UNIVERSITY OF RWANDA

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF BUSINESS

Master of Business Administration (MBA)

USING SCORECARDS FOR MANAGING THE CREDIT RISK WITHIN BPR LTD

Period: 2009-2014

Thesis submitted in partial fulfilment of the requirements for the award of the Degree of Master in Business Administration (MBA)

by

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October 2015

DECLARATION

I hereby declare that, "**USING SCORECARDS FOR MANAGING THE CREDIT RISK WITHIN BPR LTD. Period: 2009-2014"** is my own work and has never been presented elsewhere for any other academic qualification.

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DEDICATION

To my family

To my relatives

To my friends

ACKNOWLEDGMENTS

The successful completion of this study has been possible thanks to different people. That's why I would like to thank all the people who contribute in the success of this thesis.

Especially I would like to acknowledge the work done by my supervisor, Dr. Emmanuel MUGUNGA. Indeed, he has helped me in many respects with his advice, encouragement and even by providing me with some useful materials for the research. He deserves full respect and recognition.

I would like to thank also all BPR staff who helped me in the data collection process.

Finally, I express full gratitude to all other people who contributed directly or indirectly in the completion of this thesis: they include but they are not limited to my lecturers, my colleagues in MBA College of Business and Economics, Gikondo.

Thank you all!

Isaïe SEBAGENZI

ABSTRACT

This study is related to the use of credit scorecards (also known as credit scoring models) in managing the credit risk in BPR Ltd. Indeed, this tool was introduced in early 2012 in order to help in analysing and assessing the credit risk for small loans less than Rwf 5 Million. This study is about evaluating the contribution of loans analysed within this tool (referred to in this study as scored loans) in BPR credit risk management. The period of the study is from 2009 to 2014, which corresponds to three years before the use of scorecards and three years after their introduction in BPR. In short, it is to examine whether or not these scored loans have contributed in reducing the NPL rate which is the principal measure of the performance of a bank and any other lending institution. The methodology followed is the comparative analysis of loans analysed using scorecards and other loans as well as the analysis of the correlation and regression between scored loans and the performance of BPR expressed in terms of the NPL rate. The study has revealed that BPR scorecards is a good tool for managing the credit risk. Indeed, the regression analysis has shown that there is a significant impact of scored loans on BPR NPL rate. The correlation analysis done using the data from the last two years of the period of the study showed that there is a negative correlation between scored loans and NPL rate. This means that these scored loans help in reducing the credit risk (expressed by the degree of NPL rate) and that they contribute in the performance of BPR loan portfolio. As the scoring models are still new in Rwanda and that BPR is the sole Rwandan bank using them, literature and researches on this tool are still few (or even inexistent in Rwanda). That's why we have suggested some areas of further research. Especially it would be better to make a comparative study of the performance of loans analysed within scorecards and similar loans not scored (of any other bank or any lending institution). Moreover, it would also be interesting to compare the performance of BPR scoring models with other scoring models of any other bank on the international scene, for example any other bank in Africa. Finally, we have suggested the use of these scoring models in other banks and lending institutions in Rwanda, especially in MFIs where small loans are found in large proportions.

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ACRONYMS AND ABBREVIATIONS

ANOVA: Analysis of variance

BNR: Banque Nationale du Rwanda

BPR: Banque Populaire du Rwanda Ltd

Df: Degree of freedom

EAD: Exposure at Default

EL: Expected Loss

F: Fisher (test statistics)

IRB: Internal Ratings-Based (Approach)

LGD: Loss Given Default

MFIs: Micro Finance Institutions

MS: Mean Square

NPLs: Non-Performing Loans

OECD: Organization of Economic Cooperation and Development

PD: Probability of Default

P-value: Statistical test of significance

R^2: Coefficient of determination

SMEs: Small and Medium Enterprises

SS: Sum of Squares

CHAPTER 1. GENERAL INTRODUCTION

1.0. Introduction

This study is related to the new tool for managing the credit risk within BANQUE POPULAIRE DU RWANDA LTD (BPR Ltd). This tool is the "BPR scorecards", developed since 2011 and introduced in 2012. The study aims at finding out whether or not this tool has brought change in managing the credit risk within BPR Ltd.

The **credit scorecards** (or *credit scoring models*) are the use of modern information technology (IT) and statistics to measure the level of risk associated with a prospective borrower. Indeed, Benton E. GUP and James W. KOLARI (2005, p. 508) state that, "credit scoring is the use of statistical models to determine the likelihood that a prospective borrower will default on a loan". The credit scorecards use the data from observed borrower behavior such as credit payment history, stability of job, volatility of the borrower earning and so on to estimate the probability of default, and to sort borrowers into different risk classes (HEFFERNAN, 2005). Each borrower group is assigned a score at each characteristic observed. The sum of the scores will determine whether or not the loan is to be accepted or is to be rejected. In fact, there will be the minimum score (the cut-off score) under which the borrower's application is rejected and each bank will select it according to its risk appetite (i.e. to the degree of risk it can tolerate) (BESSIS, 2002; HEFFERNAN, 2005).

Scorecards may be for external origin (i.e. bought or acquired by the lending institution) or internal products (i.e. developed locally by the institution itself). It is in this last category that fall BPR scorecards. Indeed, they have been developed by BPR Ltd itself and it has adapted them to its needs and to Rwandan lending environment. It is in this regard that we need to evaluate their impact on managing the credit risk and on the performance of the loan portfolio.

Normally, any financial institution must put in place some tools that can help in managing different risks it faces such as interest rate risk, liquidity risk, operational risks, credit risk…

All these risks can hamper its success. However, managing the credit risk, for a lending institution such as a bank, is one of the key elements in that struggle for controlling different risks. This effort to control the credit risk may include, among other measures, establishing the powerful and well-structured credit policy. As stated by Morton GLANTZ (2003, p. 348) quoting the Basel Committee on Banking Supervision (1999), "the credit policy establishes the framework for lending within banks". To be effective this policy must be supported by other tools and the credit scoring models (or scorecards) are among them.

This chapter deals with the following:

- the background of the study;
- the statement of the problem;
- the objectives of the research;
- the research questions;
- the hypotheses;
- the significance of the study;
- the scope of the study;
- the organization of the study;
- the overview of the case study: BPR Ltd.

1.1. The background of the study

As seen above since 2011, BPR Ltd has developed and introduced a tool (BPR scorecards) to help it manage the credit risk. According to BPR Ltd (2014, p. 52), "the credit risk is the largest single risk for a bank". Etienne NTAGANDA (2006, p. 1) also maintains that the credit risk is the main risk faced by Rwandan financial institutions as lending is their core activity. Furthermore H.R. MACHIRAJU (2008, p. 195) maintains that, "studies of banking crises show that the most frequent factor in the failure of banks has been poor loan quality". Credit default risk is the risk that the borrower fails to comply with the loan contract and not service the debt. In other words, the borrower is not able or not willing to

pay the principal and interests as promised (SAUNDERS, A. & CORNETT, M.M., 2011, p. 330; BESSIS, 2010, p. 29; HEFFERNAN, 2005, p. 103).

From 2008 after BPR Ltd was transformed from a cooperative to a commercial bank (after the Dutch bank RABOBANK took in 35% stake); the credit risk has been one of the big issues to manage. It is in this regard that BPR has developed credit scorecards as one of the tools to manage that risk. However, the global Non-Performing Loans ratio (NPL ratio), also called the "Delinquency Rate", was at 14% of the total normal loan portfolio of BPR Ltd as at December 31, 2013 (BPR Ltd, 2014). This NPL ratio is still above the 5% limit fixed by the National Bank of Rwanda (BPR Ltd, 2014).

In this regard, we need to evaluate the contribution of BPR scorecards in managing the credit risk. Indeed, Anthony SAUNDERS and Marcia Millon CORNETT (2011, p. 337) maintain that, "according to credit scoring experts, using credit scoring models means fewer defaults and write-offs for commercial loans". In fact, the credit scorecards use experienced borrower behavior to estimate the applicant's probability of default. That's why normally they lead to less defaulting loans.

Until now, these scorecards are used for small loans as it has been decided by the BPR Board of Directors. In fact, the study conducted in early 2011 showed that more than 95% of BPR loans (in number of individual loans), representing more than 60% of BPR loan portfolio (book value) were composed with small loans with borrowers that have the same similarities (VAN DER BERG, 2011, p. 5). As seen above, it has been accepted that credit scoring models (or scorecards) can mitigate the credit risk, and that many banks and other financial institutions use them for both individual loans and the whole loan portfolio in general (GLANTZ, 2003). It is necessary to evaluate the NPL ratio of BPR in general and the one for loans processed within scorecards in particular, among others, for a period from 2009 to 2014 in order to see the contribution of scorecards in managing the credit risk within BPR Ltd.

1.2. The statement of the problem

As stated earlier managing the credit risk is one of the tricky issues of any bank. BPR Ltd as a retail bank which deals essentially with individual depositors has found that credit scorecards can be used to manage its credit risk, especially for retail loans not exceeding Rwf 5 million.

The studies on credit scorecards have been in increase these last few years in international financial literature. Even if some authors and researchers have stated that the scoring models contribute to mitigate the credit risk, there is still some doubts on whether or not this tool is helpful in credit risk management. In this regard, we have been interested with this case of BPR credit scorecards to have our contribution on the use of this tool in credit risk management; especially in Rwanda where BPR Ltd is the sole pioneer in using it. Furthermore, there are almost no researches (or any other publication) on this tool in Rwanda.

This study will help to understand the impact of this new tool in managing the credit risk and on the performance of BPR loan portfolio. This will be done by evaluating the impact of scored loans on the BPR loan portfolio performance.

Of course, the study would be more significant if it was conducted to several banks rather than one bank. However, as seen earlier this tool is new in Rwanda and BPR Ltd is the only bank that is using it (it is a pioneer in this area of credit scoring models in Rwanda). That's why we will use the case of BPR Ltd alone. We think it is sufficient enough to study the contribution of scorecards in credit risk management in Rwanda as BPR Ltd has the largest number of clients in Rwanda and it operates in the whole country; even in the remotest areas of Rwanda it is there. If it is proven that scorecards contribute in mitigating the credit risk within BPR Ltd, we shall suggest them to other banks and other lending institutions in Rwanda.

1.3. The objectives of the research

1.3.1. The general objective

The general objective of this research is to evaluate the contribution of the scorecards in managing the credit risk. This is done by evaluating the impact of scored loans on the credit risk and the performance of the loan portfolio.

1.3.2. Specific objectives

This study aims at the following objectives:

- To understand the effect of scored loans on managing the credit risk within BPR Ltd
- To evaluate the effect of scored loans on the performance of BPR loan portfolio.

1.4. Research questions

This study is aiming at answering the following researcher's questions:

- What is the effect of scored loans in managing BPR credit risk?
- Is there any significant impact of scored loans on BPR loan portfolio?

1.5. Hypotheses

A hypothesis shows relationship between variables. Indeed, it expresses the impact of the independent variable on the dependent variable. In this study, the independent variable is "scored loans" and the dependent variable is "the credit risk and the performance of BPR loan portfolio".

- **Hypothesis one**: “Scored loans have a significant impact on managing the credit risk of BPR Ltd”.
- **Hypothesis two: “**Scored loans have a significant impact on the performance of BPR loan portfolio”.

1.6. The significance of the study

This study aims at finding out the contribution of the credit scoring models (or scorecards) in the management of the credit risk. This study is necessary in the field of credit risk management as the use of credit scoring models is new in Rwandan banking industry.

The study focuses on BPR scoring models in order to find out their impact on its loan portfolio performance. Indeed, BPR is among the pioneers in this area of credit scoring models in Rwanda. The findings of this study help the researcher to make some recommendations on whether or not this tool is advisable to other banks and lending institutions in Rwanda. The study also try to understand this area of credit scoring models in Rwanda and eventually inspire other researches in this field of the study.

1.7. The scope of the study

This study analyzes the role of BPR scorecards in risk management. It compares the situation before and after the introduction of scorecards in BPR Ltd (recall that they were introduced in 2012). The period covered normally varies between 2009 and 2014. This period begins with the change of BPR into a commercial bank and goes through to 2014, according to available data.

1.8. The organization of the study

The research comprises five chapters:

Chapter I. General Introduction

Chapter II. Literature review

Chapter III. The research Methodology

Chapter IV. The analysis and the interpretation of data

Chapter V. Summary, conclusion and suggestions

1.9. Brief presentation of the case study: Banque Populaire du Rwanda Ltd

1.9.1. The background of BPR Ltd

Banque Populaire du Rwanda Ltd (BPR Ltd) dates back to 1975. Indeed, it began in the Eastern Province of Rwanda in small village named “NKAMBA” as a savings and credit cooperatives (BPR Ltd).

Subsequently other cooperatives followed and spread up the entire country so that in 1986 they were grown in number and in strength. In that year they decided to be grouped in a union called *"Union des Banques Populaires du Rwanda (UBPR)”* (BPR Ltd). However, they continued to be autonomous entities but inter-related within that union. All of their clients were their members.

In 2008, as those cooperatives were grown financially strong, they decided to be transformed in one commercial bank: “Banque Populaire du Rwanda Ltd (BPR Ltd)”. At the same time a Dutch bank, RABOBANK, took in 35% stake in BPR Ltd while the remaining 65% were held by the former members of the cooperatives who formed BPR

(BPR Ltd). BPR Ltd, continued to be the leading retail bank in Rwanda. However, it integrated also corporate banking activities.

Currently, another foreign investor ATLAS MARA from Mauritius is closing the deal with BPR to invest more than Rwf 15 billion in BPR Ltd. After this deal, BPR Ltd will buy BRD Commercial Bank Ltd.

1.9.2. BPR mission and vision

1.9.2.1. BPR mission

BPR mission is: "To offer a full range of financial services in the urban and rural areas in a market driven and financially sustainable way; based on cooperative characteristics. Special attention will be given to farmers, agribusiness enterprises, private individuals and micro as well as small and medium enterprises" (BPR Ltd).

1.9.2.2. BPR vision

BPR vision is: "To be the leading retail bank of Rwanda" (BPR Ltd; BPR , 2015).

1.9.3. BPR Ltd within other Rwandan banks

BPR Ltd is operating on the whole Rwandan territory along with other banks. According to the central bank of Rwanda (BNR), there are 17 licensed banks in Rwanda which include:

a) 11 commercial banks:

1. I&M Bank Rwanda Ltd (Former Banque Commerciale du Rwanda),
2. Bank of Kigali Ltd,

3. GUARANTY TRUST BANK RWANDA Ltd (former FINA Bank Rwanda, ex BACAR),
4. Banque Populaire du Rwanda Ltd,
5. Kenya Commercial Bank Rwanda Ltd (KCBR),
6. Equity Bank Rwanda Ltd,
7. CRANE BANK RWANDA LTD,
8. BRD Commercial Bank LTD;
9. ACCESS Bank Rwanda Ltd (fomer BANCOR);
10. ECOBANK Rwanda Ltd (ex. BCDI);
11. COGEBANQUE Ltd

b) 5 micro finance banks:

12. Urwego Opportunity Bank (UOB),
13. Unguka Bank Ltd,
14. AGASEKE BANK Ltd,
15. ZIGAMA CSS,
16. AB BANK RWANDA LTD,

c) One Development bank:

17. Banque Rwandaise de Développement Ltd (BRD)

Besides these licensed banks, there are 75 MFIs and 416 UMURENGE SACCOs (BNR, n.d.).

1.9.4. Specific features of BPR Ltd

BPR Ltd is a retail bank that provides a wide range of retail banking services (loans and deposits to small depositors) as well as corporate banking services (loans, deposits, bank guarantees and so forth to corporate clients) (BPR Ltd). Moreover, it focuses to modern technologies such as e-banking, ATM, Mobile banking (BPR Ltd, 2012)…

BPR has the largest number of client in Rwanda and it is present in more than 190 locations countrywide (BPR Ltd, 2012, p. 3).

BPR has a specificity of focusing on agro- financing.

Finally, it is the only bank in Rwanda which has developed and introduced scoring models (or scorecards) so far. Indeed, it is the pioneer of scoring models in Rwanda. Indeed, as seen earlier, they are in use in BPR since 2012.

CHAPTER 2. LITERATURE REVIEW

This chapter presents the concepts of credit risk and credit scorecards. Moreover, it shows different authors' views on the role of credit scoring models (or scorecards) in managing the credit risk.

2.1. The credit risk

2.1.1. The concept of credit risk

The credit risk is among a wide range of risks that any lending institution faces. Indeed, any bank or any lending institution faces several risks such as the interest rate risk, the exchange risk, operational risks, and the credit risk and so on.

Many authors and researchers have defined the credit risk. Most of them agree that it is the risk that the borrower is not able or not willing to pay the principal and interests as promised (SAUNDERS, A. & CORNETT, M.M., 2011; BESSIS, RISK MANAGEMENT IN BANKING, Third Edition, 2010; HEFFERNAN, 2005; MACHIRAJU, 2008).

The credit risk is one of the biggest challenges for any bank. Indeed, "it is the largest single risk for a bank" (BPR Ltd, 2014, p. 52). Joël BESSIS (2002, p. 13) also states that, the "credit risk is the first of all risks in terms of importance". Moreover, according to Limbo FAN (2004, pp. 1-19) cited by Hussein A. Hassan AL-TAMIMI and Faris Mohammed AL-MAZROOEI (2007, p. 395), "profit efficiency is sensitive to credit risk and insolvency but not to liquidity risk or to the mix of loans products". For H.R.MACHIRAJU (2008, p. 195), "credit risk management lies at the heart of commercial banking". From the above-mentioned authors' views, it is clear that the well-structured credit risk management is among the important factors of the bank success.

2.1.2. Bank risk regulations

2.1.2.1. The need for bank risk regulations

According to Joël BESSIS (2002),

> "Individual banks' risks create 'systemic risk', the risk that the whole banking system fails. (…) The failure of a single institution generates a risk of failure for all banks that have ongoing commitments with the defaulting bank. Systemic risk is a major challenge for the regulator. Individual institutions are more concerned with their own risk. The regulators tend to focus on major goals" (p. 27).

From the above-mentioned statement, bank risk regulation is necessary, especially to help protect the whole system against the 'systematic risk'.

2.1.2.2. Approaches to bank regulation

In order to have a common understanding on risks measurement, there have been some international bank risk regulations starting back from 1988 (Basel I) leading to the new Basel Accord in 2001 (Basel II) (BESSIS, Risk Management in Banking, second edition, 2002) and these regulations are still evolving with the Basel III developed from 2010. However, even if the Basel Accords are widely adopted worldwide, no universal accord exists and bank risk regulation is still a complex challenge for the 21st century banking industry (HEFFERNAN, 2005, p. 219).

The Basel Accords are widely used worldwide and they are also used in Rwanda. Indeed, Rwanda also uses and is still implementing some elements from the Basel Accords as stated here: "In accordance with the EAC agreement, Rwandan banks will be subject to the Basel III 2.5 percent capital conservation buffer, to be phased in from 2016 through end-2018" (ANDREWS, A. M.; JEFFERIS, K.; HANNAH, R. & MURGATROYD, P., 2012, p. 64).

The following section will present the overview the Basel Committee (which initiates those Accords) and the Basel Accords.

2.1.3. Overview of the Basel Committee

The Bank Supervision Committee dates back to 1974 after two major bank failures; the West German 'Bankhaus Herstatt' and the American 'Franklin National Bank'. A standing committee of bank supervisory authorities was set up, it was from the G-10 countries (Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, the UK and USA) plus Luxembourg and Switzerland; with a permanent secretariat (of 15) based at the Bank for International Settlements in Basel, Switzerland and meets there about once every three months (HEFFERNAN, 2005).

2.1.4. The Basel Accords

2.1.4.1. Basel I Accord

In 1988, the first accord, commonly known as **Basel I**, was concluded. This accord had the objective of the improved financial stability through global bank supervision (HEFFERNAN, 2005; BESSIS, 2002).

The Basel I accord main input is that all international banks must set aside the capital based on the risk assets ratio as follows: **Basel risk assets ratio = capital/weighted risk assets**. (HEFFERNAN, 2005, p. 182).

Furthermore, the committee has defined the components of the above-mentioned Basel risk assets ratio as shown by Shelagh HEFFERNAN (2005) below:

“

$$\frac{(Capital\ (tier\ 1\ \&2))}{\text{Assets (weighted by credit type)+ credit risk equivalents (weighted by counterparty type)}}$$

Where capital is defined as follows:

- **Tier 1 or core capital**: common equity shares, disclosed reserves, non-cumulative preferred stock, other hybrid equity instruments, retained earnings, minority interests in consolidated subsidiaries, less goodwill and other deductions.
- **Tier 2 or supplementary capital**: consisting of all other capital but divided into (1) upper tier 2 – capital such as cumulative perpetual preferred stock, loan loss allowances, undisclosed reserves, revaluation reserves (discounted by 55%) such as equity or property where the value changes, general loan loss reserves, hybrid debt instruments (e.g. convertible bonds, cumulative preference shares) and (2) lower tier 2 – subordinated debt (e.g. convertible bonds, cumulative preference shares)” (p. 182).

In addition, the Basel I Accord defined the risk weights to assets according to credit type as follows:

- “0%: cash, gold, bonds issued by OECD governments.
- 20%: bonds issued by agencies of OECD governments (e.g. the UK’s Export and Credit Guarantee Agency), local (municipal) governments and insured mortgages.
- 50%: uninsured mortgages.
- 100%: all corporate loans and claims by non-OECD banks or government debt, equity and property” (HEFFERNAN, 2005, p. 182).

Furthermore, Shelagh HEFFERNAN (2005, p. 183) states that, "the Basel Accord requires banks to set aside a minimum of 8% capital; 4% for core capital. At least half the capital must be tier 1, and is set aside as a safeguard against bad credit or counterparty risk".

2.1.4.2. Basel II Accord

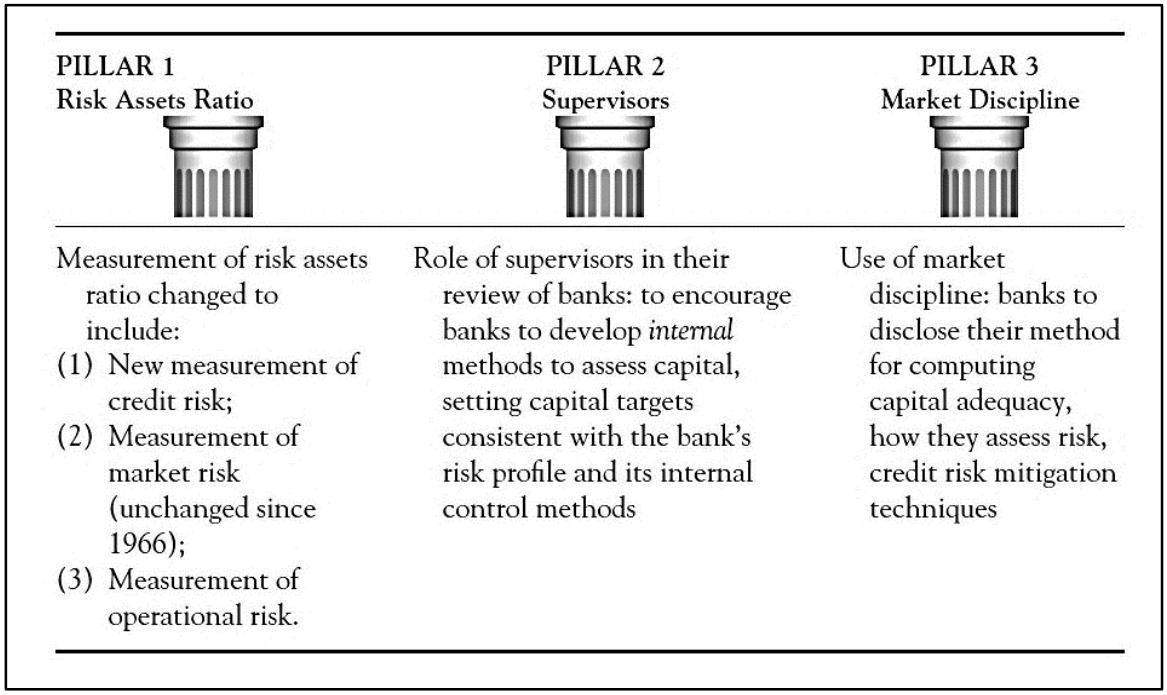
In 1996, the Basel I Accord was amended especially in relation to measurement of the market Risk. The main changes occurred in 2001, when the Basel Committee proposed the new Basel accord (**Basel II**) for comments which was finally adopted in 2004.

Note that the Basel I and II Accords were originally applied by the banks in member countries. In addition, other banks with no direct representations in the Basel Committee use these accords as the benchmarks. However, some members countries especial the USA were reluctant to use the Basel II so that most of its banks opted to continue using the Basel I instead (HEFFERNAN, 2005).

The Basel II accord is based on the **Three Pillar Approach**: pillar 1 is 'the measurement of the risk asset ratio for the credit risk, market risk and the operational risk', pillar 2 is the 'role of supervisors to encourage banks to develop internal methods to assess capital' and pillar 3 is 'the use of market discipline so that banks disclose their methods to compute capital adequacy, how to assess risk and how to mitigate it' (HEFFERNAN, 2005, p. 194; BESSIS, 2002, pp. 40-41).

The following figure summarizes the Basel II three pillars:

Figure 2.1. The Basel II three pillars



Source: Adapted from HEFFERNAN, S. (2005). *MODERN BANKING.* Glasgow. UK: Wiley & Sons Ltd. p.194.

Basel II approach to measure the credit risk

According to the Basel II Accord, in its part called 'Pillar 1 – Credit Risk'; "Measures of credit risk have been changed to deal with some of the criticisms of Basel 1. Banks must adopt one of three measurements: Standardized (modification of existing approach); Foundation Internal Ratings Based Approach and Advanced Internal Ratings Based Approach'' (HEFFERNAN, 2005, p. 195).

a) The standardized approach

The standardized approach to credit risk suggests risk weights based on assessments of the Ratings Agencies (such as Moody's, Fitch Ratings and so on) (BESSIS, 2002).

The following table shows an example of how the ratings should look like as proposed by the Basel Committee's Models Task Force (MTF):

Table 2.1. An example of ratings

Supervisory slotting class	**1-year PD**	**Approximate correspondence to external rating category[1]**
Strong	0,5%	BBB- or better
Fair	2,5%	B+ to BB+
Weak	12,5%	B or worse
Default	100%	D

Source: Basel Committee on Banking Supervision. (2001, October). *Working Paper on the Internal Ratings-Based Approach to Specialised Lending Exposures.* Retrieved 5 22, 2015, from http://www.bis.org: http://www.bis.org/publ/bcbs_wp9.pdf (p. 11).

b) Internal Ratings-Based framework

The new Basel Accord (or Basel II) of 2001, defined the approach called "the Internal ratings-Based (IRB) approach to measure the credit risk. This approach uses three main elements or "risk components". These are: the probability of default (PD), the loss given default (LGD) and the 'Exposure at Default' (EAD). To estimate these components, a bank can use its own estimates or the standardized estimates (BESSIS, 2002; Basel Committee on Banking Supervision, 2001b). These risk components are defined at the end of this section.

The IRB includes the "foundation" and "the advanced" approaches. According to Joël BESSIS (2002, p. 44) IRB, " proposes a treatment similar to the standardized approach for corporate, bank and sovereign exposures, plus separate schemes for retail banking, project finance and equity exposures".

[1] The notations follow the methodology used by Standards & Poor's. This is used as an example only; indeed, other external credit assessment agencies' ratings could also be used as stated by the cited working paper.

Retail Exposures

To assess retail exposures, the Committee proposes a treatment based on the conceptual framework for corporates modified to capture the specifics of retail exposures. Hence, banks commonly divide the portfolio into 'segments' made up of exposures with similar risk characteristics and the risk assessment will be done through segments instead of one individual loan (BESSIS, 2002).

The two IRB approaches

1) **Foundation IRB Approach**

This approach allows banks to use different sources of data such as internal data based on each bank's past experience or the data from Rating Agencies or even statistical default models to estimate the PD associated with an obligor. On the other hand, other risks components (i.e. LGD and EAD) will be estimated on the basis of standardized estimates. (BESSIS, 2002, p. 45).

2) **Advanced IRB Approach**

The difference between the advanced IRB approach and the foundation IRB approach is that with the 'advanced' approach, a bank will assess the risk components (PD, LGD and EAD) but will also estimate the LGD parameter related to recovery. (BESSIS, 2002, pp. 45-46).

The credit risk components

A. The probability of default (PD)

The probability of the default (PD) is the estimation of the likelihood that a loan will go into default. According to the Basel Committee on Banking Supervision (2001a, p. 6), "Most banks orient their borrower rating methodologies and risk management practices to the risk of borrower default. The probability of default (PD) of a borrower or group of borrowers is the central measurable concept on which the IRB approach is built".

However, the PD of a borrower by itself cannot give the full picture of the possible credit loss. That's why the other measures are used to accompany the PD. These are: the Loss given default (LGD), the exposure at default (EAD). These three components (PD, LGD and EAD) combine to provide a measure of expected loss (EL) (Basel Committee on Banking Supervision, 2001a).

The fourth component is sometimes added which is 'maturity (M)'. Indeed, for a given maturity, it is possible to estimate two types of expected loss (EL) using the four parameters:

i. **Expected loss as an amount**: EL = PD× LGD× EAD, and;
ii. **Expected loss as a percentage of exposure at default**: EL% = PD× LGD (Basel Committee on Banking Supervision, 2001a).

B. Loss Given Default (LGD)

The Loss Given Default (LGD) is the magnitude of the likely loss on the exposure and is expressed as a percentage of the exposure (Basel Committee on Banking Supervision, 2001a). For Shelagh HEFFERNAN (2005, p. 163) the Loss Given Default (LGD) is: "the amount the bank loses if the borrower defaults. If there is no security on the loan, and the loan is completely written off, this loss will be in excess of the amount loaned if the book value of the loan is less than the current value of the loan, due to compounding. If the bank is able to cash in on collateral, the LGD can be quite low".

C. Exposure At Default (EAD)

The Exposure at Default (EAD) reflects the amount to which the bank was exposed to the borrower at the time of default (Basel Committee on Banking Supervision, 2001a).

2.1.4.3. Towards Basel III Accord

Since 2010, the new framework termed as 'Basel III Accord' was proposed. According to the Basel Committee on Banking Supervision (2011, p. 1), "the objective of the reforms is to improve the banking sector's ability to absorb shocks arising from financial and

economic stress, whatever the source, thus reducing the risk of spillover from the financial sector to the real economy".

The Basel III framework defines a series of ratios to be implemented gradually until 2017 or even 2019 (Basel Committee on Banking Supervision, 2014, pp. 4-5).

In few words, the Basel III framework can be summarized as follows as per the Basel Committee on Banking Supervision (2014):

> "The enhanced Basel framework revised and strengthen the three pillars established by Basel II. It also extended the framework with several innovations, namely:
>
> - an additional layer of common equity – the capital conservation buffer – that, when breached, restricts payouts of earnings to help protect the minimum common equity requirement;
> - a countercyclical capital buffer, which places restrictions on participation by banks in system-wide credit booms with the aim of reducing their losses in credit busts;
> - a leverage ratio – a minimum amount of loss-absorbing capital relative to all of a bank's assets and off-balance sheet exposures regardless of risk weighting (defined as the "capital measure" (the numerator) divided by the "exposure measure" (the denominator) expressed as a percentage);
> - liquidity requirements - a minimum liquidity ratio, the liquidity coverage ratio (LCR), intended to provide enough cash to cover funding needs over a 30-day period of stress; and a longer-term ratio, the net stable funding ratio (NSFR), intended to address maturity mismatches over the entire balance sheet; and
> - Additional proposals for systemically important banks, including requirements for supplementary capital, augmented contingent capital and strengthened arrangements for cross-border supervision and resolution" (p. 4).

Note that nowadays several countries have implemented the Basel II (see for example http://www.bis.org/publ/bcbs/b2prog_rep_table.pdf), some others are using both Basel I

and Basel II while others are moving towards Basel III. (Details on the implementation of the Basel I, II & III can be found on www.bis.org).

2.1.5. Rwanda and the Basel Accords

Rwanda, as several other countries, has also adopted the Basel Accords. However, Rwanda does not adopt them in full as some elements of them are not relevant to Rwandan banking industry. In this regard, Rwanda adopts some of the Basel accords suitable to Rwandan needs. As stated by A. Michael ANDREWS, Keith JEFFERIS, Robert HANNAH and Paul MURGATROYD (2012):

> "The standardized approach to credit risk under Basel II is essentially a refinement of the Basel I framework which provides the base for the current Rwandan standard. The key differences are the introduction of risk-weighting based on the external credit rating of the counterparty, which will have minimal effect due to virtual absence of rated counterparties to the Rwandan banking system, and different risk-weights for some asset classes. Current risk-weights for all asset classes will be retained as there is no evidence that loss experience in Rwanda supports adopting the Basel II weightings" (p. 66)

Furthermore, the above-mentioned authors state that BNR, by adopting the ongoing risk-based supervision (RBS), is in line with the objective of Pillar 2 of Basel II which is related to the supervisory review of the risk profile and quality of risk management of individual institutions. Indeed, this will help in the implementation of Pillar 2 as BNR will be able to review and assess banks' adherence to prudential standards and the quality of their respective risk management (ANDREWS, A. M.; JEFFERIS, K.; HANNAH, R. & MURGATROYD, P., 2012).

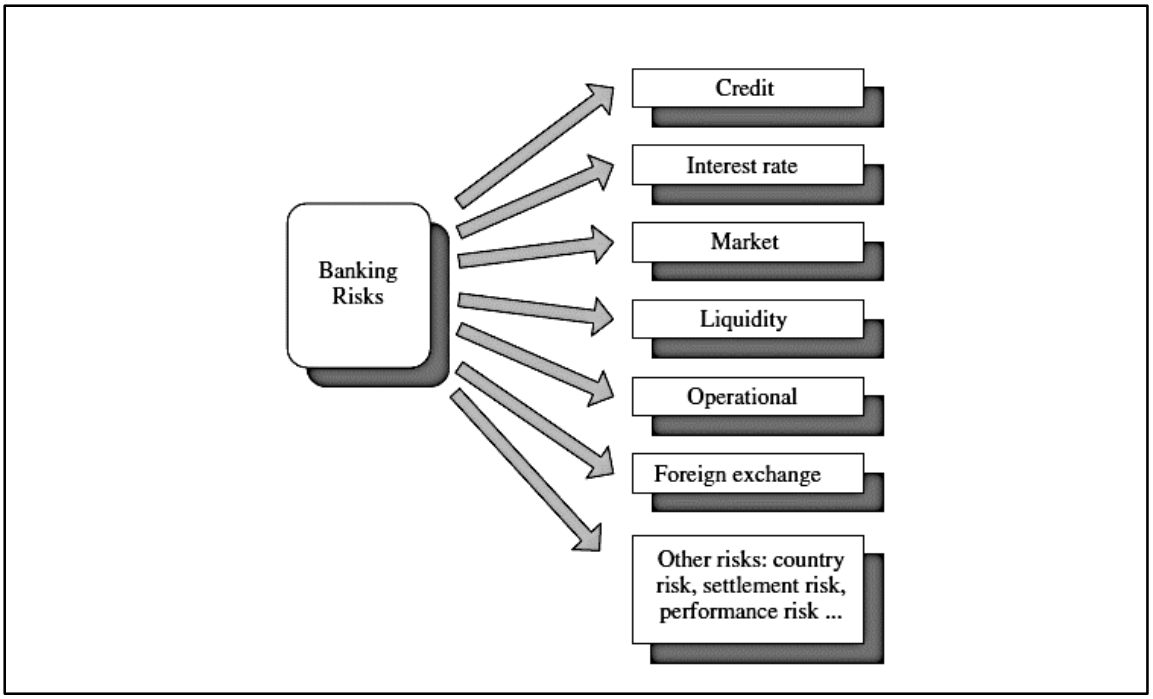
From the points above, it is clear that Rwanda has adhered to the Basel Accords and is still implementing them. However, it tries to adopt them to Rwandan lending environment.

2.1.6. The credit risk and the other important risks for a commercial bank

For H.R. MACHIRAJU (2008, p. 145), "risk denotes uncertainty that might trigger losses". As seen above, the credit risk is among a wide range of risks that a bank faces. The other important risks are: interest rate risk, liquidity risk and operational risk. Besides these risks, there is the systematic risk which represents the risk associated with the banking sector in general and several other risks; some of them are not specific to banking sector such as inflation risk, recession, natural calamities (HEFFERNAN, 2005)...

The figure below depicts the main risks for banks:

Figure 2.2. The main bank risks



Source: Adapted from BESSIS, J. (2002). *Risk Management in Banking, second edition.* John Wiley & Sons. p.12.

Interest rate risk is due to the rise of the interest rates and as the consequence the market value of a bank's asset, loan or security falls (MACHIRAJU, 2008). On the other hand, liquidity risk occurs when the bank is unable to meet its clients' needs in term of cash (depositors or borrowers) (MACHIRAJU, 2008). Finally, the operational risk is when the

bank cannot control its operating expenses: salaries, fuels…and this results in a loss (MACHIRAJU, 2008).

All the above-mentioned risks can jeopardize the bank success. However, the credit risk management is the most important factor of a bank success or failure. Indeed, according to H.R. MACHIRAJU (2008, p. 152), "the principal reason for bank failures is bad loans". Shelagh HEFFERNAN (2005, p. 102) also states that, "most bank failures are linked to a high ratio of non-performing loans to total loans".

2.1.7. Credit risk management

Banks face several risks as seen earlier (note that there are other risks not cited in this study as our focus has been the credit risk), all these risks have different methods to manage them. We only focus on management of the credit risk.

Understanding the credit risk management implies to understand that banks normally deal with two categories of loans: retail loans and corporate loans. Retail loans are small loans granted to individual clients and to small and medium enterprises (SMEs) whereas corporate loans are those granted to large corporations. This differentiation is necessary in the risk management as managing retail loans is more difficult than corporate loans as for the former, there is lack of information. Indeed, according to Shelagh HEFFERNAN (2005, p. 156), "most bankers concede that lack of information makes retail lending more difficult than corporate lending". However, a corporate loan is more risky than a retail loan because of the large amount of money involved so that one corporate NPL can seriously affect the success of a bank (HEFFERNAN, 2005).

The study of credit risk management is very wide and very complex. As this study aims at showing the role of the credit scorecards in managing the credit risk, the following sections will be limited to three elements which help to introduce scorecards: the first element is the minimization of the credit risk, the second is the assessment of the credit risk for individual loans and the last is the overview of the portfolio risk assessment.

2.1.7.1. Minimizing the credit risk

Managing the credit mainly consists in minimizing the credit risk. Some of the methods used to minimize the credit risk include: risk-based pricing, credit rationing, use of collateral, loan diversification and asset securitization and/or use of credit derivatives (HEFFERNAN, 2005, p. 156).

a) Risk-based pricing: it consists in the interest rate adjusted to the risk associated with the loan (the probability of default). Indeed, the higher the risk the higher the price of the credit (i.e. the interest rate).

b) Credit rationing: also known as "credit limits", is especially used on retail loans by fixing the ceiling for some loans based on for example income of the borrower or collateral (HEFFERNAN, 2005, p. 157).

c) Collateral or security: is the use of collateral such as a real estate, a house and so on to mitigate the credit risk.

d) Diversification: this consists in investing in different sectors such as mortgage, business, and equipment and so on in order to offset the loss incurred in one sector by the gain from another sector.

e) Credit derivatives and asset securitization: securitization consists in reducing credit risk when a third party such as an insurance company assumes responsibility of the risk of the securitized assets (HEFFERNAN, 2005, p. 158). Credit risk derivatives such as swaps can also be used to control the default risk. The credit derivative allows to separate an instrument's credit risk from its market risk and enables to redistribute it among broad class institutions (HEFFERNAN, 2005, p. 135).

2.1.7.2. Assessment of the credit risk for the individual loans

Two methods are used to assess the credit risk: the qualitative approach and the quantitative approach:

a) Qualitative approach

This uses normally the checklists when the information are available (HEFFERNAN, 2005). The checklists include: the loan history, the borrower's income, the collateral values…

John SINKEY (2002) cited by Shelagh HEFFERNAN (2005, p. 159) states that this approach can also use what is called the "5Cs": Character, Capacity, Capital, Collateral and Conditions (of the borrower). H.R.MACHIRAJU states the "6Cs": apart from the above-mentioned "5Cs", he adds Compliance (to laws and regulations) (MACHIRAJU, 2008, pp. 197-198).

b) Quantitative approach

This approach uses numerical data to predict the borrower's probability of default. This approach includes the use of credit scoring models (or scorecards) (HEFFERNAN, 2005) that will be discussed in details on point II.1.2.

2.1.7.3. Overview of the portfolio risk assessment

The above-mentioned risk assessment methods are used for loans to individuals and corporations. On the other hand, there are methods to assess the bank's whole loan portfolio. The first method is to assess the concentration of loans in one sector. Indeed, a big concentration of loans in one sector (for example in mortgage loans) can seriously threaten the stability of a bank.

Next to this there are some risk modelling methods to assess the loan portfolio. For example, in the United States there are some rating agencies such as Moody's or Standard and Poor's that assess different banks' portfolios (HEFFERNAN, 2005). Apart from this, there are other models based on the Portfolio Theory for non-traded loans (HEFFERNAN, 2005).

2.2. Credit scoring models (or scorecards)

2.2.1. The concept of credit scorecards

The credit scorecards use the data from observed borrower behavior such as credit payment history, stability of job, volatility of the borrower earning and so on to estimate the probability of default, and to sort borrowers into different risk classes (HEFFERNAN, 2005). For Naeem SIDDIQI (2006, p. 5), "risk scoring, as with other predictive models, is a tool used to evaluate the level of risk associated with applicants or customers". Furthermore, David J. HAND and Saul JACKA (1998, p. 106) state that, "the process (by financial institutions) of modelling creditworthiness is referred to as credit scoring". Finally, Benton E. GUP and James W. KOLARI (2005, p. 508) maintain that, "credit scoring is the use of statistical models to determine the likelihood that a prospective borrower will default on a loan".

Indeed, the borrowers are divided into default groups based on historical data and on different characteristics (HEFFERNAN, 2005). Each borrower group is assigned a score at each characteristic observed. The sum of the scores will determine whether or not the loan is to be accepted or is to be rejected. In fact, there will be the minimum score (the cut-off score) under which the borrower's application is rejected and each bank will select it according to its risk appetite (i.e. to the degree of risk it can tolerate) (BESSIS, 2002; HEFFERNAN, 2005).

The following checklists (SIDDIQI, 2006; HEFFERNAN, 2005) can be used for scorecards designed for individual borrowers (or retail loans):

- ✓ Past loan payment history;
- ✓ Credit bureau loan history;
- ✓ Loan payment capacity (cash flow versus expenses);
- ✓ Groups of age of borrowers (e.g. range of 20-25 years old, 25-30 years old…);
- ✓ Monthly earnings of the borrowers;
- ✓ Stability of the job;

- ✓ Industry in which the borrower is operative (restaurants & hotels, transports, public sector…);
- ✓ Volatility of earnings;
- ✓ Location of the business (e.g. urban or rural);
- ✓ Collateral (its nature, its value…);
- ✓ Employment contract (fixed term, open-ended…);
- ✓ Sex groups (male or female);
- ✓ Etc.

Note that the scoring models can also be used for corporate loans, but these will be different from the ones used for retail loans. Indeed, the large corporations have enough information as they keep accounts. Here some ratios will be used to score the corporate loans (such as the debt to equity ratio). Therefore, some models based on ratios will be used for larger corporations such as the Altman (1968) Z-score model cited by Shelagh HEFFERNAN (2005, p. 160). According to this model, each firm will be assigned a Z-score based on its financial or accounting ratios. The firm with the lower Z-score is assumed to have the higher risk so that with Z-score inferior to 1.81 the default risk is too high that no loan will be granted (HEFFERNAN, 2005, p. 160).

2.2.2. Merits of the credit scoring models

The credit scoring models (or scorecards) have several advantages. Apart from assessing the risk of the prospective borrowers, they help to analyze loans quickly (BESSIS, 2002, p. 464) and also help to gather information for small loans where it is normally difficult to get individual information because of the lack or poor reporting techniques used by individual borrowers (most of them do not keep proper accounting) (ACCION, n.d.); cited by Dean CAIRE et al. (2006, p. 1).

Next to this, the scoring models use larger information of the loans performance in the past than that a credit analyst can remember if the loan was analyzed manually (ABDOU, H. & POINTON, J., 2011). Here, scoring models provide more advantages than the classical manual credit appraisal by the credit analysts.

Furthermore, scoring models are based on observed facts and not on value judgments of the credit analysts (ABDOU, H. & POINTON, J., 2011; BESSIS, 2002).

However, other authors wonder whether or not the credit scoring decisions are better than classical credit analysts' decisions. For example Anjan V. THAKOR and Arnoud W. A. BOOT (2008) state that:

> "Research on credit scoring is still relatively new, so it remains difficult to quantify the economic impact of credit scoring on the consumer, real estate, and small business lending markets. For example, it is still an open question as to whether risk is assessed more accurately using automated credit-scoring approaches or the more traditional, case-by-case credit analysis performed by loan officers" (p. 352).

Furthermore, the same authors Anjan V. THAKOR and Arnoud W. A. BOOT (2008) citing Elizabeth MAYS (2003) maintain that,

> "Only one published study has analyzed whether human intervention can improve decision making on applicants rejected on the basis of credit scoring. This study used data from one bank with a historically high "override" rate and found that overrides of applicants who would have been rejected on the basis of the credit score did no better on average than their credit score alone predicted" (p. 352).

2.2.3. Criticisms of the credit scoring models

Some criticisms of the credit scoring models say that they are based on historical data (HEFFERNAN, 2005; ABDOU, H. & POINTON, J., 2011). Indeed, these criticisms go beyond by saying that the data may change overtime. However, the good scorecards are updated regularly (ABDOU, H. & POINTON, J., 2011; HEFFERNAN, 2005).

Another criticism say that the scorecards may be subject to type-I error and type-II error (BESSIS, Risk Management in Banking, second edition, 2002; HEFFERNAN, 2005). For Shelagh HEFFERNAN (2005, p. 160), "a type-I error occurs when the borrower is not

forecast to go into arrears but does and a type-II error when a borrower is forecast to go into arrears but does not". However this problem may be mitigated when the bank keeps records of these types of errors and consider them in designing new scorecards or in updating existing models (HEFFERNAN, 2005; ABDOU, H. & POINTON, J., 2011).

2.2.4. The Basel Committee and the scoring models

The Basel Committee on Banking Supervision also acknowledges the use of scoring models supplemented by human judgment. The bank must have some written guidance showing the complementarity between human judgment and the models to avoid misuse of them. Indeed, the Basel Committee states that (2006, p. 93), "credit scoring models and other mechanical procedures are permissible as the primary or partial basis of rating assignments, and may play a role in the estimation of loss characteristics. Sufficient human judgment and human oversight is necessary to ensure that all relevant and material information, including that which is outside the scope of the model, is also taken into consideration, and that the model is used appropriately".

Moreover, the Basel Committee on Bank Supervision recommends banks to estimate PD, LGD and EAD in each exposure pool. The committee recommends, in each pool, the use of the following (2006):

- "Borrower risk characteristics (e.g. borrower type, demographics such as age/occupation);
- Transaction risk characteristics, including product and/or collateral types (e.g. loan to value measures, seasoning, guarantees; and seniority (first vs. second lien)). Banks must explicitly address cross-collateral provisions where present.
- Delinquency of exposure: Banks are expected to separately identify exposures that are delinquent and those that are not" (p. 91).

Recall that the scoring models may be developed by the bank itself or may be acquired from external vendors. Whatever the source of the scoring models, the Basel Committee

on Banking Supervision recommends that the bank must document those models in writing their rating systems' design and operational details. The documentation helps to satisfy bank supervisors that the rating used is accurate and has good predictive power sand that those models are in conformity with regulations on capital requirements as prescribed by the Basel Accords (Basel Committee on Banking Supervision, 2006).

The Basel committee recommends that if a bank uses statistical models in its rating, it must document their methodology. The documentation provides, among others, a detailed theory, mathematical and empirical basis for grades of individual obligors or of the portfolio, indicate when and where the models can be used or not used (Basel Committee on Banking Supervision, 2006).

To ascertain the degree at which vendor credit-risk models are in conformity of the Basel Committee requirements, the Research Task Force (RTF) of the Basel committee explored some models. The objective of the research was the evaluation of how risk components (PD, LGD and EAD) were estimated to see whether or not the models are the same and also to identify if the models respect supervisors requirements (in respect of the Basel three pillar approach). At the end the Task Force concludes that a given model may be suitable for a given case and not for another. Furthermore, the RTF suggests some improvement measures aimed at making those models near the requirements of the Basel Accords (Basel Committee on Banking Supervision, 2010).

2.3. The role of the credit scoring models in managing the credit risk

2.3.1. Different authors' views on the role of scorecards in credit risk management

As seen above, the credit scoring models are used to estimate the degree of risk associated with a loan proposal which leads either to accept it or to reject it. For Joël BESSIS (2002, p. 459), "Credit scoring uses techniques for discriminating between defaulters and non-defaulters". Shelagh HEFFERNAN (2005, p. 158) has shown the role of using methods apart from individual judgment to assess the credit risk, "Managerial judgment always plays a critical role, but a good credit risk team will use qualitative and quantitative

methods to assess credit risk". Furthermore, in using quantitative methods, he states the use of credit scoring (HEFFERNAN, 2005, p. 159).

Besides, several authors have shown the role of credit scoring models (or scorecards) in managing the credit risks and most of them maintain that they lead to lower risk and less defaulting loans (SAUNDERS, A. & CORNETT, M.M., 2011; GLANTZ, 2003; BESSIS, 2002).

The credit scoring is the tool used to assess the risk associated with a loan and allows lenders to take decisions as stated by Anjan V. THAKOR and Arnoud W. A. BOOT (2008):

> "One of the key inputs for large-scale loan securitization is credit-scoring technology, which transforms quantitative information about individual borrowers (such as income, employment, and payment history) into a single numerical credit score which lenders can use when screening and approving loan applications, securitizers can use to group loans of similar risk into pools, and investors can use (together with other information) to evaluate the risk of the resulting asset-backed securities" (p. 352).

On his side Mario QUAGLIARIELLO (2009, p. 161) maintains that, "Until now, banks have generally worked with credit-scoring models which were based on the characteristics of borrowers. For business purposes, this has evidently been adequate to the task".

Furthermore, Naeem SIDDIQI (2006, p. 2) states that, "Scoring methodology offers an objective way to assess risk, and also a consistent approach, provided that system overrides are kept to a minimum".

2.3.2. Some case studies on the roles of scorecards in credit risk management

The studies on credit scorecards' role in assessing the credit risk are not abundant as this tool is new in the risk management area (THAKOR, A.V. & BOOT, A.W.A., 2008, p. 352; ABDOU, H. & POINTON, J., 2011, p. 4). This section shows some studies carried on the role of credit scorecards (some focused case studies) in risk management.

2.3.2.1. The study carried on some Banks/MFIs in Latin America, Africa and Eastern Europe

After studying the scoring models of seven banks/MFIs from six countries in three continents (Latin America, Africa and Eastern Europe), Dean CAIRE et al. (2006, p. 21) reached the following conclusion: "a scorecard, thoughtfully developed, flexibly implemented, and properly managed can speed loan processing and inform pricing and provisioning, which can help banks and MFIs save costs, reduce subjectivity, and improve risk management".

The above-mentioned study was conducted on the following banks/MFIs: BancoSol (Bolivia), CAC Leasing (Slovakia), African Bank/Credit Indemnity (South Africa), Mibanco (Peru), Teba Bank (South Africa), Unibanka (Latvia), and United Bulgarian Bank (Bulgaria) (Dean Caire et al., 2006, p. 3).

2.3.2.2. The study of the impact of the introduction of the automated scorecards at a large auto finance company

Liran EINAV, Mark JENKINS and Jonathan LEVIN (2013, p. 272), after studying the impact of scorecards of a large auto finance company on its lending practices, arrived at the following conclusion: "The adoption of credit scoring technology led to a large increase in profitability. Lending to the highest-risk applicants contracted due to more stringent down payment requirements, and lending to lower-risk borrowers expanded, driven by more generous financing for higher-quality, and more expensive cars".

2.3.2.3. The study on the applicability of credit scoring models in Egyptian banks

The study aiming at evaluating the credit risk in Egyptian banks using scorecards found that these models provided better classification than the previous system that was used before their introduction (ABDOU,H.; EL-MASRY,A. & POINTON, J., 2007).

This study was carried on one of the biggest Egyptian banks' credit data. The sample was 581 personal loans composed of 24.47% and 74.53% of bad and good loans respectively and according to the authors of this article, this sample is representative enough (ABDOU,H.; EL-MASRY,A. & POINTON, J., 2007).

In addition, each client within the sample above was sorted using the criteria below so that every loan was either declared 'good/paid' and assigned the value **'one'** or bad/defaulted and assigned the value **'zero'** (ABDOU,H.; EL-MASRY,A. & POINTON, J., 2007, p. 9) :

Table 2.2. List of variables used in building the proposed credit scoring models

Variable/Description	Code	Unit	Comment
Loan Amount	LOAN AMO	No.	-
Loan Duration	-	-	Loan duration is 4 years in all cases in this sample.
Company	COMP	10, 01, 00	10 = Public sector, 01 = Local private sector, 00 = Multinational company.
Branch	-	-	The bank has a branch to serve and collect instalments (i.e. clients work or live in a very remote area that there is no branch in the city).
Sex	SEX	0, 1	0 = Male, 1 = Female
Marital Status	MAR STA	0, 1	0 = Married, 1 = Single
Age	AGE	Years	Clients ages from 25 to 59 years.
Salary/Monthly Income	SALA	No.	-
Additional Income	ADD INC	0, 1	0 = N/A, 1 = Suitable
House Owned or Rented	HOR	0, 1	0 = Rented, 1 = Owned
House Rent > Loan Tenure or House Rental Period	-	-	The client must have a rent contract for 4 years or higher to be greater than loan tenure (4 years).
Home Telephone	TELE	0, 1	0 = N/A, 1 = Ok confirmed (land line).
Utility Bill	-	-	Clients must have a utility bill not less than 6 months.
Title/Position	-	-	It means the occupation of customers: workers are less grade than white collar, workers are not accepted.
Education Level	EDU	0, 1	0 = University, 1 = Higher education 100% university or higher, it is a must.
Loans From Other Banks	LFOB	0, 1	0 = N/A, 1 = Nil
Relation With Other Banks	-	-	Through an investigation report from the central bank of Egypt (provides the client's history).
Credit Card Status	-	-	All clients have valid credit card(s).
Corporate Guarantee	COR GUAR	0, 1	0 = No, 1 = Ok from creditable company. There is no such a default with a client has a corporate guarantee.
Other Guarantors	-	-	If required.
Loan Quality	LOAN QUA	0, 1	0 = Default/Bad credit, 1 = Paid/Good credit

Source: ABDOU,H.; EL-MASRY,A. & POINTON, J. (2007). *ON THE APPLICABILITY OF CREDIT SCORING MODELS IN EGYPTIAN BANKS. Banks and Bank Systems / Volume 2, Issue 1, 2007.* Retrieved 5 28, 2015, from http://businessperspectives.org: http://businessperspectives.org/journals_free/bbs/2007/BBS_en_2007_01_Abdou.pdf . P.9.

Secondary, an investigation report on the client history of all banks he/she is banking with was issued by the Central Banks of Egypt. As a result, the researchers concluded that the scoring models, compared to the old system, gave a better average classification of borrowers than the previous system. In addition, type I error and type II error were calculated to measure the costs associated with misclassification. However, the searchers suggested future study to use more advanced statistical methods and to include more banks in the sample (ABDOU,H.; EL-MASRY,A. & POINTON, J., 2007).

2.4. Summary

This chapter has shown the role of scorecards in managing the credit risk. The credit risk is the biggest challenge for any bank. It is in the heart of a bank success or failure. That's why this risk must be assessed and controlled. Studying risk management implies understanding the role played by the Basel Committee to try to set up worldwide regulations on bank risk management. Indeed, through its three Accords: Basel I, Basel II and Basel III, the Basel Committee on Banking Supervision is struggling to set up internationally accepted guidelines for bank risk management.

Several authors and some case studies have shown the role of using credit scoring models (also known as credit scorecards) in assessing the credit risk. Most of them agree that using well-structured and frequently updated scoring models can help a bank to control the credit risk. Moreover, they have shown other roles of these scoring models in speeding up the lending process, objectivity in lending and so forth. These scoring models are in an increasing evolution worldwide these last few years thanks to the development of modern technology. Moreover, the Basel Accord recognize the use of these models in assessing different bank's risks including the credit risk.

The next chapter is related to the research methodology.

CHAPTER 3. THE RESEARCH METHODOLOGY

C.R. KOTHARI (2004, p. 8) defines Research methodology as, "a way to systematically solve the research problem". In fact, the research methodology goes beyond using research methods to understand the logic behind them. The Research Methodology identifies relevant methods for a specific study, what they mean and why they are chosen and used (KOTHARI, 2004, p. 8).

This chapter contains the research design, the population and the sample of the study, the research methods as well as the ethics followed by the researcher.

3.1. Research design

This is an explanatory study as it focuses on understanding and explaining the contribution of scored loans in credit risk management. Indeed, it is a case study: it is a quantitative research based on BPR credit database and financial reports.

3.2. The population and sampling techniques

3.2.1. The population of the study

The targeted population is all BPR employees which are 1600 staff members (BPR, 2015). Furthermore, the credit data of BPR from 2009 to 2014 are used in this research.

3.2.2. The sampling techniques

The purposive sampling is used in this research. In this regard, the staff members selected for interview are the ones who participate in the scorecards development and monitoring. Indeed, there are only 4 people in charge of scorecards which are assisted by foreign experts who come periodically to help them or who can assist these staff members online from

abroad. That's why the sample for interview are those 4 staff members in charge of scorecards development and monitoring. However, we did not manage to contact foreign experts who assist BPR staff in scorecards development. Furthermore, we have used the data necessary to carry out this study. That's why the research is essentially focused on the loans processed in scorecards (i.e. small loans of less than Rwf 5 Million referred to in this study as "scored loans"). Indeed, the current BPR scorecards are conceived for retail loans.

3.3. Research methods

Research methods are those methods or techniques used to conduct a research. They refer to the behavior and instruments that the researcher uses to choose techniques of the research (KOTHARI, 2004, p. 7).

Research methods include all the methods used in data collection, data analysis (i.e. establishing relationship between data and findings) as well as the methods used to evaluate the accuracy of the results (KOTHARI, 2004, p. 8).

In this study the following methods are used:

1) Data collection methods, they include:
   - Official records and documents;
   - Unstructured interview.
2) Methods for data analysis and interpretation of results, which are:
   - Statistical treatment of data (correlation and regression analysis);
   - The comparative method;
   - The descriptive method;
   - The synthetic method.

3.3.1. Data collection methods

This sub section contains methods used in data collection.

3.3.1.1. Official records and documents

BPR documents such as annual reports and other reports have been used to collect secondary data. Secondary data play a key role in this study. Indeed, these data are used to evaluate and compare the performance of scored loans (i.e. loans treated and analyzed through scorecards) and the other non-scored loans.

3.3.1.2. Unstructured interview

The unstructured (or in-depth) interview is used to collect primary data. It is addressed to some BPR staff members which contribute in the development, maintenance and update of scorecards. Recall that there are 4 people in charge of scorecards which are assisted by foreign experts who come periodically to help them or can assist these staff online from abroad. As it is a purposive sampling, the interview has been addressed to only those people who are supposed to have the information needed the most. However, as said earlier we did not manage to contact foreign experts who assist BPR staff in scorecards development.

Note that as stated earlier the primary source of information used in this study is from BPR databases and reports, the interview plays a supplementary role in order to well understand those data from documents.

3.3.2. Methods for data analysis and interpretation of results

3.3.2.1. Statistical treatment of data

The use of some statistical indicators and tests (correlation and regression analysis and test of independence) are used to analyze and evaluate results. To analyze the relationship between “scored loans” and the performance of BPR and also to evaluate the effect of “scored loans” to the credit risk in BPR, the correlation and regression analysis has been done. The computer program “MS EXCEL 2013” is used in determination of these

statistical relations (correlation, regression analysis). The results of these tests are used in testing the hypotheses.

1) Correlation analysis

Indeed, loans analyzed in scorecards (scored loans) are analyzed to evaluate their impact on the performance of BPR loan portfolio. The principal measure of a bank loan portfolio performance is its NPL rate. Here, the correlation is done to evaluate the relationship between explanatory variables (scored loans as well as non-scored loans) and the dependent variable (NPL rate).

2) Regression analysis and the test of independence

Furthermore, the multi-regression analysis is used to evaluate the cause-effect relationship as well as the degree of independence between explanatory variables (scored loans and non-scored loans) and the dependent variable (NPL rate). To measure the accuracy of the regression analysis some statistical tests (the coefficient of determination "R^2"; as well as t-test are used). The first method (R^2) is used to measure how well the overall regression equation explains changes in the dependent variable. The second measure (t-test) is used to test the strength of the relationship between an independent variable and the dependent variable.

3.3.2.2. The comparative method

Secondary data are used from BPR Ltd credit reports before and after the introduction of scorecards in order to evaluate the impact of this new tool on the performance of this bank. The comparison of the performance of BPR before and after using scorecards is used to evaluate the change from this new tool (BPR scorecards).

3.3.2.3. The descriptive method

This method is used to describe the case study. Indeed, it has been used to give the overview of BPR Ltd.

3.3.2.4. The synthetic method

This method helps in summarizing BPR credit reports in order to have the general view of the evolution of the loan portfolio as well as the performance of this portfolio during the period of study.

3.4. Data processing

The data processing consists in data editing, data coding and tabulation.

3.4.1. Editing

Data editing consists in arranging them in order to facilitate their coding. At this stage, you can also detect some errors and correct them in order to have accurate results.

3.4.2. Coding

At this stage, the data are assigned numbers or symbols in order to group them into significant categories and facilitate their interpretation.

3.4.3. Tabulation

Tabulation consists in counting the number of observations. This helps in interpretation of data based on the number of observations.

3.5. Professional and ethical consideration

This study has been be done professionally and by abiding by the ethics of research including presenting views of others, honest in interpretation of data and presenting results.

CHAPTER 4. THE ANALYSIS AND THE INTERPRETATION OF DATA

This chapter is divided into two sections: section one is for data analysis. The last section is for the verification of hypotheses.

4.1. Analysis of data

4.1.1. The evolution and the performance of BPR loan portfolio

The table below shows the evolution and the performance of BPR loans portfolio from 2009 to 2014.

Table 4.1. Evolution and the performance of BPR loan portfolio from 2009 to 2014

Year	2014		2013		2012		2011		2010		2009	
	Rwf '000	%	Rwf '000	%	Rwf '000	%	Rwf '000	%	Rwf '000	%	Rwf '000	%
Performing loans	92,561,761	86%	77,461,816	77%	102,617,174	84%	89,438,626	88%	72,570,714	89%	64,064,124	86%
Watch	8,169,180	8%	9,157,855	9%	10,355,983	9%	5,417,863	5%	3,266,862	4%	3,407,652	5%
Performing loans and watch	100,730,941	94%	86,619,671	86%	112,973,157	93%	94,856,489	93%	75,837,576	93%	67,471,776	91%
NPLs	6,801,412	6%	13,726,518	14%	8,565,988	7%	7,326,329	7%	5,896,620	7%	6,879,631	9%
Total gross loans and advances	**107,532,353**	**100%**	**100,346,189**	**100%**	**121,539,145**	**100%**	**102,182,818**	**100%**	**81,734,196**	**100%**	**74,351,407**	**100%**

Source: Data compiled from BPR annual reports of 2009 to 2014

Note:

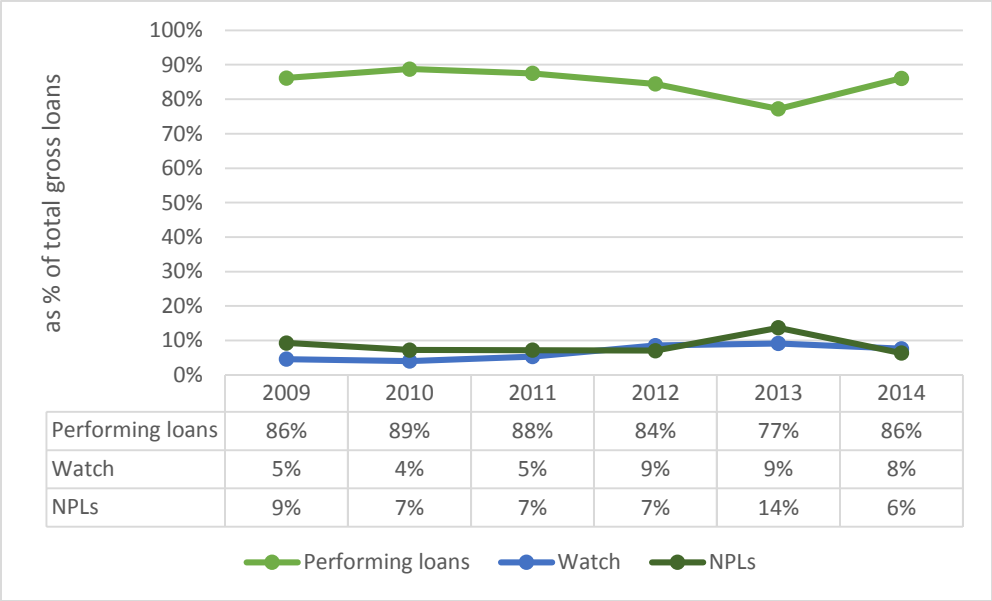
- Gross loans, here, mean all BPR loans "without deducting bank allowances for impairment. In other words, bank allowances for impairment are added back to net loans" (BPR Ltd, 2014);
- Performing loans, in BPR, are less than 30 days in arrears (BPR Ltd, 2014);
- Watch is 31 to 90 days in arrears (BPR Ltd, 2014);
- NPLs (non-performing loans) are those with more than 90 days in arrears (BPR Ltd, 2014)

The table above summarizes BPR loans portfolio evolution and performance from 2009 to 2014 (three years before the introduction of BPR scorecards in early 2012 and three years after this introduction). In general, BPR loan portfolio had been increasing from 2009 to 2012 before it decreased in 2013 to increase again in 2014.

Regarding the performance of BPR loan portfolio, the NPL rate had decreased from 2009 to 2010 and had been constant (7%) ever since until it culminated to 14% in 2013. Unfortunately, we did not manage to get the real reason behind this abnormal NPL rate of 2013. On the other hand, the effort was done in 2014 to bring it below the level of before 2013 (i.e. to 6%). However, it remained beyond BNR ceiling rate of 5% (BPR Ltd, 2014).

The following figure depicts the comparison between the evolution of BPR performing loans, watch and NPLs from 2009 to 2014.

Figure 4.1. Comparison between performing loans, watch and NPLs 2009-2014



	2009	2010	2011	2012	2013	2014
Performing loans	86%	89%	88%	84%	77%	86%
Watch	5%	4%	5%	9%	9%	8%
NPLs	9%	7%	7%	7%	14%	6%

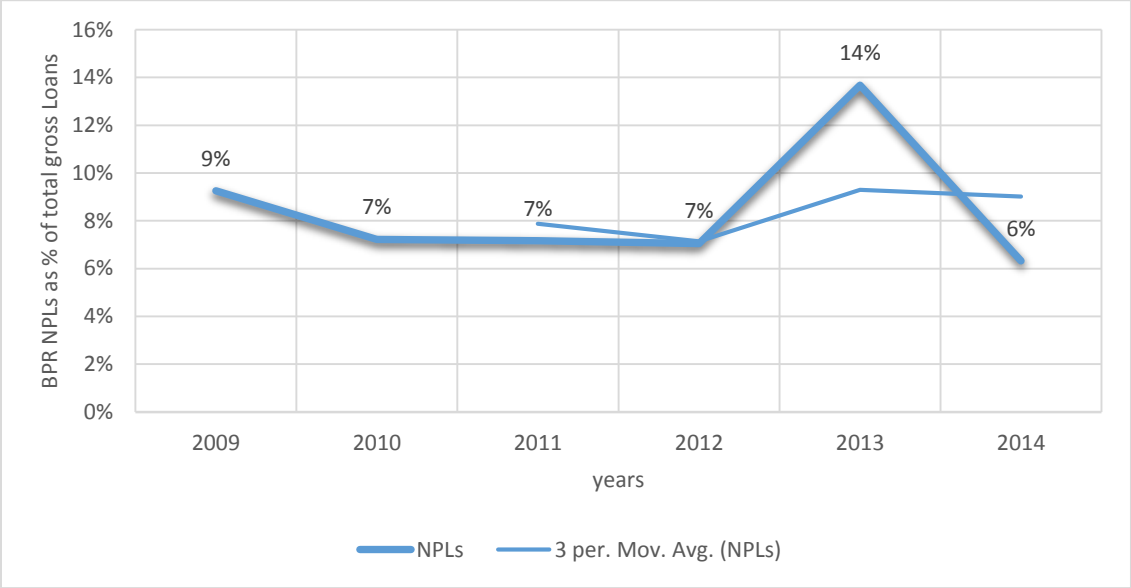
Source: data compiled from BPR annual reports from 2009 to 2014

As a remark, performing loans had had the downward trend from 2010 before they increased in 2014. On the other hand, while NPLs had been constant at 7% from 2010 to 2012; watch loans were in increase from 2009 to 2013, with a slight decrease in 2014. This

shows clearly why BPR credit risk management had been a concern from 2009 and in order to manage that risk BPR had tried several alternative courses of action. It is in this regard that scorecards were considered to be one of different solutions chosen (of course this solution was combined with some others including reinforcement of recovery as we learned from our interviewees).

Graphically, the NPLs evolution and trend can be summarized in the figure below:

Figure 4.2. BPR NPLs evolution and trend



Source: data compiled from BPR annual reports from 2009 to 2014

The figure above represents the evolution and the trend of BPR NPL rate. In general, since 2009 it has been beyond BNR limit of 5% as seen earlier. Using a three-period moving average forecast, the trend is decreasing the first time and increase the second time but it ends with a slight decreasing slope. This shows that even if it is still high, it is expected to keep on decreasing.

4.1.2. The analysis of the scored loans

As seen, scorecards were developed in 2011 but they were introduced in early 2012. That's why the following analysis will focus on the period 2012-2014 which corresponds with the real period scorecards were used to assess some of BPR loans (retail loans of less than Rwf 5 million). The following table summarizes the portion of scored loans within BPR loan portfolio:

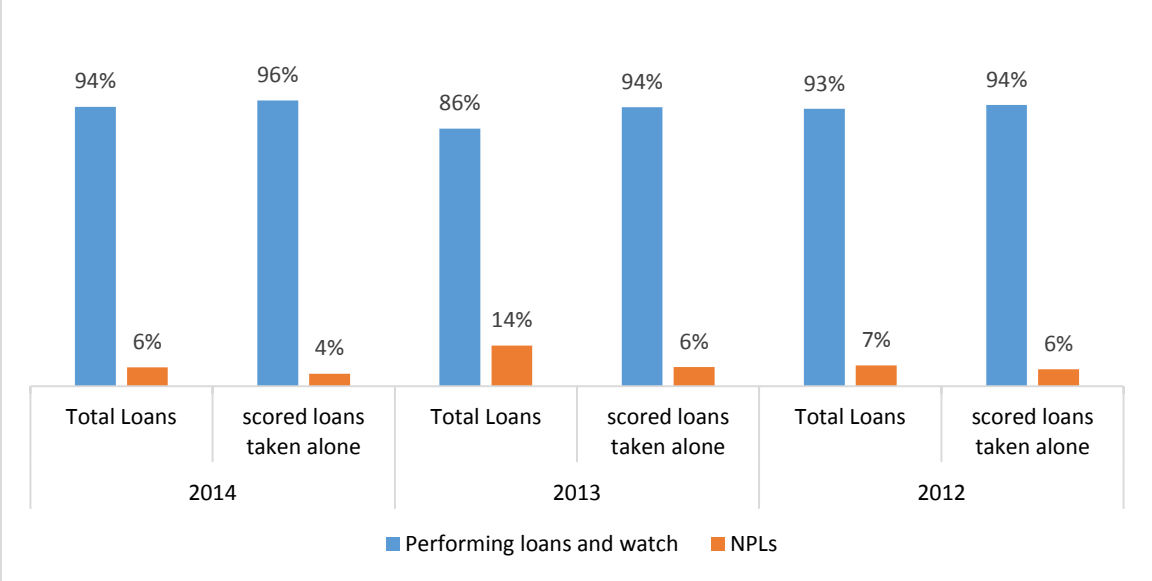
Table 4.2. Scored loans within BPR loan portfolio

	2014		2013		2012	
	Rwf '000	**%**	**Rwf '000**	**%**	**Rwf '000**	**%**
Scored performing and watch loans	23,559,472	22%	21,107,567	21%	16,330,179	13%
NPLs for scored loans	1,048,335	1%	1,455,034	1%	995,797	1%
Subtotal: total scored loans	**24,607,807**	**23%**	**22,562,601**	**22%**	**17,325,977**	**14%**
Total performing loans and watch not scored	77,171,469	72%	65,512,104	65%	96,642,978	80%
Total NPLs not scored	5,753,077	5%	12,271,484	12%	7,570,191	6%
Subtotal: total not scored loans	**82,924,546**	**77%**	**77,783,588**	**78%**	**104,213,168**	**86%**
Total gross loans and advances	**107,532,353**	**100%**	**100,346,189**	**100%**	**121,539,145**	**100%**

Source: data compiled from BPR loan portfolio at the end of 2012, 2013 and 2014

The table and figure above show that scored loans are about one quarter of the total BPR loan portfolio so far. Remark that total scored loans have been in increase since 2012 from 14% to 23% of total BPR loans (in 2014). However the NPL rate of scored loans has remained to 1% of total loans. This shows that scored loans are, in general, well-performing. The following figure depicts scored loans performance compared to the total loan portfolio performance.

Figure 4.3. Comparison of the performance of the scored loans to the global BPR loan portfolio



Source: data compiled from BPR loan portfolio at the end of 2012, 2013 and 2014

The figure above shows that the NPL rate of scored loans taken alone is below the one of the whole total loan portfolio. Indeed, when the performance of the entire portfolio was bad in 2013 (NPL at 14% of total loans); NPL rate of the scored loans taken alone was at 6% (of total scored loans). These NPL rates were at 6% (of total loans) and 4% (of scored loans only) in 2014. This is a simple scenario that shows that scored loans perform well. Even the staff in charge of scorecards in BPR confirm that scored loans, in general, perform well. The question is to know the impact of scored loans on the performance of BPR loan portfolio. Hence, the correlation and regression analysis is necessary.

4.1.3. The analysis of correlation and regression

As seen above BPR loan portfolio is composed with two categories of loans: scored loans and non-scored loans. Indeed, the performance of BPR loans portfolio depends on both scored loans and non-scored loans. Even if this study is related to the effect of scored loans on the performance of BPR loan portfolio, it is clear that non-scored loans also play a key role on the performance of BPR loan portfolio. That's why the analysis of correlation and regression has taken into consideration these two categories of loans. The correlation and regression analysis has been done by analyzing the impact of performing loans (both scored and non-scored) on NPL rates from 2009 to 2014 (year-end data).

4.1.3.1. Correlation analysis

The table below summarizes the correlation analysis between the dependent variables (NPL rate) and the independent variables (scored loans and non-scored loans).

Table 4.3. Correlation analysis

	NPL rate	***Scored loans***	***Non-scored loans***
NPL rate	1		
Scored loans	0.303591856	1	
Non-scored loans	-0.501520779	-0.976522266	1

Source: End of year data compiled from BPR loan portfolio: 2009 to 2014 (MS EXCEL 2013 output)

The table above shows that scored loans and NPL rate have the correlation coefficient of 0.303591856 whereas non-scored loans and NPL rate have the correlation coefficient of -0.501520779. On the other hand, scored loans and non-scored loans have the correlation coefficient of -0.976522266.

The correlation coefficient shows the strength of the association between two variables but does not show the dependence of one to the other. It lies between -1 and +1. The closer the coefficient to -1 or to +1 shows that there is respectively strong negative association (correlation coefficient close to -1) or strong positive association (correlation coefficient close to +1). The correlation near to zero shows that there is no association between variables.

In the table above, this means that there is a weak positive association (0.303591856) between scored loans and NPL rate and a medium negative correlation between non-scored loans and NPL rate (-0.501520779) whereas there is a strong negative correlation between scored loans and scored loans (-0.976522266).

4.1.3.2. Regression analysis

The table below summarizes the regression analysis between the dependent variables (NPL rate) and the independent variables (scored loans and non-scored loans).

Table 4.4. Regression analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999
R Square	0.998
Adjusted R Square	0.997
Standard Error	0.001
Observations	6

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.00370	0.00185	878.728	0.00007
Residual	3	0.00001	0.00000		
Total	5	0.00371			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.010	0.023	43.237	0.00003	0.935	1.084	0.935	1.084
Scored loans	-1.015	0.028	-36.258	0.00005	-1.104	-0.926	-1.104	-0.926
Non-scored loans	-1.010	0.025	-39.940	0.00003	-1.091	-0.930	-1.091	-0.930

RESIDUAL OUTPUT

Observation	*Predicted NPL rate*	*Residuals*
1	0.093	-0.001
2	0.072	0.000
3	0.072	0.000
4	0.070	0.002
5	0.137	0.000
6	0.065	-0.001

Source: End of year data compiled from BPR loan portfolio: 2009 to 2014 (MS EXCEL 2013 output)

The table above helps to analyze the fitness of data and the significance of results.

1. Analysis of fitness of data

Recall that R Square shows the fitness of data. The R Square close to 1 shows that the regression line fits very well the data. In the table above R Square is 0.998 which shows very good fit. This means that 99.8% of the variation in NPL rate is explained by the scored loans and non-scored loans performance.

2. Significance of results

To evaluate the significance of results, we use significance F which must be below 0.05. If it is more than 0.05, the variable with P-value superior to 0.05 should be omitted in the regression analysis. In the table above significance F is 0.00007 and all the variables have respectively 0.00003, 0.00005, 0.00003 of P-Values for respectively intercept, scored loans and non-scored loans. This means that the results are significant and all values must be retained in the regression.

4.2. Hypothesis testing

Referring to the above analysis of regression which has shown that the regression line fits very well the data and that the variables (scored loans and non-scored loans) are significant (with p-values less than 0.05), we conclude the following:

Both the hypotheses we have are confirmed. These hypotheses are:

- **Hypothesis one**: "Scored loans have a significant impact on managing the credit risk of BPR Ltd".
- **Hypothesis two: "**Scored loans have a significant impact on the performance of BPR loan portfolio".

However, even if "scored loans" (as well as non-scored loans) have a significant impact on the performance of BPR Ltd (measured in term of NPL rate), the study has shown that they

have different behavior vis-à-vis the NPL rate. Indeed, the correlation analysis has shown that there is a weak positive association (0.303591856) between scored loans and NPL rate and a medium negative correlation between non-scored loans and NPL rate (-0.501520779). One may conclude that scored loans influence positively the NPL rate.

On the other hand, the coefficients within the regression line are both negative (-1.015 for scored loans and -1.010 for non-scored loans), this means that they both influence negatively the dependent variable (i.e. the NPL rate).

Due to this likely contradiction between the correlation and the regression coefficients, we have analyzed the correlation in the last two years of the period of study (2013 and 2014) because it was during that period that scored loans were important in the BPR loan portfolio (they were about 1/4 of total loans). Indeed, from 2009 to 2011 there were no scored loans and in 2012 scored loans were not significant enough. The correlation analysis of the last two years is as follows:

Table 4.5. Correlation analysis (for 2013 and 2014 data)

	NPL rate	***Scored loans***	***Non-scored loans***
NPL rate	1		
Scored loans	-1	1	
Non-scored loans	-1	1	1

Source: End of year data compiled from BPR loan portfolio: 2013 to 2014 (MS EXCEL 2013 output)

The table above shows that from 2013 to 2014, there is a perfect negative correlation (-1) between scored loans and the NPL rate. As a conclusion, scored loans have negative influence on the NPL rate. The recent data confirm the coefficients of the regression equation.

CHAPTER 5. SUMMARY, CONCLUSION AND SUGGESTIONS

This last chapter summarizes results of findings and draws some suggestions. It also opens a way for further researches on the related topics.

5.1. Summary

This research has been conducted in order to evaluate the impact of the new tool for assessing the credit risk in BPR Ltd: BPR credit scorecards. This has been done through examining the impact of loans analyzed through scorecards (referred to here in this study as scored loans). This tool is new in Rwandan banking industry and BPR Ltd is the sole bank which uses it in Rwanda.

The studies on credit scorecards have been in increase these last few years in international financial literature. Even if some authors and researchers have stated that the scoring models contribute to mitigate the credit risk, there is still some doubts on whether or not this tool is helpful in credit risk management. In this regard, we have been interested with this case of BPR credit scorecards to have our contribution on the use of this tool.

We have used statistical analysis including correlation and multi-regression analysis. We have also used other methods such as comparative methods to analyze data principally from BPR credit databases and reports (secondary data), but also we have made an interview with selected BPR staff in charge of scorecards development. However, we did not manage to contact foreign experts who assist BPR staff in scorecards development.

The findings of our study has shown that, in general, scored loans have less NPL rate when taken alone and when they are compared to the total loan performance. In addition, the study has shown that there is a significant impact of scored loans on BPR loan portfolio performance. The results have also shown that scored loans have had negative influence on NPL rate, this means that they have positive impact on mitigating the credit risk in BPR (of course along with non-scored loans and with other measures taken to reduce the NPL rate).

5.2. Conclusion

The use of scoring models (or scorecards) in credit risk assessment is good. Indeed, apart from several advantages of these models such as speeding up the lending process, eliminating value judgments from credit officers by focusing on objectivity, and so on, this tool can also help in mitigating the credit risk based on the findings of this study. However, it must be updated regularly in order to have good outcome.

5.3. Suggestions

5.3.1. Suggestions to BPR and to Rwandan banking industry

Following this study, we have the following suggestions:

- BPR should examine a way to develop also scorecards for corporate loans;
- This tool (credit scorecards) is suitable for other Rwandan lending institutions (especially MFIs as they generally deal with small loans which are difficult to assess) which have enough means to maintain it, especially IT (information Technology) infrastructure;
- BNR should make an evaluation of this tool on its side and if it is found good BNR should recommend it to other lending institutions in Rwanda.

5.3.2. Suggestions to other researchers

The researches in this area of credit scoring are still few (or even non-existent) in Rwanda. Therefore, I suggest other researchers to be interested with this area of the study. Especially, they should study the following:

- It will be interesting to evaluate the performance of scored loans in BPR compared to the performance of similar loans performance of another bank which does not use the scoring models;

- Any other interested researcher can also make a comparative study of BPR scoring models with other scoring models on the international market (example he/she can use, in comparison, a sample of other banks in Africa that use scoring models).

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APPENDICES

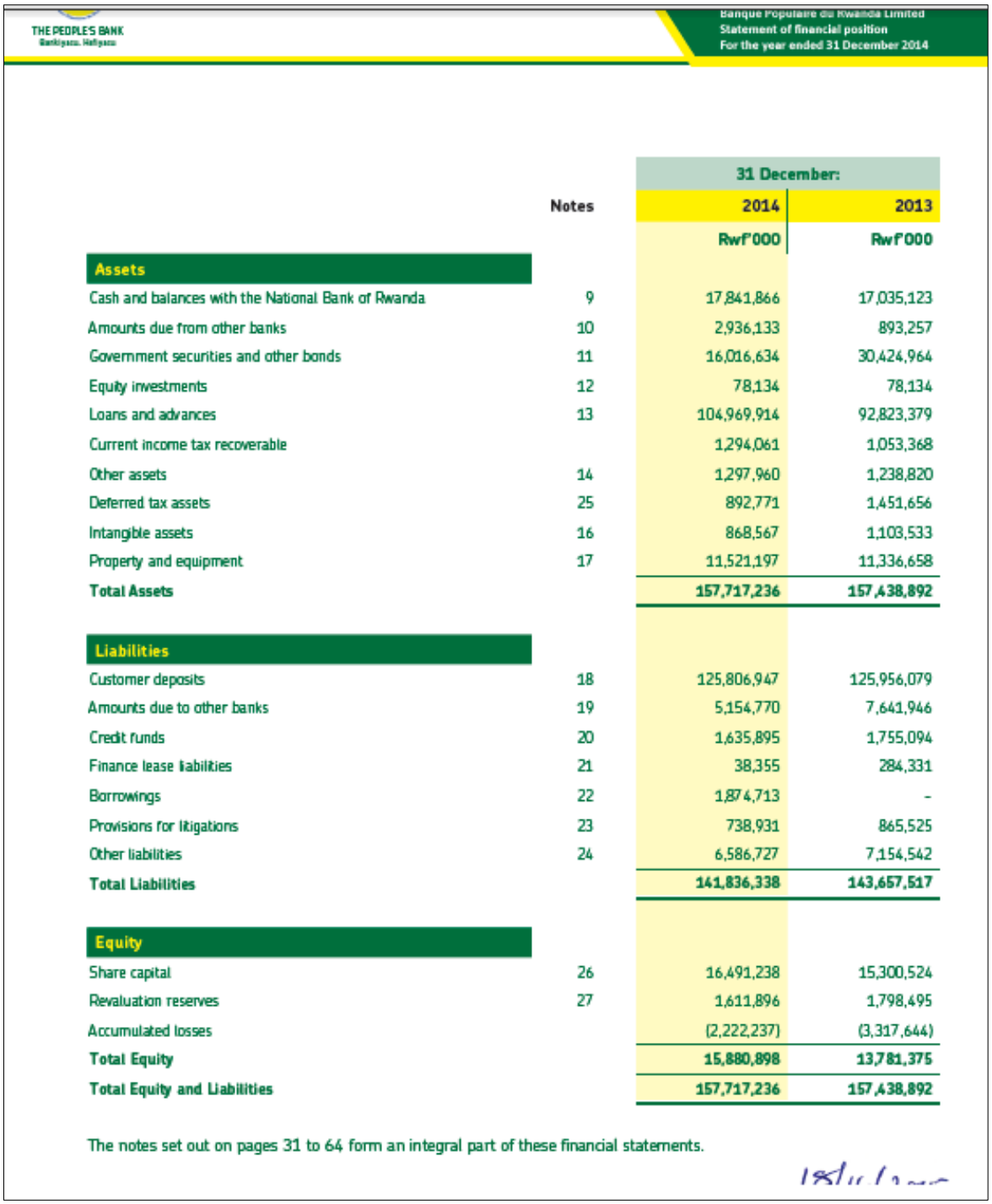
Appendix 1. BPR statement of comprehensive income 2014 and 2013

Banque Populaire du Rwanda Limited
Statement of comprehensive income
For the year ended 31 December 2014

	Notes	Year ended 31 December:	
		2014	2013
		Rwf'000	Rwf'000
Interest income	1	19,544,228	19,989,207
Interest expense	2	(3,574,340)	(3,713,987)
Net interest income		**15,969,888**	**16,275,220**
Fee and commission income	3 (a)	4,362,501	4,482,370
Fee and commission expense	3 (b)	(1,521,428)	(2,009,971)
Net fee and commission income		**2,841,074**	**2,472,399**
Foreign exchange income		375,101	1,093,895
Other operating income	4	734,228	767,933
Total operating income		**19,920,290**	**20,609,447**
Net impairment charge on loans and advances	5	(826,591)	(3,020,617)
Operating expenses	6	(17,626,006)	(24,428,442)
Profit / (loss) before taxation		**1,467,694**	**(6,839,612)**
Income tax (expense)/credit	8	(603,327)	1,628,658
Profit/ (loss) for the year		**864,366**	**(5,210,954)**
Other comprehensive income (net of tax):			
Items that will not be reclassified to profit or loss			
Deferred income tax credit on revaluation of buildings		44,442	44,442
Total comprehensive income for the year		**908,808**	**(5,166,512)**

Source: adapted from BPR Annual Report and Financial Statements 2014, p. 26

Appendix 2. BPR statement of financial position 2014 and 2013



THE PEOPLE'S BANK
Banque Populaire du Rwanda Limited
Statement of financial position
For the year ended 31 December 2014

	Notes	31 December: 2014 Rwf'000	2013 Rwf'000
Assets			
Cash and balances with the National Bank of Rwanda	9	17,841,866	17,035,123
Amounts due from other banks	10	2,936,133	893,257
Government securities and other bonds	11	16,016,634	30,424,964
Equity investments	12	78,134	78,134
Loans and advances	13	104,969,914	92,823,379
Current income tax recoverable		1,294,061	1,053,368
Other assets	14	1,297,960	1,238,820
Deferred tax assets	25	892,771	1,451,656
Intangible assets	16	868,567	1,103,533
Property and equipment	17	11,521,197	11,336,658
Total Assets		**157,717,236**	**157,438,892**
Liabilities			
Customer deposits	18	125,806,947	125,956,079
Amounts due to other banks	19	5,154,770	7,641,946
Credit funds	20	1,635,895	1,755,094
Finance lease liabilities	21	38,355	284,331
Borrowings	22	1,874,713	-
Provisions for litigations	23	738,931	865,525
Other liabilities	24	6,586,727	7,154,542
Total Liabilities		**141,836,338**	**143,657,517**
Equity			
Share capital	26	16,491,238	15,300,524
Revaluation reserves	27	1,611,896	1,798,495
Accumulated losses		(2,222,237)	(3,317,644)
Total Equity		**15,880,898**	**13,781,375**
Total Equity and Liabilities		**157,717,236**	**157,438,892**

The notes set out on pages 31 to 64 form an integral part of these financial statements.

Source: adapted from BPR Annual Report and Financial Statements 2014, p. 27.

Appendix 3. BPR statement of financial position 2012 and 2011

Banque Populaire du Rwanda Limited
Statement of Financial Position as at 31 December 2012

ASSETS	Note	2012 Frw'000	2011 Frw'000
Cash in hand		6,093,048	4,844,806
Balances with the National Bank of Rwanda	4	8,231,366	5,510,688
Due from banks	5	4,403,821	7,616,259
Held to maturity	6	13,405,351	25,491,005
Available for sale equity Investments	7	78,134	2,314
Loans and advances to customers	8	115,767,549	97,642,718
Property and equipment	9	11,060,652	9,878,660
Intangible assets	10	342,627	258,715
Deferred tax	11	804,308	575,794
Other assets	12	2,565,374	3,940,101
Tax receivable		404,088	502,550
Total Assets		163,156,318	156,263,610
LIABILITIES			
Deposit from banks	13	9,413,780	7,142,154
Deposit from customers	14	122,251,297	122,146,405
Credit Fund	15	1,969,286	1,890,514
Other liabilities	16	8,665,376	4,144,475
Tax payable		332,627	-
Total Liabilities		142,632,366	135,323,548
EQUITY			
Share capital	17	15,300,524	15,300,524
Reserves	18	5,223,428	5,639,538
Total Equity		20,523,952	20,940,062
Total Liabilities And Equity		163,156,318	156,263,610

The financial statements set out on pages 33 to 71 were approved by the Board of Directors on 23/10/2013

Source: adapted from BPR Annual Report 2012, p. 33.

Appendix 4. BPR statement of comprehensive income 2012 and 2011

Banque Populaire du Rwanda Limited
Statement of Comprehensive Income
For the year ended 31 december 2012

	Note	2012 Frw'000	2011 Frw'000
OPERATING INCOME			
Interest income	19 (a)	22,574,358	17,447,384
Interest expenses	19 (b)	(2,781,994)	(937,752)
Net interest income		**19,792,364**	**16,509,632**
Commission income	20 (a)	4,606,148	3,327,283
Commission expense	20 (b)	(1,412,665)	(1,073,959)
Net commission income		**3,193,483**	**2,253,324**
Other operating income	21	3,416,310	3,763,632
Total operating income		**26,402,157**	**22,526,588**
Net Provisions for bad and doubtful debts	8 (c)	(1,294,778)	(1,105,584)
OPERATING EXPENSES			
Personnel expenses	22	(11,030,189)	(9,952,354)
Depreciation of property and equipment	9	(1,389,369)	(1,338,466)
Amortization of intangible assets	10	(239,274)	(533,302)
Other operating expenses	23	(12,380,064)	(7,486,677)
Total operating expenses		**(26,333,674)**	**(19,310,799)**
Profit before taxation		**68,483**	**2,110,205**
Income tax expense	24	(484,593)	(467,616)
Profit/(Loss) for the year		**(416,110)**	**1,642,589**
Other comprehensive income		-	-
Total comprehensive income for the year		**(416,110)**	**1,642,589**

Source: adapted from BPR Annual Report 2012, p. 34.

Appendix 5. BPR statement of financial position 2011 and 2010

STATEMENT OF FINANCIAL POSITION AS AT 31 DECEMBER 2011

ASSETS	NOTE	2011 FRW'000	2010 FRW'000
Cash in hand		4,844,806	3,221,747
Balances with the National Bank of Rwanda	4	5,510,688	4,220,293
Due from banks	5	7,616,259	26,149,090
Held to maturity	6	25,491,005	14,031,786
Equity Investments	7	2,314	2,314
Loans and advances to customers	8	97,642,718	78,158,660
Property and equipment	9	9,878,660	9,354,028
Intangible assets	10	258,715	274,587
Deferred tax	11	575,794	575,794
Other assets	12	3,940,101	1,744,411
Tax receivable		502,550	315,405
TOTAL ASSETS		**156,263,610**	**138,048,115**
LIABILITIES			
Deposit from banks	13	7,142,154	5,368,546
Deposit from customers	14	122,146,405	103,413,409
Credit Fund	15	1,890,514	1,960,971
Other liabilities	16	4,144,475	7,443,592
Tax payable		-	503,017
TOTAL LIABILITIES		**135,323,548**	**118,689,535**
EQUITY			
Share capital	17	15,300,524	14,765,843
Reserves	18	5,639,538	4,592,737
TOTAL EQUITY		**20,940,062**	**19,358,580**
TOTAL LIABILITIES AND EQUITY		**156,263,610**	**138,048,115**

The financial statements were approved by the Board of Directors on 8/5/2012 and signed on its behalf by:

Director: Director:

Source: adapted from BPR Annual Report 2011, p. 29.

Appendix 6. BPR statement of comprehensive income 2011 and 2010

STATEMENT OF COMPREHENSIVE INCOME FOR THE YEAR ENDED 31 DECEMBER 2011

OPERATING INCOME	NOTE	2011 FRW'000	2010 FRW'000
Interest income		17,447,384	13,926,518
Interest expenses		(937,752)	(716,201)
Net interest income	**19**	**16,509,632**	**13,210,317**
Commission income		3,327,283	1,280,502
Commission expense		(1,073,959)	(365,860)
Net commission income	**20**	**2,253,324**	**914,642**
Other operating income	21	3,763,632	5,273,184
Total operating income		**22,526,588**	**19,398,143**
Provisions for bad and doubtful debts	8 (c)	(1,105,584)	(136,069)
OPERATING EXPENSES			
Personnel expenses	22	(9,952,354)	(7,199,950)
Depreciation of property and equipment	9	(1,338,466)	(1,095,082)
Amortization of intangible assets	10	(533,302)	(589,343)
Other operating expenses	23	(7,486,677)	(8,094,827)
Total operating expenses		**(19,310,799)**	**(16,979,202)**
Profit before taxation		2,110,205	2,282,872
Tax expenses	24	(467,616)	(1,060,743)
Profit for the year		**1,642,589**	**1,222,129**
Other comprehensive income:			
Revaluation of property and equipment		-	2,962,826
Other comprehensive income for the year, net of tax		-	2,962,826
Total comprehensive income for the year		**1,642,589**	**4,184,955**

The notes set out on pages 33 to 58 are an integral part of these financial statements.

Source: adapted from BPR Annual Report 2011, p. 30.

Appendix 7. BPR statement of financial position 2009 and 2008

BANQUE POPULAIRE DU RWANDA SA
STATEMENT OF FINANCIAL POSITION
AS AT 31 DECEMBER 2009

		2009	2008
ASSETS	**Note**	**Frw'000**	**Frw'000**
Cash in hand		3,057,776	2,010,309
Balances with the National Bank of Rwanda	4	4,665,357	7,482,652
Due from banks and other financial institutions	5	14,147,822	4,388,745
Financial investments – held-to-maturity	6	10,552,017	945,980
Financial investments –available-for-sale	7	2,314	2,314
Loans and advances to customers	8	68,527,957	82,877,982
Inventories		292,983	477,776
Tax receivable	9	603,561	-
Deferred tax asset	9	585,542	220,386
Intangible assets	10	320,852	127,993
Property and equipment	11	5,740,990	4,752,571
Other receivables	12	1,155,152	1,608,785
TOTAL ASSETS		**109,652,323**	**104,895,493**
LIABILITIES			
Due to banks and other financial institutions	13	1,684,092	2,805,330
Customer deposits	14	86,173,753	77,600,156
Credit fund	15	2,062,473	2,459,631
Tax payable	9	-	840,187
Other payables	16	4,558,380	4,902,385
TOTAL LIABILITIES		**94,478,698**	**88,607,689**
EQUITY			
Share capital	17	14,765,843	14,756,836
Reserves	18	407,782	1,530,968
TOTAL EQUITY		**15,173,625**	**16,287,804**
TOTAL LIABILITIES AND EQUITY		**109,652,323**	**104,895,493**

The financial statements were approved by the Board of Directors on 7th July,...2010 and signed on its behalf by:

MD /) Director

Source: adapted from BPR Annual Report 2009, p. 27.

Appendix 8: BPR statement of comprehensive income 2009 and 2008

BANQUE POPULAIRE DU RWANDA SA
STATEMENT OF COMPREHENSIVE INCOME
FOR THE YEAR ENDED 31 DECEMBER 2009

		2009	2008
OPERATING INCOME	**Note**	**Frw'000**	**Frw'000**
Interest and similar income	19	12,447,531	11,568,832
Interest and similar expenses		(513,713)	(324,681)
Net interest income		11,933,818	11,244,151
Net fee and commission income	20	703,009	1,253,464
Other income	21	3,107,590	2,300,136
Total operating income		**15,744,417**	**14,797,751**
Allowance for impairment losses	22	(3,932,553)	(1,418,752)
Net operating income		11,811,864	13,378,999
OPERATING EXPENSES			
Personnel expenses	23	5,740,089	4,800,509
Depreciation of property and equipment		1,031,379	1,042,819
Amortization of intangible assets		445,697	127,993
Other operating expenses	24	5,831,175	4,921,687
Total operating expenses		**13,048,340**	**10,893,008**
(Loss)/profit before tax		(1,236,476)	2,485,991
Income tax expense	9	113,290	(955,023)
(Loss)/profit for the year		(1,123,186)	1,530,968
Other comprehensive income for the year, net of taxes		-	-
Total comprehensive (loss)/income for the year, net of tax		**(1,123,186)**	**1,530,968**

Source: adapted from BPR Annual Report 2009, p. 28.

Appendix 9. THE INTERVIEW GUIDE

1. Description of the role of credit scorecards in BPR.
2. The opinions on whether or not BPR scorecards are considered as a tool for credit risk management.
3. The experience with BPR scorecards on their effect on BPR loan portfolio performance.
4. The views on the adoption of credit scorecards by BNR in order to recommend them to all banks and lending institutions for credit risk assessment.
5. Some recommendations on the use of credit scorecards to BPR and/or to anyone else interested in scorecards.

Thank you