



End of Studies Project

Topic :

The Relationship between risk management and financial performance in Algerian banking sector

Presented and defended by :

SAHRAOUI Fatma Zahra

Supervised by :

Pr. EI FERKTAJI Riadh

Student belonging to :

MINISTRY OF FINANCE -ALGERIA



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LIST OF ABBREVIATIONS

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ABBREVIATIONS	MEANING
ROE	Return on equity
ROA	Return on Assets
NIM	Net interest margin
IMF	international monetary fund
FL	Funding liquidity
NPL	Non-performing loans
PTL	Provision to total loans
CR	Credit risk
LTD	Loans to deposits
IRR	Interest rate risk
GDP	Gross domestic product
OLS	Ordinary least square
SOE	state owned enterprises
GFC	Great financial crisis
IT	Information technology
SOB	state owned banks
SME	small and medium enterprises
MENA	Middle East and North Africa

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DEDICATION

In the name of Allah, the Most Gracious and the Most Merciful

Dedication

Alhamdulillah, all praises to Allah for His blessing in completing this thesis.

I dedicate this work to my parents, my husband and all my family.

I would like also to dedicate this work to all my friends.

Special dedication goes to every teacher who inspired me during my studies.

Finally, I dedicate this work to the memory of my Uncle **Mohamed Sadek houhou** who passed away affected by the Coronavirus, leaving a big void in our hearts.

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My dearest gratefulness goes to my husband, my parents and siblings for their continuous love, prayers, and endless encouragements.

To those who indirectly contributed in this research, your kindness means a lot to me.

Thank you very much.

Abstract

Abstract

This study investigates the relationship between risk management and financial performance in Algeria banks for the period 2010-2019 periods. The thesis reviews the most important concepts related to risk and profitability in banking.

Next, it describes the Algerian-banking sector and presents the theories and studies realized on the subject. Finally, the thesis is concluded with an empirical study of risk management and financial performance in Algerian banks.

The results show that financial performance in Algerian banks have a significant relationship with: interest rate risk (IRR), funding liquidity ratio (FL), provision to total loans ratio (PTL), GDP, inflation, real exchange rate (USD/DZD) and to real interest rate. Findings also indicate that Algerian banks need to improve loan quality and have sound credit risk management procedures.

Keywords: Risk management, financial Performance, Algeria banks.

ملخص:

تبحث هذه الدراسة في العلاقة بين إدارة المخاطر والأداء المالي في البنوك الجزائرية للفترة 2010-2019. تستعرض الأطروحة أهم المفاهيم المتعلقة بالمخاطر والربحية في البنوك.

بعد ذلك ، يصف القطاع المصرفي الجزائري ويعرض النظريات والدراسات التي تم إجراؤها حول هذا الموضوع. وأخيرا اختتمت الأطروحة بدراسة تطبيقية لإدارة المخاطر والأداء المالي في البنوك الجزائرية.

تظهر النتائج أن الأداء المالي في البنوك الجزائرية له علاقة كبيرة بما يلي: مخاطر أسعار الفائدة (IRR) ، نسبة السيولة التمويلية (FL) ، نسبة المخصصات إلى إجمالي القروض (PTL) ، الناتج المحلي الإجمالي ، التضخم ، سعر الصرف الحقيقي (USD / DZD) وسعر الفائدة الحقيقي. تشير النتائج أيضاً إلى أن البنوك الجزائرية بحاجة إلى تحسين جودة القروض ولديها إجراءات سليمة لإدارة مخاطر الائتمان.

الكلمات المفتاحية: إدارة المخاطر ، الأداء المالي ، البنوك الجزائرية.

INTRODUCTION

INTRODUCTION

Our world's quotidian is experiencing several fortuitous incidences, from Human-caused episodes (as financial crisis, terrorism, political reversals) to unforeseen natural calamities (as global warming and other disasters) that make the bank's internal and external environment more and more uncertain, as it becomes subject to unbeknown proceedings that threaten its existence and sustainability.

As the role of banks is central in financing economic activity in general and different segments of the market in particular. A sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system. Therefore, the bank financial performance have attracted the interest of academic research as well as of bank management, financial markets and bank supervisors.

Bank's financial performance can be affected by many factors. Those factors vary depending on the economic context as well as the stability of each bank. The quality of a bank's management directly influences its ability to work efficiently in a competitive environment. The aim of a bank's management is to achieve a profit, as the essential requirement for conducting any business. An important component of a bank's management geared to achieve a successful business result is the risk management. One of the decisive factors influencing a bank's profitability is the composition of its risk management philosophy. The structure of banking risks management influences not only the bank itself, but also the reliability of the complete financial system in particular country.

Bank profitability could dependent also on a bank's ability to reduce risks in asset operations and to ensure a correspondence between assets and liabilities. The economic environment in which bank assets are placed in transforming economies is different from that of a standard economic environment.

In connection with achieving bank profitability expressed as balance-sheet profit, another particularly important fact is the structure of revenue generating assets. Revenue generating assets mean those asset operations that bring an interest income. These assets are the main source of income for commercial banks. Loans, interbank assets and securities operations all have an important position in the structure of a bank's assets. It is therefore obvious that the average revenue generation ability of these assets has a decisive influence on a bank's profitability.

However, the Algerian financial system in general is vulnerable and unpredictable due to government interference yet it was well shielded from the consequences of the subprime crisis in 2007. Amid global financial turmoil, the dominant position of public banks, low exposure to toxic securities, and the lack of full convertibility of the Algerian dinar turned out to be a blessing. Structurally, though, the weaknesses in the Algerian financial sector remain an important factor inhibiting the emergence of a free market-based economy in Algeria. High liquidity ratios in relation to total assets (46% in 2007 compared to 40% in 2005) illustrate the ineffectiveness of the Algerian financial system in channeling excess equity into value-creating projects.

INTRODUCTION

Bank profitability was a fundamental focus of the BASEL guides in the recent years, beside the risk exposure, capital adequacy, credit and operation risk. For this end, in this dissertation, we will analyze a dynamic financial statement and income statement of the Algerian banks. Afterwards, a panel data methodology is used to test if risk management have a relationship with bank's profitability, which will help understanding the quality of risk management in Algerian banks. This work investigates, in a single equation framework, the effect of risk management on bank profitability. We utilize data from the Algerian banks over the period of 2010 to 2019.

Statement of the problem

This research aims to study the relationship between risk management and financial performance in Algerian banking system, to this purpose, the fundamental question of the study is:

Does the practices of risk management impact the financial performance in Algerian banks?

Guiding research questions

To provide a basis to concluding on the problem statement above, the thesis seeks to answer the following research questions:

- ✓ What are the factors determining the profitability of banks in Algeria?
- ✓ Why some factors are more influential than others are?
- ✓ What are the main risks faced by Algerian banks?
- ✓ Does the economic situation aggravate the performance position in Algerian banks?

To answer the previously mentioned questions, this study will be conducted focusing on 18 banks operating in Algeria over the period 2010-2019, this period witnessed several changes, transformation, profit explosion and credit deterioration. Grounded on collected data from consolidated financial statements of each bank.

Hypotheses

The research's principal hypothesis is that it does exist a positive relationship between risk management practices and financial performance in Algerian banks.

Beside the main hypothesis, the following secondary hypotheses may help as comprehend the nature of the relationship studied:

- ✓ Deposits and loans are key factors in determining bank's profitability in Algerian banks.
- ✓ Some factors are more influential than others, because of the specificity of the banking sector in Algeria.
- ✓ Governance risk, exchange rate risk, credit and liquidity risk are the main risks faced by the Algerian banks.

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- ✓ The economic situation in Algeria effects negatively the banking financial performance.

Significance of the study

This research contributes to a better understanding of the Algerian banking sector and the key drivers that influence profitability within banks particularly the bank's specific determinants.

The findings from this study are beneficial to banks 'management in providing information to gain higher profit. They are also useful to the government and regulators in particular to have a better understanding of the influence of risk management on bank's performance.

This work is interesting to investors because it provides information on realizing higher returns. Finally this paper may interest academicians and students as a baseline to further studies.

Motivation of the research

In 2008, the world suffered a financial meltdown. It was considered the worse financial crisis since 1929. Most banking sectors around the world were affected. During this period, Algerian banks continued to make profits and many reports claimed that the Algerian banking sector was not affected by the subprime crisis. That has lead me to wonder if a worldwide financial crisis did not really affect the Algerian banking systems, what are the factors that do.

Construction of the study

This study is composed of three (03) chapters. The first chapter explains conceptual framework of the study, and it studied bank risks and profitability in general. It talks about the types and functions as well as the main sources of income in commercial banks. It also demonstrates the measures of financial profitability in these institutions. The second chapter discusses the financial performance and the specific risks in the Algerian banking sector. It narrates its history, presents the different laws and regulations, and finally illustrates an overview of the current banking sector situation. The third and final chapter illustrates the empirical case. This study chose to use panel data regression along with empirical tests to examine if risk management influence bank profitability and the nature of those effects.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

INTRODUCTION

Banking occupies one of the most important positions in the modern economic world. It is necessary for trade and industry. Hence, it is one of the greatest agencies of commerce. Although banking in one form or another has existed from very early times, modern banking is of recent origin. It is one of the results of the Industrial Revolution. Its presence is very helpful to the progress of an economy.

This chapter discusses the conceptual framework of the research. It consists of two sections:

Section 01: Banking risks categories and management

This first section provide the reader with a definition of the different risks in banking, followed by the subsection that interest in banking risk management.

Section 02: Bank performance measures and determinants

For the second section, we studied theoretically the financial performance, its measures and determinants.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

1. BANKING RISK CATEGORIES AND MANAGEMENT

The banking world is facing several changes and uncertain events. Risk is the uncertainties created from internal or external variations that may result profitability deterioration. The banking activity is characterize with risk, and knew a numerous type of it. However, the risk assessment and management witnessed a significant interest from professionals as from researchers in the few past years, where the risk management evolved from qualitative risk assessment to quantitative risk assessment, this evolvement is cause from two main factors: the risk practices development and regulatory incentives. Furthermore, the quantitative risk measurements require a sound base of the different risk definitions. Therefore, risk definition is getting more precise over the years.

1.1. BANKING RISKS

In the last decades, banking industry lived several transformations, scandals and collapses, which accelerated the appearance of risk management philosophy. This new ideology has drawn the attention of professionals, academicians and banking supervisory authorities. Risk management appearance can be related to various factors of change, like the size of banks that goes larger with time, their organizational complexity, also the arrival of new banking financial products, and the IT development that create the e-banking, similarly the intense competitiveness of the global financial market. The latest factor was the great financial crisis in 2007 that introduced new source of risks.

1.1.1 Credit risk

Credit risk is created from the uncertainty related to the obligator's ability to meet its obligations. This risk is associated to the borrower's capability to make the required payments in time. As result of this risk occurrence, the bank will face a potential loss of the credit principal, plus the related interest and collection charges. In case of the bank was able to restore a portion of the granted loan the loss may be limited to a fraction of the amount due. However, the situation might be more aggravated in case of the credit quality of counterparty deteriorates¹.

We will try in the following subsections to understand more credit risk, by introducing the breakdown of credit risk into: default risk, default probability and default event, exposure risk, finally recovery risk and loss given default².

❖ Default risk

Default risk is defined as the risk created from the inability of the borrowers to honor their financial engagements; several events may cause the default risk³:

¹ Gregory, J. *Counterparty Credit Risk and Credit Value Adjustment: A Continuing Challenge for Global Financial Markets*, John Wiley & Sons. 2012. PP.21-40.

² Basel Committee on Banking Supervision. *International convergence of capital measurement and capital standards: A revised framework – Comprehensive version*, Bank for International Settlements, BCBS publications. 2006.

³Jorion P, et al. *Informational Effects of Regulation FD: Evidence from Rating Agencies*. *Journal of Financial Economics*76. 2005. PP. 309-330.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

- ✓ Payments delay for a certain period or indefinitely;
- ✓ The debt obligations might be restructured due to the deterioration of the credit standing of the borrower;
- ✓ Bankruptcies.

Default and restructuring are almost the same if it created from the lack of capacity of the borrower to honor payments obligations only if the lender changed the structure of the debt. Defaults are temporary if they are adjusted within a short period as the borrower settles liquidity problems.

The default definition is based on rules, where the default is created from the first dollar payment delay from the point of view of the rating agencies. On the other hand, regulators consider the default occurs if the borrower was not able to repay within 90 days. However, if the payment delays less than 90 days then the default is temporary.

❖ **Default probability and default event**

The default probability is the likelihood of the borrower's default. The Basel accord requires the usage of annual default probabilities (DPs), in case of stable credit state, the DP increases with credit horizon and the DP fluctuates as the credit standing migrates¹.

For a particular credit state, the DPs rely on the dominant economic circumstances. The likelihood of default augments in period of economic recession where the economic conditions deteriorate.

Default probability estimation is a challenging mission. Statistics are allowed due to the large volumes of borrowers, which make the default events countable, and its frequency traceable over different periods. Retail banks and rating agencies use this method for the entire enterprises of different rating categories. In case of restricted volume of clients, this method is not valid, because the statistics are not significant. Generally, there are a several methodologies and data sources, which banks can use to map DPs to internal grades. In addition, the broad approaches are three: based on the bank's own default experience, the mapping of internal defaults to external data and the usage of default models².

❖ **Exposure and exposure risk**

The exposure represents the scope of the amount at risk related to a borrower. In other terms, the randomness of the risk size is the exposure. The Exposure At Default (EAD) is an estimate of the possible size under default, which in the current date is unknown.

The repayment schedule of a borrower derives the creation of the contractual exposure for loans. Concerning the long-term credit attached with amortization schedule, this schedule is pre-identified. Furthermore, an effective amortization schedule is different from the contractual schedule, in other cases, the loan's repayment is characterized with stochastic cash flows, floating rating loans, and interest rate related to market changes. Where the cash flows are

¹Kiefer K M. *Default Estimation, Correlated Defaults, and Expert Information*. Journal of Applied Econometrics 26. 2011. PP.173-192.

²Kealhofer, S. *Quantifying credit risk I: Default prediction*, Financial Analysts Journal, 3, 2003. PP.30–44.

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driven by the customer's behaviour as in the credit card loans. In the case of enterprises, at the initiative of the borrower the bank offers facilities as commitments of the bank. However, the bank has an obligation to lend to maximum amount to a contractual maturity under committed lines of loans, the liquidity effectively borrowed is the amount drawn, and the undrawn amount is the residual portion of the engaged line of credit, which is on off-balance sheet commitment¹.

❖ Recovery risk and loss given default

The Loss Given Default (LGD) is the part of the exposure at risk that is really lost under default, after recoveries from the guarantees. Where the percentage of exposure covered after a default is the recovery rate, also it is complement to one of the LGDs expressed in percentage of exposure. Additionally, in post-default stage, the LGD is a fundamental cause of credit losses and the capital charge for credit risk is proportional to the final losses. Due to the uncertainty related to LGD, Basel committee imposed percentages under particular approaches²:

- ✓ 45% LGDs are assigned in case of senior claims on corporates, sovereigns and banks not secured by recognized collateral;
- ✓ 75% LGDs are assigned for all subordinated claims on corporates, sovereigns and banks.

In case of default payments, the bank has a claim to the third party that provides guarantee for the borrower. When the direct borrower is unable to honour the debt payment obligation, the third party is obliged to pay the fraction or the total of the credit, same to the insurance provided by the guarantor to the lender. If the borrower defaults its obligation the bank uses credit derivatives that are instruments to recover then lender in case of loss under default. The instrument is based on the insured debt. The dissimilarity with the usual insurance contract is that the derivatives can be traded, where their prices fluctuates according to the market variation and a function of the credit risk of the underlying debt³.

1.1.2. Market risk

The market risk is related to market uncertainty movements, where the market value cannot be certain in the normal circumstances. The market risk is associated generally to trading portfolio.

The market risk in banking is more present, since the market liberalization, where globalization had its effect on the monetary, financial and international exchange rates. The previous mentioned effects of market capitalization created new financial products (derivatives) that nowadays are a fundamental part of the banking activity⁴.

¹ Crook, J.N., et al. *Recent developments in consumer credit risk assessment*, European Journal of Operational Research, 183 (3). 2007. PP.1447–1465.

² Altman, E.I., Sabato, G. *Modelling credit risk for SMEs: Evidence from the US market*, Abacus, 43 (3). 2007. PP. 332–357.

³ Brigo, D., et al. *Counterparty Credit Risk, Collateral and Funding: With Pricing Cases for All Asset Classes*, John Wiley & Sons. 2013. P7.

⁴ Ernst & Young. *IFRS 7 in the Banking Industry*, available at: [www.ey.com/Publication.vw/LUAssets/Industry_Banking_and_Capital_Markets_IFRS7_in_banking_industry/\\$FILE/Industry_Banking_and_Capital_Markets_IFRS7_in_banking_industry.pdf](http://www.ey.com/Publication.vw/LUAssets/Industry_Banking_and_Capital_Markets_IFRS7_in_banking_industry/$FILE/Industry_Banking_and_Capital_Markets_IFRS7_in_banking_industry.pdf) (accessed 18 June 2009).2008. P24.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

The bank might be exposed to market risk because of speculative position (the bank is own trading account), also it may be caused of the market creator activities for the banks 'costumers. The market conditions are continuously modified that effect the bank through the essential three dependent but distinctly managed transmission channels. These are the fluctuation of the interest rates, the variation of the foreign currency exchange rate, and as a result the variation of market value of the bonds and shares issued by the bank. Furthermore, the usage of financial products derivatives induces additional risks to the banking activity.

❖ Interest rate risk

In the banking activity both lenders and borrowers are exposed to interest rate risk, whether they were adopting fixed or variable rates. Although, if the bank and its costumer agreed to use fixed rate this will reduce the uncertainty related to interest rate fluctuation, however fixed rate adaptation does not eliminate interest rate risk. The bank faces interest rate risk at a fixed rate in case of the interest increases, where the bank bears what called the opportunity-cost, the cost of not lending at a higher rate. In contrary, the costumer in case of interest rate increases at a fixed rate, he would be cover under a lower rate. It is notable that the prediction of future exposure to interest rate risk is the same for both cases fixed or variable¹.

Lenders and borrowers have one only choice which is the type of exposure they want to have. This choice is driven by both sides' perception of interest rate fluctuation by using fixed income derivatives. Corporates and financial institutions use such derivatives as an instrument to face this risk. It is hard to change directly the variable or fixed interest rate of a certain type of credit or a debt. As a substitute, derivatives are used. Derivatives do not modify the original debt or loan but are new contracts. The next table presents the interest rate exposure by the lender and the borrower:

Table N°01: Interest rate exposure by the lender and the borrower

Rate	Change of rates	Lender	Borrower
Floating rate	Rate +	Gain	Loss
	Rate -	loss	Gain
Fixed rate	Rate +	loss	Gain
	Rate -	Gain	Loss
Future exposures	Rate +	Gain	Loss
	Rate -	loss	Gain

Source: Bessis.J. Risk management in banking. John Wiley & Sons, Ltd. 2011. P82.

❖ Foreign Exchange risk

The price of a foreign currency compared to the home currency is the definition of foreign exchange rates. For example if the home currency is the DZD (Algerian dinar), if we want to sell the US dollars (USD) to have home currency (DZD) then the operation is selling USD/DZD, automatically that's mean to buy DZD/USD.

¹ Black, F.,et al. *A One-Factor Model of Interest Rates and its Application to Treasury BondOptions*, Financial Analysts Journal, 46 (1), 1990. PP.33–39.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

Take for example that EUR/USD exchange rate is 0.8, which equals 1.25 USD/EUR. The foreign exchange risk happens due to variations of the foreign exchange rates. If we assume that an exporter closed a deal of 1 million USD (foreign currency) that will be received in EUR (home currency). In this case, the exporter will change the 1 million USD into EURs, where each USD equals 0.8 EUR. Therefore, he will receive 800,000 EUR.

One of the foreign exchange risk management measures is the Forward exchange rate, where the rate is set-up today for a future date. Those who would instantly benefit from the situation are the hedgers. The forward rates determine the future exchange rate as of today, but the forward rates have an essential condition, which is selling or buying using forward rates necessitate the expiration of the contract. The forwards are applied in the contract that expecting a future inflow or outflow in foreign currency¹.

Furthermore, there are the currency swaps exchange two debts of its principal and interests, made of two currencies in a define rate at the current time. It consists of swapping the currency of a debt issue, which means to borrow in one currency and change it into another currency. Additionally, the foreign exchange swaps buy and sell currencies at a specified horizon at a specified rate as of today. In addition, it can be seen as a sequence of forward contracts for every cash flow to be exchanges in the forthcoming horizon².

The application of the swaps for hedging purposes is understandable. The hedging strategies are based on the forward prices. For more illustration, if an exporting corporation receives foreign currency, in this case, the corporation is long in the foreign currency and facing the risk of home currency increases against the foreign currency.

❖ Shares risk

The third type of market risk is shares risk, which is the likelihood that a bank will have financial losses or not reaches the estimated revenues, due to unforeseen changes of the owned financial assets prices on the market. The shares risk is having a particular position in the trading register, this position are linked to shares with similar changing behaviour also their derivatives (futures and swaps). Additionally, the risk associated to shares is identified for the particular risk that is related with ownership of an equity or bond, also for the position on the market in general. Furthermore, the derivatives risk is assessed and managed by exchanging it into the home currency value of shares on the original instrument. The settle of the market based on the rate among the demand and supply achieves the prices equilibrium. If the latter is unbalanced, the financial assets will witness a significant fluctuation that is known as prices volatility. Concerning the diversified portfolio of financial assets, the impact of market variation of a fraction of the portfolio can be compensated; as a result, the bank's fundamental objective is to manage its assets and liabilities efficiently to avoid profitability deterioration, and leads to financial performance³.

¹ Danielsson, J. *The Value at Risk Reference: Key Issues in the Implementation of Market Risk*, Risk Publications, London.2007. PP.1-9.

² Wetmore, J. L., & Brick, J. R. *Commercial bank risk: market, interest rate, and foreign exchange*. Journal of Financial Research, 17(4), 1994. PP.585-596.

³ Canabarro, E., Duffie, D. *Measuring and marking counterparty risk, in Asset/Liability Management for Financial Institutions*, Institutional Investor Books, 2003. PP.122-134.

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Consequently, we may conclude that the market risk is created due to price fluctuation of several financial products of the bank, such as: the financial portfolio, own capital instruments, and the interest spread of foreign currencies exchange rate. As a result, the main element of risk market is the shares position, the risk associated to goods, the risk of the interest rate and foreign currency exchange rate risk.

1.1.3. Liquidity risk

The last financial crisis was caused by a shortage of liquidity in international banking system due to strategy adopted by banks of raising cash at a higher cost than habitual conditions. Furthermore, liquidity is defined as the capability of a bank to increase the cash necessary to finance loan-granting activity and face deposit withdrawals in equitable period at an equitable cost. The bank has to possible ways to increase liquidity: by collecting households' savings or increasing financial debt. As a result, the liquidity risk is the uncertainty related to the availability of liquidity or to the high cost of obtaining this liquidity¹.

❖ Liquidity gaps definition

The imbalance between the assets and liabilities of bank is the liquidity gap, in other terms, is the probable inequality of financial sources and uses of funds. The decisions associated to funding or investing are made based on the information provide from the gap reports. Additionally, the gap management is procedures made to prevent and control the mismatches between assets and liabilities².

At future dates, the banking portfolio may record differences between the projected balances of assets and liabilities to create the liquidity gap. Assets and liabilities are gradually amortized over time, and their time profiles are declining. Forecasts are stable over time, if they ignore new credits, new deposits or debts at upcoming dates.

Depending on how assets and liabilities run off liquidity gap can be static in term of their time profile in the future. The liquidity gap can be defined mathematically from the difference between the projected balances of existing assets and liabilities at a future date (t). Over the planning horizon, there are as many gaps as there are time points.

For each future date t, we have the algebraic equation of liquidity gap³:

$$\text{Liquidity gap (t)} = \text{Assets (t)} - \text{Liabilities (t)}$$

1.1.4. Operational risk in banks

The regulatory authorities in the last years have determine the operational risk as a significant risk that spread into the entire banking industry. Years ago operational risk appeared into the surface of the banking industry, however, the OR recognition and identification were made only after the high losses of many banking crises due to several types of risk exposure, as a result, the OR was treated inappropriately, underrated or not addressed at all.

¹ Acharya V.V., Viswanathan S. *Leverage, moral hazard, and liquidity*, Journal of Finance, 66. 2011. PP.91–138.

² Adrian, T., Shin, H-S. *Liquidity and leverage*, Journal of Financial Intermediation, 19, 2010. PP. 418–437.

³ Brunnermeier, M.K. Deciphering the liquidity and credit crunch 2007–2008, Journal of Economic Perspectives, 23 (1), 2009. PP.77–100.

CONCEPTUAL FRAMEWORK: BANKING RISK MANAGEMENT AND FINANCIAL PERFORMANCE

In the 90s numerous factors that introduced OR in banking was revealed, these factors nowadays are well-known, and the most important are¹:

- ✓ These days banks are characterized with their growing size that goes with progressively complex organization, and the changing of the banking business model;
- ✓ The growing amount of human errors and system faults due to the technological evolvement that concealed different types of OR;
- ✓ The banking exposure to external frauds caused by the development of e-commerce and e-banking, issues of security and cybercrime;
- ✓ Segregation of duties problems due to outsourcing of production processes;
- ✓ The mitigation instruments of credit and market risk (such as derivatives, and securitization) are widely used, accompanied by the amplified presence of particular ORs.

OR gained more attention because of the awareness of the catastrophic nature that OR can lead to. The last past years, dramatic results was caused by operational failures, for some cases it even caused the collapse of the intermediary². Back to the same period, banks and financial institutions witnessed more than 100 operational loss events, where each exceeded 100 million USD³. The significant financial crises have revealed a number of causal factors: deceptive employee behaviour, inappropriate business practices, internal control system malfunctioning, rarity of transparency in caring out investment services, inaccurate reward systems, and imprecise reporting lines. These factors highlighted the requirement for more intense control over OR, precisely in the financial concern, also the need to track the key indicators for controlling the tendencies of risk exposure.

1.2. ANALYZING BANKING RISK MANAGEMENT

The banking risk management has always been a hot topic for researchers after the Great Financial Crisis in 2007. However, risk management in banking context is challenging due to the amplified influence of the GFC on the banking sector, where regulators assumed that the crisis was provoked from the RM inefficiency, and the inadequacy of the risk models. In this subsection, we will try to analyze the several risk management types in banking industry.

1.2.1. Credit risk management

In previous subsection, we defined credit or counterparty risk as the possibility that a client, debtor or issuer will face problems to honor his financial obligation toward the bank. Furthermore, different researchers defined the credit risk management as the process of identification, measurement, monitoring and control of the risk created from the chances of default in credit repayments⁴.

¹ Ellis, B., et al. *Driving value from postcrisis operational risk management*, McKinsey Working Paper, no. 34. 2012. PP.1-8.

² Cope, E.W., Carrivick, L. *Effects of the financial crisis on banking operational losses*. Journal of Operational Risk, 8 (3). 2013. PP.3–29.

³ Fontnouvelle, P, et al. *Using loss data to quantify operational risk*, Federal Reserve, April, 2003. PP.1–32.

⁴ Coyle. B. *Framework for Credit Risk Management*. Chartered Institute of Bankers, United Kingdom.2000.

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Several financial analysts associate credit risk management' efficiency to the establishment of policies to manage credit risk. These policies are divide into three main categories: the first is limit or reduce credit risk, this policy concentrate on diversification, great risk exposure, overexposure and granting loans to related clients. The second policy is assets classification that aims to periodically appraisal the collectability of the credit portfolio. Finally, the third policy is provision for the anticipated loss by making allowances at a level adequate to absorb it¹.

For the policy that reduce credit risk, financial authorities and policy makers give huge importance to three fundamental problems: credit risk exposure to one costumer (the importance of one lender in the credit portfolio), interrelated customers financing, and overexposure to a single economic sector or geographic area.

Concerning the policy that aims to classify assets, is to guarantee the quality of the credit portfolio of the bank, by being periodically assessed using a classification and loss provision procedures. The approach of this policy is to estimate the probability and the likelihood that the loan will be repay, in addition to assess if loan classification suggested by the bank is adequate.

The lending policy of the bank need on concentrate on provision losses, and a number of fundamentals that make sound lending policies²:

- ✓ The basis of granting loans need to be sound and collectible;
- ✓ The bank's funds should be wisely invested, for the benefit of the shareholders and the protection of depositors;
- ✓ The loans granting policy should satisfy both economic agents and households.

The credit risk management has several essential objectives, which concentrate on the evaluation of the lending process, if it is soundly organized, if lending policies are appropriately translated in internal procedures and manuals, if the employees are respecting the established policy, and finally, if the policy information is available for all the lending operation.

1.2.2. Liquidity risk management

Liquidity management in banks is established through the fundamentals of the assets management that is for the short-term operations. However, the medium-term liquidity management, banks usually use the principles of liabilities management. The liquidity stability for one bank is not necessarily the same of liquidity needed for the functioning of another bank. Furthermore, the level of adequate liquidity for a certain period cannot be stagnate at any given time.

A decision-making structure is essential for the establishment of liquidity management affective policies. In addition, different approaches need to be set, such as limitation of liquidity risk exposure, establishing several liquidity plans and scenarios, and finally an approach to funding

¹ Catherine.S.F.H, Nurul.I.Y. *A preliminary study of credit risk management strategies of selected financial institutions in Malaysia*. Jurnal Pengurusan, 28. 2009. PP.45-65.

² Kithinji.A.M. *Credit risk management and profitability of commercial banks in Kenya*. School of business, university of nairobi, nairobi – kenya. 2010. P12.

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and operations. The significant of liquidity management is reflected by the decision-making structure.

The bank management to satisfy its liquidity needs. Usually tend to the assets and liabilities management. In addition, banks try to dispose of extremely liquid trading portfolio assets, that is consist of assets that can be trade easily. For the liabilities management several measures are required, such as increasing short-term borrowings and short-term deposits on the side of liabilities, also increasing capital and the maturity of liabilities¹.

The structure of liquidity risk management is establish on three milestones: the measurement and management of Net Funding Requirements, the market access, and the contingency planning. Predicting the different possible future events is a fundamental element of liquidity planning and risk management. On particular periods, the analysis of “NFR” rely on the structure of a maturity ladder and the control of the cumulative net excess or deficit funds. Moreover, the banks need to estimate frequently their predicted cash flows as an alternative of concentrating only on the predetermined periods that might be there is a cash flow out or in.

The liquidity sufficiency of bank is evaluation rely on the cash flows behavior in different circumstances. Therefore, liquidity risk management consist of numerous scenarios. Upcoming, three essential scenarios in liquidity risk management²:

- ✓ The first is the going-concern scenario: this scenario is generally apply by banks to the management of depositions use by the bank, which is based on offering a benchmark for balance sheet and cash flows movements in regular course of business.
- ✓ The second is the crisis situation scenario: this scenario is usually apply by the bank if important part of the bank’s liabilities cannot rolled-over of the bank’s balance sheet. The present scenario is subordinate by the current liquidity regulations and supervisory measures.
- ✓ The third is the market crises scenario: this scenario is frequently apply in periods of market crisis, where the banking liquidity is influenced, this scenario consist of liquidity management is predicted on loan quality, with important distinction in funding availability between banks.

The watershed of liquidity risk management is the liability diversification and funding sources, the two elements are signs that the bank has well developed liquidity management. Moreover, the bank’s ability to change its assets into cash (liquidity) and funding sources accessibility in circumstances of liquidity shortage are highly significant of the bank’s financial health. However, other factors that influence the bank liquidity, like the bank’s financial position and reputation that facilitate access to funding sources, also the bank is perspective of profitability. Over all in term of liquidity management, some banks are in a better position than other operators are in the sector.

¹ Cornett, M. et al. *Liquidity risk management and credit supply in the financial crisis*. Journal of Financial Economics, 101(2), 2011. PP. 297–312.

² Goodhart.C. *Liquidity risk management*. Financial stability review, special issue liquidity 11. 2008. PP. 39-44.

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1.2.3. Market risk management

In the previous section, the different factors of market risk were explain, as the interest rate fluctuations, equity risk, commodities and currency risk. Each parameter of market risk can be treated separately but they have a common threat, which is originates sudden changes in the portfolio structure of the bank. Therefore, the market risk management should take into consideration the next fundamental objectives¹:

- ✓ Keep the bank save from unforeseen losses and guarantee income stability by identifying, assessing and understanding the market risk in the real time.
- ✓ Assuring that the bank's management process and organizational structure are adequate with international practices.
- ✓ Set a reasonable decision-making by contributing in the creation of transparent, objective and consistent information system of the market risks.
- ✓ The creation of a structure that assist the bank to understand the link between the business strategy and the operations in one side, and among the objectives of risk control and monitoring, on the other side.

The market risk management must consist of descriptive analysis of market strategies, market fluctuations and performance. Therefore, market risk analysis is based on the following milestones: modified duration, the currency value changes, discrepancy analysis (gap analysis).

1.2.4. Operational risk management

For the different types of risk, risk managers try to optimize the risk, only for operational risk management, different approach is followed for ORM to minimize its probabilities. Consequently, ORM has multiple objectives need to be respect²:

- ✓ Determine and clarify exposures and incidents created from people, processes, systems and external events;
- ✓ Systemize early alerts of possible operational incidents and anticipating potential problem;
- ✓ Manage the susceptibility of external and systemic risks from occurrence;
- ✓ Provide qualitative and quantitative operational information;
- ✓ Participate in the business decisions;
- ✓ Clearly identify and segregate the operational duties and empower business units to take the required actions.

The ORM is generally focused on the risk characterized with high frequency and high severity, and the OR managers identifies, assess and control accurately the several sources of this type of OR, however, the easy managed OR is the risk with high frequency and low severity due to its occurrence repetitively the risk management master its management.

¹ Milanova. E. Market risk management in banks – Models for analysis and assessment. FACTA UNIVERSITATIS, Series: Economics and Organization Vol. 7, No 4, 2010, PP. 395 – 410.

²Marija.K. Operational risk: challenges for banking industry. Procredit Bank, Belgrade, Serbia. Vol. 46, No. 1-2, 2013. PP. 40-52.

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Operational risk management has its own challenges to the bank management. As known, operational risk factors are mostly internal events and the amplitude of possible losses are difficult to be exactly determined. Therefore, an effective mechanism for systematic operational risk management is needed.

1.2.5. Assets and liabilities management

The mismatch of the assets and liabilities of the bank create several types of risk, and the ALM approach provides a certain degree of protection against their arisen. The ALM is a systematic approach that define, measure, monitor, modify and manage risks born from AL mismatch. As a result, the restructuration of the bank's assets and liabilities manage directly this gap.

The assets liabilities management covers the bank against a collection of serious risks that jeopardize the sustainability of the bank, such as liquidity gap, interest rate gap, hedging position and the economic value of the bank's balance sheet. The ALM scope is divided according ALM different roles. Where ALM blocks are¹:

- ✓ Liquidity mismatches or traditional gap management;
- ✓ Interest rate mismatches or interest rate gap management;
- ✓ Hedging interest rate risk based on simple gap analysis;
- ✓ Economic value of the balance sheet, ALM target associates to time profile of net interest income;
- ✓ Hedging of economic value, through convexity or optional gaps.

The ALM process includes the guidelines to business lines for making the objectives of the ALM in consistent with the global bank's policy.

¹ Novickytė.L and Petraitytė.I. *Assessment of banks asset and liability management: problems and perspectives (case of Lithuania)*. Social and Behavioral Sciences (110). Elsevier. 2014. PP.1082 – 1093.

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2. BANK PERFORMANCE MEASURES AND DETERMINENTS

The Banking system is the centre of the modern economy. Therefore, the compliance of banks to international regulations established by the Bale agreements to guarantee positive profitability and performance ratios. After the financial crisis in 2007, the global banking system was affected by several factors that destabilised its financial equilibrium. Surely, the financial crisis did not only caused bank bankruptcies, also quasi-bankruptcies, nationalisations and a decline of large financial institutions¹. Coming further, the subsections concerning determinants of bank performance, which is divided to internal and external determinants.

2.1. BANK PERFORMANCE MEASURES: ROE, ROA, NIM

Financial and economic literature was able to define the banking performance, through several aspects that guarantee sustainable banking profitability. In this subsection, we will try to understand the internal determinants of banks performance, which can be determined as the performance indicators influenced by the bank's management decisions and policy objectives. The management effects are the outcomes of the dissimilarities in bank management policies, objectives, and actions mirrored in the differences in bank operating results, including financial performance and profitability. According to **Zimmerman (1996)** the fundamental factor in bank performance in management decisions especially, in term of loan portfolio concentration². Several studies related bank performance to management quality, and management sound decisions, which can be financially measured and assessed through the use of traditional financial indicators: return on equity (ROE), return on assets (ROA), and net interest margin (NIM).

2.1.1. Return On Equity (ROE)

Return on equity of banks is a common factor of profitability, and it is a creamy topic of debates between banks and regulators. The ROE is defined as³:

$$\text{ROE} = (\text{Net Income} / \text{Book value of equity})$$

Therefore, this indicator in banking sector can be increased or decreased in two ways: by a variation in net income, or by movements in the equities. Just before the last financial crisis, regulators drove banks to increase their ROE, by boosting income and maintaining the operating capital or with small capital buffers, as a consequence, the ROE of many banks exceeded of 15%. Once the financial crisis hit, several banks found themselves in trouble caused by the adapted strategy to increase the ROE, which basically involves more risk taking. In that moment, banks that were operating with less equity were failing and needed the state assistance,

¹ FERROUHI, El Mehdi. *Moroccan Banks analysis using camel model*. International Journal of Economics and Financial Issues, 43: 2014. PP.622-627.

² Zimmerman, G. *Factors influencing community bank performance in California*. Federal Reserve Bank of San Francisco 1. 1996. PP.26-41.

³ Berger, A.N. and C.H.S. Bouwman. *How does capital affect bank performance during financial crises?* Journal of Financial Economics 109. 2013. PP. 146-176.

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since then, regulators tried to prevent this from happening again with increasing the required capital over the years.

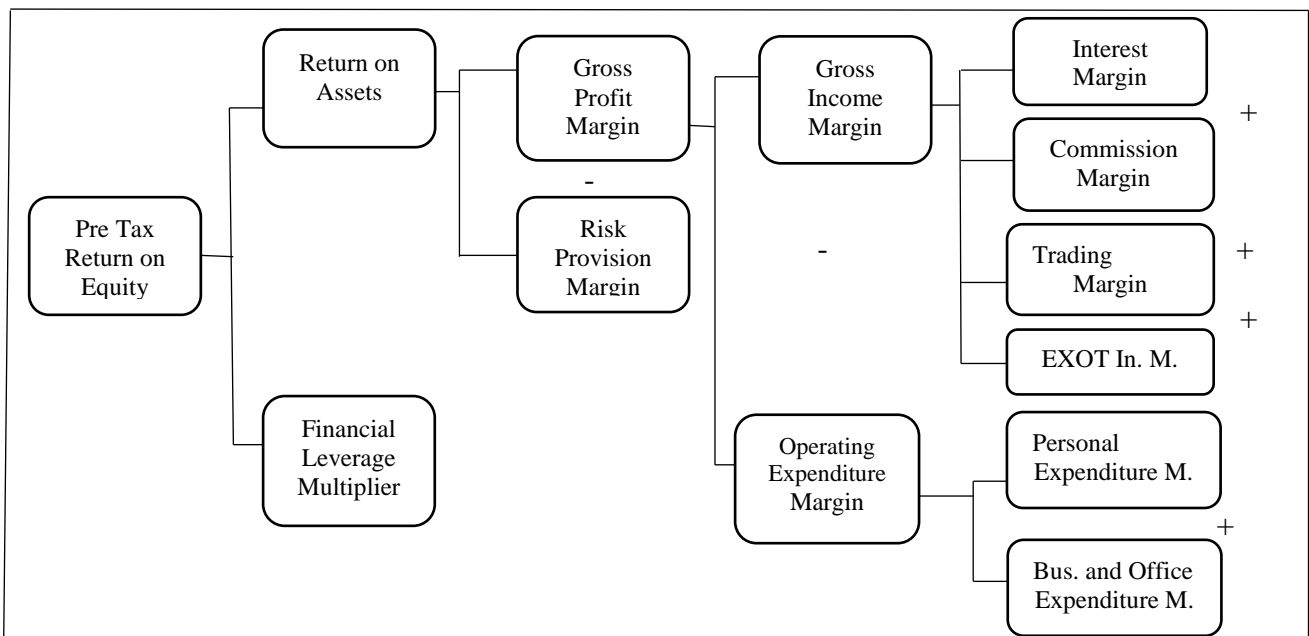
In contrary with corporation that focus on earnings per share (EPS), banks accentuate ROE, where investors define it as a key indicator to assess the market value and growth of a bank. This differentiates banks from conventional enterprises, where bank can offer interest on the collected financial resources that is a part of its capital. Banks are more motivate on managing capital to maximize shareholder value than growing earnings¹.

On the other hand, the international banking regulators such as Basel committee, in Basel III defined the minimum capital requirements, so it increased the banking working capital, which caused the shrinking of the ROE. Consequently, the level of banking ROE have been decreasing as recommended in the passage of 2009 reform. After issuing the Basel III recommendations, banking ROE has recorded an average around 5% to 10%.

The ROE ratio is a tool to measure the financial performance of a bank, and it is simply applicable using the data of the financial statements, the simplicity of this ratio is an advantage to facilitate the analysis phase. Cole (1972) proposed data separation based on the diversity between expenses and income, this suggestion also uses the key sources of income:

Net interest income; Commission income; Trading and other income. The following figure provides the ROE scheme for banks:

Figure N°01: ROE scheme for banks



Source: Christian Kalhoefer and Rania Salem, Profitability analysis in Egyptian banking sector. Faculty of Management Technology. GUC. Working Paper No. 7. 2008. P12.

¹ Investopedia, <https://www.investopedia.com/ask/answers/040815/what-level-return-equity-common-company-banking-sector.asp>, visited the 17/04/2020.

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The previous figure would be clearer after understanding the expenditure scheme, as the following table present the different type of general expenditures, administrative expenditures and depreciation, with its result over the bank income statement:

Table N°02: Bank income statement

Gross Interest Income – Interest Expenditures
= Net Interest Income + Commission Income ± Trading Income ± Other Income
=Total Operating Income – Total Operating Expenditure (1) Personnel Expenditure (2) Occupancy Expenditure
= Gross Operating Profit – Provisions for Loan and Lease Losses
= Net Operating Profit ± Extraordinary Profit/Loss
= Net pre-tax Profit – Applicable Taxes
= Net after-tax Profit

Source: Ibid, Christian Kalhoefer and Rania Salem. 2008. P13.

The income statement can be distinguished from bank to another, according to its accounting rules, and as clarified in figure 03, ROE scheme is organized as follow:

- ✓ Income components decomposition;

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Table N°03: Bank Income decomposition

IM = Interest Margin = $IM = \text{Net Interest Income} / \text{Total Assets}$
CM = Commission Margin = $CM = \text{Net Commission Income} / \text{Total Assets}$
TM = Trading Margin = $TM = \text{Net Trading Income} / \text{Total Assets}$
EXOT = Extraordinary and Other Income Margin = $\text{Net Extraordinary and Other Income} / \text{Total Assets}$

Source: Established by the author

The aforementioned income ratios their sum result the Gross Income Margin, if:

- ✓ Operating Expenditure Margin (OEM) = Operating Expenditure / Total assets;

From the previous equation, we can deduct the GPM:

- ✓ Gross Profit Margin (GPM) = Gross profit / total assets;

At this stage, we can subtract RPM:

- ✓ Risk Provisions Margin = Risk Provisions of the year / Total Assets;

We concluded that:

- ✓ Return On Assets (ROA) = Net Profit / Total Assets;

If we replace the denominator from Total Assets to Shareholder's Equity, the result will be as follow:

- ✓ Return on Equity before tax (ROE bt) = Net profit / Shareholder's Equity.

The outcome of the ROE-scheme offers general understanding of the profitability structure in banks.

2.1.2. Return On Assets (ROA)

Usually, Return on Assets (ROA) as performance indicator is more reliable than (ROE), concerning efficiency performance, as ROA is adjusted for leverage ($ROA = ROE / \text{leverage}$).

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Furthermore, ROA as a performance measurement give the investor an image of how profitable a bank is relative to its total assets¹.

ROA is the capacity of a bank's management to make profits from the bank's assets, although due to off-balanced-sheet activities it can be biased. ROA is frequently denoted as the bank's equity multiplier that evaluates the financial leverage. The banks that report higher ROA, they have lower leverage, consequently higher equity and lower ROE. ROA appears to be the key ratio for banking performance measurement².

The return on assets formula as previously mentioned is:

$$\text{ROA} = \text{Net Income} / \text{average Total Assets}$$

$$\text{ROA} = \text{Profit Margin} / \text{Total Assets turnover}$$

The first equation use average total assets as denominator, this is due to the fluctuation of the assets owned by the bank through the time, also it can be due to the seasonality of the banks revenue, and by using the average assets over time eliminate those issues.

The after-tax income is used to determine the return on assets of a bank, and to evaluate the profitability of every monetary unit in the assets that it owns. The return on assets is generally applied to test the bank's return to shareholders.

The ROA is a benchmark ratio, to compare the profitability between banks, this indicator can be useful, if only it was applied and compared between operators of the same sector, as it is will be used in this these in the banking sector, that is because dissimilar sectors require different amount of capital and assets to generate profits. Furthermore, ROA would be optimally useful if we compare the ROA ratio of the same bank over time, which mean, to compare it to different stages in the bank life cycle.

2.1.3. Net interest Margin NIM

The third traditional performance measure is Net Interest Margin (NIM), this indicator determine the bank profitability, it is the return of the bank intermediation activity, which is collecting deposits and granting loans, and the intermediation between those who have financial resources surplus, and those needs it. More precisely, this indicator is conducted by³:

$$\text{NIM} = \text{Net Interest Income} / \text{Interest-Earning Assets}$$

Where Net Interest Income is calculated as follow:

$$\text{Net Interest Income} = \text{Interest Income} - \text{Interest Expenses}$$

¹ Beyond ROE – how to measure bank performance, European central bank report, 2011.

² Panayiotis P. Athanoglou. And al. *Bank-specific, industry-specific and macroeconomic determinants of bank profitability*. Int. Fin. Markets, Inst. and Money (18). 2008 .PP. 121–136.

³ Rubi Ahmad and Bolaji Tunde Matemilola. Determinants of Bank Profits and Net Interest Margins. Researchgate. 2014. PP. 229-248. <https://www.researchgate.net/publication/257811193>.

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Where Interest Income is conducted from the bank's granting loans activity and Interest Expenses is the sum of interest paid to those who put their saving in a particular bank looking for interest income by the end of the deposition period.

Different from the aforementioned performance indicators, Net Interest Margin has this essential reason, that it uses information of the revenues and costs acquired from the traditional activity of a bank to calculate this indicator, but not other type of revenue and cost. This can be consider as a limitation of this indicator, because of abandoning several revenues originating from the bank's income statement, precisely, the NIM index emphasis a narrow bunch but very important budget items, which permits us to determine the financial performance of the bank's core business.

The other profitability indicators such as ROE and ROA can be influenced by the numerator of the NIM indicator, which is net interest income, as one of the most important elements in the net income of a bank. In case of the shrinking in net interest income the bank activity must be reinforced with strengthening of business lines, or by limiting the operating costs, or also by non-recurring incomes. All the proposed offset strategies come with several types of risks that need to be well examined and managed¹.

The NIM index has continuously been a debate territory between professionals and academicians, just after the international financial crisis, the NIM indicator has developed a high importance in bank performance analysis. Since 2007 banks was presenting severe deterioration in loan portfolios, non-performing credits increased immensely, bank operating with customers that generate high risk and with a high share of credits over total assets were facing disciplinary action from the financial authorities. The banks that were the most effected by the crisis are small and local banks, which have limited financial portfolio, and concentrated on the traditional intermediation bank activity, however, large and foreign banks also witnessed critical problems. Several monetary and economic policies were adapted by the monetary authorities to prevent the rapid spread of the financial crisis to the economy, the policy was to lower the short-term interest rates, also in developed countries it was complemented with sharp decreasing in long-term interest rates, as a result the yield curve was flatten. The previous two components of the monetary policy had an impact over the banking NIM indicator the effect was over the denominator and numerator (Net Interest Income, and Interest-Earning Assets) of the indicator. Consequently, the progression of the NIM index led to the role of presenting the way banks can change their liabilities and assets management according to the economic context changes, also showed the interest of keep the track of performance indicator in crisis period².

¹ Abreu M., Mendes V. *Commercial bank interest margins and profitability: evidence for Some EU Countries*, Proceedings of the Pan-European Conference Jointly organized by the IEFS-UK & University of Macedonia Economic and Social Sciences, Thessaloniki, Greece, 17–20 May.2001.

² Beltratti A., Stulz R.M. *The credit crisis around the globe: Why did some banks perform better?*, Journal of Financial Economics, 2012. P 105.

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Beside the importance of the NIM index in analysing banking performance, also it has several boundaries. As mentioned heretofore, the nature of the NIM indicator is to only concentrate on net interest income, and this performance measure abandon other incomes that the bank may generate with annex activities. During the last few contacts, banking system witnessed enormous development and diversification in term of financial products that generate significant revenue flows, referring to the different financial products authorised and promoted by the monetary authorities. Even though, net interest income is at the heart of the financial performance of a bank, only 30% to 40% of the bank operating revenue is from non-interest income, for this reason, NIM jeopardies offering an ambiguous image of a bank's capability to generate income¹.

Another limitation of the NIM indicator is its incapability in term of calculating the net interest income that it cannot separate between interest income and interest costs. If the NIM numerator is increasing, that might me from two different reasons, it can be from healthy assets profitability, or as it can be from cheaper funding sources, so each situation have a precise risk causes. The amelioration of interest income levels might be caused by granting loans to riskier customers that are ready to pay extra to cover their risk of insolvent. However, decreasing interest rate on savings might fade away customer loyalty, or cause cash withdrawal².

At the end, the Net Interest Margin indicator neglects the importance of efficiency that distinguishes the bank from other operators in the sector. Dissimilar to ROA and ROE previously mentioned, the NIM index does not take into consideration any signs about the operating costs, and it is restricted in interest costs as a component of the bank expenditures. As the efficiency is a significant problem in the banking sector, this NIM limitation may be crucial in term of this indicator uses³.

2.2. INTERNAL DETERMINENTS OF BANK PERFORMANCE

The financial performance or profitability in a traditional enterprise is generally linked, determined by managerial decisions and choices in term of strategy, production and organization, the managerial choices are made as a respond to the external imitations, to ameliorate the efficiency of the enterprise and prediction of the competitors' moves.

At this stage, it is suitable to sustain the theory that it does existed a direct relation between managerial decisions and the profitability of a bank, and for the first instance, it is ideally to link the serious problems in the financial aspect of a bank to a bad management. The last prediction is due to the reality that a wide range of profitability elements are controlled, affected by the top management decisions, therefore the stability and the risks faced by a company is in

¹ Calmès C., Theoret R. *The Impact of Off-Balance-Sheet Activities on Banks Returns: An Application of the ARCH-M to Canadian Data*, Journal of Banking and Finance. 2010. P. 34.

² Carbo Valverde S., Rodriguez Fernandez F. *The determinants of bank margins in European banking*, Journal of Banking and Finance, 2007. P. 31.

³ Stiroh K.J. *A Portfolio View of Banking with Interest and Noninterest Activities*, Journal of Money, Credit, and Banking, 2006. P.38.

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their hands, these elements can be grouped under the headline: internal determinants of bank profitability¹.

2.2.1. The size of a bank

One of the most prudently discovered factors between the determinants of bank performance is the size of a bank. In traditional companies, the size of a company was tremendously examined and well-known subject not only the financial aspect. On the other hand, the financial determinants have several effects on the bank performance, for **Shehzad (2013)**²: the size of a bank as factor in the bank profitability can be linked to creation of economies of scale.

In contrary, the large size banks can have particular understanding of some subjects, different ways of issues treatment, and several methods to control their demeanor and financial outcomes. The study of bank size is present practically in all empirical works as a control variable, where the differentiation in term of size is essential to ensure that the research findings are valid, and especially if the research sample is wide, so this discrimination becomes fundamental. Furthermore, in international market, we find a small banks operating simultaneous with mega banks in the same market, granting loans and collecting deposits on a global scale, in such situation, taking into consideration the size of a bank is critical and should be studied judiciously³.

Nevertheless, the empirical researches that studied the impact of size over bank profitability provided conflicting findings. The economies of scale in the banking sector is controvertible, generally, some researches such as the study of **Tregenna (2009)**⁴ found the existence of inverse relationship between the size and the profitability indicators in a bank, where the advantages related to size decrease as the size increases.

2.2.2. The business model of a bank

The business model of bank is an essential component of the internal performance determinants, where this factor profoundly conditions the strategic decisions in term of market positioning and its return-risk profile⁵. The researchers in this subject allocated enormous empirical resources just after the international financial crisis in 2007, the amount of researches in the topic is indirectly proves the position of the business model choice in bank's income and financial results.

Due to precise factors, the orientation of a bank to a particular business model can be determined, that the top management declared the strategic choice, or on the other hand, by factors that tend to apprehended précised and important connotations of the bank's activity.

¹ Rasiyah D. *Review of Literature and Theories on Determinants of Commercial Bank Profitability*, Journal of Performance Management, 2010. P. 23.

² Shehzad C.T., et al. *The relationship between size, growth and profitability of commercial banks*, Applied Economics, 2013 .P.45.

³ Goddard J., et al. *Dynamics of Growth and Profitability in Banking*, Journal of Money, Credit and Banking. 2004. P. 36.

⁴ Tregenna F. *The fat years: the structure and profitability of the US banking sector in the pre-crisis period*, Cambridge Journal of Economics. 2009. P. 33.

⁵ Gambacorta L., van Rixtel A. *Structural bank regulation initiatives: approaches and implications*, BIS Working Papers. 2013. P. 412.

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Among these, we can derivative two variables, which are the balance sheet and the income statement of a bank, respectively, the credit share over the total assets and the interest income.

Large banking groups now are heading for revenue diversification, changing from consulting to asset management, and from lending to trading, today banking activities have a large of sources of revenue. The theory of “do not put all your eggs in one basket” is valid for bank revenue diversification as in portfolio theory, where the concept is simple strategy in term of banking risk management. Although, the strategy of diversification can be applied in traditional companies with low costs, but in banking sector the strategy is expensive and difficult to carry out. In banking world, the revenue diversification requires several investments; the implantation of organisational process, technological investments, and acquisition of skills for employees assigned to the innovative roles. These changes necessitate a massive investments and it is an immense cost for the bank if it did not come to manage and to bear it down¹.

On the other hand, the credits and interest rate income subject can be affected by the possibility of loans market deterioration, as in the last international financial crisis. The literatures in this subject are several, in term of the part of non-performing credits over the total credits, concerning credits that necessitate particular attention over the total credits, or loan provisions injected in income statement of a bank. There is empirical evidence concerning these different aspects, where they have negative impact over the profitability of a bank².

2.2.3. Capital level

Another internal determinant of financial profitability in a bank is the role played by a bank regulatory capital level, in the subsection dedicated to bank performance measures, we presented the consequence of having low level of intermediaries equity can provide tremendously high level of ROE. Although, the fragility recorded the last decade of the banks categorized by high level of capital ratio is now limited by the prudential regulation proposed by international market authorities³.

View the importance of the financial leverage, empirical researches have proved that there is a positive relationship between financial leverage and risk default of a bank, which a lower level of capital ratio walk hand in hand with lower level of risk default for the bank, consequently, the bank will be more flexible financially in term of market deterioration. These concepts should participate to decrease the expectations of stakeholders ‘returns, by facilitating the creation of value. Although, the analysis using ROE as dependent variable will have a negative influence from capital ratio, because of the equity presence in denominator of the ROE indicator, and in the leverage numerator⁴.

The international banking sector witnessed in modern economy a serious decrease in interest rates, but an increase in competition level. In these circumstances, among banks there is gap of

¹ Sanya S., Wolfe S. *Can Banks in Emerging Economies Benefit from Revenue Diversification?*, Journal of Financial Services Research, 2011. P.40.

² Chronopoulos D.K., et al. *The dynamics of US bank profitability*, The European Journal of Finance, 2015. P.21.

³ Dietrich A., Wanzenried G. *The determinants of commercial banking profitability in low-, middle, and high-income countries*, The Quarterly Review of Economics and Finance, 2014. P.54.

⁴ IMF – International Monetary Fund. Spain: Financial Sector Assessment Report; Technical Note: Determinants of Bank Profitability, IMF Country Report No. 17/339, Washington, DC. 2017.

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profitability levels, this specific factor is the efficiency level of each bank, this efficiency is the capability of banks to cover the costs when incomes become narrower. Additionally, the fixed costs of bank make the bank's income and revenue more volatile. However, in the literature another ratio is used called the cost income ratio¹:

$$\text{Cost income ratio} = \text{Operating costs} / \text{Operating income}$$

This indicator highlights the ability of a bank to balance recurring costs and revenues. However, there are banks can operate with very low fixed costs, due to their particular structure. Generally, banks that have traditional intermediation activity and able to keep their fixed costs low tend to have greater profitability than others. Keeping the cost income ratio under an acceptable level needs a great care from the bank's management itself, also in term to establish effective benchmarking activities among competitors. In this concern, it should be illustrated that the significance of the cost income ratio related to the bank's ability to benchmark between its costs and revenues, and not only to provide a demonstration of the costs incurred.

2.3. EXTERNAL DETERMINENTS OF BANK PERFORMANCE

The banking system is essential for the functioning of financial markets, also the whole economy. The banking system activity based on their role of risk and asset management lead the banking system to be a fundamental structure in the economy of any country, the bank is a direct relationship of intermediation between the bank and its environment; enterprises, public administrations, families and households. To this end, the banking sector is in a strong relationship with its environment. Furthermore, these environmental factors have an effect over the sustainability of the bank and its profitability. In previous researches, the external determinants of bank performance are usually grouped in three types: competitive factors, regulatory factors and macroeconomic factors. The external elements that are the most that affect the bank performance are economic cycle, inflation and the level of market interest rates.

2.3.1. Macro-economic factors

The economic or business cycle is generally estimated by the variation and the volatility of the Gross Domestic Product (GDP), precisely, the bank performance is predicted to trail a pro-cyclical trend². Economic recession or GDP reduction lead to bank income shrinking, on the other hand, GDP growth therefore stimulate bank's revenues, this positive relation is due to the effect of GDP variation over the customer default, consequently the increase and decrease of the non-performing loans of a bank.

Several studies interested in the impact of inflation and interest rates as external profitability determinants in the banking sector, where interest rate reduction proved to be the cause for the shrinking in the bank's margins³. However, the inflation as macroeconomic external factor was demonstrated in most of the empirical studies to have a negative relationship with the bank

¹ Molyneux P., Thornton J. *Determinants of European bank profitability: A note*, Journal of Banking and Finance, 1992. P. 16.

² Kanas A., Vasiliou D., Eriotis N. *Revisiting bank profitability: A semi-parametric approach*, Journal of International Financial Markets, Institutions & Money, 2012. P. 22.

³ Claessens S., et al. *Low-for-long Interest Rates and Net Interest Margins of Banks in Advanced Foreign Economies*, IFDP Notes, Board of Governors of the Federal Reserve Board, Washington, DC. 2016.

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performance, where the focus is on the bank's capability to stabilise an adequate level of marginality by passing on price increase through the rates offered and charged to clients¹.

2.3.2. Competitive factors

In imperfectly competitive markets, the banks were able to benefit from the market imperfection (monopolistic or oligopolistic returns). Nowadays, using proxies such as Herfindal Hirschman index or the market share for the top 3,5,10 banks, market competition is a control variable in bank performance². Among the traditional theories that deal with the impact of market competition on the firm profitability that was applied in the banking sector are³: Structure-Conduct-Performance (SCP), the Efficient- Structure hypothesis, the Expense Preference hypothesis and the Galbraith-Caves Risk avoidance hypotheses. The conducted results showed that an oligopolistic rent is generally caused by a high level of market concentration related with collusive behaviours. Although, the effect of competition on the bank performance still ambiguous and uncertain, due to the results of the previously mentioned researches, which illustrate that the final outcome can be the compression of the bank's margins and reduction of the overall profitability in case of harsh competition between intermediaries.

2.3.3. Regulatory factors

The last factor that can explain the bank's ability to generate profits and to be financially profitable is the regulation factors, as the regulations can control the activity of the bank, by prohibiting certain activities, or on the other hand, obliges the bank to play certain role. Over all, the banking regulation have a purpose to affect the income opportunities of the operators in the banking sector, the study of the effect of the this factor on the financial performance should take into consideration the different regulation found in each country, therefore, the necessity to harmonize the process of the study. Due to the dissimilarities among countries, it is quite difficult to include regulatory differences in a single study⁴.

¹ Beltratti A., Stulz R.M. *The credit crisis around the globe: Why did some banks perform better?*, Journal of Financial Economics, 2012. P.105.

² Mirzaei A., et al. *Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies*, Journal of Banking and Finance, 2013. P.37.

³ Rasiah D. *Review of Literature and Theories on Determinants of Commercial Bank Profitability*, Journal of Performance Management, 2010. P.23.

⁴ Barth J. R., et al. *Bank regulation and supervision: what works best?*, Journal of Financial Intermediation. 2004. P.13.

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CONCLUSION

Banks have been playing a significant role in the economy since they were established. The banking system is a crucial element that contributes a lot into economy domestically as well as internationally. The process of production, distribution, exchange and consumption has become easier due to the banking system globally. Nowadays, the modernized banks play an important role in utilizing the resources of the economy of a specific country. Banks are considered not merely as dealers in money but also the leaders in economic development. They are not only the store houses of the country's wealth but also the reservoirs of resources necessary for economic development. They play an important role in the economic development of a country. Bank's functions differ from one bank to the other but all commercial banks have two principal roles: creation of credit and acceptance of deposits. Bank's performance in recent years became an essential concern for researchers and investors; it may be influenced by many factors including internal determinants such as capital and liquidity or external ones like inflation and GDP. Profitability of commercial banks can be measured by many financial ratios: return on asset, return on equity and net interest margin are the most widely used in academic research.

Subsequently to the present chapter, where we tried to explain the main bank risks, performance measures and determinants. The next chapter is dedicated to study the Algerian banking performance indicators, specific risks and the literature review of the study.

CHAPTER II: BANKING RISKS AND FINANCIAL PERFORMANCE IN ALGERIAN BANKS

INTRODUCTION

Algeria's economy remains dominated by the state, a legacy of the country's socialist post-independence development model. Gradual liberalization since the mid-1990s has opened up more of the economy, but in recent years Algeria has imposed new restrictions on foreign involvement in its economy and largely halted the privatization of state-owned industries. The banking sector remains small and disconnected from the global financial system. Credit growth is high, but funding is directed to government-related enterprises, as banks finance the state's spending program. This chapter gives a small overall description of the Algerian banking sector through two sections and a literature review:

Section 01: Overview of the Algerian banking risks

Section 02: Financial performance in Algerian banks

Section 03: Literature review

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1. Overview of the Algerian banking risks

The banking world is facing several changes and uncertain events, as previously defined risk is the uncertainties created from internal or external variations that may result profitability deterioration. The banking activity is characterized with risk, and knew a numerous type of it. However, the risk assessment and management witnessed a significant interest from professionals as from researchers in the few past years, where the risk management evolved from qualitative risk assessment to quantitative risk assessment, this evolution is caused from two main factors: the risk practices development and regulatory incentives. Furthermore, the quantitative risk measurements require a sound base of the different risk definitions. Therefore, risk definition is getting more precise over the years. The capital requirements imposed by the regulatory authorities helped the process of risk management. This imposing capital charges implies modeling the value of risk.

1.1. Credit risk

Credit risk is the risk due to uncertainty in counterparty's (also called an obligor's) ability to meet its financial obligations¹.

It remains the most important risk for the financial sector. In Algeria the corporate sector, comprising mostly SOEs, has reduced debt levels and hence leverage in recent years, because of capital injections by the sovereign to finance investment. Repeated government interventions in the banking system have shifted losses from public banks to the government balance sheet. Household debt is largely restricted to mortgages, which are subject to tight prudential norms- loan-to-value ratios are capped at 70 percent and debt-to-income ratios at 40 percent. The ban on consumption credit keeps credit risk contained².

1.2. Interest rate risk

The investment's value change due to variation of interest rates, in the spread between two rates, in the shape of the yield curve or in any other interest rate relationship. Such changes usually affect securities inversely and can be reduced by diversifying (investing in fixed-income securities with different durations) or hedging (e.g. through an interest rate swap). Interest rate risk affects the value of bonds more directly than stocks, and it is a major risk to all bondholders. As interest rates rise, bond prices fall and vice versa. The rationale is that as interest rates increase, the opportunity cost of holding a bond decreases since investors are able to realize greater yields by switching to other investments that reflect the higher interest rate. For example, a 5% bond is worth more if interest rates decrease since the bondholder receives a fixed rate of return relative to the market, which is offering a lower rate of return as a result of the decrease in rates³.

¹ http://www.riskencyclopedia.com/articles/credit_risk/ date visited 20 /08/2020.

² IMF Country Report No. 14/161, ALGERIA financial system stability assesment, 2014, p 15 <https://www.imf.org/external/pubs/ft/scr/2014/cr14161.pdf>.

³ IMF Country Report,op-cit, p 17.

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In Algeria, in case of liquidity shocks, risk is mitigated by banks' recourse to central bank funding facilities. Additionally, since there are no foreign inflows into the financial system, the risks associated with sudden outflows are currently absent.

1.3. Foreign exchange risk

FX risk is the risk of an investment's value changing due to changes in currency exchange rates. In other words, it is the risk that an investor will have to close out a long or short position in a foreign currency. Foreign exchange risk is also known as "currency risk" or "exchange-rate risk".

The banking sector in Algeria is largely insulated from FX risks. Lending in FX is prohibited, while a number of exchange controls require exporters to repatriate all export proceeds, with 50 percent converted into local currency. As a result, FX balance sheet risks are negligible. In addition, banks have a limited international footprint, limiting the impact of direct foreign shocks.

1.4. Liquidity risk

Liquidity is the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. (Basel Committee). The fundamental role of banks in the maturity transformation of short-term deposits into long-term loans makes banks inherently vulnerable to liquidity risk; Liquidity risk management is of paramount importance because a liquidity shortfall at a single institution can have system-wide repercussions.

In case of liquidity shocks in the Algerian banking system, risk is mitigated by banks' recourse to central bank funding facilities. Additionally, since there are no foreign inflows into the financial system, the risks associated with sudden outflows are currently absent.

1.5. Hydrocarbon risk

The low degree of trade and financial integration with the world economy insulates Algeria from most external shocks. However, with hydrocarbon exports accounting for virtually all exports, and over two-thirds of direct government revenues originating from that sector, the banking system is highly sensitive to hydrocarbon shocks. By extension, hydrocarbon risk also becomes a concentration risk for the sovereign, given its dependence on oil revenues. During the boom years, easy credit conditions lay the seeds for higher credit risk during downturns.¹

1.6. Governance risk

The government continues to play conflicting roles with respect to SOBs that weaken the banking sector's role in effectively intermediating credit. In particular, the government is the largest bank owner; it acts as regulator; and it is the main client (through the SOEs). Despite some improvements in the governance of the SOBs, important weaknesses remain. First, SOBs lack independent and seasoned experts on their boards. Second, the government lacks an ownership function to effectively manage the state's assets, e.g., policies and processes for

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setting performance contracts, tracking key performance indicators, nominating board members and voting shares are poorly defined or absent. Third, most SOBs have rudimentary incentive schemes linked to short-term indicators. Finally, in all SOBs, the chair of the board is also the Managing Director of the bank, creating potential conflicts of interest between oversight and management functions. Governance of SOBs, as highlighted in the assessment of the banking supervision practices, is a source of concern. The high NPLs in public banks reflects in part weak governance, and the associated weak risk-management and information technology (IT) systems in place, as well as incentive schemes that are not properly aligned. Banks ‘move into new business areas, notably housing and SMEs, might surface new governance risks.

1.7. Loan quality in the Algerian banks

Algeria’s banking system is characterized by an exceptionally strong and persistent presence of the public sector. The public banks direct the country’s vast domestic savings to the state-owned enterprises operating in the country’s hydrocarbon sector, which produces the country’s chief exports. Moreover, although the banks appear to be well capitalized, the loan quality is very low, especially in the portfolios of public banks, requiring constant restructuring. The predominance of state-owned banks leads to a number of issues. Firstly, by providing funding primarily to public enterprises, the present structure restricts the diversification opportunities for the Algerian economy. According to recent figures, the share of loans to the private sector represent only one-fifth of total banking assets.

Table N°04: Loan quality ratios in the Algerian banks from 2009 to 2012

	2009	2010	2011	2012
NPLs/Regulatory Capital	33.9	21.1	19.4	16.2
Public Banks	46.0	27.5	25.1	20.4
Private Banks	1.5	3.0	2.3	3.4
NPL Ratio	21.1	18.3	14.5	11.5
Public Banks	23.6	20.5	16.1	12.4
Private Banks	3.8	4.1	4.0	5.2
Net NPL Ratio	7.3	4.9	4.4	3.5
Public Banks	8.3	5.4	4.9	3.8
Private Banks	0.7	1.4	1.0	1.5
Provisioning Rates for NPLs	65.4	73.5	69.9	69.5
Public Banks	65.0	73.7	69.6	69.4
Private Banks	82.0	66.7	75.9	71.7

Source: Algeria financial system stability assessment, international monetary fund, 2014, p 27

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A large proportion of the total assets are held in loans to public enterprises, mostly in the hydrocarbons sector. Although a more effective financial intermediation and diversification of the economy are the key aims of the authorities, progress has been limited in channeling the domestic savings into the real economy, especially to non-hydrocarbon businesses and private enterprises. A second problem arises from the allocation of credit to inefficiently run public enterprises, as a result the state-dominated banking sector has been characterized by exorbitant levels of non-performing loans (NPLs), especially for loans to public enterprises.

Over the past years, this fundamental weakness has repeatedly threatened the viability of the quality of public banks portfolios, calling for a frequent clean-up of the balance sheets via government loan purchases. The government implemented such a buy-back program in 2008, when the NPL rate in public banks had dropped from 24% of total loans in 2007 to 20%. Despite these policies, the NPL rates continue to remain high for the publicly owned banks, not only for their loans to state-owned enterprises but also for the credit, they extended to private-sector businesses. In turn, foreign owned private banks, which have almost no exposures to the public sector businesses, have relatively low NPL rates.

On the other side, it is quite difficult to get credit for private enterprises especially startups. Globally, Algeria stands at 171 in the ranking of 189 economies on the ease of getting credit. The rankings for comparator economies and the regional average ranking provide other useful information for assessing how well regulations and institutions in Algeria support lending and borrowing. The finding is not surprising. Algeria is among the last countries in terms of creditors' rights and information-sharing capacity. In particular, there are no private credit bureaus and the public credit registry's coverage is largely insufficient.

To conclude, Algeria's banking system is dominated by six public banks, which continue to collect over 90% of the domestic deposits and divert a significant proportion to the mostly inefficient public enterprises concentrated in the hydrocarbon sector. Under current conditions, the Algerian financial sector is not providing the necessary funding for its private sector to successfully diversify its economy.

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2. FINANCIAL PERFORMANCE IN ALGERIAN BANKS

The Algerian banking system knew several changes, starting from the French colonial stage, to the liberalisation phase, these changes created a numerous of barriers in the face of developing a healthy system as planned by the Algerian authorities. Subsequently, the Algerian banking system was ruled and controlled by the public authorities to emerge an industrial sector, which distinguished by an intensive capital production technology.

2.1. THE EVOLUTION OF THE ALGERIAN BANKING SECTOR

In 1986, the Algerian government was pushed by the economic crisis to adopt massive economic reforms in which this reform was shaped in improving the Algerian banking system. Measures as focusing on the correction of the macro-economic imbalances, stimulate the foreign direct investment, and open the Algerian economy to the international competition were needed to smooth the transition from the centrally-planned economy to the market economy¹.

The following table summarized the historical background of the Algerian banking system:

Table N°05: Historical background of the Algerian banking system

Phase	Period	Bank owned by the state	Characteristics
Colonial phase	1851-1962	Banque de l'Algérie (Annex of banque de France)	The Algerian banks were just an extension of the French banking system; they were created to guarantee the financial needs of the colonial economy.
Sovereignty phase	1962-1966	Central Bank of Algeria CBA - Caisse Algérienne de Developpement (CAD) -Caisse National d'Epargne et de Prévoyance (CNEP) -	The Algerian authorities during this period have planned set of development programs that had economic-social objectives.
Nationalization and socialization phase	1966-1982	Banque Nationale d'Algérie (BNA) - Crédit Populaire d'Algérie (CPA) - Banque Extérieure d'Algérie (BEA)	The Algerian authorities have emphasized on the principle of the centralization of the resource allocation to ensure orienting resources according to the state objectives without taking into consideration the banks' objectives.
Restricting phase	1982-1986	La Banque de L'Agriculture et du Developpement Rural (BADR) - La Banque de Development Local (BDL)	The main characteristic of this period is restructuring the state-owned enterprises in order to improve their profitability.
Liberalization phase	1986-nowadays	-	The Algerian authorities switched the national economy from system highly dominated by state (socialist) to the market-oriented system.

Source: Ishaq HACINI, Khadra DAHOU. *The Evolution of the Algerian Banking System. Management Dynamics in the Knowledge Economy Vol.6 (2018) no.1, 2018. PP.145-166.*

The previous table shows that the Algerian banking sector has developed remarkably over time. In term of laws and regulations, the Algerian bank system went through different reforms and

¹ Ruppert, E. *The Algerian Retrenchment System: a financial and economic evaluation.* The World Bank Economic Review, 13(1), 1999.PP.155-183.

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regulations to attain the objective of the market-oriented system, which is to liberalise the banks activities and to have the autonomy needed to establish their strategy independently from the authorities. In addition, the private and foreign investments were able to enter after liberating the Algerian market. The aforementioned reforms had a positive impact on the performance of the Algerian banking system, illustrated by the development of the banks' assets, its ability to collect the deposits, and providing more credit to finance the economic development.

2.2. Credit and liquidity soundness

The banking system plays its mediation role of absorbing financial surpluses from the depositors and put to the use of investors. The banks activity is surrounded with risk and problems, and one of the main bank risks is liquidity risk, where the bank is under the obligation to meet its customer's demands of withdrawing their savings at any time.

The Following table illustrate the monetary situation of the Algerian banks during 2015 to 2018.

Table N°06: Monetary situation of the Algerian banking system (2015-2018)

In Millions of DA	2015	2016	2017	2018
MONEY et QUASI MONEY	13 704 511	13 816 309	14 974 578	15 678 893
MONEY	9 261 136	9 406 972	10 266 060	10 755 175
QUASI MONEY	4 443 375	4 409 337	4 708 518	4 923 718

Source: Annual report of CBA, 2018.

During the period 2015- 2018, the Algerian banking system seems to have a sound situation in term of the monetary security, where the money represents twice the amount of quasi money in the total of money and quasi money. In 2018, the Central bank of Algeria initiated a monetary policy to absorb the liquidity from the economy, which called "open market" operation, as a result to this policy the banking liquidity reached more than 1500 billion of Algerian dinars.

The Following table illustrate the liquid assets in the Algerian banks during 2009 to 2017.

Table N°07: Liquid assets in the Algerian banking sector (2009-2017)

Ratio	2009	2010	2011	2012	2013	2014	2015	2016	2017
Liquide assets/ total assets	51,8	53	50,2	45,9	40,5	38	27,2	23,5	23,7
liquide assets/ short term credit	114,5	114,3	103,7	107,5	93,5	82,1	61,6	58,4	53,9

Source: Annual report of CBA, 2018.

We noticed from the previous table that the liquidity in the Algerian banking system is in deterioration reached the half in 2017, due to the economic situation of the country during the period of oil prices crisis in 2014. Therefore, the liquidity must be managed by the banks, by maximising its profits, and at the same time to be able to meet the financial requirements of its

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depositors by holding a sufficient amount of liquidity, in order to achieve a balance between the profitability and liquidity.

The Following table shows the deposit structure in the Algerian banks system during 2015 to 2018.

Table 08: Deposit structure in the Algerian banking system (2015- 2018)

In millions of AD	2015	2016	2017	2018
Current deposit	5 153 064	4 909 772	5 549 155	5 969 857
Bank deposit	3 891 680	3 732 175	4 498 982	4 500 243
Deposit BCA	16 795	13 219	14 353	23 536
Deposit treasury	537 197	404 986	261 307	607 157
Deposit CCP	707 392	759 392	774 513	838 920

Source: Annual report of CBA, 2018.

The financial resources collected by the Algerian banks records a genuine progress during the period 2015-2018. In addition, the table above shows that the essential type of the financial resources is the current deposit.

The next table represents the nature of credit in the Algerian banks between 2015 and 2018.

Table N°09: Nature of credit in the Algerian banks (2015- 2018)

In millions of AD	2015	2016	2017	2018
Short term credit	1 710 642	1 914 230	2 298 014	2 420 202
Medium term credit	1 641 809	1 810 828	1 844 394	1 851 084
Long term credit	3 924 794	4 184 823	4 737 622	4 781 899

Source: Annual report of CBA, 2018.

The structure of credit by maturity indicates the predominance of long-term loans, mainly loans offered to enterprises owned by the state and active in the energy sector. Thus, the share of short-term loans increased from 2015 to 2018 similarly to the other types of loans.

The following table shows that the hydrocarbon sector does not resort to the bank loans, figures from the ratio of Credit to the economy/ GDP (NIOR), which mean that the credits offered to resident represent more than the fifty percent 50% of the GDP Not Including Oil Revenue:

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Table N°10: Credit to the economy relative to GDP not including oil revenue

Ratio	2014	2015	2016	2017	2018	2019	2020
Credit to the economy/ GDP	38.3	44.0	46.0	47.4	47.4	47.6	47.8
Credit to the economy/ GDP (NIOR)	52.5	54.2	55.7	58.5	59.8	58.7	58.0
Credit to the private sector/ GDP (NIOR)	25.2	26.7	27.9	30.1	31.3	30.8	30.1

Source: Annual report of CBA, 2020.

This subsection illustrates the improvement of the banking intermediation gradually, in parallel with banking network development, in term of credits distribution or deposits collect. However, the progress level remains below the levels reached in certain Mediterranean countries. On the other hand, the banking performance is relatively insufficient in term of a basic services provided to their customers, also in term of credit offered to small and medium-size enterprises.

Furthermore, the credit granted to the economy as a percentage of GDP passed from 38% to 48%. The inability of the banking sector to grant more credit to the economy might be caused by the opposition of the Algerian householders to count on borrowing in term to finance their activity, in the developed countries the main borrowers are the householders. But, for the Algerian people the refraining of borrowing is due to religious considerations. However, the banking sector in Algeria failed in transforming efficiently the short-term savings into long-term assets by investing into successful projects. Undeniably, the only financial source that helps the economic units in the Algerian banking sector, taking into consideration that the financial institutions and the financial market are inactive, which give the domination to the commercial banks over the financial system, as it is the case in the MENA countries¹.

It is fundamental to know that banks owned by the state rule the loans market in Algeria. More than 75% of the credit granted to the economy is offered by the state owned banks, due to their dominance over financing the public sector, on the other hand, the private banks dominate less than 25%. Nevertheless, economies such as the Algerian economy, which is centrally planned economy, are distinguished with high market power².

However, the private banking sector is important according their short experience in the Algerian market, also it is notable that the private banks' share is increasing from a year to another, for this reason, the private banks' existence will boost the competition and contribute the improvement of the public banks' services.

It existed a different theory about the dominance of the public banks, one of these theories is that the public banks sector is empowered by the Algerian authorities to enhance the financial and economic development regardless the low quality of these institutions. Which create

¹ Olson, D., and Zoubi, T.A. *Efficiency and bank profitability in MENA countries*. Emerging markets review, 12(2), 2011. PP.94-110.

² Delis, M.D. *Bank competition, financial reform, and institutions: The importance of being developed*. Journal of Development Economics, 97(2). 2012. PP.450-465.

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barriers for the private banks' performance and According to **Andrianova, Panicos, and Anja (2012)¹**: the confidence in private banks might be increased by the quality of institutions, and the appearance of opportunistic tendencies is prevented from happening in less developed banking system.

2.3. Performance indicators in Algerian banks

To create a strong financial banking sector in Algeria, the actors of the system have replied to the directions of the central bank regarding the prudential regulation by augmenting their capital. Therefore, during the period (2000- 2013), the Banks's capital amplified by 60%. Although that the solvency ratio recommended by the standards of Basel III for covering the risks is 7%, the Algerian banking system recorded 15.4% in 2012². The Algerian banking system is recognize by an excess liquidity since the granted credits are lower than the banks' deposits, and that the ratio of credits/ deposits never went less than 50% in the last decade. The central bank policy is the reason of what it called idle capital caused by the excess liquidity, this policy was made to control the inflation.

Concerning the financial soundness in the Algerian banking sector, the instructions of the central bank was executed by the banks, in term of prudential regulation of increasing their capital therefore the Algerian banks witnessed capital augmentation of 60% between 2000 and 2013. Referring to the IMF, the Algerian banking system give the impression to be sufficiently capitalized, profitable and liquid, essentially caused by the state assistance³.

Furthermore, the asset quality in the Algerian banking system is quite high, where the assets are able to cover more than 70% of non-performing loans. The Algerian banking system was able to put an end to the nonperforming loans by the assistance of the state, and record an interest margin that contribute to 70% of the operating income, which increase its profitability comparing to neighbour countries. Aforementioned, the Algerian banks are liquid, back in 2015, the Algerian banks had 48% of their assets liquid, it is a fact that this liquidity is due to oil export operations⁴.

Additionally, one of the other reasons of liquidity excess is the banks conservative policy in granting loans, this policy was taken by the Algerian banks to control credit risk, this procedure is justified by the situation explosion in 2007, where nonperforming loans reached 680 billion AD. This necessitated urgent measures to control this phenomenon, which helped to supervise this problem and decreased to 16% in 2011.

The following Figures highlight the development potential in terms of financial inclusion and the development of financial intermediation in Algeria.

¹ Andrianova, S., Demetriades, P., and Shortland, A. *Government ownership of banks, institutions and economic growth*. *Economica*, 79(315), 2012. PP.449-469.

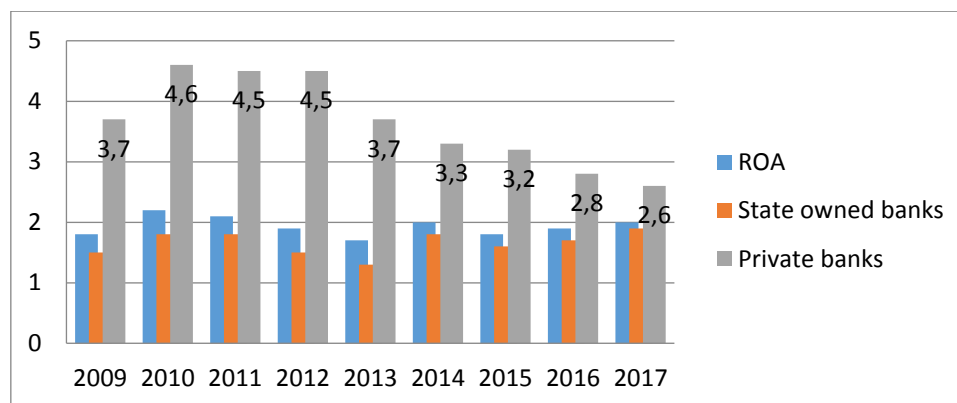
² CBA (2013). *Banques et établissement financiers*. Retrieved on April the 11, 2019, from: <http://www.bank-of-algeria.dz/html/banque.htm>

³ FMI's Report No. 14/161. *Financial System Stability Assessment*. 2014.

⁴ *Ibid*. Bouchetara Mehdi. 2018. PP. 57-67.

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Figure N°2: Return on Assets (ROA) of the Algerian banks (2009-2017)

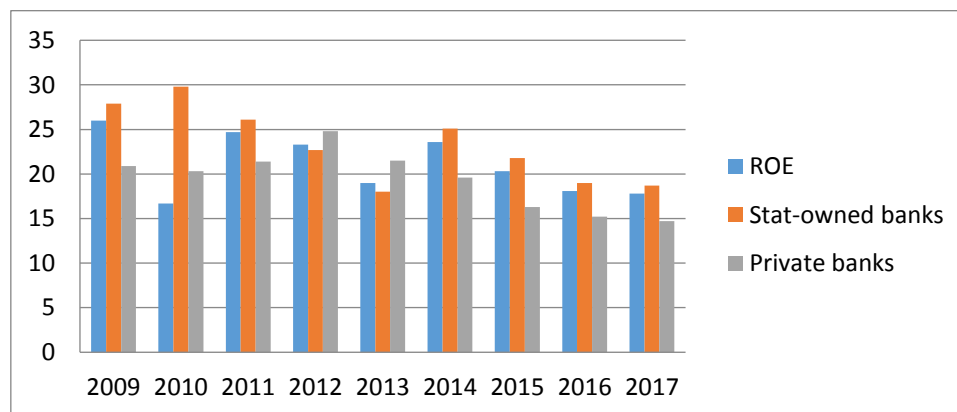


Source: Central bank of Algeria, 2019.

From the previous table it is clear that the profitability of Algerian banks has increased between 2009- 2017, and reach 2% in 2017. After the subprime crisis in 2008, the ROA as an indicator of profitability has gradually improved, this improvement shows that the Algerian banking still have potential to realise higher profits, where the Algerian market didn't reach the maturity stage and the competition didn't reach high levels.

The next figure present the evolution of ROE ratio over 2009-2017

Figure N°03: Return on Equity (ROE) of the Algerian banks (2009-2017)



Source: Central bank of Algeria, 2019.

Return On Equity (ROE) is a ratio that measures the profitability of the bank's equity. It is relatively decreasing from 26% in 2009 to 17.8% in 2017 this deterioration is due to results stabilization for the state-owned banks, and due to equity augmentation for the private banks.

It is clear the progress witnessed by the Algerian banking system, in term of regulation, quality of service and profitability. For the regulation and law aspect, different changes have been made to guide the system from the socialist system to market-oriented system, and also to give the needed autonomy for banks to establish their own strategy lines. Consequently, the banks' performance was positively affected by these reforms, and the banks' mission was more active in term of their capacity to collect the deposits and granting more loans to finance the economic development.

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Despite of the improvement of the Algerian banking system, banks in Algeria still struggle from many deficiencies that hold back their development. One of these limitations is the dominance of the state-owned banks (06 banks) over the whole banking sector, and 87% of the loans market, which curb the improvement of the service quality¹. Therefore, the Algerian authorities need to encourage the implementation of the regulations and to strengthen the institutions. Furthermore, the state-owned banks can benefit from the experience of the foreign banks, of their management style, new technologies and risk management; also the Algerian banks need to obtain effective risk management tools and financial rules according to the international standards.

¹ Abed, G.T., and Davoodi, H.R. *Challenges of growth and globalization in the Middle East and North Africa*. Washington, DC: International Monetary Fund.2003.

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3. LITERATURE REVIEW

A number of studies have examined bank performance in an effort to determine the factors that account for interbank differences in profitability. Most of these studies have examined the impact of regulatory, macroeconomic or structural factors on overall bank performance.

Determinants of bank profitability can be split between those that are internal and those that are external. Internal determinants of bank profitability can be defined as those factors that are influenced by the banks management decisions and policy objectives. External determinants of bank profitability are concerned with those factors, which are not influenced by specific banks decisions and policies, but by events outside the influence of the bank. Several external determinants are included separately in the performance examination to isolate their influence from that of bank structure so the impact of the formers on profitability may be more clearly discerned.

3.1. Tunisia

A paper realized by Samy Ben Naceur investigates the impact of bank's characteristics, financial structure and macroeconomic indicators on bank's net interest margins and profitability in the Tunisian banking industry.

This paper follows in the footsteps of Abreu and Mendes (2002), Demerguç-Kunt and Huizingha (1999) and Ben Naceur and Goaid (2001) among others who have done similar research on the Tunisian banking sector¹.

The sample includes the main deposit banks in Tunisia (10 banks) over the period of 1980-2000. The research used balanced panel data. The empirical test is concerned with the determinants of interest margin and profitability of the Tunisian deposit banks.

The research provides statistics on size and decomposition of bank's interest margin and profitability. It uses regression analysis (panel data with random effects) to find the underlying determinants of Tunisian banking industry performance.

Two measures of performance are used in the study: net interest margin (NIM) and return on assets (ROA). Five bank's characteristics indicators are used as internal determinants of performance. They comprise the ratio of overhead to total assets, the ratio of equity capital to total assets, the ratio of bank's loans to total assets, the ratio of noninterest bearing assets to total assets, and the log of bank assets. Two macro-economic variables are used: inflation (INF) and GDP per capita growth. Finally, the paper examines how the performance in banking sector is related to relative bank development, and to stock markets, by including relative size, which is calculated as the ratio of the stock market capitalization to total assets. The financial market development was studied using stock market capitalization divided by GDP as a proxy measure of the size for equity market.

¹ Samy Ben Naceur. *The determinants of the Tunisian banking industry profitability: panel evidence*, 2003, p2.

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The results show that there is a positive and significant coefficient on the overhead to assets ratio bank loans variable in the net interest margin and return on assets equations.

The size variable has negative and significant coefficients on the net interest margins equations. This suggests that larger banks tend to lower margins and is consistent with models that emphasize the negative role of size arising from scale inefficiencies.

In addition, the paper finds that the macro-economic indicators such as inflation and growth rates have no impact on bank's interest margins and profitability.

Turning to financial structure and its impact on bank's interest margin and profitability the paper Stock market development has a positive effect on bank profitability. This reflects the complementarities between bank and stock market growth¹.

3.2. Ethiopia

The paper of Tesfaye Boru Lelissa investigates the determinants of Ethiopian banks performance considering bank specific and external variables on selected banks' profitability for the 1990-2012 periods.

The study fundamentally involves both descriptive and econometric techniques. The econometrics method used in the study involves assessing the impact of selected internal and external variables on the performance of the banking sector. Basic descriptive statistics are applied for trend analysis and to identify outliers.

The variables tested in the study include: the capital to asset ratio, the provision to loans ratio, service charges to gross income, non-interest expense to total expense, liquid assets to deposits, natural logarithm of bank's asset, the real growth of GDP and inflation. The estimate of the impact of the above-mentioned internal and external variables on return to assets of these banks is also done.

The results show that among the identified five bank specific determinant factors three of them were significant and considered to be drivers of the banks' profitability in Ethiopian banking industry. These variables are the provision to total loans, share of service charges to total income and the non-interest expense to total expense. The capital adequacy ratio and the loan to deposit ratio were insignificant to explain profitability.

Among the identified three external determinant factors only one factor (inflation) appear significant to affect performance. The other variables the real GDP growth rate and the bank size measure (Log TA) were insignificant to affect profitability in the Ethiopian banking industry.

The study finds that bank specific variables by large explain the variation in profitability. High performance is related to the ability of banks to control their credit risk, diversify their income

¹ Idem

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sources by incorporating non-traditional banking services and control their overhead expenses. In addition, the paper finds that bank's capital and liquidity status are not significant to affect the performance of banks¹.

The recommendations of the paper came as follows:

- ✓ Ethiopian banks need to develop their credit risk management capacity;
- ✓ Income diversification should get focus;
- ✓ The size of large banks needs to be reduced to optimal levels,
- ✓ Finally, Ethiopian Banks should consider both internal and macroeconomic variables in their strategy design.

3.3. Ghana

Willian Bentum wrote a paper about banks 'performance determinants in Ghana before and after the financial crisis. He writes, "There is an intriguing report by IMF in June 2011, which claims that the commercial banks in Ghana still experience profitability and stability. In this time of on-going financial crisis, it is in this light that regression analysis has been employed to estimate and examine the determinants of the profitability of commercial banks during these years of global financial crisis, by focusing on the profitability of Ghana Commercial Bank".

The research separately considers the pre-crisis period, 2001–2005, and the crisis years of 2006–2011. The profitability determinants include bank-specific characteristics as well as industry-specific and macroeconomic factors. The variables that were considered are:

- ✓ Ratio of deposits to total assets;
- ✓ Ratio of loans to total deposit;
- ✓ Ratio of capital and reserve to total assets;
- ✓ Ratio of loan loss provision to total assets;
- ✓ Ratio of non-interest income to gross income;
- ✓ Ratio of taxes over operating profit before taxes;
- ✓ Ratio of Loans and advances to total assets;
- ✓ Ratio of non-interest expenses to total assets;
- ✓ Natural log of total deposits of the banks;

¹ Tesfaye Boru Lelissa. *The Determinants of Ethiopian Commercial Banks Performance*, European Journal of Business and Management, Vol.6, No.14, 2014, p 47. <http://www.iiste.org/Journals/index.php/EJBM/article/viewFile/13304/13195>.

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- ✓ Annual real GDP growth rate of Ghana;
- ✓ Annual average base lending rate of all the commercial banks;
- ✓ Annual average increase in the Ghanaian consumer price index;
- ✓ Finally, annual growth rate of money circulation.

The study observed that there is deference between the factors, which drove profitability of the banks before the global financial crisis and during these years of the crisis. Interestingly, the result shows that profitability of the banks before the global financial crisis was only influenced by internal variables namely capital and reserve ratio and logarithm total assets. And the profitability of the banks during these years of global financial crisis has been mainly influenced by all the external variables namely money supply growth, annual average base lending rate of all the commercial banks and annual inflation rate.

3.4. Europe

A number of studies on banks 'profitability determinants were conducted in European countries.

Saunders and Schumacher (2000) analyzed the determinants of interest margins in six countries of the European Union during the period 1988–95. They found that macroeconomic volatility and regulations have a significant impact on bank interest rate margins. Their results also suggest an important trade-off between ensuring bank solvency, as defined by high capital to asset ratios, and lowering the cost of financial services to consumers, as measured by low interest rate margins. **Athanasoglou, et al. (2006)** study the profitability behavior of the southeastern European banking industry over the period 1998–02. The empirical results suggest that the enhancement of bank profitability in those countries requires new standards in risk management and operating efficiency, which, according to the evidence presented in the paper, crucially affect profits. A key result is that the effect of market concentration is positive, while the picture regarding macroeconomic variables is mixed. **Athanasoglou, et al. (2006b)** apply a dynamic panel data model to study the performance of Greek banks over the period 1985–2001, and find some profit persistence, a result that signals that the market structure is not perfectly competitive. The results also show that the profitability of Greek banks is shaped by bank-specific factors and macroeconomic control variables, which are not under the direct control of bank management. Industry structure does not seem to significantly affect profitability.

More recently, a number of studies have emphasized the relation between macroeconomic variables and bank risk. **Saunders and Allen (2004)** survey the literature on pro-cyclicality in operational, credit, and market risk exposures. Such cyclical effects mainly result from systematic risk emanating from common macroeconomic influences or for interdependencies across firms as financial markets and institutions consolidate internationally. They may

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ultimately exacerbate business cycle fluctuations due to adverse effects on bank lending capacity.

Using equity returns data over the period 1973–2003, Allen and Bali (2004) examine the catastrophic risk of financial institutions. Results suggest evidence of pro-cyclicality in both catastrophic and operational risk measurements, implying that macroeconomic, systematic and environmental factors play a considerable role in determining the risk and returns of financial institutions¹.

3.5. The United States

Banking financial performance determinants have been widely studied for the US banking industry. These studies have usually been based on regression analysis in which indicators of bank performance, such as bank profitability and prices, were regressed on internal and macroeconomic indicators.

Angbazo (1997) in his study identified that net interest margin has a direct association with capital and inverse association with liquidity risk in addition investigates mainly. **Berger & Mester in (2003)** found that cost and productivity worsened even though profit margins substantially improved for banks engaging in mergers. **Molyneux and Seth (1998)** explicitly look at the performance of foreign banks in the United States (1987-91) and report the risk adjusted capital ratio to be a key determinant of these banks 'performance'².

In his thesis published by Clemson University, **shiang liu** utilized return on assets (ROA) as a dependent variable and use capital adequacy ratio along with other bank-specific, industry-specific and macro economy variables as independent variables to test the nonlinear relationship between return on assets and capital adequacy ratio. He found a positive and statistically significant relationship exists between return on assets (ROA), capital adequacy ratio (CAP), the third power of (CAP³), and a negative relationship between return on assets (ROA) and capital adequacy ratio squared (CAP²) and the fourth power of capital adequacy ratio (CAP⁴). Thus, the result suggests a nonlinear relationship between efficient return on assets and capital adequacy ratio. The conclusion was that capital adequacy ratio has an M or inverted U shape relationship with profitability of banks in the US³.

¹ Valentina Flamini, Calvin McDonald, and Liliana Schumacher, Determinants of Commercial Bank Profitability in Sub-Saharan Africa, International Monetary Fund, 2009, p5.

² Waqas Tariq, *Determinants of Commercial Banks Profitability: Empirical Evidence from Pakistan*, International Journal of Accounting and Financial Reporting, Vol. 4, No. 2, 2014. P-9. <http://www.macrothink.org/journal/index.php/ijafr/article/view/5939>.

³ Shiang liu, *Determinants of the profitability of the US banking industry*, http://tigerprints.clemson.edu/all_theses.

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CONCLUSION

The relationship between risk management and bank performance have attracted the interest of academic research as well as of bank management, financial markets and bank supervisors. The literature review supports that risk management may have contradictory influence on banking financial performance. However, these impacts may differ depending on the soundness of the economy, the region and the period of the study.

The academicians reached several findings, which rely on the type of the independent variables: as bank-specific variable, risk management variables or macroeconomic variables.

Results for one of the studied risk management ratio was the cost income ratio, which can be managed through achieving an increase in revenues at the same time to reduce the costs, so the relationship between the numerator and the denominator of this ratio that is significant. But also there is indirect relationship between cost reduction and revenue deterioration, where the banks that tend for policy of cost reduction are more likely facing customer's dissatisfaction with the received services than consequently reduction in future revenues of the bank.

The previous mentioned results have logic in its folds, since the banks specific variable presented in the size generate negative as positive aspects to the business, where it generates a range of beneficial scale effects, however at the same time, it engenders some diseconomies related the size itself as the organizational costs. Therefore, if the negative impact is greater than the positive one, it becomes a damaging feature for bank performance. Although, for small banks the opposing may happen, where this type of entities may benefit the economies generated from competitive advantages. For this end, it is fair to state that there is a relationship between the size and the profitability of a bank

Finally, one of the macroeconomic variables studied was GDP growth, as variable it was present in several empirical researches, among this academicians we found Goddard et al. (2004)¹, Demirgüç-Kunt and Huizinga (1999)², Arpa et al. (2001)³, Bikker and Hu (2002)⁴, Schwaiger and Liebig (2008)⁵ and Dietrich and Wanzenried (2014)⁶. These previous researches have reached a positive relationship between the GDP growth as the variable that measures the development of economic activity over the bank performance, where a period of prosperity and

¹ Goddard, J., et al. *The profitability of European banks: a cross-sectional and dynamic panel analysis*. Manchester School, 72(3), 2004. PP.363-381.

² Demirgüç-Kunt, A., Huizinga H. *Financial structure and bank profitability*, World Bank Policy Research Working Paper, n 2430, August. 1999.

³ Arpa, M., et al. *The influence of macroeconomic developments on Austrian banks: implications for banking supervision*. BIS Papers, 1, 2001. PP. 91-116.

⁴ Bikker, J.A., Hu, H. *Cyclical patterns in profits, provisioning and lending of banks procyclicality of the new Basel capital requirements*. BNL Quarterly Review, 221, 2002. PP.143-175.

⁵ Schwaiger, M.S., Liebig, D. *Determinants of bank interest margins in Central and Eastern Europe*. Financial Stability Report, 14, 2008. PP. 68-87.

⁶ Dietrich, A., Wanzenried, G. *The determinants of commercial banking profitability in low-, middle-, and high-income countries*. The Quarterly Review of Economics and Finance, 22, 2014. PP. 1-18.

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growth lead to increase the investments and households consumption, consequently raise the loans and as a result affect positively the bank performance.

The present chapter offered key indicators of the Algerian banking sector, and its key risks. The information provided by this chapter would be the background of our empirical research. As it illustrates the specificities of the research's field in term of risk, financial performance and at the end the literature review. Therefore, we can approximatively expect the signs (positive or negative) of the influence of independent variables on the financial performance in the following chapter.

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INTRODUCTION

This chapter examines the effects of risk management on financial performance in Algerian banks. These factors that influence banks' profitability were classified as bank-specific variables.

Various sources of empirical and theoretical reviews (chapter two: section three) were adopted to lend support to the relationship between profitability and risk management. The econometric approach of fixed effects regression was applied for the study, with the adoption of a panel data of 18 banks in Algeria over the period from 2010 to 2019. The chapter consists of three sections as follows:

Section 1: variables description

Section 2: data description

Section 3: regression results

The first section describes the dependent and independent variables of the study. It also explains the expected effects of the dependent variables on financial performance. The second section describes through descriptive statistics and it compares between private and public banks in many aspects. Finally, the third section presents the regression results and the findings of the research.

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1. VARIABLES' DESCRIPTION

1.1. DATA SOURCES

The data used in the empirical work was obtained from the financial statements of the Algerian banks). The sample includes a panel of 18 banks operating in Algeria over the period 2010-2019 which represents a panel of 180 observations.

1.2. DEPENDENT VARIABLES

The dependent variables that were chosen for this study are return on assets and return on equity. From the theoretical framework in chapter one, we can distinguish between the financial performance measures in banking. Where ROA tends to provide an image about how the bank is effectively taking earnings advantage of its base of assets. On the other hand, ROE is a measure of how a bank is effectively taking advantage of its base of equity or capital. However, the ROA ratio can be risk adjusted for mitigated interest rate risk and for expected credit risk that is mitigated by a loan loss provision. Therefore, bank executives have always preferred the ROA in term of performance measures.

1.2.1. Return on assets

The ROA is defined as net income divided by total assets. Bank profitability is best measured by ROA because high equity multiplier cannot distort ROA. ROA in actual sense signifies managerial efficiency; in other words, it demonstrates how effective and efficient the management of banks has been as they seek to transform assets into earnings.

1.2.2. Return on Equity

ROE is the ratio of a bank's net after-tax income divided by its total equity capital. The return on equity (ROE) is considered as one of the profitability performance ratios. It indicates how effectively the management of the enterprise (bank) is able to turn shareholders' funds (i.e. equity) into net profit. It is the rate of return flowing to the bank's shareholders.

1.3. INDEPENDENT VARIABLES

The independent variables of the study are macroeconomic variables and specific variables to the bank.

1.3.1. Macroeconomic variables

Since all banks in the study are operating within the Algerian economy and under the same regulatory system. In addition, because the period of the study is ten (10) years and considered to be sufficient to detect significant influence of macroeconomic variables. We choose to focus on the following macroeconomic determinants: Inflation, GDP, USD/DZD real exchange rate and real interest rate.

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Several research studied the effect of macroeconomic variables on the bank's profitability. According to **Demirguc-Kunt and Huizinga (1998)** and **Bikker and Hu (2002)**: bank profitability variate in the same direction with the economic situation. To mitigate the study, we are planning to use GDP, inflation, real USD/DZD exchange rate and real interest rate as control variables for macroeconomic risk¹.

1.3.2. Bank-specific independent variables

The bank specific characteristics assumed to affect the bank's profitability are:

✓ **Size**

There is consensus in academic literature that economies of scale and synergies arise up to a certain level of size. Beyond that level, financial organizations become too complex to manage and diseconomies of scale arise. The effect of size could therefore be nonlinear; meaning that profitability is likely to increase up to a certain level by achieving economies of scale and decline from a certain level in which banks become too complex and bureaucratic. Hence, the expected sign of the coefficient of bank size is unpredictable based on academic literature. Size is measured by logarithm of total assets.

✓ **Deposits**

Total deposits capture the effect of fund source in banks on profitability. Deposits are believed to be the major and the cheapest source of funding for banks, empirical evidence provided by Husni Ali Khrawish, who studied the Jordanian commercial banks during the period from 2000 through 2010 prove that customer deposits impact banking performance positively as long as there is a sufficient demand for loans in the market.

✓ **Funding liquidity ratio (FL): Loan / Total assets**

Loan to total asset ratio, which is a measure for counterparty exposures of banks. Credit risk is a concept used to explain the default probability of a banking firm's loan portfolio.

✓ **Unanticipated liquidity requirement ratio: Loans/ deposits (LTD)**

A commonly used statistic for assessing a bank's liquidity is by dividing the banks total loans by its total deposits. If the ratio is too high, it means that banks might not have enough liquidity to cover any unforeseen fund requirements; if the ratio is too low, banks may not be earning as much as they could be.

The performance of commercial banks is believed to be impacted by the amount of liquid assets they hold and the ability to raise funds quickly from other sources at a cheaper cost to finance

¹ Bikker, J.A. and H. Hu, *Cyclical Patterns in Profits, Provisioning and Lending of Banks and Pro-cyclicality of the New Basle Capital Requirements*. BNL Quarterly Review, 221, 2002. PP.143-175.

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loans. Some studies support the notion of positive relationship while others argue for negative relationship between banks level of liquidity and profitability.

✓ **Interest rate risk ratio (IRR) : Interest income / Total loans**

Interest sensitivity ratio is also included in the panel regression as a measure of sensitivity of bank's re-priceable assets and liabilities to interest rate fluctuation.

✓ **Credit risk ratio (CR): Non performing loans/ Total loans, Credit risk coverage ratio (PTL): Loss provision / Total loans, Non-performing loans (NPL): / Total loans**

NPL over total loans measures the credit management efficiency by the bank. In addition, Nonperforming loans over total loans as well as loan loss provision over total assets are two of the most independent variables used in similar research because credit creation represents the main activity of commercial banks and NPL give a general overview over the sanity of this activity.

In Algeria, non-performing loans are not written off. The IMF in 2014 reports: —Neither private nor public banks are writing off NPLs. The current stock of NPLs (4.7 percent for private banks and 12.7 percent for public banks) is only adjusted through swaps for T-bonds (in public sector banks) or rescheduling of NPLs.

NPLs are not written off, with the consequence that they remain for several years on banks' balance sheets, muddying the analytical value of financial statements, and delaying the resolution of bad credits and their underlying collateral.

Uncertainty on the interpretation of prudential guidelines appears to prevent private banks from writing off NPLs.

✓ **Equity-ratio : Equity / Total assets**

This is defined as total equity over total assets. This is expected to uncover the capital adequacy and capture the general average safety and soundness of the banks. According to Molyneux (1993) banks with high level of equity can reduce their cost of capital and that could impact positively on profitability. There is dissimilarity in findings among researchers concerning the effect of this ratio on profitability

The following table illustrates the different variables used in the study, its description and measurement.

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Table N°11: Variables description, and measurement

<i>Variables</i>	<i>Apriori</i>	<i>Description</i>	<i>Measurement</i>
<i>Performance variables</i>	ROA	Return on Bank's total assets	Net income divided by total assets
	ROE	Bank's equity to total assets	Equity divided by total assets
<i>Macroeconomic variables</i>	GDP	Economic growth rate is proxy for cyclicity	Selected from the world bank database
	INFLA	Domestic rate of inflation	Selected from the world bank database
	USD/DZD real	Real exchange rate USD/DZD	Selected from the world bank database
	T interest real	Real interest rate	Selected from the world bank database
<i>Liquidity ratio</i>	FL	Funding liquidity ratio	Total loans divided to total assets
	LTD	Unforeseen liquidity requirements	Total loans divided to total deposits
<i>credit risk ratio</i>	NPL	Non-performing loans	Doubtful loans divided to total loans
	CR	Credit risk ratio	Non-performing loans divided to total loans
	PTL	Credit risk coverage ratio	Loss provision divided to total loans
	IRR	Interest rate risk	Total Interest income divided to total loans
<i>capital adequacy ratio</i>	Equity ratio	Equity-ratio	Equity divided to total assets
<i>Bank specific variables</i>	Size	This stands for total asset of the bank	Natural logarithm of total asset
	Deposits	This stands for total deposits of the bank	Natural logarithm of total deposits

Source: Established by the author

Beside the results of the literature review, of the expected relationship between management risk ratios and financial performance illustrated in the previous chapter (chapter two: section three), we add that bank loans are expected to be the main source of income and are expected to have a positive impact on bank performance. Other things constant, the more deposits are

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transformed into loans, the higher the interest margin and profits. However, if a bank needs to increase risk to have a higher loan-to-asset ratio, then profits may decrease. Predicting the net effects of changes in leverage can be difficult; for example, banks with lower capital ratios are expected to have higher returns in comparison to highly capitalized financial institutions. On the other hand, banks with high capital ratios are less risky and typically perform better during difficult times and lower risk increases creditworthiness and reduces funding costs. Moreover, banks with a higher capital ratio often have a smaller need for external funding which has a positive effect on profitability. Given this, there should be a positive relationship between capital ratio and profitability. The ratio of provisions to total assets show the level of risk that the banks are being exposed to. The relationship between this ratio and financial performance is expected to be negative base on the concept that more risk reduces profitability.

Concerning the macroeconomic variables, several research investigated the effect of economic situation on bank profitability, Demirguc-Kunt and Huizinga (1998) and Bikker and Hu (2002)¹ illustrated that bank financial performance is sensible to economic changes in the country. Therefore, we expect different influences of the macroeconomic variables study on the financial performance in Algerian banks.

¹ Bikker, J.A. and H. Hu. *Cyclical Patterns in Profits, Provisioning and Lending of Banks and Pro-cyclicality of the New Basle Capital Requirements*. BNL Quarterly Review, 221, 2002. PP. 143- 175.

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2. DATA DESCRIPTION

Data used in the present paper were obtained from Algerian banks' annual reports and from databases of the World Bank, the International Monetary Fund for the period 2010-2019. As our study concerns Algerian banks, listed existing banks since 2010 to 2019 are presented in Table N°02.

Table N°12: List of Algerian banks and key indicators for 2019

<i>Bank</i>	<i>Ticker</i>	<i>Ownership</i>	<i>total assets</i>	<i>Total operating income</i>	<i>interest income</i>	<i>NPLs</i>
<i>Société Générale Algérie</i>	SGA	Private	384808749	7637435,36	22795734,2	0,13367725
<i>Gulf Bank Algérie</i>	AGB	Private	257068082	8167212	14913681	0,08244787
<i>Arab Banking Corporation</i>	ABC	Private	78764854,8	1779568,29	3609714,97	0,04094935
<i>Trust Bank-Algeria</i>	TRUST	Private	75422397	2628120	5714302	0,13183137
<i>Al Salam Bank Algeria</i>	AL SALAM	Private	131018967	5346675	7592690	0,05134305
<i>Banque Al Baraka d'Algérie</i>	AL BARAKA	Private	261568166	8614349,59	11568550,3	0,0429535
<i>The Housing Bank For Trade and Finance-Algeria</i>	HOUSING	Private	91129201,7	409239,05	3354767,66	0,0463693
<i>Fransabank Al-Djazair</i>	FRANSABANK	Private	66834891	2500751	3835578	0,05151359
<i>Crédit agricole corporate et investissement Bank-Algérie</i>	CACIB	Private	13359253,8	405077,286	716715,522	0
<i>H.S.B.C-Algeria</i>	HSBC	Private	80666472,4	1661092,62	2365800,25	0,00902394
<i>BNP Paribas Al Djazair</i>	BNP	Private	270264154	6515168,94	13776779,2	0,11780663
<i>Citibank N.A Algeria</i>	CITI	Private	188524875	7211158	4813114	0,24102969
<i>Banque nationale d'Algérie</i>	BNA	Public	3489629026	28369674,6	139557528	0,18769194
<i>Banque extérieure d'Algérie</i>	BEA	Public	3262369198	81685994,7	116903935	0,2018042
<i>Banque de l'agriculture et du</i>	BADR	Public	1575914095	5223842,21	59544173,2	0,23377061

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<i>développement rural</i>						
<i>Banque de développement Local</i>	BDL	Public	1112152199	20636223,3	44379598,5	0,31674498
<i>Crédit populaire d'Algérie</i>	CPA	Public	2514424453	28666175	93123972	0,16313531
<i>Caisse nationale d'épargne et de prévoyance</i>	CNEP	Public	1538450076	7783747,67	62502885,8	0,13645449

Source: Established by the author

In Algeria, private and public banks are very different in many aspects. They function in different ways and they have different structures. We will try to compare between private and public banks in order to highlight the most significant differences.

Table 02 above describes the data by presenting the number of banks by ownership, the total assets held by each type, the operating revenue realized by each category, the interest income and non-performing loans made by each of the two groups over the year 2019. The table above shows that public banks hold 89% of the total assets of all commercial banks in Algeria, which makes the Algerian government the dominant owner of banks in the country.

This comparison shows that private banks are more performing than public banks that could be because public banks finance government-prioritized projects, which exposes them to higher risks, and therefore lower return. Where NPLs percentage is higher in state-owned banks, than the private banks.

2.1. Descriptive statistics

Before moving on to estimation issues, it is useful to remark on some preliminary features of the data, as revealed by the descriptive analysis:

Table N°13: Descriptive statistics of data

Variables	Mean	Median	Maximum	Minimum	Std.Dev.	Observations
ROA	0.02551	0.02522	0.095974	-0.00306	0.01465	180
ROE	0.35908	0.29547	1.134301	-0.00562	0.26788	180
CR	1.26E-1	4.51E-1	1.37E-0	0.000000	2.04E-1	180
DEPOSITS	18.7072	18.6678	21.61812	13.01313	1.78760	180
EQUITY_RATIO	0.13440	0.06147	0.748545	0.010348	0.14647	180

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FL	0.54545	0.53897	0.854860	0.182579	0.15156	180
GDP	2.884000	3.09500	3.790000	1.600000	0.802409	180
INFLA	5.02782	4.65432	8.891451	2.916927	1.65870	180
IRR	0.07519	0.07109	0.231675	0.027890	0.02518	180
LTD	1.07804	0.85796	26.33388	0.238165	2.10422	180
NPL	0.11108	0.08224	1.413536	0.000000	0.13715	180
PTL	0.05612	0.04621	0.240252	0.000000	0.04712	180
SIZE	19.1849	18.9581	21.97306	16.40772	1.56324	180
T_INTERET_REAL	4.56280	4.90586	21.60764	-8.66105	9.06231	180
USD_DZD_REAL	30.9222	33.4605	66.69355	-4.50238	20.8897	180

Source: Established by the author using Eviews8.1.

Table N°03 above reports the mean, standard deviation, minimum and maximum of each variable in the sample. The mean shown is the average value of dependent as well as independent variables from the year 2010 to the year 2019. Total number of balanced panel data is 180.

The means for dependent variables (ROA) and ROE are 2.5 percent and 35.9 percent respectively. Meanwhile the standard deviations are 0.014 and 0.2678 correspondingly. FL is defined as net loans to total assets. It is a liquidity ratio which represents the percentage of assets that comprise the loan portfolio. Its average value is 54.54 percent and the standard deviation is 15.15percent. The average of IRR in the data is 7.51 percent and it has a standard deviation of 2.52 percent. PTL provide information on the efficiency of banks 'risk management through the ratio of provisions over total loans. The mean value of PTL is 5.61 percent and it has a standard deviation of 4.71 percent. The ratio of equity to total assets Equity-ratio is used in this study as a measure of capital adequacy. The mean for it is 13.44 percent and it deviates 14.64 percent from the mean. Logarithm of total asset is the measure of bank's size in this study. It has a mean 19.18 of and standard deviation of 1.56 point.

2.2. Correlation between variables

Pearson's Correlation matrix shows what type of relationship exists between two variables. Correlation explains change in one variable because of the change in the other.

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Table N°14: Correlation between variables

	<i>ROE</i>	<i>ROA</i>	<i>USD_DZ D_REAL</i>	<i>T_INTE RET_RE AL</i>	<i>SIZE</i>	<i>PTL</i>	<i>NPL</i>	<i>LTD</i>
<i>ROE</i>	1.00000 0	0.04434 2	- 0.012837	0.01295 7	0.56020 1	0.15840 6	0.138189	-0.089983
<i>ROA</i>	0.04434 2	1.00000 0	0.00455 5	- 0.134219	- 0.557409	- 0.366303	-0.246370	0.088642
<i>USD_ DZD_ REAL</i>	- 0.012837	0.00455 5	1.00000 0	- 0.714904	0.08741 8	- 0.057124	0.041475	-0.076351
<i>T_INT ERET_ REAL</i>	0.01295 7	- 0.134219	- 0.714904	1.00000 0	- 0.024675	0.03471 7	0.063898	0.032812
<i>SIZE</i>	0.56020 1	- 0.557409	0.08741 8	- 0.024675	1.00000 0	0.56855 1	0.403109	-0.112702
<i>PTL</i>	0.15840 6	- 0.366303	- 0.057124	0.03471 7	0.56855 1	1.00000 0	0.445658	-0.014311
<i>NPL</i>	0.13818 9	- 0.246370	0.04147 5	0.06389 8	0.40310 9	0.44565 8	1.000000	-0.037846
<i>LTD</i>	- 0.089983	0.08864 2	- 0.076351	0.03281 2	- 0.112702	- 0.014311	-0.037846	1.000000
<i>IRR</i>	- 0.130786	0.45454 9	0.01289 4	- 0.112644	- 0.490311	- 0.279687	-0.305312	0.026765
<i>INFLA</i>	0.01050 9	- 0.009887	- 0.434365	0.04221 2	- 0.004632	- 0.002364	-0.102279	0.162838
<i>GDP</i>	- 0.014331	- 0.008289	- 0.125300	- 0.160732	- 0.009083	- 0.061402	0.016612	-0.026466
<i>FL</i>	0.16647 9	- 0.015569	0.17298 5	0.00926 4	0.24649 9	0.20192 2	0.172933	0.024313
<i>EQUIT Y_RAT IO</i>	- 0.582852	0.39360 3	- 0.076589	0.03443 8	- 0.797547	- 0.348443	-0.314115	0.185704
<i>DEPO SITS CR</i>	0.54873 3	- 0.548493	0.10370 8	- 0.044675	0.97401 3	0.53857 3	0.392213	-0.300549
	- 0.274395	0.26162 6	- 0.125242	0.14200 6	- 0.442040	- 0.002253	0.210492	0.069917

	<i>IRR</i>	<i>INFLA</i>	<i>GDP</i>	<i>FL</i>	<i>EQUITY_RA TIO</i>	<i>DEPOSITS</i>	<i>CR</i>
<i>ROE</i>	-0.130786	-	-	-	-0.582852	0.548733	-0.274395
<i>ROA</i>	0.454549	0.010509	0.014331	0.166479	0.393603	-0.548493	0.261626
<i>USD_ DZD_ REAL</i>	0.012894	-	-	-	-0.076589	0.103708	-0.125242
<i>T_INT ERET_ REAL</i>	-0.112644	0.042212	0.160732	0.009264	0.034438	-0.044675	0.142006
<i>SIZE</i>	-0.490311	0.004632	0.009083	0.246499	-0.797547	0.974013	-0.442040

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<i>PTL</i>	-0.279687	-	-		-0.348443	0.538573	-0.002253
		0.002364	0.061402	0.201922			
<i>NPL</i>	-0.305312	-			-0.314115	0.392213	0.210492
		0.102279	0.016612	0.172933			
<i>LTD</i>	0.026765		-		0.185704	-0.300549	0.069917
		0.162838	0.026466	0.024313			
<i>IRR</i>	1.000000	-			0.449505	-0.478395	0.042569
		0.078492	0.073180	0.283707			
<i>INFLA</i>	-0.078492		-		-0.010681	-0.022314	-0.067789
		1.000000	0.100526	0.001120			
<i>GDP</i>	0.073180	-			-0.043300	0.011480	-0.009891
		0.100526	1.000000	0.059956			
<i>FL</i>	-0.283707		-		-0.234649	0.255844	-0.135665
		0.001120	0.059956	1.000000			
<i>EQUIT</i>	0.449505	-			1.000000	-0.837354	0.399804
<i>Y_RAT</i>		0.010681	0.043300	0.234649			
<i>IO</i>							
<i>DEPO</i>	-0.478395	-			-0.837354	1.000000	-0.440863
<i>SITS</i>		0.022314	0.011480	0.255844			
<i>CR</i>	0.042569	-	-		0.399804	-0.440863	1.000000
		0.067789	0.009891	0.135665			

Source: Established by the author using Eviews8.1.

Bivariate Correlations is used to determine the nature, direction and significance of the bivariate relationship of the variables of this study. A correlation of -1 represents a perfect negative correlation in which variables move in exactly the opposite direction. Consequently, variables move in the same direction when a correlation of 1 is found. Correlations indicate the relationship between the variables but they do not imply causation. As could be seen in the table, the ROA ratio is most correlated with bank's size with a negative significant correlation of -0.55, on the other hand ROE is correlated positively to size of 0.56. Than the highest correlation, level between performance variables and bank specific variables is with deposits, where ROE have positive correlation of +0.548, but the correlation between ROA and deposits is negative of -0.548. In addition, the equity ratio have a high level of correlation with the performance variables, where it has a -0.58 to ROE and +0.39 to ROA.

From the table above, we can notice an opposite correlation between the ROA and ROE with the bank specific variables, for example if ROA have a positive correlation to one variable, the most probable case is that ROE have a negative correlation with the same variable.

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3. REGRESSION RESULTS

The main goal of this research as defined before is to find the nature of the relationship between performance variables (ROE, ROA) and bank risks variables that is generally determined by bank-specific factors. In this study, a panel analysis will be conducted to check the effect of macroeconomic factors such as inflation, GDP, real USD/DZD exchange rate and real interest rate, beside to bank specific indicators on bank performance in Algeria.

The study has chosen to make use of panel data analysis as statistical instrument to analyze the impact of the risk measures on profitability. Panel data model is a combination of time series and cross-sectional statistical analysis. Three patterns are provide by the panel data analysis and we can select the most appropriate for our study by conducting a Hausman's test.

Panel data analysis is a method of regression analysis that uses more than one explanatory variable to predict values of a single dependent variable. The model with interaction terms represents an alternative way of expressing the unconstrained model; instead of running separate regressions for each group, we run a single regression, with additional variables.

Eviews8.1 software is applied to obtain the regression results. Eviews is among the most widely used programs for statistical analysis in academic research.

To test the impact of different variables on profitability of commercial banks in Algeria, The next mathematical form of the panel regression is estimated:

$$Y_{jt} = C + \alpha X_{jt} + \epsilon_{jt} \text{-----} (1)$$

The j refers to an individual financial institution; t refers to year.

Y_{jt} is an independent variable and refers a measure of profitability in a financial institution j in a particular year t .

The C is the intercept.

X_{jt} represents the factors (determinants) of profitability in a financial institution j in a particular year t .

α represents the coefficients.

ϵ_{jt} represents the standard error term.

In our essay to provide answers for our fundamental problem, we will conduct a panel regression following three models: pooled model (OLS) using this model means, we pool all 180 observations together, and run the regression model, neglecting the cross section and time series nature of data. The main problem of OLS model that it does not distinguish between the different nature of banks that we have in our panel data, which deny the heterogeneity and individuality that may exist among 18 banks that we study.

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The second pattern is the fixed effect model (LSDV) permit to heterogeneity and individuality between the banks by allowing having its own intercept value. However, the term fixed effect is because although the intercept may differ across banks, but it does not vary over time, that it is a time invariant.

Finally, the random effect model allows the existence of heterogeneity, individuality among banks and it allows the panel to vary over time. This model is favorited in case of random sampling pattern of the collected data similar to our panel data, some studies recommends the use of fixed effect model in case of specific set of observations, even though, the use of fixed effect model for large observations may lead to loss of degrees of freedom¹.

To determine the nature of the relationship among the dependent and independent variables of the study, we need to precise which model is more suitable for our panel data, than identify the appropriate model that would illustrate the best the effect of risk management on financial performance in Algerian banks.

A Hausman test is required to compare the fixed and random effects, after estimating the three models, we shall have to decide which model is suitable to accept, for this end, three stages are required:

- ✓ Hypothesis development and models identification;
- ✓ Estimating the parameters following the three models (OLS, fixed and random effect);
- ✓ Select the most appropriate model to explain the nature of the relationship between the variables of the study.

3.1. Hypotheses development and models identification

In developing the hypothesis, our main goal is to find whether there exist significant impact between independent variables and the dependent variable, and to assess the significance impact of the independent variables used together on the dependent variable, the null and alternative hypothesis are:

- 1- H0: there exists an insignificant impact of the chosen independent variables on financial performance of Algerian commercial banks.
- 2- H1: there exists a significant impact of the chosen independent variables on financial performance of Algeria commercial banks.

Before we estimates the parameters of the several variables study, we need to identify the models that we aim to analyze and interpret.

¹Baltagi, BH. *Econometric Analysis of Panel Data*, Wiley, Chichester. 1995.

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✓ Model 1:

The first model aims to explain the variability in ROA. It is presented as follows:

$$ROA_{jt} = C + \alpha_0 FL_{jt} + \alpha_2 CR_{jt} + \alpha_3 Deposits_{jt} + \alpha_4 Equity\text{-}ratio_{jt} + \alpha_5 LTD_{jt} + \alpha_6 NPL_{jt} + \alpha_7 PTL_{jt} + \alpha_8 Size_{jt} + \alpha_9 T\text{-}interest\ real_{jt} + \alpha_{10} USD/DZD\ real_{jt} + \alpha_{11} GDP_{jt} + \alpha Infla_{jt} + \epsilon_{jt} \dots (2)$$

✓ Model 2:

The second model aims to explain the effects of independent variables on ROE:

$$ROE_{jt} = C + \alpha_0 FL_{jt} + \alpha_2 CR_{jt} + \alpha_3 Deposits_{jt} + \alpha_4 Equity\text{-}ratio_{jt} + \alpha_5 LTD_{jt} + \alpha_6 NPL_{jt} + \alpha_7 PTL_{jt} + \alpha_8 Size_{jt} + \alpha_9 T\text{-}interest\ real_{jt} + \alpha_{10} USD/DZD\ real_{jt} + \alpha_{11} GDP_{jt} + \alpha Infla_{jt} + \epsilon_{jt} \dots (3)$$

The subsequent step is to estimate the models parameters using the different procedures enlightened earlier.

3.2. OLS, fixed and random effects models estimations

The following table illustrates the estimates of parameters for panel regression model:

Table N°15: Estimates of Parameters for Panel Regression Model

Independent variables	Regression model					
	Panel OLS		Fixed effect (EGLS)		Random effect (EGLS)	
	Model1	Model 2	Model 1	Model 2	Model 1	Model 2
C	0.102377 * (4.059780)	-1.559880 * (-3.438930)	0.277136 * (3.689725)	-2.789052 ** (- 2.233337)	0.115235 * (3.531087)	-1.469635 ** (-2.323556)
FL	0.031230 * (4.839076)	0.258273 ** (2.253802)	0.024227 * (2.646401)	0.075511 (0.496101)	0.025225 * (3.444549)	0.113096 (0.860036)
CR	2255138.* (4.445203)	5173273. (0.574283)	-901735.3 (-1.480442)	-867461.0 (-0.085656)	-163216.2 (-0.294375)	4235924. (0.443285)
DEPOSITS	-0.010796** (-2.083209)	(-3.318500)	0.000839 (0.154239)	0.006075 (0.067161)	-0.003147 (-0.621637)	-0.047073 (-0.543287)
EQUITY-RATIO	-0.008478 (-0.771993)	* (- 7.504531)	-0.018562 (-0.949341)	-0.007760 (-0.023870)	-0.012972 (-0.885359)	-0.402035 (-1.524172)
IRR	0.242171* (6.256735)	1.956816* (2.847194)	0.233803 * (5.624226)	1.270140 *** (1.837645)	0.201277 * (5.223468)	1.535317** (2.338726)
LTD	-0.001420 (-1.548737)	-0.044264* (-2.718712)	0.000344 (0.377213)	-0.000498 (-0.032812)	-0.000158 (-0.183320)	-0.008581 (-0.585436)
NPL	-0.008103 (-1.040381)	-0.042778 (-0.309313)	0.009503 (1.271688)	-0.027597 (-0.222109)	0.006470 (0.899258)	-0.054867 (-0.451214)
PTL	-0.090026 * (-3.821321)	-0.868568** (-2.076314)	-0.107602* (-2.790806)	-0.075436 (-0.117675)	-0.071849 ** (-2.446107)	-0.606171 (-1.137153)

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SIZE	0.011261** (2.215781)	0.339847* (3.766089)	-0.014048** (-2.016633)	0.166056 (1.433731)	-0.001280 (-0.240306)	0.149567 (1.606870)
T_interet real	-0.000617* (-3.403261)	-0.007443** (-2.313470)	-0.000472* (-2.800876)	-0.004294 (-1.533085)	-0.000707 * (-4.706812)	-0.003547 (-1.399135)
USD/DZD real	-0.000228** (-2.546273)	-0.004674 * (-2.936802)	-0.000173 *** (-1.957262)	-0.003422 ** (-2.328844)	-0.000304* (-4.067755)	-0.002814 ** (-2.219240)
GDP	-0.001797 (-1.428194)	-0.051032 ** (-2.284503)	-0.002856* (-2.706618)	-0.026483 (-1.509320)	-0.003260* (-3.162099)	-0.026907 (-1.560595)
INFLA	-0.000610 (-0.864676)	-0.023418 *** (-1.868656)	-0.000919 (-1.456677)	-0.015160 (-1.444573)	-0.001535* (-2.623061)	-0.011608 (-1.182417)
R-squared	0.430731	0.463040	0.692581	0.745759	0.435600	0.432963
F-statistic			11.18937	14.56862	7.328148	3.361511
Prob(F-statistic)			0.000000	0.000000	0.000000	0.000136
Durbin-Watson stat	0.864459	0.691624	1.034600	1.329351	1.015621	1.152737

Source: Established by the author using Eviews8.1.

The results shown in parentheses are absolute values of the t-statistic, with *, ** and *** implying rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. The panel Regression results were carried out on E-VIEWS 8.1.

We refer to Table 05 that shows the results of panel regression models, the table illustrates three patterns of estimates:

- ✓ OLS or ordinary least square model ;
- ✓ The fixed effect model;
- ✓ The random effect model.

To ensure that we estimated the right model, a Hausman test is conducted for correlated random effects in the next phase, which help us to interpret and analyze the optimal model.

In the previous table, we presented model 1 and 2 for each types of panel regression estimation. The results show that R squared in the fixed effects model is 69.25% for model 1 and 74.57% for model 2, than the OLS model, where the independent variables explains 43.07% of the variation in model 1 and 46.30% in model 2, finally the random effects model that R squared of model 1 is 43.56% and 43.29%.

Moreover, in term of the variables significance, we notice the following points:

- ✓ The NPL variables does not have a significant impact on ROE or ROA for the three panel regression estimations.
- ✓ The USD/DZD real and IRR have a significant impact on the performance variables for the three panel regression estimations.

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- ✓ The FL, PTL, Size and T-Interest real have no significant affects the ROE variable, under the fixed and random effect estimations.
- ✓ The macroeconomic variables GDP and inflation are only significant for model 2 in OLS and random effects model.
- ✓ The equity ratio, CR and deposits have no significant effect over the dependent variables for both fixed and random effect models.

The rejection and acceptance of the null hypothesis was contradictable between model one and two following the different estimations procedures. To provide answers for our main problem, it is require determining the optimal model to survey (fixed or random effect), therefore, we subtracted the next test.

3.3. Hausman test: selection of the appropriate model

The following phase is the Hausman test presented in Table 6, at this stage, we will try to test the significance of the modeled parameters in the estimates of the fixed and random effect models to select the optimal model for the study. Where the null hypothesis of this test is that random effect model is appropriate for the study and the hypothesis 1: fixed effect model is appropriate. If the probability is less than 5% than we reject the null hypothesis, otherwise, we accept that the random effect model is appropriate, than we need to conduct the appropriate model using the random effect estimation. The subsequent table elucidates the results of the Hausman test:

Table N°16: Hausman's test

Test Summary		Chi-Sq. Statistic		Chi-Sq. d.f.		Prob.		
Model 1	Cross-section random	0.000000		13		1.0000		
Model 2	Cross-section random	0.000000		13		1.0000		
Variable	Fixed		Random		Var (Diff.)		Prob.	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
FL	0.0242	0.0755	0.0252	0.1130	0.0000	0.005875	0.8558	0.6239
CR	- 901735 .30065	- 867460 .97824	- 163216 .19320	423592 3.5755 29	635864 24317. 908325	1124817 3061406. 781	0.0034	0.1281
IRR	0.2338	1.2701	0.2012	1.5353	0.0002	0.046767	0.0371	0.2201
LTD	0.0003	-0.0004	-0.0001	-0.0085	0.0000	0.000016	0.0989	0.0406
NPL	0.0095	-0.0275	0.0064	-0.0548	0.0000	0.000652	0.1330	0.2855
PTL	-0.1076	-0.0754	-0.0718	-0.6061	0.0006	0.126795	0.1523	0.1361
DEPOSIT S	0.0008	0.0060	-0.0031	-0.0470	0.0000	0.000675	0.0453	0.0408
SIZE	-0.0140	0.1660	-0.0012	0.1495	0.0000	0.004751	0.0045	0.8109

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EQUITY_RATIO	-0.0185	-0.0077	-0.0129	-0.4020	0.0001	0.036106	0.6659	0.0380
GDP	-0.0028	-0.0264	-0.0032	-0.0269	0.0000	0.000011	0.0740	0.8964
INFLA	-0.0009	-0.0151	-0.0015	-0.0116	0.0000	0.000014	0.0093	0.3382
T_INTER ET_REAL L	-0.0004	-0.0042	-0.0007	-0.0035	0.0000	0.000001	0.0021	0.5305
USD_DZ D_REAL	-0.0001	-0.0034	-0.0003	-0.0028	0.0000	0.000001	0.0053	0.4129

Source: Established by the author using Eviews8.1.

The findings of Hausman test accepted the null hypothesis, so we should be concentrating our estimation following the random effect model. In addition, the previous table provide results from different procedures for a more comparative analysis.

Furthermore, the model 1 and 2 provided by the Hausman test are characterized with a considerable R squared equal 69.25% and 74.75% consecutively. In addition, prob (f-statistic) equal 0.0000 shows that the parameters estimated are statistically significant at 0.01 level.

For the liquidity and interest rate ratio variables, we can conclude that the performance variables in the Algerian banks are positively associated with their liquidity position and interest rate levels. For all the models. This finding is coherent with literature review that illustrates a positive relationship between ROA and ROE variables with the FL and IRR ratio in Algerian banks.

Under the random effect model, all the macroeconomic variables shows a negative correlation with the performance variables with a slight difference among them. Where the inflation rate in Algeria remained approximatively high, and GDP levels float from 1% to 3 % during the last ten years. Therefore, the price determination of financing became a difficult mission for banks due to unstable interest rates. In addition to the complicated economic situation in Algeria it exist a huge parallel exchange market that aggravated the exchange rate stability consequently the USD/DZD real would have a negative impact as shown from the regression results. Therefore, we can say that the findings are consistent with the theoretical background of the study.

Afterward identifying the appropriate procedure to estimate our models (random effect regression), it is essential to estimate the optimal models, so we answer whether our null hypothesis is accepted or rejected, than estimate the two models.

The following table illustrates the estimations of model one and two using the random-effect procedure.

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Table N°17: The appropriate models estimation

variables	coefficient		t-statistic		prob	
	model 1	model 2	model 1	model 2	model 1	model 2
C	0.115235	-1.469635	3.531087	-2.323556	0.0005*	0.0214**
FL	0.025225	0.113096	3.444549	0.860036	0.0007*	0.3910
CR	-163216.2	4235924.	-0.294375	0.443285	0.7688	0.6581
IRR	0.201277	1.535317	5.223468	2.338726	0.0000*	0.0205**
LTD	-0.000158	-0.008581	-0.183320	-0.585436	0.8548	0.5590
NPL	0.006470	-0.054867	0.899258	-0.451214	0.3698	0.6524
PTL	-0.071849	-0.606171	-2.446107	-1.137153	0.0155*	0.2571
DEPOSITS	-0.003147	-0.047073	-0.621637	-0.543287	0.5350	0.5877
SIZE	-0.001280	0.149567	-0.240306	1.606870	0.8104	0.1100
EQUITY_RATIO	-0.012972	-0.402035	-0.885359	-1.524172	0.3772	0.1294
GDP	-0.003260	-0.026907	-3.162099	-1.560595	0.0019*	0.1205
INFLA	-0.001535	-0.011608	-2.623061	-1.182417	0.0095*	0.2387
T_INTERET_REAL	-0.000707	-0.003547	-4.706812	-1.399135	0.0000*	0.1636
USD_DZD_REAL	-0.000304	-0.002814	-4.067755	-2.219240	0.0001*	0.0278**
R-squared	0.435600	0.432963				
F-statistic	7.328148	3.361511				
Prob(F-statistic)	0.000000	0.000136				

Source: Established by the author using Eviews8.1.

The results shown with *, ** and *** implying rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. The panel Regression results were carried out on E-VIEWS 8.1.

The results of the panel regression showed that both model one and two are significant at level 0.01. With prob(f-statistic) almost equals zero. Moreover, R squared approximatively similar for the model that explains the variation of ROA as the one that elucidates ROE, which means that the regression explains 43% of the variation in performance variables. The results using random effect model were dissimilar between the two models studied, in the following table, we would enlighten the hypothesis that was accepted and the ones rejected by each model.

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Table N°18: Summary of hypotheses results

Hypothesis	Results	
	Model 1	Model 2
There is a significant relationship between liquidity ratio (FL) and financial performance in Algerian banks	Accepted	Rejected
There is a significant relationship between credit risk ratio (CR) and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between interest rate risk (IRR) and financial performance in Algerian banks	Accepted	Accepted
There is a significant relationship between LTD ratio and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between non-performing loans (NPL) ratio and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between provisions to total loans (PTL) ratio and financial performance in Algerian banks	Accepted	Rejected
There is a significant relationship between Deposits and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between size and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between Equity-ratio and financial performance in Algerian banks	Rejected	Rejected
There is a significant relationship between GDP and financial performance in Algerian banks	Accepted	Rejected
There is a significant relationship between inflation and financial performance in Algerian banks	Accepted	Rejected
There is a significant relationship between real interest rate and financial performance in Algerian banks	Accepted	Rejected
There is a significant relationship between real exchange rate (USD/DZD) and financial performance in Algerian banks	Accepted	Accepted

Source: Established by the author

The panel regression showed dissimilar results for model one and model two. Furthermore, the findings of the study, illustrate that the nature of panel regression used influences the final estimated model.

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Conclusion

The outcomes of the study show that there is a significant difference in model one that studied the variation of return on assets and model two that investigated the fluctuations of return on equity. In this study, we tried to understand the nature of the relationship between our dependent and independent variables using panel regression method. Under this method, we studied our sample using three patterns (OLS, fixed and random effects). To determine the appropriate econometric method, we used the Hausman's test that provide us with the optimal method to use for our sample.

The results of the study reveal that there is a positive and statistically significant relationship between funding liquidity (FL) and ROA ratio of Algerian banks. Due to this relation, financial performance will increase by 2.5% if (FL) ratio variates positively with one percent. The FL ratio illustrates the asset quality, we used total loans to total assets ratio that indicates how loaned up is the bank, so the higher the ratio, the more risky a bank may be to higher defaults. However, the results showed that FL ratio and ROA are positively related. As asset quality increases, ROA increases as well.

A statistically significant negative relationship was found between the provision to total loans ratio (PTL) and return on assets (ROA) ratio at 95% confidence level. We found that PTL has a negative impact on the profitability of Algerian banks. This result suggests that Algerian banks may not use the PTL in the right way it was designed for (PTL is a coverage ratio; to make some reserves for potential credit risk that resulted by credit failure).

The results also show that the interest rate risk (IRR) variable has positive and statistically significant effect on 99% confidence level. This means that an increase IRR ratio (equals total interest income divided to total loans) will increase the ROA ratio by 20.12% and ROE by 1.5353. This result emphasize the need for Algerian banks to adhere to prudential and regulatory guidelines that control interest rate volatility with the use of sound risk management practices in order to obtain higher valuations, achieve better financial performance.

The control variables of the study, which are the macroeconomic variables, had a negative and significant relationship with the Algerian bank's profitability, there was a negative correlation between gross domestic product growth rate (GDP) and (ROA) ratio and a significant relationship between 99% confidence level. This result shows that a one-unit change in the gross domestic product will reduce the financial performance in Algerian banks by 0.003. The findings also demonstrated a negative and significant relationship between inflation and ROA ratio. If inflation variates with one unit, than the financial performance in Algerian banks would be reduced by 0.001 at 99% confidence level. Also for the real interest rate variables, results present a significant and negative relationship with ROA ratio, at confidence level of 99%. Same for the real exchange rate (USD/DZD) proven to have negative and significant relationship with (ROA) ratio at confidence level of 99%. These results lead us to conclude that the Algerian banking system, characterized with the dominance of SOB over the banking

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market, gives priority to the macroeconomic stability. Therefore, it is required for the monetary authorities in Algeria to enhance the implementation of the international standards in term of financial guidelines and risk management tools.

GENERAL CONCLUSION

Banks play a vital role in economic development through engaging in an intermediary role, which enhances investment and growth. Commercial banks contribute positively to economic growth by channeling surplus funds to their most productive uses. Without the existence of a sound and efficient banking system, the economy cannot function well. When a bank fails, the whole of a nation's payment system could be thrown into jeopardy. The rate of return earned by banks is affected by numerous factors. These factors include elements internal to each financial institution and several important external forces shaping earnings performance. The type of explanation would determine possible policy implications and ought to be taken seriously. This study investigated banking risk that influence bank's financial performance in Algeria.

The Algerian banking sector has experienced a process of financial liberalization during the last two decades which was focused on generating a more competitive and efficient banking sector. However, in 2014, the IMF report about the Algerian financial system stating: "The global crisis has had virtually no impact on Algeria's financial system, which remains stable overall but thoroughly underdeveloped, so, if the subprime crises did not affect the Algerian financial system, what are the risks that would do? Therefore, it is important to determine the risks that affect bank's results in the country. For that purpose, we specialized our paper in studying one of these factors, which is banking risk management.

After studying the theoretical background of the research, we adopted a sort of hypothetico-deductive method, which is divided into two parts; the hypothetico refers to a theory or a hypothesis, from the different sources that researcher use to establish his conceptual framework, than a deductive part, which test hypotheses and leads to predictions. Our methodological assumption was support with a quantitative tool that is the panel regression analysis, and 18 banks operating in the Algerian banking system were studied from the period 2010-2019.

The principal aim of this study was to empirically test the existence of a relationship between risk management practices and banks profitability in Algeria. We had inspected the relationship amid financial ratios, bank specific and macroeconomic variables. As a result, we found that the risk management ratio studied had different significant influence over the bank performance ratios, for example, the variables that affected return on equity had no significant impact over return on assets variables, so, it was convenient that we divided the study into two models, which studied each dependent variables separately. Beside the performance variables separation into two models, we followed a selective procedure. we tested the three patters of the panel regression method (OLS, fixed and random effect), and at the end we selected the most appropriate model for the nature of our observations, by conducting a Hausman's test, the result showed that the random effect method is the optimal way to examine our models.

The model one studied the variation of return on assets that equals net income over the bank's total assets, and from the conceptual framework in chapter one, we presented ROA as the subtraction of the risk provision margin from the gross profit margin. The model that examined ROA supplied as with interesting empirical results. Firstly, the economic situation of the Algerian banking system affects negatively and significantly its financial performance. The second dependent variable that have significant relationship with ROA is funding liquidity ratio

GENERAL CONCLUSION

as a measure for liquidity risk, which proved to have positive effect on the return on assets variable, also interest rate risk variable revealed a positive impact on ROA, however, the regression results demonstrated a negative relationship between provision to total loans variable and ROA.

For model 2 interested in examining the variation of return on equity variable, the results showed that ROE is affected positively at significance level of 0.05 by the interest rate risk ratio (IRR). On the other hand, the only macroeconomic determinants that effects negatively the ROE ratio was the real exchange rate USD/DZD at the same level of significance 0.05.

The findings of this research were convenient with actual situation in the Algerian banking system. Where surplus liquidity was for the last two decades a fundamental characteristic of the system. On itself is not an indicator of the financial soundness. However, the empirical study found that funding liquidity ratio effects positively the ROA at significance level of 0.01. For IRR as measure for interest rate risk has a positive relationship with both variables of the financial performance. Nevertheless, the affect is more important on ROE than on ROA. This result is also coherent with theoretical situation of the banking sector in Algeria, because bank loans are expected to be the main source of income and are expected to have a positive impact on bank performance. Other things constant, the more deposits are transformed into loans, the higher the interest margin and profits. The third bank specific variable that turned to be effecting significantly the return on assets is the provision to loans ratio as measure for credit risk, the results showed that this variable have a negative relationship to financial performance at 0.05 significance level. Moreover loans which normally represent one of the ultimate source of earnings for commercial banks are affecting bank performance negatively, this due to public banks policy. However they have to be courteous in offering more loans because as they offer more loans to financing huge projects ; they expose themselves to liquidity and default risks which impacts negatively on their profits and survival.

We conclude that financial performance of the Algerian banks depends on liquidity risk, interest rate risk, credit risk, GDP, inflation, real exchange rates (USD/DZD) and real interest rate. Overall, these empirical results provide evidence that the profitability of Algerian banks is shaped by bank-specific variables and macroeconomic variables that are not the direct result of a bank's managerial decisions.

RECOMMENDATIONS OF THE STUDY

As the empirical results showed significant and multiple relationships between banking risks management and financial performance in Algerian banks. This thesis recommends the following points:

- ❖ Pay more attention to risk management in banking, by including interest rate risk to market risk and expending risk management's base.
- ❖ The necessity to develop risk management procedures in Algerian banks.
- ❖ Algerian monetary supervisors should continue to progress in the area of risk management, applying various mechanisms to reinforce the existing data infrastructure that would boost the optimal application risk management in banks.

GENERAL CONCLUSION

- ❖ The Algerian banks liquidity surplus, required to be exploit in investments to promote national economy, with the adoption of effective strategies for managing liquidity risk.
- ❖ Create internal evaluation system to manage risk of liquidity, of credit and of interest rate risk to enable early detection of any risks.

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ANNEXES

OLS model 1

Dependent Variable: ROA

Method: Panel Least Squares

Date: 11/03/20 Time: 08:11

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.102377	0.025217	4.059780	0.0001
FL	0.027754	0.006233	4.452881	0.0000
CR	1265451.	543107.3	2.330020	0.0210
IRR	0.178473	0.040215	4.438034	0.0000
LTD	-0.001363	0.000877	-1.553907	0.1221
NPL	-0.001657	0.007618	-0.217533	0.8281
PTL	-0.053248	0.024290	-2.192185	0.0298
DEPOSITS	-0.010968	0.004958	-2.212308	0.0283
SIZE	0.007050	0.004971	1.418181	0.1580
EQUITY_RATIO	-0.032134	0.012013	-2.674881	0.0082
GDP	-0.002973	0.001238	-2.401671	0.0174
INFLA	-0.001370	0.000701	-1.955833	0.0522
T_INTERET_REEL	-0.000755	0.000177	-4.275660	0.0000
USD_DZD_REEL	-0.000298	8.74E-05	-3.405084	0.0008

R-squared	0.482147	Mean dependent var	0.025519
Adjusted R-squared	0.441593	S.D. dependent var	0.014652
S.E. of regression	0.010949	Akaike info criterion	-6.116568
Sum squared resid	0.019900	Schwarz criterion	-5.868227
Log likelihood	564.4911	Hannan-Quinn criter.	-6.015876
F-statistic	11.88880	Durbin-Watson stat	0.854420
Prob(F-statistic)	0.000000		

fixed effect model 1

Dependent Variable: ROA

Method: Panel Least Squares

Date: 11/03/20 Time: 08:12

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.277136	0.075110	3.689725	0.0003
FL	0.024227	0.009155	2.646401	0.0090
CR	-901735.3	609098.5	-1.480442	0.1409
IRR	0.233803	0.041571	5.624226	0.0000
LTD	0.000344	0.000913	0.377213	0.7066
NPL	0.009503	0.007473	1.271688	0.2055
PTL	-0.107602	0.038556	-2.790806	0.0059
DEPOSITS	0.000839	0.005441	0.154239	0.8776
SIZE	-0.014048	0.006966	-2.016633	0.0455
EQUITY_RATIO	-0.018562	0.019552	-0.949341	0.3440
GDP	-0.002856	0.001055	-2.706618	0.0076
INFLA	-0.000919	0.000631	-1.456677	0.1473
T_INTERET_REEL	-0.000472	0.000168	-2.800876	0.0058

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USD_DZD_REEL -0.000173 8.84E-05 -1.957262 0.0522

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.692581	Mean dependent var	0.025519
Adjusted R-squared	0.630685	S.D. dependent var	0.014652
S.E. of regression	0.008904	Akaike info criterion	-6.449159
Sum squared resid	0.011813	Schwarz criterion	-5.899261
Log likelihood	611.4243	Hannan-Quinn criter.	-6.226199
F-statistic	11.18937	Durbin-Watson stat	1.034600
Prob(F-statistic)	0.000000		

random effect model 1

Dependent Variable: ROA
 Method: Panel EGLS (Cross-section random effects)
 Date: 11/03/20 Time: 08:13
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 18
 Total panel (balanced) observations: 180
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.115235	0.032634	3.531087	0.0005
FL	0.025225	0.007323	3.444549	0.0007
CR	-163216.2	554449.8	-0.294375	0.7688
IRR	0.201277	0.038533	5.223468	0.0000
LTD	-0.000158	0.000861	-0.183320	0.8548
NPL	0.006470	0.007195	0.899258	0.3698
PTL	-0.071849	0.029373	-2.446107	0.0155
DEPOSITS	-0.003147	0.005063	-0.621637	0.5350
SIZE	-0.001280	0.005325	-0.240306	0.8104
EQUITY_RATIO	-0.012972	0.014652	-0.885359	0.3772
GDP	-0.003260	0.001031	-3.162099	0.0019
INFLA	-0.001535	0.000585	-2.623061	0.0095
T_INTERET_REEL	-0.000707	0.000150	-4.706812	0.0000
USD_DZD_REEL	-0.000304	7.48E-05	-4.067755	0.0001

Effects Specification

	S.D.	Rho
Cross-section random	0.006456	0.3446
Idiosyncratic random	0.008904	0.6554

Weighted Statistics

R-squared	0.435600	Mean dependent var	0.025519
Adjusted R-squared	0.314874	S.D. dependent var	0.011077
S.E. of regression	0.009169	Sum squared resid	0.013955
F-statistic	7.328148	Durbin-Watson stat	1.015621
Prob(F-statistic)	0.000000		

ANNEXES

Hausman test model 1

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	13	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
FL	0.024227	0.025225	0.000030	0.8558
	-	-		
	901735.3006	163216.19320	63586424317.	
CR	51	3	908325	0.0034
IRR	0.233803	0.201277	0.000243	0.0371
LTD	0.000344	-0.000158	0.000000	0.0989
NPL	0.009503	0.006470	0.000004	0.1330
PTL	-0.107602	-0.071849	0.000624	0.1523
DEPOSITS	0.000839	-0.003147	0.000004	0.0453
SIZE	-0.014048	-0.001280	0.000020	0.0045
EQUITY_RATIO	-0.018562	-0.012972	0.000168	0.6659
GDP	-0.002856	-0.003260	0.000000	0.0740
INFLA	-0.000919	-0.001535	0.000000	0.0093
T_INTERET_REEL	-0.000472	-0.000707	0.000000	0.0021
USD_DZD_REEL	-0.000173	-0.000304	0.000000	0.0053

Cross-section random effects test equation:

Dependent Variable: ROA

Method: Panel Least Squares

Date: 11/03/20 Time: 08:13

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.277136	0.075110	3.689725	0.0003
FL	0.024227	0.009155	2.646401	0.0090
CR	-901735.3	609098.5	-1.480442	0.1409
IRR	0.233803	0.041571	5.624226	0.0000
LTD	0.000344	0.000913	0.377213	0.7066
NPL	0.009503	0.007473	1.271688	0.2055
PTL	-0.107602	0.038556	-2.790806	0.0059
DEPOSITS	0.000839	0.005441	0.154239	0.8776
SIZE	-0.014048	0.006966	-2.016633	0.0455
EQUITY_RATIO	-0.018562	0.019552	-0.949341	0.3440
GDP	-0.002856	0.001055	-2.706618	0.0076
INFLA	-0.000919	0.000631	-1.456677	0.1473
T_INTERET_REEL	-0.000472	0.000168	-2.800876	0.0058
USD_DZD_REEL	-0.000173	8.84E-05	-1.957262	0.0522

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Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.692581	Mean dependent var	0.025519
Adjusted R-squared	0.630685	S.D. dependent var	0.014652
S.E. of regression	0.008904	Akaike info criterion	-6.449159
Sum squared resid	0.011813	Schwarz criterion	-5.899261
Log likelihood	611.4243	Hannan-Quinn criter.	-6.226199
F-statistic	11.18937	Durbin-Watson stat	1.034600
Prob(F-statistic)	0.000000		

The optimal model 1

Dependent Variable: ROA
 Method: Panel EGLS (Cross-section random effects)
 Date: 11/03/20 Time: 08:14
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 18
 Total panel (balanced) observations: 180
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.115235	0.032634	3.531087	0.0005
FL	0.025225	0.007323	3.444549	0.0007
CR	-163216.2	554449.8	-0.294375	0.7688
IRR	0.201277	0.038533	5.223468	0.0000
LTD	-0.000158	0.000861	-0.183320	0.8548
NPL	0.006470	0.007195	0.899258	0.3698
PTL	-0.071849	0.029373	-2.446107	0.0155
DEPOSITS	-0.003147	0.005063	-0.621637	0.5350
SIZE	-0.001280	0.005325	-0.240306	0.8104
EQUITY_RATIO	-0.012972	0.014652	-0.885359	0.3772
GDP	-0.003260	0.001031	-3.162099	0.0019
INFLA	-0.001535	0.000585	-2.623061	0.0095
T_INTERET_REEL	-0.000707	0.000150	-4.706812	0.0000
USD_DZD_REEL	-0.000304	7.48E-05	-4.067755	0.0001

Effects Specification

	S.D.	Rho
Cross-section random	0.006456	0.3446
Idiosyncratic random	0.008904	0.6554

Weighted Statistics

R-squared	0.435600	Mean dependent var	0.022519
Adjusted R-squared	0.314874	S.D. dependent var	0.011077
S.E. of regression	0.009169	Sum squared resid	0.013955
F-statistic	7.328148	Durbin-Watson stat	1.015621
Prob(F-statistic)	0.000000		

OLS model 2

Dependent Variable: ROE

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Method: Panel Least Squares

Date: 11/03/20 Time: 08:19

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.559880	0.453595	-3.438930	0.0007
FL	0.311227	0.112114	2.775989	0.0061
CR	20252835	9769118.	2.073149	0.0397
IRR	2.927362	0.723357	4.046914	0.0001
LTD	-0.045130	0.015780	-2.860003	0.0048
NPL	-0.140994	0.137034	-1.028900	0.3050
PTL	-1.428941	0.436912	-3.270546	0.0013
DEPOSITS	-0.302735	0.089176	-3.394809	0.0009
SIZE	0.404005	0.089417	4.518232	0.0000
EQUITY_RATIO	-1.102899	0.216087	-5.103962	0.0000
GDP	-0.033110	0.022266	-1.487011	0.1389
INFLA	-0.011837	0.012603	-0.939226	0.3490
T_INTERET_REEL	-0.005329	0.003178	-1.676948	0.0954
USD_DZD_REEL	-0.003615	0.001573	-2.298482	0.0228
R-squared	0.498750	Mean dependent var		0.359085
Adjusted R-squared	0.459495	S.D. dependent var		0.267880
S.E. of regression	0.196943	Akaike info criterion		-0.337219
Sum squared resid	6.438564	Schwarz criterion		-0.088878
Log likelihood	44.34968	Hannan-Quinn criter.		-0.236527
F-statistic	12.70554	Durbin-Watson stat		0.761031
Prob(F-statistic)	0.000000			

fixed effect model 2

Dependent Variable: ROE

Method: Panel Least Squares

Date: 11/03/20 Time: 08:20

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.789052	1.248828	-2.233337	0.0270
FL	0.075511	0.152208	0.496101	0.6206
CR	-867461.0	10127230	-0.085656	0.9319
IRR	1.270140	0.691178	1.837645	0.0681
LTD	-0.000498	0.015180	-0.032812	0.9739
NPL	-0.027597	0.124250	-0.222109	0.8245
PTL	-0.075436	0.641053	-0.117675	0.9065
DEPOSITS	0.006075	0.090458	0.067161	0.9465
SIZE	0.166056	0.115821	1.433731	0.1537
EQUITY_RATIO	-0.007760	0.325088	-0.023870	0.9810
GDP	-0.026483	0.017546	-1.509320	0.1333
INFLA	-0.015160	0.010494	-1.444573	0.1507
T_INTERET_REEL	-0.004294	0.002801	-1.533085	0.1274
USD_DZD_REEL	-0.003422	0.001469	-2.328844	0.0212

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Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.745759	Mean dependent var	0.359085
Adjusted R-squared	0.694570	S.D. dependent var	0.267880
S.E. of regression	0.148046	Akaike info criterion	-0.827153
Sum squared resid	3.265726	Schwarz criterion	-0.277255
Log likelihood	105.4438	Hannan-Quinn criter.	-0.604193
F-statistic	14.56862	Durbin-Watson stat	1.329351
Prob(F-statistic)	0.000000		

random effect model 2

Dependent Variable: ROE

Method: Panel EGLS (Cross-section random effects)

Date: 11/03/20 Time: 08:21

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.469635	0.632494	-2.323556	0.0214
FL	0.113096	0.131501	0.860036	0.3910
CR	4235924.	9555763.	0.443285	0.6581
IRR	1.535317	0.656476	2.338726	0.0205
LTD	-0.008581	0.014658	-0.585436	0.5590
NPL	-0.054867	0.121598	-0.451214	0.6524
PTL	-0.606171	0.533061	-1.137153	0.2571
DEPOSITS	-0.047073	0.086645	-0.543287	0.5877
SIZE	0.149567	0.093080	1.606870	0.1100
EQUITY_RATIO	-0.402035	0.263773	-1.524172	0.1294
GDP	-0.026907	0.017242	-1.560595	0.1205
INFLA	-0.011608	0.009817	-1.182417	0.2387
T_INTERET_REEL	-0.003547	0.002535	-1.399135	0.1636
USD_DZD_REEL	-0.002814	0.001268	-2.219240	0.0278

Effects Specification

	S.D.	Rho
Cross-section random	0.150342	0.5077
Idiosyncratic random	0.148046	0.4923

Weighted Statistics

R-squared	0.432963	Mean dependent var	0.359085
Adjusted R-squared	0.146398	S.D. dependent var	0.160866
S.E. of regression	0.148625	Sum squared resid	3.666848
F-statistic	3.361511	Durbin-Watson stat	1.152737
Prob(F-statistic)	0.000136		

hausman test model 2

Correlated Random Effects - Hausman Test

ANNEXES

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	13	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
FL	0.075511	0.113096	0.005875	0.6239
	-			
	867460.9782	4235923.5755	11248173061	
CR	40	29	406.781	0.1281
IRR	1.270140	1.535317	0.046767	0.2201
LTD	-0.000498	-0.008581	0.000016	0.0406
NPL	-0.027597	-0.054867	0.000652	0.2855
PTL	-0.075436	-0.606171	0.126795	0.1361
DEPOSITS	0.006075	-0.047073	0.000675	0.0408
SIZE	0.166056	0.149567	0.004751	0.8109
EQUITY_RATIO	-0.007760	-0.402035	0.036106	0.0380
GDP	-0.026483	-0.026907	0.000011	0.8964
INFLA	-0.015160	-0.011608	0.000014	0.3382
T_INTERET_REEL	-0.004294	-0.003547	0.000001	0.5305
USD_DZD_REEL	-0.003422	-0.002814	0.000001	0.4129

Cross-section random effects test equation:

Dependent Variable: ROE

Method: Panel Least Squares

Date: 11/03/20 Time: 08:24

Sample: 2010 2019

Periods included: 10

Cross-sections included: 18

Total panel (balanced) observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.789052	1.248828	-2.233337	0.0270
FL	0.075511	0.152208	0.496101	0.6206
CR	-867461.0	10127230	-0.085656	0.9319
IRR	1.270140	0.691178	1.837645	0.0681
LTD	-0.000498	0.015180	-0.032812	0.9739
NPL	-0.027597	0.124250	-0.222109	0.8245
PTL	-0.075436	0.641053	-0.117675	0.9065
DEPOSITS	0.006075	0.090458	0.067161	0.9465
SIZE	0.166056	0.115821	1.433731	0.1537
EQUITY_RATIO	-0.007760	0.325088	-0.023870	0.9810
GDP	-0.026483	0.017546	-1.509320	0.1333
INFLA	-0.015160	0.010494	-1.444573	0.1507
T_INTERET_REEL	-0.004294	0.002801	-1.533085	0.1274
USD_DZD_REEL	-0.003422	0.001469	-2.328844	0.0212

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.745759	Mean dependent var	0.359085
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Adjusted R-squared	0.694570	S.D. dependent var	0.267880
S.E. of regression	0.148046	Akaike info criterion	-0.827153
Sum squared resid	3.265726	Schwarz criterion	-0.277255
Log likelihood	105.4438	Hannan-Quinn criter.	-0.604193
F-statistic	14.56862	Durbin-Watson stat	1.329351
Prob(F-statistic)	0.000000		

The optimal model 2

Dependent Variable: ROE
 Method: Panel EGLS (Cross-section random effects)
 Date: 11/03/20 Time: 08:26
 Sample: 2010 2019
 Periods included: 10
 Cross-sections included: 18
 Total panel (balanced) observations: 180
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.469635	0.632494	-2.323556	0.0214
FL	0.113096	0.131501	0.860036	0.3910
CR	4235924.	9555763.	0.443285	0.6581
IRR	1.535317	0.656476	2.338726	0.0205
LTD	-0.008581	0.014658	-0.585436	0.5590
NPL	-0.054867	0.121598	-0.451214	0.6524
PTL	-0.606171	0.533061	-1.137153	0.2571
DEPOSITS	-0.047073	0.086645	-0.543287	0.5877
SIZE	0.149567	0.093080	1.606870	0.1100
EQUITY_RATIO	-0.402035	0.263773	-1.524172	0.1294
GDP	-0.026907	0.017242	-1.560595	0.1205
INFLA	-0.011608	0.009817	-1.182417	0.2387
T_INTERET_REEL	-0.003547	0.002535	-1.399135	0.1636
USD_DZD_REEL	-0.002814	0.001268	-2.219240	0.0278

Effects Specification

	S.D.	Rho
Cross-section random	0.150342	0.5077
Idiosyncratic random	0.148046	0.4923

Weighted Statistics

R-squared	0.432963	Mean dependent var	0.359085
Adjusted R-squared	0.146398	S.D. dependent var	0.160866
S.E. of regression	0.148625	Sum squared resid	3.666848
F-statistic	3.361511	Durbin-Watson stat	1.152737
Prob(F-statistic)	0.000136		