ISLAMIC AND CONVENTIONAL BANKS’ PROFITABILITY MODELLING

Capstone Design

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ISLAMIC AND CONVENTIONAL BANKS’ PROFITABILITY MODELS

Capstone Report

Student Statement:
I affirm having applied ethics to the design process and in the selection of the final proposed design. And that, I hold the safety of the public to be paramount and has addressed this in the presented design wherever may be applicable.

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Approved by the Supervisor(s)

_____________________________________________________

Dr. Ilham Kissani
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ABSTRACT:

The financial world knows day after day innovative services and firms to generate profits. Among those innovations, there are the Islamic banks whose growth and expansion have unexpectedly increased too fast and known a great success everywhere in the world. Therefore, many studies are concerned about this outstanding growth and are conducting various studies as to explore this phenomenon more in dept.

Consequently, the aim of my capstone project is to compare between the performance of both banks: Islamic and conventional, in terms of their profitability. The sample used is gathering data from the top listed banks in Africa and non-African MENA region countries over the period of 2011-2015, resulting in 250 observations. The methodology consists of a descriptive statistics of the following variables: capital adequacy, asset quality, management quality, earning quality, liquidity, GDP per capita, and inflation. To compare between the significant factors on profitability between both banks, One way ANOVA was used. Then, to determine the major determinants of bank’s profitability, a regression model is introduced to different dataset to measure, first the effect of the variables on profitability in general, second, the effect of those variables on profitability accounting for the type of bank, then last but not least, the difference effect of these variables when accounting for the region’s economy.

The results of this conducted project have shown a significant difference among Islamic banks and conventional banks concerning the management quality, the profitability, and asset quality. The Islamic banks are also leading in terms of return on assets, return on equity, they also have a better asset quality, and an outstanding management quality. Meanwhile, they are weaker in terms of earnings quality, and capital adequacy and in terms of profits from investments, which makes their net interest margin lower. Finally, the significant factors affecting the profitability are the liquidity, the management quality, the asset quality, and earning quality. Nonetheless, when taking into consideration the type of bank, the most factors affecting profitability are the liquidity, the management quality and the GDP.

Keywords: Data analysis, financial ratios, Regression model, Prediction, Islamic banks, conventional banks, profitability.
INTRODUCTION:

Few years ago, exactly on the 5\textsuperscript{th} of March 2015, the first Islamic bank was introduced in Morocco\cite{1}. Many questions rose along this introduction about these banks’ services, its functioning and how different it is from the multiple conventional banks that are taking over the financial world. Several empirical studies showed an important curiosity towards this emerging new banks’ model due to its unexpected and outstanding growth of total assets and importance in the market share. They all aim at having a better insight into the Islamic banking model in order to evaluate the different variables that helped into its development.

Subsequently, this project represents a comparative study between both types of banks, which evaluates their performance based on different variables and gives a predicting model of bank’s profitability. The size chosen comprises the top 50 listed banks in Africa and the non-African countries of the MENA region over the period of 2011-2015, with a total of 12 different countries. Therefore, the model has 250 observations. Descriptive statistics will be used on the specific internal banks’ performance variables and the external macroeconomic variables. Later on, using ANOVA test, we will test for the statistical significance of the differences. Moreover, by using the regression analysis, the study will attempt to examine the determinants of the banks’ performance and evaluate whether the type of the bank influences these determinants and how this latter affects its profitability.

These banks will be compared in terms of their capital adequacy, asset quality, liquidity, management quality and their earnings quality by respecting the financial ratio analysis. The macroeconomic variables used are the GDP per capita and the inflation rate.

Consequently, this project represents a strong basis for the implementation of Islamic banks or services in Morocco, and represents a reference towards what helped these banks in gaining profits and what stepped them back. Indeed, the region of the study was not randomly chosen but represents one of the main influences our country is under, subsequently, it represents an accurate reference for the financial projects.

2. LITERATURE REVIEW:
2.1 Banks’ Performance Indicators:

Many studies have been implied in determining the main indicators of banks’ performance such as growth, liquidity, profits etc. A majority of these researchers agreed that the main determinants of a bank performance are its profitability since this latter is one of the main purposes of these institutions. Some research studies have been studying the profitability of banks in different regions while others got specialized in only one country. Results have been different but many agreed on some specific factors. The main reason behind such studies is to improve the banking system especially after the consequences of the several financial crises, which kicked toughly the system world widely. Nonetheless, since the system of Islamic banks is different from the system of the conventional banks, the determinants may either differ or converge. This part of the literature review would be discussing the different profitability determinants used by statisticians and economists.

In the study conducted by Bachir[2], they preferred the use of ratios linked with the capital, the expenditure, loans, liquidity, and the institutions’ method of financing. As for the macroeconomic factors, they used variables linked with the country’s taxation policy, the structure of banks and they relied on the country dummies. This study indicated that sufficient capital ratios and loan portfolios have an important role in explaining the performance of Islamic banks. Meanwhile, a previous study done by Molyneux and Thornton [3], that involved about 18 European banks showed that there is a positive association between the return on equity, the interest rates, banks’ concentration and the government ownership. Meanwhile, others studies have been concerned about the size of the bank, which means the total assets of the bank, and its impact on the performance, and fairly controversial results, have been found. Indeed, Goddard et.al [4] found that there is a positive relationship between risk and profitability but the size of the bank is insignificant. Moreover, a previous study conducted by Javaid, et.al [5] showed that the higher is the size, which implies higher total assets, might not necessarily lead to higher profits for the bank. In the other hand, Rahman et.al [6] found that the size and the profitability have a positive relationship. These results are controversial; therefore, questions are raised about how size may affect the profitability of Islamic banks.
Other studies, such as Athanasoglou et.al [7] have proven that the GDP per capita does not affect banks’ profitability while the inflation rate and the concentration of the bank does. Berger [8] explains the positive relationship between concentration and profits by the lower costs generated due to management or the production steps. Revell[9] noticed as well that the inflation affects the banks’ profitability. Indeed, the unstable variability of inflation may lead to cash movement problems for borrowers who can close their arrangement with the bank and lead it to lose its loans. Simiyu and Ngile [10] on their study found that the GDP per capita has indeed a positive but insignificant relationship with the profitability. A study conducted by Scott and Arias[11] in the US, proved that the GDP per capita did not influence the profits, meanwhile, other studies such as Saksonova and Solovjova [12] found that the GDP per capita contributed into profits. All in all, it has been broadly settled that return on assets and return on equity are considered as the most accurate measure of profitability as confirmed by Hassan & Bashir[13].

2.2 Islamic Banks during the 2008 crisis:

Due to the difference of the system of banking among Islamic banks in comparison with the conventional ones, differences on the influence of the global financial crisis are suspected to happen. Indeed, after the crisis many economists tried to find other alternative to the system they have always known, and among those alternatives, the Islamic banks rose victoriously in popularity, nonetheless, the consequences of this crisis are still disagreed on. While others claim that since it is an asset financing, it won’t be affected as much as conventional banks did, others found that many variables were affected by the crisis. Indeed, Parashar & Sat[14] found that Islamic banks suffered in terms of the return on assets, the capital ratio, the return on equity, and the leverage while the conventional banks saw their return on assets and liquidity affected. However, unexpectedly, another study concerning the same problematic found out that there is no significant difference between Islamic banks & conventional ones because their business standard is not the same as they claim theoretically. This study relied on the measurement of the Z-score and capital-to-asset ratio and was conducted by Bourkhis & Nabi[15]. Another study found different results claiming that Islamic banks are better exploited with lower losses on loans, the thing that makes it less operative but more provisional during crisis as asserted by Beck, Kunt & Merrouch[16].
Maher & Jemma’s [17] analysis suggested that both banks were affected differently after the financial crisis. For instance, even though the Islamic banks’ business model factors helped limit the damages, the fragile risk management led to a decline in its profitability in some Islamic banks. Nonetheless, its credit and asset growth achieved better than did the conventional banks.

These studies show that the difference in the business model of Islamic banks prevented their financial system from collapsing, as did unfortunately the conventional banks. Nonetheless, they were still affected by the crisis and this is due to either their weak risk management system or to the fact that some banks converged to the same system as the conventional banks have.

2.3 Challenges Facing the Islamic banks:

Islamic banks know a considerable growth in all countries due to their business model that were partially resistant to the global crisis. Nonetheless, in their way to glory, these banks are facing many challenges in order to remain viable and sustainably present. Therefore, many studies have been concerned about the future of these banks and showed high interest in addressing these issues as to maintain the development and growth of these banks worldwide.

Firstly, these banks’ deposits are mainly due to the religious claim the bank has; therefore, most clients are religiously attracted to this bank, which makes the conventional banks have a higher advantage due to the numerous clients they attract, which has increased competition. Islamic banks suffer also from a lack of portfolio diversification, which is due to its small size. Indeed, economists have found that larger banks have more chances of reaching the finest output. Therefore, Islamic banks should work on their size.

Another point is that since competition is getting higher and conventional banks are being more creative, the Islamic banks should start looking for other products to offer and work on their financial engineering tools. However, these new genuine tools should still be approved by the Shari’ah before being offered, therefore, more professional scholars are needed as to
assure the success of their evaluation of these products. Furthermore, the Islamic banks should expand their strategic alliances and promote the training and research in this sector.

2.4 Islamic Banks’ Characteristics:

Widely known as interest-free banks, Islamic banks have actually more rules and considerably different policies than conventional banks. Indeed, these banks are known for their shared risk between the borrowers and their lenders and are based on a religious source of rules, Shari’ah, the Islamic law. This law is mainly set by a Board of Islamic Affairs whose main role is, to conduct the operations in a “Halal” manner. This latter means literally permissible in Islam and religiously acceptable as it has many characteristic such as fairness and justice. In this part of this study, the main vocabulary of Islamic financial institutions is going to be explored as clearly as possible, relying on numerous specialized books.

The theory of an interest-free banking system comes from the Muslim belief religiously known as “Riba”, the ‘raison d’être’ of Islamic banking, this means any and all gain the lender makes from a loan, financially known as an interest. Therefore, the Shari’ah came with other concepts to base the Islamic financial transactions on and they are known as: “mudaraba”, “murabaha” and “musharaka”. According to Saeed[18], the interest was hidden under the terms of fees, commissions and profit, when it concerned bonds and currency swaps, therefore, the theory differed from practice which consequently lead theorists to agree on one principle for the Islamic banks: The Profit and Loss Sharing principle.

The best way of describing Islamic banks would be by presenting the main products it offers which are its modes and instruments of financing. There are two different types of instruments according to Dr. Mohammed Jamaldeen, an Islamic Finance Expert: Instruments for mobilizing fund and Instruments for utilizing fund. The first one is used to organize funds through the saving and current accounts, it is similar to the conventional banking except that it acts on different principles. There are four different products it offers:

- Current Accounts: these accounts are mainly made for businessman, since it requires a higher minimum deposit and offers a unlimited amount of deposits and withdrawals and simplifies transactions at all time and places. Not all conventional banks do pay interest on these accounts, but none of the Islamic banks does.
• Investment Accounts: or known as fixed accounts for conventional banks is an account that generates a greater interest than do the saving accounts. In Islamic banking, there are two types of investment accounts; the restricted and the unrestricted. These two differ in terms of the authorization given to the bank in order to invest these deposits in any project or in a specific project chosen by the depositor himself. Therefore, the money given or taken away is considered as a profit or a loss.

• Savings Accounts: it is a type of accounts that saves deposits and allows depositors to get annual interest from their savings. Concerning Islamic banks, they act on a profit/loss basis, meaning that the deposit is used by the bank for investment purposes that are totally consenting with the Shari’ah law, thus, when the bank generates profits from investing that money, they give the depositors their part of profit agreed on upon opening the saving account. This type of accounts work upon the principle of “Al Wadi’ah” that requires the bank to take permission before investing the client’s deposits and to guarantee their money bank without any surplus. Nonetheless, the bank may express its gratitude by offering a “Hibah” that is paid semiannually in case it generates profits from the investment.

• Islamic Bonds “ Sukuk”: are the equivalent of bonds for conventional banks, where the issuer has to pay the principal with interest at a certain period of time. Nonetheless, “Sukuk” is mainly about shared shares in a debt, but this concept cannot ignore the importance of the time value of money, which creates a controversial opinion among scholars.

The second one is used for using these funds and represents the entrepreneurship side of banks:

• Mudaraba: is a contract between an investor (the bank) who offers money for a project and a person (an entrepreneur) who, uses his expertise to achieve the contractual work. Therefore, it acts on a profit sharing & loss-bearing principle, that allows the worker to get his ratio of profit and the bank to deal with losses if any occurs.

• Murabaha: the bank buys an item under a prearranged profit and sells it in form of periodical installments to its client under a set fee that is not considered as “Riba” which makes the loan interest-free. This set fee is mainly made because of the risk where the client may not buy back the item as promised.
• Musharaka: is in the form of a partnership structure that allows both parties to share the profits and losses under agreed-on ratios. This concept allows a party to achieve a certain investment without having to take loans.

• Ijara: is the equivalent of leasing in conventional banking. This financial instrument is a type of contract where the owner of the item allows the use of that item under periodical payment without announcing the ownership. Therefore, this instrument is prominently useful in case of uncertain profitability of a certain future investment since there is no surplus charge in case of a missed payment and the owner pays all maintenance unless it is the lessee’s negligence or disrespect of the agreements.
3. RESEARCH METHODOLOGY:

In this section, the methods behind this project will be specified and all details about the design process, the data collection, the variables used, the tools chosen and the model specification will be introduced. The main primary data distribution is going to be highlighted under different methods of data description.

3.1 Data Collection:

All the data was generated from Orbis Bank Focus, a database source gathering all banks of the world assembled from annual reports, sources of information and regulatory sources. This latter contains information about 42,000 banks offering the most detailed and up-to-date financial format available making a cross-country comparison possible. It is also very reliable in terms of data, format and is supported by a greatly expert bank analysis team. The missing bank-specific information were taking from the banks’ personal annual reports and transformed into ratios as to make all the data accurately formulated. Concerning the external factors used in this study, they were extracted from World Bank Open Data source that contains most global development data. (See Appendix B)In this section, all types of data used are going to be described, as follow:

3.1.1 Dependent Variables:

These variables represent the profitability indicators as concluded from the literature review results.

   a) ROAE: Return on Average Equity

\[
ROAE = \frac{Net\ Income}{Total\ Average\ Equity}
\]

This ratio represents a measure of profitability that reflects what the company relies on to achieve a higher return: profitability, leverage, or the asset turnover. It approximately gives the net benefit the shareholders get from investing in the bank as confirmed by Momeneen et al [19]. As explained by William A. Fruhan, a high ratio is more attractive because it reflects that the profits engendered outdo the cost of equity, which generates a value for its shareholders. An interesting return on equity ratio is also the one that demonstrates a continuous and constant raise within a time frame displaying firmness of growth rather than risky volatility.

   b) ROAA: Return on Average Assets
\[ ROAA = \frac{Net \, Income}{Total \, Average \, Assets} \]

This represents a measure of profitability that reflects how effectively is the company using its assets to generate a benefit by calculating the return on assets purchased using those dollars, as stated by Madvari et al. It represents, as stated by Popovici[21], the number of cents generated at each dollar of assets.

c) **NIM:** Net Interest Margin

\[ NIM = \frac{Investment \, Returns - Interest \, Expenses}{Average \, Earning \, Assets} \]

It is a measure that indicates how the bank makes the investment decisions relatively to its debt condition. For instance, if the net interest margin is negative, it means that the bank has lost more money than it generated from the investment, meaning that the investment decision was not profitable, as it was confirmed by Rose [21].

### 3.1.2 Independent Variables:

There variables are the different qualifications of banks that we want to test to see if they are linked with the profitability ratios and how they affect the banks’ profitability. These variables have been ranked in two groups: Internal and external factors. Indeed, the first part is about specific-bank factors and the second is external and is linked with the general economy of the country.

a) **Capital Adequacy:**

It measures the strength and the stability of the institution by calculating the bank’s capital and represents a ratio of the primary capital to its assets. The utility of this ratio is not only to maintain stability and the effectiveness of the financial system world widely but also to protect the depositors. The ratio represents \[ CAR = \frac{Total \, Capital}{Risk \, Weighted \, Asset} \]. According to Investopedia, the total capital represents the sum of Tier 1 Capital, that absorbs losses without having to cease trading, and tier 2 Capital is used in case of liquidation. As asserted by Samad[22]& Akhtar et al [23] the lower is the ratio, the higher is the risk in the banks, since this ratio helps the bank provide enough support to rise its credit actions, and decrease the unforeseen risks.

b) **Asset Quality:**
For a bank, a big portion of its assets is represented by its loans. Therefore, they are the main source of generating profits. In this research, we are going to use the LLR ratio 
\[
\text{LLR} = \frac{\text{Loan Loss Reserve}}{\text{Total Loans}}
\]
, the importance of this ratio is that it shows the reliability of a credit, which is linked with its risk. Therefore, it plays an important role in the banks’ portfolio management. This ratio helps in understanding what was kept for unforeseen bad cases. Therefore, if the ratio is high it means the bank is expecting future losses as confirmed by Merchant[24].

c) **Liquidity:**

According to Kumbirai & Webb[25], it indicates the capability “of the bank to meet its financial obligations in a timely and effective manner” and Samad[22] confirms that it represents “the life and blood for a commercial life”. As used previously by Kumbirai & Webb[25], this study is using:

\[
\text{NLTA} = \frac{\text{Net Loans}}{\text{Total Assets}},
\]

this ratio represents the percentage of assets that represents loans. The higher this ratio, the less liquid is the bank.

d) **Management Quality:**

This measure reflects the quality of the management policy inside a financial institution. Since, both banks chosen for this study have different policies, this measure would be helpful in the process of comparison between both types of bank. The ratio is 
\[
\text{LDR} = \frac{\text{Loans}}{\text{Total Deposits}}
\]

and it indicates the portion of loans that are based on the deposits. Therefore, it reflects how well the bank succeeds in getting more deposits from strong depositors and how effectively it reduces the randomness of borrowers who get loans.

e) **Earning Quality:**

It is a measure used to show how efficient is the bank at using its assets to generate an income and increase its productivity. In this study, the efficiency ratio 
\[
\text{EOR} = \frac{\text{Expenses}}{\text{Revenues}}
\]

will be applied, and it measures the ability to turn assets into revenue. The lower is the ratio the better is the bank operating.

External Factors:
f) GDP:

*It is an indicator of the country’s economic health, since it reflects the cost of goods/services within a country during a specific period. Because it is uniformly measured all around the world, it represents an accurate measure to compare between countries.*

g) Inflation:

*It represents a persistent rise in the value of money of products and services in a specific country. This phenomenon becomes a noticeable problem when it conducts to a rise in the monetary value of good and an absence of raise in the worth of labor.*

3.1.2 Research Hypothesis:

H0: IBs are more liquid than CBs.

H1: IBs have better asset quality than CBs.

H2: IBs have a better capital adequacy than CBs.

H3: IBs have a better earning quality than CBs.

H4: IBs have a better management quality than CBs.

3.1.3 Significance level:

This data analysis will be taken care of with respect to a 5% significance level. Denoted by an alpha sign, this latter represents the probability of the risk of rejecting H0 when it is correct.

3.1.4 Software Used:

All the analysis used in this project has been run using the statistical tools offered by R. This latter is an open source programming tool made for statistical computing and graphics as explained in the official website [https://www.r-project.org].

I chose to use this software due to the fact that it is free, since it is an open source unlike other statistics’ tools, and to its powerful ability of manipulating data and performing adequate analysis.
Throughout the statistical analysis many packages were used. This latter contains powerful functions for this project, which are mainly:

- **XLConnect**: was used to import, read, write and edit the dataset presented firstly in an excel format.
- **Car**: which stands for companion of applied regression, is the tool I am relying on to generate the functions needed for a proper regression for this model. This package has the ANOVA function, residuals plots, durbinWatsonTst
- **Hmisc**: contains as well many advanced useful data analysis functions, which provide high-level graphics and descriptive statistics.
- **Ppcor**: this package provides advanced graph designs and was particularly used to generate the correlation plot between a independent variable and a dependent variable.[appendix A: figure x.x]
- **Corrplot**: was used to generate the multicollinearity plot and to implement the code testing for the significance level for all independent variables as shown in figure x.x and the code [Appendix A: code x.x]. As described by the official website of R, this package is used to display correlation matrices and has important algorithms for restructuring.

All tutorials and codes were inspired by the online class notes offered by Princeton University online, which therefore, makes them a reliable tool.

Note 1:

\(^1\) In both ROAA & ROAE, the average of total assets and total equity was used to have more accurate results, since both are found in the balance sheet, which represents only a snapshot in time.
4 DATA ANALYSIS

4.1 Descriptive statistics: the difference in the performance of both types of banks.

The mean of ROAE, return on average equity, of conventional banks is equal to 12.28%, which is lower than the ROAE of Islamic banks, that is 20.77%. This difference means that Islamic banks are better at generating profits from their shareholders than are conventional banks. Therefore, they are more profitable using this ratio as a measure.

The mean of ROA, return on average assets, of conventional banks is equal to 1.51%, which is lower than the ratio of Islamic banks that is equal to 2.49%. This difference means that the Islamic banks are better at generating profits from their assets. This means that the Islamic banks chosen in our study have a more efficient management that allows converting their money into a better investment that returns better profit.

The mean of NIM, net income margin, of conventional banks is equal to 3.78% which is higher than the Islamic banks’ of -0.51%. The negative value of the NIM of the Islamic Banks mainly means that the revenue is less than the expenses, so, the banks did not make an optimal decision.

To measure the liquidity of these banks, this study relies on the NLTA ratio. For the conventional banks, we had 57.49%, which is less than the ratios of the Islamic banks that are 59.86%. This results states that the Conventional banks are more liquid than the Islamic banks. The NLTA indicates the percentage of total assets that are loans, the higher it is, the more is the bank involved in lending, consequently, the less it is liquid.

To measure the asset quality of both types of banks, the ratio LLR was used. For Conventional banks, the ratio equals 3.22%, which is higher than the ratio of Islamic bank that is equal to 2.1%. Therefore, the Islamic banks have a better asset quality since their loan loss reserve is fewer than the Conventional banks’. This means that the Islamic banks are expecting fewer losses on loans than do the Conventional banks.

To measure the capital adequacy of both banks, the ratio CAR is used. The Islamic banks had a 18.06%, which is lower than the conventional banks who had only 19.23%. Therefore, the conventional banks are better at providing a minimum of resources for any unforeseen risk from their equity. This is also important at providing enough information for the depositors.
about the security of their deposits. Thus, Conventional banks have a better capital adequacy than the Islamic banks.

To measure its earning quality, the ratio OER was used. For the Islamic banks, the OER is equal to 61.04% while for the conventional banks it is 59.41%. Therefore, the conventional banks are more profitable since they generate more revenue with spending less. This shows that the conventional banks have better earning quality than do the Islamic banks.

For management quality, the ratio LTD has been used and it represents as said earlier the ratio of loans in the deposits. In the study, the Islamic banks had a ratio of 101.8% while the conventional banks had 80.9%. This ratio indicates the percentage of loans that are based on the deposits. The ratio shows how efficient is the management inside the bank at choosing reliable depositors. Therefore, Islamic banks are acquiring more trustworthy clients and thus, have a better management quality than the conventional banks.

(As shown in Appendix B).

4.2 One-way ANOVA: the significance of the difference

This analysis tool is used to determine whether the difference in the performance between the two types of banks is significant.

To test for the significance of the performance between the two types of banks, the ANOVA one-way test is used according to these hypotheses and with a significance level equal to 5%.

4.2.1 Hypothesis:

H0: there are no significant difference between Islamic banks and Conventional banks.

Ha: There is a significant difference between Islamic Banks and Conventional banks.

4.2.2 Results:

Capital Adequacy: p-value= 0.5519 >0.05, therefore, we do not reject H0. This means that there is no significant difference between both types of banks in terms of the capital adequacy.
Asset Quality: p-value=$8.71\times10^{-5}<0.05$, therefore, we reject $H_0$. This means that there is a significant difference between both types of banks in terms of the asset quality.

Management Quality: p-value=$7.31\times10^{-5}<0.05$, therefore, we reject $H_0$. This means that there is a significant difference between both types of banks in terms of the management quality.

Earnings Quality: p-value=$0.78>0.05$, therefore, we do not reject $H_0$. This means that there is no significant difference between both types of banks in terms of the earnings quality.

Liquidity: NLTA ratio gives a p-value of 0.15, which is higher than alpha meaning that we do not reject $H_0$. Therefore, there is no significant difference between the banks in terms of liquidity.

Profitability Indicators: ROAE, ROAA, and NIM have a p-value of 0.0048, 0.0145, and $1.07\times10^{-18}$ which are all smaller than alpha. Therefore, we reject $H_0$ and we conclude that the difference in the performance between both types of banks is significant.

(See Appendix B)

4.3 Correlation:

During this data analysis, correlation was used to highlight any linear relationship existent between the dependent variables and the independent ones before proceeding in using the regression analysis. This way the results will be less biased and more accurate. Indeed, correlation is mainly used to find out the type of relationship the variables have. This relationship varies from weak to strong, negative to positive. Therefore, this study is relying on the correlation analysis to predict whether the independent variables are related between each other, if that is the case, this may create problems of accuracy.

The results show that all independent variables have a coefficient less than 0.4 belonging to this interval $[0.35; 0.16]$, meaning that there is a weak relationship between the independent variables. This latter means that there is no variable that can be interfering throughout the regression analysis run.

The correlation result is not only used for testing for multi-collinearity problems between the independent variables, but, is also used to determine the nature of relationship between the dependent variables, which is represented by the three performance indicators, and the
independent variables. Therefore, the test was run twice: the first time to test if there is any apparent significant relationship between the independent variables alone, and the second was to find out the type of relationship the dependent variables and independent variables have.

Starting by the liquidity, the NLTA ratio is negatively related with ROAA, ROAE, and NIM. This means that as the liquidity ratio increases the performance indicators decrease, which is completely normal since the higher is the liquidity ratio, the higher is the amount of assets that are loans, the less liquid is the bank, the thing that decreases the profitability of the bank and therefore affects it negatively.

For the asset quality, the LLR is positively related with NIM and negatively related with ROAE and ROAA, which make sense. Obviously, whenever the LLR is high, it means that the bank is expecting losses; therefore, it is reserving part of its assets for unwanted situations. Moreover, an important part of the bank’s revenue comes from its loans; therefore, this latter represents a risk for its profitability. Thus, this ratio is negatively related with the profitability indicators. Nonetheless, this latter is positively related with the NIM.

The capital adequacy ratio, CAR, is found to be positively related with ROAA, and NIM. CAR, according to Giordana & Schumacher[26], measures how much the bank can absorb losses. Indeed, the higher the ratio, the higher are the return on assets and more secured is the bank from taking risks. Thus, the investment returns increase more than the expenses, which lead to a higher NIM. The capital adequacy ratio is found negatively related to ROAE; meaning that the higher is CAR the lower becomes ROAE. Allen Berger explained this relationship in his working paper about the relationship between capital and earning in banking. Hence, according to Allen Berger[27], when CAR increases, the after tax return on equity decreases because of the decrease of the tax shield. Moreover, when CAR increases, the risk on equity decreases, consequently lowering the equilibrium expected return on equity by investors. Controversially, other studies previously conducted, have found a negative relationship with ROAA and NIM. This was explained by the fact that higher CAR means a prediction of risks, which implies that this latter leads people to avoiding these assets, which brings up less return and affects negatively the investment returns. Concerning the return on equity, it was found positively related with CAR. As Osborne[28] explains: “higher risk is linked to higher returns for shareholders.”
For the management quality, the ratio LTD used shows a negative relationship with all the profitability indicators. These results may be due to the fact that as the LTD ratio increases, more deposits are linked with loans, which mean that the bank has less profitability. This conclusion can be explained by the fact that the bank has a poor liquidity when the high LTD ratio. Conversely, other studies have found that a high LTD should lead to a better performance due to the fact that this ratio mainly shows how the bank is creating loans based on the deposits given, consequently, showing the strength of the depositors chosen by the banks and the efficiency of their management system as established by Javaid et al [5].

For the earning quality, the ratio used is OER. This ratio has been found negatively related with all the profitability indicators. Indeed, the higher is the ratio, the higher are expenses compared to revenues, meaning that this affects negatively the ROAA, ROAE, and the NIM. Therefore, based on this analysis, the OER affects negatively the profitability.

For the external factors, the results found for the GDP are supposed to be positively related with the profitability of the banks. This is explained by the fact that the more is the country growing, better it is for the economy which leads to a significant profitability for the banks. The results found have a positive relationship with the NIM and a negative relationship with the ROAE and the ROAA. This means that the GDP helped in generating more return on investments while it decreased the return on equity and the return on assets.

For the inflation, it has a positive relationship with the ROAA and NIM and a negative relationship with the ROAE. Globally speaking, and accordingly with the saying of Henry C.Wallish, one of the board of governors’ member of the US Federal Reserve System, bankers profit considerably but fictitiously from the increase in the inflation rate. This means that the inflation rate influences positively the ROAE. Nonetheless, Frank K Reilly (1997) argues using DuPont’s formula and provides evidence that historically return on equity have performed better at low inflation.
Table 4.3: Correlation generated by RStudio

Graph 4.3: Multicollinearity Matrix by RStudio

4.4 Regression:

This dataset consists of 250 observations \( \{ y_i, x_i \} \) for \( i = 1, n \).

With: \( Y_i = \{ \text{ROAE}, \text{ROAA}, \text{NIM} \} \).

\( X_i = \{ \text{CAR}, \text{LLR}, \text{LTD}, \text{EOR}, \text{NLTA}, \text{GDP}, \text{INF} \} \)

This study is testing for the effect of 7 variables on the profitability's indicators across 5 years, which makes it a panel data model. A panel data is a mixture between a times series...
and a crossed-sectional data. In this case, all the regressors are found to be time-varying regressors, meaning they all change throughout the years.

Description of the data tendency:

According to the test of normality done, such as, P-P Plot and histograms, the data is found to be following a normal distribution (Appendix C) with an exogenous tendency, implicating that the variations are due to a negligible change tendency out of control due to external factors.

After the analysis of the results found through the correlation analysis, this section is about to introduce the analysis of the results found using regression. The regression analysis was mainly used to analyze the determinants of the performance and how they are affected by the various independent variables used in this study as well as predicting a model for each profitability indicator. First of all, the regression is run on all banks in the sample, then, the regression is run while taking into consideration the type of the bank and the region’s economy. Knowing that there are three dependent variables (ROAA, ROAE, NIM) and two types of regression analysis, there will be 6 regression models.

4.4.1 Model Specification:

The regression models, to be found, are as follow:

\[
\text{ROAE}_{it} = \beta_0 + \beta_1 \cdot \text{LADST}_{it} + \beta_2 \cdot \text{CAR}_{it} + \beta_3 \cdot \text{OER}_{it} + \beta_4 \cdot \text{LTD}_{it} + \beta_5 \cdot \text{GDP}_{it} + \beta_6 \cdot \text{INF}_{it} + \beta_7 \cdot \text{LLR} + \alpha_{it} + \epsilon_{it1}
\]

\[
\text{ROAA}_{it} = \beta_0 + \beta_1 \cdot \text{LADST}_{it} + \beta_2 \cdot \text{CAR}_{it} + \beta_3 \cdot \text{OER}_{it} + \beta_4 \cdot \text{LTD}_{it} + \beta_5 \cdot \text{GDP}_{it} + \beta_6 \cdot \text{INF}_{it} + \beta_7 \cdot \text{LLR} + \alpha_{it} + \epsilon_{it2}
\]

\[
\text{NIM}_{it} = \beta_0 + \beta_1 \cdot \text{LADST}_{it} + \beta_2 \cdot \text{CAR}_{it} + \beta_3 \cdot \text{OER}_{it} + \beta_4 \cdot \text{LTD}_{it} + \beta_5 \cdot \text{GDP}_{it} + \beta_6 \cdot \text{INF}_{it} + \beta_7 \cdot \text{LLR} + \alpha_{it} + \epsilon_{it3}
\]

Knowing that:

LADST = liquidity
CAR = capital adequacy
OER = Earning quality
LTD = management quality
LLR = asset quality
GDP = Gross Domestic Product
INF = Average annual inflation rate
ε = error
β_t = Coefficients
β_0 = Intercept
i = bank
\( t = \text{time}; \)

4.4.2 Assumptions:
As to proceed in further analysis, the model is assumed to have these specific distinctions:

- Covariates are exogenous: \( E[\varepsilon | \text{LADST}_{it}, \text{CAR}_{it}, \text{OER}_{it}, \text{LTD}_{it}, \text{GDP}_{it}, \text{INF}_{it}, \text{LLR}] = 0 \)
- Uncorrelated errors: \( \text{Cov} \varepsilon_{it3}, \varepsilon_{it2}, \varepsilon_{it1} = 0 \)
- Homoscedastic errors: \( \text{Var} \varepsilon_{it1} = \text{ROAA}_{it} | \text{LADST}_{it}, \text{CAR}_{it}, \text{OER}_{it}, \text{LTD}_{it}, \text{GDP}_{it}, \text{INF}_{it}, \text{LLR} = \sigma^2 \)
- Normality: according to the Central Limit theorem, when the size of data is large, inevitably, the distribution is more likely to be normal.

4.4.3 Results:
In this study, we have different independent variables. Hence, the multiple regression analysis is advised as to proceed in checking the results of this data analysis. Therefore, each dependent variable will be firstly checked with all the independent variables for all banks. Later on, the regression analysis will take into consideration the type of the bank and a comparison will be made between both results to see if the bank type plays a significant role on the profitability of the banks.

4.4.3.1 Fixed-Effect model (type of bank):
1. ROAE
   a) From the results of the regression we get the following model:
      \[
      \text{ROAE} = -0.439 \times \text{NLTA} - 0.23x\text{CAR} - 0.105x \ \text{EOR} - 0.255x \ \text{LTD} - 1.07x \ \text{LLR} - 1.268 \times 10^6 \times \text{GDP} - 0.32x \ \text{INF} + 0.881x \ \text{factor(BT=1)} + 0.759 \ \text{factor(BT=0)} + \varepsilon
      \]
   b) After adjusting for the significance:
For a level of significance of 10%, we find that CAR and INF are insignificant for this model, therefore the model after accounting for this insignificance becomes:

\[ \text{ROAE} = 0.42 \times \text{NLTA} - 0.1 \times \text{EOR} - 0.25 \times \text{LTD} - 1.17 \times 10^{-6} \times \text{GDP} + 0.69 \times \text{factor(BT=0)} + 0.8 \times \text{factor(BT=1)} + \epsilon \]

c) Adjusted \( R^2 \) is equal to 45.91%, this means that 45.91% of the return on average equity is explained by these variables: management quality, earning quality, asset quality, liquidity, GDP and type of bank.

d) \( F \) is found to be equal to \( 5.98 \times 10^{-16} \), which is smaller than 0.05, which makes this model significant.

Table 4.4.1: Regression of ROAE against all Dep Variables

2. ROAA:
   a) From the results of the adjusted regression we get the following model:

\[ \text{ROAA} = -0.06 \times \text{NLTA} - 0.013 \times \text{EOR} - 0.033 \times \text{LTD} - 0.2 \times \text{LLR} + 0.09 \times \text{factor(BT=0)} + 0.1 \times \text{factor(BT=1)} + \epsilon \]

b) Adjusted \( R^2 \) is equal to 42.5%, this means that 42.5% of the return on average assets is explained by these variables: management quality, earning quality, liquidity, asset quality and type of bank.

c) \( F \) is found to be equal to \( 2.2 \times 10^{-16} \), which is smaller than 0.05, which makes this model significant.
3. NIM:

a) From the results of the adjusted regression we get the following model:

\[ \text{NIM} = -0.046 \times \text{NLTA} + 0.144 \times \text{CAR} + 2.53 \times 10^{-7} \times \text{GDP} + 6.53 \times 10^{-2} \times \text{INF} + 0.033 \times \text{factor(BT=0)} + \epsilon \]

b) Adjusted $R^2$ is equal to 56.03%, this means that 56.03% of the net interest margin is explained by these variables: management quality, earning quality, liquidity, asset quality and type of bank.

c) $F$ is found to be equal to $2.22 \times 10^{-16}$, which is smaller than 0.05, which makes this model significant.
Result’s Analysis:
As observed from the above tables, the coefficients for the conventional and Islamic banks differ from one model to another. Concerning, the return on equity and the return on assets, the Islamic banks is leading in terms of its impact on the return on equity. However, the net interest margin is better for conventional banks in terms of its statistical significance and its impact on NIM. As to proceed in further comparison, each bank type will be distributed into three different groups, that depends on the GDP per capita of the countries involved, by assuming that the economy of the country plays a significant role on the bank-specific variables. Therefore, the three groups formed were based on intervals of (StandardDeviation/Mean(of the GDP) x 100), the first group has Morocco, UAE, Malta and Bahrain. The second group contains Qatar, Jordan, Israel and Saudi Arabia. Then, the third and last group has Iran, Kuwait, South Africa, and Nigeria. The main aim of this redistribution is to find a more coherent dataset to work with and get a more precise model.

4.4.3.2 Fixed-effect Model(region’s economy):
For the 1st group:

a. ROAA

For this groups of banks, the return on assets is 80% explained by the management quality, the earnings quality, the asset quality, the liquidity of the bank, inflation and the type of bank.
b. ROAE
According to this model 56% of the return on equity of these banks is explained by the asset quality, the GDP and the type of the bank which included other factors not comprised in this study.

c. NIM
According to this model, 79% of the net interest margin is explained by the asset quality, the liquidity, and the type of the bank.

For the 2nd group:

a. ROAA
For this group of banks, the return on assets is 69% explained by the asset quality and liquidity.

b. ROAE
Concerning this model, 75% of the return on equity is linked with the liquidity.

c. NIM
This latter is 55% explained by the inflation, GDP, the capital adequacy and the Islamic banks’ specific properties. At every increase in these variables, the net interest margin increases.

For the 3rd group:

a. ROAA
For the third group, 80% of the return on assets is related with the management quality, earnings quality, assets quality, liquidity, inflation and the type of bank with a leading from the Islamic banks.

b. ROAE
Concerning this model, 82% of the return on equity is linked with the management quality, earnings quality, assets quality, liquidity, inflation and the type of bank with a leading from the Islamic banks.

c) NIM
For the net interest margin, 79% is explained by the asset quality, liquidity and the type of bank.

From these results, we conclude that the region’s economy matters in predicting the profitability of banks, since every indicator has its own different predictors in every different group. Nonetheless, when running the regression for the entire model without accounting for the differences in the type of bank we get this model:
4.4.3.3 Multiple Regression Model:

a) \[ \text{ROAE} = 5.08 \times 10^{-15} + 0.04 \times \text{LTD} + 0.003 \times \text{EOR} + 0.006 \times \text{LLR} + 8.66 \times 10^{-5} \times \text{NLTA} + 0.08 \times \text{GDP} + \varepsilon \]

b) \[ \text{ROAA} = 0.09 - 4.2 \times 10^{-8} \times \text{GDP} + 0.004 \times \text{INF} - 0.00019 \times \text{CAR} - 0.03 \times \text{LTD} - 0.013 \times \text{EOR} - 0.26 \times \text{LLR} - 0.06 \times \text{NLTA} + \varepsilon \]

c) \[ \text{NIM} = 0.024 + 3.8 \times 10^{-8} \times \text{GDP} - 0.025 \times \text{INF} + 0.14 \times \text{CAR} + 0.0018 \times \text{LTD} - 0.008 \times \text{EOR} + 0.12 \times \text{LLR} - 0.06 \times \text{NLTA} + \varepsilon \]

Results’ analysis:

Indeed, the type of the bank matters and affects considerably the profitability. As seen in the fixed-effect model the asset quality, GDP and the earning quality have a negative relationship with the return on equity when the type of the bank is accounted for. Nonetheless, when the type is neglected, the liquidity has a stronger effect on the return on equity, asset quality, earning quality; management quality and GDP per capita have positive relationship with ROAE while the capital adequacy and the inflation have both negative. 

For the return on assets, the GDP and capital adequacy have both a negative relationship with the return on assets, but this remains statistically insignificant. The difference between both models is present meaning that the type of bank matters to determine the return on assets. Accordingly, liquidity, earning asset and management quality and asset quality all have a negative relationship with the return on assets. Thus, at every increase in these variables, the return on assets is affected. 

In the model that does not account for the bank’s type, the inflation has a negative impact on the net interest margin while the asset quality has a positive relationship with the net interest margin but remains statistically insignificant. 

Therefore, the type of the bank has a significant impact on the profitability of banks. This latter relies on many bank specific variables and external factor as to know as many profits as possible.
5 CONCLUSION

This chapter includes all major findings with the limitations encountered and the recommendations.

As previously stated, this project is a financial data analysis of bank’s performance in Africa and non-African Countries that belongs to the MENA region. The choice of the region is purely strategic. Due to the growth of importance of Islamic banks over the world, this sector remains quite a mystery for the financial world. Therefore, this study gathered 50 banks, which includes 32 conventional banks and 18 Islamic banks, with data from 2011 to 2015, involving 12 different countries.

The descriptive statistics have shown that the Islamic banks are better than the conventional ones in generating return from their assets, return on equity, they also have a better asset quality, and an outstanding management quality. Meanwhile, the conventional banks are leading in terms of profits from investments which makes their net interest margin higher, they are also better in earning quality and capital adequacy.

During the ANOVA analysis, it has been shown that the difference in the profitability indicators is significant. Furthermore, both types of banks are significantly different in terms of asset quality and management quality. Then, the Pearson’s correlation coefficient analysis showed an absence of multicollinearity between the independent variables and highlighted the different types of relationships each one has with the dependent variables.

The regression results have shown that the most significant factors affecting the profitability are the liquidity, the management quality, the asset quality, and earning quality. Nonetheless, when taking into consideration the type of bank, the most factors affecting profitability are the liquidity, the management quality and the GDP
6 REFERENCES


With the introduction of the first islamic bank in Morocco during the past few years, exactly on the 5th of march 2015, many questions are raised about its service, functioning and difference compared with the normal conventional banks which are getting over the moroccan monetary system. This study aims to enlighten the differences and the similitudes between banks by adopting a statistical approach towards the matter.

The main aim of this study is to compare between the different variables that play on the first most important goal of banks which is to sustain/ameliorate profits. The different principles and rules of these banks play a big role in their capital strength and may put their equity and dept holders in serious risks. Thos variables will vary and explore every inch of the banking world from the interest rates to leverage, earnings, efficiency, main investors, capital, risk-taking and so on.

This comparative study requires a deep statistical approach applying various statistics measurements adequate with the kind of data used, a statistic appropriate programming tool such as R and JULIA, and a simulation will be designed showing the results clearly.

All data will be surely reliable and statistics’ subject will be fully documented.
## Table 3.1: Islamic Banks

<table>
<thead>
<tr>
<th>Bank Name</th>
<th>Total Assets Million USD</th>
<th>Country Name</th>
<th>World Rank by Assets</th>
<th>Accounting Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Rajhi Bank Public Joint Stock Company</td>
<td>84,155</td>
<td>Saudi Arabia</td>
<td>254</td>
<td>IFRS</td>
</tr>
<tr>
<td>Bank Makkah</td>
<td>59,971</td>
<td>Islamic Republic of Iran</td>
<td>384</td>
<td>IFRS</td>
</tr>
<tr>
<td>Kuwait Finance House</td>
<td>54,454</td>
<td>Kuwait</td>
<td>356</td>
<td>IFRS</td>
</tr>
<tr>
<td>Bank Tejarat</td>
<td>34,048</td>
<td>Islamic Republic of Iran</td>
<td>547</td>
<td>IFRS</td>
</tr>
<tr>
<td>Abud Dhabhi Islamic Bank</td>
<td>32,234</td>
<td>UAE</td>
<td>574</td>
<td>IFRS</td>
</tr>
<tr>
<td>Al Baraka Banking Group</td>
<td>24,618</td>
<td>Bahrain</td>
<td>699</td>
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</tr>
<tr>
<td>Al Baraka Bank</td>
<td>23,860</td>
<td>Saudi Arabia</td>
<td>720</td>
<td>IFRS</td>
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<tr>
<td>Mawarif Al Rayan</td>
<td>22,809</td>
<td>Qatar</td>
<td>748</td>
<td>IFRS</td>
</tr>
<tr>
<td>Bank Aljada</td>
<td>13,650</td>
<td>Saudi Arabia</td>
<td>1066</td>
<td>IFRS</td>
</tr>
<tr>
<td>Ahli United Bank</td>
<td>12,864</td>
<td>Kuwait</td>
<td>1104</td>
<td>IFRS</td>
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<tr>
<td>Qatar International Islamic Bank</td>
<td>11,137</td>
<td>Qatar</td>
<td>1209</td>
<td>IFRS</td>
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<td>Ansar Bank</td>
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<td>Islamic Republic of Iran</td>
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<td>Jordan Islamic Bank</td>
<td>5,351</td>
<td>Jordan</td>
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<td>Al Salam Bank-bahrain</td>
<td>4,406</td>
<td>Bahrain</td>
<td>2014</td>
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<td>Agman Bank</td>
<td>4,357</td>
<td>UAE</td>
<td>2620</td>
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<tr>
<td>GFC Financial Group B.S.C</td>
<td>3,393</td>
<td>Bahrain</td>
<td>2886</td>
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<tr>
<td>Bahrain Islamic Bank</td>
<td>2,597</td>
<td>Bahrain</td>
<td>2718</td>
<td>IFRS</td>
</tr>
</tbody>
</table>

## Table 3.1: Conventional Banks

<table>
<thead>
<tr>
<th>Bank Name</th>
<th>Total Assets Million USD</th>
<th>Country Name</th>
<th>World Rank by Assets</th>
<th>Accounting Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absa Bank Ltd</td>
<td>60,221.00</td>
<td>South Africa</td>
<td>356</td>
<td>IFRS</td>
</tr>
<tr>
<td>Access Bank plc</td>
<td>13,154.00</td>
<td>Nigeria</td>
<td>1279</td>
<td>IFRS</td>
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<tr>
<td>Al Ahli Islamic Bank</td>
<td>33,965.00</td>
<td>Bahrain</td>
<td>601</td>
<td>IFRS</td>
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<tr>
<td>Al Ahli Bank of Kuwait</td>
<td>14,368.00</td>
<td>Kuwait</td>
<td>1198</td>
<td>IFRS</td>
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<td>Al Awal Bank</td>
<td>26,619.00</td>
<td>Saudi Arabia</td>
<td>581</td>
<td>IFRS</td>
</tr>
<tr>
<td>Arab national Bank Public Joint Stock Co</td>
<td>45,446.00</td>
<td>Saudi Arabia</td>
<td>456</td>
<td>IFRS</td>
</tr>
<tr>
<td>Attijariwafa Bank</td>
<td>42,499.00</td>
<td>Morocco</td>
<td>496</td>
<td>IFRS</td>
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<tr>
<td>Bank Hadrami BM</td>
<td>110,620.00</td>
<td>Israel</td>
<td>207</td>
<td>IFRS</td>
</tr>
<tr>
<td>Bank Leumi Le Israel BM</td>
<td>106,740.00</td>
<td>Israel</td>
<td>207</td>
<td>IFRS</td>
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<tr>
<td>Bank et Shanah</td>
<td>7,512.00</td>
<td>UAE</td>
<td>1878</td>
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<tr>
<td>Banque Centrale Populaire SA</td>
<td>33,196.00</td>
<td>Morocco</td>
<td>613</td>
<td>IFRS</td>
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<tr>
<td>Banque Marocaine du Commerce</td>
<td>28,208.00</td>
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<td>690</td>
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<tr>
<td>Banque Marocaine pour le Commerce et l'Industrie</td>
<td>6,809.00</td>
<td>Morocco</td>
<td>2089</td>
<td>IFRS</td>
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<tr>
<td>Banque Saudi Fransi JSC</td>
<td>48,093.00</td>
<td>Saudi Arabia</td>
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<td>BOK B.S.C</td>
<td>5,658.00</td>
<td>Bahrain</td>
<td>1583</td>
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<td>Diamond Bank</td>
<td>8,909.00</td>
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<td>FBB Bank</td>
<td>32,157.00</td>
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<td>Fidelity Bank Plc</td>
<td>4,252.00</td>
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<td>2097</td>
<td>IFRS</td>
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<td>Guarantee Trust bank plc</td>
<td>12,815.00</td>
<td>Nigeria</td>
<td>1303</td>
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<tr>
<td>Housing bank for trade and finance</td>
<td>11,159.00</td>
<td>Jordan</td>
<td>1435</td>
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<td>HSBC Bank Malta Plc</td>
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<td>Malta</td>
<td>1827</td>
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<td>Israel Discount Bank LTD</td>
<td>52,604.00</td>
<td>Israel</td>
<td>394</td>
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<td>Mardhi Tefashot Bank Ltd</td>
<td>52,608.00</td>
<td>Israel</td>
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<td>IFRS</td>
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<td>National Bank of Ras Al Khaimah</td>
<td>11,047.00</td>
<td>UAE</td>
<td>1445</td>
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<td>Samba Financial Group</td>
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<td>Saudi Investment Bank</td>
<td>26,969.00</td>
<td>Saudi Arabia</td>
<td>762</td>
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<td>Sky Bank Plc</td>
<td>6,086.00</td>
<td>Nigeria</td>
<td>2340</td>
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<td>The Commercial Bank QSC</td>
<td>35,915.00</td>
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<td>921</td>
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Table 4.1: Descriptive Statistics between both types of banks

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<th>Islamic Banks</th>
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<tr>
<td><strong>GDP</strong></td>
<td>Min.: 2514</td>
<td>Min.: 4266</td>
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<tr>
<td><strong>INF</strong></td>
<td>Min.: -0.008729</td>
<td>Min.: -0.008729</td>
</tr>
<tr>
<td><strong>1st Qu.</strong></td>
<td>1st Qu.: 3142</td>
<td>1st Qu.: 20482</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>Median: 23256</td>
<td>Median: 24406</td>
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<tr>
<td><strong>Mean</strong></td>
<td>Mean: 21937</td>
<td>Mean: 31633</td>
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<tr>
<td><strong>3rd Qu.</strong></td>
<td>3rd Qu.: 35728</td>
<td>3rd Qu.: 42987</td>
</tr>
<tr>
<td><strong>Max.</strong></td>
<td>Max.: 94944</td>
<td>Max.: 49444</td>
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</table>

**EOR:** Earning Quality **LLR:** Asset Quality **NLTA:** Liquidity **ROAE** | **ROAA**

<table>
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<tr>
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<th>Min.: 0.00430</th>
<th>Min.: 0.00430</th>
<th>Min.: -0.008729</th>
<th>Min.: -0.008729</th>
<th>Min.: -0.008729</th>
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<tr>
<td><strong>1st Qu.</strong></td>
<td>1st Qu.: 0.01660</td>
<td>1st Qu.: 0.021846</td>
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<td>1st Qu.: 0.00610</td>
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<tr>
<td><strong>Median</strong></td>
<td>Median: 0.02390</td>
<td>Median: 0.028916</td>
<td>Median: 0.02010</td>
<td>Median: 0.02010</td>
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<tr>
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<td>Mean: 0.063996</td>
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Table 4.2: ANOVA Results

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<th>MS</th>
<th>F</th>
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<td>0.551948</td>
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</tbody>
</table>

Call:

`lm(formula = ROAE ~ X + factor(BT) - 1, data = dataset1)`

Residuals:

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>1Q</th>
<th>Median</th>
<th>3Q</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.68001</td>
<td>-0.08216</td>
<td>-0.01079</td>
<td>0.05650</td>
<td>1.31535</td>
</tr>
</tbody>
</table>

Coefficients:

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|---------|
| XCAR: Capital Adequacy | -2.270e-01 | 1.700e-01 | -1.335 | 0.1830 |
| XLLTD: Management quality | -2.547e-01 | 6.486e-02 | -3.376 | 9.28e-05 *** |
| XEOR: Earning Quality | -1.047e-01 | 3.317e-02 | -3.156 | 0.0018 ** |
| XLLR: Asset Quality | -1.072e+00 | 6.134e-01 | -1.747 | 0.0819 |
| XNLTA:liquidity | -4.308e-01 | 1.846e-01 | -2.222 | 3.43e-05 *** |
| XGDP | -1.299e-06 | 6.253e-07 | -2.029 | 0.0436 * |
| XINF | -3.201e-01 | 2.221e-01 | -1.441 | 0.1508 |
| factor(BT)0 | 7.594e-01 | 8.288e-02 | 9.252 | < 2e-16 *** |
| factor(BT)1 | 8.816e-01 | 8.724e-02 | 10.106 | < 2e-16 *** |

Signif. codes:  0 ‘***’  0.001 ‘**’  0.01 ‘*’  0.05 ‘.’  1

Residual standard error: 0.1984 on 241 degrees of freedom
Multiple R-squared: 0.4838, Adjusted R-squared: 0.4645
F-statistic: 25.1 on 9 and 241 DF, p-value: < 2.2e-16
### Table 4.4.1: All banks, ROAE Analysis

```
Call:
  lm(formula = ROAE ~ X + factor(BT) - 1, data = dataset1)

Residuals:
  Min     1Q Median     3Q    Max
-0.071936 -0.012579 -0.001663  0.006996  0.182235

Coefficients:
  Estimate Std. Error t value Pr(>|t|)
XCAR:Capital Adequacy 3.856e-04 2.295e-02  0.017 0.98658
XLTQ: Management quality -3.105e-02 8.649e-03 -3.596 0.00040 ***
XERO: Earning Quality -1.347e-02 4.479e-03 -3.008 0.00291 **
XLRQ: Asset Quality -2.019e-01 8.283e-02 -2.437 0.01553 *
XNLP:A:Attractiveness -6.162e-02 1.404e-02 -4.380 1.7e-05 ***
XGDP -1.012e-07 8.443e-08 -1.198 0.23206
XINF -2.162e-02 2.999e-02 -0.721 0.47173
factor(BT)0 9.325e-02 1.108e-02 8.414 3.5e-15 ***
factor(BT)1 1.062e-01 1.178e-02 9.013 < 2e-16 ***

---
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.02679 on 241 degrees of freedom
Multiple R-squared: 0.443, Adjusted R-squared: 0.4222
F-statistic: 21.3 on 9 and 241 DF, p-value: < 2.2e-16
```

### Table 4.4.1: All banks, ROAA analysis

```
Call:
  lm(formula = ROAA ~ X + factor(BT) - 1, data = dataset1)

Residuals:
  Min     1Q Median     3Q    Max
-0.144713 -0.013076 -0.002297  0.014696  0.068177

Coefficients:
  Estimate Std. Error t value Pr(>|t|)
XCAR:Capital Adequacy 1.440e-01 2.305e-02  5.504 5.7e-08 ***
XLTQ: Management quality 6.466e-03 9.682e-03  0.668 0.50490
XERO: Earning Quality -6.831e-03 5.013e-03 -1.363 0.17427
XLRQ: Asset Quality -1.127e-01 9.272e-02 -1.216 0.22532
XNLP:A:Attractiveness -4.690e-02 1.572e-02 -2.984 0.00313 **
XGDP 2.528e-07 9.451e-08  2.675 0.00798 **
XINF 6.632e-02 3.357e-02  1.976 0.04934 *
factor(BT)0 3.306e-02 1.241e-02  2.665 0.00822 **
factor(BT)1 -1.392e-02 1.319e-02 -1.055 0.29232

---
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.02999 on 241 degrees of freedom
Multiple R-squared: 0.5761, Adjusted R-squared: 0.5603
F-statistic: 36.39 on 9 and 241 DF, p-value: < 2.2e-16
```

### Table 4.4.1: All banks, NIM analysis
Table 4.4.2: Group1, ROAA analysis

```r
Call:
  lm(formula = ROAA ~ X + factor(BT) - 1, data = pdata)

Residuals:
            Min          1Q      Median          3Q         Max
-0.053755   -0.015834   -0.083286   0.013389   0.081599

Coefficients:
                       Estimate  Std. Error t value Pr(>|t|)
XCAR          -5.892e-03   3.374e-02   -0.175   0.861956
XLDI         -1.162e-01   2.096e-02   -5.545    6.7e-07 ***
XEBOR         -2.950e-02   1.717e-02   -1.718    0.089889    .
XLLR         -6.363e-01   1.809e-01   -3.518    0.000827 ***
XNLTA         -9.088e-02   2.600e-02   -3.464    0.000978 ***
XGDP          1.630e-07   3.771e-07    0.432    0.667056
XINF         -1.517e-01   4.905e-02   -3.093    0.002987 **
factor(BT)0   2.052e-01   1.731e-01   11.853    < 2e-16 ***
factor(BT)1   2.606e-01   1.858e-02   14.025    < 2e-16 ***
---
Signif. codes:  < 0.001 ***  0.001 **  0.01 *  0.05 .  1

Residual standard error: 0.0266 on 61 degrees of freedom
Multiple R-squared:  0.8313,   Adjusted R-squared:  0.8064
F-statistic: 33.4 on 9 and 61 DF,  p-value: < 2.2e-16
```

Table 4.4.2: Group1, ROAE analysis

```r
Call:
  lm(formula = ROAE ~ X + factor(BT) - 1, data = pdata)

Residuals:
            Min          1Q      Median          3Q         Max
-0.44719   -0.11065   -0.01549   0.09964   0.57013

Coefficients:
                       Estimate  Std. Error t value Pr(>|t|)
XCAR          -2.345e-01   2.450e-01   -0.965    0.338282
XLDI         -9.047e-01   1.590e-01   -5.994    1.2e-07 ***
XEBOR         -2.212e-01   1.237e-01   -1.788    0.078670    .
XLLR         -3.724e-00   1.303e+00   -2.859    0.005807 **
XNLTA         -6.631e-01   1.873e-01   -3.541    0.000771 ***
XGDP          1.309e+00   2.716e-06    4.820    0.631591
XINF         -1.214e+00   3.352e-01   -3.637    0.000106 **
factor(BT)0   1.563e+00   1.247e-01   12.539    < 2e-16 ***
factor(BT)1   1.995e+00   1.338e-01   14.908    < 2e-16 ***
---
Signif. codes:  < 0.001 ***  0.001 **  0.01 *  0.05 .  1

Residual standard error: 0.1909 on 61 degrees of freedom
Multiple R-squared:  0.8448,   Adjusted R-squared:  0.8219
F-statistic: 36.89 on 9 and 61 DF,  p-value: < 2.2e-16
```
table 4.4.2: Group1,NIM analysis

Call:
lm(formula = NIM ~ factor(BT) + X, data = pdata)

Residuals:
Min 1Q Median 3Q Max
-0.053975 -0.009651 -0.001995 0.087966 0.065975

Coefficients:
Estimate Std. Error t value Pr(>|t|)
XCAR 2.435e-02 2.464e-02 0.996 0.323001
XLT0 -7.171e-03 1.520e-02 -0.469 0.646971
XOR 4.832e-03 1.254e-02 0.385 0.701241
XLR -2.245e-01 1.320e-01 -1.700 0.0994163
XNLTA -6.965e-02 1.898e-02 -3.669 0.000514 ***
XGDP 1.133e-07 2.753e-07 0.412 0.681980
XINF 1.680e-02 3.581e-02 0.469 0.649728
factor(BT)0 8.476e-02 1.264e-02 6.708 7.356e-09 ***
factor(BT)1 4.460e-02 1.357e-02 3.287 0.001882 **

---
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 1

Residual standard error: 0.01935 on 61 degrees of freedom
Multiple R-squared: 0.817, Adjusted R-squared: 0.79
F-statistic: 30.27 on 9 and 61 DF, p-value: < 2.2e-16

Call:
lm(formula = ROAE ~ factor(BT) + X, data = pdata)

Residuals:
Min 1Q Median 3Q Max
-0.238312 -0.047601 0.066003 0.033419 0.290003

Coefficients:
Estimate Std. Error t value Pr(>|t|)
XCAR -1.753e-01 1.063e-01 -1.649 0.103
XLT0 4.328e-02 4.951e-02 0.874 0.384
XOR -5.337e-02 3.945e-02 -1.353 0.180
XLR -5.939e-01 6.816e-01 -0.987 0.326
XNLTA 1.707e-01 6.572e-02 2.597 0.011 *
XGDP -4.032e-07 3.559e-07 -1.133 0.260
XINF -7.326e-03 5.110e-03 -0.014 0.989
factor(BT)0 8.059e-02 7.062e-02 1.141 0.257
factor(BT)1 9.324e-02 7.588e-02 1.229 0.222

---
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 1

Residual standard error: 0.07812 on 89 degrees of freedom
Multiple R-squared: 0.773, Adjusted R-squared: 0.7501
F-statistic: 33.68 on 9 and 89 DF, p-value: < 2.2e-16

---
table 4.4.2: Group2,ROAE analysis
### Table 4.4.2: Group 2, ROAA Analysis

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|----------|
| XCAR     | 1.395e-02  | 1.450e-02 | 0.963 | 0.3384 |
| XLTQ     | 6.994e-03  | 6.752e-03 | 1.090 | 0.2858 |
| XOR      | -3.472e-03 | 5.381e-03 | -0.684 | 0.5029 |
| XRL1     | -2.057e-01 | 2.204e-02 | -2.483 | 0.0149 * |
| XNLTA    | 2.282e-02  | 8.964e-03 | 2.546 | 0.0126 * |
| XGDP     | 7.199e-08  | 4.853e-08 | 1.483 | 0.1415 |
| XINF     | 7.403e-02  | 6.969e-02 | 1.062 | 0.2890 |
| factor(BT)0 | 2.865e-03 | 9.362e-03 | -0.297 | 0.7668 |
| factor(BT)1 | -7.105e-03 | 1.835e-02 | -0.692 | 0.4906 |

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 1

Residual standard error: 0.1065 on 89 degrees of freedom
Multiple R-squared: 0.7271, Adjusted R-squared: 0.6995
F-statistic: 26.35 on 9 and 89 DF, p-value: < 2.2e-16

---

### Table 4.4.2: Group 2, NIM Analysis

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|----------|
| XCAR     | 2.438e-01  | 4.861e-02 | 5.287 | 8.786e-07 *** |
| XLTQ     | 2.300e-02  | 2.146e-02 | 1.071 | 0.28718 |
| XOR      | -2.722e-02 | 1.712e-02 | -1.590 | 0.11530 |
| XRL1     | -3.269e-01 | 2.616e-01 | -1.253 | 0.21354 |
| XNLTA    | -3.640e-02 | 2.851e-02 | -1.277 | 0.20508 |
| XGDP     | 3.948e-07  | 1.544e-07 | 2.557 | 0.01225 * |
| XINF     | 6.403e-01  | 2.217e-01 | 2.889 | 0.00486 ** |
| factor(BT)0 | -1.106e-02 | 3.063e-02 | -0.361 | 0.71902 |
| factor(BT)1 | -6.263e-02 | 3.292e-02 | -1.902 | 0.06034 . |

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 1

Residual standard error: 0.03389 on 89 degrees of freedom
Multiple R-squared: 0.5951, Adjusted R-squared: 0.5541
F-statistic: 14.53 on 9 and 89 DF, p-value: 3.47e-14

---

49
table 4.4.2: Group3, ROAE analysis

```
Call:
  lm(formula = ROAE ~ X + factor(BT) - 1, data = pdato)

Residuals:
     Min      1Q  Median      3Q     Max
-0.44719 -0.11865 -0.01549  0.09964  0.57013

Coefficients:
            Estimate Std. Error t value Pr(> |t|)    
XCAR  -2.345e-01 2.430e-01  -0.965  0.338282   
XLD  -9.047e-01 1.505e-01  -5.994  1.2e-07 ***
XOR  -2.212e-01 1.237e-01  -1.768  0.079070    
XLR  -3.724e-01 1.505e-01  -2.489  0.007807 **
XLTA -6.631e-01 1.873e-01  -3.541  0.000771 ***
XGDP  1.309e-06 2.716e-06   0.482  0.631591    
XINF -1.214e+00 3.532e-01  -3.437  0.001064 **
factor(BT)0  1.563e+00 1.247e-01 12.559  < 2e-16 ***
factor(BT)1  1.995e+00 1.338e-01 14.908  < 2e-16 ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1909 on 61 degrees of freedom
Multiple R-squared: 0.8448, Adjusted R-squared: 0.8219
F-statistic: 36.89 on 9 and 61 DF,  p-value: < 2.2e-16
```

table 4.4.2: Group3, ROAE analysis

```
Call:
  lm(formula = ROAE ~ X + factor(BT) - 1, data = pdato)

Residuals:
     Min      1Q  Median      3Q     Max
-0.053755 -0.015834 -0.003286  0.013389  0.081599

Coefficients:
            Estimate Std. Error t value Pr(> |t|)    
XCAR  -5.892e-03 3.374e-02  -0.175  0.861956   
XLD  -1.162e-01 2.096e-02  -5.545  6.7e-07 ***
XOR  -2.950e-02 1.717e-02  -1.718  0.095889    
XLR  -6.363e-01 1.809e-01  -3.518  0.000827 ***
XLTA -9.008e-02 2.600e-02  -3.456  0.000978 ***
XGDP  1.630e-07 3.771e-07   0.432  0.667056    
XINF -1.517e-01 4.905e-02  -3.093  0.002987 **
factor(BT)0  2.052e-01 1.731e-02 11.853  < 2e-16 ***
factor(BT)1  2.698e-01 1.858e-02 14.025  < 2e-16 ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.0265 on 61 degrees of freedom
Multiple R-squared: 0.8313, Adjusted R-squared: 0.8064
F-statistic: 33.4 on 9 and 61 DF,  p-value: < 2.2e-16
```

table 4.4.2: group3, ROAA analysis
```r
Call:
  glm(formula = NIM ~ X + factor(BT) - 1, data = pdata)

Residuals:
    Min     1Q  Median     3Q    Max
  -0.053975 -0.009651 -0.001995  0.007966  0.065975

Coefficients: Estimate Std. Error t value Pr(>|t|)
  XCAR      2.435e-02  2.464e-02  0.996  0.323001
  XLDI      -7.171e-03  1.530e-02 -0.469  0.640971
  XEOR      4.832e-03  1.254e-02  0.385  0.701241
  XLLR     -2.245e-01  1.320e-01 -1.700  0.094163 .
  XNLTA     -6.965e-02  1.938e-02 -3.569  0.000514 ***
  XGDP      1.133e-02  2.753e-07  41.26  < 2e-16 ***
  XINF      1.650e-02  3.581e-02  0.469  0.648728
  factor(BT)0  8.476e-02  1.264e-02  6.708  7.35e-09 ***
  factor(BT)1  4.460e-02  1.357e-02  3.287  0.001682 **

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.01935 on 61 degrees of freedom
Multiple R-squared:  0.817,  Adjusted R-squared:  0.79
F-statistic: 30.27 on 9 and 61 DF,  p-value: < 2.2e-16
```

Table 4.4.2: Group3, NIM analysis
Figure 4.3: Correlation plot: ROAA vs CAR

Figure 4.4: normal distribution
Figure 4.4: Predicted vs Observed ROAE

Figure 4.4: Predicted vs Observed ROAA
figure 4.4: predicted vs observed NIM
APPENDIX D

Code 4.3: Pearson’s Correlation
code 4.4.1: All Banks, fixed effect analysis(type of bank)
Code 4.4.2: Group analysis