software company that provides products and services to companies and individuals. The company is best known for producing soft programs for credit scoring which are used by money lenders. Lenders use credit scoring in risk-based pricing. Credit ranking applies to business, individuals and governments. Each lender has its cut-off points depending on the risk it is willing to take. Thus, a lender may use a rating system such as presented in table 2.3.

Table 2.3

Categories of FICO scores

FICO Score	Rating		What the score means
<580	Poor	Very high risk	<ul style="list-style-type: none"> Well below average Demonstrates to lender that you are a risky borrower
580-669	Fair	High Risk	<ul style="list-style-type: none"> Below average Many lenders approve loans
670-739	Good	Good credit	<ul style="list-style-type: none"> Near or slightly above average Most lenders consider this a good score

740-779	Very good	Very good credit	<ul style="list-style-type: none"> • Above average • Demonstrates to lender you are a very dependable borrower
800 +	Exceptional	Excellent credit	<ul style="list-style-type: none"> • Well above average • Demonstrates to lender you are exceptional borrower

Source: <https://www.investopedia.com/terms/f/ficoscore.asp>

Five of major factors that FICO scores, and their weights, are presented in the table 2.4.

Table 2.4

Factors for FICO scores

	Factors	Percent	Description
1	Payment History	35	Bills paid on time
2	How much is owned	30	The amount owed on all account?
3	Length of credit history	15	How long credit account been established?
4	New credit	10	Are you taking on more debit?
5	Type of credit in use	10	Mix of retail credit, instalment loans, mortgage
	Total	100	

Source: <https://www.investopedia.com/terms/f/ficoscore.asp>

2.6.20 Internal credit rating

Knowing from the author's long-term experience in banking, most banks have procedures for rating the creditworthiness of their clients (corporate and individuals). Rating agencies such Fitch, Moody's and Standard & Poor publish rating only for large corporate clients. Banks ask credit agencies to get financial information, especially incomes for the last three years about individual clients.

A well-structured internal risk rating system is a good means of differentiating the degree of credit risk in the different credit exposures of a bank. This allows a more accurate determination of the overall characteristics of the credit portfolio, concentrations, problem credits, and the adequacy of loan loss reserves. More detailed and sophisticated internal risk

rating systems, used primarily at larger banks, can also be used to determine internal capital allocation, pricing of credits, and profitability of transactions and relationships.

Typically, an internal risk rating system categorizes credits into various classes designed to consider gradations in risk. Simpler systems might be based on several categories ranging from satisfactory to unsatisfactory; however, more meaningful systems have numerous gradations for credits considered satisfactory to truly differentiate the relative credit risk they pose. In developing their systems, banks must decide whether to rate the riskiness of the borrower or counterparty, the risks associated with a specific transaction, or both.

Internal risk ratings are an important tool in monitoring and controlling credit risk. To facilitate the early identification of changes in risk profiles, the bank's internal risk rating system should be responsive to indicators of potential or actual deterioration in credit risk. Credits with deteriorating ratings should be subject to additional oversight and monitoring, for example, through more frequent visits from credit officers and inclusion on a watchlist that is regularly reviewed by senior management. The internal risk ratings can be used by line management in different departments to track the current characteristics of the credit portfolio and help determine necessary changes to the credit strategy of the bank. Consequently, it is important that the board of directors and senior management also receive periodic reports on the condition of the credit portfolios based on such ratings.

The ratings assigned to individual borrowers or counterparties at the time the credit is granted must be reviewed periodically and individual credits should be assigned a new rating when conditions either improve or deteriorate. Because of the importance of ensuring that internal ratings are consistent and accurately reflect the quality of individual credits, responsibility for setting or confirming such ratings should rest with a credit review function independent of that which originated the credit concerned. It is also important that the

consistency and accuracy of ratings are examined periodically by a function such as an independent credit review group (Ciby, 2013).

Banks must have information systems (MIS) and analytical techniques that enable management to measure the credit risk inherent in all on- and off-balance sheet activities. The management information system should provide adequate information on the composition of the credit portfolio, including identification of any concentrations of risk.

Ghosh (2012) advises that banks should have methodologies that enable them to quantify the risk involved in exposures to individual borrowers or counterparties. Banks should also be able to analyse credit risk at the product and portfolio level to identify any sensitivities or concentrations. The measurement of credit risk should take account of (1) the specific nature of the credit (loan, derivative, facility, etc.) and its contractual and financial conditions (maturity, reference rate, etc.); (2) the exposure profile until maturity about potential market movements; (3) the existence of collateral or guarantees; and (4) the potential for default based on the internal risk rating. The analysis of credit risk data should be undertaken at an appropriate frequency with the results reviewed against relevant limits. Banks should use measurement techniques that are appropriate to the complexity and level of the risks involved in their activities, based on robust data, and subject to periodic validation.

2.7 Credit scoring vs. credit rating

A similar concept, credit ratings, should not be confused with credit scoring. Credit ratings apply to companies, sovereigns, sub-sovereigns, and those entities' securities, as well as asset-backed securities. As a traditional approach to credit risk analysis, credit scoring is most effective for small owner-operated businesses and individuals. Credit scoring models make up a picture of your relationship with credit and scores vary (although usually not drastically change)

between the three main credit bureaus. A credit rating determines both the interest rate for the repayment and if the borrower is approved for a loan of credit or debt issue.

2.7.1 Credit risk (or default risk)

Basel Committee on Banking Supervision (2000) defined credit risk as the potential that a bank borrower or counterparty will fail to meet its obligations following agreed terms. We can say that credit is a possibility that a borrower can fail to repay the loan as s/he promised.

2.7.2 Credit rating and probability of default

Banks must complete the credit evaluation process before deciding if accept or refuse to provide credit to the loan applicant. Credit risk grading is evaluating loan applicant from different aspects. Credit risk grading comprises different levels. These grades of credit risk are associated with the current condition of the borrower. The Basel Accord has prescribed that at least seven risk grades are necessary. For example, if the scale comprises 8 levels, level 1 to 5 would represent various grades of acceptable credit risk while levels 6 to 8 represent various grades of unacceptable credit risk. In table 2.5 Basel Acord definition of the credit rating scale is presented.

Table 2.5

Credit Rating Scale

Category	Credit Risk Grades
Very low Risk	1
	2
Low Risk	3
	4
Low-Moderate Risk	5
	6
Moderate Risk	7
	8
Satisfactory	9
	10
Acceptable Risk	11
	12
Moderate -High Risk	13
Moderate -High Risk (poor quality)	14

High Risk	15
High Risk (speculate quality)	16
Very High Risk	17
Very High Risk	18
Default	19
Loss	20

Source: Joseph (2013, 163)

2.7.3 Benefits of credit risk grade system

Joseph (2013) concludes that credit grade systems have many advantages. These are:

- A well-established credit rating system provides an essential framework for the credit decision making process.
- Risk rating provides an insight into the credit quality of the portfolio and enables better monitoring of high-risk customers.
- Risk rating enables the calculation of PD s which in turn is useful in ensuring better credit pricing and allocation of capital.

2.7.4 Default probability

The default probability is the likelihood over a specified period, usually one year, that a borrower is not able to make scheduled repayments. It can be applied to a variety of different risk management or credit analysis scenarios. Also called the probability of default (PD), it depends, not only on the borrower's characteristics but also on the economic environment. The probability of default (PD) is a statistical percentage probability of the borrower defaulting, usually within a one-year time horizon. PD is directly linked to the credit risk grades.

Table 2.6

PD Grading Scale

Category	Credit Risk Grades	PD
Very low Risk	1	0.006%
	2	0.012%
Low Risk	3	0.024%

	4	0.036%
Low-Moderate Risk	5	0.048%
	6	0.072%
Moderate Risk	7	0.132%
	8	0.216%
Satisfactory	9	0.336%
	10	0.504%
Acceptable Risk	11	0.756%
	12	1.200%
Moderate -High Risk	13	1.944%
Moderate -High Risk (poor quality)	14	3.120%
High Risk	15	5.040%
High Risk (speculate quality)	16	7.440%
Very High Risk	17	10.440%
Very High Risk	18	14.400%
Default	19	68.280%
Loss	20	100.000%

Joseph (2013, 164).

Figure 2.2 *PD Behaviour and probability of default*

original rating	probability of migrating to rating by year end (%)							
	AAA	AA	A	BBB	BB	B	CCC	Default
AAA	93.66	5.83	0.40	0.08	0.03	0.00	0.00	0.00
AA	0.66	91.72	6.94	0.49	0.06	0.09	0.02	0.01
A	0.07	2.25	91.76	5.19	0.49	0.20	0.01	0.04
BBB	0.03	0.25	4.83	89.26	4.44	0.81	0.16	0.22
BB	0.03	0.07	0.44	6.67	83.31	7.47	1.05	0.98
B	0.00	0.10	0.33	0.46	5.77	84.19	3.87	5.30
CCC	0.16	0.00	0.31	0.93	2.00	10.74	63.96	21.94
Default	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

From: Joseph, C. (2013). *Advanced Credit Risk Analysis and Management* (3rd ed.), page 164.

New Jersey: Wiley & Sons.

According to Joseph (2013), nowadays, PD is used for allocation of capital, better credit risk pricing, client selection and credit quality monitoring. The PD can range from nil to 100% for a very high-risk customer. In figure 2.2, credit ratings from 1 to 12 represent good quality, credit ratings from 13-16 represent comprise risky assets. 17-18 represent very high risk and 19-

20 are default cases. Higher credit risk grades (i.e., low quality) have higher PDs, reflecting higher credit risk. For example, a credit risk grades of 12 has a PD of 1.2% p.a.

2.7.5 Benefits of PD values

The PD value is usually derived based on past observation, close examination and the study of various factors. The use of PD has several advantages, which are listed below:

- The most important advantage of PD is that it quantifies credit risk.
- The PD is useful for credit pricing. The higher the PD, the higher the risk, hence the credit premium ought to be higher.

2.7.6 Measurement of credit risk

The bank manager needs to measure the probability of borrower default. The ability to do this depends largely on the amount of information the bank has about the borrower. At the retail level, much of the information needs to be collected internally or purchased from external credit agencies.

a) Qualitative models

Saunders & Cornett (2006) suggest that in the absence of publicly available information on the quality of borrowers, the bank manager must assemble information from a private source such as credit and deposit file or purchase such information from external sources such as credit agencies. The information helps a manager make an informed judgment on the probability of default of the borrower and price the loan or debt correctly.

b) Credit scoring

Credit scoring is the use of statistical, operational research, and data mining models to determine the credit risk of a prospective borrower. A credit score is a number that is calculated by a credit bureau or another company, such as the Fair Isaac Corporations FICO score that is used in making credit decision and for other purposes.

Hull (2010, 289) mentions that rating agencies such as Moody's, Standard & Poor and Fitch are in the business of providing ratings describing the creditworthiness of corporate bonds. The best rating assigned by Moody's is Aaa. Bonds with rating Aaa are considered to have almost no chance of defaulting. Credit Rating estimates the creditworthiness of an individual, corporation or country. It is an evolution made by credit bureaus of borrower's overall credit history. Credit rating is based on financial history and current assets and liabilities

c) FICO Score

A FICO score is a type of credit score created by the Fair Isaac Corporation. Lenders use borrowers' FICO scores along with other details on borrowers' credit reports to assess credit risk and determine whether to extend credit. FICO scores take into account various factors in five areas to determine credit worthiness: payment history, the current level of indebtedness, types of credit used, length of credit history, and new credit accounts.

d) Goal of credit risk management

The goal of credit risk management to maximize a bank risk-adjusted rate return by maintaining credit risk exposure with acceptable parameter (or limitation). Joseph (2013) mentions that credit risk remains the most important risk that banks must manage. Large banks tend to allocate roughly half of their economic capital to this risk.

Historically, credit risk was lodged mainly in the banking book. However, with the growth in holdings of corporate securities and derivatives, credit risk in the trading book has increased. Ghosh (2012) concludes that the goal of credit risk management is to maintain a bank's credit risk exposure within parameters set by the board of directors and senior management. The establishment and enforcement of internal controls, operating limits and other practices help ensure that credit risk exposures do not exceed levels acceptable to the individual

bank. Such a system enables bank management to monitor adherence to the established credit risk objectives.

e) Sources of credit risk

Basel Committee on Banking Supervision (2000) concludes 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 the trading book, and both on and off the balance sheet. Banks are increasingly facing credit risk (or counterparty risk) in various financial instruments other than 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.

Diversification is used with evaluating the creditworthiness of customer to manage credit risk. Dejene (2015) mentions that diversification is the first line of defence against major credit losses. In the banking book, diversification is used to avoid concentration of credit risk with a particular borrower, or group of borrowers, or with a particular industry or region.

Many researchers on banking (Rose & Hudgins, 2013; Hull, 2010; Basel Committee for Banking Supervision) attempted to define credit risk as to the potential that a bank borrower or counterparty will fail to meet its obligation following the agreed terms. Credit risk means that loss is probable because the borrower unable to repay the bank the loan or bond issuer, and counterparties in derivatives transactions may default. Central banks (or Regulators) have for time required banks to keep adequate capital for facing credit risk exposure. Ghosh (2012) focus that credit risk has two dimensions, first inability to pay back the loan due to inadequacy of income, insufficient cash flow from operations to repay the lender, unemployment or failure of a business. The second reason is unwilling of an obligor to pay to meet its obligation through it has adequate income.

For most banks, loans are the largest and most obvious source of credit risk. However, there are other sources of credit risk both on and off the balance sheet. Off-balance sheet items include letters of credit unfunded loan commitments and lines of credit. Other products, activities, and services that expose a bank to credit risk are credit derivatives, foreign exchange, and cash management services. Credit risk and market risk are closely linked since volatilities in market risk factors generate credit risk.

2.7.10 Credit rating agency

A credit rating agency is a company that assigns credit ratings, which rate a debtor's ability to pay back debt by making timely interest payments and the likelihood of default. An agency may rate the creditworthiness of issuers of debt obligations, of debt instruments, and in some cases, of the services of the underlying debt but not of individual consumers.

a) What credit rating tells us?

According to Ghosh (2013), credit rating tells the lender (or a bank) how the loan applicant can payback a loan within the conditions of the loan agreement without defaulting. A high credit rating suggests that the loan applicant has a strong possibility to pay back the loan without any delay. In the contrast a poor credit rating suggests that the loan applicant who had troubles paying back loans in the past has a high possibility to get trouble paying back and may follow the same pattern in the future. The credit rating affects the entity's chances of being approved for a loan and receiving favorable terms for that loan.

b) Is credit rating necessary?

Credit rating is an opinion expressed by an independent professional organization after making a detailed studying of all relevant factors. Such opinion is a great assistant to investors in making their investment decision. It helps the issuer of debt securities (bonds) to price its bond.

The two different but similar credit rating approaches are presented in table 2.8 (as proposed by Ghosh) and table 2.9 (as used by Standard & Poor).

Table 2.8

Borrower's rating scale

Rating scale	Description of risk	Level of safety	Weighted average score %
AAA	Very low risk	Highest Safety	More than 85
AA	Marginal risk	Very high safety	80--85
A	Low risk	High safety	75-79
BBBB	Moderate risk	Moderate safety	65-74
BB	Fair risk	Less than average safety	55-64
B	High risk	Law safety	50-54
C	Very high risk	Very low safety	Less than 50
D	Defaulted loans	Risk has materialized	0

Source: Ghosh (2012, 140, 190)

Table 2.9

Standard & Poor long-term issuer Credit Rating

Rating	Description
AAA	Extremely strong capacity to meet financial commitment
AA	Very strong capacity to meet financial commitments
A	Strong capacity to meet financial commitment, but some what
BBB	Adequate capacity to meet financial commitments, but more subject to adverse economic condition
BBB-	Considered lower investment grade by market participants.
BB+	Considered highest speculative grade by market participants.
BB	Les vulnerable in the near term but faces major ongoing uncertainties to adverse business, financial and economic condition.
B	More vulnerable to adverse business, financial, and economic condition but currently has the capacity to meet financial commitments.
CCC	Currently vulnerable and dependent on favorable business, financial and economic condition to meet financial commitments.
CC	Currently highly vulnerable
C	A bankruptcy petition has been fielded or similar action taken, but payments of financial commitments are continued.
D	Payment default on financial commitments

Source: Bouteille and Coogan-Pushner (2013: 55)

c) Estimating credit losses

Credit losses on a loan depend primarily on the probability of default and recovery rate.

Every bank must have a framework for estimating losses for different types of loans. At the core is a transitions-based probability of default model which yields directly observable cash-flows at the loan level. The models usually include coefficients on unemployment, loan to value ratios and interest rates, all of which allow a macroeconomic scenario to be fed through the model and impact loans' probability of default and cure. This framework allows a hysteresis effect of the time spent in default on the probability of loan cure to be modelled (Gaffney, Kelly, & McCann, 2014).

2.7.11 Market risk

Market risk represents the potential for adverse changes in the prices or volatility of financial assets and liabilities. While market risk is typically not the largest risk that banks face, it has risen in importance over the past two decades and poses unique challenges, given the complexity of the financial instruments from which it is derived and the markets where they trade. The complexity of new products and strategies derived from market activities has increased the banks' reliance on quantitative methods that employ several assumptions and sophisticated statistical theory to price products and manage their exposures.

Most banks continue to use the toolkit of model technology generically referred to as value at risk (VaR) for measuring and managing their exposure to market risk at the portfolio level. Technically, VaR represents the maximum expected dollar loss that could be experienced, given a specified confidence level, over a specified time horizon. While originally developed to measure market risk in the trading book, this approach has been extended, to some extent, to other areas, such as market risk in the banking book and even the credit risk.

a) Credit risk diversification

Joseph (2013) thinks that one of the main reasons for the collapse of banks is concentration risk. Diversification of credit is the technique to spread risk. Diversification of credit means diversifying credit to a different geographical place, lending to different economic sectors and different terms. The main aims of diversification are to reduce correlation across loan portfolio. Joseph (2013) testifies that Northern Rock in the UK ran into difficulties due to the concentration of wholesale funding. During 2008, several banks in the US failed or were bailed out-Lehman Brothers, Bear Sterns, Washington Mutual, Countrywide Financial are few examples that had exposure to the real estate market as one of the main reasons for the crises.

b) Modern diversification of credit portfolio

The primary objective of the credit portfolio review is to detect in time the deterioration in portfolio quality, avoid undue portfolio concentration that may contain hidden and significant credit risk, and mitigate overall credit risk by redirecting credit to relatively less risky and more gainful business lines.

Joseph (2013) suggests that banks should develop criteria for deciding portfolio composition and norms for identifying portfolio concentration to establish appropriate portfolio evaluation mechanism. Portfolio evaluation involves the examination of portfolios from two angles - tracking changes in portfolio quality through borrower rating migration analysis and estimating variations in the quantum of potential losses from the portfolio over the review period.

2.7.12 Internal credit reviews

Ghosh (2012) states that Internal Credit Risk Rating System refers to the system to analyse a borrower's repayment ability based on information about a customer's financial condition including its liquidity, cash flow, profitability, debt profile, market indicators, industry and operational background, management capabilities, and other indicators. The summary

indicator derived from the system is called Internal Credit Risk Rating (ICRR) - a key reference for credit risk assessment and decision making.

Basel Committee for Banking Supervision (2001a) instructs that banks must establish a system of independent, ongoing assessment of the bank's credit risk management processes and the results of such reviews should be communicated directly to the board of directors and senior management. Because various appointed individuals throughout a bank have the authority to grant credit, the bank should have an efficient internal review and reporting system to manage effectively the bank's various portfolios. This system should provide the board of directors and senior management with sufficient information to evaluate the performance of account officers and the condition of the credit portfolio.

Ghosh (2012) concludes that Internal credit reviews conducted by individuals independent from the business function provide an important assessment of individual credits and the overall quality of the credit portfolio. Such a credit review function can help evaluate the overall credit administration process, determine the accuracy of internal risk ratings and judge whether the account officer is properly monitoring individual credits. The credit review function should report directly to the board of directors, a committee with audit responsibilities, or senior management without lending authority (e.g., senior management within the risk control function).

2.8 Use of internal credit risk rating system (ICRRS)

Internal Credit Risk Rating System is an integral part of credit risk management for banks. The key uses of this guideline are as follows:

1. To provide a granular, objective, transparent, consistent framework for the measurement and assessment of borrowers' credit risk.
2. To facilitate the portfolio management activities.

3. To assess the quality of individual borrower to help banks to determine the quality of the credit portfolio, line of business of the branch or the bank as a whole.
4. To be used for individual credit selection, credit pricing, and setting credit limit and terms & conditions.

2.8.1 Bad loans

Banks face problems from some borrowers because they cannot repay a part of their loan. Many studies have examined the causes of bad loans occurrence in financial institutions. According to Basel Committee for Banking Supervision (2006), experience indicates that the main cause of bank failures is poor credit quality and credit risk assessment. Furthermore, Berger & De Young (1997) identified poor management as one of the major causes of problem loans. They stated that managers in many banks with problem loans do not practice adequate loan underwriting, monitoring and control. Also, it has been observed that the accumulation of non-performing loans is generally attributable to several factors, including economic downturns and macroeconomic volatility, terms of trade deterioration, high-interest rate, excessive reliance on overly high-priced inter-bank borrowings, insider lending and moral hazard among others. Goldstein & Turner (1996) mention that a high amount for overdrawn account and credit extend for a high leverage borrower is likely to have large losses in default. Changing the macroeconomy toward recession leads to increased bad loans due to rising unemployment.

2.8.2 Capital adequacy

Bank regulators (or Central Banks) require banks to adopt the capital-asset ratio (or leverage ratio) and risk-based capital ratio that is in turn subdivided into a Tier I capital risk-based ratio and a total capital (Tier I plus Tier II capital) risk-based ratio.

2.8.3 Credit risk-adjusted assets

Under both Basel I and Basel II, risk-adjusted assets represent the dominator of the risk-based capital ratio. To be adequately capitalized, a bank must hold a minimum ratio of total capital (Tier I core capital plus Tier II supplementary capital) to credit risk-adjusted assets of 8%, that is its total risk-based capital ratio is calculated as

$$\text{Total risk-based capital ratio} = \frac{\text{Total capital (Tier 1+Tier 11)}}{\text{credit risk-adjusted assets}} \geq 8\%$$

$$\text{Tier 1 (core) capital ratio} = \frac{\text{Core capital (Tier 1)}}{\text{credit risk-adjusted assets}} \geq 4\%$$

2.9 Need for security

Although several colleagues may have different opinions, the author believes from his banking experience that the supervisor has an important role over banks in each country. The supervisor has power according to the law to provide license, order banks, charge them and withdraw licenses. The goal for supervision is to influence banks to practice guidelines for credit risk management principles to provide soundness and financial stability. Basel Committee on Banking Supervision (2013) states that Supervisors should require that banks have an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management. Supervisors should conduct an independent evaluation of bank's strategies, policies, procedures, and practices related to granting of credit and ongoing portfolio management. Supervisors should consider setting prudential limits to restrict bank exposures to single borrowers or groups of connected counterparties.

Basel Committee on Banking Supervision (2006) instructs that the supervisors shall check and evaluate the most important activities of banks. Supervisor authority evaluates the content of the balance sheet for a bank. Supervisor authority monitors capital adequacy, cash reserve requirement and distribution of loans. Supervisors expect bank's credit risk assessment and

valuation policies and practices to be consistent with prudential guidelines and applicable accounting frameworks. Ghosh (2012) mentions that banking supervisors should confirm that the methods employed by a bank to calculate loan loss provisions produce a reasonable and prudent measurement of estimated credit losses in the loan portfolio that are recognized promptly. Banking supervisors should consider credit risk assessment and valuation policies and practices when assessing a bank's capital adequacy.

Basel Committee on Banking Supervision (2001a) states, that banks have an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management. Supervisors should conduct an independent evaluation of a bank's strategies, policies, procedures, and practices related to the granting of credit and the ongoing management of the portfolio. Supervisors should consider setting prudential limits to restrict bank exposures to single borrowers or groups of connected counterparties. Ghosh (2012) mentions that supervisors should, as part of their ongoing supervisory activities, assess the system in place at individual banks to identify, measure, monitor and control credit risk. This should include an assessment of any measurement tools (such as internal risk ratings and credit risk models) used by the bank.

Basel Committee on Banking Supervision (2001a) states that supervisor should evaluate the quality of credit risk management systems by requiring sound asset valuation procedures. Most typically, supervisors, conduct a review of the quality of a sample of individual credits. Supervisors or external auditors should also assess the quality of a bank's internal validation process where internal risk ratings and/or credit risk models are used. Supervisors should also review the results of any independent internal reviews of the credit-granting and credit administration functions. Supervisors should also make use of any reviews conducted by bank's external auditors, where available.

According to Ghosh (2012), Supervisors should take note of whether bank management recognizes problem credits at an early stage and takes the appropriate actions. Supervisors should monitor trends within a bank's overall credit portfolio and discuss with senior management any marked deterioration. Supervisors should also assess whether the capital of the bank, in addition to its provisions and reserves, is adequate related to the level of credit risk identified and inherent in the bank's various on- and off-balance sheet activities.

In reviewing the adequacy of the credit risk management process, home country supervisors should also determine that the process is effective across business lines, subsidiaries, and national boundaries. Supervisors must evaluate the credit risk management system not only at the level of individual businesses or legal entities but also across the wide spectrum of activities and subsidiaries within the consolidated banking organization.

Ghosh (2012) mentions that the supervisor should point out to management any weaknesses detected in the system, excess concentrations, the classification of problem credits and the estimation of any additional provisions and the effect on the bank's profitability of any suspension of interest accruals. In those instances where supervisors determine that a bank's overall credit risk management system is not adequate or effective for that bank's specific credit risk profile, they should ensure the bank takes the appropriate actions to improve promptly its credit risk management process.

2.9.1 Role of a bank supervisor

Bank's supervision authority has a significant influence on private banks to practice principles of credit management issued by Basel Committee on Banking Supervision (2011, 5), which require that supervisors conduct, directly or indirectly, regular independent evaluations of a bank's policies, processes and systems related to operational risk as part of the assessment of the Framework. Supervisors ensure that there are appropriate mechanisms in place which allow

them to remain apprised of developments at a bank. Supervisory evaluations of operational risk include all the areas described in the principles for the management of operational risk. Supervisors also seek to ensure that, where banks are part of a financial group, there are processes and procedures in place to ensure that operational risk is managed in an appropriate and integrated manner across the group. In performing this assessment, cooperation, and exchange of information with other supervisors, following established procedures may be necessary. Some supervisors may choose to use external auditors in these assessment processes.

Deficiencies identified during the supervisory review may be addressed through a range of actions. Supervisors use the tools most suited to the circumstances of the bank and its operating environment. So, the supervisors receive current information on operational risk, they may wish to establish reporting mechanisms directly with banks and external auditors (e.g., internal bank management reports on operational risk could be made routinely available to supervisors).

Supervisors continue to take an active role in encouraging ongoing internal development efforts by monitoring and evaluating a bank's recent improvements and plans for prospective developments. These efforts can then be compared with those of other banks to provide the bank with useful feedback on the status of its work. Further, to the extent that there are identified reasons why certain development efforts have proven ineffective, such information could be provided in general terms to assist in the planning process.

2.9.2 Role of disclosure

In banking, disclosure refers to the release of all information about a bank that may influence depositors and investors decision. It reveals both positive and negative news, data and operational details that impact its business.

The author knows from his experience that banks are required to provide supervisor authority and public all information which may be important for the public, and access to this information should be provided through the website. It should also be published in newspapers. Banks should have disclosures in all activities. Principle No.11 of the Supervision commission refers, that banks should disclose to the public all their operation activities, and Gray (1996) mentions that disclosure is essential for the banking system since it provides early warning of such problems, which is highly valuable.

Putra & Simanungkalit (2014) indicate that the implementation of good corporate governance has a key yet indirect role in increasing the value of companies. As a result, some companies in their sample are still in development and require further information disclosure. Therefore, despite their high equity value, these companies are not yet able to maximize their profit earnings. The data which should be disclosed may be financial statements, big 20 depositors, big 20 borrowers, big 20 shareholders.

2.9.3 Mitigating operational risk

In broad terms, risk management is the process of mitigating the risks faced by a bank, either by hedging financial transactions, purchasing insurance, or even avoiding specific transactions. Concerning operational risk, several steps can be taken to mitigate such losses. For example, damages due to a natural disaster can be insured against. Losses arising from business disruptions due to electrical or telecommunications failures can be mitigated by establishing redundant backup facilities. Losses due to internal reasons, such as employee fraud or product flaws, are harder to identify and insure against, but they can be mitigated with strong internal auditing procedures.

Since operational risk management depends on many firm-specific factors, many managerial methods also are possible and probably put in place over time. However, some

general principles, such as good management information systems and contingency planning, are necessary for effective operational risk management. BCBS (December 2001) laid out a framework for managing operational risk at internationally active banks; this framework also could be more broadly applied to other types of financial institutions.

The framework consists of two general categories. The first includes general corporate principles for developing and maintaining a bank's operational risk management environment. For example, a bank's governing board of directors should recognize operational risk as a distinct area of concern and establish internal processes for periodically reviewing operational risk strategy. To foster an effective risk management environment, the strategy should be integral to a bank's regular activities and should involve all levels of bank personnel.

The second category consists of general procedures for actual operational risk management. For example, banks should implement monitoring systems for operational risk exposures and losses for major business lines. Policies and procedures for controlling or mitigating operational risk should be in place and enforced through regular internal auditing.

2.9.4 Risk transfer and mitigation

Basel Committee on Banking Supervision (2001a, 19) focuses on risk transfer as a method of operation risk management. It includes an effort to encourage better risk management practices. The Committee is keenly interested in efforts by institutions to better mitigate and manage operational risk. Such controls or programs have the potential to reduce the exposure, frequency, or severity of an event. Due to the crucial role these techniques can play in managing risk exposures, the Committee intends to work with the industry on risk mitigation concepts over the next several months. However, careful consideration needs to be given to whether the control is truly reducing risk, or merely transferring exposure from the operational risk area to another business sector.

2.9.5 Insurance

Purchasing insurance policies against different types of operational risk can be used to reduce bank's risks. Basel Committee on Banking Supervision (2001a, 20) suggests that one growing risk mitigation technique is the use of insurance to cover certain operational risk exposures. During the discussion with the industry, the Committee found that firms were using, or were considering using, insurance policies to mitigate operational risk. These include several traditional insurance products, such as banker's blanket bonds and professional liability insurance. Specifically, insurance could be used to externalize the risk of potentially low frequency, high severity losses, such as errors and omissions (including processing losses), physical loss of securities, and fraud. The Committee agrees that, in principle, such mitigation should be reflected in the capital requirement for operational risk. However, the market for insurance of operational risk is still developing.

2.9.6 Independence of the audit system

Saunders & Cornett (2013) suggest that bank management should allow complete freedom to the internal auditors and distance themselves from the subjects of the audit. The internal audit focuses attention on compliance with internal rules and regulations. Cayman Islands Monetary Authority (n.d.) issued guidelines for internal audit in banks. The guidelines run that an internal audit in the bank provides an independent assessment of the adequacy for liquidity, capital and all types of risk management. The internal audit function assists senior management and the board of directors in the efficient and effective discharge of their responsibilities. Cayman Islands Monetary Authority (n.d.) states that there are different types of internal audit which may include:

- The financial audit
- The compliance audits

- The operational audit
- The management audits

The internal audit department examines and evaluates the whole of the bank's activities in all its entities. Internal audit should focus on all activities of the bank. The director of the Internal audit department prepares a plan for all the assignments to be performed. The auditing plan includes periodic auditing work. The audit is based on a methodical control risk assessment.

2.9.7 Credit approving authority

Delegation of power in each bank should be carefully formulated. The bank should determine the approval authority for the lending process. The credit committee includes three to four officers. Each member represents the head of units. Members are a credit risk manager, head of internal audit, general manager of the bank. Each member of the credit committee must have relevant training and experience to carry out their duty effectively. In addition, they should have skills for analyzing financial statements, credit risk, and understanding market risk. Credit approving authority should be separated from the marketing /relationship management function. The approval process should be documented in writing or by electronic signature. Approval records should be kept with the credit application file.

2.9.8 Risk rating

Risk rating means classifying risks according to an assessment of a counterparty. Risk can classify as low, medium and high risk according to the impact on the borrower (or counterparty). According to several researchers (Rose & Hudgins, 2013; Gauguin & Bilardello, 2005), many banks have a risk rating system for credit scoring of the loan applicant and use it in credit approval decisions. The risk rating system includes all factors. Sounders & Cornet (2006) mention that a risk rating system is designed to cover overall risk in lending. Banks use financial

rations, collateral, industrial and management characters that bear on the creditworthiness of borrowers.

2.9.8.1 Credit scoring

Credit scoring is classifying loan applicants according to their ability to repay the loan. According to Ghosh (2012), credit scoring is a statistical analysis performed by lenders to evaluate a person's creditworthiness and soundness. Credit scoring is used by lenders to help to make their decision (whether to extend or reject credit). A person's credit score is a number between 300 and 850, 850 being the highest credit rating possible. A credit score is used for credit decision for many types of lending including mortgages, credit card, consumer loans and auto loans. Ghosh (2012) thinks that credit scoring is influenced by five factors, which are payment history, types of credit, new credit, current debt, and length of credit. Banks check the history of loan applicant in providing new loans. Hull (2010) testifies that rating agencies such as Moody's, Standard & Poor and Fitch are in the business of providing ratings describing the creditworthiness of large firms and corporate bonds, but credit scoring for small firms and individual is done by banks.

2.9.8.2 Risk pricing

According to Bodie et al. (2010), there is a trade-off between risk and return. This means that investors should bear a high risk to get a high return. Thus, risk pricing is a reflex of the degree of the risk. Borrowers in weak financial position are placed in a high credit risk category and will have to pay a higher price, thus banks should use scientific systems to price the credit risk. Banks calculate the expected probability of default for the loan applicant. Risk is priced according to different methods.

a) RAROC models

According to Ghosh (2012), large size banks across the globe have their software program for the pricing of loans. The risk-adjusted return on capital (RAROC) framework for pricing loans is among the more popular methods. Saunders & Cornet (2006) testify that the RAROC model is used to evaluate (and price) credit risk based on market data. Ghosh (2012) mentions that the RAROC formula can calculate as follows.

$$\text{Risk-adjusted Return on Capital} = (\text{Net income}) / (\text{Risk-Weighted Asset})$$

Where:

$$\text{Risk - Weight Assets} = \text{Allocated Risk Capital, economic capital, or Value at Risk}$$

There is, however, a need for comparing the prices quoted by competitors for borrowers perched on the same rating /quality. Thus, any attempt at price-cutting for market share would result in the mispricing of risk and "Adverse Selection".

b) Market determined to price

The pricing of loans is highly influenced by offers from competitors in lending markets. Suppliers of credit usually offer homogenous products and the competition use pressure on pricing. Ghosh (2012) suggests that most creditworthy customers invite price quotation from different credit providers before making their decision. Banks can form price according to LIBOR (London inter Bank Offered Rate). LIBOR is a worldwide method for international lending which use a variable interest rate plus a commission as a profit.

c) Economic profit-based pricing

According to Ghosh (2012), banks seek a better return for risks that they are taking against some standard lending, such as purchasing treasury bonds and government securities. It can formulate the equation.

$$\text{Economic profit} = \text{Normal Earning} - \text{Cost of Capital}$$

This means that it compares the present value (PV) of cash flow with the cost of capital.

According to Berk & De Marzo (2017), Net Present Value (NPV) is the value of future cash flows over the life of the investment discounted to the cost of investment. If the result of NPV is positive, the project is accepted. In contrast, the project is rejected if the result of NPV is negative. NPV is calculated as Net Cash flow from investment during the life of the project by discount rate of future cash flows. NPV is widely used for making decisions while comparing different alternatives in investments.

d) Cost-plus pricing

The basic pricing model is to consider all the costs and adding a mark-up for profit. The attractiveness of this kind of pricing is that it is fairly simple and straightforward. It ensures that the cost is recovered from pricing, provided unduly large credit losses don't occur, which is a function of proper credit risk analysis.

$$\text{Price} = \text{Cost} + \text{Markup percentage}$$

$$\text{LIBOR based loan rate} = \text{LIBOR} + \text{Default Risk Premium} + \text{Profit Margin}$$

e) Other methods of pricing

The other known methods of pricing are (1) Structure Pricing, (2) Grid Pricing, (3) Net Present Value (NPV) Pricing, and (4) RANPV (Risk-adjusted NPV) pricing.

2.9.9 Portfolio management

Saunders & Cornet (2006) mention that there are various approaches available to a bank manager to measure credit portfolio and concentration risk. Portfolio Diversification can reduce the loan risk exposure of a bank. Two simple models allow a bank to monitor and manage its loan concentration risk.

2.9.9.1 Migration analysis

According to several authors (Barry et al., 2002; Ghosh, 2012; Gavalas & Syriopoluos, 2014), migration analysis is an approach for credit risk management and is used to evaluate the credit score of a loan for a portfolio of the bank due to movement credit score in future.

Migration analysis tracks the movements in credit quality factors (or credit score) of the pool of the loans over a while to see if the credit score of the loan pool has been of better quality or degraded. The migration approach provides information about final credit losses realized and at what time they were realized. Thus, this information can help credit risk manager make better decisions during managing the credit risk of the loan portfolio.

2.9.9.2 Concentration limit

Banks should manage risk concentrations and try to decrease all similar direct and indirect exposure. The banking supervision committee (2019) emphasizes that unmanaged risk concentration is an important cause of major problems in banks. Banks should check if diversification of credit is provided according to an economic sector (industry), geographic areas and terms of lending. Risk concentrations should be analysed on both a bank legal entity and a consolidated basis. Risk concentrations should be viewed in the context of a single or a set of closely related risk drivers that may have different impacts on a bank. These concentrations should be integrated when assessing a bank's overall risk exposure. A bank should consider concentrations that are based on common or correlated risk factors that reflect more subtle or more situation-specific factors than traditional concentrations, such as correlations between market, credit risks and liquidity risk.

Banking literature emphasizes that banks should use the diversification approach as a credit risk management tool. Concentration limit means that banks avoid concentrating their portfolio and distribute their loan to different economic sectors and different geographic districts

to avoid large exposure and avoid positive correlations. Supervision authority in all countries require from banks to have limited loan concentration to the individual borrower to a maximum of 10 % of bank's capital. The external limit set on the maximum loan size that can be made to an individual borrower. Saunders & Cornett (2006) mention that banks should determine the concentration limit of the proportion of the loan portfolio that can go to any single customer by assessing the borrower's current portfolio.

Concentration limit = Maximum loss as a percent of capital x 1/ (loss rate)

Source: Saunders & Cornett (2006)

Banks should carefully manage and avoid excessive risk concentration to types of lending with similar characteristics to avoid a positive correlation of risk. Hong Kong Monetary (2019) warns that banks should watch against over-extension of credit to asset-dependent sectors such as property, the stock market and other speculative investments. Slowly economy can market value of the property and stocks fall and this creates a problem for banks during selling collateral due to default credentials. Thus, banks provide credit with 60% for the market value of properties.

2.9.9.3 Loan review mechanism (LRM)

Lending credit is the first part, loan review and collection are the second and more important part. Loan review refers to the examination of outstanding loans and makes sure that borrowers are paying according to their credit agreement. Banks should follow their loan policies and Hudgins (2013) testifies that loan review is a necessity for sound lending. Banks should put the attention more to review large size loans and should own an active software program for loan review. The credit department should review their loans periodically for example every 30 days. Banks should review the record of borrowers' payment to ensure that customer is not falling behind payment schedule. Banks should not ignore borrowers. The review department should be separated from the credit department and check credit department's credit decision. Loan review

provides information for determining the adequacy of loan loss provision, evaluate loan policies and lending procedures.

2.9.9.4 Loan loss reserves

Experience of lending shows that there is the probability that around 1-3% of the number of loans will not be paid back due to many reasons. Thus, banks should determine funds from their profits as reserves in their balance sheet to cover such losses of loans as reserves. Banks should establish policies on provisioning which ensure that loans are carefully provided for on a timely basis.

Abiola & Olausi (2014) explain that loan loss provision is an expense included in income statement as an allowance in the liability side of a balance sheet to be used as a provision to cover different types of loan losses and customer insolvency. Loan loss reserves is a balance sheet item that represents the number of loan losses deducted from a bank's loans. Bank supervisors require banks to determine provisions for loan losses as a reserve.

Hong Kong Monetary Authority (2019) states that those provisions should ideally be evaluated on a loan-by-loan basis with full provision being made for the likely loss. The level of provisions is normally a matter for monetary authority in each country. If it is not possible to estimate the loss reliability, the following provisioning benchmarks may be adopted:

Substandard: 20% - 25% of unsecured portion.

Doubtful: 50% - 75% of unsecured portion.

Loss: 100% of the unsecured portion.

According to Ghosh (2012), banks create loan loss reserves following the regulatory guidelines and in conformity with the standard accounting practices. Bank regulators generally recommend a minimum considerable of loan loss reserves and provisions against the decline in

assets values. The minimum amount of loan loss reserve for any loan depends on three variables which are:

- The age of default loan
- The value of the collateral
- The prospect of recovery expressed as a percentage of outstanding dues.

Two types of reserves and provisions are required by regulators. Types are loan loss reserves and loan-specific provision. Basel Committee on Banking Supervision (2006) refers to principle 4 that a bank adopts and documents a sound loan loss methodology that addresses risk assessment policies, procedures and controls for assessing credit risk identifying problem loans and determine loan provisions promptly. Rose & Hudgens (2013) mention that loan loss reserve services as a cushion against the possibility of losses on loan in specified assets. Loan loss reserves are calculated as a fixed percentage of the total loans in advance.

2.9.11 Need for security

Banks require from loan applicant to provide a guarantee to the bank. Collateral is recognized as the second line of defence for the bank if the borrower fails to get cash flow and repay the loan. According to Rose & Hodgins (2013) and Ghosh (2012), a bank asks a loan applicant to provide an asset such as land, real estate, jewellery, equipment, government bonds or personal guarantee. The collateral acts as a protection for the bank in the case the borrower defaults on the payment. Bank obligates the borrower to work hard to repay the remainder of the loan, otherwise, he/she loose collateral because the bank can seize the collateral and sell it to recover some or all its losses. Finally, the asset which is used as collateral should have high marketability, stability of price, long duration, and identification. Joseph (2013) mentions that

banks ask loan applicant to provide a pledge of a specific property to a lender, to secure repayment of a loan. The collateral acts as a protection for the loan to be paid back.

2.9.12 Elements of credit risk analysis

Different authors on banking (Joseph, 2013; Gup & Kolari, 2005; Bouteille & Coogan-Pushner, 2013) agree that credit analysis is a process of concluding available data (both quantitative and qualitative) regarding the creditworthiness of an entity, and making recommendations regarding the perceived needs, and risks. Credit Analysis is also concerned with the identification, evaluation, and mitigation of risks associated with an entity failing to meet financial commitments.

The credit department is responsible for deciding daily case by case which lenders to undertake when evaluating a credit request. Granting credit approval depends on the willingness of the creditor to lend money in the current economy and that same lender's assessment of the ability and willingness of the borrower to return the money. The traditional methods involve the financial analysis of balance sheet and income statement. In general, the granting of credit depends on the confidence the lender has in the borrower's creditworthiness. Creditworthiness which encompasses the borrower's ability and willingness to pay is one of many factors defining a lender's credit policies.

2.9.13 Problem loan management

Banks face some problems with a loan provided to customers. Banks desire to handle the problem quickly to minimize final credit losses. Ghosh (2012) mentions that some loans that are not repaid on the dates are classified as overdue loans. Those loans are categorized as nonperforming for accounting purpose after a specific period. Credit risk is considered to have materialized in the case of a nonperforming state. Those loans are usually marked as watch category loans or problem loans.

Hong Kong Monetary Authority (2019) states that less serious cases are followed by the front office, but more serious cases are transferred to the middle office to be followed. The credit committee or senior management is responsible for overseeing the collection process on large non-performing credits and determining the level of provisions for the problem account.

2.9.14 The role of supervision

Supervision authority plays an important role in providing instructions and guides about the good management of private banks. The supervision authority has an audit department that examines banks on-site and off-site. The purpose of supervision is to prevent bank failure, provide confidence to the public and protect depositors. Basel Committee on Banking Supervision (2012) issued Principles for Effective Banking Supervision. These principles envisage that supervision authority is an independent institution that has responsibilities, objectives, and powers. Among the main functions for supervision authority is the authority to provide license and supervise commercial banks. The main objective for bank supervisions authority provide confidence in the financial system and protecting depositors from bank collapse.

Basel Commission on Banking Supervision (2000) issued instruction to commercial banks to be practised. Central banks all over the world provide commercial banks with instructions to be practised for their benefit. Basel Committee on Banking Supervision (2000) advises that Supervisors should require that banks have an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management. Supervisors should conduct an independent evaluation of a bank's strategies, policies, procedures, and practices related to the granting of credit and the ongoing management of the portfolio. Supervisors should consider setting prudential limits to restrict bank exposures to single borrowers or groups of connected counterparties

Ghosh (2012) mentions that the supervisors should set up standards that the bank is expected to achieve and specify the parameters concerning that bank supervisor. The bank supervisor evaluates the bank's procedure for identification, measurement, monitoring and control of credit risk. The bank supervisor should periodically review and identify the weakness of the bank's credit risk management system. The bank supervisor observes and evaluates commercial banks through on-site and off-site techniques.

1. On-site examination

The Control directorate within the bank supervision authority is responsible for checking, auditing and investigating commercial banks activity. External auditors for supervision authority visit commercial banks without an appointment to check files for credit lending and ensure that lending decision by a bank is according to instructions from the supervision authority. They examine many files from banks departments to evaluate the reliability of these cases with the supervisor's instruction. In addition, they require answers to a number of questions related to bank's activities.

2. Off-site examination

Supervision authority requires a commercial bank to send financial statements (balance sheet, income statements and cash flow statements) monthly. In addition, the supervision authority requires commercial banks to send reports about loans provided, default loans, correspondent banks with which the bank deals, and balances with correspondent banks. A special department in Supervision authority observes and checks financial statement to calculate and evaluate important ratios such as capital adequacy, reserve requirement ratio, portfolio of loans and ten largest depositors. Supervision authority evaluates CAMELS rating for the banks. In addition, the supervision authority evaluates the practice of corporate governance and different committees in the bank.

Bank supervisors examine banks activities, in addition, the supervisor's authority examines the onsite and off-site examinations relative to legal and regulatory compliance. Finally, the purpose of supervision is to evaluate credit risk to avoid bank failure (Ghosh, 2012, 232; Rose & Hudgins, 2013). Basel Committee on Banking Supervision (2012) has revised core principles for effective banking supervision. Among areas that should be audited there are the following ones:

- *Corporate governance, disclosure, and transparency for banks:* An effective corporate governance is essential in the safe and sound functioning of banks. Banks are required to have active corporate governance with different committees for different purposes such as auditing committee, credit committee, Investment committee and asset and liability committee.
- *Licensing criteria:* The banking supervision authority has the power to set standards and reject applications for the establishment of the new bank or new branches for existed banks. Banking Authority sets a minimum capital requirement and ownership structure, internal control, operating plan and managing risk.
- *Supervisory reporting:* The supervisor collects, reviews and analyses reports received from banks monthly, quarterly, and annually. These reports are on through off-site or on-site examinations.
- *Risk management process:* The supervisor focuses on the risk management process by banks. Supervision authority identifies, measures, evaluates, monitors, and mitigates all material risks on a timely basis and assesses the adequacy of their capital and liquidity to their risk profile and macroeconomic condition.

- *Capital adequacy*: The supervisor requires banks to have adequate capital. The ratio for capital over assets are as a minimum 8% which is Basel standards. The central bank of Iraq requires 12% as a ratio of capital / Total Assets.
- *Credit risk*:
 - The supervisor controls that the banks have an adequate credit risk management process considering their risk appetite, risk profile, a trend of the market and macroeconomic condition.
 - This includes careful policy measure, evaluation, report, and control of credit risk on a timely basis.
- *Problem assets, provisions, and reserves*: The supervisor requires banks to have an adequate policy for early identification and management of problem assets (default loan) and the maintenance of adequate provisions and reserves.
- *Concentration risk and large exposure limits*: The supervisor requires from bank to avoid concentration in lending. It is not allowed to provide a loan to a single borrower that would exceed 10% of the bank's capital. A supervisor suggests banks diversify their loans in different sectors and geographic areas.
- *Internal control and audit*: The supervisor ensures that banks have an adequate internal control department. The internal Audit department controls all bank's activities and sends reports to the Board of directors.
- *Financial reporting and external audit*: The supervisor requires that banks prepares financial statements according to generally accepted accounting principles and bears an independent external auditors' opinion. External auditor focuses on articles in both assets and liability and equity.

- *Disclosure and transparency*: The supervisor requires that banks publish information on a consolidated and solo basis that is easily accessible and fairly reflects their financial condition, performance, risk exposure, risk management strategies and corporate governances
- *Money laundering and financing terrorism*:

Basel Committee on Banking Supervision (2012) issued core principles for effective banking supervision. Among requirements is to know their customers to prevent money laundering and financing terrorism. The bank should ask its customers about the source for numerous deposits and ask the reason for sending money to other accounts.

- Knowing bank's customer is important for preventing money laundering.

2.9.15 Independence of the audit system

There is an internal audit department in banks. Internal audit should be conducted by the internal audit department (or unit) with full staff. The objective of the internal audit unit is to provide assurance, consulting, prevent the risk of fraud and protect customers from unfair practice. Basel Committee on Banking Supervision (2001b) states that internal auditing is an independent unit and it is to provide assurance and consulting activity to different units of the bank. Internal audit is designed to add value and improve the effective management of different risks in the bank and support board of governance (Monetary Authority of Hong Kong, 2019; Gauguin & Bilardello, 2005)

According to Basel Committee on Banking Supervision (2001a), Board of directors has the responsibility for ensuring that senior management establish and maintain an adequate and effective internal control that should assess different types of risks of the bank's operation. The

internal audit unit should ensure that banks activities comply with regulations, supervisory instructions and internal policies.

Basel Committee on Banking Supervision (2001a) states that the bank's senior management is responsible for developing processes of internal auditing that include identifying, measuring, monitoring and controlling risks incurred by the bank. Reviewing process should be done at least once a year. Table 2.10 includes scopes for internal audit in banks.

Table 2.10

Scope of internal audit

No.	Scopes
1	Examination and evaluation of the adequacy and effectiveness of the internal control system.
2	Review of the application and effectiveness of risk management procedures and risk assessment methodologies.
3	Review of management and financial information systems, including the electronic information system and electronic banking services
4	Evaluation of the accuracy and reliability of the accounting records and financial reports.
5	Assessment of the means of safeguarding assets.
6	Appraisal of the bank's system of evaluating its capital in relation to its estimate of risk.
7	Evaluation of the economy and efficiency of the operations.
8	Testing of both transactions and the functioning of specific internal control procedures;
9	Evaluation of the systems established to ensure compliance with legal and regulatory requirements, and implementation of policies and procedures.
10	Appraisal of the reliability and timeliness of the regulatory reporting.

Source: Basel Committee on Banking Supervision (2001a).

Basel Committee on Banking Supervision (2001b) states that the internal audit department should be able to exercise its task creatively in all departments of the bank. It must be free to report its findings and appraisals and to disclose them internally. The principle of independence means that the internal audit department works under the direct control of either the bank's chief executive officer or the board of directors, depending on the corporate governance framework. Saunders & Cornett (2013) think that bank management should allow

complete freedom to the internal auditors and distance themselves from the subjects of the audit. The internal audit focuses on compliance with internal rules and regulations.

According to Hong Kong Monetary Authority (2019), credit audits should be conducted to evaluate individual credits on a sampling basis and the overall quality of the credit portfolio. Credit audit is useful for evaluating the performance of account officer and the effectiveness of the credit process

External Auditor is the company independent from the client company, thus external audit opinion is not influenced by any relationship between them. External Auditors are expected to give a neutral and honest professional opinion on the financial statement to shareholders. According to Basel Committee on Banking Supervision (2001b), the internal audit department shall prepare a plan for assignments for auditing. The audit plan includes auditing all activities of the bank to ensure that the process is running according to rules, instructions of supervisor authority.

2.9.16 Money laundering and financing of terrorism

Basel Committee on Banking Supervision (2020) issued a guide related to money laundering (ML) and financing of terrorism. Supervisors globally obligate banks to collect data about customers. Know Your Customer (KYC) is the policy to get information about customers to avoid corruption or prevent terrorist financing. Many banks begin KYC procedures by simply collecting basic data and information about their customers, ideally using the electronic identity.

CHAPTER 3

METHODOLOGY AND SAMPLING

This chapter describes the empirical approach of the present study. The empirical research is mostly based on quantitative analysis of the data collected through the survey among the staff members of the private banks. The data collection took place in December 2020 via distributing hard-copies of questionnaires to branch managers of different banks with a request as a random sample of bank users to fill them in. A 97% response rate was measured out of the total number of questionnaires filled in by respondents. The researcher applied the SPSS program version 26 to analyse data collected by questionnaire. In total, 256 questionnaires were used to analyse data.

3.1 Empirical model

The study follows Warsame (2016) approach and suggests the following models for credit risk management. The first model is the main determinants of good principles for credit risk management.

$$\begin{aligned} \text{Ln}(\text{Pit}) = & \alpha + \beta_{11}\text{n}(\text{w1},\text{it}) + \beta_{21}\text{n}(\text{w2},\text{it}) + \beta_{31}\text{n}(\text{w3},\text{it}) + \beta_{41}\text{n}(\text{w4},\text{it}) + \beta_{51}\text{n}(\text{w5},\text{it}) + \beta_{61}\text{n}(\text{w6},\text{it}) \\ & + \beta_{71}\text{n}(\text{w7},\text{it}) + \beta_{81}\text{n}(\text{w8},\text{it}) + \beta_{91}\text{n}(\text{w9},\text{it}) + \beta_{101}\text{n}(\text{w10},\text{it}) + \beta_{111}\text{n}(\text{w11},\text{it}) + \beta_{121}\text{n}(\text{w12},\text{it}) + \\ & \beta_{131}\text{n}(\text{w13},\text{it}) + \beta_{141}\text{n}(\text{w14},\text{it}) + \beta_{151}\text{n}(\text{w15},\text{it}) + \beta_{161}\text{n}(\text{w16},\text{it}) + \beta_{171}\text{n}(\text{w17},\text{it}) \\ & + \epsilon_{it} \end{aligned} \quad \text{Equation 3.1}$$

3.2 Variables

The present study analyses the following variables described in further sections. There is one dependent variable and several independent variables which together comprise the linear regression model.

3.2.1 Dependent variable

The dependent variable (P1t) is establishing or measuring an appropriate credit risk environment in a bank.

3.2.2 Independent variables

Independent variable of this study is based on principles of credit risk management (2000) and sound credit risk assessment and valuation for loans (2006) issued by the Basel Committee on Banking Supervision. The study gets an advantage for determining independent variables also from general principles of credit risk which is a supervisory policy manual issued by Hong Kong Monetary Authority (2019). The present study uses the following independent variables.

In the equation 3.1 $\ln(\text{Pit})$ is a dependent variable describing establishing an appropriate credit risk environment while the independent variables are:

- w1 is board of directors' governance
- w2 is top management
- w3 is credit risk strategy
- w4 is sound granting process
- w5 is credit limit
- w6 is credit administration
- w7 is credit risk management
- w8 is market risk management
- w9 is ensuring adequate over credit risk
- w10 is information system
- w11 is investment portfolio policy
- w12 is loan review
- w13 is adequate amount of loan loss provision
- w14 is skills of credit staff
- w15 is credit risk management

- w16 is role of supervision
- w17 is internal audit system

In the second part of the study more details of principles for credit risk management are expended so that more independent variables are included in the linear regression model.

$$\begin{aligned}
 \text{Ln}(\text{Pit}) = & \alpha + \beta 1 \text{In}(w1, \text{it}) + \beta 2 \text{In}(w2, \text{it}) + \beta 3 \text{In}(w3, \text{it}) + \beta 4 \text{In}(w4, \text{it}) + \beta 5 \text{In}(w5, \text{it}) + \beta 6 \text{In}(w6, \text{it}) \\
 & + \beta 7 \text{In}(w7, \text{it}) + \beta 8 \text{In}(w8, \text{it}) + \beta 9 \text{In}(w9, \text{it}) + \beta 10 \text{In}(w10, \text{it}) + \beta 11 \text{In}(w11, \text{it}) + \beta 12 \text{In}(w12, \text{it}) + \\
 & \beta 13 \text{In}(w13, \text{it}) + \beta 14 \text{In}(w14, \text{it}) + \beta 15 \text{In}(w15, \text{it}) + \beta 16 \text{In}(w16, \text{it}) + \beta 17 \text{In}(w17, \text{it}) + \beta 18 \text{In}(w18, \text{it}) \\
 & + \beta 19 \text{In}(w19, \text{it}) + \beta 20 \text{In}(w20, \text{it}) + \beta 21 \text{In}(w21, \text{it}) + \beta 22 \text{In}(w22, \text{it}) + \beta 23 \text{In}(w23, \text{it}) + \beta 24 \text{In}(w24, \text{it}) \\
 & + \beta 25 \text{In}(w25, \text{it}) + \beta 26 \text{In}(w26, \text{it}) + \beta 27 \text{In}(w27, \text{it}) + \beta 28 \text{In}(w28, \text{it}) + \beta 29 \text{In}(w29, \text{it}) + \\
 & \beta 30 \text{In}(w30, \text{it}) + \beta 31 \text{In}(w31, \text{it}) + \beta 32 \text{In}(w32, \text{it}) + \beta 33 \text{In}(w33, \text{it}) + \beta 34 \text{In}(w34, \text{it}) + \\
 & \beta 35 \text{In}(w35, \text{it}) + \beta 36 \text{In}(w36, \text{it}) + \beta 37 \text{In}(w37, \text{it}) + \beta 38 \text{In}(w38, \text{it}) + \beta 39 \text{In}(w39, \text{it}) + \\
 & \beta 40 \text{In}(w40, \text{it}) + \beta 41 \text{In}(w41, \text{it}) + \beta 42 \text{In}(w42, \text{it}) + \beta 43 \text{In}(w43, \text{it}) + \beta 44 \text{In}(w44, \text{it}) + \\
 & \beta 45 \text{In}(w45, \text{it}) + \beta 46 \text{In}(w46, \text{it}) + \beta 47 \text{In}(w47, \text{it}) + \beta 48 \text{In}(w48, \text{it}) + \beta 49 \text{In}(w49, \text{it}) + \\
 & \beta 50 \text{In}(w50, \text{it}) + \beta 51 \text{In}(w51, \text{it}) + \beta 52 \text{In}(w52, \text{it}) + \beta 53 \text{In}(w53, \text{it}) + \beta 54 \text{In}(w54, \text{it}) + \beta 55 \text{In}(w55, \text{it}) \\
 & + \beta 56 \text{In}(w56, \text{it}) + \beta 57 \text{In}(w57, \text{it}) + \beta 58 \text{In}(w58, \text{it}) + \beta 59 \text{In}(w59, \text{it}) + \beta 60 \text{In}(w60, \text{it}) + \\
 & \beta 61 \text{In}(w61, \text{it}) + \beta 62 \text{In}(w62, \text{it}) + \beta 63 \text{In}(w63, \text{it}) + \beta 64 \text{In}(w64, \text{it}) + \beta 65 \text{In}(w65, \text{it}) + \\
 & \beta 66 \text{In}(w66, \text{it}) + \beta 67 \text{In}(w67, \text{it}) + \beta 68 \text{In}(w68, \text{it}) + \beta 69 \text{In}(w69, \text{it}) + \beta 70 \text{In}(w70, \text{it}) + \\
 & \beta 71 \text{In}(w71, \text{it}) + \beta 72 \text{In}(w72, \text{it}) + \beta 73 \text{In}(w73, \text{it}) + \beta 74 \text{In}(w74, \text{it}) + \beta 75 \text{In}(w75, \text{it}) + \\
 & \beta 76 \text{In}(w76, \text{it}) + \beta 77 \text{In}(w77, \text{it}) + \beta 78 \text{In}(w78, \text{it}) + \beta 79 \text{In}(w79, \text{it}) + \beta 80 \text{In}(w80, \text{it}) + \\
 & \beta 81 \text{In}(w81, \text{it}) + \beta 82 \text{In}(w82, \text{it}) + \beta 83 \text{In}(w83, \text{it}) + \beta 84 \text{In}(w84, \text{it}) + \beta 85 \text{In}(w85, \text{it}) + \\
 & \beta 86 \text{In}(w86, \text{it}) + \beta 87 \text{In}(w87, \text{it}) + \beta 88 \text{In}(w88, \text{it}) + \beta 89 \text{In}(w89, \text{it}) + \beta 90 \text{In}(w90, \text{it}) + \\
 & \beta 91 \text{In}(w91, \text{it}) + \beta 92 \text{In}(w92, \text{it}) + \beta 93 \text{In}(w93, \text{it}) + \beta 94 \text{In}(w94, \text{it}) + \beta 95 \text{In}(w95, \text{it}) + \beta 96 \text{In}(w96, \text{it}) \\
 & + \beta 97 \text{In}(w97, \text{it}) + \beta 98 \text{In}(w98, \text{it}) + \beta 99 \text{In}(w99, \text{it}) + \beta 100 \text{In}(w100, \text{it}) + \beta 101 \text{In}(w101, \text{it}) + \\
 & \beta 102 \text{In}(w102, \text{it}) + \beta 103 \text{In}(w103, \text{it}) + \beta 104 \text{In}(w104, \text{it}) + \beta 105 \text{In}(w105, \text{it}) + \beta 106 \text{In}(w106, \text{it}) +
 \end{aligned}$$

$$\beta_{1071n}(w_{107,it}) + \beta_{1081n}(w_{108,it}) + \beta_{1091n}(w_{109,it}) + \beta_{1101n}(w_{110,it}) + \beta_{1111n}(w_{111,it}) + \beta_{1121n}(w_{112,it}) + \beta_{1131n}(w_{113,it}) + \beta_{1141n}(w_{113,it}) + \beta_{1151n}(w_{115,it}) + \beta_{1161n}(w_{116,it}) + \beta_{1171n}(w_{117,it}) + \beta_{1181n}(w_{118,it}) + \beta_{1191n}(w_{119,it}) + \beta_{1201n}(w_{120,it}) + \beta_{1211n}(w_{121,it}) + \epsilon_{it}$$

Equation 3-2

The equation 3.2 Ln (Pit) is a dependent variable describing establishing an appropriate credit risk environment while the independent variables are as follows.

A. Having effective members of board of directors

- w1 is the board of directors are governing the bank
- w2 is the board of directors is active to approve credit risk strategy.
- w3 is the board of directors is active to review credit risk strategy.
- w4 is the board of directors is active to approve written loan policy
- w5 is the board of directors is responsible for ensuring that the bank has appropriate credit risk assessment process.
- w6 is the board of directors is responsible for ensuring that the bank has an effective internal control to consistently determine provision for loan losses in accordance with banks policies and procedure.
- w7 is the board of directors is responsible for ensuring that the bank has an effective system and consistently applied process to determine provision for loan losses.
- w8 is the board of directors is active to determine credit risk strategy management function.
- w9 is board of directors is active to approve strategy for selecting risks and maximize profits.

- w10 is the board of directors should specify the methods for granting credit and conduct an independent review of credit exposure.

B. Top management

- w11 is the responsibility of senior management to implement credit risk strategy approved by the board directors.
- w12 is the top management develops policies and procedures for identifying, measuring, monitoring and controlling credit risk.
- w13 is the top management addresses policies and credit procedure for individual loan.
- w14 is the banks should identify and manage credit risk inherent in all products and activities.
- w15 is the senior management should maintain aggregate loan provisions at the appropriate level.
- w16 is the senior management should monitor the credit risk assessment and provisioning process.

C. Credit risk strategy

- w17 is the credit risk strategy reflects the bank's tolerance for the risk and the level of profitability of the bank.
- w18 is the credit risk strategy objectives is guiding banks credit activity.
- w19 is the credit risk adopts the necessary policies and procedure for conducting such activities.
- w20 is the credit risk strategy includes a statement of the bank willingness to grant credit based on exposure type.

- w21 is the credit risk strategy covers types of credit, economic sectors and geographic location.
- w22 is the credit risk strategy determines target market.
- w23 is the credit risk strategy aims to diversify credit types.
- w24 is credit risk avoids credit concentration.
- w25 is the credit risk gives recognition to goals of credit quality, earning and growth.
- w26 is the credit risk strategy determines the acceptable risk/reward trade/off for its activities, factoring in the cost of capital.
- w27 is the credit risk strategy considers the macroeconomy and its impact.
- w28 is the credit risk strategy shifts the composition of quality of credit portfolio.
- w29 is the credit risk strategy reflects the bank tolerance for risk and the level of profitability.

D. Operating under a sound credit granting process

- w30 is the bank has sound, well-defined credit granting criteria.
- w31 is the criteria should set out who is eligible for credit.
- w32 is the credit should set out the amount of credit.
- w33 is the principle should set out the terms and conditions under which the credit should be granted.
- w34 is the bank operates in a clear target market.
- w35 is the bank understands the borrower before lending.
- w36 is the bank arranges a structure contract before lending.
- w37 is the bank understands the source of repayment of the loan.
- w38 is the bank requires a collateral coverage and tenure to support lending.

- w39 is the bank determine lending rate according to collateral.
- w40 is the bank should have a set of application forms for collecting all relevant data and information about the borrower.
- w41 is the bank should take all factors from loan applicant to determine credit risk rating.
- w42 is the purpose of the credit and repaying capacity of the borrower are more important.
- w43 is the “know your customer” principle is equally important for establishing credit relationship.
- w44 is the bank should clearly define the functional responsibility for credit origination.
- w45 is the bank has clearly established processes in place for approving new credits, renewals, and refinancing of existing credits.

E. Credit limit

- w46 is the bank has a credit limit at the level of an individual borrower.
- w47 is the bank has a credit limit for each trading book.
- w48 is the bank has a credit limit for each item in letter of a credit.
- w49 is the bank has a credit limit for each item in a guarantee letter
- w49 is the bank has a clearly established process in place for approving a new credit.

F. Maintaining a suitable credit administration process

- w50 is the bank has established a credit administration process in keeping with its size, credit turnover, client composition and product range.

- w51 is the bank has a system in place for the ongoing administration of their various credit risk - bearing portfolios.
- w52 is the bank has in place a system for monitoring the condition of individual credits.
- w53 is the bank has in place a system for determining the adequacy of provisions and reserves.
- w54 is the bank uses internal risk rating in managing credit risk.
- w55 is the bank has information systems about customers.
- w56 is the bank uses analytical techniques that enable management to measure the credit risk inherent in all on-and off-balance sheet activities.
- w57 is the bank has a clearly established process in place for approving new credits as well as the amendments, renewals and re-financing of existing credits.
- w58 is the bank has a clearly established process in place for approving renewal and refinancing of existing credit.
- w59 is the bank uses internal risk rating system in managing credit risk.
- w60 is the bank updates periodically borrows -related records such as financial statements and business status.

G. Credit risk management

- w61 is the credit risk management aims to set up procedures that assist in selecting good exposures, maintain credit quality and minimize the chances of defaults.
- w62 is the bank has in place a system for monitoring the condition of individual credits.

- w63 is the bank has a system in place for providing the adequacy of provisions and reserves.
- w64 is the bank has internal risk rating system in managing credit risk.
- w65 is the bank has data bases about its customers.
- w66 is the bank uses its own analytical techniques that enable management to measure the credit risk.
- w67 is the management information system in Central Bank of Iraq provides an adequate information about customers.
- w68 is the bank has its own management information system to provide adequate information about credit portfolio.
- w69 is the bank has its own management information system to provide adequate information about concentrations of risk.
- w70 is the bank has in place a system for monitoring the overall composition and quality of the credit portfolio.

H. Market risk management

- w71 is the bank takes into confederation potential future changes in economic conditions when assessing individual credits.
- w72 is the bank takes into consideration potential future changes in economic conditions when assessing credit portfolio.

I. Ensuring adequate controls over credit risk

- w73 is the bank has a permanent assessment of the bank credit risk management processes.

- w74 is there is a communication system between credit risk management directly to the board of directors and senior management.
- w75 is there is a suitable management of the credit-granting function.
- w76 is the credit exposure is within level consistent with prudential standards and internal limits.
- w77 is the bank implements internal controls and other practice to ensure that exceptions to policies.
- w78 is the bank has a system for early remedial action on deteriorating credit.
- w79 is the business functions should be independent from credit granting /verification functions to avoid the conflict of interest.
- w80 is the accounting functions should be independent from credit /granting /verification functions and business functions to avoid fraud and malpractice.
- w81 is the bank has a system for early remedial action for managing credit problems and similar workout situations.
- w82 is the credit information functions should be independent from credit granting functions to make sure the credit results are reported objectively.

J. Investment portfolio policy

- w83 is the bank has the policy of investment across different countries.
- w84 is the bank has the policy of diversifying investment across different countries.

K. Provisions for loan losses

- w85 is the bank determines provisions for loan losses.
- w86 is the bank determines provisions for loan losses according the degree of the credit risk.

L. Loan review process in the bank

- w87 is the bank officer constantly reviews payment of borrowers.
- w88 is the bank officer reminds borrower for delay payments.
- w89 is the bank raises claim in the court against default borrowers.
- w90 is the bank handles problems quickly.
- w91 is determines adequate amount of loan loss provision

M. Skills of credit staffs in the bank

- w92 is the credit staff has experience.
- w93 is the credit staff have practical training program.

N. Credit risk management

- w94 is the bank has an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management.
- w95 is the bank has an effective system in place to measure credit risk as part of an overall approach to risk management.
- w96 is the bank has an effective system in place to monitor and control credit risk as part of an overall approach to risk management.
- w97 is the bank has a system in places to reliably classify loans based on credit risk.
- w98 is the credit risk grading process typically considers a borrower's current financial condition and paying capacity.
- w99 is risk rating should be reviewed and updated whenever relevant new information is received.

O. The role of supervision authority

- w100 is the supervisor obligates a bank to have an effective system in place to identify and measure the credit risk as a part of overall approach to the risk management.
- w101 is the supervisor obligates a bank to have an effective system in place to monitor and control the risk as a part of overall approach to risk management.
- w102 is the supervisor conducts an independent evaluation of bank's strategies related to the granting of credit and the ongoing management of the portfolio.
- w103 is the supervisor conduct an independent evaluation of bank's policies related to the granting of credit and the ongoing management of the portfolio
- w104 is the supervisor considers setting prudential limits to restrict the bank's exposure to a single borrower.
- w105 is the supervisor assesses the system in place at an individual bank to identify, measure, monitor and control credit risk.
- w106 is the supervisor assesses the internal risk rating and credit risk models used by the bank.
- w107 is the supervisor conducts a review of the quality of a sample of individual credits.
- w108 is the supervisor assesses the quality of a bank's own internal validation process where the internal risk rating and /or the credit risk models are used.
- w109 is the supervisor takes note of whether bank management recognize problem credits at an early stage and take the appropriate actions.

- w110 is the supervisor assesses whether the capital of the bank, in addition to its provision and reserves is adequate related to the level of the credit risk identified.
- w111 is the supervisor requires that banks have an effective system to identify, measure, monitor and control the credit risk as part of an overall approach to the risk.
- w112 is the supervisor should consider setting prudential limits to restrict the bank's exposure to single borrowers or groups of connected counterparties.
- w113 is the supervisor conducts an independent evaluation of a bank's strategies related to the granting of a credit and the ongoing management of the portfolio.
- w114 is the supervisor conducts an independent evaluation of the bank's policies related to the granting of credit and the ongoing management of the portfolio.
- w115 is the supervisor conducts an independent evaluation of the bank's policies, procedures and practices related to the granting of a credit and the ongoing management of the portfolio.

P. Internal audit systems

- w116 is the freedom of internal auditors.
- w117 is having principles of internal audit system.
- w118 is the internal audit provides an independent assessment of the adequacy of, and compliance with, the bank's established policies and procedures.
- w119 is the internal audit function assists the senior management and the board of directors in the efficient and effective discharge of their responsibilities.
- w120 is the review of the application and effectiveness of risk management procedures and risk assessment methodologies.

- w121 is the head of the internal audit department should have the authority to communicate directly, and on his/her own initiative, to the board, the chairman of the board of directors.

3.3 Population and sampling design

Selecting population for the research and extracting the appropriate sample is one of the crucial steps in every empirical research. In this point we describe how we managed this task for this research.

3.3.1 Population

Mugenda and Mugenda (2003) describe a population as a complete group of individuals having common observable characteristics. According to Sharp and Howard (2006), the total anthology of elements from which reference is made and is referred to as a population. The target population in this study is credit risk management officers, credit department, audit officers, CEO, and board members for retail banks in Iraq.

3.3.2 Sampling design

3.3.2.1 Sampling frame

According to Cooper and Schindler (2008), a sampling frame is a correct and complete list of the population from which a sample is drawn. The sampling frame includes all representative elements in the population selected for a specific investigation. For this study, samples are managers and staff members of risk management departments in retail banks in Iraq.

3.3.2.2 Sampling technique

The study collects data from banks staff members using the convenience selection method. According to Saunders et al. (2008), convenience sampling, which is a non-probability method, is applied to those situations where the researcher can only obtain responses from willing

respondents. The reason why this sampling technique was selected for this study is that formal access to lists of populations from the banks is not possible.

3.3.2.3 Sample size

Mugenda & Mugenda (2003) suggested the following formula to achieve an adequate sample size:

$$n = x = \frac{Z^2 - pq}{d^2}$$

Where:

n = the desired sample size (if the target population is greater than 10,000).

Z = the standard normal deviation is at the required confidence level

p = the proportion in the target population estimated to have characteristics being measured

$$q = 1 - p$$

d = the level of statistical significance set.

An estimate of 50% has been used for the “ p ”; this has been reported by Mugenda & Mugenda (2003), where if there is no estimate available of the proportion in the target population assumed to have the characteristics of interest, 50% should be used. Given a desired correctness of at least 90% (0.1 level), the sample size is calculated as follows:

$$n = \frac{(1.96)^2 - (0.50)(1-0.50)}{(0.1)^2} = \frac{3.8416 - 0.25}{0.01} = \frac{3.5916}{0.01} = 359.16$$

In the study, 260 questionnaires were distributed to 25 private banks, which makes the sample smaller than estimated, but it is still believed that it enables the relevance of the study. The distribution of this sample was based on the ratio of the banks in the Iraqi Market. Since public local banks were few compared to the other banks, fewer respondents were taken from

them while local private banks gave a larger number of respondents based on their large number and probably large customer base. The distribution is displayed in table 3.1.

3.4 Data collection

The study collected data through a survey and represents qualitative research, and it is based on a questionnaire, thus primary data was collected from a sample of respondents who represent a majority of the banks in Baghdad and Erbil. Most banks located their headquarters in Baghdad (capital of Iraq), meanwhile, five banks have their headquarters in Erbil (capital of Kurdistan region). Mosul bank located its headquarters in Mosul city (North Iraq). For a piece of research to produce a realistic outcome, a buffet of data must be distributed over a large population. A survey questionnaire needs to be designed to apply heterogeneous target groups so that responses come from the generally open and wide public (from different gender, races, age groups, marital status, educational background, different ethnicities).

Table 3.1

Distribution of respondents in different banks

	Bank	City	Country	Number of respondents	Percentage of sample
1	RT Bank	Baghdad-Erbil	Iraqi	12	4.7%
2	Kurdistan international bank - Main branch	Baghdad-Erbil	Iraqi	12	4.7%
3	Kurdistan international bank - Azadi branch	Erbil	Iraqi	5	1.9%
3	Trade Bank of Iraq	Baghdad-Erbil	Iraqi	12	4.7%
4	Cihan Bank - Main Branch	Baghdad-Erbil	Iraqi	12	4.7%
	Cihan Bank- Bajger Branch	Erbil	Iraqi	5	1.9%
5	Ashur Bank	Baghdad-Erbil	Iraqi	12	4.7%
6	Summer bank	Baghdad	Iraqi	12	4.7%
7	France Bank	Erbil	Lebanon	10	3.9%
8	Biblus Bank	Erbil	Lebanon	10	3.9%
9	Al-Baraka Bank	Baghdad-Erbil	Turkey	10	3.9%
10	Ziarat Bank	Erbil	Turkey	10	3.9%
11	Ish Bank	Erbil	Turkey	11	4.3%
12	Credit Bank	Baghdad	Lebanon	12	4.7%

13	Erbil Bank	Baghdad-Erbil	Iraqi	12	4.7%
14	Middle East bank	Baghdad	Iraqi	12	4.7%
15	Abu-Dahabi Bank	Erbil	UEA	10	3.9%
16	Iraqi Investment Bank	Baghdad	Iraqi	12	4.7%
17	Auda Bank	Erbil	Lebanon	10	3.9%
18	Islamic Bank	Baghdad	Iraqi	10	3.9%
19	Economic Bank	Baghdad-Erbil	Iraqi	10	3.9%
20	Trust Bank	Baghdad	Lebanon	6	2.3%
21	Commercial Bank	Baghdad	Iraqi	6	2.3%
22	North Bank	Baghdad-Erbil	Iraqi	6	2.3%
23	Mosul Bank	Mosul	Iraqi	6	2.3%
24	Economic Bank	Baghdad	Iraqi	6	2.3%
25	Warka Bank	Baghdad-Erbil	Iraqi	5	1.9%
	Total			256	100%

Source: Author's own research and statistical data analysis

The study collects data mostly through a survey and statistical analysis which is on several occasions complemented by the researcher's own opinions. Data were collected through a questionnaire submitted by the staff of credit risk management departments. Primary data are collected from 25 private banks in Iraq. For the research produce a realistic outcome, the buffet of data should be distributed over a large population. The survey questionnaires are designed to apply heterogeneously, where target respondents come from different gender, educational background, different positions, different ethnics. Questionnaires were distributed to 270 people in 25 private banks in Iraq. Respondents of questionnaires comprise board directors, CEOs and the staff responsible for credit risk management, credit department, auditors, and heads of finance departments. For the study, it was expected to receive at least 256 fully completed questionnaires, which is 95% response rate. The questionnaire comprises 136 closed questions. Questions are designed to get answers about issues that are focused on principles of credit risk management, as suggested by Basel Committee on Banking Supervision (2000) and Hong Kong Monetary Authority.

3.5 Cronbach's alpha

Cronbach's alpha or coefficient alpha is the most common test score reliability coefficient for single administration. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is a measure of scale reliability. A "high" value for alpha does not imply that the measure is unidimensional. If, in addition to measuring internal consistency, you wish to provide evidence that the scale in question is unidimensional, additional analysis can be performed. Exploratory factor analysis is one method of checking dimensionality. Technically speaking, Cronbach's alpha is not a statistical test – it is a coefficient of reliability (or consistency). Respondents' processing summary and reliability statistics for the quantitative research are presented in table 3.1 and table 3.2.

Table 3.2

Case processing summary

		N	%
Cases	Valid	253	98.8
	Excluded ^a	3	1.2
	Total	256	100.0

a. Listwise deletion based on all variables in the procedure.

Table 3.3

Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.342	0.982	137

The alpha coefficient for the four items is 0.982, suggesting that the items have relatively high internal consistency. Note that a reliability coefficient of 0.70 or higher is considered "acceptable" in most social science research situations.

3.6 Data analysis

The study applied a statistical analysis SPSS software version 26 as analysing tool and to test the hypotheses. The data was collected via a questionnaire in which the majority of the questions were expected to be responded to by using a 5-point Likert scale giving 5 for “very satisfied” respond, 4 for “satisfied”, 3 for “neutral”, 2 for “dissatisfied” and 1 for “very dissatisfied”. The study found mean values, variance, and standard deviation and, the correlations between variables. The study used multivariate regression analysis and calculated ANOVA, R-squared and F-test to check the fit of the model and significance of different variables. The results of the ANOVA test are presented in table 3.4 and prove the reliability of the results. The interclass correlation coefficients, which are a descriptive statistic method that can be used when quantitative measurements are made on units that are organized into groups, are presented in table 3.5. They generally describe how strongly units in the same group resemble each other, which is not the case in this piece of research.

Table 3.4

ANOVA results

	Sum of squares	df	Mean square	F	sig.	
Between People	15535.916	252	61.650			
Within People	Between Items	3901985.920	136	28691.073	707.487	0.000
	Residual	1389849.934	34272	40.554		
	Total	5291835.854	34408	153.797		
Total	5307371.770	34660	153.127			

Grand Mean = 5.12

Table 3.5*Intraclass correlation coefficient*

	Intraclass Correlation ^b	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	0.004 ^a	0.002	0.006	1.520	252	34272	0.000
Average Measures	0.342 ^c	0.222	0.452	1.520	252	34272	0.000

Two-way mixed effects model, where people effects are random and measure effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter we start providing some details from the data analyzed by SPSS, version 26. We continue with the statistical analysis of the two statistical models. We describe and discuss results of the ANOVA test and correlations test. We conclude the chapter with the hypothesis confirmation.

4.1 Qualitative approach to research

Interviews can help the researcher to better understand the feelings and opinions of a small number of people about the study. An interview can be used by a researcher to collect data about their feelings and understanding of high position staff members in a bank about the degree of following up for practicing private banks for credit risk principles which confirmed by the Basel Committee on Banking Supervision. An interview can cover questions about board directors, chief executive officer, strategy of credit risk, credit risk management, credit committee, credit lending process, diversification of the loan portfolio, diversification of investments, internal audit and the role of supervision authority. In our case, the researcher himself works as Chief Executive Officer for Region Trade bank in Erbil and spent more than three decades of his career at different positions in banking industry. Thus, the researcher's opinion is presented in the manner of the qualitative findings and wherever in the dissertation the researcher's opinion is presented, this is transparently explained. The researcher's opinion is that all private banks in Iraq are obligated to practice credit risk principles. Supervision Authority in Iraq is active and has a significant role to control and review the activities of private banks. The Supervision authority requires that on the 10th day of each month private banks should send their financial statements (balance sheet and income statement). Supervision authority analyses many ratios for the bank's, such as the ratio of Capital / Total assets, which should be not less than 12%,

and reserve requirement, which should not be less than 20%. The ratio of cash maintained by banks and balance with the Central Bank to total assets determines the liquidity of the bank. Supervision authority evaluates the overall performance of the banks and determines their strengths and weaknesses. CAMELS for banks, which includes:

C is Capital adequacy of the bank (20%)

A is the Asset quality of the bank (20%)

M is evaluation of Management of the bank (25%)

E is earning level (15%)

L is Liquidity (10%)

S is Sensitivity (10%)

Supervision authority provides private banks with a benchmark score for CAMEL that ranges from 1 to 5, where 1 is the highest score and 5 is the lowest score. Supervising authority reviews most banks' operation through both on-site checking and off-site checking. There is a bank's control department in the organization structure of the Central Bank of Iraq (CBI). The control department in CBI uses data for the financial statement to calculate the ratio of capital / assets which should not be less than 12%. CBI checks the ratio of gross non-performing loans to gross loans to determine how banks are active in collecting their loans. Supervisor authorities require all positions for vice and heads of departments be occupied by people whose education background fits their positions, who have passed training programs, and are over 30 years old. Supervision authority charges financial penalties of \$200 per day if the report is sent later than a determined date. Therefore, all private banks should send their requirement in time to avoid penalties. Supervision authority requires private banks to have highly skilled staff in the credit department, with minimum training hours and minimum ages.

4.2 Statistical analysis

The study analysed the data collected from 256 bank staff members who responded, using SPSS version 26. Table 4.1 provides the results of respondents. The study presents the first statistical analysis for the first model, which includes 16 determinants for establishing an appropriate credit risk environment.

4.2.1 Analysis of coefficients for the first model

The results of the data analysis presented in table 4.1 show that determinants (set of independent variables) have high means (over 4.0), which means that majority of respondents are feeling that there is an effective practice of credit risk management. A low-value variance of the results shows that the distribution of population is close to mean. There is a significant $p = 0.000$ (2-tailed) impact for independent variables on the practice of credit risk management. The results prove that determinants factors (independent variables) have an impact on establishing an appropriate credit risk environment. The results of the first model confirm that private banks are practicing principles of credit risk management confirmed by the Basel Committee on supervision. Figure 4.1 shows the histogram for the distribution of the observations.

Table 4.1

Results of responses for the first model

				95% confidence interval of the differences			
	t	Sig. (1-tailed)	Lower	Upper	Mean diff.	St. deviation	Variance
Establishing an appropriate credit risk environment	x1	0.089	0.288	0.525	4.48	0.500	0.250
Having effective board	x2	6.587	0.000	0.267	0.595	4.36	0.308

Figure 4.1 Histogram for distribution of observations

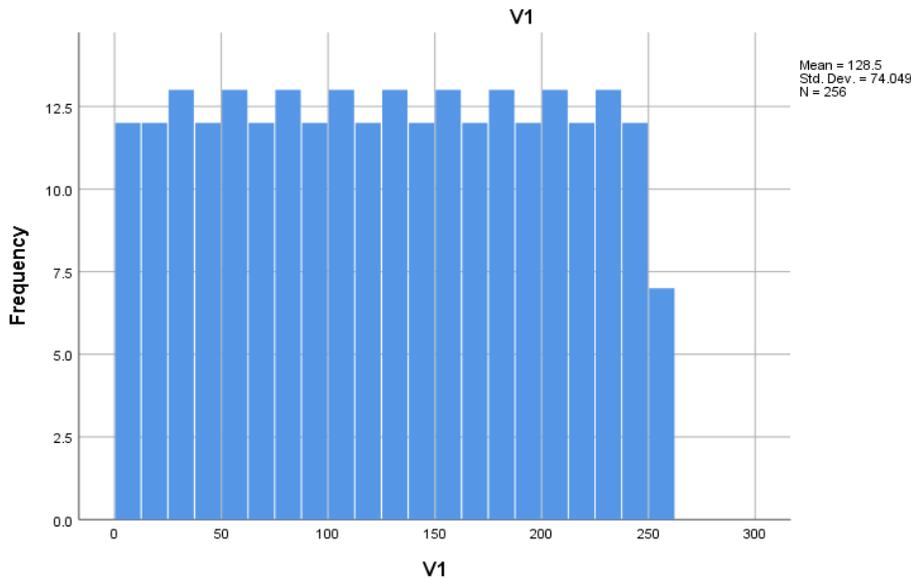


Figure 4.1 shows a bell-shaped curve. This means that there is a normal distribution of observed data. This histogram shows how numerical data is represented and distributed.

Table 4.2

Model summary for the first model

Model	R	R-sqr.	Adj. R-sqr.	Std. Error of estimate	R-sqr-change	F change	df1	df2	Sig. change	F	Durbin-Watson
1	0.741	0.549	0.521	0.346	0.549	19.501	15	240	0.000		1.669

a. Predictors: (Constant), x63, V1, x19, x51, x108, x33, x82, x12, x93, x130, x57, x96, x73, x98, x79, x115, x68, x105, x2

b. Dependent Variable: x1

The study used regression analysis to measure the degree of relationship between establishing an appropriate credit risk environment (as a dependent variable) and determinants of establishing an appropriate credit risk environment (as independent variables). Stock & Watson (2015) state that R-squared is the fraction of the sample variance of Y_i , it ranges between 0 and 1. As it is displayed in table 4.2, the value of R-squared in regression is 0.549 which means that this model fits in 54.9% and this shows that other variables are not included in the model. Both R-

squared and the adjusted R-squared give an idea of how many data points fall within the line of the regression equation. Adjusted R-squared indicates how well terms fit a curve or line but adjusts for the number of terms in a model. Both R-squared and the adjusted R-squared give an idea of how many data points fall within the line of the regression equation.

The results of the study show that there is a significant ($p = 0.000$) (2-tailed) impact from a set of independent variables on the dependent variable. This proves the null hypotheses of the study to be confirmed. Durbin-Watson statistics are used to test the possible autocorrelation between the pairs of independent variables. The Durbin-Watson value lies between 0 to 4. A value between 0 to <2 implies positive autocorrelations. The value for Durbin-Watson in this model is 1.650, which indicates a positive autocorrelation. We can observe that the degree of fitness is only 0.0106. According to Fraser (2012), small R-squared values are not constantly problematic, and high R-squared values are not essentially good.

According to Dougherty (2016), the Durbin-Watson test reports a test statistic with a value from 0 to 4. From 0 to < 2 is positive autocorrelation and if test statistic values are in the range of 1.5 to 2.5 this is relatively normal. The value of Durbin-Watson in the model is 1.650, which shows there is positive autocorrelation between the variables. The strong positive value of the coefficient of correlation shows that there is a correlation between the establishment of an appropriate credit risk management environment and determinants. Table 4.3 shows the results of the ANOVA test.

Table 4.3

ANOVA for the first model

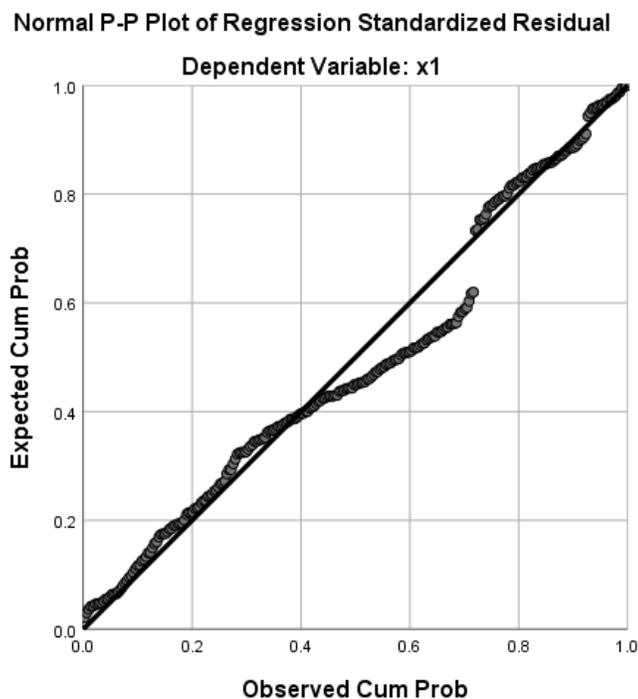
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	35.079	15	2.339	19.501	0.000 ^b
	Residual	28.781	240	0.120		

Total	63.859	255			
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a. Dependent Variable: x1

b. Predictors: (Constant), x130, v1, x12, x33, x57, x82, x51, x92, x19, x2, x108, x79, x98, x68, x115, x105,

Figure 4.2 *Plot of Regression*



ANOVA test performs an analysis of variance. ANOVA test is a way to find out if survey or experiment results are significant. In other words, they help a researcher to figure out if the study needs to reject the null hypothesis or accept the alternate hypothesis. The degrees of freedom represent the level of over-identification of the model. The results of ANOVA show that there is a significant impact. The value $p = 0.000$ (2-tailed) for the set of independent variables on the establishment of an appropriate credit risk management environment proves the null hypothesis to be confirmed. The value of the F-test is 19.532, which is rather high. A high F-test value means that the distance between the means is large relative to the random error within each

group. F-test is calculated by dividing $2.339 / 0.120 = 19.501$. The plot in figure 4.2 shows the line of regression and distribution of independent variables around the line. The plot of regression for the first model in figure 4.2 shows the high level of linearity, which means that data are fit with a regression line and there are residual values that are not fitted with the regression line. The coefficients for the first model are presented in table 4.4.

Table 4.4

Coefficients for the first model

		Std. Coeff.	Std. Coeff.				95% of confidence interval for B	
	Model 1	B	Std. Error	Beta	t	Sig. (2-tailed)	Lower Bound	Upper Bound
	(const.)	1.863	0.315		5.911	0.000	1.242	2.484
v1	v1	0.000	0.000	0.074	1.707	0.089	0.000	0.001
Having effective board director members	x2	0.406	0.060	0.451	6.748	0.000	0.288	0.525
Top Management	x12	0.236	0.048	-0.360	-4.919	0.000	-0.330	-0.141
Credit risk strategy	x19	0.231	0.052	0.298	4.427	0.000	0.128	0.334
Operating under a sound credit granting process	x33	-0.079	0.064	-0.089	-1.235	0.218	-0.204	-0.047
Credit limit	x51	0.154	0.051	0.188	3.029	0.003	0.054	0.255
Maintaining a suitable credit administration	x57	0.204	0.068	0.203	2.973	0.003	0.069	0.338
Credit Risk Management	x68	0.021	0.055	0.065	0.379	0.705	-0.087	0.129
Market Risk Management	x79	0.091	0.051	0.132	1.804	0.072	-0.008	0.191
Ensuring adequate controls over credit risk	x82	-0.040	0.062	0.040	-0.651	0.516	-0.162	0.081

Investment Portfolio Policy	x92	-0.057	0.043	0.087	1.329	0.185	-0.140	0.027
Provisions for loan losses	x98	-0.049	0.070	-0.057	-0.696	.4487	-0.187	0.089
Skills of credit staff	x105	-0.077	0.074	-0.103	-1.034	0.302	-0.224	0.070
Credit risk management	x108	0.251	0.052	0.344	4.822	0.000	0.148	0.353
The role of supervision authority	x115	-0.190	0.080	-0.206	-2.379	0.018	-0.347	-0.033
Internal Audit system	x130	0.046	0.060	-0.055	-0.773	0.440	-0.163	0.071

The results of the study show that the establishment of an appropriate credit risk environment (as a dependent variable) depends on the following factors: Having effective board director members (X2) had the greatest effect ($\beta = 0.406$) with $p=0.000$ significance (2-tailed). Credit risk strategy, x108 (credit risk management) ranked second as effect ($\beta = 0.251$) with $p=0.000$ significance (2-tailed). (X19) ranked third as effect ($\beta = 0.231$) with significance $p=0.000$ (2-tailed) on the establishment of appropriate credit risk management. Credit limit maintaining a suitable credit administration (X57) ranked as a fourth influence effect ($\beta = 0.204$) with $p=0.003$ significance (2-tailed). Credit limit (X51) ranked as a fifth influence effect ($\beta = 0.154$) with $p=0.003$ significance (2-tailed). Market risk management (X79) ranked as the sixth influence effect ($\beta=0.151$) with $p=0.072$ significance (2-tailed) on the establishment of an appropriate credit risk environment. Other independent variables have less impact on the establishment of an appropriate credit risk environment.

4.2.2 Correlation test

The study tests the first variables in the first model. A correlation matrix is a statistical measure that measures linear relation between two variables. Correlation matrix measure how two variables move concerning each other presents as coefficients. The value of correlation is

varying between +1.0 and -1.0. Correlation is used to compete for the significant level for Pearson correlation. It returns both the correlation coefficients and the p-value of the correlation for all possible pairs of columns in the data table 4.5. x61 (service prices) has a positive correlation with both x19 (tangibility), x38 (competence) and x52 (empathy). Also, x66 (communication) has a positive correlation with both x8 (online banking), x29 (trust with a bank) and x35 (reliability). There are few negative correlations.

Table 4.5*Pearson correlations (first model)*

	x1	x2	x12	x19	x33	x51	x57	x68	x79	x82	x93	x96	x99	X105	X108	X115	X130
x1	Pearson r(256) 1 Sig. (2-tailed)																
x2	Pearson r(256) 0.587** 1 Sig. (2-tailed) 0.000																
x12	Pearson r(256) 0.063 0.305** 1 Sig. (2-tailed) 0.312 0.000																
x19	Pearson r(256) 0.445** 0.551** 0.509** 1 Sig. (2-tailed) .000 0.000 0.000																
x33	Pearson r(256) 0.047 0.307** 0.159* 0.173** 1 Sig. (2-tailed) 0.453 0.000 0.011 0.005																
x51	Pearson r(256) 0.248** 0.322** 0.326** 0.182** 0.390** 1 Sig. (2-tailed) 0.000 0.000 0.000 0.003 0.000																
x57	Pearson r(256) 0.302** 0.377** 0.245** 0.275** 0.098 -0.053 1 Sig. (2-tailed) 0.000 0.000 0.000 0.000 0.116 0.400																
x68	Pearson r(256) 0.203** 0.311** 0.322** 0.249** 0.598** 0.571** 0.185** 1 Sig. (2-tailed) 0.001 0.000 0.000 0.000 0.000 0.000 0.003																
x79	Pearson r(256) 0.088 0.197** 0.513** 0.124* 0.460** 0.491** 0.126* 0.656** 1 Sig. (2-tailed) 0.162 0.002 0.000 0.048 0.000 0.000 0.043 0.000																
x82	Pearson r(256) -0.039 0.020 0.149* -0.047 0.408** 0.163** 0.272** 0.545** 0.553** 1 Sig. (2-tailed) 0.535 0.745 0.017 0.454 0.000 0.009 0.000 0.000 0.000																
x92	Pearson r(256) 0.209** 0.305** 0.357** 0.223** 0.160* 0.149* 0.281** 0.237** 0.249** 0.175** 1 Sig. (2-tailed) 0.001 0.000 0.000 0.000 0.010 0.017 0.000 0.000 0.000 0.005																
x96	Pearson r(256) -0.024 0.183** 0.535** 0.268** 0.308** 0.106 0.487** 0.499** 0.470** 0.438** 0.369** 1 Sig. (2-tailed) 0.701 0.003 0.000 0.000 0.000 0.090 0.000 0.000 0.000 0.000 0.000																
x99	Pearson r(256) 0.008 0.191** 0.288 0.055 0.423** 0.123* 0.452** 0.250** 0.247** 0.400 0.596** 0.539** 1 Sig. (2-tailed) 0.896 0.002 0.000 0.377 0.000 0.050 0.000 0.000 0.000 0.000 0.000 0.000																
x105	Pearson r(256) 0.226** 0.459** 0.085 0.041 0.248** 0.091 0.555** 0.083 0.201** 0.174** 0.368** 0.390 0.598** 1 Sig. (2-tailed) 0.000 0.000 0.174 0.513 0.000 0.147 0.000 0.185 0.001 0.005 0.000 0.000 0.000																
x108	Pearson r(256) 0.354** 0.423** 0.277** 0.225** 0.082 0.219** 0.277** 0.134* 0.283** 0.093 0.594** 0.212** 0.443** 0.656** 1 Sig. (2-tailed) 0.000 0.000 0.000 0.000 0.191 0.000 0.000 0.032 0.000 0.136 0.000 0.001 0.000 0.000																
x115	Pearson r(256) 0.166** 0.452** 0.132* 0.251** 0.423** 0.366** 0.164** 0.307** 0.319** 0.179** 0.484** 0.381** 0.426** 0.617** 0.594** 1 Sig. (2-tailed) 0.008 0.000 0.034 0.000 0.000 0.000 0.009 0.000 0.000 0.004 0.000 0.000 0.000 0.000 0.000																
x130	Pearson r(256) 0.124* 0.260** 0.135* 0.211** 0.172** 0.151* 0.331** 0.219** 0.193** 0.237** 0.406** 0.396** 0.470** 0.504** 0.120** 0.135** 1 Sig. (2-tailed) 0.048 0.000 0.030 0.001 0.006 0.016 0.000 0.000 0.002 0.000 0.000 0.000 0.000 0.000 0.000 0.000																

* Correlation is significant at the p<0.05 level (2-tailed)

** Correlation is significant at the p<0.01 level (2-tailed)

Table 4.5 shows that there is a positive correlation between establishing an appropriate credit risk environment (x1) with independent variables x2, x19, x51, x57, x68, x92, x105, x108, x115 and x130.

4.2.3 Analysis of coefficients for the second model

The study tests second model regression which includes contents for nine main determinants of risk assessment. Table 4.6 shows the results for the responses.

Table 4.6

Results for the second model

	Beta	St. Error	T	Sig (2-tailed)	95% confidence interval of the difference		Mean Dif.	St. Dev.	Variance
Model					Lower	Upper			
Constant		0.619	7.134	0.000	3.736	10.563			
x1							4.48	0.500	0.250
Board director									
x2									
x3	0.635	0.052	7.554	0.000	0.355	0.607	4.29	0.657	0.432
x4	-0.003	0.025	-0.108	0.914	-0.054	0.048	4.20	0.547	0.299
x5	-2.881	0.060	-4.777	0.000	-2.627	-1.091	4.20	0.778	0.605
x6	1.501	0.107	5.021	0.000	0.613	1.406	4.30	0.741	0.548
x7	0.054	0.033	0.979	0.329	-0.038	0.113	4.27	0.722	0.521
x8	1.368	0.119	7.820	0.000	0.695	1.164	4.21	0.737	0.544
x9	-0.003	0.044	-0.053	0.957	-0.089	0.085	4.24	0.677	0.459
x10	0.638	0.362	1.541	0.125	-0.157	1.273	4.22	0.573	0.328
x11	-0.058	0.026	-1.595	0.113	-0.093	0.010	4.18	0.713	0.509
Top management									
x12									
x13	0.443	0.220		0.106	-0.077	0.792	4.40	0.637	.405
x14	-0.174	0.129	-1.096	0.274	-0.395	0.113	4.39	0.635	0.403
x15	0.033	0.023	0.992	0.323	-0.022	0.068	4.27	0.715	0.511
x16	-0.197	0.035		0.000	-0.226	-0.088	4.35	0.627	0.394
x17	3.916	0.394	-4.500	0.000	1.968	3.524	4.25	0.714	0.510
x18	0.000	0.111	6.968	1.000	-0.219	0.219	4.34	0.702	0.493

	x58							4.13	0.799	0.638
	x59	2.669	0.332	6.818	0.000	1.126	2.043	4.15	0.838	0.702
	x60							4.26	0.880	0.774
	x61		0.223		0.000			4.39	0.624	0.389
	x62	-0.978	0.147	-4.118	0.000	-0.894	-0.314	4.09	0.809	0.655
	x63							3.95	0.857	0.734
	x64							4.16	0.888	0.789
	x65							4.07	0.772	0.596
	x66							3.93	0.797	0.635
	x67	-1.343	0.320	-3.171	0.002	-1.646	-0.383	4.25	0.674	0.455
Credit risk management	x68									
	x69	1.327	0.236	4.175	0.000	0.519	1.448	4.37	0.690	0.476
	x70		0.159					3.99	0.728	0.525
	x71	0.483	0.165	3.242	0.001	0.158	0.650	4.08	0.596	0.355
	x72	0.012						4.20	0.639	0.409
	x73	0.012	0.088	0.106	0.915	-0.165	0.183	4.07	0.659	0.434
	x74	-1.850	0.235	-6.233	0.000	-1.925	-0.999	4.18	0.630	0.396
	x75	-0.138	0.116	-0.668	0.505	-0.306	0.151	4.03	0.896	0.803
	x76	1.305	0.120	8.124	0.000	0.739	1.213	3.97	0.697	0.485
	x77	0.282	0.111	1.484	0.140	-0.054	0.383	3.97	0.898	0.807
	x78	-3.882	0.394	-5.988	0.000	-3.139	-1.583	4.09	0.840	0.706
Market risk management	x79									
	x80	1.059	0.244	7.302	0.000	1.298	2.259	4.10	0.576	0.332
	x81							4.14	0.581	0.338
Ensuring adequate controls over credit risk	x82		0.105					4.14	0.539	0.291
	x83	0.074	0.080	0.647	0.519	-0.106	0.209			
	x84	0.000	0.079	0.003	0.997	-0.162	0.163	4.37	0.619	0.383
	x85	-1.580	0.271	-4.563	0.000	-1.769	-0.701	4.23	0.637	0.405
	x86		0.110		0.000			4.04	0.704	0.496
	x87		0.123		0.110			4.09	0.494	0.244
	x88	0.000	0.083	0.000	1.000	-0.165	0.165	3.83	0.742	0.551
	x89	-0.234	0.152	-0.963	0.337	-0.447	0.154	3.92	0.793	0.629
	x90	-0.765	0.215	-2.160	0.032	-0.888	-0.040	4.21	0.824	0.679
	x91							4.11	0.702	0.493
	x92							4.10	0.770	0.594
Investment portfolio	x93									
	x94	0.000	0.086	0.000	1.000	-0.170	0.170	3.59	0.821	0.674
	x95	0.008	0.084	0.055	0.956	-0.161	0.170	3.83	0.832	0.692

Provisions for loan losses	x96									
	x97							4.22	0.627	0.393
	x98							4.30	0.587	0.344
Investment portfolio policy	x99	-2.675		-7.021	0.000	-2.274	-1.276			
	x100				0.000			4.29	0.705	0.497
	x101	0.595	0.205	2.198	0.000	0.046	0.854	4.24	0.658	0.433
	x102							4.46	0.619	0.383
	x103	1.092	0.135	5.651	0.000	0.495	1.027	4.20	0.723	0.523
	x104							4.38	0.669	0.448
Skills of credit department staffs	x105									
	x106							4.23	0.616	0.380
	x107				0.000			4.26	0.749	0.561
Credit risk management	x108									
	x109	1.702	0.204	4.741	0.000	0.565	1.372	4.02	0.892	0.796
	x110	-1.898						4.07	0.797	0.635
	x111							4.15	0.675	0.456
	x112	-1.898	0.204	-5.837	0.000	-1.881	-0.930	4.17	0.694	0.482
	x113	-0.339		-1.489	0.138	-0.574	0.080	4.25	0.703	0.494
	x114		0.166					3.99	0.708	0.502
Supervision authority role	x115									
	x116							4.33	0.569	0.323
	x117							4.28	0.538	0.289
	x118	-0.339	0.429	0.024	0.981	-0.836	0.857	4.26	0.514	0.265
	x119							4.34	0.507	0.257
	x120	0.922	0.344	2.456	0.015	-1.216	-0.447	4.19	0.542	0.294
	x121	-0.781						4.31	0.562	0.316
	x122							4.32	0.536	0.288
	x123		0.195	-4.269	0.000	-1.216	-0.447	4.27	0.480	0.231
	x124	0.152	0.235	0.687	0.000	-0.303	0.626	4.18	0.468	0.219
	x125	1.518	0.241	5.705	0.000	0.899	1.851	4.39	0.557	0.310
	x126	-1.888	0.334	-5.321	0.000	-2.437	-1.118	4.30	0.529	0.280
	x127							4.40	0.572	0.328
	x128	-2.882	0.309	-6.000	0.000	-2.465	-1.244	4.14	0.776	0.603
	x129							4.06	0.675	0.456
Internal audit	x130									
	x131	-0.015	0.041	-0.234	0.815	-0.091	0.071	4.01	0.792	0.627

x132	-	0.041	-0.128	0.898	-0.086	0.076	4.22	0.756	0.572
	.0007								
x133	-0.035	0.035	-0.763	0.447	-0.095	0.042	4.03	0.708	0.501
x134	0.017	0.082	-0.164	0.870	-0.149	0.176	4.13	0.671	0.450
x135	0.000	0.045	0.000	1.000	-0.089	0.089	4.16	0.829	0.687
x136	-3.214	0.806	-3.897	0.000	-4.735	-1.551	4.35	0.510	0.260

Note: Number of observations is 256.

There are excluded variables which have collinearity statistics tolerance.

The results on responses show that the set of independent variables has a significant $p=0.000$ (2-tailed) impact of credit risk assessment. This confirms the null hypothesis for the study. We can observe that means for independent variables are high, over 4.0, and standards deviations are low, which means that there is a small difference in population distribution. The variance for all independent variables is low, it means that population distribution is close to the mean. The study runs the second model regression. Table 4.7 shows the results for the model summary.

Table 4.7

Model summary for the second regression

Model	R	R-squared	Adjusted R-squared	Standard Error of Estimate	R-squared Change	F Change	Df 1	Df 2	Sig. F Change	Durbin Watson
1	0.992 ^a	0.983	0.975	0.078	0.983	126.062	80	17	0.000	2.083

a. Predictors: (Constant), x136, x59, v1, x35, x5, x29, x90, x16, x75, x50, x78, x101, x88, x11, x42, x4, x85, x48, x56, x37, x44, x71, x49, x77, x82, x14, x13, x76, x123, x32, x15, x7, x125, x45, x95, x38, x31, x128, x99, x53, x80, x69, x52, x46, x67, x17, x40, x94, x120, x36, x84, x87, x22, x34, x3, x41, x134, x47, x112, x6, x10, x60, x20, x124, x43, x24

b. Dependent Variable: x1

The study used regression analysis to measure the degree of relationship between establishing an appropriate credit risk environment (as a dependent variable) and determinants of establishing an appropriate credit risk environment (as independent variables). Stock and Watson (2015) note that R-squared is the fraction of the sample variance of Y_i , it ranges between 0 and 1.

The value of R. Square in regression is 0.983, which means only 98% of the data is fitted and that other variables are not included in the model. Both R-squared and the adjusted R-squared give an idea of how many data points fall within the line of the regression equation. Adjusted R-squared indicates how well terms fit a curve or line but adjusts for the number of terms in a model. Adjusted R-squared determines the model fit. Adjusted R-squared does not increase (remain or decrease) unless the newly added variable is truly useful.

The value of adjusted R-squared is 0.975 for establishing an appropriate credit risk environment, which means that the model fits perfectly. According to Dougherty (2016), the Durbin-Watson test reports test statistics with a value from 0 to 4. From 0 to < 2 is positive autocorrelation and if test statistics values in the range of 1.5 to 2.5 are relatively normal. The value of Durbin-Watson in the model is 2.083, which shows that there is positive autocorrelation between the variables. The high positive value of the coefficient of correlation shows that there is a correlation between customer services and determinants. The results of F statistics show significance ($p=0.000$) of the model, which means that independent variables have a certain impact on establishing an appropriate credit risk environment. Durbin-Watson test in the second model indicates better positive autocorrelation than the previous model.

4.3 ANOVA test

ANOVA test performs an analysis of variance and it shows the impact of independent variables over the dependent variable. An ANOVA test is a way to find out if the survey or the experiment results are significant. In other words, they help the researcher to figure out if the study needs to reject the null hypothesis or accept the alternate hypothesis.

Table 4.8*ANOVA results*

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.025	80	0.775	126.02	0.000 ^b
	Residual	1.058	172	0.006		
	Total	63.083	252			

a. Dependent Variable: x1

b. Predictors: (Constant), x136, x59, v1, x35, x5, x29, x90, x16, x75, x50, x78, x101, x88, x11, x42, x4, x85, x48, x56, x37, x44, x71, x49, x77, x82, x14, x13, x76, x123, x32, x15, x7, x125, x45, x95, x38, x31, x128, x99, x53, x80, x69, x52, x46, x67, x17, x40, x94, x120, x36, x84, x87, x22, x34, x3, x41, x134, x47, x112, x6, x10, x60, x20, x124, x43, x24

The resulting data which is shown in ANOVA table 4.8 shows that there is a significant $p=0.000$ (2-tailed) impact of the independent variables on establishing an appropriate credit risk environment. This proves null hypotheses for the study to be confirmed. F-test can be calculated by dividing $0.775/0.006 = 126.062$, which is a low value, and it means that the distance between the means is small relative to the random error within each group.

Mean squares are generally the variance among sample means. The mean square can be calculated by dividing the sum of squares by the degree of freedom and the result is $= 62.025/80 = 0.775$. The F value in the ANOVA test also determines the P-value, which is the probability of getting a result at least as extreme as the one that was observed, given that the null hypothesis is confirmed.

F statistics and F-test can be used to test the overall significance compared to regression models. F-test can be used to compare the fits of different models. ANOVA uses the F-test to determine whether the variability between group means is larger than the variability of the observations within the groups. If the value of that ratio is sufficiently large, one can conclude that not all the means are equal. The results show that the independent variables have a

significant impact on establishing an appropriate credit risk environment. Null hypotheses can be accepted. F-tests compares the fits of different models, test the overall significance in regression models, test specific terms in linear models and, determine whether sets of means are all equal.

The results of the study show that establishing an appropriate credit risk environment (as a dependent variable) depends on the following factors: clear definition of the functional responsibility for credit origination (x499) had the greatest effect ($\beta=3.109$) with $p=0.0000$ significance (2-tailed). The bank has in place a system for the ongoing administration of their various credit risk-bearing portfolios (x59) ranked as the second most influencing effect ($\beta=2,669$) with a significance of $p=0.0000$ (2-tailed) on establishing an appropriate credit risk environment. The bank operates in a clear target market (x39) ranked as a third important influencing effect ($\beta=2.028$) with $p=0.000$ significant (2-tailed). As the last to mention, the Internal Audit system (x48) is ranked as the fourth most important influencing effect ($\beta=1.920$) with $p=0.000$ significant (2-tailed) on that establishing an appropriate credit risk environment. Other independent variables have less or even a minor impact on Credit risk assessment. Table 4.9 shows the ranking of effect independent variables have on that establishing an appropriate credit risk environment.

Table 4.9

Ranking of effects of independent variables on dependent variables

Variable	Item	Rank	Beta	Sig. (2-tailed)
x49	Banks should clearly define the functional responsibility for credit origination.	1	3.109	0.000
x59	The bank has in place a system for the ongoing administration of their various credit risk-bearing portfolios	2	2.669	0.000
x39	The bank operates in clear target market	3	2.028	0.000
x130	Internal Audit system	4	1.920	0.000
x56	Bank has a clearly established process in place for approving new credit	5	1.799	0.000

x109	The bank has an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management	6	1.702	0.000
x25	Credit risk strategy determines target market	7	1.598	0.000
x125	Supervisor takes note of whether bank management recognizes problem credits at an early stage and takes the appropriate actions.	8	1.518	0.000
x6	Board directors are responsible for ensuring that the bank has appropriate credit risk assessment process.	9	1.501	0.000
x8	Board of directors are responsible for ensuring that the bank has an effective system and consistently applied process to determine provision for the loan losses.	10	1.368	0.000
x69	Credit risk management aims to set up procedure that helps to maintain credit quality and minimize the chance of default.	11	1.327	0.000
x32	The strategy should reflect the bank's tolerance for risk and the level of profitability	12	1.220	0.000
x50	Bank has established process for approving new credit, renewal and refinancing of existing credits.	13	0.756	0.004
x21	Credit risk strategy objectives guiding bank's credit-granting activities	14	0.728	0.000
x22	Credit strategy adopts the necessary policies and procedures for conducting such activities	15	0.679	0.000
x71	Bank has in place a system for determining the adequacy of provisions and reserves	16	0.483	0.000

Figure 4.3 Histogram of Distribution for the Second Model

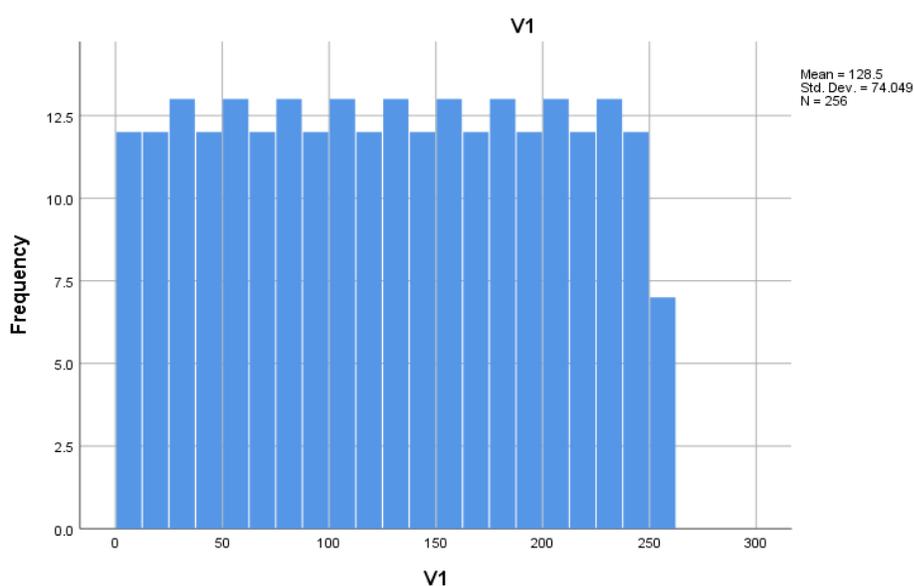
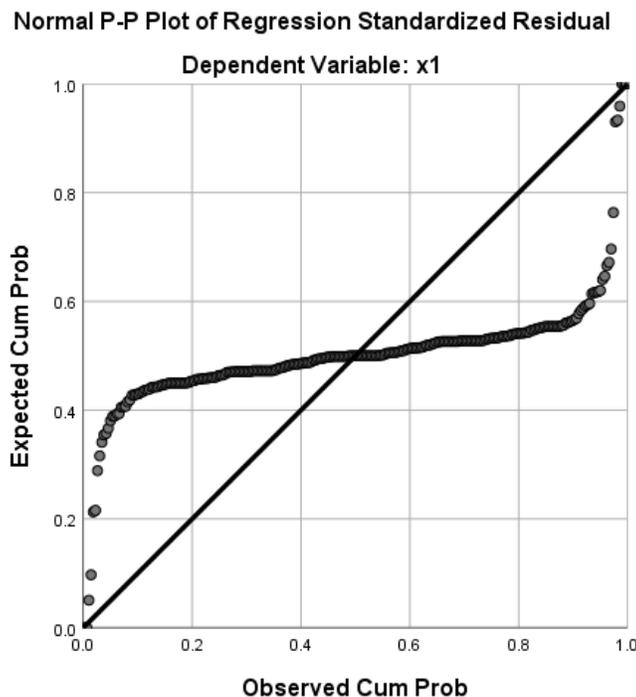


Figure 4.3 shows a bell-shaped curve. This means that there is a normal distribution of observed data. This histogram shows how numerical data is represented and distributed. The plot of regression in figure 4.4 shows linearity. This means that data of observation are fitted with a regression line with few residuals. We can observe that the linearity of regression for the second model is more fitted to data comparing to the first model. We can observe from this plot figure that numerical observed data are closer to the regression line.

Figure 4.4 *Plot for the Second Model of Regression*



4.4 Correlation matrix test

A correlation matrix is a statistical method that measures a linear relationship between two variables. It is a measure that shows how two variables move with each other and are presented as coefficients. The value of correlation is varying between +1.0 and -1.0 and is used to compete for the significant level for Pearson and Spearman correlation. It returns both the

correlation coefficients and the p-value of the correlation for all possible pairs of columns in table 4.10.

(2-tail.)	x1	x3	x5	x7	x8	x9	x10	x11	x12	x14	x15	x16	x25	x36
X109														
Pearson r(256)	0.123*	0.221**	0.204**	0.320**	0.161**	0.209**	0.079	0.302**	0.394**	0.578**	0.345**	0.380**	0.535**	0.530**
Sig. (2-tail.)	0.049	0.000	0.001	0.000	0.038	0.001	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*Correlation is significant at $p < 0.05$ level (2-tailed)

** Correlation is significant at $p < 0.01$ level (2-tailed)

The study checked the interrelation between variables using Pearson correlation. There are positive correlations between variables. There is a high positive correlation between x1 (establishing an appropriate credit risk environment) with x2 (having effective board director members), x3 (board directors are active to approve credit risk strategy), x4 (board directors are active to review credit risk strategy), x5 (board directors are active to approve written loan policy), x6 (board directors are responsible for ensuring that the bank has appropriate credit risk assessment process), x7 (board of directors are responsible for ensuring that the bank has an effective internal control to consistency determine provision for loan losses in accordance with banks polices and procedure), x11 (board directors specify the methods for granting credit and conduct an independent review of credit exposure), x21 (credit risk strategy objectives guiding bank's credit-granting activities), x27 (credit risk strategy aims to diversify credit), x30 (credit risk strategy consider the cyclical aspects of macroeconomy and the resulting shifts in the composition and quality of the overall credit portfolio), x40 (the bank understands the purpose of the loan), x56 (bank has a clearly established process in places for approving new credit), x72 (bank has internal risk rating system in managing credit risk), and x86 (credit exposures are within levels consistent with prudential standards and internal limits) as shown degree of significance.

There is also a positive correlation between x7 (board of directors are responsible for ensuring that the bank has effective internal control to consistently determine provision for loan losses following banks policies and procedure. With x3 (board directors are active to approve credit risk strategy), x6 (board directors are responsible for ensuring that the bank has appropriate credit risk assessment process), x10 (board directors are active to approve strategy for selecting risks and maximize profit), x16 (banks should identify and manage credit risk inherent in all products and activities), x22 (credit strategy adopts the necessary policies and procedures for

conducting such activities), x28 (credit risk avoids credit concentration), x40 (the bank understands the purpose of the loan), x47 (the purpose of the credit and repaying capacity of the borrower are more important), 56 (bank has a clearly established process in place for approving new credit) and x61 (the bank has in place a system for determining the adequacy of provisions and reserves), x71 (bank has in place a system for determining the adequacy of provisions and reserves), x83 (Bank has a constant assessment of the bank's credit risk management processes), x97 (bank determines provisions for loan losses) and x116 (supervisor requires a bank to have an effective system in place to identify and measure credit risk as part of an overall approach to risk management). x18 has a positive correlation with x1, x14, x20, x27, x33, x40, x56, x77, x90, x106, x112 and x132. There are positive and negative correlations between variables. Table 4.11 presents the one-sample t-test for all variables.

Table 4.11

One-sample test

Test Value = 0						
t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
				Lower	Upper	
v1	27.765	255	0.000	128.496	119.38	137.61
x1	143.127	255	0.000	4.477	4.41	4.54
x2	125.478	255	0.000	4.355	4.29	4.42
x3	104.303	255	0.000	4.285	4.20	4.37
x4	122.766	255	0.000	4.195	4.13	4.26
x5	86.784	255	0.000	4.199	4.10	4.29
x6	92.923	255	0.000	4.301	4.21	4.39
x7	94.726	255	0.000	4.273	4.18	4.36
x8	91.385	255	0.000	4.211	4.12	4.30
x9	103.396	255	0.000	4.254	4.17	4.33
x10	117.783	255	0.000	4.219	4.15	4.29
x11	95.086	255	0.000	4.184	4.10	4.27
x12	87.754	255	0.000	4.184	4.09	4.28
x13	113.868	255	0.000	4.406	4.33	4.48
x14	113.914	255	0.000	4.395	4.32	4.47

x15	95.527	255	0.000	4.270	4.18	4.36
x16	110.983	255	0.000	4.352	4.27	4.43
x17	95.237	255	0.000	4.250	4.16	4.34
x18	100.545	255	0.000	4.348	4.26	4.43
x19	107.863	255	0.000	4.348	4.27	4.43
x20	127.828	255	0.000	4.336	4.27	4.40
x21	140.761	255	0.000	4.289	4.23	4.35
x22	129.743	255	0.000	4.332	4.27	4.40
x23	109.968	255	0.000	4.168	4.09	4.24
x24	122.717	255	0.000	4.277	4.21	4.35
x25	85.336	255	0.000	4.043	3.95	4.14
x26	100.454	255	0.000	4.156	4.07	4.24
x27	87.742	255	0.000	4.145	4.05	4.24
x28	100.895	255	0.000	4.148	4.07	4.23
x29	107.294	255	0.000	4.191	4.11	4.27
x30	109.267	255	0.000	4.195	4.12	4.27
x31	99.770	255	0.000	4.082	4.00	4.16
x32	105.275	255	0.000	4.156	4.08	4.23
x33	119.519	255	0.000	4.234	4.16	4.30
x34	103.800	255	0.000	4.133	4.05	4.21
x35	98.113	255	0.000	4.207	4.12	4.29
x36	90.746	255	0.000	4.102	4.01	4.19
x37	84.938	255	0.000	4.184	4.09	4.28
x38	87.519	255	0.000	3.934	3.85	4.02
x39	99.087	255	0.000	4.184	4.10	4.27
x40	97.601	255	0.000	4.199	4.11	4.28
x41	144.288	255	0.000	4.516	4.45	4.58
x42	105.625	255	0.000	4.309	4.23	4.39
x43	143.384	255	0.000	4.488	4.43	4.55
x44	96.820	255	0.000	4.039	3.96	4.12
x45	104.110	255	0.000	4.340	4.26	4.42
x46	125.567	255	0.000	4.313	4.24	4.38
x47	97.714	255	0.000	4.273	4.19	4.36
x48	148.348	255	0.000	4.582	4.52	4.64
x49	149.756	255	0.000	4.301	4.24	4.36
x50	108.098	255	0.000	4.262	4.18	4.34
x51	110.612	255	0.000	4.211	4.14	4.29
x52	84.588	255	0.000	4.176	4.08	4.27
x53	68.604	255	0.000	3.961	3.85	4.07
x54	77.357	255	0.000	4.070	3.97	4.17
x55	105.798	255	0.000	4.199	4.12	4.28
x56	124.821	255	0.000	4.383	4.31	4.45
x57	142.949	255	0.000	4.465	4.40	4.53

x58	82.693	255	0.000	4.129	4.03	4.23
x59	79.284	255	0.000	4.152	4.05	4.26
x60	77.487	255	0.000	4.262	4.15	4.37
x61	112.759	255	0.000	4.395	4.32	4.47
x62	80.877	255	0.000	4.090	3.99	4.19
x63	73.668	255	0.000	3.945	3.84	4.05
x64	76.052	255	0.000	4.172	4.06	4.28
x65	85.685	255	0.000	4.074	3.98	4.17
x66	80.084	255	0.000	3.941	3.84	4.04
x67	103.263	255	0.000	4.258	4.18	4.34
x68	104.059	255	0.000	4.449	4.37	4.53
x69	103.786	255	0.000	4.375	4.29	4.46
x70	89.207	255	0.000	3.996	3.91	4.08
x71	109.566	255	0.000	4.078	4.00	4.15
x72	104.990	255	0.000	4.195	4.12	4.27
x73	99.437	255	0.000	4.074	3.99	4.15
x74	106.114	255	0.000	4.176	4.10	4.25
x75	72.777	255	0.000	4.035	3.93	4.14
x76	94.877	255	0.000	3.980	3.90	4.06
x77	74.394	255	0.000	3.992	3.89	4.10
x78	80.166	255	0.000	4.098	4.00	4.20
x79	92.847	255	0.000	4.207	4.12	4.30
x80	113.854	255	0.000	4.098	4.03	4.17
x81	113.830	255	0.000	4.137	4.07	4.21
x82	135.137	255	0.000	4.156	4.10	4.22
x83	94.910	255	0.000	4.234	4.15	4.32
x84	120.413	255	0.000	4.383	4.31	4.45
x85	106.295	255	0.000	4.230	4.15	4.31
x86	92.320	255	0.000	4.047	3.96	4.13
x87	132.466	255	0.000	4.086	4.03	4.15
x88	84.918	255	0.000	3.844	3.75	3.93
x89	79.110	255	0.000	3.922	3.82	4.02
x90	81.831	255	0.000	4.215	4.11	4.32
x91	93.731	255	0.000	4.113	4.03	4.20
x92	85.179	255	0.000	4.102	4.01	4.20
x93	85.764	255	0.000	4.000	3.91	4.09
x94	71.252	255	0.000	3.605	3.51	3.71
x95	75.377	255	0.000	3.844	3.74	3.94
x96	117.935	255	0.000	4.285	4.21	4.36
x97	107.723	255	0.000	4.223	4.15	4.30
x98	117.244	255	0.000	4.301	4.23	4.37
x99	89.374	255	0.000	4.215	4.12	4.31
x100	97.391	255	0.000	4.289	4.20	4.38

x101	103.031	255	0.000	4.238	4.16	4.32
x102	117.859	255	0.000	4.465	4.39	4.54
x103	94.265	255	0.000	4.207	4.12	4.29
x104	107.494	255	0.000	4.387	4.31	4.47
x105	104.631	255	0.000	4.398	4.32	4.48
x106	112.832	255	0.000	4.234	4.16	4.31
x107	92.796	255	0.000	4.266	4.18	4.36
x108	100.820	255	0.000	4.324	4.24	4.41
x109	73.890	255	0.000	4.035	3.93	4.14
x110	84.242	255	0.000	4.082	3.99	4.18
x111	100.454	255	0.000	4.156	4.07	4.24
x112	98.372	252	0.000	4.178	4.09	4.26
x113	98.904	255	0.000	4.258	4.17	4.34
x114	90.162	255	0.000	3.992	3.90	4.08
x115	125.934	255	0.000	4.277	4.21	4.34
x116	121.794	255	0.000	4.328	4.26	4.40
x117	128.866	255	0.000	4.285	4.22	4.35
x118	132.567	255	0.000	4.262	4.20	4.33
x119	137.077	255	0.000	4.340	4.28	4.40
x120	123.542	255	0.000	4.188	4.12	4.25
x121	123.967	255	0.000	4.313	4.24	4.38
x122	128.751	255	0.000	4.316	4.25	4.38
x123	144.362	255	0.000	4.277	4.22	4.34
x124	143.045	255	0.000	4.180	4.12	4.24
x125	127.771	255	0.000	4.398	4.33	4.47
x126	129.891	255	0.000	4.297	4.23	4.36
x127	123.049	255	0.000	4.402	4.33	4.47
x128	85.870	255	0.000	4.148	4.05	4.24
x129	96.230	255	0.000	4.059	3.98	4.14
x130	115.690	255	0.000	4.352	4.28	4.43
x131	84.168	255	0.000	4.031	3.94	4.13
x132	96.080	255	0.000	4.246	4.16	4.33
x133	99.121	255	0.000	4.055	3.97	4.14
x134	103.755	255	0.000	4.148	4.07	4.23
x135	84.320	255	0.000	4.188	4.09	4.29
x136	136.485	255	0.000	4.352	4.29	4.41

4.5 Summary of hypotheses confirmation

The hypotheses confirmation is summarized in table 4.12. For the transparency matter, only null hypotheses are presented. As can be observed in table 4.12. the first three hypotheses can be regarded as confirmed. The reference chapter is given to provide a direct link to the evidence on

which we judge the validity of a certain hypothesis. The first two hypotheses can be regarded as confirmed due to the significance of the appropriate coefficients in the two regression models. The third hypothesis can be conformed to ranking value and coefficient significance. The fourth hypothesis turns out to be not relevant or better, it cannot be judged on the given sample for the two reasons: (1) none of the respondents has ever filed a complaint to his/her bank and (2) the coefficients for the variable are not significant. To summarize: three out of four hypotheses are confirmed and the fourth cannot be judged.

Table 4.12

Hypotheses confirmation

	Hypothesis	Status	Reference chapter
1	H0: Private banks in Iraq have effective board director members	confirmed	4.2.1
2	H0: Private banks in Iraq are operating under a sound credit granting process	confirmed	4.2.1, 4.2.3
3	H0: Private banks in Iraq are maintaining a suitable credit administration.	confirmed	4.4.3
4	H0: Supervision authority in Iraq has a significant role over private banks in Iraq.	confirmed	4.4.2

CHAPTER 5

CONCLUSIONS

In the concluding chapter we provide some summary of the work done on this thesis. We repeat some most important conclusions and findings and admit some limitations of the study. We finalize the chapter by providing some ideas and recommendations for the future research in the field of banking risk management.

5.1 Introduction

The study examines practice of credit risk management principles by private banks in Iraq. The history of private banks is related to a new law No. 56 adopted in 2004 for Central Bank of Iraq (CBI). The new law allows that both domestic and foreign banks operate under supervision of CBI. Supervision authority in Iraq is active to audit and review activities for private banks to ensure practicing regulators instructions. There is a specific department for the audit & control of private banks in Iraq.

The study relied on the two models for assessing practicing of credit risk managements principles by private banks. The first model includes main determinants of establishing an appropriate credit risk environment. The second model contains details for each determinant on establishing an appropriate credit risk environment.

5.2 Conclusions and findings

The objective of the study was mainly to evaluate practicing credit risk management principles by private banks in Iraq. The study checks if private banks in Iraq practice principles of credit risk management suggested and confirmed by Basel Committee on Banking Supervision (2000). The study aims to identify and confirm determinants of establishing an appropriate credit risk environment. The particular study finds that respondents think that private banks in Iraq in general are effective in practicing credit risk management principles. Respondents' opinion in

general, is that board of directors' members are active to approve and review credit risk strategy. The study finds that top managers are active to develop policies and procedures for identifying, measuring, monitoring and controlling credit risks. Furthermore, respondents' opinion is that private banks are operating under a sound credit granting process which envisions that the private banks in Iraq are effectively operating in a clear target market, banks understand the purpose of the loan effectively, and set-out who is eligible for credit and amount of credit. In addition, private banks are active in arranging a structure contract before lending.

Banks generally are effective in determining the adequacy of provisions and reserves. The study finds that private banks in Iraq are active in ensuring adequate controls over credit risk. The study finds that private banks are not active in investing across different countries. Banks are effectively active in determining provisions for loan losses. The results of study show that private banks are active in loan review process by reminding borrowers of delay payments, raising claim in the court against default borrowers and handling problems quickly.

The study finds that in general, credit staff members are educated in banking and finance department in universities, majority of them participated in training programs arranged in a workshop format (now online due to corona virus). Researcher observe that there are many courses which are available for bank staff members to participate.

The study finds that the Supervision authority in Iraq has a significant role in forcing private banks to practice credit risk management principles. Supervision authority is active to conduct an independent evaluation of a bank's policies related to the granting of credit and the ongoing management of the portfolio. Supervision authority effectively obligates private banks to provide monthly financial statement (balance sheet and income statements). In addition, Supervision authority obligates private banks to send information about distribution of loans according to branches and economic sectors. Supervision authority is effective to review ratio of capital / assets

and the ratio of liquidity reserves. Supervision Authority is active to enforce private banks to practice instructions of bank regulation, otherwise they face financial penalties.

The study finds that Internal audit in private banks provides effective an independent assessment of the adequacy of capital, compliance and established policies and procedure. Finally, Internal audit function effectively assists senior management and the board of directors in the efficient and effective discharge of their responsibilities.

5.3 Limitations of the study

The study has some potential limitation of generalization of its finding. The study could use more interviews in different headquarters for commercial banks. Thus, as usually, the generalization of the study shall be considered when appropriate. Also, the potential biases of respondents were not checked, which may, again, be a certain weakness of this study. On the other side, we believe that the study, despite the limitation consideration, fully reached its objectives.

5.4 Recommendation for further research

It would be recommended to repeat the study on a sample which would be geographically more diversified and address the bigger number of respondents which may be tested for representativeness and possible biases. Also, international repetition would provide interesting insights for possibility of comparisons with different economic and cultural environments with different level of banking sector maturity and development.

Another interesting research can be on credit risk assessment in an individual bank. This approach may be a step into transforming this type of research into a consulting tool and the research methodology serves as an assessment and diagnosis tool and shows first time opportunities for improvements. Additional research could be extended toward banks staff members as service quality and customer loyalty.

The banks benefit from adopting sound strategies to improve control over credit risk. Strategies such as diversification, hedging, corporate governance and the capital adequacy ratio have all been cited in extant research as being crucial for the success in this regard; in fact, many problems arising from credit risk can be resolved by implementing some combination of these strategies. The research findings can help to ensure that commercial banks take appropriate risk management measures to help keep them from failures. Society depends on the smooth operation of the banking sector, so bank performance can help contribute to the development and improved welfare of the economy. Therefore, effective supervision should be employed by the banks to check and safeguard bank resources. Effective trainings and courses should be given to bank employees in the areas of risk asset management, risk control and credit utilization in order to ensure proper usage and performance.

REFERENCES

- Abiola I., & Olausi, A.S. (2014). The impact of credit risk management on the commercial banks performance in Nigeria. *International Journal of Management and Sustainability*. 3(5). 295–306.
- Cayman Islands monetary authority. (n.d.). *Statement of Guidance internal audits*. Cayman Islands: Cayman Islands monetary authority.
- Bank of Canada. (2004). *Bank of Canada Lender of Last - Resort Policies*. Ottawa: Bank of Canada Financial System Review.
- Basel Committee on Banking Supervision. (1998). *Working paper on the risk management subgroup of the Basel committee on banking supervision*. Basel: Bank of international Settlement.
- Basel Committee on Banking Supervision. (1999). *Credit Risk Modeling: Current practice and application*. Basel: Bank for international settlement.
- Basel Committee on Banking Supervision. (2000). *Principles for the management of credit risk*. Basel: Bank of International Settlement.
- Basel Committee on Banking Supervision. (2001a). *Working paper on the consultative document operational risk*. Basel: Bank for international settlement.
- Basel Committee on Banking Supervision. (2001b). *Internal audit in banks and the supervisor relationship with auditors*. Basel: Bank of International Settlements.
- Basel Committee on Banking Supervision. (2002). *Working paper on the regulatory treatment of operation risk*. Basel: Bank of International Settlement.
- Basel Committee on Banking Supervision. (2006). *Sound Credit Risk Assessment and Valuation for Loans*. Basel: Bank for International Settlements.

- Basel Committee on Banking Supervision. (2011). *Working paper on Principles for sound Management of Operational Risk*. Basel: Bank of International Settlement.
- Basel Committee on Banking Supervision. (2012). *Core Principles for Effective Banking supervision*. Basel: Bank for international Settlements.
- Basel Committee on Banking Supervision. (2014, reviewed in 2020). *Sound Management of Risk Related to Money Laundering and Financing of Terrorism*. Basel: Bank of international Settlements.
- Basel Committee on Banking Supervision. (2019). *Risk Management*. Basel: Bank for International Settlements.
- Berk, J., & DeMarzo, P. (2017). *Corporate Finance Fourth Edition*. London: Pearson.
- Bodie, Z., Kane, A., & Marcus, A. J. (2010). *Essential of Investment Eighth Edition*. New Jersey: John Wiley & Son.
- Bouteille, S., & Coogan-Pushner, D. (2013). *The Handbook of Credit Risk Management Third Edition*. New Jersey: John Wiley & Sons.
- Brown, K., & Moles, P. (2016). *Credit Risk Management Second Edition*. Edinburgh: Edinburgh Business School.
- Central Bank of Iraq. (2004). *Banking law No 94*. Baghdad: Central Bank of Iraq.
- Ciby, J. (2013). *Advanced Credit Risk, Analysis and Management Second Edition*. New Jersey: Wiley Finance.
- Cooper, R. D., & Schinider, P. S. (2002). *Business Research Methods Second Edition*. New York: McGraw Hill.
- Dejene, B. (2015). *Assessment of Credit Risk Management Practice of commercial bank in Ethiopia*. Addis Ababa: St. Mary University.
- Dougherty, C. (2016). *Introduction to Econometrics Fifth Edition*. Oxford: University Press.

- Ernst & Young. (2010). *Recover, Adapt, Advance: Back to Business in an uncertain world*. London: Ernst & Young.
- Ernst & Young. (2010). *Risk appetite: The strategic balancing Act*. London: Ernst & Young.
- Fraser, E. (2001). *Commercial Banking, The Management of Risk Second Edition*. Cincinnati: South -Western College Publishing.
- Gaffney, E., Kelly, R., McCann, F. (2014). *A transitions-based framework for estimating expected credit losses*. Dublin: Central Bank of Ireland.
- Ganguin, B., & Bilardello, J. (2005). *Fundamentals of Corporate Credit Analysis*. New York: McGraw Hill.
- Gavalas, D., & Syriopoulos, T. (2014). Bank Credit Risk Management and Rating Migration Analysis on the Business Cycle. *International Journal of Financial Studies*. 2(1), 122-143. <https://doi.org/10.3390/ijfs2010122>.
- Gitman, J. L., & Joehnk, M. D. (2008). *Fundamentals of Investing Tenth Edition*. London: Pearson International Edition.
- Gray, B. (1996). *The Role of Disclosure in Bank Supervision*. Sydney: Reserve Bank of Australia.
- Ghosh, A. (2012). *Managing Risk in Commercial and Retail Banking*. New Jersey: John Wiley and Son.
- Gup, E. B., & Kolari, J. W. (2005). *Commercial Banking - The Management of Risk Third*. New Jersey: John Wiley & Sons.
- Hong Kong Monetary Authority. (2019). *General Principles of Credit Risk Management*. Hong Kong: Hong Kong Monetary Authority.
- Hull, C. J. (2010). *Risk Management and Financial Institution Second Edition*. Boston: Pearson International Edition.

- Joseph, C. (2013). *Advanced Credit Risk analysis and Management Third Edition*. New Jersey: John Wiley & Sons.
- Khalid, S., & Amjad, S. (2012). Risk Management practice in Islamic Banks of Pakistan. *Journal of Risk Finance*, 13(2), 148-159.
- Lalon, R. M. (2015). Credit Risk Management (CRM) practice in commercial Banks of Bangladesh. *International Journal of Economics*, 3(2), 78-90.
- Rehman, Z.U., Muhammad, N., Sarwar, B. & Raz, M. A. (2019). Impact of risk management strategies on the credit risk faced by commercial banks of Balochistan. *Financial Innovation* 5(44), 11-30. <https://doi.org/10.1186/s40854-019-0159-8>
- Rose, S. P., & Hudgins, S. C. (2013). *Bank Management & Financial Services Ninth Edition*. Boston: McGraw Hill.
- Saunders, M., Lewis, P., & Thornhill, B. (2009). *Research Methods to Business Students Fourth Edition*. New York: Pearson Education Publisher.
- Saunders, A., & Cornet, M. M. (2006). *Financial Institutions Management, A Risk Management Approach Fifth Edition*. Boston: McGraw Hill.
- Striscek, D. (2002). Credit Culture, Part II: Types of Credit Cultures. RMA Journal. Philadelphia: The Risk management Association.
- Sweeting, P. (2012). *Financial Enterprise Risk Management Fourth Edition*. Cambridge: Cambridge University Press.
- Thomsen, S., & Conyon, M. (2012). *Corporate Governance Mechanism and system*. London: McGraw Hill.
- United Nations. (2003). *United Nations conference on Trade and Development*. Selected Issue on Corporate Governance (1-20). New York: United Nations.

Vidal, M. F., & Barbon, F. (2019). *Credit Scoring in Financial Inclusion*. Washington: World Bank.

Warsame, M. (2016). *Credit Risk Management Practices and Its Impact on banks financial performance: An empirical study of conventional and Islamic banks in Kenya*. Proceedings of Business and Social Sciences Research Conference. London: University of London.

						Effective
X1	Establishing an appropriate credit risk environment					
X2	Having effective board director members					
X3	board directors are active to approve credit risk strategy.					
X4	board directors are active to review credit risk strategy.					
X5	board directors are active to approve written loan policy.					
X6	board directors are responsible for ensuring that the bank has appropriate credit risk assessment process.					
X7	board of directors are responsible for ensuring that the bank has an effective internal control to consistency determine provision for loan losses in accordance with banks polices and procedure.					
X8	board of directors are responsible for ensuring that the bank has an effective system and consistently applied process to determine provision for the loan losses.					
X9	Board directors are active to determine credit risk strategy management function.					
X10	Board directors are active to approve strategy for selecting risks and maximize profit.					
X11	Board directors specify the methods for granting credit and conduct an independent review of credit exposure.					
X12	Top Management					
X13	Senior management has responsibility for implement credit risk strategy approved by the board of directors.					
X14	Top manager develops policies and procedures for identifying, measuring, monitoring and controlling credit risk.					
X15	Top manager address policies and procedure credit risk for individual loan.					
X16	Banks should identify and manage credit risk inherent in all products and activities.					
X17	Senior management should maintain aggregate loan provisions at the appropriate level.					
X18	Senior management should monitor the credit risk assessment and provisioning process.					
X19	Credit Risk Strategy					
X20	Credit risk strategy reflects the banks tolerance for the risk and the level of profitability of the bank.					
X21	credit risk strategy objectives guiding bank's credit-granting activities.					
X22	Credit strategy will adopt the necessary policies and procedures for conducting such activities.					
X23	Credit risk strategy should include a statement of the bank's willingness to grant credit based on exposure type.					

X24	Credit risk strategy will cover different types of credit, economic sectors and geographic location.					
X25	Credit risk strategy will determine target market.					
X26	Credit risk strategy will aim to diversify credit.					
X27	Credit risk strategy will avoid credit concentration.					
X28	Credit risk will avoid credit concentration.					
X29	credit risk strategy give recognition to the goals of credit quality, earnings and growth.					
X29	Credit risk strategy determine the acceptable risk/reward trade-off for its activities, factoring in the cost of capital.					
X30	Credit risk strategy consider the cyclical aspects of macroeconomy and the resulting shifts in the composition and quality of the overall credit portfolio.					
X31	Credit risk strategy will shift the composition and quality of credit portfolio.					
X32	The strategy should reflect the bank's tolerance for risk and the level of profitability.					
X33	Operating under a sound Credit granting process					
X34	The bank has a sound, well-defined credit-granting criteria					
X35	The criteria should set out who is eligible for credit.					
X36	The criteria should set out the amount of credit.					
X37	The principle should set out the term and condition the credit should be granted.					
X38	The bank operates in clear target market.					
X39	The bank will understand the borrower before lending.					
X40	The bank will understand the purpose of the loan.					
X41	The bank will arrange a structure contract before lending.					
X42	The bank will understand the source of repayment of the loan.					
X43	Bank will require collateral coverage and tenure to support lending.					
X44	Bank determine lending rate according to collateral.					
X45	Bank should have a set of application forms for collecting all relevant data and information about the borrower.					
X46	Bank should take all factors from loan applicant to determine credit risk ranting.					
X47	The purpose of the credit and repaying capacity of the borrower are more important.					
X48	"The know your customer "principle is equally important for establishing credit relationship.					
X49	Banks should clearly define the functional responsibility for credit origination.					

X50	Bank has established process for approving new credit, renewal and refinancing of existing credits.					
X51	Credit limit					
X52	Bank has credit limit at the level of individual borrower.					
X53	Bank has credit limit for each item in trading book.					
X54	Bank has credit limits for each item in letter of credit.					
X55	Bank has credit limit for each item in guarantee letter.					
X56	Bank has a clearly established process in places for approving new credit.					
X57	Maintaining a suitable credit administration					
X58	Bank has established a credit administration process in keeping with its size, credit turnover, client composition and product range.					
X59	The bank has in place a system for the ongoing administration of their various credit risk-bearing portfolios.					
X60	The bank has in place a system for monitoring the condition of individual credits.					
X61	The bank has in place a system for determining the adequacy of provisions and reserves.					
X62	The bank uses internal risk rating in managing credit risk.					
X63	The bank has Information system about customers					
X64	The bank uses analytical techniques that enable management to measure the credit risk inherent in all on- and off-balance sheet activities.					
X65	Banks have a clearly established process in place for approving new credits.as well as the amendment, renewal and re-financing of existing credits.					
X66	The bank uses internal risk rating system in managing credit risk.					
X67	The bank will update periodically of borrow - related records such financial statements and business status.					
X68	Credit risk Management					
X69	Credit risk management aims to set up procedure that assist in selecting good exposure, maintain credit quality and minimize the chance of default.					
X70	Bank has in place a system for monitoring the condition of individual credits.					
X71	Bank has in place a system for including determining the adequacy of provisions and reserves.					
X72	Bank has internal risk rating system in managing credit risk.					
X73	Using data base about customers					

X74	Using its own analytical techniques that enable management to measure the credit risk					
X75	management information system in central bank of Iraq will provide adequate information about customers.					
X76	The bank has his own management information system to provide a adequate information about credit portfolio.					
X77	The bank has his own management information system to provide adequate information about concentration of risk.					
X78	Banks have in place a system for monitoring the overall composition and quality of the credit portfolio.					
X79	Market Risk Management					
X80	Bank take into consideration potential future changes in economic conditions when assessing individual credits.					
X81	Bank take into consideration potential future changes in economic conditions when assessing credit portfolios.					
X82	Ensuring adequate controls over credit risk					
X83	Bank has a constant assessment of the bank's credit risk management processes.					
X84	There is a communication system between credit Risk management directly to the board of directors and senior management.					
X85	There is a suitable management of the credit-granting function.					
X86	Credit exposures are within levels consistent with prudential standards and internal limits.					
X87	Bank will implement internal controls and other practices to ensure that exceptions to policies.					
X88	In your bank, there is a system for early remedial action on deteriorating credit.					
X89	Business functions should be independent from credit granting/verification functions to avoid the interest conflict.					
X90	Accounting functions should be independent from credit granting/verification functions and business functions to avoid fraud and malpractice.					
X91	In your bank, there is a system for early remedial action for managing credits problems and similar workout situations.					
X92	Credit confirmation functions should be independent from credit granting functions to make sure the credit results are reported objectively.					
X93	Investment portfolio policy					
X94	The bank has the policy of investment across different countries.					
X95	The bank has the policy of diversifying investment across different countries.					
96	Provisions for loan losses					

97	The bank will determine provisions for loan losses.					
98	The bank will determine provisions for loan losses according the degree of the credit.					
X99	Loan review process in the bank					
X100	Bank officer will constantly review payment of borrowers.					
X101	Bank officer will remind borrower for delay payments.					
X102	Banks will raise claim in the court against default borrowers.					
X103	Bank will handle problem quakily.					
X104	My bank will determine adequate amount of loan loss provision.					
X105	Skills of credit staff in my bank					
X106	Credit staffs have experience					
X107	Credit staffs have participated training programs					
X108	Credit Risk Management					
X109	The bank has an effective system in place to identify, measure, monitor and control credit risk as part of an overall approach to risk management.					
X110	The bank has an effective system in place to measure credit risk as part of an overall approach to risk management.					
X111	The bank has an effective system in place to monitor and control credit risk as part of an overall approach to risk management.					
X112	The bank has a system to reliability classify loans based on credit risk.					
X113	Credit risk grading process typically consider a borrower current financial condition and paying capacity.					
X114	Risk rating should be reviewed and update whenever relevant new information is received.					
X115	The role of Supervision Authority					
X116	Supervisor require a bank to have an effective system in place to identify and measure credit risk as part of an overall approach to risk management.					
X117	Supervisor require a bank to have an effective system in place to monitor and control credit risk as part of an overall approach to risk management.					
X118	Supervisor conduct an independent evaluation of a bank's policies related to the granting of credit and the ongoing management of the portfolio.					
X119	Supervisor conduct an independent evaluation of a bank's procedure and practice related to the granting of credit and the ongoing management of the portfolio.					
X120	Supervisor consider setting prudential limits to restrict bank exposures to single borrower.					

X121	Supervisor will assess the system in place at individual bank to identify, measure, monitor and control credit risk.					
X122	Supervisor will assess of internal risk ratings and credit risk models used by the bank.					
X123	Supervisor conduct a review of the quality of a sample of individual credits.					
X124	Supervisor will assess the quality of a bank's own internal validation process where internal risk ratings and/or credit risk models are used.					
X125	Supervisor will take note of whether bank management recognizes problem credits at an early stage and takes the appropriate actions.					
X126	Supervisor will assess whether the capital of the bank, in addition to its provisions and reserves is adequate related to the level of credit risk identified.					
X127	Supervisors require that banks have an effective system to identify, measure, monitor and control credit risk as part of an overall approach to risk.					
X128	Supervisors should consider setting prudential limits to restrict bank exposures to single borrowers or groups of connected counterparties.					
X129	Supervisors conduct an independent evaluation of a bank's procedure and practice related to the granting of credit and the ongoing management of the portfolio.					
X130	Internal Audit system					
X131	Freedom of internal auditors					
X132	Having principles of internal audit system					
X133	Internal audit provides and independent assessment of the adequacy of capital, compliance and established policies and procedure.					
X134	Internal audit function assists senior management and the board of directors in the efficient and effective discharge of their responsibilities.					
X135	The review of the application and effectiveness of risk management procedures and risk assessment methodologies.					
X136	Head of internal audit department should have the authority to communicate directly, and on his/her own initiative, to the board, the chairman of the board directors.					

CU APPENDIX QUESTIONNAIRE

The researcher is a student of Kwame Nkrumah University of Science and Technology pursuing Master of Business Administration (MBA) in finance and conducting a Research on Assessment of Credit Risk Management of Agricultural Development Bank

(2010- 2013). In view of this; the Researcher would be grateful if you could provide responses to the questions below. Information provided are strictly confidential and only be used for the purpose of this study.

SECTION A Background Information

1. Sex:

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SECTION B

What are the bank's risk management frameworks for managing credit risk?

Please indicate your level of agreement to the following statement as your bank's risk management framework for managing credit risks by ticking [✓] the appropriate option.

S/N Frameworks Agree Undecided Disagree

10 Detailed and formalized credit evaluation/ appraisal process

11 Credit approval authority at various hierarchy levels including authority for approving exceptions.

12 Risk identification, measurement, monitoring and control

13 Risk acceptance criteria

14 Credit origination and credit administration and loan documentation procedures

15 Roles and responsibilities of units/staff involved in origination and management of credit

16 Guidelines on management of problem loans

17. In your opinion, what other risk management frameworks for managing credit risk are used in your bank?

.....

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SECTION C

To what extent are the risk management frameworks for managing credit risks effective?

Please indicate your level of agreement to the following statement as the extent to which your bank's risk management framework for managing credit risk are effective by ticking [✓] the appropriate option. Very Effective (6.0), Effective (5.0), Partially Effective (4.0), Not Sure (3.0), Less Effective (2.0) and Not Effective (1.0)

Frameworks 6 5 4 3 2 1

18 Detailed and formalized credit evaluation/ appraisal process

19 Credit approval authority at various hierarchy levels including authority for approving exceptions

20 Risk identification, measurement, monitoring and control

21 Risk acceptance criteria

22 Credit origination and credit administration and loan documentation Procedures

23 Roles and responsibilities of units/staff involved