MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

ECOLE SUPERIEURE DE COMMERCE

Kolea

A Dissertation submitted in partial fulfilment of the requirements for Master's degree in Financial Science and Accounting

Major: Finance, Money and Banking

Topic:

A COMPARATIVE STUDY ON THE EFFICIENCY OF ISLAMIC AND CONVENTIONAL BANKS IN MENA REGION APPLYING DATA ENVELOPMENT ANALYSIS (DEA) METHOD

Submitted by:

BERROUM IMENE

Supervised by:

Mr. AZZAOUI KHALED

Mem. SELOUGHA FAYROUZ

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Dedications

From the depths of my heart, I dedicate this work to all those who are dear to me, To my dear parentes as a sign of love, gratitude and appreciation for all the support and sacrifices they did for me.

To my dearest sister Sara, for beeing my partner in this journey and for all the motivation and support she gaved me.

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Contents

List of tables:

Chapter one:

Chapter tow:

Chapter three:

List of figures:

List of abbreviation:

Abbreviation	Signification
MENA	Middle east and north Africa
DEA	Data envelopment analysis
3P	Principal of sharing loss and profit
OCC	Office of the comptroller of the currency
PLS	Profit and loss sharing
OIC	Organization of Islamic countries
IDB	Islamic development bank
IIFA	International Islamic fiqh academy
GCC	Gulf cooperation council
AAOIFI	Accounting and auditing organization for Islamic financial institution
SFA	The stochastic frontier approach
FDA	The fee distribution approach
TFA	The thick border approach
FDH	The free disposal hull method
DMU	Decision making unit
CCR	Charnes, Cooper et Rhodes, 1978 model
BCC	Bnaker, Charnes et Cooper, 1984 model
PTE	Pure technical efficiency
CRS	Constant return to scale
VRS	Variable return to scale
TE	Technical efficiency
AE	Allocative efficiency
ES	Efficiency of scale
VARMULT	Multiplicative variant
INVARMULT	Multiplicative invariant

OECD	Organization for economic co-operation and development
DEAP	Data envelopment analysis program
BNA	Banque National d'Algérie
ABC	Arab banking corporation
EBE	Export development bank of Egypt
ATB	Arab Tunisian bank
FAB	First Abu Dhabi bank
BisB	Bahrain Islamic bank
NBB	National bank Bahrain
NBI	Net banking income
IRS	Increasing return to scale
DRS	Decreasing return to scale
CNV	Conventional
Islmic	Islamic
STATA	Statistic data analysis

Table of annexes:

Abstract

The aim of this study is twofold, the first is to measure the efficiency of Islamic and conventional banks in MENA region using the data envelopment analysis (DEA) approach. The second is comparing between both Islamic and conventional banks so we can determine the which banks are more efficient and see if there any difference between Islamic banks efficiency and conventional banks efficiency by using the Mann-Whitney non-parametric test. This study is for the time period 2016 to 2018. It is based on financial data of 20 banks from 10 countries from MENA region which divided into 5 countries from North Africa and 5 countries from Middle East.

The analysis of the results obtained by the DEA approach allowed us to determine which are efficient and witch banks are not and so determine which banks are benchmarks. As for the comparison we used the Mann-Whitney non-parametric test to obtain the rank sum on the scores of efficiencies of both banks and see if there are any significant differences between efficiency of Islamic banks and efficiency of conventional banks. The result of this test shows that Islamic banks in MENA region are mostly more efficient than conventional banks but there was no significant difference between Islamic banks efficiency and conventional banks efficiency.

Key words: Islamic banks, conventional banks, MENA region, Efficiency, DEA.

نبذة مختصرة

إن الهدف من هذه الدراسة ذو شقين، الشق الأول هو قياس كفاءة البنوك الإسلامية والتقليدية في منطقة الشرق الأوسط وشمال إفريقيا باستخدام نهج تحليل مغلف البيانات بينما الشق الثاني هو المقارنة بين البنوك الإسلامية والتقليدية حتى نتمكن من تحديد البنوك الأكثر كفاءة ومن معرفة ما إذا كان هناك فرق بين كفاءة البنوك الإسلامية وكفاءة البنوك التقليدية باستخدام اختبار Mann-Whitneyغير المعياري. تمتد هذه الدراسة على الفترة الزمنية من 2016 الى 2018 وترتكز على البيانات المالية لعشرين بنكا من 10 دول من منطقة الشرق الأوسط وشمال إفريقيا: 5 بنوك من منطقة شمال افريقيا و5 بنوك من منطقة الشرق الأوسط.

سمح تحليل النتائج التي تم الحصول عليها من خلال تطبيق نهج تحليل مغلف البيانات بتحديد البنوك ذات الكفاءة والبنوك التي لا تتمتع بالكفاءة وبالتالي تحديد البنوك التي تعتبر معايير مرجعية. أما بالنسبة للمقارنة فقد سمح استخدم اختبار Mann-Whitney بالحصول على مجموع الرتب على درجات كفاءات كل من البنوك الإسلامية والبنوك التقليدية ومعرفة ما إذا كانت هناك فروق ذات دلالة إحصائية بين كفاءة هذه البنوك. تظهر نتيجة هذا الاختبار أن البنوك الإسلامية في منطقة الشرق الأوسط وشمال إفريقيا هي في الغالب أكثر كفاءة من البنوك التقليدية ولكن لم يكن هناك فرق كبير بين كفاءة كل من هذه البنوك.

الكلمات المفتاحية: البنوك الإسلامية، البنوك التقليدية، منطقة الشرق الأوسط وشمال إفريقيا، الكفاءة، تحليل مغلف البيانات

GENERAL INTRODUCTION

Globalization encompassed a great variety of impact in the economic, social and cultural sectors. It has brought revolutionary changes through deregulation of economies, technological advancements, innovation of products and services in every single sector including banking sector which experienced a several transformations. Islamic banks have a history of conducting business activity under niche market to attract and offer the products and services based on profit and loss sharing paradigm governed by Islamic principles of Sharia. The growing significance of Islamic banking during recent years and their outperformance against conventional system globally has increased relative competitiveness of both banking systems.

As the evolution that Islamic finance and banking know those recent years specially after the financial crises the interest about the Islamic finance had increased and many economists was interested in studying the efficiency of Islamic banks and compare them to conventional banks. So, banking system in the MENA region was one of the interesting systems to studies as the most of countries in MENA zone are Muslim countries and most of these countries have a dual banking system: Islamic banking and conventional banks.

Many studies have proved that Data Envelopment Analysis methods DEA is the most appropriate method to measure the efficiency like the study of Berger and Humphrey in 1997. Data Envelopment Analysis methods (DEA) present many interests to evaluate effectiveness, in particular, for organizations gathering multiple comparable units such as commercial networks. These interests are illustrated by an application to the case of a banking network. In this study, we will use Data Envelopment Analysis approach (DEA) to try answering the Problematic below:

Are there any significant differences between MENA region's Islamic and conventional banks in the term of efficiency? And which banks are more efficient?

Secondary questions emerge from the analysis of the content of the problematic:

- Are there any differences between the techniques used by Islamic banks and the ones used by conventional banks in performing their function as financial intermediary?
- Can bank's efficiency be measured and what are the main approaches used to measure this efficiency?
- Which banks are more efficient in MENA region Islamic banks or conventional banks?

To be able to find answers to our problems and secondary questions formulated above, we will test the following hypotheses:

H1: There are differences between the techniques used by Islamic banks and conventional banks in performing their function as financial intermediary.

H2: yes, there are many approaches that can be used to measure bank's efficiency.

H3: Islamic banks are more efficient than conventional banks in MENA region.

Our study aims to rank the banks in terms of Efficiency by measuring the efficiency of MENA region's banks using data envelopment analysis approach, while comparing the efficiency of Islamic and conventional banks and determine which type of banks is more efficient.

Methodology of research:

In order to fulfil our study, we are going to adopt the following approaches:

- **Descriptive:** we are going to do some descriptive statistic related to the variables chosen for the study
- **Data envelopment anlysis (DEA):** we are going to apply data envelopment analysis (DEA) approach to obtain the efficiency scores of each bank in our sample. Also, we are going to apply Mann-Whitney non-parametric test on those scores and calculate the rank sum of efficiencies and see if there are any significant differences between efficiency of Islamic and conventional banks in MENA region.
- **Analytic:** after applying data envelopment analysis(DEA) approach we are going to analyse the obtained results to make our judgments and answer the main question of our research.

For achieving this study, we are going to develop our research around three chapters:

Chapter one:

In this chapter, we are going to identify the main techniques used in both Islamic and conventional banks in the MENA region in order to perform their function as financial

intermediary while comparing between them to see Identify the main differences existing between the techniques used by both banks.

Chapter two**:**

This chapter, is going to discuss the concept of efficiency, its measurement and the main approaches used in its measurement including data envelopment analysis DEA approach. It will also represent data envelopment analysis with its different models and discuss a few of its history.

Chapter three**:**

In this chapter, we will talk about the bank's sector in the MENA region and its evolution in this recent year. Using the data envelopment analysis, we will measure the efficiency of Islamic and conventional banks in MENA region. Using the Mann-Whitney non parametric test we are going to calculate the rank sum of the efficiency scores of both bank and see whether there are significant differences between them.

CHPTER ONE: GENERALITIES ON CONVENTIONAL AND ISLAMIC BANKING

Introduction:

Banks are considered the key to financing an economy. Without the exestance of banks, there is no financing and without financing, the companies have no investment capacity because self-financing is no longer sufficient to finance the companies investments. Without banks, there is no support for household savings.

Globalization encompassed a great variety of impact in the economic. It has brought revolutionary changes through deregulation of economies, technological advancements, innovation of products and services in every single sector including the transformation of banking sector. Islamic banks have a history of conducting business activity under niche market to attract and offer the products and services based on profit and loss sharing paradigm governed by Islamic principles of Sharia. The growing significance of Islamic banking during recent years and their outperformance against conventional system globally has increased relative competitiveness of both banking systems.

In this chapter we are gowing to talk about teh historical development of both conventional and Islamic banks and we are going to show the main exacting differances and similarties between both Islamic and conventional banking through the study of both bankig secteurs in a several sides such as mecanism of banking governance and risk exposer…ect.

Section one: Generalities on conventional banking

This section will present both of the historical devlopment and the basis of conventional banking in addition to the finacial intermediatin and risk exposor for conventional Banks.

1. The historical development of conventional banking:

1.1. Bank and Banking:

Bank invented after starting usage of money the same way As usage of money started after barter trade . Latin words Banko, Banco, Bangk, Bank, Bancus etc are the origin of the modern word bank.[1]A bank basically deals with money and credit. According to Crowther "bank is a financial institution and a financial intermediary that accepts deposits from the public and channels those deposits into lending activities, makes the funds available to those who need them, either directly or through capital markets." A bank is the line that connects customers with capital surpluses to customers with capital deficits.[2]An establishment authorized by a government to pay interest, clear checks, accept deposits, make loans, act as an intermediary in financial transactions, and provide other financial to its customers.[3]

In general 'Banking' is considerd as the collection of activity done by a bank. According to the Indian Companies Act, 1949, banking means "the accepting for he purpose of Indian Companies lending or investment, of deposits of money from the public, repayable on demand or otherwise, and withdraw able by cheque, draft or otherwise."[4]To run any banking activity in this modern age banker should perform various types of functions as depositing money and repay that deposited money along with interest payment.

1.2. Evolution of banking business:

The concept of bankig was growing in the cradles of different cultures, the history of this concept goes back to the early stage of the human civilization. At the very hour, when the early people learned to exchange commodities banking and finance concepts was born.[5]

stating the complete historical background of banks or banking is very difficult. It is mostly impossible to learn how or when the banking system came into existence. Of course, it is sure

[1] Albuquerque, Martim (1855). Notes and Queries. London: George Bell.pp. 431
[2] "Note on Bank", conselt the: http://www.preservearticles.com/201012281837/note-on-bank.html
[3] "Definition of bank, conselt the: http://www.businessdictionary.com/definition/bank.html
[4] Iindian banking act,1994, clause5(1)
[5] **Ullah**,**P.A** "banking & insurance" 7th ed. Dhaka, Commerce publication 2010.p119

that the banking system came into existence naturally and gradually it did not come all on a sudden by way of any revolution.

1.3. Banking in pre-historic days:

It is said that banking in its simple form is as old as authentic history. As early as 2000 B.C. Babylonians has developed a system of banks. The practice of granting credit was widely prevalent in ancient Greece and Rome. In Rome some of the banks were appointed by the government to receive the taxes and others carried business on their own account. With the gradual development, various types of documents, slips, hand notes, etc., used by the early money lenders in transacting their business have been evolving into different documents and instruments of modern banking.[6]

During the early periods, even though banking business was mostly done by private individuals, for the purpose of facilitating commerce and to serve to the government. many countries established public banks either The bank of Venice is supposed to be the most ancient bank, it was established in 1157. Deposit and exchange banks in some other countries of Europe, were established in 14th century. First bank of Sweden was established in 1556.[7]

In recent years world had konwen an increase interest for ethical financial products and consumers began to value not only financial revenues but also opportunities to make a good deed. As investment has become more valuable than profit customers has oriented to more ecthical and safer alternative. This has been one of reasons that encouraged the growth and spread of Islamic banking that earlier became a unique and growing segment in the international banking sector.

1.4. Banking in middle age:

During the 13th century the Jewsin were gradually replaced their traditional role as money-lenders to the rich and powerful.by bankers from north Italy, collectively known as Lombards, The invention of double-entry book-keeping enhanced business skills of the Italians. Creative accountancy enables them to avoid the Christian sin of usury; interest on a loan is presented in the accounts either as a reward for the risk taken.or as a voluntary gift from the borrower.

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[6]"What is historical background of bank". (n.d.). Retrieved Dec. 02, 2011, " conselt the: http://www.blurtit.com: http://www.blurtit.com/q140164.html

By the early 14th century by offering financial services the Bardi and the Peruzzi families, have grown immensely wealthy. Due to great feudal powers, in particular the papacy they arrange for the collection and transfer of money. They facilitate trade by providing merchants with bills of exchange, by means of which money paid in by a debtor in one town can be paid out to a creditor presenting the bill somewhere else.[8]

1.5. Banking in modern age:

Modern banking started after 14th century. Opportunity also led to an unexpected outcome entrance into the market of other financial intermediaries: non-bank financial institution. Large companies also beginning to find their way into the financial service community, offering competition to established banks. The main services offered included insurances, pension, mutual, money market and hedge funds, loans and credits and securities.[9]

The process of financial innovation advanced enormously in the first decade of the 21 century increasing the importance and profitability of nonbank finance. Such profitability priory restricted to the non-banking industry, has prompted the Office of the Comptroller of the Currency (OCC) to encourage banks to explore other financial instruments, diversifying banks' business as well as improving banking economic health. Hence, as the distinct financial instruments are being explored and adopted by the banking and non-banking industries, the distinction between different financial institutions is gradually vanishing.[10]

The first decade of the 21st century also saw the culmination of the technical innovation in banking over the previous 30 years and saw a major shift away from traditional banking to internet banking.[11]

2. Basis of conventional banking and finance:

Convetionnelle finance is baisecly builded on interests. The intermediering activite is foused on lending pricipels and reseving intesrests in return. Conventional bank pays interest to its savers while at the same time which, in turn, receives interest on the loans it lends: this is the income from the bank. The banking activite put banks in face of a sevderal risks.In many times

[8]BANKS AND MONEY. (n.d.). Retrieved Dec. 02, 2011, " conselt the: http://www.boisestate.edu: http://www.boisestate.edu/courses/latemiddleages/econ/banking.shtml
[9] HISTORY OF BANKING. (n.d.). Retrieved December 02, 2011, from http://www.historyworld.net: http://www.historyworld.net/wrldhis/PlainTextHistories.asp?groupid=2450&HistoryID=ac19&gtrack=pthc
[10] Idem
[11] **Ullah, P. A.** Op. Cit, p129

the bank standes inabil to deal with some kinds of risks. In conventional banking, decisions are generaly taken in orderto optimize the principle of risk-return, better known as performance.

Banks are the financial institutions that collect deposits from the public (in particular overnight deposits) and grant loans to businesses and households. Together with insurance companies and stock exchange mutual funds, they form part of what economists call financial intermediaries. The function of financial intermediaries is to collect the savings of economic agents with financing capacity (most households and some companies) and distribute them to agents with financing needs (the government, most companies and some households). But savers can also invest directly on financial markets by buying securities issued by certain borrowers. Depending on whether these lending and borrowing agents meet in this way directly on the market or through a financial intermediary, we speak of "direct financing" or "indirect or intermediated financing".

Among financial intermediaries, banks (also known as credit institutions) are the only ones with the power to create money. Indeed, each time a bank grants credit, the amount of money in circulation in the economy increases, since this credit necessarily materialises (at least initially) in the form of an additional deposit (the bank "credits" the borrower's account), which the borrower then uses as he wishes. The banking system therefore plays a crucial role in the process of money creation.

Traditional banking economics focused on the links between money and credit at the macroeconomic level and, in particular, on the transmission mechanisms of the monetary policy conducted by the central bank. The modern approach, which developed from the early 1980s onwards and which we present here, takes a more microeconomic perspective, studying in detail the behaviour of individual banks faced with changes in their competitive and regulatory environment.

3. Financial Intermediation in conventional banks:

Traditional financial intermediation is defined as the transfer of savings from households with monetary surpluses to investors in search of liquidity through financial intermediaries. The existence of these financial intermediaries is mainly due to the inconsistency between the requirements of surplus agents and the needs of deficit agents. Nobody can deny the primordial role of financial intermediaries in economic development, despite the trend towards intermediation and the direct use of capital markets.

Thanks to the intervention of these intermediaries, the requirements of savers and the needs of investors can be met. Indeed, household deposits need to undergo some transformations in order to meet the expectations of capital seekers and to be useful to the economy. The major transformations are at the level of maturity and amounts, because savings are generally small and short-term, while loans represent large amounts, in the long and medium term.

4. Risk exposure for conventional banks:

- **Definition of risk:**

Banking risk is defined as the eventuality that a reel return on an investment can be decrease than the predicted go back. There are many categories Financial risk: capital risk, delivery risk, economic risk, exchange rate risk, interest rate risk, liquidity risk, operational risk, market risk, credit risk, etc. In a for-profit bank, a unit can be the entire bank. Risk can also be measured by different financial products. However, the goal of the bank as a whole is to increase the value of bank capital by maximizing shareholder risk-adjusted returns. In that sense, banks are like all other businesses, but for banks, profitability will depend on risk management. The large multi-purpose banks will focus on bank accounts (traditional asset and liability management), trading accounts (banks buying and selling bonds, stocks, etc.) and bank risk analysis. Provide risk management advice to client businesses.

As a result of poor financial risk management, the Corporate treasurers of a non-financial company can suffer significant losses. However, if the company's core business remains healthy, this rarely leads to bankruptcy. For banks, on the other hand, risk management is their core business. In extreme cases, inadequate risk management threatens the bank's solvency, because bankruptcy is defined as negative assets, i.e. liabilities exceed assets.

4.1. Market risk:

It is defined as the risk associated with the financial portfolio due to market price fluctuations such as share prices, exchange rates, interest rates and commodity prices, or due to certain market events. Consequently, market risk includes a large number of other risks, namely foreign exchange and interest rate risks. If the exchange rate is flexible, any short or net short position in a given currency will expose the bank to currency or foreign exchange risk, which is a market risk in this case, it is the foreign exchange market, and the relative price of the currency is given by the exchange rate. A bank operating a global business will be exposed to

several currencies. The foreign exchange risk is due to unfavorable exchange rate fluctuations that affect the foreign exchange positions held by banks for their own accounts or accounts receivable. However, the risk of interest rates (money prices) is linked to the inadequacy of interest rates. Banks are engaged in asset conversion, and their assets and liabilities have different terms and quantities. The bank's asset and liability management team has traditionally focused on managing interest rate risk, but this activity has been extended to off-balance sheet projects[12].

4.2. Liquidity risk:

It is defined as specific risks associated with trading on non-liquid markets, as evidenced by the low trading volume and significant differences between bid and ask prices. In this case, an attempt to sell the asset may result in a price decrease and the asset may have to be sold at a price lower than its base value or longer than expected.

The liquidity of an asset is a means of easily converting it into cash. Banks can reduce liquidity risk by maintaining asset liquidity (that is, by investing in short-term assets), but if liquidity is too high, their returns will decline. All the banks are making money by dividing up the maturity dates, which is more short-term deposits and more long-term loans, “short-term financing and long-term loans”. They can do this through derivative reserve loans - only a portion of the deposits is reserved and the rest is lent. Liquidity can be expensive, as funds that have been locked away in a specified period of time could have resulted in higher interest.

Banks need to have liquidity to compensate for expected and unpredictable balance sheet fluctuations and provide the necessary funds for growth. It shows that banks have the capacity to repay deposits and other liabilities and to meet loan and portfolio funding needs. If the bank can quickly obtain the necessary funds at a reasonable cost (by increasing debt, securitizing or selling assets), it has sufficient liquidity potential. Liquidity prices depend on market conditions and the market's perception of the risks inherent in borrowing institutions[13].

[12]**Faten Ben Bouheni Chantal Ammi Aldo Levy**, Banking Governance, Performance and Risk-Taking Conventional Banks Vs Islamic Banks First Edition, p166

[13]Idem, pp166-167

4.3. Credit risk:

Is the probability that an asset or a loan becomes uncollectible in the event of a total default, or the risk of an unforeseen delay within the servicing of a loan. Since bank and borrower normally sign a loan contract, credit risk can be considered as a form of counterparty risk.
However, the term "counterparty risk" is often used for currency instruments traded (for example, counterparties in swap transactions), while credit risk refers to the possibility of default on a loan contract.
Banks can avoid credit risk by choosing assets with very low default risk but low returns, but banks can take advantage of the risks. If there are many low- and medium-quality loans on the bank's books, credit risk will increase, but the return will be higher. As a result, banks will choose asset portfolios with varying degrees of risk and will always take into account the fact that higher risk of default is accompanied by higher expected returns. Since most of the risk of default stems from moral hazard and information problems, banks need to monitor their borrowers in order to increase the profitability of the loan portfolio[14].

4.4. Operational risk:

Defined as the risk of loss due to a physical disaster, technical failure and human error in business operations (including fraud, management failure and process error). The Bank for International Settlements defines operational risk as "the risk of direct or indirect losses due to failures or failures of internal processes, personnel and systems, or external events".
The Basel Committee of the Bank for International Settlements (BIS) and the Solvency Committee of the International Association of Insurance Supervisors (IAIS) define operational risk as the risk of internal processes, people and systems, or external events resulting from losses due to insufficient or failing insurance funds. Although designed for financial institutions, the definition should apply to any department, institution or individual.
Basel and solvency methods for operational risk are divided into seven main categories, 18 minor categories and 64 sub-categories. The vast majority are not specific to financial services and can provide a good framework to manage operational risks in any industry. Pareto has established 80-20 rules, with a few exceptions. In this case, approximately 10-15 of the 64

[14]Ibid, p167

categories will represent at least 80% of the organization's risk exposure. According to Basel II (2004), the main types of operational risks are:[15]

a) Physical capital:

It can be expressed in the following forms: physical damage of assets, interruption of activities and system failure, execution and delivery, and/or process management problems. Technical failures dominate, and the main concern here is the bank's computer system. A computer system crash can damage the bank. Most banks have a duplicate system and if there is a problem with the main computer system, the system will be backed up in real time in a secret location. More generally, loss of tangible assets (such as clean buildings) is an operational risk[16].

However, the banks have taken out insurance against the risk of fire or other disasters and, to that extent, they have already taken risks for themselves and are therefore fully underwritten.

b) Human capital:

This type of risk is caused by human error, problems related to work practices or employee health and safety and internal fraud. Banks can be fined for violating health and safety rules or taken to an employment tribunal for wrongful dismissal[17].

c) Legal:

The main legal risk is the risk of litigation against the banks. This may be due to the treatment of customers, the sale of products or business practices. There are many cases where legal actions have been taken against banks by dissatisfied customers companies. These companies claim to be misled by the advice they receive or the commercial products sold, even the contract with the customer can be disputed[18].

[15] Ibid, p167-168
[16] Idem,p168
[17] Idem,p168
[18] Idem,p168

d) Fraud: fraud may be internal or external to the bank:

- **Internal fraud**: such as unauthorized activities (unreported (informative) transactions, types of unauthorized transactions (with monetary losses), incorrect marking of positions (international), etc.) and theft and fraud (credit fraud, worthless deposit fraud, theft / ransom / misappropriation of public funds / theft, misappropriation of public funds, forgery, cheque writing, smuggling, account recovery / immigration).

- **External fraud**: such as theft and fraud (theft/theft, forgery, issuing of cheques) and system security (hacking, theft of information (with loss of money), etc.)[19].

[19] Ibid,p169

Section tow: Generalities on Islamic banking

In this section we are going to present The origins and the historical devlopment of Islamic banking, the basis of Islamic banking, the finacial intermediatin and risk exposor for Islamic Banks. We will also represent risk management in Islamic Financial Institutions.

1. The origins of Islamic banking: the early days transaction:

1.1. The Era of the Prophet:

During this era, the predominant modes of transactions included:

- Shirkah: which means partnership. It based on sharing profit and loss (PLS)
- Al qard Al hasan: which means benevolent loan.
- Salam: Forward contract
- Sarf: it means money exchange, either gold for gold or silver for silver at the same sitting.
- Ijarah: it means leasing
- Trans-regional trade that involved trade caravans from Mecca to other countries and vice versa.[20]

1.2. The Period of Orthodox four rightly guided Caliphs: (632 – 661 C.E.):

a) **The era of Umar ibn Al-Khattab (634 – 644):** in this era dramatic reforms have been applicated on the economic policy of the state. In addition to Bait al-mal or the Treasury House that had been entered in the Islamic economic system.[21]

b) **The era of Uthman ibn Affan (644 – 656):** in this era the principal development was the introduction of the first Muslim coins

1.3. Period of the Noble Companions and the Succeeding Generations marked by:

This era was building on the reforms introduced by the Prophet (PBUH). The commercial interaction between merchants in the Islamic state and elsewhere was Tremendously increased

[20] **Hassan, M. K., Kayed, R. N., & Oseni, U. A**. Introduction to Islamic Banking & Finance. *England: Pearson Education Limited. 2013,pp9-14*.
[21] Idem *pp9-14*

and the fiqh was highly developed (Islamic jurisprudence). It knows an economic reform based on self-exerted judgment (ijtihad).[22]

a) The Umayyad and Abbasid Eras

In this era the first Islamic dirham has been issued: containing bismillah, the crescent and the Star and a bigger building were designated as Bait al-Mal in Damascus, capital of the Umayyad where the Treasury House has been shifted. During the Abbasid period and Mamluk era. The Treasury House still significant and the dinar and dirham still used as mediums of exchange in this era too[23].

2. The historical development of Islamic Banking: modern days:

After Ottoman Empire's fall the Muslim nation was fragmented into different countries which leaded the Muslim communities away from their Islamic roots and allowed the emergence of an interest-based banking and finance system. After that the awareness of Islamic injunctions increased among the Muslim communities allowing the emergence of experiments in Islamic finance in Egypt, Malaysia, and Pakistan these experiments were the basis of modern Islamic banking and finance.

The official beginning of Islamic banking was the establishment of the first interest-free bank in Egypt in 1963. In 1974, the OIC or The Organization of Islamic Countries founded an Islamic bank called the IDB or Islamic Development Bank, the aim of the IDB was the providing of funds for the development and the promotion of the economic development in Muslim countries according to the rules of Shariah.

By the end of 1970s, in the Muslim world a several banking systems were founded; in 1975, the first private commercial bank was founded in Dubai. In Sudan in 1977 the Faisal Islamic Bank of Sudan and Bahrain Islamic bank in Bahrain in 1979 (Institute of Islamic Banking and Insurance, The Islamic Banker).

In the 1980s in the first stages of growth of the Islamic financial market, a lot of Islamic banks had suffered from the lack of quality investment opportunities, that allowed conventional banks from the West to become mediators in utilizing the funds of Islamic banks. Therefore, by agreeing that a merchant buys goods on behalf of an Islamic banks and sells them at an interest rate margin, conventional banks from the west helped Islamic banks to direct the funds in

[22] Ibid *pp9-14*
[23]Idem *pp9-14*

business and trade-related activities. Western banks started to offer Islamic financial products through so called Islamic windows after noticing the significance of Islamic financial markets, these Islamic windows allowed the western banks to attract the clients directly without Islamic banks' mediation.[24]

Today the world counts hundredths of Islamic banks in several countries: more than 70 countries, including Australia, the Bahamas, Denmark, the USA, Switzerland, the UK, France, Ireland, Luxembourg, Germany, as well as the only Southeast Europe countries where banks operate on Islamic financial principles: Albania, Bosnia and Herzegovina. Today in Muslim countries there are dual banking Systems which comprise of both Islamic banks and conventional banks. The United Arab Emirates is considered as the example of the first Muslim country with a dual banking system where the Dubai Islamic Bank was founded in Dubai in 1973, that was similar to the conventional commercial bank in the way it operated, except for receiving and paying interests[25].

3. Basis of Islamic banking and finance:

The Islamic law is the basis of Islamic finance, it is also known as the Shariah and the central ruling body is the International Islamic Fiqh Academy or IIFA. The modern Islamic banking and finance industry include a several principals such as[26]:

- The prohibition of interest (al riba), understood as predetermined profit, in loans or any economic transactions.
- Principle of sharing loss of profit 3p.
- Prohibition of risk of loss, uncertainty (al-ghararar).
- The condemnation of speculation (al_maysir).
- Backing of a real asset.
- Prohibition of selling what you don't own.
- Prohibition of illegal activities.
- Prohibition of hoarding and status of currency.
- Compulsory collection of alms (Zakat)[27].

[24] Ibid *pp15-18*
[25] Idem *pp15-18*
[26] Idem p4.
[27] Idemp4

The Shariah is a definer of man-to-God and man-to-man relationships, it is also the divine prescriptions in the form of faith and beliefs, laws and moral norms are classified into two strands:

Ibadah: concern worship and devotional practices (five pillars of Islam)

Muamalat: concern the civil transactions in all kind of activities: political, social and economic activities (man to man relationship)

The Qur'an and Sunnah are considered as the primary sources of the Shariah

- **The Qur'an:**

The Qur'an is considered as the first source of the Shariah. It contains general and specific rules on religious, commercial, political, economic, legal and social norms. It emphasizes on mutual consent among consenting parties. The Qur'an prohibits exploitative measures such as excessive risk or uncertainty (***gharar***) and usury or interest (***riba***). It also prohibits cheating and corrupt practices in the management of funds and dealings in prohibited products.[28]

- **The Sunnah:**

The Sunnah is the second primary source of the Shariah, it Comprises the practices, sayings and tacit approvals of the Prophet Muhammad. The Sunnah came to explain the injunctions of the Qur'an. For example, the affirmative evidence of the prohibition of riba which is already mentioned in the Qur'an is highlighted by many prophetic traditions that deal with riba.

Islamic economics can be defined as the knowledge and application of injunctions of Islamic law (the Shariah) that emphasizes justice in the disposal of material resources so that human beings are satisfied and able to perform their obligations to Allah and the society[29].

4. Financial Intermediation in the Islamic banks:

In fact, in Islamic finance, the concept of intermediation goes far beyond its concept in conventional finance. Above all, it must be between the financial sphere and the real economy so that financing needs can be met in a balanced, equitable and socially responsible manner. This specific role of Islamic banks means that their financing operations must be 100% backed by tangible assets, through participatory methods based on the notion of risk sharing.

[28] Ibid. pp4-8

[29] Idem p4-8

Historically, the role of financial intermediation in the real economy has been based on the notion of risk sharing.

Islamic is derived from the principle "el mudharib youdharib" which can be interpreted as follows: "Whoever raises funds on the basis of shared profits, offer them to users on the same basis". This practice has existed in Muslim society since the early days of Islam, where most of the caravan goods were financed by the Mudharabah. The ulema considers that profiting from the role of the Mudharabha intermediary is permitted, however, it must be closely related to the exchange of goods and services; in other words, to the real economy.

Financial intermediation in the Islamic sense is addressed, it is now agreeing to define the main category of agent's economic institutions that ensure it, namely Islamic banks.

5. Risk exposure for Islamic banks:

Islamic banking is a financial institution that bridges different liquidity and risk situations between the public and parties with excessive funds and capital deficits, while converting risk into return.

The risks facing the Islamic banking sector are diverse and complex, as are the innovations in financial and banking products available to the public.

5.1. Credit Risk:

In terms of terminology, it is more proper to use the term «credit risk» in conventional banks. The idiom credit risk is often used for interest-bearing loans. The most accurate term in Islamic banking is financing risk, as it covers risks in several other forms of financing contracts, such as interest-free loans (Qardh), sales-based contracts (Salam, Murabaha, Istisnna) Lease (Ijarah). Conventionally, credit risk is identified as the risk that arises when a customer or other party defaults on its obligations to Islamic banks in accordance with a previously signed contract. This default can be caused by two things: non-repayment or the inability to repay the loan. In several risk management works, this risk is also referred to as default risk, financing risk, rating downgrade risk and contract completion risk[30].

[30] **Imam Wahyudi Fenny Rosmanita Muhammad Budi Prasetyo Niken Iwani Surya Putri Depok**, Risk Management for Islamic Banks Recent Developments from Asia and Middle East, March 2015, p13

5.2. Market Risk:

Market risk is the risk resulting from adverse market developments, such as the prices of Islamic stocks and bonds, commodity prices and the monetary value of the various assets held by Islamic banks in their investment portfolios; this will of course result in actual losses. This risk occurs only when the bank holds the asset not to be owned or hold it until the asset's maturity period is up but to resells it at some point in the future. In general, market risk hedging includes foreign exchange risk, commodity price risk and equity price risk, as well as benchmark interest rate risk[31].

1.1. Liquidity Risk:

Liquidity risk refers to the risk that Islamic banks may not be able to meet their debts. This risk results from the bank's source of funding, the time lag between third-party funds and the various debtors' financing contracts, particularly if the bank's funding often defaults or generates lower returns than initially expected. Usually, the main cause of the failure of large and small banks is not due to losses incurred but to the failure to compensate for the lack of liquidity[32].

1.2. Operational Risk:

Operational risk refers to the risk of loss due to an inadequate internal control system, internal process failure, human error, system failure and/or certain external events that may damage internal control. Bank. An Islamic bank may also fail to comply with Sharia rules and principles, which fall into the category of risk compliance. Commercial risks are generally included in the operational risk category. Counterparty risks have been integrated into financing risks, including the Islamic bank itself, buyers, tenants, business partners, suppliers and other relevant parties. Operational risk[33]

[31] **Faten Ben Bouheni Chantal Ammi Aldo Levy,** Op. cit, p13
[32]Idem, p13
[33] Idem, p14

1.3. Legal Risk:

Legal risk arises from the possibility of lawsuit and legal defects in certain commercial aspects of the bank. Some experts place legal risks as operational risks; as legal disputes are usually accompanied by the failure or inadequacy of written contracts. This risk may manifest itself in certain respects, such as through litigation and the absence of laws and regulations against the contract, or any weakness in the contract, such as non-performance of the contract, effective conditions, etc., or imperfect warranty conditions[34].

1.4. Reputational Risk:

When stakeholder confidence in Islamic banks declines, reputational risk arises from misperceptions about Islamic banks. Among other factors, this risk is due to media reports and negative rumors about Islamic banks, as well as ineffective communication strategies of Islamic banks. Negative publications about Islamic banks can damage the reputation of other Islamic banks. Even if these Islamic banks are not involved in related events or actions[35].

1.5. Strategic Risk:

Strategic risks are due to the inaccuracy of Islamic banks in formulating and implementing strategic decisions, and the inability of Islamic banks to anticipate changes in the business environment, including internal and external risks, in addition to the inconsistency between strategies and Islamic banks vision and mission; also this risks can due to the lack of a comprehensive strategic analysis of the environment and the differences between the strategic levels of the strategic plan. In addition to this, strategic risks may also be due to the fact that Islamic banks have not anticipated the evolution of environmental activities, such as technological changes, changes in macroeconomic conditions and competitive dynamics. Policy changes in the market and competent authorities[36].

[34] Ibid, p14
[35] Idem, p14
[36] Idem, p14

1.6. Compliance Risk:

This risk arises when Islamic banks do not comply with existing Shariah rules and principles, which are expressed in the form of a fatwa from the Shariah commission. In addition to complying with all regulations and rules like conventional banks, Islamic banks must also comply with sharia principles in their business activities. Islamic banks should only operate according to the basis of Islamic law[37].

1.7. Rate of Return Risk:

Rate of return risk is due to changes in the rate of return paid by Islamic banks to customers, which affects customer behavior. When depositing funds in Islamic banks, clients will have expectations about the rate of return they want. Deviations from expectations may be caused by internal factors, such as depreciation of bank assets, a decrease in the debtor's share of earnings or an increase in defaulters, and external factors, such as an increase in returns provided by other Islamic banks, higher interest rates of traditional banks, and as market inflation increases, rational and strictly transactional investors will begin to expect a higher rate of return. These changes in expected rates of return will trigger the transfer of funds to other banks[38].

1.8. Investment Risk:

The main raison behind the occurrence of investment risk is that when the business is financed with a profit–loss sharing contract, like Mudharabah or Musharakah the Islamic bank bears the risk of the debtor's business experiencing losses. If the profit-sharing base used is operating profit or net profit of the debtor's business the investment risk will be larger. The Islamic bank can lose the principal financing channeled to the debtor if the debtor's business goes bankrupt[39].

[37] Ibid, p14
[38] Idem, p15
[39] Idem, p15

1.9. Fiduciary Risk:

Frequently that risk occurs from the frailer of Islamic bank in fulfilling both the implicit and the explicit standard that can be applied towards their fiduciary responsibility. Investment failure can cause the Islamic bank to experience bankruptcy (insolvency) in which it cannot pay back its third-party funds. If an Islamic bank provides a rate of return that is lower than the market rate and if the depositors interpret this low rate of return as being due to the Islamic bank making mistakes in managing their funds and to violations in the Islamic bank's investment contract. AAOIFI categorizes that risk as a fiduciary risk[40].

6. Risk Management in Islamic Financial Institutions

6.1. Credit risk management through reserves and provisions:

Islamic financing methods are numerous and relatively heterogeneous compared to conventional finance. This requires more rigorous and credible calculations. To this end, a standardization of loss recognition standards has been carried out. The reserves of Islamic banks are built up through the contribution between shareholders and investment deposit holders. Their purpose is to protect the bank against losses or defaults[41].

6.2. Credit risk management through collateral:

Pledging is a method of protection against credit losses. It is a contract by which a debtor gives an asset to its creditor as security for its debt. Since pledging is allowed under Sharia law, Islamic banks use this mechanism to secure their assets. In accordance with the principles of Islamic finance, receivables, perishable goods and interest-bearing financial instruments cannot be accepted as collateral. On the other hand, tangible goods, cash, gold and other valuables are accepted by these same banks[42].

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[40] Ibid, p15

[41] **KORBI, Fakhri.** La finance islamique: une nouvelle éthique?: Comparaison avec la finance conventionnelle. 2016. Thèse de doctorat.p 79

[42] Idem, p 80

6.3. **Credit risk management through contractual clauses**:

Uncertainty and speculation about the terms of a financial contract are prohibited in Islamic finance. These can directly or indirectly cause injustices and loopholes in the signed contracts, resulting in payment defaults. Contractual clauses have therefore appeared in order to reduce these deficiencies. Indeed, the risk can be minimized by a clause in the contract stating an agreement between the two parties that a certain level of price fluctuation would be acceptable. However, above this level, the winning party would have to compensate the other party affected by the price fluctuation. This arrangement is known as the charity clause "band al_ihsen ≫. It is a practice that has become common in Islamic contracts[43].

6.4. The internal rating:

All banks carry out an evaluation or rating of their assets and clients to determine the provisions for losses on their loans. An internal rating system can be defined as an analytical method for determining the probability that a debtor will not be able to meet its financial commitments to the bank. It involves assigning a default risk class to each contract.

This system identifies the credit risks incurred by the bank for each asset item instead of calculating the overall risk linked to the entire portfolio. The internal rating applies mainly to banks with a wide variety of financing methods and different risk characteristics. This is the case for Islamic banks.

Thus, a financing operation offered to a client on the basis of Murabahah exposes the bank to different risks than a financing operation based on another contract[44].

6.5. The internal monitoring process:

The establishment of an appropriate supervisory system ensures the proper functioning of banks, which enhances the confidence of savers and investors in the financial system. Since the crisis, financial institutions have become more distrustful in terms of risk. As a result, they have an internal control system that makes it easier to identify risks arising from changes in their business environment.

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[43] Ibid, p 80

[44] Idem, p80

To this end, these institutions have contingency plans in place to deal with external hazards. For example, the banks have separated the functions that generate risks from those responsible for management and control[45].

6.6. Enhancing public confidence:

The efficiency of financial markets depends on public confidence in financial intermediaries. This confidence strengthens the financial intermediation system and provides it with a degree of stability and balance. As it is ethical finance, which emanates from ethical principles and values, Islamic finance is therefore about building trust. Therefore, it must guarantee the interests of depositors because they are not able to protect their own interests as the shareholders of banks do. Indeed, financial intermediaries are in the best position to assess counterparty risks and the risks of different investment opportunities, unlike individual savers. Indeed, recent years have seen a considerable development of risk management methods in Islamic finance. Thanks to their good management, Islamic financial institutions have escaped the consequences of this development[46].

[45] Ibid, p81
[46] Idem, pp 81-82

Section three: Conventional banking versus Islamic banking

This section will basically present the financial transactions in both conventional and Islamic banking and finance ending with concluding some differences and similarities between Islamic and conventional Banks.

I. Financial transactions:

❖ Financial transactions in conventional banking and finance:

1. Balance sheet operations

Balance sheet income covers transactions that are subject to immediate or deferred but still actual recording in the operators' balance sheet (buy/sell transactions or issues of securities also being included, but the choice was made to isolate the "securities" item because of the scope of the subject). Cash loans/borrowings, unsecured or collateralized (repos) are the seemingly simplest part of the balance sheet, since it is basically a question of lending or borrowing cash. Foreign exchange transactions concern the foreign exchange market and cover all spot and forward purchases and sales of foreign currencies. These products are traded over-the-counter only.

2. The diffrentes types of lones:

2.1. Lones for individuels :

Consumer Loans: Consumer loan (or consumer credit) is a loan granted by credit institutions or specialized institutions to individuals. It is intended only for households and does not concern companies. For example, the purchase of a company car by a company cannot be financed by a consumer contract. It has the characteristics of:

- Financing cash flow requirements
- Instalment purchase of consumer goods
- Be distributed by banks or specialized financial companies
- Are closely monitored by the public authorities because of their impact on the national economy and on households (incentive to over-indebtedness)[47]

[47] Consult the https://www.jurifiable.com/conseil-juridique/droit-de-la-consommation/credit-la-consommation

a) Cash Credit:

Cash credit includes the overdraft facility and the authorized overdraft on a current account. With this overdraft credit, the Bank grants a customer a debit authorization for a limited amount in the short term (less than three months), provided that the customer has regular income or sufficient assets. As this is a riskier credit than others because it is not backed by specific collateral, it is generally more expensive than ordinary credits[48].

b) The personal loan:

The personal loan is a consumer credit. It can allow you to finance all your projects, even without a contribution. Depending on the amount borrowed and your ability to repay, you can generally spread your repayment period over 6 to 84 months.

The conditions of the loan are known at the signature of the contract. The interest rate, the amount of the monthly payments and the total cost of the credit are fixed. They depend on the amount borrowed and the repayment period chosen by the borrower. The faster you repay, the lower the cost of your loan[49].

c) The lease-purchase contract:

The lease-purchase is a contract by which a person, the lessor (finance company, bank...) buys an asset and makes it available to another person, the lessee (tenant), in return for the payment of a rent. The lessee is therefore not legally the owner of the property placed at his disposal. However, for the purposes of consolidated accounts, assets acquired under financial leases are treated as fixed assets. This contract is accompanied by a unilateral promise to sell, according to which the lessee has the option, at the end of the agreed period, to purchase the asset[50].

At the end of the leasing period, the lessee may either buy the asset at a price agreed in advance and fixed by the leasing agreement, continue to lease it or terminate the leasing agreement.

- **Principles :**

  The leasing agreement is an agreement between an owner of equipment (the lessor) and a company wishing to lease the equipment on a financial lease (the lessee). By

[48] Principes thechnique bancaire cours p11
[49] Idem p11
[50] **JEAN BARREAU, JACQUELINE DELAHAYE**, « Gestion financière » DUNDO 6ième Edition, p105

leasing. The lessee has a right to use the leased asset in return for the payment of rentals.

d) Real estate loan:

Real estate credit is a long-term credit obtained from a credit institution and which is intended to finance all or part of a real estate purchase, a real estate construction operation, or work on a real estate property. The real estate credit is a means of financing for which the money lender (credit institution) claims from the borrower in return for its financing a guarantee of repayment of the type mortgage, privilege of the money lender or housing guarantee.

2.2. business loans:

2.2.1. The operating loan

During its operating cycle, a company needs liquidity to cover its expenses and the cash gaps related to the payment terms it grants to its customers.One of the solutions used by companies to smooth out these short-term capital shortfalls is operating credit.

It is used to finance the current assets on the balance sheet by providing companies with the cash needed for short-term payments while waiting for them to recover invoiced receivables[51].

A distinction is made between different types of operating credit :

a) Global credits:

- **Overdraft facilities:**

The overdraft facility is granted to a company when she needs to deal with an embarrassment. It responds to the financing needs induced by the Shifting cash inflows and outflows. Sound reimbursement is provided each month by the staggered entries. Although generally valid for one year, it should in principle only be used for a temporary cash flow period very limited (e.g. month-end deadline)[52]

- **The overdraft:**

Granted for a longer period of time (from a few weeks to a few months). The overdraft may be authorized in the event that the company is waiting for a cash inflow and wishes to have the expected funds available in advance (for example: waiting for the settlement of a large market). In practice, however, the overdraft is often granted to provide the company with a fund ofcash

[52] Principes thechnique bancaire cours, Op.cit p 20

when the partners are unwilling or unable to contribute additional funds to the business. In the latter case, the bank will in most cases only provide assistance if it is guaranteed by the guarantee of the partners, who may be called upon to reimburse the bank n the event of the company's default[53].

- **Campaign credit:**

The campaign loan is a short-term professional loan that meets the needs arising from a periodic activity and, therefore, from the seasonal nature of purchases and manufacturing, or, sales of companies. The campaign loan may take the form of a credit per cash register, a loan per ticket or an advance on goods[54].

b) Specific credits:

- **The commercial discount**:

This is an operation which consists for the banker to buy back from a company the commercial bills of which it is the bearer (final beneficiary) before the expiry date and this in return for the payment of premiums, the assignor (the beneficiary) remaining the guarantor of the payment[55].

- **Credits by signature:**

If a bank usually helps a business by providing funds in the form of cash credits, it may also provide assistance in the form of commitments known as "appropriations by signature".

The bank then simply lends its signature without incurring any charges. of cash flow. The study made by the bank must be as thorough as for any other bank loan, as this commitment may result in a loss of in some cases, large disbursements[56].

2.3. Investment loan:

The investment loan is a loan that allows the company to make medium or long-term professional investments. The investment loan generally corresponds to the financing of the company's balance sheet, with the main objective of developing or renewing the company's fixed assets and work tools.

[53] Ibid p20
[54] Idem p21
[55] Idem p21
[56] Idem p25

- **Long-term loans:**

Long-term loans, with a term of 7 to 20 years, are distributed by banks and specialized financial institutions. For this type of financing, the banks act, most of the time, in the framework of a consortium (syndicated loans) with the aim of sharing the risks, and also with regard to compliance with prudential rules.

Specialised financial institutions finance these loans from their own resources and also by recourse to bond issues[57].

- **Medium-term loans**

Medium-term loans, with a term of 2 to 7 years, are intended to finance investments consisting in particular of the acquisition by companies of production equipment. They are granted either by a bank alone or by a specialised financial institution.

Financing by means of a medium-term loan does not normally have to cover the entire investment; it is logical that the firm wishing to acquire equipment should make an effort to finance itself. The portion of financing by means of a medium-term loan is included, in Generally, between 50% and 75% of the investment amount. However, for modest investments (passenger vehicles, IT equipment), Banks often agree to finance the investment 100%[58].

- **Leasing:**

Leasing is a technique for financing a fixed asset by which a bank or finance company acquires an asset movable or immovable property to lease it to a company, the latter having the option to buy back the leased property for a generally low residual value at the end of the contract[59].

3. Securities:

Securities or "transferable securities" cover all direct financing instruments of companies, banks, governments or public bodies. A security represents a share of a short- or medium-term debt (negotiable debt securities) or a long-term debt (bonds), or a share in the capital of a company (shares). For the issuer of the security it is a financing instrument, for the buyer it is an investment instrument. Securities are traded over-the-counter or on organised markets in variable quantities, expressed as whole numbers (shares), decimal numbers (certain UCITS units) or in nominal amounts for bonds. Securities are negotiable instruments, i.e. they can

[57] Ibid p29
[58] Idem p30
[59] Idem p30

change hands after they are issued, on what is known as the secondary market, provided, of course, that a counterparty can be found to make the exchange.In this section we deal with related topics such as securitization or securities transactions.

7. Financial Transactions in Islamic Banking and finance:

1. Financial transactions with the bank's participation (sharing loss and profit):

1.1. Mudarbah (profit sharing):

Mudarbah, a profit and loss sharing model contracts. It is an arrangement between the provider of capital (financial institutions), wherein an institution provides funds that are utilized by the entrepreneur for the creation of wealth or production. The entrepreneur arrange labor, management skills and expertise for production. Before the start of the project the banks and the entrepreneur fixe a predetermined or contracted ratio of the profit share. If the loss occurs, both parties bear the losses, the entrepreneur in the form of management skill and expertise and banks in the shape of capital and labor. As a bank invests its money in an entrepreneur project, the financial risk taken by the banks entitles them to claim the profit share. The profit-sharing system continues until the loan is repaid[60].

1.2. Musharkah (joint venture):

Musharkah is contract based on partnership. The word Musharakah comes from the term Chirka that is used in fiqh (Islamic jurisprudence), which would mean sharing participation. Musharakah is an agreement between two parties, the bank and the investor, who contribute their money in any business for making profit. The profit is divided accordingly with respect to the agreement. This type of contract is used for three main projects: the letter
of credit, investment in a big project or purchase or renting of the real estate.
In purchasing the real property, the share is accordingly divided in advance after the banker and the investor calculate the rental earnings of the project. Both parties of Musharakah contract are not mandatorily participate in the management but they are entitled to participate in the activities. As the earnings of the project are predetermined and profit is shared on the pre-agreed ratio, similarly the loss will be borne by the partners according to their proportion of capital investment or contributions[61].

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[60]**Faten Ben Bouheni Chantal Ammi Aldo Levy**,Op.cit, p53-54
[61] Idem p55

2. Financial transactions without the bank's participation:

2.1. Murabaha (cost plus):

Derived from the word Rib, meaning profit, Murabahah means "profit taking" in a commercial sense. Murabahah is a purchase agreement between the client and the banker in which the good is sold to the client at a given price. The agreement includes the profit margin agreed by both parties, costs and selling price. Both the price and the profit margin must be determined accurately and the price can't be modified in the case of delay or anticipation of
Regulations. The bank compensates the client for the time value of money in the form of profit. This may be referred to as a fixed income loan by the client for the purchase of assets like a tangible asset on which the profit is charged with the fix rate calculated by profit margin. The bank is not allowed to charge the time value of money in the case of delay payments so it can make extra profit. Until it receives the full amount of the asset the banks remain the owner of the asset[62].

2.2. Ijarah (Leasing Contract):

Ijarah is a term that comes from the Fiqh it means to rent. The Ijarah is essentially leasing. The banks give the client the right to use its asset, property or equipment for a specific period and fixed price. So, Ijarah's concept is to sell the benefits of the assets in a fixed price and period. The asset would be transferred to the lessee by the end of the lease period. It works as Cost plus contract[63].

2.3. Bai' Bithaman Ajil (deferred payment sale):

Bai' Bithaman Ajil has the same Mudarbah's concept both include the deferred payments in the sale on goods which also includes the profit margin on the agreement by both parties. But the difference between Bai' Bithaman Ajil and Mudarbah is that in Bai' Bithaman Ajil, instead of paying the monthly equal installments the customers make the full payments on the maturity. As in other modes of finance, the high price is charged to the client for the use of an asset to make profit, which is more than or equal to the market interest rate at that time[64].

[62] Ibid 58
[63] Idem p59
[64] Idem p61

2.4. Bai Salam:

Bai Salam is a mode of finance in which the buyer makes advance payments for the goods that will be delivered at the future dates by the seller. The payment has to be in advance and made in full not in installments and the goods has to be delivered on the specific date agreed so that the transaction will be counted as successful. If the payment is not made in full, the transaction will be treated as the sale of debt against debt, which is prohibited according to Islamic law. At the date of the delivery the quality of the delivered goods should be same as written in the agreement. In Bai Salam, the buyer and seller can't trade gold, silver or any kind of currency that was barred from being traded. In Salam the quality, the quantity and workmanship must clearly be defined in the contract. The derivatives of conventional finance contain a large element of chance so the Salam contact which includes Garar prohibited principles is used to replace those derivatives[65].

2.5. Qard Hassan (good loan):

Qard Hassan is a loan where the creditors receive only the principle amount of the loan so the debtors don't have to pay any interests. This type of loan is a loan of benevolence it is forwarded to the debtor so they can develop their business. In Qard Hassan no compensation is made to the creditor for the time value of money. According to experts this is the only type of loan that is free from Riba so it does not violate the Islamic principles. The debtor can pay an extra amount on the return of Qard Hassan as an act of appreciation but this is not mandatory. Qard Hassan is given in limited quantities for a short period of time[66].

2.6. Istisna:

Istisna is a sales contract such as Salam. In this contact the buyer contracts with the seller produce, construct and fabricate any asset accordantly to given descriptions, quality and quantity identified ant at an agreed price and during a specific period of time. The seller uses his raw materials and his effort to produce the asset. With the mutual consent of both parties all conditions and details of Istisna contract must be discussed and agreed in advance[67].

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[65] Ibid p62
[66] Idem p65

3. Islamic Bank Financing operations:

3.1. Sukuk (Islamic bonds):

Sukuk is an Islamic alternative for conventional bonds. It is a financial certificate that works in same way as author bonds however it prohibits the charging of interest according to Islamic rules. Unlike conventional bonds Sukuk requires an underlying asset in the form of ownership or lease agreement. The Sukuk market knows a big growth during this last decade and Sukuk have become the most popular investment vehicle in the GCC and South-East Asia.

Table 1.1: Islamic financial transactions and their alternatives in conventional banking.

FINANCIAL TRANSACTION	SPECIFICATIONS	CORRESPONDENCE WITH CONVENTIONAL TRANSACTIONS
Mudarbah	Financing of a project by the bank with profit and loss sharing according to a pre-established ratio.	Private equity: consists mainly of equity investments in unlistd companies in order to finance their development.
Musharaka	Co-financing by the bank and the promoters with profit and loss sharing according to a pre-established ratio	Private equity
Qard Hassan	Interest-free loan with coverage of actual bank charges by the borrower.	Mutualist loan
Bai Salam	Purchase of a client's asset by the bank and then resale to the client at term.	Assignment of lease: is a contract by which the lessee transfers to another person the rights and obligations he holds under the lease (replacement of the tenant by another). An assignment of lease is also called a sublease.
Bai Muadjal	The bank buys equipment and materials from the supplier on a spot basis and sells them to the customer on a forward basis.	Forward: is an agreement to benefit from today's exchange rate at a future date. It is a simple but essential and effective financial instrument to offset exchange rate risk.
Ijarah	Purchase of a client's asset by the bank and then leases it to its client with a promise to sell it forward.	Leasing
Murabaha	Short-term interest-free loan with a pre-established bank margin.	Microcredit: is a mechanism for lending small amounts of money to individuals or families who do not have access to the conventional banking system due to a lack of real guarantees or sufficient personal capital.
Sukuk	A financial certificate that works in same way as author bonds however it prohibits the charging of interest	Bonds: is a negotiable debt security issued by a legal entity, which receives a certain amount of money on loan from the subscribers of the securities. It is a debt that is repayable on a predetermined date and for a predetermined amount and bears interest.

4. The Islamic Bank and the Balance Sheet Structure:

The different modes of financing suggested by Islamic Finance imply a specific structure of the Assets of the Islamic Bank (Chong and Liu, 2009). Indeed, for short and medium-term investments, constant income financing instruments are often used, such as Murabaha (Purchase and Resale with Margin), Salam (Forward Sale Contract), Ijara (Leasing), Istisnaa (Sale in Future State of Completion). On the other hand, as far as long-term investments are concerned, equity financing is more appropriate.

Short-term assets such as Asset Based Instruments (Murabaha, Ijara) are less risky and generate more secure returns than equity investments. Indeed, the latter present problems of agency and informational asymmetry (e.g. the risk that an entrepreneur may be tempted to declare a lower profit to the bank than the actual profit. (Muljawana et al. 2004). This preference for sales contracts (constant income financing instruments) characterizes the balance sheet structure of Islamic Banks. Murabaha and Ijara (Leasing) contracts are the main contracts resulting in the composition of the asset portfolio of Islamic Banks.

The Accounting and Auditing Organization of Islamic Financial Institutions is now a key player in the world of finance. Its mission contributes significantly to the harmonization of accounting, auditing and governance practices. Eventually, Islamic Banks should have common guidelines on the presentation of income statements, balance sheets, fiduciary activities and other information to be published.

4.1. Principles of balance sheet: conventional versus Islamic bank:

Table 1.2: Principles of balance sheet: conventional versus Islamic bank

Conventional Banks	**Islamic Banks**
Assets	
Current assets	
Marketable securities	Cash
Standard loan	Investment: – Financing Musharka – Financing Mudaraba
Discovered	Interbank Murabaha
Other advances Murabaha Salam Istisnaa	Credit sale: – Salam – Istisnaa – Murabaha
	Equity investments, real estate
Non-current assets	
Participation	Musharaka
Estate	Buildings
	Diminishing Musharka
Liabilities	
Current liabilities	
Deposits	Current account (Qard Hassan)
Loans and various financial debts	Investment Account (PSIA) – Restricted – Unrestricted Savings account Zakat and withholding tax Murabaha interbank non-current Provision (IRR)
Non-current liabilities	
	Islamic funds, Salam, Istisnaa
Equities	Equities
Earnings	Earnings
Stocks, reserves	Profit to purify (Zakat)
	Reserves (PER)

Source: Faten Ben Bouheni Chantal Ammi Aldo Levy, Banking Governance, Performance and Risk-Taking Conventional Banks Vs Islamic Banks First Edition, p85

❖ Differences and similarities between Islamic and conventional banking:

1. Similarities of Islamic Bank and Conventional Bank:

Around the world, the role of any financial system is the same. However, we can observe the influence of external factors, such as politics, economics, society, culture, and various beliefs, which lead to changes in the system's performance. The similarities identified between the Islamic banking systems and the conventional banking systems are:

- Both of the banking systems provide basic function of financial intermediation.
- The creation a wide range of assets and liabilities to meet the customer needs with distinct features as per the time, risk etc.
- An efficient allocation of resources for the economic development.

2. The main operational differences between Islamic Bank and Conventional Bank:

We can sum up the main operational differences between Islamic banking and conventional banking in the points representing in the following table.

Table 1.3: The main operational differences between Islamic Bank and Conventional Bank**.**

ISLAMIC BANKING	CONVENTIONAL BANKING
Operates according to the principles of shariah and the Islamic law	Operates according to self-developed principles
Making profits through service charges.	Making profits through pre-determined interest rates
Functional primarily as asset-based financing	The financing activity backed with assets
Provides for Profit and Loss sharing	Provides predetermined fixed rate of return
Generates profit according to Sharia laws	Generates profits without any restrictions
No extra charge for a non-payment of installments by the customer	Extra charge is incurred on interest for non-payment of installment by the customer
Focus on promotion of partnership	Focus only on lending principles
Due importance to the customers therefore it aims to ensure growth with equity	As the bank earns through interest it makes no effort to ensure growth with equity.
As it shares profit and loss it pays greater attention to development of project appraisal and evaluations	As advances are fixed, it pays less attention to development of project appraisal and evaluations.
Greater emphasis on the viability of the projects	Greater emphasis on credit-worthiness of the clients
Relationship with its clients as partners, investors, trader, buyers and sellers.	Relationship with its clients as creditor and debtor
Can guarantee deposits for deposit account based on the principle of al-Wadiah, however if the account is based on the Mudarabah concept, client has to share in case of loss.	Banks guarantees the returns on all its deposits to the customers.
Cannot issue loans instead commodities are provided	Issues all types of loans for the fixed rate of interest

Conclusion:

This chapter began with a presentation of both conventional and Islamic banks from different sides. First, it presented the historical development, the financial transactions and risk exposer for each type of banks we also presented risk management in Islamic institutions. Then it showed the financial transactions in both Islamic and conventional banking and finance and it ended with determining the differences and similarities between those Banks.

The results of this chapter show that there exists differences and similarities between both Islamic and conventional banking in the way they perform their function as financial intermediary.

CHAPTER TWO: APPROACHES OF EFFICIENCY MEASUREMENT

Introduction:

Studies on efficiency has been very intense over the last years, resulting in a well-established literature on the fundamental concepts and methodology of efficiency analysis. In this context, significant research has assessed the efficiency of financial institutions, providing relevant information that has served not only regulatory and management objectives, but also contributed to the development of research methodology. Our work will be divided into three sections: section one will discuss Concepts on efficiency; section two will focus on data envelopment analyses DEA and its different models; section three will be a literature review on comparative studies of efficiency in Islamic banks and conventional banks.

SECTION ONE: Banking efficiency

This section presents the definition of the concept efficiency and what are the different type of efficiency and how can this efficiency be measured: what are the main approaches to measure efficiency. It presents also the value of analysing efficiency in banks and the application of non-parametric approaches in measuring banking efficiency.

1. Performance:

"Performance is an all-encompassing and integrative concept, and therefore difficult to define precisely. According to the majority of the literature consulted, there are several conceptually acceptable but distinctive definitions of performance depending on the field involved and the context of use". As Saucier points out, "the notion of performance must therefore also be clarified each time it is to be used". In management, the term performance is defined as the combination of effectiveness and efficiency. Effectiveness is the achievement of expected (planned) results. Efficiency is the relationship between the result obtained and the resources used. The requirement of efficiency thus corresponds to the achievement of the result with a minimum of resources mobilized (minimum time, limited effort, economy of means). It is possible to delimit efficiency with the two notions of idleness and waste. Idleness is the non-utilization of production capacities which generates capacity costs. Wastefulness is the degraded use of useful capacities that could produce more and that generates operating costs. Thus, efficiency can be defined as the product of a return on resources used (non-wastefulness) by a rate of resource use (non-idleness).

Performance therefore requires an interdependent global vision of all the internal and external, quantitative and qualitative, technical and human, physical and financial parameters of management. Thus, its definition depends on the context of its application and use[68].

2. Performance management tools:

Performance management measures the degree of achievement of an objective, the implementation of a strategy or the accomplishment of a task or activity, and is therefore part of the company's short and medium-term vision. The steering system of the company is composed of different information supports; we distinguish in practice three categories of steering tools:

[68] **Faten Ben Bouheni Chantal Ammi Aldo Levy**, OP. Cit, P118

- Forecasting tools: they allow to study the future and to be interested in it according to the opportunities and its know-how (strategic plan, operational plan and budget);
- Tools that compare results to objectives: they allow us to interpret variances and take corrective decisions (general and cost accounting, budgetary control, reporting and dashboard);
- Performance tools: they record performance and tend to provide explanations (Benchmarking and Reengineering).

These different tools all contribute to performance management, but at different levels or stages. C. Performance management indicators are measurable or non-measurable (qualitative) indicators that reflect "states" that characterize an organization in terms of efficiency, adequacy (budgetary means) and effectiveness (results).

The definition and measurement of relevant indicators makes it possible to reflect these three elements (efficiency, adequacy and effectiveness). The latter are analysed and interpreted by distinct "reading" levels, more commonly referred to as hierarchical levels. Three decision-making levels, with different degrees of competence and responsibility within the same organisation, can be juxtaposed: The Operational level, that of managers who carry out an activity that directly contributes to the achievement of the organisation's explicit objectives; The Management level, that of activity managers who exercise a management function within the organisation and who hold decision-making powers; The Executive level, that of the General Management for example, who has the power and responsibility to manage the organisation in question. The operational level seeks to optimize the level of effort required to achieve the objectives set for it, and then adjusts its resources and makes them "adequate" as the situation progresses;

For its part, management is constantly seeking to optimize the performance of a set of means and resources in order to achieve, as quickly as possible, the targets and objectives set for the sake of efficiency. Management is particularly interested in the results obtained and their compliance with the targets and objectives set for the organization. The development of the scorecard for each level of the hierarchy is based on the principle that indicators are skimmed down as the level of hierarchy increases. Consequently, the steering indicators that are monitored at the highest hierarchical level are necessarily "encapsulated" and monitored by the lower levels.

In short, D. Narcie and B. Espinasse define performance steering in three phases: Strategy definition; Strategy implementation; and Monitoring and evaluation of the company.

3. The concept of efficiency:

Efficiency is a concept that combines two other concepts since it relates effectiveness to the means used to achieve expected results. If we consider two systems producing identical results, we can consider that the one that uses fewer resources is the most efficient or the one that achieves better results with the same resources is also the most efficient. Thus, efficiency would measure the relationship between effectiveness and cost.[69]

[70]Johnson &Scholes (1997) defined efficiency as follows: "Efficiency is an internal measure of a firm's performance; it is very frequently measured in terms of production costs, profit or productivity, and it measures the amount of resources used to produce a unit of goods or services. Thus, efficiency analysis allows comparisons to be made between banks' competitiveness. The sources of efficiency identified by Jonhso n& scholes (1997) are economies of scale, experience, input purchase costs, production processes and product design.

Another approach combining the two concepts was presented by Leclerc and fortin in 1958, who consider that efficiency should be analysed on two levels: allocative efficiency, which consists of the company must ensure that it uses as few resources as possible; and technical efficiency, which consists in choosing the least costly[71] combination of factors, the combination of the two factors makes it possible to obtain economic efficiency in minimising costs for a given level of production, this term succeeded the term overall efficiency, initially used by Farrel[72] (1957); this same author was the first to demonstrate the distinction between distributive efficiency and technical efficiency and considers that efficiency is obtained by a benchmark analysis by comparing the performance of a unit with the best in achieving the specified objective.

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[69] **Gonsard, H., & Gonsard, B**. L'efficience coût et l'efficience profit des établissements de crédit français depuis 1993. Bulletin De La Commission Bancaire, p 20, pp 25 -35.

[70] **Jonhson, G., & schools.K**. Exploring corporate strategy, texts and cases (4e ed.). NewYork : Prentice Hall. 1997

[71] **Bekkar, M**. Etude comparative d'un réseau bancaire modélisation de la consommation des ressources par la régression PLS, et application du benchmarking interne par la technique Data Envelopment Analysis (DEA) 2006.

[72]**Farrel, M.J.** The measurement of productive efficiency. Journal of the Royal Statistical Society 1957 . Series A (General), 120(3), p253-281.

4. The value of analysing efficiency in banks:

A bank's overall efficiency is the product of two types of efficiency: technical efficiency and allocative efficiency, and although there is a positive and a priori strong relationship between the two, a technically efficient bank can be economically under-efficient if its pricing, market or risk management policies are not well researched, such as poor pricing, underpricing, underestimation of risks, etc. Conversely, an economically efficient bank may use obsolete production techniques or waste part of its resources. Or it may benefit from favorable market positions that do not encourage it to adopt a competitive approach vis-à-vis other banks. In short, a bank will be globally efficient if it chooses well what it has to do 'economic efficiency' and does well what it has chosen to do 'technical efficiency'.

The ability of banks to improve information asymmetries between borrowers and lenders and their ability to manage risk is the essence of bank output. These capacities are integral components of banks' output and influence managerial incentives to produce financial services prudently and efficiently. The liabilities held by the bank are debt obligations, and provide an incentive advantage over other intermediaries[73] (Hughes &Mester,1993).

The ability of banks to operate efficiently - to obtain up-to-date information on the financial prospects of their customers, to draw up contracts, to strengthen them - depends in part on property rights, regulation, and the environment in which they operate. Such an environment includes the accounting practices, lien rules, government regulations and market conditions under which banks operate.

The concept of banking efficiency therefore focuses on the quality of the organization and the quality of the market position. It measures the productive performance of banks, not just their financial performance. Financial performance is usually judged using financial performance indicators, such as return on equity. These indicators focus, in a way, on short-term performance. They are not completely insensitive to financial market developments. In contrast, indicators of economic and technical efficiency show the state of the determinants of performance in the longer term. They focus on the internal determinants of banks, namely their ability to control production and distribution costs, through appropriate choices of network size

[73]**Hughes, J.P., & Mester, L.J**. A quality and risk-adjusted cost function for banks: Evidence on the too-big- to-fail doctrine. Journal of Productivity Analysis, 1993. ,pp293-315

and organization, and their ability to optimize supply variables, i.e. to choose the right prices, the quality of services offered and the extent of skills used[74](Hughes & Mester, 1993).

5. Different types of efficiency:

The concept of efficiency is used to indicate the level of resource utilization that will be reflected in output/input ratio measures. Efficiency represents the level of performance in transforming a set of inputs into a set of outputs. It corresponds to the difference between the maximum output allowed given the inputs consumed and the output achieved the question of maximum output is resolved by using the upper bound of the output set. A unit is considered efficient if it is located on the production frontier. In this context, the output objective is seen as either the provision of services or the achievement of results. Farrell (1957) was the first to decompose total or economic efficiency into technical efficiency and allocative efficiency.

5.1. Technical efficiency:

This is the control and optimal management of production factors (inputs) necessary to obtaining a maximum level of output. An efficient company technically whether it is able to use the fewest resources at its disposal to arrive to the best possible results. Technical efficiency itself has two sub-types of efficiency, are:

5.1.1. Pure technical efficiency :

Pure technical efficiency has two aspects, it can be presented by the ability to the company to optimize its production while keeping the same level of inputs, as it did in the past can take the other direction of minimizing its consumption of resources and factors to reach a certain level of production.

It is based on the good organization of work within the entity, motivation and the control over staff, and over the choice of good decisions, whether short or long term.

However, the measure of pure technical efficiency has no relationship to either the prices of the results of the analysis are not dependent on the availability of products and resources or on the availability of inputs.

[74] Ibid pp293-315

5.1.2. Efficiency of scale :

The efficiency of scale is linked mainly by the notion of economy of scale, it is presents the difference between what has been found and what would be achieved in a competitive equilibrium (when profit is zero), i.e. the company is efficient if it is in a situation where returns to scale are constant, as it is inefficient when returns to scale are increasing or decreasing.

Emphasized that it is said that returns are increasing when there is a variation of production higher than that of the inputs. Conversely, they are decreasing if the change in output is higher than the change in inputs of resources is more important than the change in output.

5.2. Allocation efficiency:

refers to the prices of factors of production. A unit of production is considered to be allocatively efficient if its cost of production is minimal. While allocative inefficiency is due to the combination of inputs in sub-optimal proportions in relation to relative prices.

Technical efficiency and allocative efficiency make up what [75]Berger & Mester (1997) call economic efficiency. However, under certain conditions, the researchers limit themselves to the analysis of economic efficiency, which they consider to be the most important greater than efficiency. We will begin by introducing the concept of efficiency of scale and scope. The various aspects of economic efficiency will then be analysed.

5.3. The different concepts of economic efficiency (X-efficiency):

The concept of cost-efficiency and profit-efficiency have the particularity of being based on economic optimization given price and competition in the market, and not on the choice of the appropriate technology as is the case with the concept of scale efficiency and scope efficiency. The first is based on the study of the cost function, while the second takes the profit function as a starting point. In other words, it is cost minimization or profit maximization. Berger &,Mester (1997) consider these concepts to be not only useful for measuring efficiency differences in the banking sector, but also very interesting for analyzing the performance and productivity of these banks.

The two authors also introduced two concepts of profit efficiency. A standard method for measuring profit-efficiency and an alternative method. The first is based on the quantity of

[75]**Berger, A.N., & Mester, L. J.** Inside the black box: What explains differences in the efficiencies of financial institutions? 1997. Journal of Banking & Finance, 21(7),p895-947

'alternative profit maximisation' outputs and the second is based on the price of 'standard profit maximisation' outputs. Thus, a bank which operates under optimal best practice conditions is the one which manages to achieve the lowest costs or the highest profits, given certain hypotheses relating to cost and profit functions, and which reflects optimal use of technology, better adaptation to market prices and better consideration of stakeholders, including shareholders[76] (Berger & Mester, 1997).

5.4. Cost Efficiency Concept:

The concept of cost efficiency is based on a method that measures a bank's costs and compares them to the costs of the most efficient bank in the market, which implies that the bank minimizes costs given exogenous factors that are known in advance, namely the price of input variables, the quantity of output variables and the quantities of fixed net outputs and other external factors. The authors assume that banks can produce the same outputs when operating under the same conditions.

Cost efficiency is inferred from a cost function that is written as follows:

$$C=C\ (w, y, z, v, uc, \varepsilon c)$$

C: is the variable cost; w: is the variable output quantity vector; y: is the variable output quantity vector; z: is the quantity of fixed net puts; v: is the market variable that can influence performance or control variable; uc: is the inefficiency factor that can increase the cost above the optimal cost; εc: is the error variable. The inefficiency factor uc is interesting to analyse because it encompasses two kinds of inefficiency:

- Inefficiency due to the poor consideration of inputs and outputs, i.e. the implementation of a poor production plan: this is allocative-allocativeinefficiency.
- Inefficiency due to the use of too large a quantity of inputs to produce a given quantity of outputs: this is technical inefficiency technicalinefficiency. It is the difficulty of implementing the chosen output plan.

$$Ln\ C = f(w, y, z, v)+ Lnuc +Ln\varepsilon c$$

[76] Ibid, pp895-947

- The cost efficiency of bank b is thus defined as the estimated cost necessary to produce outputs when b is the most efficient in the market, in a sample with the same exogenous variables (w,y,z,v), divided by the current cost of bank b and adjusted by the error variable.

This ratio could be interpreted as the cost component or the resources that are used efficiently. It is the following ratio:

$$\text{Cost}EFF^b = \frac{C^{min}}{C^b}$$

6. Efficiency measurement:

6.1. Border-based measurement techniques:

Despite the abundance of articles and studies devoted to measuring the efficiency of financial institutions, there is, at present, no consensus on the methodology to be used.[77] Berger and Humphrey (1997), in their excellent review of microeconomic studies of banking efficiency, the vast majority of which focus on industrialized countries, identify five main techniques:

- Three parametric approaches: the Stochastic Frontier Approach SFA the Free Distribution Approach FDD and the Thick Frontier Approach TFA.

- Two non-parametric approaches: the DEA data wrapping method and the Free Disposal Hull FDH

[77]Ibid, p 97,pp 175-212.

6.1.1. Parametric Techniques:

Parametric methods specify the structural relationships between inputs and outputs, usually using a production function, a cost function, or a profit function. This function can be of the Cobb-Douglas, Tran slog, or Fourier type, and the frontier of the production set can take three forms: that of a stochastic frontier, that of a thick Frontier, or that of a Distribution-Free Frontier (Weill, 2004). They thus assume that the set of production possibilities can be represented by a particular function whose parameters are constant. The form of the technical relationship between inputs and outputs is imposed a priori and the parameters of this function are estimated using econometrics (Weil, 2004).

Parametric techniques consider a bank to be inefficient when costs are higher or profits are lower than those generated by the most efficient bank on the market. After taking into account the error variable, the most well-known parametric methods are: The Stochastic Frontier Approach or SFA, Distribution Free Approach or DFA and Thick Frontier Approach or TFA.

a) The Stochastic Frontier approach(SFA):

This approach is based on the cost or profit frontier of the production function that relates inputs, outputs and other factors. It allows the identification of an error variable ε whose distribution is assumed to be different from that of the efficiency term u. It is also called the econometric frontier or compound error model.

Indeed, unlike non-parametric methods, this method takes into account the presence of random errors. It is based on the following hypothesis (Parmeter & Kumbhakar, 2014): inefficient observations follow an asymmetric distribution (usually a standard normal distribution). Thus, inefficient observations must have a truncated distribution since they cannot be negative.

The other hypothesis states that inefficient observations, as well as errors, are orthogonal to inputs and outputs, i.e. there is independence between these variables and errors. Despite these assumptions, the distinction between random errors and inefficient observations remains rather difficult to determine**.**

b) The Free Distribution Approach (FDA):

This method assumes the existence of an average efficiency for each firm over a given time interval and is distinguished by the error variable, which is considered constant (Parmeter & Kumbhakar, 2014). With this approach, a functional form is also specified - as with the SFA-. While there are no precise specifications for the distributions of errors and efficient observations, the first assumption states that a bank's efficiency is stable over time, while random errors tend towards zero on average.

After estimating the cost or profit function for each period, the residual that incorporates inefficiency is calculated as the difference between the average residuals and the average borderline residuals (Parmeter and Kumbhakar 2014).

c) The Thick Border Approach (TFA):

This approach also specifies a functional form, generally the same as the SFA. It does not give an exact estimate of the efficiency of individual banks, but rather gives an estimate of the overall level of efficiency by comparing the sample of banks. The efficiency comparison is thus made by quartile (Weill 2004).

6.1.2. Non-parametric efficiency measurement techniques:

Non-parametric methods construct the efficiency frontier directly from observations using linear programming techniques. They do not impose an a priori form of the relationship between inputs and outputs; in doing so, they do not allow for the consideration of a statistical error term 'unlike the methods of the parametric approach'. The most popular non-parametric technique is Data Envelopment Analysis DEA, which is particularly suitable for measuring the relative efficiency of firms when several inputs are used to produce several outputs and, better still, it makes it possible when the production technique is uncertain or unknown[78] (Bekkar, 2006). It is, therefore, particularly interesting in the case of banks or financial institutions. Its main drawback, however, is that it is sensitive to measurement errors.

The FDH Free Disposal Hull, on the other hand, is a variant of the DEA, the main difference between the two methods concerns the formulation of the hypothesis of return to scale; the DEA is applied with a constant or varying return to scale hypothesis and the results obtained in the two cases are different; whereas the FDH does not require the definition of such a constraint However, the application of the FDH, in order to be reliable, requires a large sample.

[78] **Bekkar, M**. Op.cit

a) Data Envelopment analysis Method (DEA):

The most common method is the DEA method. This method is referred to as a data wrapping method. As its name suggests, it determines an envelope that contains all efficient observations and their linear combinations, with the other observations (the inefficient ones) below. The envelope is linear per fragment. It is interpreted as the efficient technology frontier and is called the efficiency frontier (Seiford&Thrall, 1990). The distance between inefficient observations and the efficiency frontier is the efficiency measure: the efficiency measure is relative.

It is on the principle of iterative comparison that the DEA method identifies efficient observations: each observation is compared to all the others. If an observation is not dominated in terms of production technology by another observation in the sample, then it is said to be efficient and it is given a score of 1[79] (Seiford&Thrall, 1990). Efficient observations are on the efficiency frontier, and thus define it. The main advantage of this method is that it does not impose a priori hypotheses on the relationship between inputs and outputs.

b) The Free Disposal Hull (FDH) method:

This estimation method is a special case of the DEA approach, in fact, the DEA method assumes that a substitution between inputs is possible in order to produce a certain quantity of outputs. On the other hand, the FDH method considers that there is no substitution possible between combinations of inputs at frontier (Seiford&Thrall, 1990).

[80]Berger & Humphrey (1997) presented the main drawbacks of non-parametric methods. They state that the major disadvantage is the elimination of the error variable in constructing the frontier. They also state that nonparametric techniques focus on technological optimization rather than economic optimization. As a result, their ability to measure economic efficiency remains relatively limited.

[79] **Seiford, L.M., & Thrall, R.M**. Recent developments in DEA : The mathematical programming approach to frontier analysis 1990. Journal of Econometrics,p 46, pp 7–38
[80] **Berger, A.N., & Mester, L. J.** Op. Cit, pp 97, pp175-212.

6.2. Interest and limits of the two approaches:

The two approaches can be complementary in providing additional performance information. Researchers use both efficiency measurement methods to compare results. But the choice between the approaches can be made on the basis of the information available and the objectives to be sought. For example, if we are only interested in measuring the technical efficiency of a sector, the non-parametric approach is the most appropriate. However, if in addition to efficiency we also want to measure production technology, then the parametric approach should be adopted.

- The SFA (parametric) method requires a large sample size for the econometric technique to be properly applied. While the DEA method is known to be sensitive to outliers (outliers) (Wilson, 1993).
- The DEA method does not require special assumptions since the boundary is determined by the data. In the health sector, the use of the SFA method is risky since it uses a functional form that requires specific assumptions regarding the distribution of the error term. Therefore, from an empirical point of view, measuring efficiency using the DEA method is more preferable in the health sector.
- The advantage of the DEA method over the SFA method is its ability to perform efficiency estimates in a multi output framework. This makes it more interesting in the health sector (multidimensional character). However, DEA is quite sensitive to the choice of outputs and inputs. Especially since this method does not make it possible to verify whether or not one or more variables should be included in the model. This sometimes leads to biases resulting in an under- or over-estimation of efficiency (Bowlin, 1998).

Table 2.1: advantages and limits of parametric and non-parametric methods

Non-parametric methods	**Parametric methods**
Advantages	**Advantages**
- No special functional relationship specification for the technology - Easy decomposition of inefficiencies: technical inefficiency, allocative inefficiency, scale inefficiency.	- Reduced inefficiencies may have statistical properties -Takes into account hazards other than inefficiency (stochastic frontiers)
Limits	**Limits**
- Reduced inefficiencies have no statistical properties; - Large errors in measurement and/or omission of variables can affect inefficiency measures.	- Need to represent the technology in a particular parametric form - The decomposition of different components of inefficiency is not always possible, especially for multi-product technologies.

Source : Chaffai M. 1997

6.3. Application of non-parametric methods in measuring banking efficiency:

The Data envelope analysis DEA method has been widely used to measure the economic efficiency of production units in various sectors of activity: in manufacturing industry, in electricity distribution, in the analysis of production processes, in distribution and logistics networks, in agriculture, in forestry engineering, etc. In the service sector, we find these methods widely used in the education and higher education sector, in the insurance sector, in the health and hospital sector ...etc.

Concerning the banking sector, the application of non-parametric methods dates back to the mid-1980s, the article by Sherman and Gold Bank branch operating efficiency: Evaluation with Data Envelopment Analysis is generally considered to be the first study applying this technique to the banking sector (Bekkar, 2006). Thereafter, many studies followed in rapid succession. Berger & Humphrey (1997) conduct an incredible literature review that summarizes 55 applications of the technique to the banking sector.

SECTION TWO: Introduction to the DEA Data Envelope Analysis Methodology

This section is a simple presentation of data envelopment analysis (DEA) approach, it's mathematical formulation and it's the different modes.

1. Introduction to the Data Envelopment Approach:

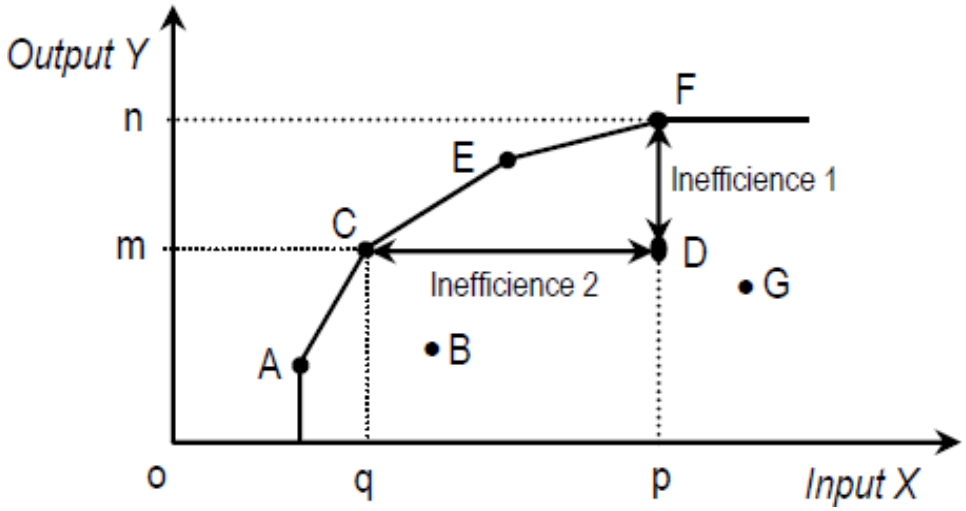
The DEA "Data Envelopment Analysis" method, initially introduced by Charnes, Cooper, and Rhodes in 1978, and by Banker, Charnes, and Cooper in 1984, made it possible to extend the analysis of technical efficiency to multi-product situations and non-constant returns to scale. According to the latter, the frontier is constructed by the linear programming technique. The term "Envelopment" is used to refer to the assumption that the production frontier envelops all observations.

The DEA method assesses the relative efficiency of comparable production units and generates efficiency levels from information on the inputs and outputs of firms. It is based on linear programming and identifies empirical production functions. It is a method based on microeconomic theory, which compares all similar units by taking into account several dimensions simultaneously. It determines the efficiency frontier from the point of view of best practice. Each unit is considered as a Decision-Making Unit (DMU) The DEA method allows the identification of an efficient set that can be used as a benchmark for inefficient operations. Efficient farms have inputs and outputs similar to those of inefficient farms. Thus, they can be used as a reference.

The DEA method produces an empirical production area in pieces or fragments which, in economic terms, represents the production frontier of the revealed best practice. Efficient farms are on the empirical efficiency frontier which indicates the maximum production that can be produced with different combinations of factors for a given technology.

The DEA boundary illustrated in the diagram below can be estimated using two techniques, namely input orientated approach and output orientated approach. The first aims at optimising the consumption of inputs for a given level of outputs, while the second maximises the supply of outputs for a defined level of inputs. According to Berger and Humphrey, 1997; Badillo and Paradi, 1999, these techniques give very similar scores, with an identical ranking of the firms evaluated (Dannon, 2009).

Figure 2.1: Measurement of technical efficiency (in Input and Output)



Source : schéma extrait de Coelli (1996, p.07).

In Figure, units A, C, E and F on the border are considered efficient and their input and output quantities are therefore assumed to be optimal. They are therefore reference units for units B, D and G, which are considered inefficient. In addition, for each inefficient unit, there are two reference units for which inefficiency gaps are defined. For example, unit D can become efficient by increasing its output level (Inefficiency 1, distance to unit close to F) or by reducing its input level (Inefficiency 2, distance to unit C), depending on whether its managers have control over inputs or outputs.

2. Returns to scale:

In the literature, the two most widely used variants of the DEA method are the CCR model (Charnes, Cooper and Rhodes, 1978), which assumes constant returns to scale (CRS model), and the BCC model (Banker, Charnes and Cooper, 1984), which assumes variable returns to scale (VRS model). In the case of constant returns to scale, it is assumed that an increase in the amount of inputs consumed will lead to a proportional increase in the amount of outputs produced. On the other hand, in the case of variable returns to scale (increasing or decreasing), the quantity of outputs produced is assumed to increase more or less proportionally than the increase in inputs. The difference in efficiency measures between the two models gives the efficiency of scale which represents the case of a firm in a situation of perfect competition, and which operates at an appropriate scale; i.e. its marginal cost must be equal to the market price of its product.

It should also be noted that the shape of the DEA frontier varies according to the assumption of returns to scale. Under the constant returns to scale CRS assumption, the

efficiency frontier takes the form of a straight line, whereas under the variable returns to scale VRS assumption, it takes a convex form. Or the example illustrated by the diagram above, based on a simplified technology, producing an output from an input, assuming an input-oriented approach. The first CRS hypothesis makes it possible to calculate the overall technical efficiency of point A, given by the distance between points C and A.

The VRS hypothesis, on the other hand, leads to the pure PTE technical efficiency from points B and A. Both hypotheses result in a technical efficiency due to scaling, which is the ratio between overall and pure efficiency, so that the overall technical efficiency 'CRS hypothesis' ultimately comprises two components, namely the pure VRS efficiency and the scaling efficiency (Coelli, 1996).

3. The mathematical formulation of the DEA approach:

Referring to the Charnes, Cooper and Rhodes model, the construction of a non-parametric production frontier that can be used as a benchmark for efficiency measures, assumes the existence of K inputs and M outputs of N firms over a period t (t=1....T).

The vectors $\boldsymbol{xi}, \boldsymbol{t} \in \boldsymbol{IR}+^{\boldsymbol{K}}$ and $\mathbf{yi}, \boldsymbol{t} \in \boldsymbol{IR}+^{\boldsymbol{M}}$ are respectively the inputs and the outputs of firm i at period t. For any period, t, the Xt matrix of sizes (K×N) and the Yt matrix of sizes (M×N) represent the input and output matrices of the N firms during period t. The idea of the DEA method is to solve for each firm the program that simultaneously determines the optimal weighting vectors of the M outputs(u) and K inputs(v) by solving the following mathematical program [81](Seiford & Thrall, 1990).

$$Maxu,v \ (u' yt/ v' xt)$$

$$\textbf{\textit{sous la contrainte}} : (u' yj/v' xj) \leq 1 \ , j = 1, \dots \dots N$$

$$u, v \geq 0$$

This program means that the efficiency of the ith firm will be obtained as a ratio between outputs and inputs under the condition that this same ratio is less than or equal to 1 for all the other firms in the sample. However, this form of the program is rather difficult to solve. It would admit an infinity of solutions. In this case, it can be reprogrammed by introducing a

[81]**Seiford, L.M., & Thrall, R.M**, Op. Cit, p 46, pp 7–38.

constraint on the components of the vector V according to which v'xi= 1. By changing the notation to differentiate the variables, then the new program is written (Seiford & Thrall, 1990):

$$Max\mu, \nu \ (\mu' yt)$$

$$\boldsymbol{s/c:}\ xi = 1 \qquad [4.2]$$

$$\mu' yj - \nu' xj \leq 0 \ ; \ j = 1, \ldots \ldots, N$$

$$\mu, \nu \geq 0$$

This new program in μ and ν is linear and therefore easier to solve. The use of duality theorems in linear programming would result in the equivalent of the "4.2" program in the form of an envelope:

$$Min\ \theta, \lambda^{\theta}$$

$$\boldsymbol{s/c:}\ -yi + Y\lambda \geq 0$$

$$\theta xi - X\lambda \geq 0$$

$$\lambda \geq 0$$

where λ is a vector of N variables of this dual program. A program of this type must be solved N times; once for each firm in the sample. The estimated value of the scalar variable θi obtained gives the estimate of the technical efficiency (TE) of firm (bank) i at period t.

The value of θ is between 0 and 1 $\mathbf{0} \leq \boldsymbol{\theta} \leq \mathbf{1}$. The unit value (θ =1) marks a point on the frontier and thus a technically efficient firm (bank) according to Farrell's (1957) definition. If θ <1, the firm is technically inefficient. The use of the fixed and variable inputs contained in the vector x is limited to their actual observed level. Θ then indicates the maximum level that production can reach through the use of all the inputs considered. It is therefore an output-based analysis. The level of technical efficiency of production is the result of the value of θ for the observed production (Y)[82].

[82] For more details on DEAapproach consult Luis R. Murillo-Zamorano « Economic Efficiency and Frontier Techniques » Journal of Economic Surveys Vol. 18, No. 1. 2004 .

4. The different models of the DEA approach:

The DEA approach includes several models that address different analytical needs with respect to scaling performance, measurement of distance from the enveloped surface, or the functional form of the envelope being analyzed. The literature generally distinguishes four different models of DEA application:

3.1. **The CCR Model of Charnes, Cooper and Rhodes, 1978:**

This model is based on an evaluation with a production technology with constant efficiency of scale, as well as a linear fragmentation efficiency frontier. The model can be developed with an input or output orientation. In the first case, we assume the possibility of input reduction with constant output, and in the second case we reverse the trend. (Quoted by Bekkar,2006)

3.2. **The BCC Model of Bnaker , Charnes and Cooper , 1984 :**

this model allows, contrary the CCR model, to distinguish between technical efficiency and scale efficiency. This model allows an evaluation under the hypothesis of a non-increasing return to scale, a non-decreasing return to scale, or a variable return to scale. The BCC model is estimated under the assumption of a linear fragmentation efficiency frontier with an input or output orientation. (Quoted by Bekkar,2006).

3.3. **The Multiplicative Model of Charnes, Cooper, Seiford and Stutz. 1983**:

The multiplicative model offers different characteristics at the efficiency frontier, contrary to the CCR and BCC model, using log-linear fragmentation, or Cobb-Douglas to identify the efficiency frontier. The assumptions of efficiency of scale depend on the interpretation given to the production process in the determination of the frontier; the use of a log-linear area assumes a constant efficiency of scale, while the Cobb-Douglas form is more consistent with a variable efficiency of scale (cited by Bekkar,2006).

3.4. **The Additive Model by Charnes, Cooper, Golany, Seiford and Stutz, 1985:**

The additive model is a non-unoriented model, i.e. it does not assume a difference between an input or output orientation. Indeed, i is possible to assume a reduction in input with a simultaneous increase in output. The model assumes a constant output of scale and a linear fragmentation of the efficiency frontier.

Table 2.2: Different DEA models.

Model	Return to Scale	Type of envelopment	Score of efficiency	Type of efficiency	Data inputs	Data outputs
CCR Input / CCR Output	CRS	Piecewise linear	0 - 1	T E	Semi-parametric	Free
BCC Input / BCC Output	VRS	Piecewise linear	0 -1	PTE, SE	Free	Semi-parametric
ADD	CRS, VRS	Piecewise linear	Free	TE, AE	Free	Free
VARMULT	CRS (Log linear)	Piecewise log linear	0 - 1	TE	Free	Free
INVARMULT	VRS (log linear)	Piecewise Cobb Douglas	0 - 8	TE	Free	Free

Source: extract from Gocht et Balcombe 2003, p.05

CRS: constant returns to scale**; VRS:** variable returns to scale

TE: technical efficiency; **AE**: Allocative efficiency

PTE: pure technical efficiency; **SE:** efficiency of scale

VARMULT: Multiplicative variant; **INVARMULT**: Multiplicative invariant

Charnes, Cooper, Lewin and Seiford, 1995 suggest that the success of the DEA is due primarily to the following reasons (cited by Weill, 2004):

- It provides conclusions on each of the observations rather than on a single entire population,
- It provides a measure for each DMU in terms of the use of input factors 'independent variables' to produce the desired output (the dependent variable),
- It allows the use of several categories of inputs and outputs that do not necessarily have the same units of measurement,
- It is possible to use binary variables,
- Does not impose any restrictions on the form of the production function,
- Allows to conclude on the existence of potential for improvements and adjustments possible for a specific DMU,
- Schematizes the best possible practice rather than a general trend often given by regression methods.

SECTION THREE: A Review on the comparative studies of efficiency between Islamic banking and conventional banking.

This section represents a review on the comparative studies of efficiency between Islamic banking and conventional banking.

1. Literature review:

The comparison between Islamic banks and conventional banks is carried out through two methods: an approach by calculating returns via financial and economic ratios and the so-called efficiency approach, the stochastic frontier approach. It is in this sense that Samad and Hassan (1999), Iqbal (2001)5 Samad (1999), Bashir (1999), Hassanet Bashir (2003),Bader, Ariff, and Shamsher (2007) have compared the performance, in In particular, the profitability of Islamic banks with their conventional counterparts in using financial ratios, while other authors, namely Al-Jarrah and Molyneux (2003),Shammari (2003), Hussein(2004), Brown and Skully (2005) and Bader , Ariff and Shamsher (2007) used the stochastic frontier approach for the analysis of efficiency between conventional and Islamic banks Bahrain over the period (1985-2001) is relatively stable and in line with the banks of the Organisation for Economic Co-operation and Development (OECD).

Hassen noted, that in general, there is no great difference in efficiency between Islamic banks and the traditional investment banks. On the other hand, the only Islamic bank in its sample outperformed their conventional counterparts it was due to a lack of competitions where the Islamic commercial bank has been able to reduce costs inputs and loads.

In the same vein, several economists have supported the idea of efficiency of Islamic banks compared to conventional banks as shown by Hassan and Bashir (2003), Sarker (1999), Bashir (1999), Yudistira (2004) and Hassen (2004).

However, there is no conclusive evidence in this respect. To further substantiate on this controversial issue, the study Shamsher Mohamad, Taufiq Hassan and Mohamed Khaled I. Bader (2009) used a new set of international data over the period (1990-2005) and applied the stochastic frontier approach (SFA) to measure efficiency -cost of 37 conventional banks and 43 Islamic banks at the level of the size, age and region. The results show that there was no difference in between the overall efficiency performance of conventional banks and the overall efficiency the Islamic ones.

Moreover, Mohamed Khaled I. Bader; Shamsher Mohamad; Mohamed Ariff and, Taufiq Hassan (2008) used the method of data envelopment analyses DEA to masur cost, revenue and profit efficiency of Islamic banks versus conventional banks. They measured the cost, revenue and profit efficiency of 43 Islamic and 37 conventional banks over the period 1990-2005 in 21 countries using Data Envelopment Analysis. The result of this study shows that there is no significant different between efficiency in Islamic banks and conventional banks. Also, both of Habib Ahmed, Syed Zulfiqar Ali Shah and Idrees Ali Shah (2011) utlised Data Envelopment Analysis DEA to measure efficiency of Islamic and conventional banks. The result of their study shows that Islamic banks were technically more efficient than its conventional.

In the same context Jill Johnes, Marwan Izzeldin and Vasileios Pappas (2014) examined efficiency in 19 Islamic bank and 50 conventional bank in the GCC region (2004-2007) using financial ratio analysis (FRA) and data envelopment analysis (DEA).This study showed two different results : The FRA suggests that Islamic banks are less cost efficient and more revenue and profit efficient than conventional banks while DEA results suggests that gross efficiency is significantly higher, on average, amongst conventional compared to Islamic banks, and the difference is significant for both pure technical and overall technical efficiency across the pooled set of efficiencies. In the same year Dr. Said Jaouadi, Rachida Ben Jazia and Azza Ziadi examined the Efficiency and the Effectiveness of Islamic and Conventional Banks in Indonesia using empirical methods. The result of this study shows that Islamic banks in Indonesia are more effective and efficient than conventional banks.

In June 2016 Majed Alharthi economics and Finance Plymouth Business School Plymouth University used Data Envelopment Analysis DEA to measure of Efficiency, Profitability and Stability in the Banking Sector he made a cooperation between Islamic, Conventional and Socially Responsible Banks in MENA zone and United Kingdom UK. The result of his study about efficiency shows that Islamic banks are mor efficient than conventional banks.

Conclusion:

This chapter presented the concept of efficiency, its different types and how this efficiency can be measured. It presented the main approaches used to measure efficiency and focused on the data envelopment analyses and it ended with a small A Review on the comparative studies of efficiency between Islamic banking and conventional banking**.**

The main results that we can conclude from this chapter are:

- Economic efficiency is a concept that has been widely debated in recent years, mainly due to increased competition in the financial markets.
- Indeed, this concept allows for comparisons between banks in terms of minimising costs or maximising the benefits of their activity's profits through the use of efficiency measurement approaches like data envelopment analysis DEA.
- In other words, it is a question of verifying whether they act in the best possible way, taking into account the constraints of the market.

CHAPTER THREE: MEASUREMENT OF EFFICIENCY OF CONVENTIONAL AND ISLAMIC BANKS IN MENA REGION USING DEA.

Introduction:

A dominant place in the financial systems of MENA countries is occupied by conventional banks that ensuring the allocation of available resources among all productive sectors. It thus appears that the efficiency of a financial system, based on the banking system, necessarily requires effective intermediation.

The countries of the MENA region, and more particularly the North African countries, applied a policy of financial repression until the mid-1980s, then opted for financial liberalization policies in the framework of structural adjustment plans set up by the Bretton Woods institutions. These reforms consisted of a redefinition of monetary policy, the establishment of a prudential framework and the restructuring of the banking system. And in the face of the internationalization of economies and increased competition, it has become imperative to strengthen its competitiveness. With financial liberalization underway, banks have begun to look for new sources of income while developing new business lines to diversify their resources.

Indeed, with the rise of financial innovations impregnated by an increasingly competitive environment, banking products have multiplied. It was all a question of speed and size, with the aim of standing out through the services offered and gaining significant market share. In this context, in order to understand the efficiency of the sector, the analysis carried out through traditional financial analysis tools have become insufficient today. The use of new performance indicators is becoming increasingly necessary. As a result, it has become imperative in performance analysis to look beyond the accounting aspect to economic performance, which highlights the efficient and effective management of the resources available to banks.

As the evolution that Islamic finance and banking know those recent years specially after the financial crises the interest about the Islamic finance had increased and many economists was interested in studying the efficiency of Islamic banks and compare them to conventional banks. So, banking system in the MENA region was one of the interesting systems to studies as the most of countries in MENA zone are Muslim countries and most of these countries have a dual banking system: Islamic banking and conventional banks.

In the first section of the chapter, we present the banking system in MENA region: evolution of banking system, conventional banks and Islamic banks in MENA region.

In the second section we are going to represent the methodological elements used to fulfil the study: the sample, the output and the input used in the study. Finally, in the third section we are going apply the non-parametric technique DEA Data Envelope Analysis to measure the technical efficiency of Islamic and commercial banks in the North African region (Algeria, Tunisia, Morocco and Egypt…) and in the Medill east (Qatar, Bahrain and the United Arab Emirates ...) by adopting the intermediation approach.

SECTION ONE: Banking system in MENA region.

This section presents the banking system in middle east and North Africa region. It present both of conventional and Islamic banking in this region.

I. Banking system in MENA region:

Thanks to the improvements in macroeconomic conditions, Middle East banking sector will see better overall financial performance in 2019. The profitability pressure in regional banking system will be alleviated, largely driven by widening net interest margins and increasing lending activity, as well as their strong culture of cost management. Banks have significant low-cost demand deposits on their balance sheets. They reprice loans as the interest rates rise in line with US monetary policy tightening, and thus their net interest income will be higher. Moreover, the lending growth picked up modestly in 2018 and will accelerate slightly in 2019 on the back of higher government spending. This will result in some improvements in the profitability of banks. However, lending growth is projected to remain in the mid-single digits and profit growth is forecast to be modest. In addition, banks in the region are making consistent efforts to manage operating costs effectively. Their cost to income ratios have been well controlled, although they have invested heavily in digitalisation.

Most banks in the region are expected to be able to withstand sudden stress. Their loss absorption buffers have been stronger, partially due to the implementation of International Financial Reporting Standards 9 (IFRS 9), which came into force on January 1, 2018. However, high levels of credit concentration and related-party lending remains a key risk, and a modest rise in problem loans is expected due to the lagging effect of the economic slowdown. Overall, the impacts of IFRS 9 on banks are manageable. The capital positions of banks will remain broadly adequate, as the lending growth will be modest and the profitability will be stable. Moreover, governments' willingness and capacity to support banks remain high. In addition, Middle East banking sector's liquidity will remain at a healthy level in 2019, on the back of current oil prices and sovereign support. Banks' funding has been less pressured and is expected to remain stable.

Nevertheless, the financial performance of Qatari banks has been affected negatively by the continued boycott imposed by other Gulf states. Some banks in the country also face potential risks posed by their international operations, specifically the exposure to Turkey. In addition, the profitability of banks in Oman and Bahrain is expected to deteriorate, because of

the higher loan loss provision charges. The fiscal balances of Oman and Bahrain continues to be under pressures, which reduces the governments' capacity to support banks. In October 2018, Bahrain received $10 billion (BHD 36.73 billion) in financial aid from Saudi Arabia, Kuwait and the UAE, and its government announced a package of reforms that aims to balance its budget by 2022.

Middle East banks are increasingly looking to gain scale and stay competitive through consolidation. Many banks in the region have been involved in takeover or merger talks, especially those in the UAE and Saudi Arabia. For example, Abu Dhabi Commercial Bank announced that it is in merger talks with Union National Bank and Al Hilal Bank in September 2018, and National Commercial Bank, Saudi Arabia's biggest lender, has started initial talks with Riyad Bank for a merger in December 2018. However, only some of these talks can result in a merger. Bank mergers are complex in the region, largely due to substantial government ownership of major banks. Increasing regulatory demand, higher compliance costs, and rapid technological innovations are also key drivers of consolidation. Looking forward, the bank consolidation and merger trend is expected to continue in the region, which will help further consolidate the over-crowded banking systems and improve banks' funding and profitability.

In conclusion, despite the downside risks, the outlook for the Middle East region is positive. The economic growth for the region is expected to strengthen in 2019, and the banking sector on the whole, will deliver good financial performance[83].

1. **Conventional banking industry in MENA region:**

A dominant place in the financial systems of MENA countries is occupied by conventional banks that ensuring the allocation of available resources among all productive sectors. Most of conventional banks in middle east and north Africa region provide Islamic banking services along with conventional banking services, through Islamic banking windows. These windows were crated to meet the needs of Muslim customers of Middle East and North Africa region.

[83] Prospects for the middle east banking improve. Consult the http://www.theasianbanker.com , 3august 2020.

2. Islamic banking industry in MENA region:

In the Middle East and North African (MENA) countries Islamic finance has become one of the important elements in t societies development agendas. As Islamic finance caters to the financial needs of the people without conflicting with their social and religious values it has become a growing business in MENA zone.

Among the financial institutions that emerged in the Islamic financial services industry Islamic banks were the first financial institutions that emerged. As the conventional financial sector in MENA countries diversified into capital markets and other segments, the Islamic financial services industry has expanded as well due the emerge of many other non-banking financial institutions and services. Now days the Islamic financial services industry not only confine on Islamic banks but also comprises mutual funds ana investment, takaful institutions and project finance companies. Capital market products and new instruments of financing and have also emerged.

The majority of Islamic banks in MENA region are owned by the privet sector. the majority of MENA countries has a dual banking system where Islamic banking exist along with the conventional banking and financial institutions. Iran is the only country in MENA region that classifies all its banks as Islamic majority of them are state-owned. The most developed Islamic banking sectors are found in Bahrain, Saudi Arabia, Kuwait, Qatar and United Arab Emirates. The nature of funding and operations of Islamic banks are somewhat different from that of conventional banks. In these countries Islamic banks raise depositor funds mainly under three categories:

2.1.Demand Deposits:

These deposits are similar to current accounts in conventional banking system. It can be withdrawn by the depositor at any time and do not give any returns to the depositor. the relationship between the bank and the depositor for these types of deposits is that of debtor and creditor. Thus, the amounts in this category of deposits are a liability in the accounting books of the bank. The primary motives of the individuals and businesses in keeping such accounts with the banks are Safekeeping and payments facilitation.

2.2.Unrestricted Investment Accounts:

The bank utilizes raise funds in its general investment and financing activities based on their own judgment, then the bank and the holders of unrestricted investment accounts share the profits or losses from the overall business of the bank. The account holders do not have the right to intervene on how, where, and for what period the bank invest the funds. Except that the investment avenues and methods should go with Shariah principles – a fiduciary responsibility of Islamic banks. In this account the contractual relationship between the depositor and the bank is that of unrestricted Mudarabah, with bank acting as Mudarib. Moreover, the account holder is allowed to withdraw his funds any time; however, such early withdrawal will reduce the proportion of profit share that he will receive. The unrestricted investment accounts are similar to quasi equity due to the combination of debt like feature (i.e., possibility of withdrawal) with non-voting equity-like features (i.e., sharing in profit and losses by depositors and free hand to bank in investment decisions). This also gives rise to a corporate governance issue that is how to keep investment risk and return preference of the bank aligned to that of the unrestricted account holders.

2.3.Restricted Investment Accounts (also called special investment accounts):

the bank invests raise funds only in the specific projects and sectors pre-agreed between it and the account holders. The profits and losses from the specific investments are shared between the bank and the account holders who are expected to keep the investment account up to the end of its maturity. The contractual relationship between the bank and the depositor is that of restricted Mudaraba. Given to these features, this category of accounts are not liabilities of the bank, they are considered as a kind of equity of the bank where the shareholders do not have full voting rights. This last feature rises the corporate governance issue of how to keep the investment and risk preference of the bank and the depositors in alignment with each other or how to protect the interests of the depositors. The closest counterparts of such arrangement in conventional finance are the closed end mutual funds or collective investment schemes. The issues of governance, disclosure and protection that arise therein are also relevant here. The restriction on premature withdrawal of funds and the specificity of investment avenues create higher risk for the depositors in restricted investment accounts but such kind of investments can also bring higher returns. Generally, the minimum investment requirements in these

accounts are higher than that in unrestricted investment accounts and these are offered for wealthy or sophisticated investors[84].

Restricted and Unrestricted investment accounts constitute one of the distinguishing funding arrangements between conventional banking present-day Islamic. The amounts thus raised constitute limited-term, non-voting equity closer to trust funds. The Accounting Standards issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) therefore classifies unrestricted investment accounts as a separate entry between liabilities and owners‟ equity on the balance sheet of Islamic banks. Whereas it treats restricted investment accounts as separate off-balance sheet item.[85] Only the banks in jurisdictions which follow AAOIFI standards (Bahrain in MENA) report data in this way. Banks in other countries of MENA region report all deposits on their balance sheet.

[84] **Ali, S. S**. Islamic banking in the MENA region. *The World Bank and Islamic Development Bank, February*. 2011

[85] Statement of Financial Accounting No.2 and Financial Accounting Standard No.1 in AAOIFI 2008

SECTION TOW: Methodological elements.

In this section we are going to represent the methodological element of this study. We are going to present the sample determination, the variables choice, the type of orientation and the adopted approaches.

I. Methodology:

Before proceeding to measure the efficiency of conventional and Islamic banks in MENA region using DEA method, it is necessary to present the choices of hypotheses prior to the construction of an DEA model.

1. Sample determination (DMU):

In order to conduct a meaningful evaluation of efficiency, the DEA Method requires the selection of the homogenous decision-making units operating in comparable environments in terms of opportunities and constraints.

As a response, and in the aim of assessing the efficiency of conventional and Islamic banks in MENA region, in three years from 2016 to 2018, we have chosen to measure the efficiency of the 20 bank from MENA region (10 Islamic banks and 10 conventional banks) to determine the difference in terms of efficiency between the two types of bank (Islamic and conventional).

The table below represents the chosen banks to fulfill the study.

Table 3.1: Sample banks

BANK	COUNTRIE	THE TYPE OF BANK
BNA Algeria	Algeria	Conventional
ABC Bank Algeria	Algeria	Conventional
Popular Bank Morocco	Morocco	Conventional
Export Development Bank of Egypt EBE	Egypt	Conventional
Attijari bank Tunisia	Tunisian	Conventional
Arab Tunisian Bank ATB	Tunisian	Conventional
Bank Sohar Oman SAOG	Oman	Conventional
First Abu Dhabi Bank FAB in UAE	Emirates Arab Union EAU	Conventional
National Bank of Bahrain NBB	Bahrain	Conventional
Capital bank Jordan	Jordan	Conventional
Oumnia Bank Morocco	Morocco	Islamic
Faysel Bank Egypt	Egypt	Islamic
Barakah Bank Algeria	Algeria	Islamic
Zitouna Bank Tunisia	Tunisia	Islamic
Al salam bank al Bahrain	Bahrain	Islamic
Bahrain Islamic Bank BisB	Bahrain	Islamic
Dubai Islamic Bank UAE	Emirates Arab Union EAU	Islamic
Sharjah Bank UEA	Emirates Arab Union EAU	Islamic
Alizz bank Oman	Oman	Islamic
Jordan Islamic Bank	Jordan	Islamic

2. Choice of returns to scale:

The use of DEAP software to get the results of the efficiency measurement of Islamic and conventional banks requires us to make a few decisions before proceeding, among which, we should choose a type of returns to scale whether CRS or VRS.

On the one hand, the assumption of constant returns to scale requires that the DMUs operate in an environment characterized by perfect competition, which is impossible to realize. This implies the choice of the variable return on scale assumption. On the other hand, the CRS hypothesis helps us to make comparisons between all the banks some are their ability to make decisions about their sizes.

So, in our work we're going to take into consideration both hypotheses, namely constant return on scale (CRS) and variable return on scale (VRS).

3. **Choice of model:**

The DEA method records the existence of four models, two of which are fundamental. The first model is the CCR, which assumes perfect competition under the assumption of constant returns to scale. While the second model the BCC assumes CRS for the measure of total efficiency and VRS for the measure of pure efficiency.

Since we chose to conduct our study under both hypotheses, we will use both models mentioned.

4. **Choice of orientation:**

When we measure the efficiency, using the DEA method, of a company that seeks to minimize its inputs while keeping a fixed level of outputs, we say that its system is input-oriented.

On the other hand, when it has a given level of inputs and aims to maximize its outputs, the measurement system is said to be output-oriented.

The choice of orientation has no impact on the results if we assume a constant CRS scale performance. On the contrary, if we assume a variable scale performance VRS, the results obtained by opting for the two orientations will be different.

In our study, we select an input orientation because the quantity of inputs appears to be the variable on which primary decisions are made.

5. **Choice of approach:**

The construction of the DEA method requires a precise determination of inputs and outputs. This determination focuses on two approaches that imply taking deposits as an output or input:

- The production approach which considers the bank as a firm that uses recourses (input) to distribute products and services to customers. The deposits in this approach are considered as an output.

- The intermediation approach which assumes that the production process for a financial institution requires intermediation. The financial institution collects deposits and makes loans with the aim of making a profit. The deposits in this approach are considered as an input and loans are considered as an output.

In our work, we have chosen intermediation as an approach that we believe is more appropriate to the bank's core business. That is, we consider financial institutions as agents that mediate between agents in need and agents with financing capacity. In this sense, the bank produces intermediation services

6. Choice of variables:

In order to make the choice of outputs and inputs, we have opted for the variables used by the researchers in previous studies, the logic used to build the model and, above all, the availability of data.

Moreover, one of the conditions necessary for the application of the DEA method is that the number of observations must be greater than or equal to twice the product of the number of outputs multiplied by the number of inputs. We have chosen three inputs and two outputs to meet this condition.

The outputs and inputs used are measured in in thousands monetary units.

Before applying the DEA method, it is necessary to describe all the outputs and inputs used and justify the choice

a) Inputs:

The banking inputs choosing to fulfil this study are: 1 total deposits, 2 capital and 3 staff costs.

The table below presents the description of the variables.

Table 3.2: The inputs.

Variable	Description	Justification	References
Total deposits	It represents the level of deposits collected by a bank from its customers (clients and financial institutions).	deposits reflect the main activity of the bank and they serve as resources for the granting of credits.	Athanassopoulos AD, Giokas D (2000)[86].
Capital	Bank capital is the difference between a bank's assets and its liabilities, and it represents the net worth of the bank or its equity to investors.	Capital is supposed to protect a bank from all sorts of uninsured and unsecured risks apt to turn into losses. This is where we get to the two principal functions of capital to absorb losses and to build and maintain confidence in a bank. Capital is needed to allow a bank to cover any losses with its own funds. That's why capital is important in the measurement of bank's efficiency.	Weill, L. (2006)[87].
Staff costs	It represents Wages, salaries and social insurance received by the bank employees	Personnel expenses or staff costs represent a significant cost paid by the bank.	Aitabdellah, K., & Boulahrir, L. (2015)[88].

Source: Elaborated from the literature review.

b) **Outputs:**

The banking outputs choosing to fulfil this study are: 1 total credit and 2 the net banking income NBI. The table below presents the description of the variables.

[86] **Athanassopoulos AD, Giokas D** « The Use of Data Envelopment Analysis in Banking Institutions: Evidence from the Commercial Bank of Greece », 2000.

[87] **Weill, L.** Propriété étrangère et efficience technique des banques dans les pays en transition : Une analyse par la méthode DEA 2006. Revue Economique, 57(5), PP 1093-1108

[88] **Ait Abdellah, K., & Boulahrir, L**. L'efcience opérationnelle des banques islamiques et des banques conventionnelles au Moyen-Orient. Une comparaison à l'aide de l'analyse d'enveloppement des données. 2015 Critique économique, (33).

Table 3.3: The outputs

Variable	Description	Justification	References
Total credit	it represents the level of credit granted by a bank to its customers (clients and financial institutions).	Credits generate most of the bank's income and constitute the objective of intermediation.	Athanassopoulos AD, Giokas D (2000)[89].
Net banking income NBI	The NBI represents net interest income and non-interest income (fees and commissions).	A bank's activity and profitability are measured by its net banking income.	Yudistira, D. (2004)[90].

Source: Elaborated from the literature review.

7. The descriptive study of inputs and outputs:

Before presenting the results given by the DEA method, it is first necessary to present some descriptive statistics relating to the variables used to measure the efficiency of conventional and Islamic banks in MENA region during the period 2016-2018

[89] **Athanassopoulos AD, Giokas D** « The Use of Data Envelopment Analysis in Banking Institutions: Evidence From the Commercial Bank of Greece », 2000.

[90] **Yudistira, D.** Efficiency in Islamic banking: an empirical analysis of eighteen banks 2004. *Islamic economic studies*, *12*(1).

Table 3.4: Descriptive study of inputs and outputs in conventional and Islamic banks

Descriptive study of inputs and outputs.						**In thousand**
Variables	Number	Year	Minimum	Maximum	Average	Stander deviation
Total credit	20	2016	7998,319328	95807559,18	9748852,154	22160840,32
	20	2017	24421,351322	93749592,375766	10532510,943729	22436873,833154
	20	2018	65140,5547	101377904,8241	11545249,6008	23649664,9994
Net banking income NBI	20	2016	8,897676718	4749191,567	554449,9016	1111832,071
	20	2017	10,600707	4484115,724983	559692,976921	1081410,294348
	20	2018	1796,2323	4469762,3326	606189,8938	1085973,7098
Total deposits	20	2016	16806,72269	116462081,6	11600450,87	26607396,18
	20	2017	19453,367598	116111640,571818	12633560,902019	27013523,421069
	20	2018	31879,4349	137684419,3074	14088782,0246	31515729,7373
Capital	20	2016	9077,210755	2968306,867	537534,9945	756320,7481
	20	2017	40741,495213	2967336,963921	541454,419676	786237,280339
	20	2018	33925,9058	3748330,2164	798824,2811	1078250,0511
Staff costs	20	2016	2076,124567	64861744,32	3349798,208	14480466,66
	20	2017	2611,093265	47111657,773087	2456950,763304	10512817,904738
	20	2018	1762,7420	862293,6404	102915,4314	200749,5053

Source: results obtained from EXCEL

Descriptive statistics show that the total deposits and total credit during the three years correspond to very large sums compared to other inputs and outputs. In addition, the variables show a significant disparity and an important interval between the minimum and maximum. The variables increased from 2016 to 2018, reflecting the improvement in banking activity and the increase in the level of intermediation.

SECTION THREE: Measuring the efficiency of conventional and Islamic banks in MENA region using DEA method

Results of the study:

We focus on the results obtained by the application; we will represent them an interpret them.

1. **Results presentation**:

We applied the DEA method on the model using DEAP version 2.1 software. Subsequently, we obtained results in the form of efficiency scores under the two return to scale assumptions. The Constant Return to Scale (CRS) hypothesis is used to determine the efficiency scores.

gives us the scores for overall technical efficiency, while the assumption of variable scale efficiency gives us the scores for pure technical efficiency. Scale efficiency is given by the CRS/VRS ratio. The results obtained for each year are the following

Table 3.5: Efficiency score for 2016.

Number	Bank	Crste	Vrste	Scale	
1	BNA Algeria	0,883	1	0,883	Drs
2	ABC Bank Algeria	0,728	0,879	0,827	Irs
3	Popular bank Morocco	1	1	1	-
4	Export Development Bank of Egypt EBE	0,724	0,877	0,826	Irs
5	Attijari bank Tunisia	0,912	0,923	0,988	Drs
6	Arab Tunisian Bank ATB	1	1	1	-
7	Bank Sohar Oman SAOG	0,896	0,904	0,991	Irs
8	First Abu Dhabi Bank FAB in UAE	1	1	1	-
9	National Bank of Bahrain NBB	0,687	0,71	0,968	Drs
10	Capital bank Jordan	1	1	1	-
11	Oumnia Bank Morocco	0,107	1	0,107	Irs
12	Faysel Bank Egypt	1	1	1	-
13	Barakah Bank Algeria	1	1	1	-
14	Zitouna bank Tunisia	0,872	0,933	0,935	Irs
15	Al salam bank al Bahrain	1	1	1	-
16	Bahrain Islamic Bank BisB	1	1	1	-
17	Dubai Islamic Bank UAE	1	1	1	-
18	Sharjah Bank UEA	0,7	0,808	0,866	Drs
19	Alizz bank Oman	0,296	0,366	0,809	Irs
20	Jordan Islamic Bank	1	1	1	-

Irs: increasing return to scale, **Drs:** decreasing return to scale

Source: results obtained by DEAP software.

Table 3.6: Efficiency score for 2017.

Number	Bank	crste	vrste	Scale	
1	BNA Algeria	1	1	1	-
2	ABC Bank Algeria	0,877	1	0,877	irs
3	Popular bank Morocco	1	1	1	-
4	Export Development Bank of Egypt EBE	0,736	1	0,736	irs
5	Attijari bank Tunisia	1	1	1	-
6	Arab Tunisian Bank ATB	1	1	1	-
7	Bank Sohar Oman SAOG	0,913	0,923	0,989	irs
8	First Abu Dhabi Bank FAB in UAE	0,976	1	0,976	drs
9	National Bank of Bahrain NBB	0,703	0,723	0,973	drs
10	Capital bank Jordan	0,779	0,799	0,975	irs
11	Oumnia Bank Morocco	0,609	1	0,609	irs
12	Faysel Bank Egypt	1	1	1	-
13	Barakah Bank Algeria	0,628	0,757	0,829	irs
14	Zitouna bank Tunisia	0,858	1	0,858	irs
15	Al salam bank al Bahrain	0,788	0,806	0,978	irs
16	Bahrain Islamic Bank BisB	1	1	1	-
17	Dubai Islamic Bank UAE	1	1	1	-
18	Sharjah Bank UEA	0,69	0,799	0,864	drs
19	Alizz bank Oman	0,392	0,451	0,869	irs
20	Jordan Islamic Bank	1	1	1	-

Irs: increasing return to scale, **Drs:** decreasing return to scale

Source: results obtained by DEAP software

Table 3.7: Efficiency score for 2018.

Number	Bank	crste	vrste	Scale	
1	BNA Algeria	1	1	1	-
2	ABC Bank Algeria	0,762	0,885	0,861	Irs
3	Popular bank Morocco	0,917	1	0,917	drs
4	Export Development Bank of Egypt EBE	0,49	0,525	0,933	Irs
5	Attijari bank Tunisia	0,857	0,876	0,978	drs
6	Arab Tunisian Bank ATB	1	1	1	-
7	Bank Sohar Oman SAOG	0,7	0,704	0,995	Irs
8	First Abu Dhabi Bank FAB in UAE	1	1	1	-
9	National Bank of Bahrain NBB	0,397	0,399	0,997	Irs
10	Capital bank Jordan	0,434	0,45	0,964	Irs
11	Oumnia Bank Morocco	0,477	1	0,477	Irs
12	Faysel Bank Egypt	1	1	1	-
13	Barakah Bank Algeria	0,57	0,683	0,835	Irs
14	Zitouna bank Tunisia	0,808	1	0,808	Irs
15	Al salam bank al Bahrain	0,526	0,538	0,977	Irs
16	Bahrain Islamic Bank BisB	1	1	1	-
17	Dubai Islamic Bank UAE	0,936	1	0,936	drs
18	Sharjah Bank UEA	0,66	0,84	0,786	drs
19	Alizz bank Oman	0,289	0,327	0,884	Irs
20	Jordan Islamic Bank	0,963	0,965	0,999	Irs

Irs: increasing return to scale, **Drs:** decreasing return to scale

Source: results obtained by DEAP software.

2. Results analysis:

If we refer to pure technical efficiency dimension, i.e., efficiency under the assumption of a variable return on scale, in 2016, twelve banks are pure technically efficient, including five conventional banks (BNA Algeria, Banque Popular Morocco, Arab Tunisian Bank ATB, FAB in EAU and Capital bank Jordan) and seven Islamic banks (Oumnia Bank Morocco Faysel Bank Egypt, Barakah Bank Algeria, Al salam bank al Bahrain, Bahrain Islamic Bank BisB, Dubai Islamic Bank UAE and Jordan Islamic Bank). These banks represent the best practices and are considered as benchmark banks within the analyzed sample and form an efficiency frontier.

In 2017, thirteen banks are pure technically efficient including six conventional banks (the same banks as 2016 in addition to ABC bank Algeria and Attijari bank Tunisia which become pure technically efficient in this year) and six Islamic banks. In this year both Barakah Islamic Bank Algeria and Al salam Islamic bank al Bahrain went pure technically inefficient while Zitouna Islamic bank Tunisia become pure technically efficient.

In 2018, nine banks are pure technically efficient including four conventional banks and five Islamic banks. In this year ABC bank Algeria, Arab Tunisian Bank ATB, Attijari bank Tunisia and Jordan Islamic Bank become pure technically inefficient.

During the last three years, Alizz bank Oman scored the lowest pure technical efficiency score.

3. Benchmark banks:

In the DEA approach, each inefficient bank is compared to a group of "referents" or "peers' group" banks that are efficient and close to it in terms of combinations of inputs and outputs.

The banks that represent a strong occurrence as a "referent" to other banks are called benchmarks. The following table shows the occurrence of the banks as benchmarks during the three years:

Table 3.8: Number of occurrences of banks as benchmarks.

2018		2017		2016	
Bank	Number of occurrences	Bank	Number of occurrences	Bank	Number of occurrences
BNA Algeria	2	ABC Bank Algeria	2	Popular bank Morocco	6
Arab Tunisian Bank ATB	1	Popular bank Morocco	5	First Abu Dhabi Bank FAB in UAE	1
First Abu Dhabi Bank FAB in UAE	2	Arab Tunisian Bank ATB	1	Capital bank Jordan	1
Oumnia Bank Morocco	6	Oumnia Bank Morocco	3	Oumnia Bank Morocco	5
Faysel Bank Egypt	7	Faysel Bank Egypt	1	Barakah Bank Algeria	3
Banque Zitouna Tunisia	1	Dubai Islamic Bank UAE	2	Al salam bank al Bahrain	1
Bahrain Islamic Bank BisB	8	Jordan Islamic Bank	6	Bahrain Islamic Bank BisB	1
				Dubai Islamic Bank UAE	4
				Jordan Islamic Bank	2

Source: Design based on the results of DEAP software.

According to the table above, Oumnia Islamic Bank Morocco is the benchmark of our sample during the three years. As results shows Oumnia Islamic Bank is the benchmark for five other banks in 2016, three banks in 2017 and six banks in 2018.

During the tow first years both Jordan Islamic bank and Popular bank Morocco were benchmarks for other banks; Popular bank Morocco was benchmark for six banks in 2016 and

for five banks in 2017.As for Jordan Islamic bank, it was benchmark for tow bank in 2016 and for six banking 2017.

During the tow last years both Arab Tunisian Bank ATB and Faysel Islamic bank Egypt were benchmarks for other banks: Arab Tunisian Bank ATB was benchmark for one bank during the tow years 2017 and 2018. As for Faysel Bank Egypt, it was benchmark for one bank in 2017 and seven banks in 2018.

In 2018 Bahrain Islamic Bank BisB had the highest number of occurrences. It was benchmark for eight banks while in 2016 It was benchmark for only one bank contrary to Dubai Islamic Bank UAE that was benchmark for four banks in 2016 and for two banks in 2017 then disappear in 2018.

4. The decomposition of efficiency:

We are going to verify whether there are any significant differences in the scores of Islamic and conational calculated in the tables above using the Mann-Whitney test, a rank comparison non parametric test. The results obtained by the test are represented in the table below:

Table 3.9: Efficiency decomposition of conventional and Islamic banks from 2016 to 2018.

	Technical efficiency				**Pure technical efficiency**				**Scale efficiency**			
	Rank sum		**z/p**		**Rank sum**		**z/p**		**Rank sum**		**z/p**	
	Cnv	**Islmic**	**Z**	**P**	**Cnv**	**Islmic**	**Z**	**P**	**Cnv**	**Islmic**	**Z**	**P**
2016	**101**	**109**	**-0.323**	**0.7466**	**113.5**	**96.5**	**0.725**	**0.4683**	**108**	**102**	**0.242**	**0.8085**
2017	**93**	**117**	**-0.937**	**0.3487**	**98.5**	**111.5**	**-0.577**	**0.5640**	**96**	**114**	**-0.703**	**0.4821**
2018	**102**	**108**	**-0.229**	**0.8193**	**111**	**99**	**0.476**	**0.6344**	**87**	**123**	**-1.371**	**0.1704**

Cnv: conventional Islmic: Islamic

Source: developed from statistical processing using STATA 11 software.

According to the results obtained by the Mann-Whitney test, no significant difference was noted in 2016 or in the tow next years while Islamic banks have scored the highest rank of technical efficiency during the three years of study, the rank of Islamic banks increased during the period of the study contrary to the rank of conventional banks. In 2016 conventional bank scored a higher rank of pure technical efficiency than Islamic bank it was the same case scenario for 2018 while in 2017 Islamic banks scored the highest rank of pure technical efficiency, no significant difference was noted in these three years. As for scale efficiency conventional bank scored the highest rank for the year 2016 while Islamic bank scored a highest rank for both 2017 and 2018, during the three years of the study no significant difference was noted between the scores of Islamic and conventional banks.

Conclusion:

According to the third chapter, the application of DEA method allowed us to measure the efficiency of twenty banks in the MENA region, determine which banks are efficient and which banks are not and so to determine the benchmarks banks.

The application of the test Mann-Whitney allowed us to obtain the rank sum on the scores of efficiency of both Islamic and conventional banks in MENA region which we used to compare between the two type of banks and so determine which banks are more efficient.

The results of this test shows that there is no significant difference between the efficiency scores of Islamic and conventional banks while the rank sum shows that Islamic banks in MENA region are mostly more efficient than conventional banks.

GENERAL CONCLUSION:

The objective of this study was to assess the efficiency of Islamic and conventional banks in the MENA region during the period of 2016-2018 while make comparison to find out which banks are more efficient by applying data envelopment analysis (DEA) approach. In order to answer the main research question: **Are there any significant differences between MENA region's Islamic and conventional banks in the term of efficiency? And which banks are more efficient?** we used the DEA method to obtain efficiency scores from each bank and then we applied the Mann-Whitney test on those scores to see whether there are any significant differences in term of efficiency between Islamic and conventional banks in MENA region.

Through the bibliographical documentation as well as the application of the DEA method and the Mann- Whitney test, we were able to find answers to our main questions asked in general introduction and confirm or disprove our hypotheses.

Based on the theoretical part as well as the bibliographical documentation, we were able to identify the main differences between Islamic and conventional banks and so the first hypothesis: **H1**: **There are differences between the techniques used by Islamic banks and conventional banks in performing their function as financial intermediary** is confirmed.

Based on the definition of the efficiency concept and presentation the history of the data envelopment analysis in efficiency measurement specially in banking sector we came to conclusion that efficiency is an internal measure of a bank's performance, it measures the amount of resources used to produce a unit of goods or services. Thus, efficiency analysis allows comparisons to be made between banks. Also we were able to determine the main approaches used to measure efficiency specialty banking efficiency and so our second hypothesis: **H2: yes, there are many approaches that can be used to measure bank's efficiency** is confirmed.

After using data envelopment analysis, we were able to measure the efficiency of both Islamic and conventional banks. The application of DEAP software allowed us to obtain the efficiency scores of both banks and determine the benchmark banks.

The results of the efficiency scores of MENA region's banks show that the scores of each bank vary from year to year during the three years of study and some banks that have being determine efficient in the first year of the study can became inefficient in the next year. In addition, the application of the Mann-Whitney non parametric test on the scores obtained by DEAP software allowed us to calculate the rank sum of efficacy of each type of bank during the period of 2016-

2018 and so we were able to compare between Islamic and conventional banks efficiency in MENA region and answer our last hypothesis.

The results of the Mann-Whitney test showed that Islamic banks are mostly more efficient than conventional banks in MENA region and yet no significant difference in the efficiency scores of both banks were notes during the three years of study so our last hypothesis: **H3: Islamic banks are more efficient than conventional banks in MENA region** is confirmed.

So the answer for the main question of our study: **Are there any significant differences between MENA region's Islamic and conventional banks in the term of efficiency? And which banks are more efficient?** is that Islamic banks are mostly more efficient than conventional banks in MENA region even though there is no significant difference between the score of efficiency of both banks.

- **Limits and recommendations**

1. Limits of the study:

Like any other study, our study has a several limitations that justify the need to conduct more research. First, the DEA technique evaluate efficiency by making benchmark from available information but several of input and output variables that are used can be difficult to manage. Second, the data set is limited to a selected number of input and output so the selection of the variables may not be exhaustive. Finally, the sample and period selected in this study might not be exhaustive. The sample may be too small to represent all banks in MENA region this is due to the lack and non-availability of information.

2. Recommendations:

Future studies may enhance the scope by choosing an exhaustive sample and comparing the efficiency score of more other countries.

Furthermore, future studies of banking industry should compare efficiency score based on parametric approach along with non-parametric and ratio analysis approach to check efficiency and consistency between and among them.

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List of Annexses:

Annex 01: results from DEAP: summary of peers 2016

SUMMARY OF PEERS:

firm	peers:				
1	1				
2	20	3	11	10	
3	3				
4	3	11	8		
5	6	13	20	17	
6	6				
7	16	17	3	11	
8	8				
9	20	17	3	13	
10	10				
11	11				
12	12				
13	13				
14	13	20	11		
15	15				
16	16				
17	17				
18	17	3	15	20	
19	16	3	11		
20	20				

Annex 02: results from DEAP: summary of peers 2017

SUMMARY OF PEERS:

firm	peers:				
1	1				
2	2				
3	3				
4	4				
5	5				
6	6				
7	17	3	20	11	
8	8				
9	17	12	3	20	
10	2	3	20		
11	11				
12	12				
13	12	20	17	11	6
14	14				
15	2	3	20		
16	16				
17	17				
18	3	20			
19	20	3	11		
20	20				

Annex 03: results from DEAP: summary of peers 2018

SUMMARY OF PEERS:

firm	peers:			
1	1			
2	14	12	16	11
3	3			
4	1	12	16	11
5	12	8	16	6
6	6			
7	12	1	16	8
8	8			
9	1	12	16	11
10	16	12	14	11
11	11			
12	12			
13	14	12	16	11
14	14			
15	11	1	12	16
16	16			
17	17			
18	17	16	12	
19	14	12	16	11
20	12	11	16	

Annex 04: results of the Mann-Whitney test obtained by STATA: results for 2016

```
. ranksum crste2016, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10         101         105
           1 |         10         109         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -21.71
                        ------
adjusted variance        153.29

Ho: crs~2016(firm==0) = crs~2016(firm==1)
             z =  -0.323
    Prob > |z| =   0.7466

. ranksum vrste2016, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10       113.5         105
           1 |         10        96.5         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -37.63
                        ------
adjusted variance        137.37

Ho: vrs~2016(firm==0) = vrs~2016(firm==1)
             z =   0.725
    Prob > |z| =   0.4683

. ranksum scale2016, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10         108         105
           1 |         10         102         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -21.71
                        ------
adjusted variance        153.29

Ho: sca~2016(firm==0) = sca~2016(firm==1)
             z =   0.242
    Prob > |z| =   0.8085
```

Annex 05: results of the Mann-Whitney test obtained by STATA: results for 2017

```
. ranksum crste2017, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10          93         105
           1 |         10         117         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -11.05
                        ------
adjusted variance        163.95

Ho: crs-2017(firm==0) - crs-2017(firm==1)
             z =  -0.937
    Prob > |z| =   0.3487

. ranksum vrste2017, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10        98.5         105
           1 |         10       111.5         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -48.03
                        ------
adjusted variance        126.97

Ho: vrs-2017(firm==0) - vrs-2017(firm==1)
             z =  -0.477
    Prob > |z| =   0.5640

. ranksum scale2017, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10          96         105
           1 |         10         114         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance      175.00
adjustment for ties      -11.05
                        ------
adjusted variance        163.95

Ho: sca-2017(firm==0) - sca-2017(firm==1)
             z =  -0.703
    Prob > |z| =   0.4821
```

Annex 06: results of the Mann-Whitney test obtained by STATA: results for 2018

```
. ranksum crzta2018, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10         102         105
           1 |         10         108         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance        175.00
adjustment for ties         -2.63
                        ----------
adjusted variance          172.37

Ho: crz-2018(firm==0) - crz-2018(firm==1)
             z =  -0.229
    Prob > |z| =   0.8192

. ranksum vrzta2018, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10         111         105
           1 |         10          99         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance        175.00
adjustment for ties        -15.79
                        ----------
adjusted variance          159.21

Ho: vrz-2018(firm==0) - vrz-2018(firm==1)
             z =   0.476
    Prob > |z| =   0.6344

. ranksum zcala2018, by(firm)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        firm |        obs    rank sum    expected
-------------+---------------------------------
           0 |         10          87         105
           1 |         10         123         105
-------------+---------------------------------
    combined |         20         210         210

unadjusted variance        175.00
adjustment for ties         -2.63
                        ----------
adjusted variance          172.37

Ho: zcs-2018(firm==0) - zcs-2018(firm==1)
             z =  -1.371
    Prob > |z| =   0.1704

.
```

Table of contents: