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CREDIT RISK ASSESSMENT OF COMMERCIAL BANKS IN THE DEMOCRATIC REPUBLIC OF CONGO

EVALUATION DE RISQUE DE CREDIT DES BANQUES COMMERCIALES EN REPUBLIQUE DEMOCCRATIQUE DU CONGO

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SUMMARY

The normal functioning of any company involves interactions with financial institutions. Thus, they often resort to external financing, mainly the bank. In reality, the bank is not totally assured of being reimbursed for any credit granted. It finds itself in various situations, either the credit contracted is not repaid, or it is only partially repaid, or it is not repaid on time. It is this non-payment that is known as credit risk, which is much more random, significant and poorly handled, leading several banks to default. Given that, in the business of commercial banks, the granting of loans is the main activity on the one hand and the non-repayment of these loans being the main risk incurred on the other hand, in this article the objective is to calculate the default rate (TD) and the financial risk of banks by statistical techniques, in particular the coefficients of variation (CV) of the profitability of capital. On a sample of 7 banks, the result shows that the commercial banks established in the Democratic Republic of Congo (DRC) run enormous financial risks which can lead them to bankruptcy.

Key words: default; risk; portfolio; information asymmetry; bank.

RESUME

Le fonctionnement normal de toute entreprise implique des interactions avec des institutions financières. Ainsi, elles font souvent recours au financement externe principalement la banque. En réalité, la banque n'est pas totalement assurée de se faire rembourser pour tout crédit octroyé. Elle se retrouve dans des situations diverses, soit le crédit contracté n'est pas remboursé, soit il n'est remboursé que partiellement, soit il n'est pas remboursé à temps. C'est ce défaut de paiement que l'on appelle risque de crédit, celui-ci est beaucoup plus aléatoire, important, mal traité conduisant plusieurs banques à la défaillance. Etant donné que, dans le métier des banques commerciales l'octroi des crédits est l'activité principale d'une part et le non remboursement de ces crédits étant le principal risque encouru d'autre part, dans cet article l'objectif est de calculer le taux de défaut (TD) et le risque financier des banques par les techniques statistiques notamment les coefficients de variation (CV) de la rentabilité des capitaux. Sur un échantillon de 7 banques, le résultat montre que les banques commerciales implantées en République Démocratique du Congo (RDC) courent des risques financiers énormes qui peuvent les conduire à la faillite.

Mots clés : défaillance ; risque ; portefeuille ; asymétrie de l'information ; banque.

INTRODUCTION

Everyone has their own view of risk. Risk is frequently defined as an unforeseen event or set of conditions that significantly reduces the ability of managers to carry out the envisaged business strategy (DARSA, J.-D. and DUFOUR, N., 2014:24). This approach is reassuring for some (managers) but not necessarily for all.

In finance, risk becomes an uncertainty about the future value of a present, current datum (financial asset) which is identified with a probability of monetary loss affecting the wealth of a man or an institution. This probability is a quantifiable uncertainty (DARSA, J.-D. and DUFOUR, N., 2014:24).

Often, risk and uncertainty are two notions that are frequently confused. A situation of choice in an uncertain future is a risk situation when it is possible to associate a probability distribution of outcomes with each strategy. On the other hand, a situation of uncertainty exists when the decision-maker is unable to establish such distributions. This dichotomy allows the criterion of maximisation of utility expectation to correspond to a situation of risk, and that of statistical decision theory to a situation of uncertainty (GILLES, P., 1992: 3).

Thus, financial risk is a function of exchange rates, interest rates and commodity prices. To these can be added the activity or business or operational risk, which is inseparable from fluctuations in future financial results following decisions taken by companies and the economic situation in which they operate. Both types of risk exposure can influence the value of the company (MSEDDI, S., 2008: 2).

The foundation of the banking business is risk management. These risks arise mainly from the relationship between the borrowers and the bank. This relationship is characterised by information asymmetry and major uncertainty regarding the harmful behaviour of borrowers towards the bank. This behaviour is materialised by the logic of insolvency. Hence, the emergence of banking risk (HERTOUCH A. & ACHIBANE M. 2020).

Default risk is defined as a loss linked to a loan operation summarised by two types of events: on the one hand, losses due to the default of the counterparty and, on the other hand, losses due to credit deterioration (deterioration of the credit or signature quality of the issuer). Counterparty default risk is the uncertainty about the ability of an economic agent to honour its debts and commitments (payment of interest and/or principal).

The financial crisis of 2007-2008 was the basis for credit risk. This crisis was marked by a liquidity and solvency crisis for both banks and governments, and a shortage of credit for

businesses. It began in July 2007 and was triggered by the deflation of price bubbles (including the American real estate bubble of the 2000s) and the major losses of financial institutions caused by the subprime crisis. The financial crisis of autumn 2008 amplified the movement and caused a fall in stock market prices and the bankruptcy of several financial institutions.

The DRC was already affected by this situation at the beginning of the 2000s, when a number of banking institutions went bankrupt and none of the funds deposited were reimbursed or compensated to savers. This is notably the case of the Banque Congolaise (BC) liquidated in 2011, the Banque de commerce et de développement (BCD), the Banque à la confiance d'or (BANCOR), the Union Zaïroise des Banques (UZB) and the Banque Zaïroise de commerce Extérieur (BZCE). In the same batch were also grouped many initiatives of remuneration of deposits at PONZI such as those of Bindo, Masamuna, Madova (MUADIMANGA ILUNGA, E., 2016: 17). These cases are close to swindling.

Today, with the deep dysfunctions of financial institutions, monetary reforms, the persistent shortage of banknotes, the permanent loss of the value of the national currency, the gap in parity between the street exchange rate and those of the banks' indicative rates, and the promises of remuneration of deposits at unrealistic rates, these push us to make a profound study of financial risk.

In 2010, the DRC had 21 commercial banks, in June 2014 the number was reduced to 18 (annual report of the Central Bank of Congo), and currently to 15. In other words, banking risk in the DRC is not covered by a secure prudential system. This is due to the absence of institutions specialised in rating banks.

Several types of risk can affect a credit institution, including market risk, default risk, liquidity risk and operational risk. However, default risk is the first, most lethal and current risk faced by a financial institution and by nature quantifiable. While the quantification of risks is often a difficult exercise, in the case of finance it is precisely through quantification that this risk is addressed and the assessment of its impact is therefore immediate (TULLIO TANZI, and D'ARGENLIEU, P., 2013: 48). This is why in this essay the financial risk will be more developed, as it is much more random, poorly treated in banks.

Generally, Congolese banks, when making a decision to grant credit, face a main problem of determining exactly whether the client will honour his debts or not. This decision is based on the prior assessment of the credit manager. The credit manager, based on his or her experience, repayment history and assessment of the client's creditworthiness, is able to intuitively

distinguish the "bad" client from the "good" one, before presenting the file to the credit committee. However, this assessment based on the banker's subjectivity is not always effective and has a certain twist. In doing so, the assessment of counterparty risk leads to the use of a number of qualitative and quantitative methods.

Indeed, a viable bank is one that achieves a very high repayment rate for the loans granted. Thus, the insolvency of borrowers confirms the need to anticipate their default in order to ensure the protection of creditors. Customer default situations are detrimental to creditors as well as to stakeholders, who in turn risk defaulting. In this study, we propose two quantitative analysis tools to assess the client's insolvency risk profile in an objective way through the examination of historical data focusing on financial ratios.

To achieve this, two questions are asked in this paper: How high is the default rate of banks? And how much financial risk do the banks under analysis run?

To answer these two questions, we hypothesize that: more than half of the banks under analysis would be in an uncontrollable threshold, i.e. their default rates would be higher than 5%; and the financial risk would be important once the realized losses become higher than the equity.

The key to this work is to calculate the default rate and to estimate the financial risk using statistical techniques, in particular the coefficients of variation of the return on capital.

In this article five points will be discussed: overview of banks in DR Congo, theories of reference to the study of risk, financial risk, methodological approach and results applicable to Congolese banks.

1. Overview of banks in DR Congo

According to the statistics of the Central Bank of Congo (BCC) of 30 January 2020, the country currently has 15 commercial banks. The term "commercial banks" covers institutions with different statuses, including mutual banks, cooperative sector banks, etc. These banks are known as "network banks". These are the so-called "network" banks, which have traditionally developed through the establishment of a large network of branches. These institutions belong to the retail banking sector: the loans granted, the savings products subscribed to and the assets managed are very varied (ALEXANDRE, H., 2013: 11).

Thus, a commercial bank is defined as a credit institution whose main business is oriented towards individuals (deposits of funds and granting of credit), companies or public authorities. They may be physical (branches, distributors) or virtual (online or remote presence only). Their

capital is held by shareholders who are not necessarily clients (http://financedemarche.fr/definition/banque-commerciale, Accessed 25 December 2019).

In the DRC, financial service providers are heavily concentrated in Kinshasa, Goma, Bukavu and Central Kongo. Some banks have also opened branches in other major cities in the country such as Lubumbashi, Kisangani, Mbuji Mayi and Kananga. The sector is dominated by private initiatives. Individual credit is the most common approach used by borrowers. In doing so, Table 1 presents a list of operational commercial banks in the DRC.

Table 1. Commercial banks operating in the DRC

Number	Bank	Date of creation	City	Swift code
1	ACCESS BANK CONGO DR	2006	KINSHASA	ABNGCDKI
2	ADVANS BANQUE CONGO	2008	KINSHASA	ADVBCDKX
3	AFRILAND FIRST BANK –RDC	2005	KINSHASA	AFCDCDKI
4	BANK OF AFRICA-RDC	2010	KINSHASA	AFRICDKS
5	BANQUE COMMERCIALE DU CONGO	1909	KINSHASA	BCDCCDKI
6	BGFIBANK RDC	2010	KINSHASA	BGFICDKI
7	CITIBANK CONGO	1971	KINSHASA	CITICDKX
8	ECOBANK SA	2008	KINSHASA	ECOCCDKI
9	FBNBANK DRC SA	2015	KINSHASA	BICDCDKI
10	PROCREDIT BANK CONGO SA	2004	KINSHASA	PRCBCDKI
11	RAWBANK SA	2002	KINSHASA	RAWBCDKI
12	SOFIBANQUE SA	2008	KINSHASA	SFBXCDKI
13	STANDARD BANK RDC SA	1973	KINSHASA	SBICCDKX
14	TRUST MERCHANT BANK SARL	2004	LUBUMBASHI	TRMSCD3K
15	UNITED BANK FOR AFRICA RDC SARL	2010	KINSHASA	UNAFCDKS

Source: https//informagenie.com/2707/liste-de-banques-et-leurs-codes-swift-en-rdc, accessed on 07 December 2019.

After the bankruptcy and liquidation of FIBANK in 2017, the placing under supervision of BIAC in 2015 by the BCC and the observed cessation of activities of the international bank BYBLOS in 2018, fifteen (15) commercial banks are now operational on Congolese territory. Among them: three (3) are international (ADVANS BANK, CITIGROUP and STANDARD BANK) they represent 20% of the Congolese market; four (4) are local (BCDC, RAWBANK, SOFIBANQUE and TMB) they represent 27% and eight (8) are pan-African (ACCESS BANK,

AFRILAND FB, BGFI BANK, BOA CONGO, ECOBANK, FBNBANK, UBA and EQUITY BANK)

Under the umbrella of the BCC, all these commercial institutions are deposit banks, authorised to collect savings and grant credit. Some are specialised for low-income clients such as: ADVANS BANK, ACCESS BANK, EQUITY BANK, TRUST MERCHANT BANK etc. Others are linked to financial messengers such as SOFICOM, specialised in money transfer and EQUITY BANK with the Cash Express network through the local (Procard) or international (Visa, Master Card, China Union Pay...) card can make deposits (with or without card) or withdrawals at approved shops. The remainder of the so-called business banks are oriented towards investment operations, regardless of their spatial distribution. The sector suffers from a chronic fragility that has led two commercial banks (BIAC and Fibank) to close down.

Among these banks established in DR Congo, 10 best banks are selected by taking into account six (6) indicators: total assets, receivables from customers, customer deposits, equity, net banking income, net result.

Table 2. Top 10 banks in DR Congo in billion Congolese francs

N°	Bank	TOTAL ASSETS	LOANS TO CUSTOMERS	CUSTOMER DEPOSITS	SHAREHOLDERS' EQUITY	NET BANKING INCOME	NET INCOME
1	Rawbank	2 183	680	1 486	170	162	9.39
2	BCDC	1 124	449	772	144	113	13.21
3	TMB	1 019	332	851	120	85	12.19
4	Equity Bank	651	331	503	80	68	4.41
5	Ecobank	603	205	488	48	55	12.42
6	FBN	560	157	434	23	55	8.37
7	BGFI	455	178	290	39	36	11.12
8	Standard Bank	453	78	295	67	34	13.84
9	BOA	328	194	187	32	28	6.10
10	SofiBanque	227	124	135	74	41	9.50

Source: http://magazinekivuzik.com/les-10-meilleures-banques-en-rdc/, Accessed, 08 December 2019.

Despite the fact that the number of active bank accounts with financial institutions has quadrupled in the space of eight years, from 1,547,120 accounts in 2011 to 6,663,259 accounts in 2019 (MUTOMBO, D., 2018), the sector remains under-banked for nearly 70,000,000 inhabitants, i.e. the active population. Certain facts impact on operational risks, including the

inadequacy and marginalisation of credit institutions; the poverty of financial services; excessive pricing; the limited number of specialised training institutions in banking techniques and management; the absence of local private bank rating institutions ; the exaggeration of informality; the crisis of confidence; the high volatility of prices and the omnipresent dollarisation of services ; Inappropriate pricing; credit management ; risk aversion; cumbersome response to complaints; decline in the export products sector; self-sufficiency of staff masking approximate knowledge or training in the business; and the general non-existence of procedure manuals or job descriptions.

At the internal and functional levels, several banks have happily lightened the conditions for opening and managing accounts. The initial deposit has been reduced to around USD 100 or nothing at all; systematic sponsorship has been introduced; the formalities for accessing credit have been eased; and account management fees have been waived for certain categories. (MUADIMANGA ILUNGA, E., 2016: 56-62)

Thus, it is important at point 2 to define the theoretical anchorage of this concept of financial risk in order to determine the theories to which researchers refer for the analyses.

2. Theories of reference to the study of risk

Two main theories are used as reference for the study of financial risk: portfolio theory and the theory of information asymmetry.

2.1. Portfolio theory

The modern portfolio theory was developed by MARKOWITZ in 1952 with the publication of Harry Markowitz's seminal article which won him the Nobel Prize in Economics in 1990. According to this theory, the decision to invest in a financial asset depends essentially on the profitability/risk ratio of this asset. In other words, the theory examines the relationship between the return on individual securities and their risk (MATUMUENI NSONA , J., 2021 :40)

Based on the postulate that the risk of a portfolio can be correctly examined by the profitability-risk relationship, Markowitz makes explicit and formalises the fundamental dilemma of modern finance: obtain a low but certain profitability, or accept to take a risk in the hope of increasing this profitability, the expectation of profitability being all the higher as the risk is important (BARNETO, P. and GREGORIO, G., 2009: 50).

Thus, the return expected by an individual holding a financial security is measured by the return on this security, the standard deviation or variance of which is the appropriate measure of risk.

Similarly, the expected return of an individual holding the diversified portfolio is measured by the return of this portfolio whose standard deviation is the appropriate measure of risk (LUMONANSONI- MAKWALA, F., 2017: 25-26). In accounting, the measure of risk is expressed by the constitution of provisions (LUMONANSONI- MAKWALA, F., 2014: 13-14).

2.2. Asymmetric information theory

The risk for a bank is based on the fundamental asymmetry of granting credit, i.e. taking out the money today, and not being repaid tomorrow.

Information asymmetry is the main obstacle identified in the business of commercial banks, it occurs at three levels, before credit is granted, during the granting of credit and at the time of credit repayment (VUJISIC, M., (2007:1).

The risk arises when the creditor never has perfect information about the situation of his client and what he will really do with his money (LELART, M. 2016, quoted by ESSOMBA AMBASSA, C. et al 2013: 3).

In the relationship between creditor and debtor, the information problem appears before the project is completed, i.e. before the credit file is signed. It does not allow the creditor to know the exact repayment capacity of his client (CIELPY, S. and GRANDINE, M. 2000: 1). In other words, it is a problem that arises when the borrower retains an informational advantage over his partner, even after careful examination of the available information by the lender (NDIAYE, G.-S., 2008: 91). It is the inability of lenders to distinguish between borrowers of different degrees of risk (GHOSH, et al., 2008:3).

In order to limit this informational asymmetry and to reduce the risk of loan default, the banker is required to conduct a study of the borrower's environment and a sound financial analysis when deciding whether or not to grant credit. Indeed, there are several ways to approach the risk as shown in point 3.

3. Financial risk

Risk is a broad concept that is difficult to define, as different authors have different views on its definition. And every organisation is confronted with a multitude of heterogeneous risks. There are several risks that threaten, on a daily basis, companies, 365 risks for 365 days (DARSA, J.- D., 2014: 8).

For each sector of activity there is a specific bundle of risks that may affect the banks operating in that sector in their own specific way. And, for each bank in the same sector of activity, the spectrum of risks to be covered will be specific to its history, size, age, organisation, mode of operation, management, the vision of its management team, the individual profile of each of its employees... Similarly, each company, each manager, each player in any organisation has, by its very nature, a specific risk profile, built according to its knowledge, experience, vision, seniority in the company, psychological profile, age, professional maturity, appetite or aversion to risk, individual sensitivity to the issues at stake, the impact of its decision-making capacity, accountability, mobilisation, feedback, etc. (DARSA, J. - D., 2014 : 44).

Counterparty risk, otherwise known as solvency risk for traders, is the risk of loss on a debt. It is characterised by three indicators: the amount of the debt, the probability of default and the proportion of the debt that will be recovered in case of default (VERNIMMEN, P., 2002: 1056). It concerns: default risk; inflation risk (the risk of being repaid in a depreciated currency, of obtaining a rate of return lower than the inflation rate); and downgrading risk.

For the bank, it is defined as the risk that a borrower will not repay all or part of his loan on the due dates stipulated in the contract signed between him and the lending institution (Association d'Économie Politique: 2).

The distribution function of the random variable net profit depends on the amount of interest to be paid. The latter, in turn, is a function of the firm's financial structure or leverage or debt, assuming total assets are constant. This is ultimately the financial risk (LUMONANSONI MAKWALA, F., 2014:108).

The financial risk to which the bank is subject is perceived above all by the default risk (probability that the debtor will not respect his obligations). This is based on two uncertainties: the assessment of a debtor's default and the amount that it will be possible to recover in the event of default.

Default occurs when the company can no longer meet its obligations to its creditors. There are two possible outcomes to such an event: either the company can renegotiate the terms of its commitments with its creditors (rescheduling of payments, reduction of interest rates, etc.), or the company cannot do so, in which case it is declared bankrupt.

Once the company is declared bankrupt, two situations are again possible: receivership and judicial liquidation. Reorganisation allows the company to survive while clearing its liabilities and rescheduling the debt with the agreement of the creditors. The purpose of judicial

liquidation is to realise the company's assets in order to repay the creditors. The bankruptcy or default of a debtor can significantly affect the profitability of creditors, but more importantly the default can jeopardise their solvency. As debtors of their depositors, banks in turn risk default (CHARBONNEAU, A., 2013-2014: 35). For banks, the probability of failure is significantly affected by their level of indebtedness to the central bank (POWO FOSSO, B., 2000: 32).

Thus, the main internal factors of bank failure are respectively: excess credit risk and poor governance. Excess risk is the major cause of bank failure. Poor management and control of credit risk leads to excess risk at the bank level. This is the result of a credit decision that generates the risk of a large default of the bank in relation to the objectives of its stakeholders. (GOGLEWSKI, C., 2003: 2)

The notion of default of an organisation does not only concern the non-payment of its coupons or principal, let us note that the credit risk is expressed according to three parameters (BENOIT GARNIER, 2013: 29-30): the probability of default of a counterparty which is the probability that this counterparty will default at a given period of time; the exposure to default; and the loss in case of default which corresponds to the amount of the debt that could not be recovered.

In fact, the distribution function of the random variable net profit depends on the amount of interest payable. The latter, in turn, is a function of the firm's financial structure or leverage or debt at constant total assets. This is ultimately the financial risk. The expression of the effect of leverage makes it possible to study the distribution of the return on assets and the return on equity. It shows the relationship between the rate of return on assets and the rate of return on equity. A company that makes successive deficits is not bankrupt. This is because it is able to obtain loans, subsidies or even short-term aid. If the return on invested capital is equal to -100%, the bankruptcy will cause the shareholders or owners to suffer a loss equal to their stake. Thus, there is a methodological framework to best assess the credit risk of banks.

4. Methodological framework

Our study focuses only on commercial banks operating in the DRC over a seven-year period from 2011 to 2017. To constitute our sample, firstly we selected the banks according to the ranking of the ten best banks established in the DRC in Table 2 and secondly the reasoned choice or empirical sample. For the reasoned choice method, when we wish to constitute a representative sample of the population we wish to study, it is advisable to have a minimum

sample equivalent to 30% of the population. And we took the option of going beyond 30%, i.e. to 70%, i.e. 7 banks among the 10 best in the country.

In terms of methodology, we relied on the documentary technique for data collection. The annual reports of the banks (financial statements) allowed us to collect the following data: loans granted, outstanding loans to determine the default rate as summarised in Table 6 on the one hand, and balance sheet totals, profits, equity, operating results before interest and taxes to calculate the coefficient of variation in Table 8 on the other hand.

To determine the failure of companies, we always start from three criteria: the legal process of bankruptcy, the failure to pay and the level of risk. In this article, we have used the last two criteria (the default rate to verify the criterion of payment default and the coefficient of variation to examine the level of risk), as these are the indicators most commonly used in the study of bank credit risk. This justifies our methodological choice.

Various parameters can characterise a probability distribution. The mean and standard deviation are generally sufficient to determine the level of risk when the probability distributions chosen are normal. The operational risk of a company whose amount amounts to the Total Assets (AT), will be characterised by the mean $\bar{re}$ and standard deviation σ_{re}. The study of this risk focuses on the probability distribution associated with the financial profitability (ρ or rf) as well as the economic return (re).

The distribution of re has the following parameters (LUMONANSONI-MAKWALA , F., 2016: 117-121):

$\bar{r}$: $\frac{Operating\ profit\ before\ interest\ and\ tax}{AT}$, and

$\sigma_{re} = \frac{\sigma_{Operating\ profit\ before\ interest\ and\ tax}}{AT}$

The distribution of ρ gives the following parameters:

$\bar{\rho} = [\overline{re} + \lambda(\overline{re} - b)](1 - T_S)$ and

$\sigma_\rho = \sigma_{re}(1 + \boldsymbol{\lambda})(\mathbf{1} - \boldsymbol{T_S})$

where b: interest ; CP: equity ; re : economic return ; ρ : the financial return; $\bar{re}$: average economic return ; σ_{re} : standard deviation ; Ts : tax rate; $\boldsymbol{\lambda}$: characteristic ratio of the financial structure which is obtained by B/CP or B/(AT-B) ;

The probability of bankruptcy is the probability that in the period. The fact of having less than a certain critical value, in the probabilistic future, means that the firm is not able to pay the interest b on the debt B and does not benefit from possibilities of short-term financial assistance. The probability of ruin (PR), which is characterised by the coefficient of variation $\frac{\sigma_\rho}{\overline{\rho}}$, is both an increasing function of $\boldsymbol{\lambda}$ and a key element in assessing financial risk. When P follows a normal distribution, P(R) is an increasing function of the coefficient of variation $\sigma_\rho / \overline{\rho}$. We therefore obtain this ratio:

$$\frac{\sigma_\rho}{\overline{\rho}} = \frac{\sigma_{re}(1+\lambda)}{\overline{re}+\lambda(\overline{re}-b)}.$$

The financial risk is defined by the ratio:$\frac{\sigma_\rho}{\overline{\rho}}$. All these formulas are demonstrated in Section 5.

5. Results of the study

These are the results of the calculation of the default rate and the calculation of the credit risk using the coefficient of variation method.

5.1. Calculation of the default rate of banks (MATUMUENI NSONA, J. , 2022).

The default rate is determined by the ratio between doubtful loans and gross loans

Given that the banks under analysis operate in an economic environment influenced by inflationary effects, it seemed imperative to deflate the raw data using the deflator coefficients determined in table 3.

Table 3. Determination of the deflator coefficient

Years / Elements	2011	2012	2013	2014	2015	2016	2017
Average exchange rate in the base year (1)	919,49	919,49	919,49	919,49	919,49	919,49	919,49
Average exchange rate (2)	919,49	919,76	919,57	925,23	925,98	1010,3	1464,42
Deflator (3)= (1)/(2)	1	0,9997	0,9999	0,9938	0,9930	0,9101	0,6279

Source: Authors, based on data from **www.perspective.usherbrook.ca.**

Table 3 clearly indicates the approach to determining the deflator by the ratio between the average exchange rate of the base year and the average exchange rate. Thus, Table 4 gives us information on deflated gross loans to customers.

Table 4. Deflated gross credits (in billions of Congolese francs)

Years	B.O.A	BCDC	ECOBANK	EQUITY BANK	RAWBANK	SOFIBANQUE	TMB
2011	14,88	152,87	63,47	40,65	139,24	3,50	118,03
2012	25,92	200,76	88,53	52,44	211,37	10,22	122,26
2013	48,67	227,52	112,16	69,40	270,55	23,55	194,09
2014	80,91	260,58	105,14	87,68	315,94	33,54	182,58
2015	114,66	257,63	128,92	126,84	414,87	67,86	201,58
2016	155,30	403,52	173,72	189,19	511,40	107,15	254,91
2017	129,76	305,79	132,94	212,13	436,97	72,94	222,12
Total	570,10	1 808,66	804,88	778,33	2 300,33	318,76	1 295,58

Source: Authors, based on data from banks' annual reports.

During the entire period under study, RAWBANK dominated the Congolese banking market in terms of the total amount of credit granted, with more than 2 300.33 billion Congolese francs granted to customers. It is followed by the BCDC, which granted a gross credit of 1,808.66 billion Congolese francs. The third position is occupied by the TMB with an overall credit envelope of loans granted of 1,295.58 billion Congolese francs. ECOBANK, EQUITY BANK, B.O.A and SOFIBANQUE followed with loans of 804.88 billion Congolese francs, 778.33 billion Congolese francs, 570.10 Congolese francs and 318.76 billion Congolese francs respectively. Table 5 provides us with data on deflated doubtful loans as follows.

Table 5. Deflated doubtful loans (in billions of Congolese francs)

Years	B.O.A	BCDC	ECOBANK	EQUITY BANK	RAWBANK	SOFIBANQUE	TMB
2011	0,45	16,55	0,14	8,42	1,97	-	16,84
2012	1,05	19,72	0,36	8,31	3,40	0,09	11,82
2013	1,73	21,20	0,92	10,60	5,30	0,11	14,80
2014	2,47	37,39	4,61	9,67	8,04	0,64	18,15
2015	3,52	82,50	7,06	8,66	9,41	0,38	25,20
2016	10,18	112,37	8,48	22,29	18,72	4,11	44,76
2017	13,43	62,01	24,89	27,30	11,37	0,92	54,49
Total	32,84	351,73	46,45	95,26	58,20	6,24	186,06

Source: Authors, based on data from banks' annual reports.

However, out of all the credits granted, 58.20 billion Congolese francs are in doubt and disputed for RAWBANK. TMB has not been able to recover 186,063.84 billion Congolese francs. EQUITY BANK is at risk of losing 95,257.27 billion francs. ECOBANK has not been able to collect 46,451.34 billion Congolese francs. B.O.A and SOFIBANQUE complete the list with 32,842.35 billion Congolese francs and 6,242.64 billion Congolese francs respectively. Table 6 shows the default ratios calculated on the basis of the data in Tables 4 and 5.

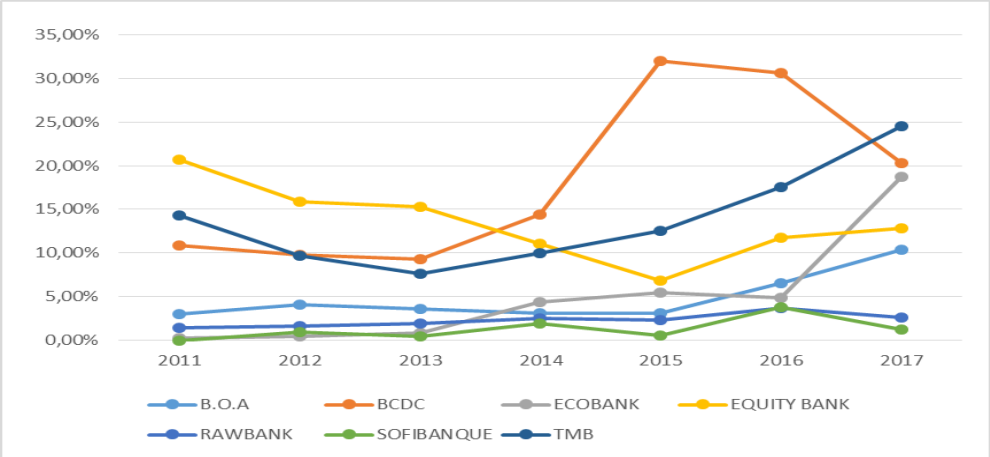
Table 6. Default rates from 2011 to 2017 in percent

Years	B.O.A	BCDC	ECOBANK	EQUITY BANK	RAWBANK	SOFIBANQUE	TMB
2011	3,03	10,83	0,22	20,72	1,41		14,26
2012	4,07	9,82	0,41	15,85	1,61	0,90	9,67
2013	3,56	9,32	0,82	15,27	1,96	0,46	7,63
2014	3,05	14,35	4,38	11,03	2,54	1,90	9,94
2015	3,07	32,02	5,47	6,83	2,27	0,56	12,50
2016	6,56	27,85	4,88	11,78	3,66	3,83	17,56
2017	10,35	20,28	18,72	12,87	2,60	1,26	24,53
Moyenne	4,81	17,78	4,99	13,48	2,29	1,49	13,73

Source: Authors, based on data from banks' annual reports.

The table above shows that the average default rates are 5%, 18%, 5%, 13%, 2%, 1% and 14% respectively for B.O.A, BCDC, ECOBANK, EQUITY BANK, RAWBANK, SOFIBANQUE and TMB. We note that overall, only RAWBANK and SOFIBANQUE are within the controllable threshold, i.e. their average default rates are less than 5%. For the other five (5) banks, the control of the risk related to the credits granted poses a problem, as their average default rates are higher than 5%. This situation can also be presented graphically.

Figure 1: Evolution of default rates from 2011 to 2017



Source: Authors, based on Excel 2016.

It is indeed noticeable that for RAWBANK and SOFIBANQUE, their curves evolved below the 5% threshold, which means that their default rates remained within the controllable threshold during the whole period under consideration. This is not the case for the other banking institutions.

In addition, Table 7 allowed us to find interesting results by determining the percentage of credit extended by all the banks under review in relation to the total credit extended during the period under review. This exercise proved useful insofar as theoretically a bank that grants large amounts of credit takes a greater risk than others.

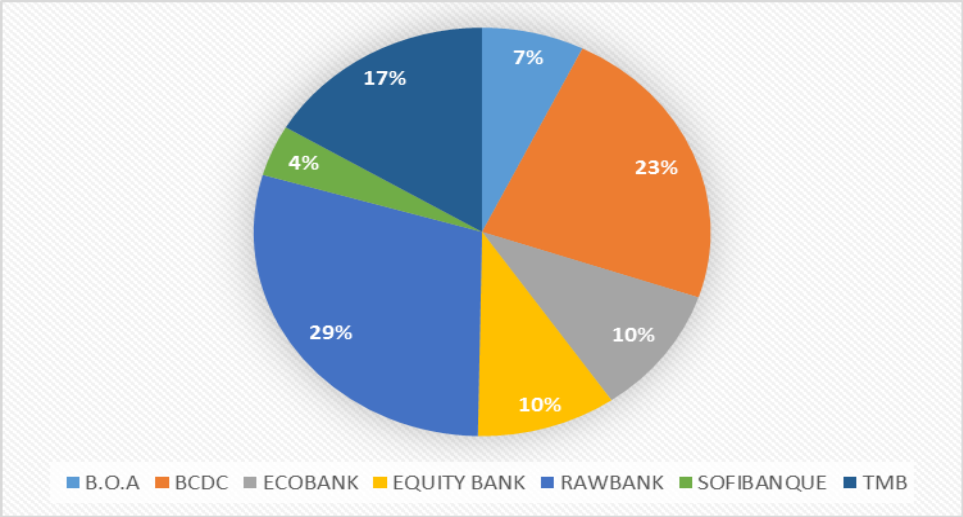
Table 7. Percentage of loans granted by bank from 2011 to 2017

Banque	**Total credit granted in billions of Congolese francs**	**Pourcentage**
B.O.A	570,10	7%
BCDC	1 808, 66	23%
ECOBANK	804,88	10%
EQUITY BANK	778, 33	10%
RAWBANK	2 300, 33	29%
SOFIBANQUE	318, 76	4%
TMB	1 295, 58	16%
TOTAUX	7 876, 64	100%

Source: Authors, based on data in Table 4.

From table 7, it can be seen that RAWBANK with its 29% is the banking institution that has granted a significant amount of credit, while SOFIBANQUE is the one that has granted less credit, that is 4%.

Figure 2. Percentage of loans granted by bank from 2011 to 2017



Source: Authors, based on Excel 2016.

This pie chart shows the percentages of loans granted by each bank over the period. It can be seen that RAWBANK leads with 29%, followed by BCDC, TMB, ECOBANK, EQUITY BANK, BOA and SOFIBANQUE with 23%, 17%, 10%, 10%, 7% and 4% respectively.

Although RAWBANK and SOFIBANQUE have respectively a higher and a lower percentage of credit granted, both institutions have lower average default rates of 2% and 1% respectively, as shown in Table 6, which are at the manageable threshold. In the case of RAWBANK, we found that, despite the high risk involved in granting large loans, it was able to recover them better. This situation is probably justified by a good internal management strategy for granting and recovering loans, which could be the subject of further research. SOFIBANQUE, on the other hand, has a restrictive credit granting policy, which is why it grants smaller credits. This policy has also allowed it to have a manageable average default rate.

To express the level of financial risk and volatility, we apply statistical techniques, in particular the coefficients of variation of the return on capital.

5.2. Analysis of the coefficients of variation

The calculations of the coefficients of variation of the return on equity on the banks constituting our sample from 2011 to 2017 have given us ratios that are far from the averages and that can be found in Table 8.

Table 8: Coefficients of variation (CV) of return on equity

Banques	$\bar{\rho}$	$\sigma_{\bar{\rho}}$	$CV = \frac{\sigma_{\bar{\rho}}}{\bar{\rho}}$
BCDC	0,147414	0,049529	0,33598573
RAWBANK	0,079739	0,044099	0,553041799
EQUITY BANK	0,057735	0,028209	0,48859444
ECOBANK	0,03207	0,149894	4,673963205
TMB	0,084476	0,066339	0,78529997
SOFIBANQUE	0,120148	0,132411	1,102065786
BOA	-0,100331	0,171501	-1,70935204

Source: Authors based on data in our possession.

The return on equity (ROE) ratio expresses the return from the point of view of the shareholder and does not necessarily meet the needs of financial analysis. It is therefore a performance ratio used by banks and financial institutions.

This table shows that the average equity performance levels of all the banks under analysis could not exceed the required threshold (i.e. 15% ROE). However, the fact that a bank fails to exceed this critical level means that it does not have the capacity to pay interest on loans or even pay dividends to shareholders will be a problem. Hence, we say that none of the commercial banks in the DR Congo performed well during the period under review.

Recall that the probability of ruin P(R) is characterized by the coefficient of variation σ_ρ^{-}/ρ^{-} and that it is an element that allows us to assess the financial risk. The coefficients of variation of the return on equity of the deposit money banks concerned (BCDC, Rawbank, Equity bank l'Ecobank, TMB, Sofibanque and BOA) amount to 34%, 55%, 49%, 467%, 79%, 110% and (-171%) respectively. The latter also expresses the level of financial risk and volatility of each of them.

This result leads us to say that the different banks studied run huge financial risks that could lead them to bankruptcy, if the realized losses become higher than the equity. We can clearly

see that the achievement of the performance threshold (the realisation of high profits) and the control of risk (evaluated by the standard deviation) directly impact the financial risk of each of them.

The results found are theoretically supported by the authors BENOIT GARNIER and VERNIMMEN mentioned in the literature review. According to these authors, credit risk is the risk of loss on a claim, naturally a function of three parameters: exposure to default, probability of default and loss given default.

CONCLUSION

The main objective of this study was to calculate the default rate and the financial risk rate using the coefficient of variation approach.

In order to achieve this objective, the study relied on the documentary technique (banks' annual reports including their financial statements) for data collection. Thus, we used the CV model for a prediction of bank failures.

From our analysis, the following emerges: only RAWBANK and SOFIBANQUE are in a controllable threshold due to their respective average TD of 2% and 1% which are lower than 5%, consequently, more than half of the banks under analysis are in the uncontrollable zone; none of the banking institutions under analysis has been performing well since they have not met the prudential ROE rule which requires this ratio to be higher than 15%. Thus, considering the values of their CV, we understand that they are at a high level of risk that exposes them to default.

In the end, although the results of our study show that the institutions under study were exposed to a high risk of failure, they did not close their doors. As bankruptcy is a legal procedure, its occurrence is subject to certain technical and legal prerequisites. Beyond the prudential rules laid down by the theory, bankruptcy is declared when there is effectively a cessation of payments and a credit crunch. These institutions remain in existence until then because they are not unable to honour their financial commitments to depositors.

However, there are some limitations to this analysis. Looking at the different studies conducted on bank risk, our sample size is small, as well as the financial risk estimated by the coefficient of variation method did not take into account qualitative variables such as shareholders' behaviour, management committee strategies, market developments, economic conditions,

monetary and financial conditions, etc. In addition, the period of the study is only 7 years, which may seem short to have to analyse the risks incurred by the banks.

With this in mind, we recommend the following to bankers: to reduce the financial risk represented here by $\frac{\sigma_\rho}{\overline{\rho}}$, banks should seek to hedge against this risk, i.e. neutralise this risk and, for the purpose of presenting the profitability of the transaction with their clients to their benefit; banks should also maintain a margin in the calculation of premiums and speads defined as the spreads between the interest rate paid by a borrower and the so-called risk-free rate generally the rate of public loans ; to reduce the default rate, banks should add to the study of bankable files the analysis of credit by mathematical or economic methods allowing them to determine whether a client will default or not; to allow the prediction of bankruptcy with accuracy; to protect commercial banks from credit risk, the BCC should develop a model based on the analysis of the borrowers' ability to repay, rather than on the nature and value of the financed assets which by nature are more volatile and also reduce the key rate.

Ultimately, we suggest as a research avenue to propose to the BCC a model based on the analysis of borrowers' repayment capacity that would allow categorising good and bad borrowers by taking into account the latter's qualitative and quantitative information.

Our research fills this gap in the financial literature on bank financial risk. Since few studies have been conducted in this area in my country, the DRC, the managerial implication of this work is that, based on the recommendation made, this paper constitutes an instrument for the credit manager to make decisions in credit supply policy.

Future studies may focus on "implementing Altman's model through discriminant analysis in order to split good and bad borrowers" which could be summarised by the following question: should the modelling of banks' credit risk be specifically addressed ?

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