UNIVERSITY OF SKÖVDE

School of Technology and Society

MASTER DEGREE PROJECT

Title: BANK PERFORMANCE AND CREDIT RISK MANAGEMENT

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ACKNOWLEDGEMENT

ABSTRACT

Banking is topic, practice, business or profession almost as old as the very existence of man, but literarily it can be rooted deep back the days of the Renaissance (by the Florentine Bankers). It has sprouted from the very primitive **Stone-age** banking, through the **Victorian-age** to the technology-driven **Google-age** banking, encompassing automatic teller machines (ATMs), credit and debit cards, correspondent and internet banking.

Credit risk has always been a vicinity of concern not only to bankers but to all in the business world because the risks of a trading partner not fulfilling his obligations in full on due date can seriously jeopardize the affaires of the other partner.

The axle of this study is to have a clearer picture of how banks manage their credit risk. In this light, the study in its first section gives a background to the study and the second part is a detailed literature review on banking and credit risk management tools and assessment models. The third part of this study is on hypothesis testing and use is made of a simple regression model. This leads us to conclude in the last section that banks with good credit risk management policies have a lower loan default rate and relatively higher interest income.

TABLE OF CONTENT

TITLE   **PAGES**

SECTION FOUR: CONCLUSION AND SUGGESTIONS

SECTION ONE: BACKGROUND TO STUDY

1.1-Background to the study:

Adequately managing credit risk in financial institutions (FIs) is critical for the survival and growth of the FIs. In the case of banks, the issue of credit risk is of even of greater concern because of the higher levels of perceived risks resulting from some of the characteristics of clients and business conditions that they find themselves in.

Banks are in the business of safeguarding money and other valuables for their clients. They also provide loans, credit and payment services such as checking accounts, money orders and cashier's checks. Banks also may offer investment and insurance products and a wide whole range of other financial services (in accordance with the 1999 Financial Services Modernization Act by the US congress) which they were once prohibited from selling (by the Glass-Steagall or Banking Act of 1933 in the USA).

Credit creation is the main income generating activity for the banks. But this activity involves huge risks to both the lender and the borrower. The risk of a trading partner not fulfilling his or her obligation as per the contract on due date or anytime thereafter can greatly jeopardize the smooth functioning of a bank's business. On the other hand, a bank with high credit risk has high bankruptcy risk that puts the depositors in jeopardy.

Among the risk that face banks, credit risk is one of great concern to most bank authorities and banking regulators. This is because credit risk is that risk that can easily and most likely prompts bank failure.

Credit risk management is a structured approach to managing uncertainties through risk assessment, developing strategies to manage it, and mitigation of risk using managerial

resources. The strategies include transferring to another party, avoiding the risk, reducing the negative effects of the risk, and accepting some or all of the consequences of a particular risk.

Some traditional risk managements focused on risk stemming from physical or legal causes (such as natural disasters or fires, accidents, deaths and lawsuits). Financial risk management on the other hand focuses on risks that can be managed using traded financial instruments.

The objective of risk management is to reduce the effects of different kinds of risks related to a preselected domain to the level accepted by society. It may refer to numerous types of threats caused by environment, technology, humans, organizations and politics. On the other hand it involves all means available for humans, or in particular, for a risk management entity (person, staff, organization).

This thesis takes a fast look on Banking and Credit risk management and further probes into bank risk exposure, assessment, management and control. An attempt will be made to unfold the use of some risk management, evaluation and assessment tools, models, and techniques.

1.2-Statement of the Problem:

The advent of the Financial Services Modernization Act of 1999 was embraced with a lot of excitement by all in the banking sector. The present possibility for banks to diversify into broader range of services and products make life really cool for banking entrepreneurs and managers. But this diversification advantage is a once in a life time opportunity that should be consumed with some caution and prudence as this involves a great deal of risk. This is in direct line with the saying that the higher you go, the colder life becomes.

The very nature of the banking business is so sensitive because more than 85% of their liability is deposits from depositors (Saunders, Cornett, 2005). Banks use these deposits to generate credit for their borrowers, which in fact is a revenue generating activity for

most banks. This credit creation process exposes the banks to high default risk which might led to financial distress including bankruptcy. All the same, beside other services, banks must create credit for their clients to make some money, grow and survive stiff competition at the market place.

The principal concern of this thesis is **to ascertain to what extent banks can manage their credit risks, what tools or techniques are at their disposal and to what extent their performance can be augmented by proper credit risk management policies and strategies.**

1.3- Objective of the Study:

The main objective of the study is to have a bigger picture of how banks manage their credit risk. Thus attention is geared towards:

I-Ascertaining why and how banking credit risk exposure is evolving recently.

II- Seeing how banks use credit risk evaluation and assessment tools to mitigate their credit risk exposure.

III-The steps and methodologies used by banks to identify, plan, map out, define a framework, develop an analysis and mitigate credit risk (steps in the risk management process).

IV-Determine the relationship between the theories, concepts and models of credit risk management and what goes on practically in the banking world.

V-Ascertain the scope to which resourceful credit risk management can perk up bank performance.

1.4-Layout of the study:

This study is divided into four sections; the first section is on background to the study and cuts across a general introduction, statement of purpose, objective of the study, and layout of the study.

Section two is on literature review on commercial banking and credit risk management

Section three is on hypothesis testing using a simple linear model on excel. Here we also interpret the findings of the tests

Section four concludes the study with a summary and some useful suggestions.

SECTION TWO: Literature Review

2.1- CREDIT RISK MANAGEMENT:

2.1.1-Introduction:

A commercial bank is a type of financial intermediary and a type of bank. After the Great Depression, the U.S. Congress required banks only engage in banking activities, whereas investment banks were limited to capital market activities. Since the two no longer have to be under separate ownership, some use the term "commercial bank" to refer to a bank or a division of a bank primarily dealing with deposits and loans from corporations or large businesses. Commercial bank is the term used for a normal bank to distinguish it from an investment bank.

This is what people normally call a "bank". The term "commercial" was used to distinguish it from an investment bank. Since the two types of banks no longer have to be separate companies, some have used the term "commercial bank" to refer to banks which focus mainly on companies. In some English-speaking countries outside North America, the term "trading bank" was and is used to denote a commercial bank. During the great depression and after the stock market crash of 1929, the U.S. Congress passed the Glass-Steagall Act 1930 (Khambata,1996) requiring that commercial banks only engage in banking activities (accepting deposits and making loans, as well as other fee based services), whereas investment banks were limited to capital markets activities. This separation is no longer mandatory. It raises funds by **collecting deposits** from businesses and consumers via checkable deposits, savings deposits, and time (or term) deposits. It **makes loans** to businesses and consumers. It also buys corporate bonds and government bonds. Its primary liabilities are deposits and primary assets are loans and bonds.

Commercial banking can also refer to a bank or a division of a bank that mostly deals with deposits and loans from corporations or large businesses, as opposed to normal individual members of the public (retail banking).

Origin: The name bank derives from the Italian word **banco** "desk/bench", used during the Renaissance by Florentine bankers, who used to make their transactions above a desk covered by a green tablecloth (de Albuquerque, Martim, 1855). However, there are traces of banking activity even in ancient times.

In fact, the word traces its origins back to the Ancient Roman Empire, where moneylenders would set up their stalls in the middle of enclosed courtyards called **macella** on a long bench called a **bancu**, from which the words banco and bank are derived. As a moneychanger, the merchant at the bancu did not so much invest money as merely convert the foreign currency into the only legal tender in Rome- that of the Imperial Mint (Matyszak and Philip, 2007).

In the most basic terms, commercial banks take deposits from individual and institutional customers, which they then use to extend credit to other customers. They make money by earning more in interest from borrowers than they pay in interest to those whose deposits they accept. They're different from investment banks and brokerages in that those kinds of institutions focus on underwriting, selling, and trading corporate and municipal securities.

The Balance Sheet: A bank's balance sheet is different from that of a typical company. You won't find inventory, accounts receivable, or accounts payable. Instead, under assets, you'll see mostly loans and investments, and on the liabilities side, you'll see deposits and borrowings.

Loans represent the majority of a bank's assets (Saunders and Cornett, 2005). A bank can typically earn a higher interest rate on loans than on securities, roughly 6%-8%. Loans, however, come with risk. If the bank makes bad loans to consumers or businesses, the bank will take a hit when those loans aren't repaid. Because loans are a bank's bread and butter, it's critical to understand a bank's book of loans. Other assets, including property

and equipment, represent only a small fraction of assets. A bank can generate large revenues with very few hard assets. Compare this to some other companies, where plant, property, and equipment (PP&E) is a major asset. Surprisingly, cash represents only about 2% of assets. That's because the bank wants to put its money to work earning interest. If the bank simply sticks its cash in a vault and forgets about it, it will have a hard time making a profit. Thus, a bank keeps most of its money tied up in loans and investments, which are called "earning assets" in bank-speak because they earn interest. Banks don't like putting their assets into fixed-income securities, because the yield isn't that great. However, investment-grade securities are liquid, and they have higher yields than cash, so it's always prudent for a bank to keep securities on hand in case they need to free up some liquidity.

Assessing Assets: A bank's assets are its meal ticket, so it's critical for investors to understand how its assets are invested, how much risk they are taking, and how much liquidity the bank has in securities as a shield against unforeseen problems. In general, investors should pay attention to asset growth, the composition of assets between cash, securities, and loans, and the composition of the loan book. Also, investors should note a bank's asset/equity (equity multiplier) ratio, which measures how many times a dollar of equity is leveraged.

The liability side of a bank's balance sheet is made up of various types of deposit accounts and other forms of borrowings used to fund their investments. A major difference between banks and other is their high leverage or debt-to-asset ratio.

Assets and liability management (ALM) is the management of the structure of a bank's balance sheet in such a way that interest related earnings are maximized within the overall risk tolerance of the bank's management (J.S.G Wilson, 1988).

2.2-The Bank for International Settlement (BIS) and the Basel Accords:

2.2.1-The Bank for International Settlement (BIS):

The Bank for International Settlements (or BIS) is an international organization of central banks which exists to "foster cooperation among central banks and other agencies in pursuit of monetary and financial stability" (Wikipedia online, 2008). It carries out its work through subcommittees, the secretariats it hosts, and through its annual General Meeting of all members. The BIS also provides banking services, but only to central banks, or to international organizations like itself. Based in Basel, Switzerland, the BIS was established by the Hague agreements of 1930. As an organization of central banks, the BIS seeks to make monetary policy more predictable and transparent among its 55 member central banks. While monetary policy is determined by each sovereign nation, it is subject to central and private banking scrutiny and potentially to speculation that affects foreign exchange rates and especially the fate of export economies. Two aspects of monetary policy have proven to be particularly sensitive, and the BIS therefore has two specific goals: **to regulate capital adequacy** and **make reserve requirements transparent.**

 Capital adequacy policy applies to equity and capital assets. These can be overvalued in many circumstances. Accordingly the BIS requires bank capital/asset ratio to be above a prescribed minimum international standard, for the protection of all central banks involved. **The BIS' main role is in setting capital adequacy requirements.** From an international point of view, ensuring capital adequacy is the most important problem between central banks, as speculative lending based on inadequate underlying capital and widely varying liability rules causes economic crises as "bad money drives out good" (Gresham's Law).

The BIS sets "requirements on two categories of capital, **Tier 1 capital** and Total capital. Tier 1 capital is the book value of its stock plus retained earnings. **Tier 2 capital** is loan-loss reserves plus subordinated debt. Total capital is the sum of Tier 1 and Tier 2 capital. Tier 1 capital must be at least 4% of total risk-weighted assets. Total capital must be at least 8% of total risk-weighted assets. When a bank creates a deposit to fund a loan, its assets and liabilities increase equally, with no increase in equity. That causes its capital ratio to drop. Thus the capital requirement limits the total amount of credit that a bank

may issue. It is important to note that the capital requirement applies to assets while the bank reserve requirement applies to liabilities."

2.2.2-The Basel Accords:

The Basel Accord(s) refers to the banking supervision accords (recommendations on banking laws and regulations), Basel I (first published in 1988 and enforced by law in 1992 by the G-10 countries) and Basel II (published in June 2004) issued by the Basel Committee on Banking Supervision (BCBS). They are called the Basel Accords as the BCBS maintains its secretariat at the Bank of International Settlements in Basel, Switzerland and the committee normally meets there. The Basel Committee consists of representatives from central banks and regulatory authorities of the G10 countries, plus others (specifically Luxembourg and Spain). The committee does not have the authority to enforce recommendations, although most member countries (and others) tend to implement the Committee's policies. This means that recommendations are enforced through national (or EU-wide) laws and regulations, rather than as a result of the committee's recommendations - thus some time may pass between recommendations and implementation as law at the national level.

Tier 1 capital is the core measure of a bank's financial strength from a regulator's point of view. It consists of the types of financial capital considered the most reliable and liquid, primarily Shareholders' equity. Examples of Tier 1 capital are common stock, preferred stock that is irredeemable and non-cumulative, and retained earnings. Capital in this sense is related to, but different from, the accounting concept of shareholder's equity. Both tier 1 and tier 2 capital were first defined in the Basel I capital accord. The new accord, Basel II, has not changed the definitions in any substantial way. Each country's banking regulator, however, has some discretion over how differing financial instruments may count in a capital calculation. This is appropriate, as the legal framework varies in different legal systems.

Tier 2 capital is a measure of a bank's financial strength with regard to the second most reliable form of financial capital, from a regulator's point of view. The forms of banking capital were largely standardized in the Basel I accord, issued by the Basel Committee on Banking Supervision and left untouched by the Basel II accord.

Tier 1 capital is considered the core capital and more reliable form of capital

2.3- VALUE-AT-RISK

2.3.1-BANK LOANS:

A loan is a debt. Like all debt instruments, a loan entails the redistribution of financial assets over time, between the lender and the borrower.

The borrower initially receives an amount of money from the lender, which he pays back, but sometimes not always in regular installments, to the lender. This service is generally provided at a cost, known as **interest** on the debt. The lender may subject the borrower to certain restrictions known as loan covenants.

One of the principal duties of financial institutions is to provide loans, this is typically the source of income to banks, bank loans and credit also constitute one of the ways of increasing money supply in the economy.

2.3.2-VALUE AT A RISK (VAR):

This is a technique used to estimate the probability of portfolio losses based on the statistical analysis of historical price trends and volatilities.

Value at risk is commonly used by banks, security firms and companies that are involved in trading energy and other commodities. VAR is able to measure risk while it happens and is an important consideration when firms make trading or hedging decision (Simon Manganelli and Robert Engle, 2001).

Some people have described VAR as the **"new science of risk management"**, but you do not need to be a scientist to use VAR. Here, we look at the idea behind VAR and the three basic methods of calculating it. Basically, VAR is represented by;

VAR= (dollar value of position)(price sensitivity)(potential adverse move in price/yield). …………………………………………(1)

For financial institutions, risk is about the odds of losing money given out as loans, and VAR is based on that common-sense fact. By assuming financial institutions care about the odds of a really big loss on loans, VAR answers the question, **"What is my worst-case scenario?"** or **"How much could I lose in a really bad month?"**

To be more specific, a VAR statistic has three components: a time period, a confidence level and a loss amount (or loss percentage). Keep these three let's take note of this as we give some examples of variations of the questions that VAR answers:

• What is the most I can - with a 95% or 99% level of confidence - expect to lose in default on loan repayment over the next month?

• What is the maximum percentage I can - with 95% or 99% confidence - expect to lose over the next year?

We can see how the "VAR question" has three elements: a relatively high level of confidence (typically either 95% or 99%), a time period (a day, a month or a year) and an estimate of lose on loan default (expressed either in dollar or percentage terms) (David Harper, 2008).

2.4- PORTFOLIO THEORY AND TRADITIONAL METHOD TO CREDIT RISK MANAGEMENT

2.4.1- PORTFOLIO APPROACH:

Since the 1980s, banks have successfully applied modern portfolio theory (MPT) to market risk. Many banks are now using earnings at risk (EAR) and value at risk (VAR) models to manage their interest rate and market risk exposures. Unfortunately, however, even though credit risk remains the largest risk facing most banks, the practical of MPT to credit risk has lagged (William Margrabe, 2007).

Banks recognize how credit concentrations can adversely impact financial performance. As a result, a number of sophisticated institutions are actively pursuing quantitative approaches to credit risk measurement, while data problems remain an obstacle. This industry is also making significant progress toward developing tools that measure credit risk in a portfolio context. They are also using credit derivatives to transfer risk efficiently while preserving customer relationships. The combination of these two developments has precipitated vastly accelerated progress in managing credit risk in a portfolio context over the past several years.

1. **Asset-by-asset Approach:**

Traditionally, banks have taken an asset-by-asset approach to credit risk management. While each bank's method varies, in general this approach involves periodically evaluating the credit quality of loans and other credit exposures, applying a credit risk rating, and aggregating the results of this analysis to identify a portfolio's expected losses. The foundation of the asst-by-asset approach is a sound loan review and internal credit risk rating system. A loan review and credit risk rating system enable management to identify changes in individual credits, or portfolio trends in a timely manner. Based on the results of its problem loan identification, loan review, and credit risk rating system management can make necessary modifications to portfolio strategies or increase the supervision of credits in a timely manner.

2. **Portfolio Approach:**

While the asset-by-asset approach is a critical component to managing credit risk, it does not provide a complete view of portfolio credit risk, where the term risk refers to the possibility that actual losses exceed expected losses. Therefore to gain greater insight into credit risk, banks increasingly look to complement the asset-by-asset approach with a quantitative portfolio review using a credit model.

Banks increasingly attempt to address the inability of the asset-by-asset approach to measure unexpected losses sufficiently by pursuing a portfolio approach. One weakness with the asset-by-asset approach is that it has difficulty identifying and measuring

concentration. Concentration risk refers to additional portfolio risk resulting from increased exposure to a borrower, or to a group of correlated borrowers. Table 1 summerises strategies for reducing and coping with portfolio credit risk.

Table 1: Strategies for Reducing and Coping with Portfolio Credit Risk

Technique	Advantages	Disadvantages	Implication
Geographic Diversification	External shocks (climate, price, natural disasters, etc.) are not likely to affect the entire portfolio if there is spatial diversification.	If the country is small or the Institution is capital constrained, it may not be able to apply this principle. It will become vulnerable to covariate risk, which is high in agriculture.	
Loan Size Limits (Rationing)	Prevents the institution from being vulnerable to nonperformance on a few large loans.	Can be carried to the extreme where loan size does not fit the business needs of the client and results in suboptimal use and lower positive impact by client. Client could become dissatisfied	Protects asset quality in the short-run but creates client retention problems in the long run. Inimical to relationship banking.
Over Collateralization	Assures the institution that enough liquidation value will exist for foreclosed assets.	Excludes poor, low-income clients who are the vast majority of the market.	Not a recommended technique if goal is to better serve the low- and moderate income clients.
Credit Insurance	Bank makes clients purchase credit insurance. In event of default, bank collects from insurer.	Databases and credit bureaus may not exist to permit insurer to engage in this line of business in cost-effective manner.	
Portfolio Securitization	Lender bundles and sells loans to a third party. Transfers default risk and improves liquidity so that it can continue to lend. Allows lender to develop expertise in analyzing creditworthiness in one sector or niche.	Requires well documented loans and long time series of performance data to permit ratings and reliable construction of financial projections.	Requires a well developed secondary market, standardized underwriting practices, and existence of rating companies.

Source: Publication of the Inter-American Development Bank, May 2007.

2.4.2-TRADITIONAL APPROACH:

It is hard to differentiate between the traditional approach and the new approaches since many of the ideas of traditional models are used in the new models. The traditional approach is comprised of four classes of models

1. Expert Systems

In the expert system, the credit decision is left in the hands of the branch lending officer. His expertise, judgment, and weighting of certain factors are the most important determinants in the decision to grant loans. the loan officer can examine as many points as possible but must include the five "Cs" these are; character, credibility, capital, collateral and cycle (economic conditions) in addition to the 5 Cs, an expert may also take into consideration the interest rate.

2. Artificial Neural Networks:

Due to the time consuming nature and error- prone nature of the computerized expertise system, many systems use induction to infer the human expert's decision process. The artificial neural networks have been proposed as solutions to the problems of the expert system. This system simulates the human learning process. It learns the nature of the relationship between inputs and outputs by repeatedly sampling input/output information.

3. Internal Rating at Banks:

Over the years, banks have subdivided the pass/performing rating category, for example at each time, there is always a probability that some pass or performing loans will go into default, and that reserves should be held against such loans.

4. Credit Scoring Systems:

A credit score is a number that is based on a statistical analysis of a borrower's credit report, and is used to represent the creditworthiness of that person[1]. A credit score is primarily based on credit report information. Lenders, such as banks use credit scores to evaluate the potential risk posed by giving loans to consumers and to mitigate losses due to bad debt. Using credit scores, financial institutions determine who are the most qualified for a loan, at what rate of interest, and to what credit limits (Wikipedia, 2008).

2.5-SUPERVISORY AUTHORITY OF BANK CREDIT RISK MANAGEMENT

The Bank of International Settlement (BIS) on November 28th 2005 in a press release issued a series of ten principles on **Sound Credit Risk Assessment and valuation for Loans:**

Principle 1: The bank's board of directors and senior management are responsible for ensuring that the banks have appropriate credit risk assessment processes and effective internal controls to consistently determine provisions for loan losses in accordance with the bank's stated policies and procedures, the applicable accounting framework and supervisory guidance commensurate with the size, nature and complexity of the bank's lending operations.

Principle 2: Banks should have a system in place to reliably classify loans on the basis of credit risk.

Principle 3: A bank's policies should appropriately address validation of any internal credit risk assessment models.

Principle 4: A bank should adopt and document a sound loan loss methodology, which addresses risk assessment policies, procedures and controls, for assessing credit risk, identifying problem loans and determining loan provisions in a timely manner.

Principle 5: A bank's aggregate amount of individual and collectively assessed loan provisions should be adequate to absorb estimated credit losses in the loan portfolio.

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[1] That is, the likelihood that the person will pay his or her debts.

Principle 6: A bank's use of experienced credit judgment and reasonable estimates are an essential part of the recognition and measurement of loan losses.

Principle 7: A bank's credit risk assessment process for loans should provide the bank with the necessary tools, procedures and observable data to use for credit risk assessment purposes, account for impairment of loans and the determination of regulatory capital requirements.

Principle 8: Banking supervisors should periodically evaluate the effectiveness of a bank's credit risk policies and practices for assessing loan quality.

Principle 9: Banking supervisors should be satisfied 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 in a timely manner.

Principle 10: Banking supervisors should consider credit risk assessment and valuation practices when assessing a bank's capital adequacy.

I. **Individual Credit Rating:** A credit rating assesses the credit worthiness of an individual, corporation, or even a country. Credit ratings are calculated from financial history and current assets and liabilities. Typically, a credit rating tells a lender or investor the probability of the subject being able to pay back a loan. However, in recent years, credit ratings have also been used to adjust insurance premiums, determine employment eligibility, and establish the amount of a utility or leasing deposit.

II. **Corporate credit ratings**: The credit rating of a corporation is a financial indicator to potential investors of debt securities such as bonds. These are assigned by credit rating agencies[2] such as Standard & Poor's, Moody's or Fitch Ratings and have letter designations such as AAA, B, CC. The Standard & Poor's

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[2] In the United States, the main credit bureaus are Experian, Equifax, and TransUnion. A relatively new credit bureau in the US is Innovis. In the United Kingdom, the main credit reference agencies for individuals are Experian, Equifax, and Callcredit. In Canada, the main credit bureaus for individuals are Equifax, TransUnion and Northern Credit Bureaus/ Experian. The leading credit bureau in Sweden is Upplysningscentralen AB. In India, the main credit bureaus are CRISIL and ICRA. The largest credit rating agencies are Moody's, Standard and Poor's and Fitch Ratings.

rating scale is as follows: AAA, AA, A, BBB, BB, B, CCC, CC, C, D. Anything lower than a BBB rating is considered a speculative or junk bond. The Moody's rating system is similar in concept but the verbage is a little different. It is as follows: AAA, Aa1, Aa2, Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3, B1, B2, B3, Caa1, Caa2, Caa3, Ca, C.

III. **A sovereign credit rating** is the credit rating of a sovereign entity. The sovereign credit rating indicates the risk level of the investing environment of a country and is used by investors looking to invest abroad. It takes political risk into account. The countries with the least sovereign risk are ranked as follows.

Table 2: Country risk rankings (Least risky countries), Score out of 100

Source: Euromoney, Country risk, March 2008.

Rank	Previous Rank	Country	Score
1	1	Luxembourg	99.88
2	2	Norway	97.47
3	3	Switzerland	96.21
4	4	Denmark	93.39
5	5	Sweden	92.96
6	6	Ireland	92.36
7	10	Austria	92.25
8	9	Finland	91.95
9	8	Netherlands	91.95
10	7	United States	91.27

According to the results (see table 2), Austria's country rating has improved from 10th to 7th position while the USA has dropped to the10[th] position from 7th.

2.6-MANAGING CREDIT RISK USING FINANCIAL RATIOS:

Ratio analysis (financial and accounting ratios) is a measurement system to analyse the strength, weakness, opportunity and threats (SWOT Analysis) of an FI. The table below depicts some of the frequently used ratios in credit analysis (table 2):

Table 3: Frequently Used Ratios in Credit Analysis[3]

Category	Ratio
Operating Performance	Earnings before interest, taxes, depreciation and amortization(EBITDA)/Sales Net Income/ Sales Net Income/ Net Worth Sales/ Fixed Assets
Debt Service Coverage	EBITDA/ Interest Payment>1.5 Free Cash-flow expenditure/ Interest payments Free Cash-flow expenditures-dividend/Interest
Financial Leverage	Long-term debt/Capitalization Long-term debt/Tangible net worth Total liabilities/Tangible net worth Current liabilities/Tangible net worth
Liquidity	Current ratio (current assets/current liabilities) Quick ratio (current assets-inventory/current liabilities) Inventory turnover(inventory/Net sales) Inventory to Net working capital Current debt to Inventory Raw materials,WIP, and finished goods as a percentage of total Inventory
Receivables	Aging of receivables:30,60,90,90+days

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[3] These ratios are commonly used in credit analysis but have to be adapted to specific environment of industries and countries.

	Average collecting period

Source: Caoutte, et al., 1998

2.7 Credit Risk Models

Over the last decade, a number of the world's largest banks have developed sophisticated systems in an attempt to model the credit risk arising from important aspects of their business lines. Such models are intended to aid banks in quantifying, aggregating and managing risk across geographical and product lines. The outputs of these models also play increasingly important roles in banks' risk management and performance measurement processes, including performance-based compensation, customer profitability analysis, risk-based pricing and, to a lesser (but growing) degree, active portfolio management and capital structure decisions. The Task Force recognizes that credit risk modeling may indeed prove to result in better internal risk management, and may have the potential to be used in the supervisory oversight of banking organizations. However, before a portfolio modeling approach could be used in the formal process of setting regulatory capital requirements for credit risk, regulators would have to be confident not only that models are being used to actively manage risk, but also that they are conceptually sound, empirically validated, and produce capital requirements that are comparable across institutions. At this time, significant hurdles, principally concerning data availability and model validation, still need to be cleared before these objectives can be met, and the Committee sees difficulties in overcoming these hurdles in the timescale envisaged for amending the Capital Accord (BIS, credit risk modeling, 19th April 1999).

Credit scoring models use data on observed borrower characteristics either to calculate the probability of default or to borrowers into different default risk classes (Saunders and Cornett, 2007).

Prominent amongst the credit scoring models is the **Altman's Z-Score.** The Z-score formula for predicting Bankruptcy of Dr. Edward Altman (1968) is a multivariate formula for measurement of the financial health of a company and a powerful diagnostic

tool that forecast the probability of a company entering bankruptcy within a two year period with a proven accuracy of 75-80%.

The Altman's credit scoring model takes the following form;

$$Z=1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \dotfill (2)$$

Where, X_1 = Working capital/ Total assets ratio

X_2 = Retained earnings/ Total assets ratio

X_3 = Earnings before interest and taxes/ Total assets ratio

X_4 = Market value of equity/ Book value of long-term debt ratio

X_5 = Sales/ Total assets ratio.

The higher the value of Z, the lower the borrower's default risk classification. According to Altman's credit scoring model, any firm with a Z-Score less than 1.81 should be considered a high default risk, between 1.81-2.99 an indeterminate default risk, and greater than 2.99 a low default risk.

Critics: Use of this model is criticized for discriminating only among three borrower behavior; high, indeterminate, and low default risk. Secondly, that there is no obvious economic reason to expect that the weights in the Z-Score model – or, more generally, the weights in any credit-scoring model- will be constant over any but very short periods. Thirdly the problem is that these models ignore important, hard to quantify factors (such as macroeconomic factors) that may play a crucial role in the default or no-default decision.

Outstanding also is the **KMV credit Monitor Model**[4]. In recent years, following the pioneering work on options by Merton, Black, and Scholes, we now recognize that when a firm raises funds either by issuing bonds or by increasing bank loans, it holds a very valuable default or repayment option (Black and Scholes, 1973) and (Merton, 1974). The KMV Model is a credit monitor model that helps to solve the lending problems of banks

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[4] KMV is a trademark of KMV Corporation that was founded in 1989. The KMV model calculates the Expected Default Frequency (EDF) based on the firm's capital structure, the volatility of the assets returns and the current asset value. This model best applies to publicly traded companies for which the value of equity is market determined.

and further look at the repayment incentive problem (Gilbert, 2004). To try resolving the problems, the KMV Model uses the structural relationship between the **volatility of a firm's asset** and the **volatility of the firm's equity.**

The KMV Corporation (purchased by Moody's in 2002) has turned this relatively simple idea into a credit-monitoring model now used by most of the large US banks to determine the Expected Default Frequency (EDF) that is the probability of default of large corporations (KMV Corporation, 1994).

The expected default frequency that is calculated reflects the probability that the market value of the firm's assets will fall below the promised repayments on debt liabilities in one year. If the value of a firm's assets falls below its debt liabilities, it can be viewed as being economically insolvent. Simulations by the KMV have shown that this model outperforms both accounting-based models and S&P ratings (Saunders and Cornett, 2007). The relevant net worth of a firm is therefore the market value of the firm's assets minus the firm's default point.

Net worth= (Market Value of Assets) - (Default Point) …………………………... (3)

A firm will default when its market net worth reaches zero.

$$\text{Distant to Default} = \frac{(\text{Market Value of Assets}) \ (\text{Default Point})}{(\text{Market Value of Assets})(\text{Asset Volatility})} \ \dots\dots\dots\dots\dots\dots \ (4)$$

(Source: Moody's KMV; Modeling Default Risk, 18th December 2003.)

The KMV's empirical EDF is an overall statistics that can be calculated for every possible distance to default (DD) using data either aggregated or segmented by industry or region. To find the EDF for any particular firm at any point in time, one must look at the firm's EDF as implied by its calculated DD. As a firm's DD fluctuates, so do its EDF. For firm's that are actively traded, it would be possible in theory to update the EDF every few minutes (Gilbert, 2004).

CRITICS: The KMV EDF Model has been criticized on the basis that they are not true probabilities of default. This is reflected in the poor results obtained using KMV empirical EDFs in order to replicate risky bond prices (Kao, Eom et al, 2000).

An increasingly popular model used to evaluate the return on a loan to a large customer is the **R**isk-**A**djusted **R**eturn on **C**apital **(RAROC)** Model. This model, originally pioneered by Bankers Trust (acquired by Deutsche Bank in 1998) is now adopted by virtually all the large banks in Europe and the US, although with some differences among them (Saunders and Cornett, 2007). The essential idea behind RAROC is that rather than evaluating the actual promised annual cash flow on a loan as a percentage of the amount lent or (ROA), the lenders balance the loan's expected income against the loan's expected risk.

The RAROC Model is basically represented by,

RAROC = (one year net income on loan)/ (Risk adjusted assets). ………………… (5)

For denominator of RAROC, duration approach can be used to estimate worst case loss in value of the loan:

DLn = -DLnx Ln x (DR/ (1+R)) ....(6)

Where, DR is an estimate of the worst change in credit risk premiums for the loan class over the past year.

Ln= Loan

DLn= Change in loan class

R=Interest Rate

According to James Christopher (1996), the immediate purpose of the RAROC risk-measurement systems is to provide bank managements with a more reliable way to determine the amount of capital necessary to support each of their major activities and, thus, to determine the overall leverage for the bank as a whole. This paper also stipulates that the RAROC system provide a uniform measure of performance and that management can, in turn use this measure to evaluate performance for capital budgeting and as an input to the compensation system used for senior managers.

Section Three: Hypothesis Testing.

3.1. Research Design:

Prior research finds that banks manage credit risk for two main purposes: to enhance interest income (profitability) and to reduce loan losses (bad debts) which results from credit default (Sim, 2006).

We expect that banks with better credit risk management practice have lower loan losses (non performing loans). We use profitability (ROA, ROE) as proxy for credit risk management indicators. Accordingly we have the following hypotheses:

3.2. Hypothesis:

1: Banks with higher profitability (ROE, ROA) have lower loan losses (Non-Performing Loans/ Total Loans).

2: Banks with higher interest income (net interest/Average total assets, interest net /total income) also have lower bad loans (NPL).

Thus we test the hypothesis using the following regression model:

$$P (ROA, ROE) = \alpha + \beta NPL/TL + \mu$$

……………………………………………………………….. (7)

Where, NPL denotes non-performing loans, TL denotes total loan and P denotes profitability (ROA, ROE). Also, α is the intercept and β is the parameter of explanatory variable ROA and ROE, μ represents the disturbance terms.

3.3. Data description

We use the data from Qatar Central Bank (table 4) in our analysis. We do a time-series analysis of a five year financial data of Qatar Central Bank (QCB), to examine the relationship between profitability (ROE and ROA, separately) which are performance indicators and loan losses (NPL/TL) which represent the credit risk management effectiveness.

Table 4: Bank Performance Indicators 2006 (Qatar Central bank)

Banking Performance Indices
(In Percentage)

	2001	2002	2003	2004	2005
1. Capital Adequacy					
Regulatory Tier 1 Capital/Total Assets	11.7	10.7	10.0	11.7	11.2
Regulatory Tier 1 Capital/Risk Weighted Assets	26.9	24.4	22.2	22.1	21.7
Regulatory Capital/Risk Weighted Assets	27.7	25.1	25.3	24.9	24.8
Non-Performing Loans/Capital	21.6	17.4	6.8	3.6	3.3
2. Asset Quality Standards					
Non- Performing Loans/Total Loans	10.7	11.1	8.1	6.3	4.3
Loans Provisions/Non-Performing Loans	61.9	70.9	85.4	87.6	84.3
Loans Provisions/Total Loans	6.6	7.9	6.9	5.5	3.6
Total Provisions/Total Assets	5.3	5.9	5.2	3.9	2.4
3. Profitability Standards					
Net Profits/ Average Shareholders' Equity	15.8	18.1	20.8	20.8	28.5
Net Profits/Average Total Assets	1.9	2.1	2.5	2.8	4.3
Net Interest/Average Total Assets	2.0	3.3	3.0	2.7	3.0
Net Interest/Total Income	25.6	53.1	50.4	48.0	37.2
Other Income/Average Total Assets	1.8	1.2	1.7	1.8	3.1
Other Income/Total income	22.9	20.0	28.9	30.6	39.0
Other Expenses/Total Income	28.5	39.1	38.5	30.5	22.4
Wages & Salaries/Other Expenses	30.6	30.6	31.0	38.0	35.8
4. Liquidity Standards					
Cash and Balances with QCB/Total Assets	3.0	3.4	3.2	3.7	4.0
Liquid Assets/Total Assets	34.0	39.0	38.5	41.6	41.5
Liquid Assets/Liquid Liabilities	44.2	51.1	50.9	54.8	55.4
Financial Assets' Portfolio/Total Assets	15.6	16.0	15.3	15.3	12.9
Total Loans/Customers' Deposits	83.5	79.1	82.7	81.4	81.7

Total Loans/Total Assets	61.9	57.8	57.5	53.8	53.5
5. Uses Standards					
Loans to Private Sector/Private Sector Deposits	77.4	70.7	76.2	80.2	92.1
Loans to Private sector/Total Loans					
Domestic Credits/(Total Deposits +	53.4	52.9	53.5	60.3	69.9
Shareholder's Equity)	69.1	67.7	70.0	65.3	64.5
Total FC Assets/Total FC Liabilities	138.6	150.6	168.3	159.3	153.1
6. General Ratios					
Growth Rate of Total Assets	14.1	9.3	21.5	20.9	41.6
Growth Rate of Total Customers' Deposits	17.0	7.6	15.7	14.8	40.5
Growth Rate of Total Credit Facilities	21.9	2.0	20.9	13.0	40.9
Growth Rate of Financial Assets Portfolio	15.8	11.7	16.0	21.5	19.3

Source: Qatar Central Bank, 2006.

Table 4a: Definitions:

1. Capital Adequacy
Non-Performing Loans/Capital

NPL/C

2. Asset Quality Standards
Non- Performing Loans/Total Loans
Loans Provisions/Non-Performing Loans   NPL/TL
Loans Provisions/Total Loans   LP/NPL
Total Provisions/Total Assets   LP/TL
3. Profitability Standards   TP/TA
Net Profits/ Average Shareholders' Equity
Net Profits/Average Total Assets   ROE

ROA

Table 4b: Summarization of variables for 2001-2005 (in percentages)

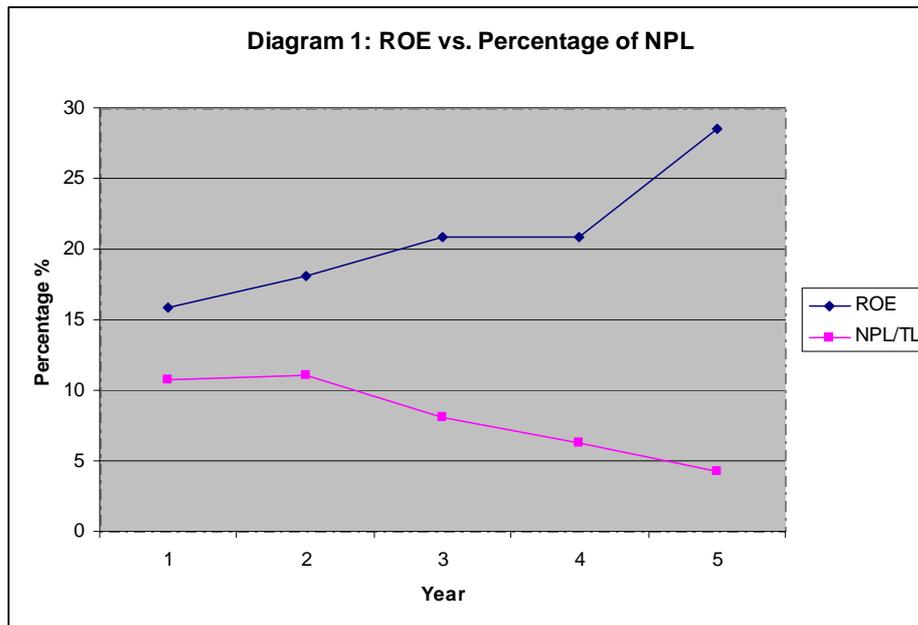| YEAR	ROE	ROA	NPL/TL	LP/NPL	LP/TL	TP/TA	NPL/C
2001	15,8	1,9	10,7	61,9	6,6	5,3	21,6
2002	18,1	2,1	11,1	70,9	7,9	5,9	17,4
2003	20,8	2,5	8,1	85,4	6,9	5,2	6,8
2004	20,8	2,8	6,3	87,6	5,5	3,9	3,6
2005	28,5	5,3	4,3	84,3	3,6	2,4	3,3

* for variable definition see table 4a.

Diagram 1 shows a negative correlation between ROE and NPL as we expected. Since Non performing loans is an indicator to poor credit risk management. We therefore expect better credit risk management is related to lower non-performing loans.

Table 5: Regression result of ROE on NPL/TL.

	Coeff.	STD	t Stat	P-value	R square	Adjusted- R2
α	32,9984***	3,3679	9,7980	0,0023	0,8281	0,7709
NPL/TL	-1,5060**	0,3961	-3,8021	0,0320		

* significant at 10% level. ** significant at 5% level, *** significant at 1% level.

Table 6: Regression result of ROA on NPL/TL.

Dependent variable: ROA

	Coeffi.	STD	t Stat	P-value	R square	Adj. R2
α	6,2966**	1,1252	5,5958	0,0113	0,7679	0,6905
NPL/TL	(-0,4168)*	0,1323	-3,1501	0,0513		

* significant at 10% level. ** significant at 5% level, *** significant at 1% level.

The results of ROE on NPL/TL show that non-performing loan of the FIs is significantly negatively related to profitability (table 5). That is, 1 percent increase in non-performing loans decreases profitability (ROE) by 1,506 percent.

The results of ROA on NPL/TL show that non-performing loan of the FIs is significantly negatively related to profitability (table 6). The parameter value shows that 1 percent increase in non-performing loans decreases profitability (ROA) by 0, 4168 percent.

The results verify our hypothesis that better credit risk management results in better bank performance. We are aware that profitability is an endogenous variable which means that it can influence the magnitude of non-performing loans, since better profitability affords the FIs to write off more bad loans. But we focus our analysis on one sided relations of NPLs on profitability for our purposes.

Section Four: Conclusion and Suggestions

4.1 Conclusion:

This study shows that there is a significant relationship between bank performance (in terms of profitability) and credit risk management (in terms of loan performance). Better credit risk management results in better bank performance. Thus, it is of crucial importance that banks practice prudent credit risk management and safeguarding the assets of the banks and protect the investors' interests.

The study summarizes that banks used different credit risk management tools, techniques and assessment models to manage their credit risk, and that they all have one main objective, i.e. to reduce the amount of loan default which is a principal cause of bank failure.

The study also reveals that banks with good or sound credit risk management policies have lower loan default ratios (bad loans) and higher interest income (profitability).

The study also reveals banks with higher profit potentials can better absorb credit losses whenever they crop up and therefore record better performances.

Furthermore, the study shows (in table 4b) that there is a direct but inverse relationship between profitability (ROE, ROA) and the ratio of non-performing loans to capital (NPL\C).

These results are in line with our expectations and actually tallies with conventional wisdom.

This has led us to accept our hypothesis and conclusion that banks with higher interest income have lower non-performing loans, hence good credit risk management strategies.

4.2 SUGGESTIONS:

We would suggest that the banks could establish a credit risk management team that should be responsible for the following actions that will help in minimising credit risk;

- Participation in portfolio planning and management.

- Working with Business Groups in keeping aggregate credit risk well within the bank's risk taking capacity (risk tolerance).

- Developing and maintaining Credit Approval Authority structure.

- Approving major credits.

- Granting approval authority to qualified and experienced individuals.

- Reviewing the adequacy of credit training across the bank

- Setting systems to identify significant portfolio indicators, problem credits and level of provisioning required.

- Presents information about the bank's exposure to and its management and control of credit risks, in time

- Establishment of credit policies and standards that conform to regulatory requirements and the bank's overall objectives.

- Counterparty ratings, are obtained through the local authorized and External Credit Rating Agencies

- Assessment and the continuous monitoring of counterparty and portfolio credit exposures is carried out by the

- To ensure that the wholesale portfolio, which includes corporate, commercial and agricultural loans are ideally collateralized by cash equivalents, fixed and current assets including property plant and equipment, and land.

- Loans to individuals are typically secured by autos for car loans and private or income producing real estate is secured by a mortgage over the relevant property.

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List of Equations (Models):

List of Tables:

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