An Evaluation of Islamic versus Conventional Banks' Efficiency: A Global Study

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Abstract

The study compares the efficiency of Islamic and conventional banks, during the period 2006-2012, by employing a non-parametric approach- the Data Envelopment Analysis (DEA). In order to minimise the bias resulting from the inherent dependency in the first stage of the DEA, the DEA outcomes were replaced with the bootstrapped estimators and replicated them 500 times. Accordingly, confidence intervals are constructed for efficiency measures, which subsequently, improved further the accuracy of the findings and provided more reliable arguments for policy implications.

The study applies a two-stage Data Envelopment Analysis. The first stage of the DEA compares banks based on their Overall Technical Efficiency (OTE) and its components (Pure Technical Efficiency (PTE) and Scale Efficiency (SE)). Although proven to be more resilient during the financial crisis (Farooq and Zaheer, 2015), the research found that Islamic banks to be normally on a par with their conventional counterparts in terms of PTE and that they were significantly higher in terms of OTE and SE . In addition, according to the study's results, both Islamic and conventional banks suffered from managerial underperformance rather than a failure in operating at optimal production levels. In other words, Islamic and conventional banks were managerially inefficient in controlling their operating costs and utilising their resources.

The second stage of the DEA, which accounts for the country- and bank- specific factors, confirms the findings that there was no significant difference in PTE between Islamic and conventional banks. Moreover, the findings imply that Islamic banks have no significance on pooled PTE and show no significant difference in PTE when compared to conventional banks during the entire period of the study including the financial crisis (2007-2009). In the light of the study's empirical findings, Islamic banks should explore the benefits of moving to more diversified investments and tools in order to make use of their liquidity. Moreover, Islamic banks have to employ more solid risk management techniques in order to limit the number of risks, including credit risk, market risk, liquidity risk and operational risk, which may arise in the shari'ah banking industry.

The research is extended to study the PTE determinants of four regions, namely, MENA, East Asia and Pacific, South Asia, and Europe and Central Asia. The outcomes show that PTE had a different significance for each region's determinants related mainly to the levels of the indicators of governance, namely, Voice Accountability (VACC) and Regulation Quality (REGQ). The findings suggested that the more developed and democratic countries were favourable to banks having more operations that are efficient. In addition, these countries' excessive regulation and supervision (i.e. limited financial freedom), encouraged financial institutions to create unclear new instruments and misjudge the risks. These resulted in the banks being less efficient. The study found, also, that there were different determinants for Islamic and conventional banks operating in Muslim and non-Muslim countries.

PLAGIARISM POLICY COMPLIANCE STATEMENT

I certify that I have read and understood Plagiarism Policy. I understood that failure to comply with this policy can lead to academic and disciplinary actions against me. This work is substantially my own, and to the extent that my part of this work is not my own. I have indicated that by acknowledging its sources.

In loving memory of my grandmother, Fatima Kawtharani
(1935–2014)

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LIST OF ABBREVIATIONS

AE	Allocative Efficiency
BCC	Banker, Charner and Cooper
BDL	Banque Du Liban
BMA	Bahrain Monetary Agency
BSP	Bangko Sentral ng Pilipinas
BTI	Bertelsmann Stiftung
C. Asia	Central Asia
CB	Conventional Bank
CBO	Central Bank of Oman
CCR	Chames, Cooper and Rhodes
CII	Council of Islamic Ideolog
CORRUP	Control of Corruption
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DEPSTF	Deposits and short-term funding
DFA	Distribution Free Approach
DIFE	Dubai International Financial Exchange
DIFC	Dubai International Financial Centre
DMU	Decision Making Unit
DRS	Decreasing Returns to Scale
EE	Economic Efficiency
EIU	Economist Intelligence Unit
EMH	Efficiency Market Hypothesis
EQ/TA	Equity to Total Assets
EU	European Union
FCA	Financial Conduct Authority
FCRIS	Financial Crisis Dummy Variable
FDH	Free Disposal Hull
FE	Fixed Effects
FXASSET	Fixed assets
GCC	Gulf Cooperation Council
GDP	Gross domestic product
GLS	Generalized Least Square

GOVEFF	Government Effectiveness
HDI	Human Development Index
HHI	Herfindahl–Hirschman Index
IB	Islamic Bank
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
INFL	Inflation
IRS	Increasing Returns to Scale
ISFCRIS	Islamic Banks during Financial Crisis
ISMDUM	Islamic Dummy Variable
NINCOME	Net income
NL/TA	Net Loans to Total Assets
NLOANS	Net loans
LLP/GL	Loan Loss Provision to Gross Loans
MAS	Monetary Authority of Singapore
MENA	Middle East and North Africa
MKTCY	Market Capitalization
NCB	National Commercial Bank
NIRS	Non-Increasing Returns to Scale
OBU	Offshore Banking Unit
OLS	Ordinary Least Square
OECD	Organization for Economic Cooperation & Development
OTE	Overall Technical Efficiency
PEREXP	Personnel expenses
PIRI	Prudential Information and Regulations for Islamic Banks
POLTC	Political Stability and Absence of Violence/Terrorism
PTE	Pure Technical Efficiency
PTIE	Pure Technical Inefficiency
QMA	Qatar Monetary Agency
QCB	Qatar Central Bank
RE	Random Effects
REGQ	Regulatory Quality
ROA	Return On Asset
ROE	Return On Equity
SAMA	Saudi Arabian Monetary Agency
SCP	Structure Conduct Performance

SCPR	Syrian Centre for Policy Research
SE	Scale Efficiency
SFA	Stochastic Frontier Approach
SIE	Scale Inefficiency
SIZERT	logarithm of Total Asset
TFA	Thick Frontier Approach
TFP	Total Factor of Productivity
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
VACC	Voice and Accountability
VRS	Variable Returns to Scale
VRS500	Pure Technical Efficiency bootstrapped at 500 replicas
WBG	World Bank Group
WGI	Worldwide Governance Indicators
YBRD	Yemen Bank for Reconstruction and Development
YFIT	Estimated Model
YGR	Growth in GDP
YPCRAT	Per capita GDP

List of Arabic terms

Al-Anssab	Sacrifices at altars
Al-Azlam	Arrows for seeking luck or decision
Ahkam (plural of Hukum)	Shari'ah ruling associated with rules, provisions and laws
Bai' Salam	Advanced payment/forward buying (purchasing contract)
Fiqh	corpus of Islamic jurisprudence
Gharar	Uncertainty, risk, hazard, speculation
Haram	Forbidden in Islam (unlawful)
Ibadat	Worship of Ritual act
Ibaha	permissibility
Ijarah	Leasing contract
Ijara wa iktinaa	Lease purchase financing
Khamr	Alcohol
Mayssir	Gambling
Mu'amalat	Dealing between the humans
Mudarabah	Profit sharing, trust finance (financing contract)
Mudareb	Entrepreneur, agent manager
Murabaha	Cost plus financing, financing resale of goods
Musharaka	Partnership, participating partner (partnership contract)
Qard al Hassan	Interest-free loan
Quran	The sacred book of Islam
Rabb-al-mal	Lendor, investor
Riba al-fadl	Usury of increase
Riba al-nassiah	Usury of deference
Sadaqah	Charitable giving (act of charity)
Shirkah	Sharing, A contract between persons who launch a business
shirkat al 'aqd	Same as ' shirkah'.

Shirkat al-mulk	Partnership by ownership
Shari'ah	Islamic law
Sukuk	Similar to bond in conventional finance
Wadi'ah	Custody
Zakat	Islamic wealth tax
Zulum	Injustice, oppression, exploitation

Chapter 1 Introduction

1.1 Introduction

Banks are one of the most significant contributors to a modern economy and an integral part of the infrastructure of today's society. They carry out some very vital tasks in society and, accordingly, they have a significant effect on the level of economic activity**.** According to Iqbal and Molyneux (2005), banks carry out the following four major tasks: firstly, it is considered that banks ar play the role of financial intermediary in channeling funds from depositors (lenders) to investors (borrowers). The financial intermediation develops the efficiency of the procedure of savings and investments by removing the existing mismatches in the need of an economy to have surplus and deficit units (Iqbal and Molyneux, 2005). Secondly, banks offer a broad variety of further financial services which are not linked to the banks' main role of financial intermediation. These services include payment services, insurance asset management etc. (Iqbal and Molyneux, 2005). Thirdly, banks initiate a wide range of assets and liabilitieswhich have distinct features concerning liquidity, maturity, returns, and risk-sharing (Iqbal and Molyneux, 2005). A bank's fourth essential task is the initiation of motivations for an efficient allocation of the resources used inside an economy and the allocation of insufficient financial and actual resources between rivals (Iqbal & Llewellyn, 2002). In other words, banks make accurate assessments and efficient valuations of risk. These are reflected in the interest rate (in conventional banking only) and fixed (profit-sharing) and variable (market-up) returns (in Islamic banking).

The traditional banking system has existed since the 13th century and depends on applying interest to loans which is monitored by the commercial regulations of the hosting country (Iqbal and Molyneux, 2005). However, in the Muslim beliefs system, which follows *Shari'ah* (the legal code of Islam), interest is prohibited. Therefore, during the golden ages (known in Europe as the dark ages) of the Islamic civilization and countries, there was a quite effective system of merchandising recourses to finance productive activities and consumer needs was free from interest (Iqbal and Molyeux, 2005).

During the 12th and 13th centuries in the Mediterranean region, partnership and profit-margin sharing constituted the basis of commerce and trading activities rather than interest-based borrowing and lending (Goitem, 1971; Igbal and Molyneux,2005). However, as some countries' focus on the world's economic activities shifted to the western world, western financial initiations and practices became more influential while Islamic practices became dormant (Igbal and Molyneux, 2005).

As a result, Muslim people have avoided dealing with interest-based commercial banks since this is an inherent contradiction to their values and Islamic standards. Therefore, they have expressed their reservations regarding the financial intermediation model of commercial banking (Wilson, 2007).

Thus, this has generated a high demand for a banking system that does not oppose their religious beliefs and has called for an attractive mechanism to function as financial intermediation in Muslim societies. Such a mechanism began with theoretical and model discussions among Muslims economists and banks. Nevertheless, Islamic banks did not exist until the second half of the 20th century (Iqbal and Molyneux, 2005). Following the Second World War and the independence of most Muslim countries from colonial rule, *Shari'ah*-compliant financing began to be practiced on a small scale before expanding into formal banking institutions in many countries in the Middle East and Asia regions (Wilson, 2007).

In the early 1980s, as Islamic banks grew and required tools for managing liquidity, a number of banks, based in London, offered *Shari'ah*-compliant deposits through mark-ups generated from short-term trading transactions at the London Metal Exchange (Wilson, 2007). At the same time, European banks dealing with Gulf Islamic banks, which were involved in imports from Europe, started to learn Islamic finance in order to understand the working mechanism (Wilson, 2007). According to Kuwait Finance House (KFH), in terms of assets, the Islamic finance market realized a total of USD 2.4 trillion in 2015. Moreover, based on The Economist (2012 and 2014), since 2006 the total value of *Shari'ah*–compliant assets has increased by 150% and will grow by an average of 19.7% a year to 2018. Globally, Islamic banks hold nearly 80 per cent of these assets (Economist, 2014).

Although Islamic banks are considered sometimes to have limited options, in fact, it is widening the banking choice of both Muslims and non-Muslims (conventional users). Furthermore, Islamic banks are not regarded as a threat to the current traditional system. Alternatively, Islamic banks are considered to offer available opportunities for new investments since its tasks fall within the scope of socially responsible banking operations (Wilson, 2007). Therefore, multinational and domestic conventional banks have opened *Shari'ah*-compliant windows in meeting demand from the Muslim communities as well as, particularly in countries with a mixed environment, offering both Muslim and non-Muslim customers an alternative to interest-based banking .

1.1 Motivations

As Islamic banks are part of a country's banking system of a country, its performance may affect the soundness and stability of the banking system as well as a country's economic development. Moreover, for conventional banks with Islamic windows, the performance of these windows has a certain influence on the performance of conventional banks. Consequently, the assessment of the performance of Islamic banks, relative to their conventional counterparts, will help policy makers in formulating strategies. These strategies may improve the performance of a country's banking system and may minimize any future failure leading to financial crisis. Additionally, the information, which is obtained from the evaluation of bank performance, may help to ameliorate managerial performance by determining "best" and "worst" practice banks (Berger and Humphry, 1997).

The increasing number of Islamic banks - 145 full-fledged Islamic banks operating globally including banks in Iran (Bankscope, 2013) – has also heightened the competition between fully-fledged Islamic banks and conventional banks. Thus, the determination of the relative performance will encourage both fully-fledged Islamic and conventional bank managers to improve their respective bank performances in order to compete with each other. Performance is measured through efficiency and productivity and Chapter 3 explains this in detail.

Furthermore, since modern Islamic banks have been in operation for over 30 years, the performance of its operations needs further evaluation. Moreover, as an alternative to the well- established interest-based banking, it is rational to compare the performance of Islamic banks with their conventional counterparts. Although, the nature of mechanism, i.e. *Shari'ah*-compliance, involved in Islamic bank is different from interest-based banking, it would be significant to find a mutual ground to compare their respective performances. Given the above reasons, the evaluation of how Islamic banks perform globally, when compared to conventional banks, is significant and requires further investigation in order to provide the latest empirical evidence on the relative performance of Islamic banks.

1.2 Contribution and objectives

This study is unique and differs from others in the literature review for the following reasons. Firstly, the study covers all Islamic banks in the world, as found in BankScope database, including those operating in countries that have both Islamic and conventional banks. During the period of the data collection (i.e. late 2013), the BankScope indicates that 28 countries host fully-fledged Islamic banks in the world. However, we exclude the following countries Brunei, Cayman Island, Gambia, Iran, Mauritania, Palestine, and Russia from the study. Based on BankScope database, Islamic banks operating in Brunei, Gambia, Mauritania and Russia either were withdrawn or were marked as Inactive by BankScope, or covered less than 4 years of the study's timeline (2006-2012), or had more than 4 years of not available data. Cayman Island and Palestine were removed too since no economic and governance indicators existed for both countries, mainly in the World Bank databases. Moreover, Iran did not take part of this study as its banking system consists only of banks that comply with Islamic laws (i.e. Shari'ah principles). Consequently, the study includes 21 countries worldwide and, in particular, four different regions.

Secondly, the study observe the potential determinants of Islamic and conventional banks' efficiency in Muslim and non-Muslim countries. Finally, to the best of the researcher's knowledge, none of the pervious researchers examined the existence of association between the WGIs and the efficiency of Islamic and conventional banks.

Consequently, our study is the first to use the WGIs for this purpose. In summary, this study seeks to address the following questions:

1. Do the scale efficiency and the overall and pure technical efficiency vary across the two different bank types over 2006-2012?
2. How efficient are Islamic banks at the global level when compared to conventional banks during 2006-2012, particularly during the financial crisis (i.e. 2007-2009)? In other words, is there any significance between both types of banks?
3. What are the determinants of efficiency for Islamic and conventional banks, at the pooled level?
4. Do the determinants of bank efficiency differ across regions and in Muslim countries when compared to non-Muslim countries? Do the determinants of Islamic and conventional banks vary in Muslim countries and in non-Muslim ones?
5. Do the World Governance Indicators (WGIs) have any influence on the pure technical efficiency of banks?

Given the above research questions, the study aims to compare the efficiency of Islamic banks relative to conventional banks over 2006-2012. The study's objectives are to:

- Measure the efficiency of Islamic banks compared to their conventional counterparts in countries operating Islamic banking.
- Assess the efficiency of Islamic banks compared to conventional banks prior to the financial crisis (up to 2006), during the crisis (2007-2009) and after the crisis (2010-2012).
- Determine the factors that influenced the efficiency of Islamic and conventional banks. Although extensive literature had examined bank efficiency, mainly in the U.S and European banking sectors, there were few empirical researches which had evaluated the global performance of Islamic banks compared to conventional banks and these produced contradictory results.
- Examine whether World Governance Indicators (WGI) affect bank efficiency.

- Investigate whether there are different determinants of bank efficiency for Islamic and conventional banks operating in Muslim countries[1] and non-Muslim countries. This is done by dividing our sample into Muslim countries and non-Muslim countries, and conducting many regression models to capture any significance on PTE. Some authors concluded that there were no significant efficiency differences between the Islamic and conventional banks (e.g. Abdul-Majid et al., 2005b; El-Gamal and Inanoglu, 2005; Mokhtar et al., 2006; Bader, 2008; Hassan et al., 2009; Shahid et al., 2010) and others found that Islamic banks were significantly less efficient than conventional banks (e.g. Mokhtar et al., 2007, 2008; Srairi, 2010). On the other hand, Al Al-Muharrami (2008) stated that Islamic banks were significantly more efficient than conventional banks
- Investigate possible regional influences on the PTE determinants. The study classifies the 21 countries[2] into four regions: Middle and North Africa, East Asia & Pacific, South Asia, and Europe & Central Asia. We captured potential influence by conducting regression models with dummy variables (as explanatory variables) for the four regions.
- Examine any potential effect from the WGIs on the banks' PTE. Previous research used different bank efficiency determinants. However, for the first time, a study investigates the influence of the World Bank governance indicators on the efficiency of Islamic and conventional banks-at the global level.

Moreover, the study aims to integrate more than one approach and statistical techniques in order to generate robust results for policy makers to regulate effectively the productivity of the banking industry; for bankers to improve their bank performance; and for the investors to maximizing their benefits. For the first stage, we used Data Envelopment Analysis (DEA) to calculate various efficiency scores - Overall Technical Efficiency (OTE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE). For the second stage, we used an appropriate regression model, i.e. the random effects model.

[1]The researcher refers to Muslim countries as those countries where Islam is the main religion (at least 60% of the total population).

[2] The 21 countries are countries that cover all Islamic banks in the world up to year 2012, and in which Islamic and conventional banks operate. Iran is excluded as it only operates Islamic banking.

1.3 Research approach

In this study, we tackled the research objectives by implementing distinct data sets and methodologies. The research methodology starts with employing a literature review of theories concerning the determinants of bank performance. In order to address the first research objective, the research conducts the DEA to evaluate the efficiency of Islamic banks relative to conventional banks. Three distinct types of efficiency scores (OTE, PTE and SE) are obtained, and the overall measure of each efficiency type are analysed over the research period (2006-2012). The research period is divided into three stages: prior to crisis, during-crisis and post-crisis. The study measures the efficiency scores by selecting appropriate inputs and outputs, and uses the intermediate approach rather than the production approach for the variables included in the DEA. The intermediate approach sees a bank as a financial go between which employ inputs (e.g. deposits) to produce outputs (e.g. loans).

Afterwards, the bootstrapped technical efficiency scores, extracted from the Data Envelopment Analysis, is regressed on environmental (i.e. bank and country- specific) variables. The PTE is selected as the only dependent variable since, unlike OTE, this type of efficiency computes each bank's efficiency relative to other banks of a similar size. On the other hand, normally the OTE measures the efficiency of a particular bank against all banks. The Constant Return to Scale (CRS) specification given by Charnes et al. (1978) provides misrepresenting estimates of technical efficiency. In other words, the OTE scores, extracted from the CRS model, are biased by the scale efficiency. Another reason for selecting PTE, derived from Variable Return to Scale (VRS), as the dependent variable is that the CRS assumption is used in DEA when banks are operating at an optimal scale. However, frequently in real life, this optimal performance is rejected by a diversity of conditions such as different level of market power, monopoly, diseconomies of scale, different regulations and supervisions, imperfect competition etc.

The following two types of environmental variables are included in the regression analysis: (I) the Bank-specific variables, namely, Net Loans to Total Assets (NL/TA), the ratio of Equity over Total Assets (EQ/TA), Bank Size (SIZERT), and Loan Loss

Provision to Gross Loans (LLP/TA). (II) the country-specific variables which are Inflation (INFL), Growth In Real GDP (YGR), Per Capita GDP (YPCRAT), the Herfindahl–Hirschman Index (HHI) (or market concentration), and Market Capitalization (MKTCY), Voice and Accountability index (VACC) and Regulation Quality (REGQ).

The dataset covers 104 Islamic banks and 95 conventional banks in 21 countries (i.e. Arab Emirates, Bahrain, Bangladesh, Egypt, Great Britain, Indonesia, Iraq, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sudan, Syria, Tunisia, Turkey, and Yemen) hosting Islamic banking between 2006 and 2012. This provides a sample of 1125-year observations. The inputs and outputs, used in the computation of efficiency scores, are extracted from the banks' financial statements held on the BankScope database while macroeconomic data are obtained from the World Bank International Financial Statistics.

1.4 Structure of the thesis:

This thesis is divided into 7 chapters including the introductory chapter outlining the motivation and aims of the study. Chapter 2 provides detailed background of Islamic banking and discusses the issue of *Riba* (interest) and other prohibitions and the various modes of Islamic financing. The background focuses particularly on the Islamic rationale for the prohibition of interest, the legal basis of Islamic banking and its origin and development. Moreover, Chapter 2 lists the main principles of the Islamic jurisprudence concerning financial contracts and presents the alternative financial instruments and finances on which Islamic banks depend. In addition, it includes a brief comparison of Islamic and conventional banks. Consequently, this provides the necessary religions and pragmatic framework to understand the Islamic banks and allows the reader to appreciate the primary differences with conventional banks. The final section tries to depict the diverse socio-economic backgrounds of the countries included in the study.

Chapter 3 presents the reader with a critical review of the existing conventional and Islamic bank efficiency literature. Within the area of relative efficiency of Islamic banks compared with conventional banking, by using various techniques, this

Chapter presents a wider review of previous research to provide a basic understanding of how we measured this relative efficiency . Moreover, there is a review of research on how environmental factors were considered in single and cross-country bank efficiency studies with the objective of modelling a function in order to measure the efficiency of Islamic and conventional banks.

Chapter 4 focuses on the introduction and description of the frontier technique, namely the Data Envelopment Analysis (DEA), implemented in several studies in order to evaluate the performance of different countries' conventional and Islamic banks between 2006 and 2012 (This period is dependent on the age of the required financial data on Islamic banks held by BankScope).

Chapter 5 concentrates in conducting the mathematical approach, DEA, and reporting and analyzing the generated results of the calculations for the efficiency scores for both Islamic and conventional banks at the global level. We analyzed empirically over the period from 2006 to 2012 the output efficiency of banks in 21 countries operating Islamic banking.

Chapter 6 examines banking environment and bank-level characteristic, through employing generalized least squares- random effects models, in order to understand the determinants of pure technical efficiency (PTE) and control for environmental factors which influence the bank's efficiency. We based our analysis of the regressions on pooled model, regional models, and Muslim versus non-Muslim countries models. The chapter ends by outlining the major findings.

Finally, the concluding Chapter 7 summarizes the main findings of the thesis with related policies and makes suggestions and directions for future areas of research.

Chapter 2 Origin and Development of Islamic Banking

2.1 Introduction

The chapter aims to provide the basic concept of Islamic banking and the background of countries involved in this research. It defines Islamic banking and its objectives; explains the legal basis of Islamic banking; discusses its origin and traces its development; and describes the modes of operation of Islamic banking. Moreover, this chapter assesses the importance of Islamic banking and compares it with the conventional banking system. Furthermore, it briefly discusses the socio-economic background of countries under study.

2.2 *Shari'ah* (Legal Code of Islam)

A Muslim is expected to lead their life according to the *Shari'ah* extracted from the Quran and the *Sunnah* (the sayings and practices of the Prophet Mohammed). Although often assigned as Islamic Law, *Shari'ah* can be described as either moral guidance or a series of principles monitoring all aspects of the day-to-day activities of Muslims (Kashyap, 2014). It has been more than 1400 years since the Quran was revealed; in the Muslim belief system, the message from the Quran is applicable to all people and times. Besides the above two main sources of *Shari'ah*, there are *Ijmaa* (the consensus among Islamic scholars) and *Qiyas* (reasoning by taking analogy). Islam does not distinguish spiritual from worldly affairs, hence business is considered as ethics and is subject to *Shari'ah*. Hence, *Shari'ah* governs Islamic banking in addition to the regulations set up by the host country (Karim, 2001).

The most significant values on which the modern Islamic financial structure depends on are:

- Prohibition of the payment or receipt of interest *(Riba):*

Money itself is assumed to have no essential value. It is considered to be only a store of wealth and a medium of exchange (Kashyap, 2014). Interest, which is the pre-determined return on financial transaction required by the lender from the borrower over and above principal amount being lent, is forbidden but not the uncertain rate of

return on the transaction represented by profit. The *Shari'ah* defines *riba* as a premium that is obliged to be paid by the borrower to the lender together with the face value of the borrowed sum as a condition for the loan or for extending date of repayment (i.e. maturity date) (Abu Umar Faruq & Hassan, 2007).

- Prohibition of uncertainty or speculation *(Gharar):*

Any participant engaged in financial transactions must be sufficiently informed and not cheated or deceived (Kashyap, 2014).

- Prohibition of funding particular businesses:

Investments, which are not permitted in activities, are believed to be socially damaging and that are not compliant with Islamic principles. These businesses comprise gambling, pornography, alcohol trading and production, and armaments (Iqbal and Molyneux, 2005).

- Significance of profit and loss sharing:

The entrpreneur (borrower) and capital provider (lender) are obliged to share the risk of all financial transactions (Iqbal and Molyneux, 2005). The principle of profit and loss sharing (PLS) is considered as one of the most significant characteristics of Islamic finance (Khediri et al., 2015). The lenders (funders) and borrowers (investors) share risk arisen from given investment in exchange for sharing profits and losses (Iqbal and Molyneux, 2005). This PLS principle opposes the principles of conventional banks which depend on defining a pre-agreed fixed rate prior to any financial transaction (Khediri et al., 2015).

- Assets-banking principle:

Any financial transaction has to be given security by a known and tangible asset.

It is the responsibility of *Shari'ah* scholars to evaluate whether a financial instrument or service complies with the *Shari'ah* codes (Kashyap, 2014). The explanation of Shari'ah is recognized to be either *Fiqh*, or Islamic Jurisprudence, and is performed by Islamic scholars (Iqbal and Molyneux, 2005). Although there are many areas of consensus, the opinions of scholars vary occasionally based on their ways of analysis.

In other words, this means that some scholars may regard some contractual terms of Islamic finance as being permissible under *Shari'ah,* whereas others may consider them to be inappropriate (Kashyap, 2014).

2.3 Definition of Islamic banking

An Islamic bank is described as a financial institution with the objectives to employ the economics and financial principles of Islamic banking (Hassan, 1999). The financial transactions of an Islamic bank are in compliance with the principles *Shari'ah* (i.e. Islamic laws). As a financial business, the primary objective of an Islamic bank is seeking to maximize profit in order to increase shareholders' value. As a development financial institution, an Islamic bank helps economic development as well as ensure justice and fairness in the society including mobilizing savings, maintain sectoral balance of the economy, developing labor skills through training, mobilizing non-human resources such as *Sadaqah* (Islamic voluntary contribution) and *Zakat* (Islamic wealth tax), maintaining equitable income and wealth distribution, and providing efficient banking services. An example that an Islamic bank tries to establish an equitable income distribution is the availability of interest-free loans for the needy, in which the consumer has to pay only the principal amount and the administrative costs. Although the contribution of interest-free loans to total financing of the Islamic banking operation is very minimal, still the reason behind the establishment of an Islamic bank is not solely to maximize profit or revenue – the major features of Islamic banking are to avoid interest in all transactions and avoid unethical activities such as prostitution, gambling ,alcoholism etc. Accordingly, Muslims should certainly invest their funds in businesses that comply with *Shari'ah*, and they must obtain *Halal* earnings on their investments (Iqbal and Molyneux, 2005). Therefore, the two major aims of an Islamic bank are to maximize profit for shareholders and depositors and to achieve their social obligations.

2.4 principles of Islamic finance: The basis

Two sorts of rulings, or *"ahkam",* are present in the Islamic jurisprudence. The first type is known as *"Ibadat"* (worship) which monitors the relationship of a human towards God (Iqbal and Molyneux, 2005). A traditional principle of *"ibadat"* is that nothing is permissible unless backed by clear or analogical permission from *Shari'ah* (Iqbal and Molyneux, 2005). The second type of "*ahkam*", also known as "*mu'amalat"* (or mutual dealings), rules overs, also, the relationship of mankind . Two major principles rule the Islamic theory of contracts including: *"Ibaha"* (permissibility) which states that all is allowed unless clearly forbidden by God. This is referred as the "doctrine of universal permissibility" (Iqbal and Molyneux, 2005). "The Golden Principle of free choice" allows the parties, participating in transactions or contracts, to consent to any circumstances since they do not breach any rule of *Shari'ah* (Iqbal and Molyneux, 2005).

Islam forbids few activities and the reason for such prohibition is to protect the interest of weaker parties and to ensure justice and fairness among participants in transactions or investments. Moreover, this also ensures joint interests for all parties and promotes social harmony (Iqbal and Molyneux, 2005). The next paragraph examines the restrictions, imposed by *Shari'ah,* that are applicable when initiating financial transactions and contracts between participants.

a) Prohibition of interest (Usury)

Islam forbids all types of interest, also called "*riba"*. Literally, the term *"riba"* means an increase, or the act of increasing (Iqbal and Molyneux, 2005). This term is used in the Quran to reflect the modern theory of interest. According to Quran, *"Zulum"* which is arisen from the practice of applying interest is the main reason for prohibiting the interest. *Zulum* refers to the spiritual, moral, and socio-economic injustice brought by charging interest in society (Iqbal and Molyneux, 2005).

Shari'ah does not permit any premium or reward or pre-fixing positive return, whether big or small, on any type of loan. According to Iqbal and Molyneux (2005), the definition of *riba* is anything pecuniary or non-pecuniary in addition to the face

value of a loan that the borrower is obliged to pay to the lender together with the principal as a condition. On the other hand, any surplus is not considered as *riba* if provided by the borrower out of his own agreement without the presence of any norm or tradition that requires him to offer such excessive amount (Iqbal and Molyneux, 2005).

b) Reasons for Interest prohibitions

According to Siddiqi (2006), an interest-based transaction may be unfair to one of the engaged parties (i.e. lender or borrower). The borrower or the investor may encounter injustice when performing riba-based contract. For instance, the investor will always be entitled to pay the interest and the initial value of the loan even if the business, financed by this loan, ends up with losses (Iqbal and Molyneux, 2005). In other words, the lender will always obtain this money along with the interest regardless the financial position of the underlying business. Accordingly, generally this transaction is considered to be unjust and unfair. On the other hand, the interest-based transaction may also be unfair to the lender. For instance, if the inflation rate increases and becomes greater that the initial return rate of loan, the real rate of interest turns into negative. Moreover, the borrower or the investor, who may earn large profit from an investment financed by the loan, is only entitled to pay back smaller amount reflected by interest rate cost (Iqbal and Molyneux, 2005). However, if these invested funds were based on the profit and loss sharing ratio, which is an essential principle in Islamic banking, the depositor would have earned a better return.

Riba, which is used as broad term, can be divided into two subsidiaries that are included in the category of riba *of al-baye'* (Iqbal and Molyneux, 2005). *Riba of al-baye'* refers to the interest that is associated with sales transactions. The type of riba discussed previously is known as *riba al-qurud* or *riba al-nassiah or riba al-quran*.

The first type of *riba is riba al-nassiah* which is discussed in previous paragraphs. It refers to the increase in place of delay or postponement of payment of outstanding charges (Ariff et al., 2012). In other words, it stands for the pre-fixed excess or premium that the borrower should pay on a loan as a reward for waiting (Chapra, 1985).

The second type of *riba* is called *riba al-fadl* which results in barter exchange of commodities. It represents the excess obtained by one of the trading parties when dealing in commodities of similar or equal kind (Iqbal and Molyenux, 2005).

Riba al-nassiah and *riba al-fadl* are considered to be crucial counterparts of the verse of Quran: "Allah has permitted trade and has forbidden *riba*" (2:275), where *riba al-fadl* is linked to trade while *riba al-nassiah* is linked to loans (Ariff et al., 2012).

c) Prohibition of *Gharar*

The second major prohibition in contractual deals is *gharar* trading. The literal meaning of *gharar* is to make oneself or a party's property vulnerable to hazard (Iqbal and Molyneux, 2005). Nevertheless, *gharar* may be regarded as the acts and conditions that are engaged in exchange contracts but are unclear and uncertain to other participants (Ariff et al., 2012). This is considered to be very equivalent to asymmetric information (Iqbal and Molyneux, 2005). According to *Shari'ah,* the principle of voluntary consent of all participants is violated if any party possesses inferior information about a transaction relative to other involved parties (Ariff et al., 2012). In other words, any party has the right not to engage in a contract if full knowledge about the implications of this contractual transaction is acquired. *Gharar* can be divided into two types: *gharar fahish* (extensive) and *gharar yassir* (minor) (Iqbal and Molyneux, 2005). The first is forbidden in Islam whereas the latter is permitted since this may be inevitable without substantially harming one of the parties (Iqbal and Molynenux, 2005).

Frequently, it is difficult to disclose all information concerning a contractual transaction since it is in the nature of the subject (Ariff et al., 2012). *Gharar* has always been a hard term to comprehend among Islamic scholars. Nevertheless, Islamic jurisprudence counts on the general conditions of honesty and transparency of participants in a contract to manage this (Iqbal and Molyneux, 2005).

d) Prohibition of *Mayssir*

Islam forbids all sorts of gambling and games of chance. This is illustrated in the following clear text in the Quran (5:90):

"O, you who believe! Intoxicants (Alcohols) (Arabic: *Khamr*), and gambling, and Al-Anssab (animals that are sacrificed in the name of idols on their altars) and Al-Azlam (arrows thrown for seeking luck on decisions) are on abomination of Satan's handiwork. So avoid that (abomination) in order that you may be successful"

On the other hand, it is significant to distinguish between pure games of chance, and tasks and businesses that are associated with life uncertainty and include element of chance and risk-taking (Ariff et al., 2012). For instance, one of the major principles of Islamic banking is the risk-sharing aspect which implemented between fund providers (lenders) and investors or entrepreneurs (borrowers).

2.5 Islamic banking: modes of operation

The Islamic economic model depends on judgment of *Shari'ah*. Two of the major features, which manage modern Islamic finance, are presented as follows:

a) Financial instruments or contracts have to be collateralized always by physical (i.e. tangible) assets in order to avoid speculation.
b) As discussed earlier, *Shari'ah* strictly and clearly forbids *riba* ; this includes the interest payments and the exchanging of any positive fixed return.

These fundamental rules have made Islamic financial instruments to be mainly assets-backed and to be dependent on the performance of the underlying assets (Iqbal and Molyneux, 2005).

2.5.1 Sources of funds

Modern Islamic finance has initiated many methods to substitute interest return for cash flows (incomes) generated from investments and business activities (DTZ, 2008). These include returns from trading in real assets and rental income obtained

from leasing of assets, etc. There are three main modes of Islamic financing which include:

1. Debt-based: refers to the loans initiated through a repurchase agreement transaction or back-to-back trades of borrower or third parttheld assets (DTZ, 2008). The most famous type of debt-based financing is Al-Murabahah produced from the acquisition and resale of a current or future asset at a mark-up (i.e. initial price plus a margin) instead of interest payments (Jobst, 2007).

Al-Murabahah

Often called the 'mark-up' or 'cost-plus' sale, *Al-Murabaha*h is analogous to buy – sell back or back-to-back sales arrangements. It is a contract where a customer willing to buy an asset (such as apartment, equipment, etc.) request from an Islamic bank to buy it for him. Afterwards, the bank sells this asset to the borrower at a price that include the face value of this given asset, any charges or expenses applied for the asset's acquisition and an additional pre-agreed reasonable profit. The total price is made usually through a series of installments

The basic features of *Al-Murabahah* are outlined below (Shinger, 1994):

(i) The buyer should know about all associated costs and the initial price of the asset. The profit (or markup) should be displayed as a percentage of the total price plus costs.
(ii) The subject of the sale should be tangible assets or goods against money;
(iii) The seller should hold and own the asset, which underpins the contract. Moreover, the seller should be able to deliver the asset to the buyer.
(iv) The repayment should be delayed postponed.

2. **Asset-based:** also referred to as lease contract where a sale-leaseback (i.e. operating lease) agreement is put in place . It also includes the lease of a third party asset with option of purchase it. Such a type of lease contract is known as financing lease. The most common type of asset-based financing is *Al-Ijarah*. Based on Al-*Ijarah* contract, credit is received in exchange for rental fees during the temporary use of an asset (Jobst, 2007). The borrower (or entrepreneur) also has an option to purchase this asset at maturity (Jobst, 2007).

Al-Ijarah

This Islamic method of financing is equivalent to operating leases (sale-leaseback/lease-buyback) or financing leases (lease-purchase). The investor rents a given project or asset for a definite amount and over a specific period of time. The investor retains ownership of the asset during the transaction where he sustains all the expenses related to the asset's ownership. On the other hand, the lessee has to cover all the costs resulting from utilizing the asset. In the case of a lease-purchase, each payment presents a portion of the final price of purchase and transfer of ownership of the asset. Two types of leasing finances are promoted by *Shari'ah*:

1) *Ijarah* (simple leasing)

2) *Ijarah Wa Iqtinaa* (purchase lease)

- *Ijarah* depends on a contract between the lesser (Investor) and the lessee (client) (DTZ, 2008). The investor, represented by the Islamic bank in our case, buys a capital asset and rents it to a client. In return, the client should pay the bank a pre-agreed regular rental fees during the period of the transaction. The maturity of the contract depends on the requirement of the lessee, the lifetime of the capital asset, and the agreement between the investor (i.e. Islamic bank) and the customer (i.e. lessee). During the period of the transaction, the ownership of the asset remains with the Islamic bank but the customer has the limited right to utilize this asset in return for rental fees. At the maturity of the contract, the asset is returned to the bank.

- *Ijarah Wa Iqtinaa* is equivalent to hire-purchase arrangement. The rental payments are recovered by the lesser throughout the contract period in series of periodical installments. At maturity, the lessee obtains ownership of the given asset after the amount of the contract is paid in full (Chapra, 1985). In our case, the Islamic bank purchases equipment and leases it to the customer. The latter makes a yearly payment that represents a portion of the total price of the equipment owned by the lessee when the entire amount of the contract is paid.

The advantages of finance leasing

In a leasing contract, there is a chance that the lessee misuses the leased asset as the lessor takes the total risk (Iqbal and Molyneux, 2005). However, the Islamic financial leasing, known by *Al-Ijarah,* has many features that may tackle this problem (Iqbal and Molyneux, 2005):

(I) The period of a leasing contract is sufficiently long to permit the lessor to amortize the cost of the asset with additional profit. The length of *Al-Ijarah* generally covers the complete service life of a leased asset (Ariff et al., 2012).

(II) At maturity of a leasing contract (*Al-Ijarah)*, the lessee has the option to buy the leased asset from the lessor at fair market value (Iqbal and Molyneux, 2005).

(III) The contract cannot be before the expiry date without the agreement of both participants.

(IV) In a case of default, the lessor is able to repossess the equipment without the need to a court order.

(V) The high level of depreciation associated with the equipment helps the lessor to decrease his tax obligations towards authorities.

(VI) The lessor has the right to sell the equipment during the term of a contract. Consequently, the new owner collects any leasing fees. This enables the lessor to get cash liquidity. *Shari'ah* allows only the trading of physical assets and, exceptionally, any monetary debts can be sold at their nominal values.

3. **Equity-based:** this is regarded as profit and loss sharing contract where investors (i.e. financers) and entrepreneurs make an agreement to distribute any gain or loss resulting from the underlying project or business (DTZ, 2008). The profit or loss is shared based on the level of participants' ownership or the portions of capital provided by each party (DTZ, 2008). The two most frequently exercised equity-based contracts are *Al-Mudarabah* and *Al-Musharakah*.

Al-Mudarabah

This method of Islamic financing is treated as a contract between two parties. In this transaction, the investor, known as *rabb-al-mal*, provides money to expertise, referred to as *Mudareb,* for the purpose of business and trading management (Iqbal and Molyneux, 2005). One of the major features of this contract is that any potential profit is split between the investor and the *Mudareb* according to a pre-agreed ratio (DTZ, 2008). However, uniquely the investor absorbs any resulted loss. (Saeed, 1996)

In *Al-Mudarabah* financing, the bank does not play a part in the management of the investment being financed. However, it sufficiently regulates the underlying business to assure that funds are used in compliance with *Al-Mudarabah* agreement. This is what has come to be termed two tiers *Mudarabah* in current Islamic literature. Out of the total funds assigned to the financed business, a share might be given for the complete agreed term, whereas another share might be available for a short period as an overdraft to counterbalance the funds being in route to *Mudareb* and to manage any potential or seasonal deficiency in liquidity (Chapra, 1985).

Al-Musharakah (partnership)

It is the second Islamic financing method and is based on profit and loss sharing (PLS) concept (Iqbal and Molyneux, 2005). In Arabic Literality, *Al-Musharakah* means sharing, and its financial term is extracted from the Islamic legal word *shirkah*. In *fiqh, shirkah* consist of two types: (i) *shirkat al-mulk* refers to joint ownership of two or more participants in a specific property. This kind of partnership may arise through either inheritance or joint purchase. (ii) *Shirkah al 'aqd* stands for a partnership and is originated through a contract. This contractual PLS generally exists for commercial reason and takes several forms such as partnership in the capital of the enterprise, partnership in labor and management, mutual goodwill or a combination of these elements. (Iqbal and Molyneux, 2005)

Al-Mudarabah differs from *Al-Musharakah* in at least one aspect. In the latter, the financier is allowed to engage in the management of the business in which he invested i. On the other hand, in *Al-Mudarabah*, the investor is unable to participate in managing the business or project that he is funding (Iqbal and Molyneux, 2005).

These two types of partnership have a common feature that is the provider of funds share the profits and tolerates any possible losses resulting from his investment. Based on this fact, these two methods of financing are referred as to profit and loss sharing method (Khan, 1995).

The fundamental principles regulating *Al-Musharakah* are as follows:

(i) Profits, generated from the underlying business, are shared based on a pre-agreed proportion. However, no party is allowed to receive any fixed lump amount of profit .

(ii) Any possible loss should be shared in accordance with each party's capital contribution.

(iii) All partners should generally contribute capital and management in the business. However, a partner may be exempt from participating in the management, but the profit should be distributed always according to the capital contribution of each partner.

(iv) All partners are unlimitedly liable.

2.5.2 Origin and development of Islamic Banks

Major experiments of exercising the Islamic principles into financial transactions have started with the setting-up of the *Mit-Ghamr* Saving Association in a small Egyptian village called *Mit-Ghamr* from 1963 to 1967 (Iqbal and Molyneux, 2005). Moreover, in 1962, another Islamic implication was a saving organization, called *Tabung Haji,* located in Malaysia for Muslims who are willing to perform pilgrimage to Mecca (IFSB, 2007).

The *Mit-Ghamr* Saving Association derived the concept from German saving banks. It used to hold small savings, mainly through interest-free saving accounts, from the rural areas (Ariff et al., 2012). Nevertheless, depositors willing to invest in productive sectors were entitled to small, short-term, and interest-free loans as incentives (Iqbal and Molyneux, 2005). They were allowed, also, to withdraw their savings on demand. Moreover, investment accounts, based on the profit and loss sharing concept, began to finance particular projects of entrepreneurs (Iqbal and Molyneux, 2005).

In 1976, Mit-*Ghamr* Association was succeeded by the first interest- free bank, called Nasser Social Bank. The main purposes of the public-owned Nasser Social Bank were social including providing interest-free loans to the poor and needy borrowers, scholarships to students, and micro-credits to small projects based on the profit and loss sharing model (Iqbal and Molyneux, 2005). In 1975, a group of businessmen founded the world's first Islamic commercial bank, the Dubai Islamic Bank (DIB), in Dubai in the United Arab Emirates (UAE) (Iqbal and Molyneux, 2005).

The major significant development in the history of Islamic banking occurred when the Islamic Development Bank (IDB) was founded in 1975. The IDB is a multilateral development financing organization originated to promote the economic and social development of the member countries and Muslim communities in compliance with the principles of *Shari'ah* (Islamic Development Bank, 2013). The IDB was initiated as an international financial foundation following the announcement of purpose resulted from a conference of Islamic countries' ministers of treasury held in Jeddah-Saudi Arabia, in December 1973 (IDB, 2013). The announcement was approved by the representatives of twenty-three countries which were members of the Organization of the Islamic Conference (OIC) (Hassan and Lewis, 2009). The IDB started to operate in 20th of October 1975 following an opening meeting of the Board of Governors of the IDB that occurred in Riyadh, Saudi Arabia (Iqbal and Molyneux, 2005).

The industry grew progressively over the 1980s, but it is not until the early 1990s that the demand for the investments and loans that are in compliance with the *Shari'ah* principles began to rise drastically. Over this term, Islamic banking developed into a feasible financial intermediary. Also, numerous *Shari'ah*-compliant financial instruments were issued. The period was distinguishable by the opening of a vast number of privately owned Islamic banks operating under different socio-economic circumstances. Moreover, three countries including Pakistan, Iran and Sudan, expressed their intention to remove interest from their total banking system to comply with *Shari'ah* principles (Iqbal and Molyneux, 2005). Currently, Iran has a banking system that is entirely Islamic and *Shari'ah* complied. Several global banks like HSBC, Citibank and more have also opened Islamic windows and started to offer

Islamic financial instruments. This was considered clear recognition and acceptance of the Islamic financial intermediation by international organizations, International Monetary Fund (IMF), and World Bank (Iqbal and Molyneux, 2005). The amount of assets managed under Islamic finance has been estimated increasing from US$ 150 billion in the mid-1990's to around US$ 2 trillion in 2014 (The Economist, 2014). On the other hand, Islamic banking is still considered to be a growing industry and needs more time to be corresponding to the well- developed conventional financial intermediary in spite of significant growth and solid performance (Ariff et al., 2012). It has made considerable progress towards that end, but there are still several challenges that it has to confront. Numerous unresolved theoretical issues and operational problems, mainly related to the poor regulation and corporate governance of Islamic banking system, may constrain further growth and effectiveness of the industry. Hence, the Islamic banking industry is still at an evolutionary stage, it has scored a number of successes, but a lot more needs to be achieved.

Table2.1 Difference between Islamic & conventional banks' financial instruments

Deposit Mechanism	
***Al Wadiah* Current Deposit** Bank promises to return the deposits in full and the depositors do not receive any payment from the profit or other return	**Current Deposit** It is equivalent to Al *Wadiah* current deposit
***Mudarabah* Savings Deposit** Bank invests the savings at its own risk, but ensures to return the entire deposits full return and to share any profit.	**Savings Deposit** Bank safeguards deposits provided by customers in return for interest payment. The depositors are capable to withdraw the held amount.
***Mudarabah* Term Deposit** Savers share the profit and loss resulting from the projects financed by the bank. Consequently, they are not eligible to deposit's withdrawal and do not receive any interest. The return is based on the actual profits generated from the investments operated by the bank.	**Fixed or Term Deposit** This account is opened frequently for a definite term. Depositors obtain different interest rates for different terms of fixed deposits. Usually, the savers cannot withdraw the funds from these accounts. However, withdrawals might be allowed in special situations.
Investment Mechanism	
Murabahah The customer requests the bank to provide funds to his specific requirement or project. The bank then notifies the particular customer about the markup the bank would like to receive. Then, the final cost is paid through installments. The ownership of the asset remains with the bank before selling it to the customer.	**Cash Credits** The bank permits the borrower to request cash beyond the limit of the credit by issuing cheque. Interest charges are based on the day-to-day balance of the account. Overdrafts The bank lets the borrower overdraw amounts of money greater than his credit balance but defined to a specific limit.

Source: extracted from different sources, i.e.; Noman (2002), Alam (2003), Hussein (2004), Kamali (2007), and Ahmad and Hassan (2007), modified.

Table 2.1: Difference between Islamic & conventional banks' financial instruments continued

Deposit Mechanism	
Bai'-Salam	**Purchase or Discount of Bills**
It is a sale of commodity to bedelivered on a future date for cash price. Payment is made in advance to the seller who makes in return the delivery of commodity of defined specification on a precise due date. Usually, the items traded under this mode consist of agricultural products.	A customer makes an agreement with the bank by initiating a Letter of Credit which assures that the bank will pay the customer's bill on a particular date and beyond in return for pre-determined interest return. If the bill found to reach well prior the mentioned, the bank might buy the bill, if requested, on discount.
Qard al Hassan	**Loans**
It is an interest-free loan that contributes socially in financing profitable activities.	A loan is a requested amount of funds paid in advance to a borrower. The sum can be re-paid in full at a definite time or by pre-agreed installment. Interest is applied usually on such type of transactions.
Musharakah	
In this type of Islamic financial contract, one or more entrepreneurs seek financing of a project from an Islamic bank. The latter provides the funds and is able to participate in the management of the given project. The profits or losses are shared among parties corresponding to a pre-agreed ratio or as per the capital contribution.	
Mudarabah	
It represents a contractual agreement between two parties. One party provides the necessary funds whereas the second party offers the expertise and management. The profits are distributed based ion pre-agreed proportion, whereas only the financier absorbs the losses.	
Ijarah	**Conventional Leasing**
It is equivalent to operating leases (Sale-leaseback/Lease-buyback) or financing leases (lease-purchase). The investor rents a given project or asset for a definite amount and over a specific period of time. The ownership of the asset is kept with the investor during the transaction where he sustains all the expenses which are related to the asset's ownership. On the other hand, the lessee has to cover fully the costs resulting from utilizing the asset. In the case of a lease-purchase, each payment presents a portion of the final price of purchase and transfer of ownership of the asset. The bank is not permitted to apply any additional charges on the client in case of delay in payment of the rentals since it is assumed to be a Riba. However, Islamic jurists have reached a solution that is the defaulted customer could be requested to make a payment to charity	It is a contractual agreement between landlord and tenant for leasing a specific asset. The lessor maintains the ownership of the given asset which the lessee uses for a definite term in return for a series of rental fees. During the period of the transaction, the ownership of the leased property goes to the lessee. In case of default, the lessee incurs charges as penalties. Buying the given asset at a discounted price at maturity should not be an option included in the contract. At the expiry of a contract, the underlying asset should have a different value from the initial value of lease. The lease rate is based on market rate of interest.

Source: extracted from different sources, i.e.; Noman (2002), Alam (2003), Hussein (2004), Kamali (2007), and Ahmad and Hassan (2007), modified.

2.6 Comparison of Islamic and conventional banks

Islamic Banks (IBs) perform alongside conventional banks (CBs) and play all the roles which banks are supposed to play (Mejía et al., 2014). They are considered to be the main contributor in the issuance of information and, consequently, help to address the problem arise from asymmetric information problem (adverse selection and moral hazard) (Hasan and Dridi, 2010). Moreover, IBs reduce the costs of the transaction and facilitate the diversification for small savers and investors (Mejía et al., 2014). They also handle risks resulting from their operational projects, liquidity, market risk and other types of risks (Hasan and Dridi, 2010). Additionally, they are contributing in the economy by providing alternative methods of financing to the business and entrepreneurs. However, Islamic banks differ from conventional counterparts in terms of philosophy and operations. The major difference between conventional banks (CBs) and Islamic counterparts is that the latter functions in compliance with the principles of *Shari'ah*. The principal concept in Islamic banking and finance is fairness and justice. This could be achieved primarily through interest depending on interest-free financial contracts or transactions and on the profit/loss and risk sharing models

Unlike conventional banks, which are largely debt-based and are permitted to transfer risk , Islamic banks promote risk sharing and are asset-based (Hassan and Dridi, 2010). IBs vary in terms of the level of risk sharing (Hassan and Dridi, 2010). The Capital Adequacy and Risk Management standards released by the Islamic Financial Services Board (IFSB) recommend that the type and size of financial risks in Shari'ah-compliant instruments do not drastically differ from those issued by conventional banks. For instance, most methods of financing in Islamic banking are in the form of *Murabahah* contracts (markup financing) or *Ijarah* (Installments sales) As a result, the credit risk is the major type of risk that encounters the IBs, and this is similar to CBs (Hassan and Dridi, 2010). A main difference between CBs and IBs is that the latter does not allow investing in or funding any types of instruments or contracts which had initiated the financial turmoil (2007-2009) and consequently damaged directly the conventional banks (Hassan and Dridi, 2010). These financial products include toxic assets, derivatives, and securities of conventional financial institutions.

Similar to CBs, IBs encounter credit and market risks, and, also, their dealings develop liquidity, operational, strategic, and other types of risks. Handling liquidity is considered a more significant challenge for IBs than it is for CBs. The reason behind that is the limited capability of numerous IBs to attract investors for projects based on profit sharing concept as the return on these investments is uncertain. Moreover, the liquidity risk management in Islamic banks is still in growing stage and lack effective jurisdictions (Hassan and Dridi, 2010).

Table 2.2 Differences between Islamic & Conventional Banks

Islamic Banking System	Conventional Banking System
All activities comply with *Shari'ah* principles. Islamic scholars give advice and guidance, and assure consistency of transactions to Islamic laws.	Secular banking rules monitor transactions performed by the conventional bank.
The contractual transactions are backed by tangible assets. The Islamic bank maintains the ownership of this financed asset before the resale.	Extreme dependency on credit and indebtedness can cause financial hardship.
This enables several parties, including the Islamic bank to provide equity capital to a project or venture. Losses are shared on the basis of equity participation while profits are shared on a pre-agreed ratio. Management of the enterprise can be in one of several forms depending on whether the financing is through Mudarabah, *Musharakah*, etc.	Equity financing with risk to capital is not generally available through commercial banks, but through venture capital companies and investment banks which typically take equity stakes and management control of an enterprise for providing start-up finance.
Transactions, which include speculation (*Gharar),* are forbidden. For instance, It is not allowed to deal in and trade derivatives since it consists of factor of *Gharar.*	It is permissible to trade and deal in securities and derivatives.
All transactions are based on the profit and loss sharing concept. Profits are not guaranteed and vary based on the performance of the given Islamic bank. Therefore, customers may have a share in the profits generated by the Islamic bank.	The model of Profit and loss sharing is not employed in transactions. The depositor is eligible to a pre-agreed fixed return regardless the performance of a given bank. In other words, The depositor only gets a predetermined interest rate, and does not get a portion of the profits made by the bank Unlike the customer of an Islamic bank, the depositor cannot theoretically benefit from the improvement of a bank's performance.

Source: Abu Dhabi Islamic Bank (2015), modified

The Islamic banks also suffer from a low dependency on deposits since the Islamic financial market is immature and the interbank rate unavailable except under the reverse *Murabahah* contract (Hasan and Dridi, 2010). Islamic banks tackle this kind

of risk by holding high level of liquidity as a buffer. On the other hand, limited investing tools prevent Islamic banks from efficiently using excessive liquidity and, consequently, becoming a major player in the financial market alongside CBs.

2.7 Chapter Summary

This chapter indicates the meaning of Islamic banking, the history of its origin and its development. It also shows the features of this type of sector and the differences from conventional counterparts. Moreover, this chapter presents the different sources of funds in Islamic and conventional banks, and the financial services and instruments provided by each of them. Additionally, it examines the significant relationship between Islamic banks and the principles of *Shari'ah*, and shows how the latter govern the different activities as well as the financial instruments and services provided by Islamic banks.

Chapter 3 Literature review: Efficiency of Islamic and Conventional Banks

3.1 Introduction

This chapter begins with the review of studies on the performance of Islamic banks as compared to their conventional counterparts; this review ranges from financial ratios to techiques which are more sophisticated. Particularly, it addresses the theoretical approaches to the assessment of efficiency. Moreover, it defines efficiency and returns to scale, parametric and non-parametric models and their methods to measure efficiency, and it summarizes each model's strengths and weaknesses. The chapter provides, also, recommendations which might minimize the limitation of the approach used in the study, namely Data Envelopment Analysis (DEA). This is done by extending it into more a flexible and developed model, i.e. by means of a re-sampling technique, such as bootstrapping, to obtain an empirical approximation of the underlying sampling distribution of DEA efficiency estimates.

Furthermore, the chapter discusses the recent empirical evidences on the efficiency of Islamic and conventional banks. Moreover, it shows numerous reviews on techniques implemented to evaluate existing efficiency. The chapter ends with the discussion on the approaches to define bank input and output variables.

3.2 Measurement of performance

Performance is examined from two different angles (Olson and Zoubi, 2011). Firstly, the accounting-based perspective computes the performance of an institution by relying on comprehensive information from financial statements, financial indicators like debt to equity ratio, net profit margin, Return on Equity (ROE), and Return on Assets (ROA) where the last two are the ones used most frequently. Secondly, an economic-based perspective computes the distance of each Decision Making Unit (DMU) in a sample of observation from the efficient frontier with respect to the maximization of output or minimization of inputs and the maximization of profits or minimization of costs (Olson and Zoubi, 2011). The economic-based perspective, used in the literature, was referred to as "efficiency" (Olson and Zoubi, 2011).

Efficiency is calculated by means of analysis of the relationship between outputs and inputs of a DMU (production unit) (Olson and Zoubi, 2011).

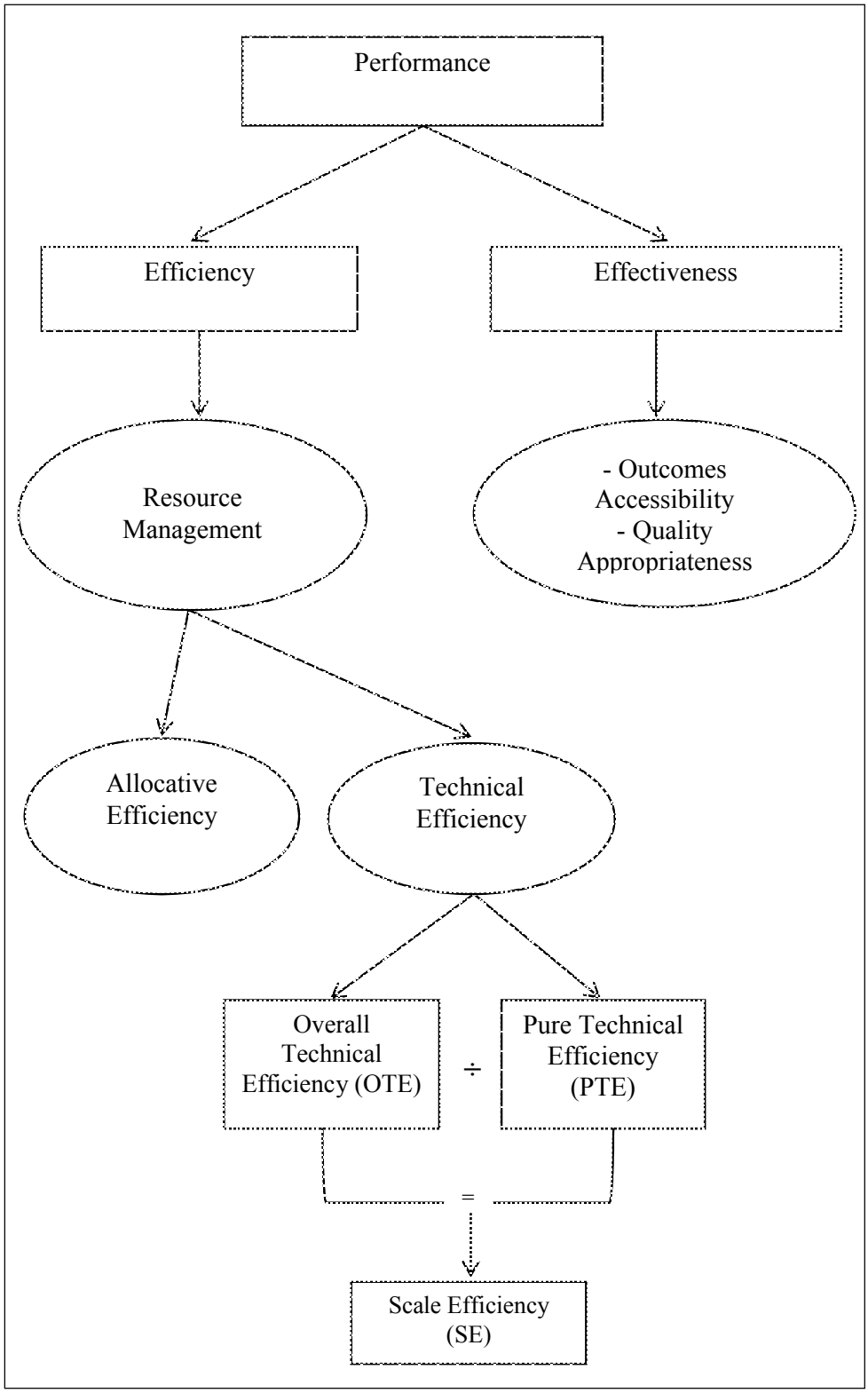
3.3 Theoretical Literature: Efficiency and Productivity

Bank performance is measured through efficiency and productivity. Both measurements inform interested parties, such as bank managers, on the different aspects of bank performance and inform governments for policy purposes. The increased competition in the banking industry, particularly between Islamic and conventional banks, domestic and foreign banks and between banks and non-banks, requires them to be efficient. In order to run an analysis and provide theoretical evidence, there is a need to understand the concept of efficiency (Ellahi et al., 2011). The efficiency analysis of a DMU refers to the outputs and inputs used in the production process of services or products (Hamim et al., 2008). Efficiency can be divided into two components (Kumbhakar and Lovell, 2003): namely, allocative efficiency; and technical efficiency. Allocative efficiency refers to the ability to obtain the optimal combination of inputs and outputs at a given price (Kumbhakar & Lovell, 2003). Technical efficiency is determined when the firm maximizes output from a given input or minimizes input for the production of output (Murillo-Zamorano, 2004). Based on Berger and Mester (1997), I used two two economic concepts to measure efficiency. These are cost efficiency and profit efficiency.

Cost efficiency means how effectively a firm uses its resources in producing services and products. Profit efficiency examines either how effectively a firm generates income from these services and products or Technical efficiency which measures how much of a firm's actual/or minimum input approaches its maximum/or actual production. In this thesis, the concept of efficiency is important because it allows particularly the comparison of performance between Islamic and conventional banks.

Efficient banks are able to increase profitability, intermediate more funds, offer better prices and service quality and enhance bank soundness and safety if efficiency improves the capital buffer to absorb risks (Berger, Allen, Hunter and Timme 1993).

Figure 3.1: Methods of evaluating performance



Source: Porcelli (2009), modified

According to Lovell (1993), the productivity of a production unit is computed by the ratio of its output to its input. However, productivity differs according to variations in production technology, in the production process and dissimilarities in the environment in which production occurs (Porcelli, 2009). In such circumstances, the major concern is in examining the efficiency component in order to determine its contribution to productivity. Units are considered efficient if they produce as much as possible from the outputs with the actual level of inputs at minimum cost (Greene, 1997). As reported in Figure 3.1, it is important to be aware that efficiency is only one component of the overall performance.

3.3.1 The Brief Theory of Production Efficiency

Farrell (1957) defines the overall efficiency as Economic Efficiency (EE); this includes both Technical Efficiency (TE) and Allocative Efficiency (AE) (Murillo-Zamorano, 2004). This measure comes from the multiplicative interaction of both technical and allocative components, EE= TE × AE (Murillo-Zamorano, 2004).

1. AE refers to the capability to group inputs and outputs in optimal proportions taking into consideration existing prices. AE is measured in terms of the production unit's functioning objective, for instance, this is observed vs. optimum cost or observed profit vs. optimum profit (Porcelli, 2009).
2. On the assumption that the inputs are fixed, TE is the ratio between the observed output and the maximum output, assuming that the inputs are fixed. This is under the output- oriented approach. On the other hand, on the assumption that the outputs are fixed, under the input-oriented approach, TE is measured as the ratio between the observed input and the minimum input (Porcelli, 2009). In the literature, TE is defined as:

(a) Based on Koopmans (1951) "a DMU is technically efficient if increasing an output necessitates decreasing in at least one other output or rising in at least one input. Alternatively, a drop in any input necessitates an increase in at least one other input or a decrease in at least one output".

(b) Distinctly, Debreu (1951) and Farrell (1957) described the following measure of TE referred to as the Debreu-Farrell measure: "one minus the maximum equi-proportionate decrease in all inputs that still permit the production of given outputs. A

value of one indicates that a unit is technical efficient, whereas a score of less than value of one shows that the unit is significantly technical inefficiency".
Technical efficiency does not need necessarily a use of price data or other weights. If product costs and prices are available, the perceptions of AE and Overall Technical Efficiency (OTE) are introduced and related to TE t in a way first introduced by Farrell (1957) (Cooper et al., 2004).

In the bank efficiency analysis, it was assumed that banks had the same production technology and, hence, differences between banks were in their managerial abilities. Under the parametric model, it was assumed that the shape of production frontier was characterized by an explicit functional form such as cost or profit function. However, under the non-parametric model, the frontier is created as the piecewise linear combinations which connect the set of this best-practice yielding convex production possibilities set (Berger and Humphrey, 1997). Furthermore, the sample data could predict an efficient production frontier and the banks with superior managerial abilities, known as the best-practice banks, were located on this frontier. Hence, EE is the discrepancy between the "optimal" level and the observed level of a bank's productive inputs and outputs of a lies on the production frontier.

Estimating the outcomes of a production frontier can be categorized as either deterministic or stochastic. An error term in a deterministic frontier, as in DEA which assumes an exact maximum possible output, is comprised of only inefficiency and given input level (e.g., English, Grosskopf, Hayes, and Yaisawamg 1993; Iqbal, Ramaswamy, and Akhigbe 1999). On the other hand, the error term in the stochastic frontier is as in the SFA which assumes random maximum output, contains random noise and inefficiency components and the given input level.

3.3.2 Efficiency Measurement in Banking Industry Literature

Methods used in the literature to measure banking performance range from financial ratios, which are based on certain financial indicators, to more sophisticated techniques such as DEA and SFA (Iqbal & Molyneux, 2005). As shown below, existing studies in this area were split into two categories. The first category

comprises accounting-based studies which evaluate the performance of banks using financial ratios (e.g. Samad, 1999; Bashir, 1999; Hassan and Bashir 2003; Bader, et al., 2007). The second category of researches examines bank efficiency and runs the frontier analysis approach rather than traditional financial ratios. This group's economic-based studies were divided into the following three categories: i) studies evaluating Islamic banks' efficiency (e.g. Yudistria, 2004; Brown and Skully, 2005; Hassan, 2005; Bader et al., 2007); ii) studies investigating conventional banks' efficiency (e.g. Weill, 2004; Bos and Kool, 2006; and Bader, 2007); and iii) studies comparing the efficiency of Islamic banks with the conventional banks (e.g. Al-Shammari, 2003; Hussein, 2004; Al-Jarrah and Molyneux, 2005; Bader, Shamsher and Taufiq, 2007). Based on the above-mentioned techniques, this section discusses the studies.

3.3.2.1 Financial Ratios

Using financial ratios, accounting-based studies (see for example, Nienhaus (1988); Samad and Hassan (1999); Hassan and Bashir (2003); Samad (2004); Olson and Zoubi, 2011), show that the relative performance of Islamic and conventional banks varies according to the measured financial indication. Accounting- based studies of banks performance use generally comprehensive information and financial indexes from financial statements to identify the factors, as measured by debt to equity ratio, ROI (Return on Investments), Return on Assets (ROA), and Return on Equity (ROE) (Olson and Zoubi, 2011). Accounting-based studies, investigating factors of bank profitability, examined the bank-specific, industry-specific, and macroeconomic factors affecting individual bank performance. The majority of researchers assessed performance using either ROE or ROA (Olson and Zoubi, 2011).

Samad and Hassan (1999) conducted a financial ratio analysis to examine the performance of a leading Malaysian Islamic bank (Bank Islam Malaysia Berhad (BIMB)) during 1984-1997. Their findings recommend that the Islamic bank management's lack of knowledge was generally the major cause of slow growth of loans under profit sharing. However, the Islamic bank was found to perform better relative its conventional counterparts in term of liquidity and risk management (lower

risks). Samad and Hassan (1999) found that the given Islamic bank faced less risk because of its high equity-to-assets ratio and greater investment in government securities. However, as measured by both ROA and ROE, they did not find any statistically significant difference in managerial performance. The Malaysian Islamic bank's profitability performance was found to be significantly lower than conventional banks because of a smaller opportunity set for Islamic bank in stocks and securities due to religions constraints. Similarly, Samad (2004) found that Bahraini Islamic banks were found to be exposed less to liquidity risks due to their high liquidity arising from restricted *Shari'ah* compliant investments opportunities which have short term loans and investments as well as more conservative lending. Furthermore, on average, I found that six Islamic banks were doing as well as their fifteen conventional counterparts in terms of profitability and liquidity, and, by using financial ratios over the period from 1991 to 2001 after the Gulf War, even exhibited better credit performance.

Hassan and Bashir (2003) also found that Islamic banks performed better in terms of assets quality and capital adequacy but that Islamic banks held less liquidity when compared to conventional banks. Using financial ratio, the author compared for the period between 1994 and 2001 Islamic banks and conventional banks which had similar deposits and total assets. Likewise, Iqbal (2001) found that Islamic banks did not suffer from excess liquidity but they were not cost effective (cost to income ratio). By using financial ratios, the study compared twelve private Islamic banks from various countries with conventional banks from the same countries. It concluded that Islamic banks had comparatively higher rates of growth rate in terms of equity, deposits, investments and total assets; better use of resources; and higher profitability in terms of Return on Investment and ROE. In another study, by using financial ratios, Hamid (1999) evaluated an Islamic bank relative to two conventional private banks in Bangladesh. In line with the previous studies, Islamic banks were found to outperform private banks better in term of liquidity, profitability, and overall productivity (i.e. total income to total expenditure). However, an Islamic bank is found to generate less income per unit of personal expenditure and suffer from excess liquidity due to the lack *Shari'ah* compliancy in the central bank's investments opportunities. Moreover, since the Islamic banks are relatively new and hire experienced bankers from the

conventional banks, they incur higher labor costs. On the other hand, by using financial ratios during the period from 1980 to 1986, Nienhaus (1988) compared seven Islamic banks with twenty six conventional banks from the same countries. The author found that, in terms of assets, profit and capital, Islamic banks performed equally, if not less well than the conventional banks. The study's banks operated in four countries in the Middle East - Bahrain- Egypt, Jordan, and Kuwait.

The financial ratio-based analyses or accounting-based analyses are used for benchmarking and present significant perceptions (Olson and Zoubi, 2011). However, these analyses may be restricted in scope because they take a one aspectual view of a service or a product or a process and they ignore any interactions, substitutions or trade-offs between key variables (Berger and Humphrey, 1997). Furthermore, this simple technique does not take in consideration, also, the value of management actions and investment decisions might be affected by future performance rather than current performance. Therefore, it is considered to be a short-run indicator and may not be effective means of interpreting whether or not a bank is efficient in the long-run (Berger and Humphrey, 1997).

3.3.2.2 Regression Analysis

By using Middle Eastern bank level data, Bashir (1999) and Bashir (2001) conducted regression analyses to determine the underlying drivers of Islamic performance. The author found that, with regard to profits, the bank's performance was influenced frequently by overheads, customer short term funding, and non-interest earning assets. Furthermore, because deposits in Islamic banks are treated as shares, according to Bashir (2001), reserves held by banks propagate a negative influence through such as reducing the amount of funds available for investment.

Metwally (1997) concluded that there was no significant difference between Islamic banks and conventional banks with regard to their efficiency and profitability. By investigating the structural variations between the two groups during the period from 1992 to 1994, Metwally (1997) assessed the performance of thirty banks (fifteen Islamic and fifteen commercial banks) from all over the world. Although unlikely, Hassoune (2002) found that, by using also the linear regression technique, the ROE of

Islamic banks became less unstable than that of conventional banks since the latter the seconds depended on interest rate movements. During the period from 1994 to 2001, the author compared a Saudi Arabian Islamic bank with six conventional banks which had homogenous balance sheet structures. Moreover, when the sample was extended to include Qatar, Saudi Arabia and Kuwait from 2000 to 2001, Islamic banks' ROE (profitability) was noted to be greater than conventional banks.

3.3.2.3 Efficiency frontier models

It is significant to summarize the techniques in which bank efficiency has been calculated in the literature prior to examining recent empirical evidence on the efficiency of Islamic and conventional banks. Various approaches were initiated in the banking literature to compute bank efficiency; these ranged from simple financial ratios, as shown earlier, to intricate econometric models (i.e. parametric models). The parametric approach comprises Stochastic Frontier Analysis (SFA), the Thick Frontier Approach (TFA), and Distribution-Free Approach (DFA). On the other hand, the non-parametric approach included the Data Envelopment Analysis (DEA) and the Free Disposal Hull (FDH). Both approaches were based on Farrell's same seminal paper (1957). However, unlike the non-parametric approach, the parametric method computes for the noise. Therefore, any divergence from the efficient frontier is considered noisy and inefficient while the non-parametric approach views it as inefficiency. Frontier approaches are considered better than standard financial ratio analysis because they employ programming or statistical techniques that eliminate the effects of variations in input prices and other exogenous market circumstances influencing the institutions' regular performance (Bader, 2008).

Thus, these approaches provide more precise measures of the underlying performance of the institutions and their managers. The efficiency frontier approach was used widely in the existing banking literature to determine the effects of capital regulation, deregulation of deposit rates, removal of geographic restrictions on branches and holding company acquisitions, mergers and acquisitions, and on financial institution performance generally (Bader, 2008). Furthermore, researchers prefer efficiency frontier models rather than other performance estimators mainly because these models

result in an objectively determined quantified measure of relative performance that removes many exogenous factors (Iqbal and Molyneux, 2005). This allows the researcher to concentrate on quantified units of costs, inputs, outputs, revenues, profits, and so on in order to assign efficiency relative to the best practice institutions in the population (Iqbal and Molyneux, 2005). Moreover, the frontier methods allow us, also, to see banks as multi-product firms using multiple inputs.

This study focuses on frontier efficiency, in other words, the closeness of a bank to a best-practice frontier of similar specification counterparts. There is a fundamental accord in the literature that, as far as financial institutions were concerned, variations in frontier efficiency are assigned to an incorrect scale or scope of output (Berger et al., 1993). However, there is no consensus on the favored method to evaluate the best-practice frontier against which relative efficiencies are calculated (Berger and Humphrey, 1997).

3.3.2.3.1 Non-parametric approach

The non-parametric approaches, including Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH), impose a minimal structure on the requirements for a best-practice frontier (i.e. efficient frontier) (Berger and Humphrey, 1997). DEA is a linear programming technique whereby the group of best-practice or efficient frontier DMUs make the most of every output (given specific level of inputs) or the least of every inputs (given specific level of outputs) (Berger and Humphrey, 1997). The DEA frontier is created as the piecewise linear combinations that join the group of this best-practice (efficient), giving a convex production possibilities group (Casu and Molyneux, 2003). As such, DEA does not necessitate either the explicit specification of the form of the underlying production relationship or the distributional function (Berger and Humphrey, 1997).

The Free Disposal Hull (FDH), developed by Deprins, Simar and Tulkens (1984) and Harkins (2012) is another non-parametric approach which was employed to determine bank efficiency. . FDH is a special case of DEA where the points on lines connecting the DEA vertices are not included in the frontier (Iqbal & Molyneux, 2005). Alternatively, the FDH production possibilities set is formed only of the DEA vertices

and the free disposal hull points interior to theses vertices (Berger and Humphrey, 1997). From the perspective of input requirements to create a given output, DEA assumes that linear change is probable between observed input combinations on an isoquant (which is created from the observations in piecewise linear forms) (Berger and Humphrey, 1997). Conversely, FDH presumes that there is no potential for a replacement and so the isoquant looks like a step function created by the intersection of lines drawn from observed (local) Leontief-type input combinations (Harker and Zenios, 2000). The FDH frontier covers the data more tightly than by using the DEA frontier and has a staircase shape (Gulati and Kumar, 2012). In other words, the FDH frontier is either congruent with or interior to the DEA frontier (Tulkens, 1993). Therefore, the FDH approach produces typically produce greater measures of the efficiency score than by using the DEA approach Also, slackness is a much more serious problem in FDH than in DEA (Berger and Humphrey, 1997). Both models, DEA and FDH, allow efficiency to differ over time and make no prior presumptions concerning the form of the distribution of inefficiency across DMUs unless non-dominated observations are 100% efficient (Berger and Humphrey, 1997).

The non-parametric models set less structure on the frontier; however, there is a drawback with them since they presume that there is no random error. In other words, given the absence of random error, any deviations from the efficient frontier are considered to be in efficient (Berger and Humphrey, 1997). If random error exists, computed efficiency scores may be contradicted by these random deviations from the true efficiency frontier (Harker and Zenios, 2000). Moreover, the non-parametric approach encounters, also, difficulty in drawing statistical inferences due to the lack of a definite functional form encapsulating the production technology (Iqbal and Molyneux, 2005).

3.3.2.3.2 Parametric Approach

There are three main parametric frontier approaches. Although they all specify an efficient frontier form, they differ in their distributional assumptions of the inefficiency and random components (see Cummins and Weiss, 2011) (Eling and Luhnen, 2010). Translog is usual form of efficient frontier that is employed

commonly in these approaches. However, there are, also, different forms such as generalized translog, Fourier flexible or composite cost. The Stochastic Frontier Approach (SFA) is the first parametric approach; this defines a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and counts for random error (Berger and Humphrey, 1997). SFA postulates a composed error model where inefficiencies are presumed to follow an asymmetric distribution- usually the half-normal distribution- whereas random errors follow a symmetric distribution- usually the standard normal distribution (Harker and Zenios, 2000). The half-normal assumption for the distribution of inefficiencies is relatively inflexible and assumes that most firms are clustered near to full efficiency. However, in practice, other distributions may be more appropriate (Greene, 1990). The inefficiency must have a truncated distribution since it cannot be negative (Berger and Humphrey, 1997). Some financial institution studies have concluded that defining the more general truncated normal distribution for inefficiency produces minor different results which, at the statistic level, are significant from the special case of the half-normal (Berger and DeYoung, 1997).

Furthermore, given the observation of the composed error term, the estimated inefficiency for any institution is taken to be the conditional mean or mode of the distribution of the inefficiency term (Burger and Humphrey, 1997). Both inefficiencies and errors are assumed to be orthogonal in relation to inputs, outputs, or environmental variables specified in the estimating equation (Burger and Humphrey, 1997). According to Eling and Luhnen (2010), two outline decisions have to be made when employing SFA. These are, firstly, the selection of the functional form to evaluate the real fundamental production, cost, revenue, or profit function and, secondly, the distributional assumption for the inefficiency term (Eling and Luhnen, 2010). The Translog form is the frequently used functional form (Eling and Luhnen, 2010). However, there are a diversity of other functional forms, such as the Cobb-Douglas, Fuss normalized quadratic (see Morrison and Berndt, 1982), and generalized translog (see Caves et al., 1980) (Eling and Luhnen, 2010). The Fourier flexible form (see Gallant, 1982) and composite cost (see Pulley and Braunstein, 1992, Pulley and Humphrey, 1993) were employed, also, in the studies of the financial institutions. According to Eling and Luhnen (2010), the commonly used flexible functional forms

are the Cobb-Douglas, Fourier Flexible and Translog Functional Fuss normalized quadratic (see Morrison and Berndt, 1982), and generalized Translog (see Caves et al., 1980). Amomg the previously mentioned forms, the Translog specification is the most commonly and widely used functional form (Iqbal & Molyneux, 2005; Eling and Luhnen, 2010). However, recent studies tended to employ the more flexible Fourier functional form (Iqbal & Molyneux, 2005) since, in one case, it reduced the amount of calculated inefficiency by about half - from 10% to 5% of costs - and it was able to be closer to more of the data (Berger and DeYoung, 1996).

The Distribution Free Approach (DFA) is the second parametric approach. DFA defines, also, a functional form for the frontier, but using a distinct method, separates the inefficiencies from random error (Berger and Humphrey, 1997). However, unlike the SFA, DFA does not make strong assumptions concerning the specific distributions of the inefficiencies or random errors. Alternatively, DFA presumes that the efficiency of each institution (DMU) is constant over time, while random error tends to average out to zero over time (Berger and Humphrey, 1997). The difference between the inefficiency average residual and the DMU's average residual, referred to as the estimate of inefficiency for each unit in a panel data group, is computed then with some truncation performed to consider the possible failure of the random error to average out to zero fully (Harker and Zenios, 2000). By employing DFA, inefficiencies, even if fairly close to symmetric, can follow almost any distribution since their values are positive (Harker and Zenios, 2000).

However, DFA tends to describe the average deviation of each DMU from the best average-practice frontier (i.e. efficient frontier) rather than the efficiency at any one point in time. This is particularly so if the efficiency is varying over time because of technical change, regulatory reform, the interest rate cycle, or other influences, (Berger and Humphrey, 1997). Since no restrictive presumptions are set on the distribution of either inefficiency or the random error, it is considered easier to use the DFA than the SFA. This is because it does not require the use of maximum likelihood methods to determine the cost or profit function (Cummins and Weiss, 2011). One disadvantage of DFA is that it may provide misleading outcomes if the period selected is too long or if the inefficiency component of the error term is unstable over time or

if the number of available data years is insufficient to average out the random error term (Cummins and Weiss, 2011). Therefore, the accuracy of the efficiency results may depend on the length of the period of the study. De Young (1997) shows that a six year time period is long enough to tackle all these issues.

The Thick Frontier Approach (TFA) is the third parametric approach. This defines a functional form and does not set any distributional assumptions (Berger and Humphrey, 1997). This approach measures the cost function for both the lowest average cost quartile and the highest average cost quartile of banks. Banks, within the lowest average cost quartile, are considered to be of higher than average efficiency and to create a thick frontier (Bauer and Hancock, 1993). Similarly, banks, within the highest performance quartiles, are assumed to have less efficiency than average (Berger and Humphrey, 1997). TFA considers that divergences from forecasted performance values within the highest and lowest performance quartiles of observations correspond to random error, while deviations in predicted performance between the highest and lowest quartiles correspond to inefficiencies (Harker and Zenios, 2000).

The major disadvantage of the previously discussed frontier approach is that there is a somewhat random option between inefficiencies and errors due to the following factors (Burger and Humphrey, 1997): (i) DEA ignores the random selection; (ii) SFA outcomes depend on pre-considered distributional assumptions; (iii) DFA imposes strong suppositions on the evolution of X-efficiency over time; and (iv) TFA classifies the data of a randomly chosen set of firms, i.e. there is the possibility to select other quartiles (Wagenvoort & Schure, 1999).

The parametric approaches suffer from the drawback of imposing functional form and behavioural assumptions about the shape of frontier (Berger and Humphrey, 1997). Computed efficiency can be contradicted by the specification error and, if the functional form is unspecified, can be divergent from its initial approximate estimate (Harker and Zenios, 2000). However, processes of addressing this main limitation have begun by designating a Fourier-flexible functional form which provides a standard translog function with Fourier trigonometric terms (Berger and Mester, 1997;

Berger and Humphrey, 1997). The Fourier flexible form may ameliorate considerably the flexibility of the frontier (Berger and Humphrey, 1997). This is by allowing for many inflection points and by including essentially orthogonal trigonometric terms which ease installing the frontier to the data wherever it is most required (Berger and Humphrey, 1997).

3.3.4 The Empirical Literature on the Efficiency Studies

Mokhtar et al. (2006) investigated the efficiency of fully-fledged Islamic Banks, conventional banks, and Islamic windows in Malaysia. They concluded that Islamic banks were the most cost and profit efficient when compared to both conventional and investment banks. They employed SFA in order to calculate the technical and cost efficiencies of 288 observations from the annual reports of 20 Islamic windows, two full-fledged Islamic Banks and 20 conventional banks over the period from 1997 to 2003. The findings state that, in terms of assets, deposits and financial base, the Malaysian Islamic banking sector developed significantly between 1997 and 2003 relative to the conventional banking counterpart. Islamic banking technical and cost efficiencies were expected to provide major perceptions to management and policy makers with reference to the optimal utilization of capacities and the allocation of scarce resources in different banks (Mokhtar et al., 2006). By running SFA, Al-Shammari (2003) found, also, that Islamic banks were the most cost and profit efficient when compared to conventional commercial and investment banks in GCC countries. Moreover, the author concluded that Bahraini banks were the most cost efficient and Oman banks were the least efficient.

Al-Shammari (2003) represented bank types and country dummy to affect inefficiency directly in order to limit loan quality and capital in both cost and profit functions. Similarly, Al-Jarrah and Molyneux (2003) employed the SFA, with the Fourier-flexible functional form, and found that Islamic banks were more cost and profit efficient than conventional banks. They computed cost and profit efficiency for the banks operating in Bahrain, Egypt, Jordan, and Saudi Arabia. Likewise, Bader et al. (2008) and found that, when compared to their conventional counterparts, the Islamic banks were the most efficient. Moreover, Bader et al., (2008) concluded that

the small Islamic banks were more efficient than the conventional banks due to their capital structure. Between 1990 and 2005, they studied eighty banks of which forty-three were Islamic banks and thirty-seven were conventional banks. The study demonstrated, also, that, since they had gained more experiences firstly, over time, the cost and profit efficiency of older Western banks were more efficient than older Islamic banks (Bader et al., 2008).

On the other hand, Hussein (2004), EI-Gamal and Inanoglu (2005), Alpay and Hassan (2006), and Mokhtar, et al. (2006) found no significant difference in efficiency between Islamic banks and conventional banks. Hussein (2004) investigated the performance of Bahraini banks by determining their profit efficiency using the Fourier's flexible functional form for the period from 1985 to2001. Afterwards, he compared the profit efficiency of Islamic banks with conventional banks. His findings showed that the profit efficiency of Bahrain banks was relatively stable and in line with the Organization for Economic Co-operation and Development (OECD) banks. Moreover, the researcher concluded that there was not too much of a difference in terms of profit efficiency between Islamic and conventional banks regardless of the fact that many Islamic banks were small and operated as venture capital. In contrast, the only Islamic commercial bank in his sample outperformed the conventional counterparts. This was due to lack of competition whereby the Islamic commercial bank was able to reduce its input costs and charge a higher mark-up. In addition, during the period from 1997 to 2003, Mokhtar, et al. (2006) found no significance difference between companies or merchant banks using cost function and between Islamic banks and all conventional banking institutions using profit function.

However, this Malaysian banking study does not assume any environmental factors either to influence the function or to influence directly the inefficiency. El-Gamal and Inanoglu (2005) found no significant difference in efficiency between Islamic and conventional banks. According to them, this is due to Islamic asset-based financing leading to lower non-performing loans ratios. By employing SFA during the period from 1990 to 2000, El-Gamal and Inanoglu (2005) studied the cost efficiency of fifty-three Turkish banks, forty-nine conventional banks relative to four Islamic Special Finance Houses (SFHs). The Islamic institutions represent around 3% of the Turkish

banking sector (El-Gamal and Inanoglu, 2005). It is significant to mention that, whether or not subjected to many restraints, e.g. branching and the inability to hold government bonds, SFHs were able to attain high levels of efficiency. Using the same dataset, while EI-Gamal and Inanoglu (2005) employed cost function to measure efficiency, Alpay and Hassan (2006) applied DEA to measure the Turkish banks' efficiency. The study agreed that, on average, Islamic banks were equal, if not more efficient than conventional banks despite having limited *Shari'ah* compliant investment opportunities. However, unlike conventional banks, the Islamic banks' productivity and technical efficiency reduced over time.

However, studies by Omar et al., (2007), Mokhtar et al. (2007, 2008), and Srairi (2010) found that Islamic banks were significantly less efficient than conventional banks. Srairi (2010) concluded that, in terms of profit and cost during the period from 1999 to 2007, western conventional banks in the Gulf Cooperation Council (GCC) countries were more efficient than Islamic banks. Srairi employed the SFA to determine the cost and profit efficiency of seventy-one Islamic and western banks in GCC countries between 1999 and 2007. Omar et al. (2007) examined the efficiency of twenty-one privately- owned Indonesian banks (two Islamic banks versus nineteen conventional counterparts) between 2002 and 2004. They found that these two Islamic banks were more cost and profit efficient than the conventional counterparts.

On the other hand, many studies examined only the efficiency of Islamic banks (e.g. Hussein (2003); Yudistira (2004); Mostafa (2007); Kamaruddin et al. (2008); Sufian et al. (2009c)). By employing DEA, Sufian et al. (2009c) examined the efficiency of Islamic banks in 16 Asian and MENA countries, between 2001 and 2006. They found that Islamic banks were operating at a relatively optimal scale of operations but they were managerially inefficient in utilizing their resources to the fullest (Sufian et al., 2009c). The results showed that the Islamic banks' PTE declined from 2001 to 2003, increased during 2004, before declining again in 2005 and 2006 (Sufian, et al. 2009c). During the period of study, the Islamic bank's average PTE was 65.4%; this meant that these banks could save 34.6% of their inputs to produce the same current amount of outputs. By using DEA, Kamaruddin et al. (2008) examined the performance of Islamic banking operations in Malaysia in order to determine the cost and profit

efficiency of two fully-fledged Islamic banks and twelve Islamic windows operations of domestic and foreign banks between 1998 and2004. The findings indicate that the overall cost efficiency estimate is 0.695. This means that when compared to a best practice bank, an Islamic bank wasted 30.5% of its inputs in producing the same current outputs. Yudistira (2004) employed DEA to study the efficiency performance of eighteen Islamic banks between 1997 and 2000. He found that Islamic banks presented significant overall efficiency during the sample period. The study showed that 2000 was the most efficient (0.909) year when compared to 1997, 1998 and 1999 (0.902, 0.870 and 0.897 respectively).

Furthermore, Islamic banks, operating in the Middle East, were less efficient than Islamic banks operating outside the region since the latter were relatively new and were controlled by their respective regulators (Yudistira, 2004). Moreover, the study confirmed that there was a direct relationship between bank size and Variable Return to Scale (VRS) since the findings showed that large Islamic banks were responsible for scale inefficiency. It showed, also, that newer Islamic banks were less efficient than older Islamic banks, whereas the older banks, operating in western countries, were more cost and revenue efficient than their newer counterparts (Yudistra, 2004). The explanations of these findings could be related to the fact that older banks had more experience of the banking industry. By employing SFA, Hussein (2003) investigated the cost efficiency of seventeen Islamic banks in Sudan where the banking system complies entirely with *Shari'a* principles-. The study covered a period of ten years (1990-2000). In his analysis, Hussein (2003) used the specific terms of Islamic financial instruments as outputs. The findings present significant differences in the Sudanese banks' cost efficiency. Moreover, they demonstrate that foreign-owned banks are the most efficient among Sudanese banks. The study a observed, also, the determinants of bank efficiency where Hussein (2003) concluded that smaller banks were more efficient than their larger counterparts. Moreover, banks, holding greater levels of *Al-Musharakah* and *Al-Mudarabah* in total assets, may benefit from a higher level of efficiency (Hussein, 2003).

On the other hand, studies (e.g. Johnes et al., (2014), Abdul-Majid et al. (2008; 2010; 2011) concluded that Islamic banks were less efficient than their conventional

counterparts. By employing the financial ratios analysis and DEA, Johnes et al. (2009) estimated the efficiency of Islamic versus western banks operating in the Gulf Cooperation Council (GCC) countries. The study examined the performance of six banks between 2004 and 2007. The findings demonstrate that, when compared to western banks, Islamic banks have lower cost efficiency but relatively higher revenue and profit efficiency (Johnes et al., 2014). By conducting SFA, Abdul-Majid et al. (2008; 2011) studied Malaysian banks' gross and net efficiency. Unlike net efficiency, gross efficiency is computed by considering each bank's various characteristics in the SFA's function (Abdul-Majid, 2011). The findings deduced that both the gross and net efficiency of conventional banks are relatively higher than their Islamic counterparts and that the dummy variable for Islamic banks shows significant differences (Johnes et al., 2014).

3.3.5 Controlling for Bank and Country-Specific Factors

A significant problem that might be encountered when determining efficiency is to control the influence of bank and country- specific factors (i.e. environmental factors) on efficiency. Since the introduction of the efficiency measurement, most researchers had studied a single country and very few cross-country studies had been done. However, the latter is gaining in importance despite difficulties in analyzing them due to the different countries' banking markets. Most previous cross-country analyses studied banks in the European countries (e.g. Altunbas, Y. and Chakravarty (1998); as Cavallo and Rossi (2002); Carbo, Gardener, and Williams (2002)). However, cross-country studies were being extended currently to cover more areas, for instance, former communist countries (i.e. former Soviet republics(e.g. Bonin, et al. (2005), Carvallo and Kasman (2005)), Central and South American countries (e.g. Carvallo and Kasman (2005)), emerging countries (e.g. Boubakri, Cosset, Fischer, and Guedhami (2005); Clarke, Cull, and Shirley (2005)) and Asian countries (e.g. Abd Karim (2001); Williams and Nguyen (2005)). Moreover, the significant growth of Islamic banking and the increasing number of countries hosting Islamic banks have attracted attention and promoted researches about the determination of the performance of Islamic banks (e.g. Brown, 2003; Hassan, 2005; Yudistira, 2004) as

compared to their conventional counterparts in one and multiple countries (e.g. Al-Jarrah and Molyneux 2005; Alpay and Hassan 2006).

Bank and country-specific factors (i.e. micro and macro- factors) may have significant influences on efficiency and, consequently, on the computed efficiency scores. Four approaches, provided by Coelli et al. (2005), discuss the application of environmental variables in DEA:

The first approach indicates that the bank and country- specific variables, which influence efficiency, are sorted in descending order. In other words, they are placed from the ones which least affect bank efficiency to the ones with the most effect (Banker and Morey, 1986). Based on this ordering, the approach ensures that any given bank is not compared with peer firms that operate in more favorable environments (Banker and Morey, 1986). Alternatively, the efficiency of a given bank is compared with the efficiency of those banks in the samplewhich have environmental values lower than or similar to the given bank (Fethi and Pasiouras, 2010).

Based on the second approach, developed by Charnes et al. (1981), the researcher should undertake the various following steps:

(1) Classifying the sample into smaller sub-samples to be solved next by the DEA;
(2) Assigning all data points under study into their prospective frontiers;
(3) Solving a solitary DEA using the projected points; and
(4) Assessing any differences in the mean efficiencies of the two sub-samples.

According to Coelli et al. (2005), the two common problems arising from using the above mentioned two methods are: firstly, dividing the sample into series of smaller samples reduces the comparison group and, secondly, only a single environmental variable can be included in each examination and, consequently, this limits the range of analysis for both methods (Fethi and Pasiouras, 2010).

Using the third approach, environmental variables are included directly in the DEA model as non-discretionary inputs (if these variables are presumed to have a positive impact on efficiency) or outputs (if these variables are projected to have a negative impact on efficiency). The drawback of this approach is that there is a need to know previously the direction of impact of these variables. The first method contains also this drawback. However, as an alternative al, the bank and country- specific variables are introduced as mandatory neutral variables using the equality form (Coelli et al., 2005). Pastor (1999) and Lozano-Vivas et al. (2001, 2002) applied both approaches in their studies.

The "two-stage" approach is the final method to adjust for environmental factors (Coelli et al., 2005). According to Coelli et al. (2005), the first stage requires the employment of the DEA including traditional inputs and outputs. In the second stage, the computed efficiency scores are regressed on the environment variables (Coelli et al., 2005). The banking literature employed frequently this specific approach which was assumed to be more appropriate when the objective was to assess the correlations of efficiency with different environmental variables (Fethi and Pasiouras, 2010).
With regard to the significance of environmental factors in the previous discussion, the cross-country research, in chapter 6 of this thesis, controls for these factors by adopting a two-stage DEA approach.

3.3.6 Parametric versus non-Parametric approaches

A review of different literatures recommends that SFA is the most frequently employed parametric model for measuring bank efficiency whereas DEA is the most used non-parametric model (Mokhtar et al., 2006). However, the two models are considered to be an alternative to Ordinary Least Squares (OLS). Each of the three models - OLS, SFA and DEA- has its own advantages and drawbacks. DEA is relatively different from both SFA and OLS which are regression-based models and are characterized by being less flexible and highly dependent on specific assumptions (Emrouznejad and Anouze, 2010). The DEA is considered to be more feasible to apply since, when being employed, it does not require a functional form of the production frontier to be defined. Consequently, DEA can handle multiple input and

output variables and, by using efficiency scores, can run a performance comparison (Burger and Humphrey, 1997).

However, regression-based models employ the concept of averages (Kaffash, 2014). Another benefit of using DEA is that it initiates two further concepts of return to scale and inefficiency. A major reason, which makes DEA a preferred option for measuring efficiency over other models, is the unavailability of prices of both inputs and outputs in this study. Based on the literature review, the DEA approach was employed most frequently to measure bank efficiency. DEA was considered to be by far the most frequently used technique in assessing bank performance and measuring bank efficiency (Fethi and Pasiouras, 2010). Out of the forty-six surveyed studies, thirty-seven studies used DEA, eight studies used SFA and one study used DFA. Despite Lovell (1993), Cummins & Zi (1998), and Hussels & Ward (2006) considering that no approach was better than the other, and considering the previously mentioned advantages of each model, this study used DEA to estimate the efficiency of Islamic and conventional banks.

3.3.7 Specification of Input-output approaches and Variables:

Defining and measuring inputs and outputs in the banking literature continues to be a debatable matter among researchers (Casu and Girardone, 2002; Sathye, 2003). In measuring efficiency, the selection of appropriate inputs and outputs for bank performance analysis remains the biggest challenge. The reason is that prices are assigned normally to a jointly produced financial services package (Casu and Girardone, 2002). Furthermore, there may be no harmony between banks in the production of outputs. In order to define the type of inputs and outputs which might be employed, the nature of a bank's production technology should be chosen initially (Sharma, 2008). The production and intermediation approaches are two main competing approaches put into practice to assign the flow of services provided by financial institutions (Sealey and Lindley, 1977).

3.3.7.1 Specification of Input-Output Approaches:

Two major approaches are used most commonly to select the inputs and outputs for a DMU: These are the production approach (or the service provision) and the intermediation approach (or the asset approach) (Humphrey, 1985; Hjalmarsson et al., 2000). These two approaches employ the traditional microeconomics and vary only in the specification of banking operations.

In the production approach (e.g. Lozano-Vivas et al., 2002; Drake et al, 2003; Gardener et al., 2011) the banks are considered to be providing mainly services for account holders (Berger and Humphrey, 1997). In other words, the production approach, developed by Benston (1965), assumes that banks are providers of services to customers (Kuussaari and Vesala, 1995). This approach defines the output as the services provided to the customers which are computed preferably by the number and type of transactions or documents under the process or specialized services provided over a given time period, for instance credit reports, insurance policy, applications for loans, etc. (Ferrier and Lovell, 1990; Ferrier et al., 1993; Kuussaari and Vesala, 1995). Therefore, it ignores entirely the interest expenses but concentrates on cost of operations (Kumar and Gulati, 2013). However, the number of deposits and loan accounts replaces these items when detailed data on transaction flow are unavailable (Berger and Humphrey, 1997). The input of this approach comprises physical variables (like labor, fixed assets, equipment) or their related cost as only tangible inputs are required to initiate transactions or carry out financial documents or supply advice (Berger and Humphrey, 1997). The production approach was applied in the most part when determining the efficiency of bank branches (Berger and Humphrey, 1997).

Table 3.1: Survey of the most common approaches used in efficiency determination

Study	Country	Period	Approach	Methods
Al-Jarrah and Molyneux, 2003	Jordan, Bahrain, Saudi Arabia, Egypt	1992-2000	Intermediation	SFA
Al-Muharrami, 2007	GCC countries	1993-2002	Intermediation	DEA
Al-Sharkas et al., 2008	United States	1986-2002		SFA
Arrif and Can, 2008	China	1995-2004	Intermediation	DEA
Ataullah & Le, 2006	India	1992-1998	Intermediation	DEA
Avkiran, 2009	Australian and New Zealand	1996-2003	Intermediation	DEA
Beccalli et al., 2006	Portugal	1990-1995	Intermediation	DEA – SFA
Beccalli et al., 2006	France, Germany, Italy, Spain &UK	1999-2000	Intermediation	SFA
Casu & Molyneux, 2003	Italia	1996-1999	Intermediation	DEA
Casu & Molyneux, 2003	USA	1990-1995	Intermediation	DEA
Casu and Girardone, 2004	Italia	1996-1999	Intermediation	DEA
Casu and Girardone, 2009	France, Germany, Italy, Spain and the United Kingdom	2000-2005	Intermediation	DEA
Chen & Yeh, 2000	Taiwan	1996	Intermediation	DEA
Chen et al. 2005	China	1993-2000	Intermediation	DEA
Chortareas et.al., 2012	27 European countries	2001-2009	Intermediation	DEA
Chortareas et.al., 2013	22 EU countries	2000-2008	Intermediation	DEA
Delis et al., 2008	Greece	1990-1993		SFA
Delis, 2009	10 newly acceded EU	1994-2005	Intermediation	DEA
Dietsch and Lozano-Vivas, 2000	France and Spain	1988-1992	Intermediation	DFA
Drake et al. 2006	Hong Kong	1995-2001	Intermediation	DEA
Drake et al. 2003	Japan	2001	Intermediation, Profit, Production	DEA
Drake et al., 2006	Hong Kong	2006	Intermediation, Profit	DEA
Emrouznejad and Al Anouze, 2010	GCC countries	2009	Intermediation	DEA
Figueira et al.,2009	Latin American banks	2001	Intermediation	DEA
Fiordelisi, 2008	France, Germany, Italy, and UK	1997-2002		SFA
Gardener et al., 2011	Indonesia, Malaysia, the Philippines, Thailand, and Vietnam	1998-2004	Intermediation, Production	DEA
Gonzalez, 2009	69 countries	1996-2002	Intermediation	DEA
Hall et al., 2012	Hong Kong	2000-2006	Intermediation Production	DEA
Hauner, 2005	Austria and Germany	1995-1999	Intermediation	DEA
Hermes and Nhung , 2010	Ten emerging economies	1991-2000	Intermediation	DEA
Isik and Hassan, 2002	Turkey	1988, 1992, 1996		SFA
Kenjegalieva & Simper, 2011	Central and Eastern European banks	1998-2003	Value –added	DEA
Lozano-Vivas et al., 2002	10 European Banks	1993	Production	DEA
Mahesh & Rajeev, 2008	India	1992-1999	Intermediation	DEA
Mostafa, 2009	Arab banks in Middle East	2005	Intermediation	DEA
Pancurova & Lyosca, 2013	Central and Eastern European Countries	2005-2008	Intermediation	DEA
Pasiouras, 2008	95 countries	2003	Profit	DEA
Pasiouras et al., 2008	Greece	2000-2005	Value –added	DEA
Sufian & Abdul Majid, 2007	Malaysia	2002-2003	Intermediation	DEA
Sufian, 2009b	Malaysia, Thailand	1992-2003	Value -added, Intermediation	DEA
Sufian, 2009a	Malaysia	1997	Intermediation	DEA
Thoraneenitiyan and Avkiran, 2009	Indonesia, SouthKorea, Thailand,Malaysia and Philippine	1997-2001	Intermediation	DEA
Wheelock and Wilson, 2000	United States	1984-1993		SFA
Yao et al, 2007	China	1995-2001	Intermediation	DEA
Yao et al, 2008	China	1998-2005	Intermediation	DEA

Source: modified from different sources (see for example, Kaffash, 2009).

The intermediation approach (e.g. Al-Muharrami 2007; Sufian a, 2008; Mostafa, 2009; Emrouznejad and Al-Anouze, 2010; Johnes et al., 2014) views banks as intermediaries channeling funds between surplus (lenders) and deficit (borrowers) units (Berger and Humphrey, 1997). Islamic banks initiate intermediation services by holding deposits and other liabilities of savers and sequentially investing these funds in usury-free profitable sectors of the economy (Noor and Ahmad, 2011). This approach considers deposits, employees and fixed assets as inputs whereas loans and investments are seen as outputs (Agoraki et al., 2011). Under this approach, the inputs and outputs are presumed typically to be equivalent to the stock of the financial value in the bank accounts, for instance the numbers of dollars of loans, deposits, etc. (Berger and Humphrey, 1991). Furthermore, being the major transformed resources in the financial intermediation process, funds and their interest costs should be counted as inputs in the efficiency analysis (Harker and Zenios, 2000).

None of these approaches is seen as better and worse because no one reflects sufficiently the bank's dual roles which are as follows: (i) performing transactions and documents and providing services; and (ii) channeling funds from savers to investors (Berger and Humphrey, 1997). It would be most preferable to apply both approaches to the bank efficiency analysis but adequate data for that purpose are inaccessible (Harker and Zenios, 2000). However, each of these approaches still has various advantages. The production approach is viewed as being better in assessing the efficiencies of bank branches. This is because branches perform principally customer transactions and process transactions for the firm as one entity (i.e. as a whole). Moreover, branch managers have normally little control over the bank finances and investment decisions (Berger and Humphrey, 1997). On the other hand, the intermediation approach may be more convenient when assessing the entire bank since interest expenses, which represent one-half to two-thirds of total cost, are included in this approach (Harker and Zenios, 2000). Moreover, this approach stresses that deposits be transferred to lenders at the lowest cost and this approach complies with the microeconomic theory of intermediation (Berger et al., 1987; Ferrier and Lovell, 1990). In addition, the intermediation approach may be better when investigating the significance of efficiency to the bank's profitability since reducing the total costs, not just the production costs, is required in order to make the most of

profits (Harker and Zenios, 2000). Kaparakis et al. (1994) claimed that the intermediation approach was more convenient to employ when the study comprised large banks since the greater portion of their assets were financed from non-deposit sources (Berger and Humphrey, 1997). An additional reason for favoring the intermediation approach is that details on the number of accounts are difficult to acquire since they are naturally confidential (Berger and Humphrey, 1997).

In addition to these approaches, different approaches to defining a bank's inputs and outputs were employed less frequently in the studies of bank efficiency (Agoraki et al., 2011). These include the profit or user-cost approach introduced by Hancock (1986), the value-added approach (Berger and Humphrey, 1990), and the risk management approach developed by Mester (1996). The user-cost or profit approach underlines the level of significance that a class in the balance sheet might provide to the total revenues' net contribution (Avkiran, 2006). This approach assumes a type of bank assets as an output if its returns surpass the interest cost of funds or, alternatively, it would be considered to be an input (Grigorian and Manole, 2002). Similarly, a class of bank liability is assumed either to be an output if its cost is lower than the interest cost of the funds or else it is seen an input.

The value-added approach is assumed to be an alteration to the production approach claiming that any type of liabilities or assets, which are presented in the balance sheet should be used an output if it contributes significantly to a bank (Avkiran, 2006). Alternatively, bank operations, which contribute slightly to a bank, are considered tobe either unimportant outputs or intermediate outputs, or inputs (Avkiran, 2006). For instance, balance sheet items, such as loans and deposits shown on the balance sheet, should be used as bank outputs since they generate significant contributions to almost all banks (Berger and Humphrey, 1991). On the other hand, low value-added instruments, like purchased funds and government securities, are treated as inputs and insignificant outputs respectively (Berger and Humphrey, 1991).

3.3.7.2 The Variables Specification

Table 3.2: Survey of studies that used different inputs and outputs

Study	Country	Input	Output
Parkan (1987)	Canada	Employees, stationery expenses, space, rent and terminals	Number of transactions, customers response and error corrections
Oral and Yolalan (1990)	Turkey	Employees, terminals, numbers of accounts and credit applications	Number of transactions
Vassiloglou and Giokas (1990)	Greece	Employees, suppliers, space and computer terminals	Number of transactions
Giokas (1991)	Greece	Employees, stationery expenses and rent	Number of transactions
Berg, Forsund & Jansen (1992)	Norway	Labor, machine, material, material, buildings.	Demand deposits, time deposits, short- term loans, long-term loans, other services.
Parson, Gotlieb & Denny (1993)	Canada	Labor and capital	Index of quantities of each service provided i.e. checks debit and credit loans, deposits.
Al-Faraj et al (1993)	Saudi Arabia	Employees, location, operating expenses and acquired equipment	Net profit, balance of current accounts, savings account, loans and number of accounts.
Fukuyama (1993)	Japan	Employees, capital and funds from customers	Loan revenue and other revenues
Humphrey (1993)	USA	Labor, physical capital, interest on deposits, interest on purchased funds	Value of demand deposits, small time and saving deposits, real estate loans, installment loans, commercial and industrial loans.
Tulkens (1993)	Belgium	Labor, windows, automatic teller machines	Deposits, automatic teller machine operations, international operations(transactions of foreign exchange and on travelers checks), stocks and bonds, credit operations, opening of new accounts, special services.
Berger, Hancock, & Humphrey (1993)	USA	Labor, capital, deposits, physical capital	Business loans, consumer loans.
English, Grosskopf, Hayes & Yaisawarng (1993)	USA	Labor, capital deposits, borrowing	Investments income, real estate loans, consumer loans and commercial loans.
Berg, Forsund, Hjalmarsson & Suominen (1993)	Nordic	Labor, capital (book value of machinery and equipment)	Loans, deposits and number of branches.
Bukh, Forsund, & Berg (1995)	Nordic	Capital(as a book value of machinery and equipment)	Total deposits, total loans, number of branches, guarantees given to customers.
Pavero and Papi (1995)	Italy	Employees, capital, loanable funs and deposits	Loans, investments in securities and non-interest income
Athanassopoulos and Curran (1996)	UK	ATMs, employees, counter transactions and potential market	Loans sales, liability sale, investments and insurance policies sold
Bhattacharyya, Bhattacharrya & Kumbhakar (1996)	India	Labor and physical capital	Loans and advances, fixed deposits, current deposits and investments.
Lang and Welzel (1996)	Germany	Total cost, price of labor, price of capital, price of deposits, volume of labor, volume of deposits	Short term loans to nonbanks, loans to banks, bonds, cash, real estate, investment, fees, and commissions, revenue from sales and number of offices.
Brockett, Charnes, Cooper, Huang & Sun (1997)	USA	Interest expenses on deposits, expenses for federal funds purchased and repurchased in domestic offices salaries, buildings, furniture and equipment, and total deposits	Income on federal funds sold and repurchases in domestic offices. Allowances for loan losses, loans, net of unearned income.
DeYoung (1997)	USA	Price of labor, borrowed funds, and physical capital	Total loans, transactions deposits and fee-based income

Mester (1997)	USA	Labor, physical capital, funding	Real estate loans, commercial and industrial loans, lease financing receivable, agricultural loans, other loans, private loans to individuals.
Athanassopoulos (1997)	Greece	Employees, ATMs, terminal, interest costs, non-interest costs and location	Non -interest income
Resti (1997)	Italy	Employees and capital	Loans, deposits & non-interest income
Battacharya et al (1997)	India	Interest expense and operating expenses	Advances, deposits and investments
Schaffnit et al (1997)	Canada	employees	Transactions and maintenance
Ayadi et al (1998)	Nigeria	Interest on deposits, expenses on personnel and total deposits	Total loans, interest income and non-interest income
Al-Shammari and Salimi (1998)	Jordan	Selected financial ratios	Selected financial ratios
Seiford and Zhu (1999)	USA	Employees, assets and capital stock	Revenue and profits
Golany and Storbeck (1999)	USA	Employees, space and marketing	Loans ,deposits, accounts per customer and satisfaction
Drake and Howcroft (1999)	UK	Number of loans accounts, number of mortgage account and number of cheque accounts	Personal loans, new cheque account, mortgage loans, insurance commission and change in " marketed balances"
Zenios et al (1999)	Cyprus	Employees, terminals, space, current accounts, savings accounts and credit applications	Number of transactions
Mukherjee et al (2002)	India	Net worth, borrowings, operating expenses, employees and number of branches	Deposits, net profit, advances, non-interest income and interest income
Ho and Zhu (2004)	Taiwan	Capital stocks, assets, number of branches and employees.	Sales and deposits
Sakar (2006)	Turkey	Branch numbers, employees per branch, assets, loans and deposits	ROA,ROE, interest income/assets, interest income/operating income and non-interest income/assets
Wu et al (2006)	Canada	Employees and expenses	Deposits, revenues and loans.
Huwland and Rowse(2006)	Canada	Non sales FTE, sales FTE, size and city employment rate	Loans, deposits, average number of products/customer and customer loyalty
Sufian (2007)	Malaysia	Total deposits, labor and fixed assets	Income and total loans
Mostafa (2007)	Arab countries	Assets and equity	Net profits, ROA and ROE
Al-Jarrah (2007)	Jordon, Egypt, Bahrain and Saudi Arabia	Deposits, labor and physical capital	Loans, all other earning assets and off-balance sheet items
Mokhtar et al (2008)	Malaysia	Total deposits and total overhead expenses	Total earning assets
Olson and Zoubi (2010)	10 MENA countries	Deposits, labor and physical capital	Loans and securities
Akmal and Saleem, 2008	Pakistan	Operating expenses, interest expenses, fixed assets	Net loans, liquid assets, deposits
Al-Jarrah and Molyneux, 2003	Jordan, Bahrain, Saudi Arabia, Egypt	Deposit, labor, physical capital	Total costumer loans, off-balance sheet
Arrif and Can, 2005	China	Total loanable funds, number of employees and physical capital	Total loans and investments
Ataullah & Lee, 2006	India	Interest expenses and operating expenses	Loans and advances, investment , Interest income and operating income
Avkiran, 2009	Australian and New Zealand	Interest expense and non-interest expenses	Interest income and noninterest income
Barros et al. ,2012	Japan	The number of full time employees, total deposits and physical capital	Total loans

Barros et al., 2011	China	Number of employees, deposits, and total assets	Loans, and securities
Bos et al,2009	USA & 17 European countries	Labor, financial capital, Physical capital	Loans, Investments and Off-balance sheet activities
Canhoto and Dermine, 2003	Portugal	Number of employees and physical capital	Loans, deposits, securities, interbank assets/liabilities
Casu & Girardone, 2009	EU-15 countries	Deposit ,labor, physical capital	Total loans and other earning assets
Casu & Molyneux, 2003	Italia	Labor, deposits and Capital	Total loans and other earning asset
Chen & Yeh, 2000	Taiwan	Assets, deposits and staff	Provision of loan services, portfolio investment and noninterest income
Chen et al. 2005	China	Interest expenses, noninterest expenses and capital	Loans, deposits and noninterest income
Chortareas et al. ,2012	22 EU countries	Personnel expenses, fixed assets and deposits	Total loans and other earning asset
Drake et al. 2007	Japan	Total deposits, total operating income, total provision	Total other earning assets, net commission, fees and trading income and total loans
Emrouznejad and Al Anouze, 2010	PGCC countries	Total assets, deposits and capital	Loans and net profit
Isik and Hassan, 2003	Turkey	Labor, physical capital, loanable fund	Loans, off-balance sheet activities, other earning assets
J.B. Hall et al. ,2012	Hong Kong	Total operating expenses, fixed assets, total provisions	Total loans, other earning assets, net commission, fee and trading income, other operating income
Lozano-Vivas et al., 2002	10 European Banks	Personnel expenses and non-interest expenses	Loans, deposits and other earning assets
Mahesh & Rajeev, 2008	India	Deposits, borrowing, labor, fixed assets	Interest margin, Noninterest income, Credits and Investments
Saeed AlMuharrami, 2007	PGCC countries	Fixed assets, deposits, equity and labor	Total loans, other operating incomes, other earning assets, off balance sheet activities
San et al ,2011	Malaysia	Total deposits of domestic banks, total deposits of foreign banks, fixed assets of domestic banks, fixed assets of foreign banks	The total loans of domestic banks, the total loans of foreign banks, the total investments of domestic banks, the total investments of foreign banks
Staub et al. ,2010	Brazil	interest expenses, operational expenses ,personnel expenses	Total loans , net of provision loans, investments and deposits
Sufian & Abdul Majid 2007	Malaysia	Interest Income, noninterest income	Personal expenses, noninterest Expenses
Sufian, 2009 (b)	Thailand, Malaysia	Labor, capital, interest expenses	Deposits, loans, investments
Sufian, 2009(a)	Malaysia	Labor, capital, interest xpenses	Deposits, loans, investments
Tecles & Tabak, 2010	Brazil	Deposits, number of employees, fixed assets and equity	investments, loans and advances and other noninterest fee based incomes
Thoraneenitiyan and Avkiran, 2009	Indonesia, SouthKorea, Thailand, Malaysia and Philippine	Deposits, labor, capital and physical capital	Loans, investment plus other earning assets, off-balance sheet activities and fee income
Yao et al, 2007	China	Fixed assets, deposits, equity and labor	Pre-tax profit, loans
Zhang et al. ,2011	China	interest expenses, noninterest expenses (operating expenses), and net value of fixed assets	Total loans, total deposits, other earning assets, and non-interest income, net interest income and noninterest income
Zhao and Murinde ,2011	Nigeria	Interest expenses, noninterest expenses and financial capital	Loans, deposits

Source: Own Table

Based on the input and output-used frequency (see Appendix 4), the most-used inputs in previous literature were: employees; labor; physical capital; capital; and personnel expenses. Employees and labor are different terms with the same meaning that reflect the number of workers contributing to the production process. This study uses the personnel expenses input as an alternative to employee/ labor since neither details on the total of workers nor the cost for working hours are accessible; we used both to extract the required monetary-value input. Various previous studies used the personnel expenses input (e.g. Lozano-Vivas et al., 2002; Drake and Hall, 2003; Chortareas et al., 2012) where it was claimed that they formed a large part of general and administration expenses (Johnes et al., 2014). Physical capital and capital have same meaning in describing the fixed assets that were used as input variables in our study. Hence, we employed fixed assets as a proxy for physical capital. While it may not be a perfect reflection of the labor input, it is more easily available than better measures (e.g. employee numbers or expenditure on wages) and was used in previous studies (e.g. Lozano-Vivas et al., 2002; Drake and Hall, 2003; Chortareas et al., 2012). The last input, which we used for measuring efficiency, is "deposits and short-term funding" since it represents the majority of the funds (inputs) available for financing the production of a bank's financial instruments (outputs). Moreover, we found it more convenient to use this input with the intermediation approach in our study since it assumed that financial institutions intermediated funds primarily between savers and investors/borrowers (Berger and Humphrey, 1997).

3.4 Returns to Scale

Returns to scale illustrates the level at which output changes as the quantity of all factors varies by the same or different proportions (Molyneux, Altunbas, and Gardener 1996). It is one of the features of production technology which can be defined as Constant Returns to Scale (CRS) or Decreasing Returns to Scale (DRS) or Increasing Returns to Scale (IRS) (also known as economies of scale). IRS refers to the increase in inputs which leads to a greater increase in outputs (Sufian and Noor, 2009). On the other hand, DRS mean that an increase in the level of inputs results in a lower increase in the level of outputs (Sufian and Noor, 2009). This concept is based, also, on the average cost curve in which some of the factors of production are

fixed in the short run but vary totally in the long run (Koutsoyiannis, 1979). Holding all other factors constant, the average costs of producing a good in the long run decline as banks get bigger in size or more outputs are being produced (Molyneux, et al. 1996).

The interest in returns to scale enables banks to identify potential savings which they have if they change the operation scale. Bank costs decline when outputs are increased up to the optimal scale (Kasman 2005). However, the economies of scale do not continue indefinitely since the increase in size above the optimal scale of operation increases the costs and reduces the revenue. Therefore, banks have to produce at the optimal scale (i.e. CRS) in order to have the lowest achievable level of average costs at which any changes in output will change the costs proportionately. The thesis studies the scale efficiency of Islamic bank versus their conventional counterparts.

3.5 Regression analyses

Based on the two stages-DEA's literature review, many regression models were conducted to analyze the determinants of bank efficiency. Table (3.3) presents the most frequently employed techniques**.** As presented in Table 3.3, eight out of the thirty-one studies implemented the Tobit regression in the second stage analysis. The reason for employing Tobit is that non-censored estimates are biased since efficiency scores are bounded between 0 and 1 (Kaffash, 2014). However, Ataullah and Le (2006) assumes that it is unnecessary to employ Tobit. As an alternative, they transform the efficiency score by taking the natural logarithm of [efficiency score/ (1 - efficiency score)]. Casu and Molyneux (2003) suggest a bootstrap approach in the first-stage of DEA since they are among the researchers who consider that the covariates in the second-step regression are correlated clearly with the error terms in the first-step.

On the other hand, Brissimis et al. (2008) and Delis and Papanikolaou (2009) implement an algorithm which counts on a double bootstrap procedure to examine the determinants of efficiency in the new EU banking sector. A number of researchers

conducted different economic modeling in the regression analysis (e.g. Pastor (2002) and Casu & Girardone (2004) employed Logistic model, Habibullah et al. (2005) used Granger causality, Wang and Huang (2007) conducted Gaussian mixture model and Markov model, and Casu and Molyneux (2003) and Hahn (2007a) implied Bootstrap-Tobit.

Table 3.3: Survey of most popular econometric techniques used in second stage regression

Authors (Publication year)	Country	Period	2nd Stage regression
Ariff & Can (2008)	China	1995-2004	Tobit
Ataullah & Le (2006)	India	1992-1998	Ordinary Least Square (OLS) Generalized Method of Moments (GMM)
Avkiran (2009)	Australia & New Zealand	1996-2003	Tobit
Aysan & Ceyhan (2008)	Turkey	1990-2006	Generalized Least Squares – FEM
Brissimis et al. (2008)	10 new EU countries	1994-2005	Double bootstrap two-stage least squares truncated
Casu & Girardone (2002)	Italy	1996-199	Logistic
Casu & Molyneux (2003)	France, Germany, Italy, Spain, UK	1993-1997	Bootstrap-Tobit
Chang & Chiu (2006)	Taiwan	1996-2000	Tobit
Delis & Papanikolaou (2009)	10 new EU countries	1994-2005	Double Bootstrap
Devaney & Weber (2000)	US	1990-1993	Seemingly Unrelated Regressions (SUR)
Dogan & Fauesten (2003)	Malaysia	1989-1998	General Least Squares-FEM
Drake et al. (2006)	Hong Kong	1995-2001	Tobit
Fukuyama & Weber (2009)	Japan	2002-2005	Tobit
Fung (2006)	US	1996-2003	Ordinary least squares (OLS) regressions
Habibullah et al. (2005)	Malaysia	1988-1993	Granger causality
Hahn (2007a)	Austria	1996-2002	Bootstrap- Tobit
Hauner (2005)	Germany, Austria	1995-1999	Tobit
Isik (2007)	Turkey	1981-1990	General Least Squares-FEM
Isik & Hassan (2002)	Turkey	1988, 1992, 1996	General Least Squares-FEM
Kumar and Gulati (2008)	India	1993-2006	Logistic regression
Kyj & Isik (2008)	Ukraine	1998-2003	Generalized Least Squares (GLS)
Laurenceson & Qin (2008)	China	2001-2006	Tobit
Maudos et al. (2002)	10 EU countries	1993-1996	Generalized Least Squares-REM
Molyneux et al., (2013)	Transition countries	1994-2002	Generalized Least Squares-REM
Mukherjee et al. (2001)	US	1984-1990	Generalized Least Squares (GLS)
Pastor (2002)	Spain, Italy, France, Germany	1988-1994	Tobit, Logistic
Sanyal and Shankar (2011)	India	1997-2004	General Least Squares (GLS)
Sufian (2011)	Malaysia	1993-2006	General Least Squares-FEM
Tanna (2009)	75 countries	2000-2004	General Least Squares-FEM
Wang & Huang (2007)	Taiwan	1982-2001	AR, GMM, Correlation, Markov
Weill (2004)	France, Germany, Italy, Spain, Switzerland	1992-1998	Correlation

Source: Own Table

The Generalized Least Square (GLS) estimator is one of the most commonly used models in the second stage of regression analysis. This is proven in Table 3.2 showing that eleven out of the thirty-one studies had conducted the GLS estimator. Therefore, we employed GLS in the second stage analysis in order to avoid issues resulting from heteroscedasticity which might exist when including computed parameters in the second stage as dependent variables (Isik and Hassan, 2002; Mester, 1996; Saxonhouse, 1976). Moreover, the study conducts White's correction for heteroscedascity; this does not change the coefficients themselves but only their standard deviations (Kyj and Isik, 2008).

3.7 Chapter Summary

This chapter summarized a mixture of approaches employed previously in determining efficiency. Moreover, it presented, brought together and discussed the flows of literature on conventional and Islamic bank efficiency, and different types of efficiency. Previous studies employed two approaches to calculate the efficiency: nonparametric; and parametric approaches. The non-parametric approach depends on programming techniques such as Data Envelopment Analysis (DEA). On the other hand, the parametric approach is a regression-based analysis. The non-parametric approach is considered be more helpful than the parametric approach because of its simplicity and computational ease and since it does not necessitate any particular functional assumptions. However, the non-parametric approach suffers from being exposed to biases because it does not account for any technical or allocation inefficiency.

The chapter identified DEA as the most commonly conducted approach used in previous researches. The chapter explained and discussed, also, the DEA process and its development. Furthermore, based on the summary of previous studies on bank efficiency, we recognized the intermediation approach to be the most appropriate approach for selecting this study's inputs and outputs. For the second step of the analysis, we reviewed and selected the most cited regression analysis in order to

investigate conveniently the determinants (i.e. bank and country- specific factors) affecting the bank efficiency.

The chapter verified that studies investigating the efficiency of Islamic versus conventional banks concentrated only on a single country or regions. However, to the best of the researcher's knowledge, this is the first global study to compare Islamic and conventional banks (i.e. all Islamic banks operating in countries where there are conventional banks). Moreover, reviews on the literature of previous studies identified only three studies which had applied the bootstrap technique in order to present statistical coherences for the estimated efficiency scores. A comparison of the initial efficiency scores to the bootstrapped ones showed the sensitivity of the efficiency scores of both the Islamic and conventional banks to sampling disparity. Since they lacked statistical precision, this drew our attention more to the accuracy and consistency of previous studies.

Chapter 4 Background: Socio-Economic background of each of the 21 countries

1. Bahrain

Bahrain is a small country located in the center of the Persian Gulf. Bahrain's first commercial bank, which was a branch of the British-owned Eastern Bank, opened in 1921. In the 1940's, a second bank, the British bank of the Middle East, set up a branch in Bahrain. The first wholly owned National Bank of Bahrain was established in 1957. The Bahraini Dinar replaced the Indian Rupee as the country's currency in 1965 and, thereafter, banks began to find Bahrain a more attractive location to the extent that, by 1974, fourteen commercial banks operated there. Following the increased number of banks after the country's independence, the Bahraini government established, the Bahrain Monetary Agency (BMA) in 1973. Two years later and based on those operating in Singapore, the BMA promulgated regulations in order to create offshore banking units (OBUs).

The Lebanese civil war encouraged several International banks to create OBUs in Bahrain and, post 1975, they transferred their Middle East operations to Bahrain. By the early 1980s, there existed seventy-five Bahraini OBUs with in excess of $62 billion. However, in 1985, the falling oil prices and a corresponding decline in oil revenues reduced dramatically the funds deposited in these banks OBUs which had increased to fifty-five by 1990. Despite the fluctuations in the Persian Gulf financial markets during the 1980s, Bahrain becameestablished as the Persian Gulf's principal banking and financial center.

The Kingdom of Bahrain was amongst the first countries to recognize the importance of the concept of Islamic banking and finance. Consequently, Bahrain has supported both the development of the banking industry generally and has welcomed new institutions in particular. This support has led to Bahrain having a concentration of specialist Islamic institutions based there. In 1979, Bahrain's first Islamic bank was established with the licensing of the Bahrain Islamic Bank. Ever since that date, there has been significant growth in the banking industry. Currently, there are thirty Islamic banks and financial institutions in Bahrain (Bankscope, 2013). In early 2000, the

BMA issued the Prudential Information and Regulations (PIRI) that is a comprehensive framework within which Islamic banks should conduct their business (Iqbal and Molyneux, 2005). This framework includes areas such as capital adequacy, asset quality, management of investment accounts, corporate governance, and liquidity management (Iqbal and Molyneux, 2005). Based on this setting, the Bahraini Islamic financial industry is able to benefit from sustainable growth that depends on solid investor and customer confidence, attractive products and growing markets (Iqbal and Molyneux, 2005).

2. Kuwait

Kuwait is located on the northeast Arabian Peninsula of the Persian Gulf. In 1990, Iraq invaded and occupied Kuwait. This sparked the Persian Gulf War (1991) which ended when a coalition of Arabian and Western force drove the Iraqi troops out of the country. Following the discovery of its major oil reserves in 1938, Kuwait has one of the world's highest per capita incomes (CIA, 2015). British investors established Kuwait's first bank in 1941 and, in 1952, Kuwait's National Bank was established. Thereafter, there were established several other banks such as the Credit and Savings bank in 1965 (Iqbal and Molyneux, 2005). At the 1980s, the Kuwaiti banks were among the biggest and mainly operating financial institutions in the region (Federal Research Division, 2004). Subsequently, the Kuwaiti government introduced lawwhich prohibited foreign banks from operating in the country.

The 1970's large oil revenues meant that many private individuals had substantial funds at their disposal. In the mid-1970's, this resulted in a speculation boom on the official stock market which culminated in a small crash in 1977. Only the National Bank of Kuwait, the country's largest commercial bank, survived the crash intact. The Kuwaiti government's response to this financial crisis was to bail out the affected investors and to introduce stricter regulations. Accordingly, the Kuwaiti government interfered and issued an intricate collection of policies, included in the Difficult Credit Facilities Resettlement Program (Federal Research Division, 2004). The implementation of this Program remained to be completed when, in 1990, the Iraqi invasion changed the entire financial picture (Federal Research Division, 2004).

3. Lebanon

One of the countries that performed and fared relatively well during the recent global subprime crisis is Lebanon. Lebanon did not only handle to escape totally the housing bubble, but it had also shown overall immunity to the international downturn (Bergstrom, 2010). Before the civil war, Lebanon was definitely the chief banking center of the Middle East; Lebanon was named "the Switzerland of the Middle East" for its advanced banking sector. Lebanon has since tried to regain the title and proven the prosperity and solidity of its banking sector. Banque du Liban (BDL), or the Central Bank of Lebanon, was established in 1963 in Beirut. The institution preserves the safety of the monetary and economic stability, and the soundness of the banking sector in Lebanon. It gives and supervises licenses for all financial institutions willing to operate in Lebanon. Moreover, the organization manages bank liquidity by altering interest rates, by interceding in the open market, and by regulating credit facilities to all financial institutions.

The Lebanese currency is exchangeable freely with other currencies and similar to most countries, banks operating in the country are subject to secrecy law that prevents the employees disclosing information of the clients to another party. Starting in 1994, all revenues and interest earned on all types of accounts opened in Lebanese banks are exemp from income tax (Banque Du Liban 2007). It is noted, also, that most banks in Lebanon are owned privately (Grais and Kantur 2003). With regard to Islamic banking, the country initially acted as host to a subsidiary of the foreign Islamic bank and allowed an Islamic banking window to operate under existing regulations aimed initially for conventional banks (Banque Du Liban 2007). Several applications to set-up Islamic banks were at first pending because the Central bank of Lebanon took some time to consider several laws relating to Islamic banking (Banque Du Liban, 2007). Only in 2004, there was passed a law to regulate Islamic banking transactions which allowed Islamic banks to undertake commercial and investment activities without being subject to limitations as in traditional banks (Banque Du Liban 2007). Since then, a series of guidelines on specific Islamic banking transactions have been released (Banque Du Liban, 2007).

4. Tunisia

The commercial banking system in Tunisia began to restructure in 1987 in order to increase competition, mobilize savings and allocate resources more efficiently. The reforms were done through liberalizing interest rates, credit allocation, new indirect monetary policy, and strengthening prudential regulation and opening the financial sector to foreign investors (Ben Naceur, 2003). However, labor input in Tunisian banks has been found to be more inefficiently used relative to capital, over 1980-1992 (Chaffai, 1997). Amendments to the banking law were introduced in 1993 and 1994 in order to fully integrate the development bank into the banking system hence, become a direct competitor to the commercial bank, as well as to improve prudential regulations (Cook, Hababou, and Liang 2005).

Private-owned banks are increasingly dominating commercial banks after the government privatized some of the banking assets although development banks are still largely owned by the public (Grais and Kantur, 2003). In addition, the government in its Economic Development Plan (1997-2001) has given priority to modernize the payment system as well as customer information, improve the regulatory framework, and strengthen the capital base of banks because most banks are small in size (lMF 1998). Irrespective of the above efforts, the compliance of Tunisian banks to Basel capital adequacy is still not clear (Iqbal and Molyneux 2005) and only one foreign-owned Islamic bank has been in operation (Reille and Lyman 2005) although European banks have been allowed to open branches in Tunisia since 2001 (Cook, et al. 2005).

5. Sudan

Agriculture is the main activity of the Sudanese economy but only 12 percent of this largest country in Africa is agricultural land. The process of the Islamization of the Sudanese banking system and economy has been neither smooth nor consistent. The1984 Presidential Decree was the first attempt to Islamize Sudan's entire banking system. This Decree stipulated that Sudanese commercial banks were required to cease interest-based dealings with immediate effect and that they had to convert their existing interest-bearing deposits and advances into forms which were acceptable

under Islamic banking. For a short period, the banks were permitted to pay interest on foreign transactions. There are reports that this sudden change forced the banks to adopt Al-*Murabahah* as the most appropriate available alternative Islamic banking transaction method and soon such transactions constituted 90 per cent of their financial operations.

Although the whole economy was transformed into being Shari'ah compliant in 1989, only by 1992 was the operation of all the financial sector compliant to Shari'ah (Hussein 2004). Hence, Islamic banking law governed the banks and each bank was required to have a Shari'ah committee besides a Shari'ah board at central bank level. In complying with local regulations, multinational banks also operate Islamic banking. However, the government controls most shares in the banking market (Hussein 2004). Iqbal and Molyneux (2005) noted that it is not very clear whether Sudan complies with the Basel standards of capital adequacy. Moreover, the Sudanese bank's capital adequacy ratio is always below the international standard (Hussein 2004).

Demand deposits have dominated the total deposits of Sudanese banks, which suggest the failure of banks to provide instruments suitable with potential depositors, individual preference of instant cash on hands, or that depositors have lost confidence in the banking institutions. The higher inflation compared to the profit rates received from the deposits may have diverted customers to invest in real estate (Hussein 2004). While the low financing is possibly due to high costs of borrowing for customers and less access of opportunities from abroad, the low banking profit is possibly due to low efficiency in asset management, high NPL, low labour productivity, absence of good governance, small bank size and slow access to the latest technology (Hussein 2004). Moreover, although unprofitable, banks were found to over-utilize their capital by expanding the operation through new branches because the sanctions, imposed by the United States of America and the United Nations prevented them from utilizing new technologies such as ATMs. Consequently, the banks are unable to train and to provide their staff with the skills to use the new technologies (Saaid, et al. 2003). However, banks continue to increase in size and maintain considerable profits (Saaid, et al. 2003)

6. Oman

The Sultanate of Oman is located in the south-eastern quarter of the Arabian Peninsula. Oman is bordered by the Gulf of Oman, the Arabian Sea, and Saudi Arabia; all these countries contribute to Oman's isolation. The Omani banking sector originates mainly from a November 1974 banking law which established the Central Bank of Oman (CBO). The law enabled an increase in the number of the Sultanate's local banks and the law facilitated, also, foreign-owned banks. By September 1992, the Omani banking sector consisted of twenty-one commercial banks and the three specialized development banks of the Oman Development bank (1977), the Oman Housing bank (1977) and the Oman Bank for Agriculture and Fisheries (1981) (Iqbal and Molyneux, 2004). However, the Omani banking market is the smallest within the GCC and, of the twenty-one commercial banks, eleven are foreign owned and concentrate on financing trade. Ten are local banks which operate in an increasingly competitive market.

7. Indonesia

Indonesia has the country with the largest majority – approximately 80% - of Muslim people in the world. Despite its seemingly demographic predisposition for Shari'ah banking, as at the end of 2010, only 3.2% of the total banking assets related to Shari'ah transactions. Some form of Islamic non-bank financial institutions were operating before the legal foundation for Islamic banking was passed formally in 1992; this reflected the need for such a form of banking by the society. Therefore, 150 Islamic rural banks and 11 Islamic commercial banks have been in operation since 1998 (Bank Indonesia, 2010). A new act was passed later to allow the central bank to operate based on *Shari'ah* (Central Bank of Indonesia, 2002). Additionally at bank level, a *Shari'ah* committee exists at national level to standardize the *Shari'ah* interpretations on banking (Grais and Pellegrini, 2006). During the Asian financial crisis, the NPLs of Islamic banks were much lower and improved faster than conventional banks, and the loan-to-deposits ratio for the former were also higher (Central Bank of Indonesia 2002). This may indicate that Islamic banking, which does

not rely on interest rates, managed to face economic fluctuations better than conventional banks (Central Bank of Indonesia, 2002).

8. United Arab Emirates (UAE)

The United Arab Emirates (UAE) consists of a federation of several emirates. In 1971, following the United Kingdom's withdrawal from the Persian Gulf, the six States of Abu Dhabi, 'Ajman, Al Fujayrah, Ash Shariqah, Dubayy, and Umm al Qaywayn, joinef together to form the United Arab Emirates (UAE). A further state - Ra's al Khaymah - joined the UAE in 1972. The UAE's federal system is based on each of the individual emirates having a high level of autonomy with their own rulers. The exceptions are Sharjah and Ras AlKhaymah which each has one ruling family (Federal Reserve Research, 2004). Abu Dhabi, which is the largest and wealthiest emirate, is the federation's principal petroleum producer and financier. Dubai, which is the second largest emirate, thrives on wealth derived from a services-based economy (tourism, construction, telecommunications, and financial services). Together, the two emirates provide more than 80% of the UAE's income while the northern emirates remain relatively undeveloped (Federal Research Division, 2004). Due to the unprecedented development over the last 40 years due to oil production, the UAE had changed completely from a small regional country to a globally recognized economic power. The UAE's per capita GDP is equivalent to those of leading Western European nations. Its high oil revenues and its moderate foreign policy stance have enabled the UAE to play a vital role in the region's affairs. For more than three decades, oil and global finance drove the UAE's economy. However, due to the global crisis in 2008-09, the combined effect of falling oil prices and real estate prices had a severe effect on the UAE economy.

The UAE's Central Bank of UAE was established in 1980 with the objective of governing monetary, credit and banking related policies. The Central Bank maintains the UAE government's reserves of gold and foreign currencies; acts as the central bank for banks operating in the UAE; and acts as the UAE's financial agent with international financial institutions. In late 2004, the UAE Central Bank responded to the pressure for worldwide trading activities by stating that it would consider the

establishment of new foreign banks in the UAE to create more competition in the banking sector. However, as of late 2005, the UAE Central Bank had not issued any new licenses.

The DIFC (Dubai International Financial Centre) was established officially in September 2004 to represent a financial free zone with self-regulating mechanisms. In addition, the DIFC's operations are independent to those of the UAE's Central Bank. Although the Dubai International Financial Exchange (DIFE) was established in September 2005 with the primary purpose of supporting domestic markets, but it is supposed, also, to aid the country in opening itself to foreign investors (Federal Research Division, 2004)

9. Qatar

The State of Qatar is a small country which has the waters of the Arabian Gulf on its northern, eastern and western boundaries and which has Saudi Arabia as its southern neighbor. Previously known for pearl fishing, Qatar transformed itself from a poor British protectorate into an independent state with significant oil and natural gas revenues. Qatar is one of the world's fastest developing economies due to its exports of oil and gas.

Until 1959, Qatar's principal currency was the Indian Rupee when, in an attempt to stop the smuggling of gold into India, the government replaced it with a special gulf Rupee. In 1966, Qatar and Dubai established jointly a currency board to issue a Qatar-Dubai Riyal. However, following Dubai's integration into United Arab Emirates in 1971, the Qatari government decided to rely no longer on the Dubai currency. As a direct result, in 1973, THE Qatari government created the Qatar Monetary Agency (QMA) and introduced its own Riyal; the currency was secured to the International Monetary Fund's (IMF) special drawing rights. The QMA has most of the traditional powers and prerogatives of a central bank. According to the Federal Research Division (2004), the QMA dealt with issues of banking regulations, credits and finances. Additionally, the QMA was in charge of issuing currency and managing the country's foreign currency reserves which were required to support the Qatari Riyal.

Unlike many central banks, the QMA shares control of the country's reserves with the Ministry of Finance and Petroleum (Federal Research Division, 2004)

When incorporated in 1993, the Qatar Central Bank (QCB) took over the QMA's responsibilities for supervising the banking sector. Based on the Basle Accord, the QCB introduced regulations which applied major international standards to banking supervision.

10. Saudi Arabia

Saudi Arabia is the largest country in the Arab Middle East (Wilde, 2011). The western Hijaz and Asir mountains form a backbone along a 14-65 km wide coastal plain and most other parts of the KSA are either flat or slightly undulating. Over half of the territory is desert, with the great sand sea of the Empty Quarter covering much of the south. In a formal sense, KSA did not have a currency or a banking system until the middle of the 20th century. It is worth mentioning that, by then, KSA had only a few banking functions including money exchange for the visitors to Mecca who were using international currencies.

Although the first foreign bank was established in Jeddah as early as 1926, it did not have any significant importance. As expected, the development of oil production had a significant impact in determining and shaping the banking sector (Federal Reserve Research, 2004). In 1927, the KSA government issued a silver Riyal in order to standardize the monetary units in circulation at that time. By 1950, the KSA government was required to introduce formal policies to regulate and to control the newly created private banking institutions in order to keep in check the sharp increase expenditure by both the government and foreign oil companies. In 1948, the French Banque de L'Indochine and the Arab Bank opened theit first branches in Jeddah. The British Bank of Middle East, the Pakistan National Bank and Egypt's Misr Bank opened their branches in 1950 (Federal Reserve Research, 2004). Two years later, with technical assistance from the United States of America the Saudi Arabian Monetary Agency (SAMA) was established with the objective of serving as the Central Bank within the confines of Islamic law (Federal Research Division, 2004).

In 1966, an essential banking control law clarified and strengthened the SAMA's role in regulating the banking system. This law established, also, requirements concerning banks holding reserves against their deposits. The Council of Ministers set the conditions for granting licenses to foreign banks. Applications for bank licenses were submitted to the SAMAwhich forwarded each application along with its recommendations to the Ministry of Finance and National Economy. Several limitations continued to restrain SAMA's implementation of monetary policy. It could neither expand credit to banks nor use a discount rate because these measures were forms of interest (International Monetary Fund, 2013). By the 1980s, new regulations were introduced which are dependent on a set of service charges instead of interest to circumvent Islamic restrictions (Lessambo, 2013). From the early 1990s, the country's banks have been required to hold minimum reserve of non-interest-bearing deposits with SAMA. Moreover, banks had to maintain liquid assets (e.g. currency, deposits, etc.) other than the reserve accounts with SAMA (Metz, 1992).

11. Malaysia

Malaysia is a country comprising thirteen states and three federal territories with several ethnics and religions (BBC, 2015). The country consists of two regions separated by some 640 miles of the South China Sea. In 1948, with the exception of Singapore, the British-ruled territories on the Malay Peninsula formed the Federation of Malaya and gained its independence in 1957. Malaysia was established in 1954 when the previous British colonies of Singapore and Sabah and Sarawa joined the Federation of Malay (USA International Business Publications, 2007). Over the last forty years or so, Malaysia has transformed itself from a country with a large population of poor people dependent on the production of raw materials to a country with a multi-sector economy and a population of middle- income earners. Malaysia has shifted from being a maker of raw materials, such as tin and rubber in the 1970s to, nowadays, a diversified economy and a leading exporter of electrical equipments and parts, palm oil, and natural gas. This economic growth resulted, also, in a dramatic reduction in the level of the country's poverty from 49.3% in 1970 to 1.0% in 2014 (World Bank, 2015).

Malaysia's Central Bank, known as Bank Negara Malaysia, is a constitutional entity which began operating on 26 January 1959 and, according to Blomberg, has its headquartered in Kuala Lumpur with representative offices in New York, and London. The Bank Negara Malaysia is the Central Bank for the Malaysian currency and is responsible for maintaining international reserves; adopting the national monetary policy; managing the financial system; and providing financial advice and central banking services to both the government and other banks. It operates, also, public service centers to provide financial consultancy services to public and businesses. Bank Negara Malaysia's (BNM, Central Bank of Malaysia) total assets grew from US$ 6.6 billion in 1985 to US$ 122.3 billion by December 2014.

According to The World Bank (2015), after the Asian financial crisis of 1997-1998, Malaysia continued to post solid rates of growth by averaging 5.5% annually between 2000 and 2008. During 2007-2009, Malaysia was affected by the financial crisis, but it recovered promptly showing a average growth rate of 5.7 percent since 2010 (World Bank, 2015).

12. Iraq

After the First World War and due to British influence, Iraq became a part of the Indian monetary system with the Rupee as the country's main currency. In 1947 the National Bank of Iraq was established. According to the Federal Research Division (2004), the National Bank of Iraq assumed responsibility from the London-based currency board in 1949 for issuing currency notes and maintaining financial reserves. In 1956, the National Bank of Iraq was transformed into the Central Bank of Iraq. Its tasks included currency management, foreign exchange control, and supervision of the country's banking system (Federal Research Division, 2004).

In 1964, as the result of the massive nationalization under the first Ba'ath rule, there was a merger of banks the following main groups of banks: Rafidain; Commercial; Baghdad Bank; and Credit Bank. A further restructuring followed in 1970 within two main groups- Rafidain and Commercial. Later in 1974, the Commercial group was

supervised under the Rafidain banner; this meant that it was the only bank that remained under State ownership (Federal Research Division, 2004). The second Persian Gulf War had devastating effects on the State owned banks. It was estimated that Rafidain incurred losses of $300,000,000 due to the destruction of most of its offices and branches. Additionally, its currency losses were estimated to be $69,000,000 (Federal Research Division, 2004).

13. Singapore

Of the Islands situated in Southeastern Asia, Singapore is a wealthy city State located between Malaysia and Indonesia. The United Kingdom established Singapore as a trading colony in 1819. Singapore joined the Malaysian Federation in 1963 and, two years later, Singapore became an independent country. Once a British colonial trading post, nowadays Singapore is a thriving global financial hub and was described as one of Asia's economic "tigers". It is renowned, also, for its conservatism and strict local laws and Singapore prides itself on its stability and security. Singapore experienced rapid industrialization during the 1960's and, over a ten-year period, manufacturing became the sector most responsible for the country's economic growth. Singapore achieved full employment in the early 1970's and, by the 1980s, Singapore had joined Hong Kong, South Korea and Taiwan as one of Asia's newly industrialized countries (The World Bank, 2015). At present, the vivid manufacturing and services sectors have become the main supports of the Singapore economy (The World Bank, 2015) (The World Bank, 2015). Consequently, Singapore has become one of the world's most prosperous countries with strong international trading links (In terms of tonnage handled, its port is one of the busiest in the world.) and with per capita GDP equal to that of the leading nations of Western Europe. Singapore is one of the world's most competitive economies and regarded, also, as offering businesses one of the world's most friendly business environments (The World Bank, 2015).

The Central Bank of Singapore, known as the Monetary Authority of Singapore (MAS), was established in 1971 and is based in Singapore. The MAS regulates the country's monetary, banking, and financial aspects and assists in the promotion of non-inflationary economic; issuing currency and government securities; and

developing monetary policies. Moreover, the MAS is the government's financial agent and develops strategies for the development of the private sector. In addition, it offers economic research services and assists in regulating the banking, insurance, and securities sectors. According to Bloomberg, the MAS focuses, also, on global free trade and developing economic and financial policies.

14. Syria

Syria was the home of various early civilizations including, most notably, the Phoenicans. At various times in history, Syria was part of the Persian, Macedonian, and Roman empires. From the 7th century, Syria became a center of Islamic power and civilization and, in 1516, it became part of the Ottoman Empire. Following the First World War, France acquired a mandate over Syria and the French administered Syria until it gained its independence in 1946. The two pillars of the Syrian economy are the oil sector and agriculture; each account for about a quarter of the country's Gross Domestic Product (GDP). This varies varying from year to year depending on prices and climatic conditions. The economy has diversified through growth in other sectors such as financial services, construction, telecommunications, tourism, the non-oil industry and trade.

According to Bertelsmann Stiftung (BTI) (2014), before the unrest (2011), the Syrian government was implementing redistributive reforms and liberalizing gradually Syria's centrally planned economy. Prior to 2011, Syria had reached acceptable levels in international rankings such as the UNDP's Human Development Index and was seen as a medium developed country. In the 2011edition of the UNDP's Hunan Development Index, Syria was ranked 119 with a value of 0.632 as compared to 118 with a value of 0.631 in the 2010 edition (BTI, 2014). However, there is no doubt that the current politico-economic situation has had a massive detrimental effect on Syria's economic system. Since the unrest began in 2011, the Syrian pound has experienced a devaluation of roughly 50% and, in turn, this has reduced the value of its citizens' monetary assets and savings.

The conflict has pushed millions of people into poverty and, in 2014, i four in every five Syrians were estimated to be living in poverty (SCPR, 2014). In 2014, it was estimated that the overall poverty rate was 82.5% and showed a significant increase when compared to the estimated 64.8% in 2013 (SCPR, 2014). The Syrian Centre for Policy Research (SCPR) estimated that in 2014 64.7% of Syrians were living in extreme poverty and were unable to meet their basic food and non-food needs. While the current conflict continues, it is difficult to gauge the accuracy of these estimates. However, these estimates remain highly indicative of the degree of deprivation which the embattled Syrian population is experiencing.

15. Bangladesh

Bangladesh became an independent state in December 1971 after a nine-month long war against the Pakistani government. Bangladesh is one of the world's most densely populated countries with its people living on a delta between rivers flowing into the Bay of Bengal. While there is widespread severe poverty is deep and widespread, in recent years, Bangladesh has reduced the growth of its population and improved the country's health and education. However, poverty remains the overarching problem with, in 2010, 76.5% of the population living on less than $2 a day (at 2005 international prices, adjusted for purchasing power parity) (BTI, 2014). This means that at least 65 million Bangladeshi people (31.5% of the population) live below the poverty line. From 1996, the annual rate of growth of Bangladesh's economy has been around 6%. This is remarkable when we take into account the country's political instability, poor infrastructure, corruption, insufficient power supplies, slow implementation of economic reforms and the impact of recession following the 2007-09 global financial crisis. Although the service sector generates more than half of Bangladesh's GDP , around 50% of Bangladeshis are employed in the agriculture sector with rice being the single most important product.

The Bangladesh Bank, the Central Bank and the apex regulatory body for the country's monetary and financial system, were established in 1971 in Dhaka. It performs all the core functions of a typical monetary and financial sector regulator and carries out,also, a number of other non-core functions. The major functional areas

are : formulation and implementation of monetary and credit policies; regulation and supervision of the banks and non-bank financial institutions; promotion and development of the domestic financial market; management of the country's international reserves; and issuance of currency notes.

Following the country's independence, the Bangladeshi banking industry started its journey with six nationalized commercial banks, two state-owned specialis banks and three foreign banks. In the 1980s, the banking industry achieved significant expansion with the entry of private banks. In 1983, alongside the country's conventional interest bearing banking system, Bangladesh introduced an Islamic banking system (profit-loss sharing). At present, out of Bangladesh's forty-eight 48 banks, six private commercial banks are operating as full-fledged Islamic banks and, from a total of twenty-one branches, ten conventional banks are partially involved in Islamic banking. From its inception in 1983 to June 2007, the Islamic banking industry continued to show strong growth in tandem with growth in the country's economy. This was reflected in the increased market share of the Islamic banking industry in terms of the total banking system's assets, financing and deposits (Ahamed, 2014).

16. Philippines

During the 16th century, the Philippine Islands became a Spanish colony and, in 1898, the colony was ceded to the USA following the Spanish-American War. In 1935, the Philippines became a self-governing commonwealth and, in 1946, after achieving its independence from the United States of America and becoming a Republic, the Philippines adopted a democratic presidential system. The Philippines is one of East Asia's most dynamic emerging markets with sound economic fundamentals and a globally recognized competitive workforce (The World Bank, 2015). Major credit rating agencies have rated the Philipines' investment banking opportunities because of the sound macroeconomic fundamentals of the country's economy characterized by sustained growth, low and stable inflation and a sound fiscal management. Moreover, robust remittances have provided a strong basis in stabilizing the Philippines' currency and enabling the country to build up a healthy amount of international reserves.

Pursuant to the provisions of the 1987 Philippine Constitution and the New Central Bank Act of 1993, the Bangko Sentral ng Pilipinas (BSP) was established on 3 July 1993 as the Philippines' Central Bank. Assuming the role from the Central Bank of Philippines, the BSP is the country's central monetary authority is independent of the Philippines National Government. The BSP enjoys fiscal and administrative autonomy from the National Government in the pursuit of its mandated responsibilities.

17. Pakistan

Since the modern state of Pakistan was born out of the partition of the Indian sub-continent in 1947, it has faced both domestic political upheavals and regional confrontation. Created to meet the demands of Indian Muslims for their own homeland, Pakistan consisted originally of East and West Pakistan. In 1971, With the help if India, the Bengali speaking people of East Pakistan seceded from West Pakistan and became the independent country of Bangladesh. West Pakistan - the present-day Pakistan - stretches from the Himalayas down to the Arabian Sea. Pakistan is classified as a country with "low human development" and is ranked 145 of the 187 countries in the U.N. Human Development Index (HDI). In 2008, the World Bank stated that 60.8% of the Pakistani population lived on less than $2 per day (BTI, 2014). When considering in 2013 the "best place to be born" the Economist Intelligence Unit (EIU) ranked puts Pakistan 75 of the 80 countries on its index.

Before independence in 1947, the Indian Reserve Bank was the Central Bank for both India and Pakistan. Nowadays, the State Bank of Pakistan, which was established in 1948 and is based in Karachi, operates as Pakistan's Central Bank of Pakistan. According to Bloomberg (2015), its primary functions include the issue of currency; regulation and supervision of the financial system; being the bankers' bank; the country's lender of the last resort; banker to government; and conducting monetary policy. The State Bank of Pakistan is responsible for the management of public debt and foreign exchange and its other functions include advising the Pakistani government on financial matters and interacting with international financial

institutions (Bloomberg, 2015). In addition, it offers nontraditional or promotional functions. These include the following: development of financial framework; institutionalization of savings and investment; provision of training facilities to bankers; and provision of credit to priority sectors

Pakistan was among the three worldwide countries that had been trying to implement interest free banking at a comprehensive / national level. From 1960 to 1977, the Council of Islamic Ideology (CII) provided the Government with a number of reports which examined the meaning of *Riba*. During the 1970's, efforts began to eliminate *Riba* from economic matters and, in this regard, most of the significant and practical steps were taken during the early 1980s (AlBaraka, 2015). In 2002, the State Bank of Pakistan issued the first Islamic Banking License allowing Islamic Banking Products and Services to be offered in the Country. Currently, five fully fledged Islamic Banks and various conventional banks offer the Islamic Banking Products and Services.

18. Turkey

Following the fall of the Ottoman Empire, the modern Republic of Turkey came into existence in the 1920s. Straddling the continents of Europe and Asia and controlling the entrance to the Black Sea, Turkey's location has given it major influence and strategic importance in the region (BBC, 2015). Turkey is the only country with a majority-Muslim population that has an explicitly secular political system. As determined by the Turkish Constitution (BTI, 2014), its institutions are reasonably efficient in their operations. In comparison with other Middle Eastern countries, Turkey's democratic rules function reasonably well and its elections are free and fair.

According to The World Bank, Turkey is one of the largest middle-income partners of the World Bank Group (WBG). With a Gross Domestic Product (GDP) of $786 billion, Turkey is the 18th largest economy in the world. In less than a decade, the country's per capita income has nearly tripled and now exceeds $10,000. Although economic growth was slowed by the onset of the global economic crisis in 2008 but, nonetheless, it has remained resilient and made Turkey an example from which other countries in the region can learn. Labor markets have recovered rapidly after the crisis

and both the seasonally-adjusted unemployment and employment rates improved from pre-crisis levels.

Turkey's Central Bank was established in 1931 and is based in Ankara. It regulates the issue of currency and operates the country's credit system. The Central Bank formulates, implements, and monitors the monetary policy. Its other functions include: guaranteeing deposit schemes; foreign exchange operations; holding and managing foreign reserves; and operating payment systems. The Central Bank publishes, also, CBRT bulletins, reports and statistical information on the country's balance of payments stand its t international investment position, research papers and presentations. In addition, it conducts surveys on the issuing of bank loans and the determination of the consumer confidence index. (Bloomberg, 2015).

19. Yemen

North Yemen obtained its independence from the Ottoman Empire in 1918. However, the South of Yemen got independent in 1967 after the withdrawal of British troops. In 1990, the two countries were unified formally as the Republic of Yemen and, since the country was unified , Yemen has been modernizing slowly and opening up to the world. However, Yemen still retains much of its tribal character and is one of the poorest countries in the Arab world (The World Bank, 2015). In 1990, North and South Yemen were reunited and this led to the Central Bank of Yemen merged with the Bank of Yemen under the original name of "Central Bank of Yemen". As established by law, the Central Bank of Yemen is an independent body with the paramount objective of conducting Yemeni monetary policy. The Central Bank of Yemen is responsible for keeping the country's inflation under control; stabilizing the national currency's exchange rate; and promoting investment and economic growth (Central Bank of Yemen, 2015).

The Yemeni financial system is small relative to the size of the country's economy. The Central Bank and the Yemen Bank for Reconstruction and Development (YBRD) are the dominant players. The YBRD controls some 80% of the country's commercial lending and deposit gathering activities. The Central Bank uses it, also, as a vehicle

to implement its policy decisions. According to USAID, Yemeni financial institutions and markets i are poorly developed and extremely conservative. An estimated 65% of the country's liquidity is kept in cash outside the banking system. There is no clear definition of Yemeni Banking law and the Commercial Code actively favors the borrower.

20. Egypt

Egypt gained its full independence from the United Kingdom in 1952 (CIA, 2015). It is the largest Arab country and, in modern times, has played a central role in Middle Eastern politics in modern times. Overall, Egypt has a low level of economic development. To a large extent, Egypt depends on volatile external sources of revenue, such as tourism, income from the Suez Canal and monies sent back home from workers in Arab oil-producing countries (BTI, 2014). These revenues fluctuate with Egypt's domestic situation (in the case of tourism), the global economic situation and labor politics in the oil-producing countries. Since there are only a few domestic opportunities, these factors makes it difficult for Egypt to overcome the most important socioeconomic barriers hindering its transformation. Furthermore, high levels of poverty and illiteracy and traditional gender relation patterns constrain economic performance (BTI, 2014).

Egypt's Banking sector was subject to various transformation and reforms over the years. There was a switch from a banking system, which was predominantly foreign in origin during the period from 1950 to 1960, to the banks coming under state ownership. The banking system was regarded mainly as a "quasi fiscal" agency whose main function was to provide fund for various projects and assignments of the state owned enterprises and Egyptian government. The system, which prevails currently, is a result of several previous trials and tribulations.

The Central Bank of Egypt was established in 1960 and is based in Cairo. It regulates the issue of bank notes; maintains reserves to secure monetary stability; and operates the Egyptian currency and credit system. In the mid-1970's, the Egyptian banking sector expanded markedly spurred on by the country's so-called open door policy.

This policy aimed to improve outward-looking growth with an active role for the private sector to promote economic performance. Since the 1990's, there have been major reforms of the country's banking system and, nowadays, Egypt has a liberally modern banking system which is regulated and supervised according to internationally accepted standards.

21. United Kingdom

The United Kingdom (UK) consists of England, Wales, Scotland and Northern Ireland. At its peak in the 19th century, the British Empire covered 25% of the world's land mass. The First and Second World Wars during the first half of the 20th century resulted in a severe reduction in the UK's global strength. The second half of the 20th century witnessed the UK rebuilding itself into a modern and prosperous European nation.

The UK was the world's first industrialized country. Its economy remains one of the largest but, for many years, it was based on service industries rather than on manufacturing. Regarded as one of the world's leading trading powers and financial centres, the UK has the third largest European economy after Germany and France (The Telegraph, 2015). The service industries, particularly banking, insurance, and business services, are key drivers of British GDP growth. In 2008, due to the importance of its financial sector the UK economy was hit particularly hard by the global financial crisis. The global financial crisis, the reductions in domestic house prices and high consumer debts and the compounded the UK's economic problems and pushed its economy into recession in the latter half of 2008 (CIA, 2015).

The Bank of England, founded in 1694, serves as the UK's Central Bank. In addition to managing sterling, the UK's currency, the Bank of England provides banking services to the UK Government and to other banks and financial institutions (Bloomberg, 2015). It operates, also, the UK's Real Time Gross Settlement system for payments and securities (Bloomberg, 2015). The Bank of England serves as a representative for the UK HM Treasury in handling the United Kingdom's foreign

currency assets and liabilities, and gold (Bloomberg, 2015). The Financial Conduct Authority (FCA) is responsible for ensuring that financial markets work fairly.

A small number of very large banks including Barclays, the Royal Bank of Scotland (RBS), Lloyds, and HSBC, influences the UK banking sector. In term of the value of assets, the market is clearly oligopolistic. The British banking sector went more concentrated, from 1401 to 1736, following the financial turmoil 2007-2009. The banking H-H Index increased from 1401 in 2007 to 1736 in 2010 (OFT, 2010)

Table 4.1: Descriptive statistics for different regions and countries based on total assets (in USD millions)

Region/Country	Mean			St. Dev			Minimum			Maximum			No. Year Obs.			No. of Banks		
	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T
MENA	4334.52	6783.95	5233.24	5731.73	9808.81	7085.54	12.10	44.50	12.10	71302.03	92085.36	92085.36	382	324	706	61	50	111
UAE	8616.12	8351.99	8476.58	7874.02	7815.84	7806.99	278.12	1304.21	278.12	25967.24	25765.01	25967.24	50	56	106	8	8	16
Bahrain	1724.63	4804.15	2738.62	3373.13	6935.22	5035.36	12.10	44.50	12.10	19055.10	29954.00	29954.00	110	54	164	17	8	25
Egypt	3499.65	3855.67	3677.66	1702.05	2454.31	2080.38	1287.10	706.43	706.43	6514.77	6854.90	6854.90	14	14	28	2	2	4
Iraq	323.25	361.92	343.94	213.36	303.64	263.19	55.22	59.95	55.22	884.91	1115.48	1115.48	20	23	43	4	4	8
Jordan	1592.33	1921.83	1757.08	1308.61	1024.87	1172.82	160.74	723.84	160.74	4254.23	3732.82	4254.23	21	21	42	3	3	6
Kuwait	10217.46	28892.78	15664.43	15852.43	17397.64	18268.86	482.47	10089.23	482.47	52287.70	58408.61	58408.61	34	14	48	5	2	7
Lebanon	161.11	329.02	245.06	76.08	169.59	153.76	54.91	143.01	54.91	257.49	554.35	554.35	8	8	16	2	2	4
Qatar	8418.97	11082.55	9783.24	5396.25	5475.95	5535.49	2307.12	1840.03	1840.03	20107.72	21988.41	21988.41	20	21	41	3	3	6
Saudi A.	19219.13	26113.47	22793.97	19104.48	25822.60	22889.86	3012.39	4195.70	3012.39	71302.03	92085.36	92085.36	26	28	54	4	4	8
Sudan	666.74	687.14	677.62	469.60	932.79	749.12	220.97	68.22	68.22	1870.48	3363.18	3363.18	42	48	90	7	8	15
Syria	641.67	875.39	773.77	561.72	524.50	541.45	149.68	193.76	149.68	1650.72	1998.06	1998.06	10	13	23	2	2	4
Tunisia	490.78	362.72	426.75	97.92	108.97	119.28	352.40	222.30	222.30	597.10	508.50	597.10	6	6	12	1	1	2
Yemen	776.86	552.76	673.43	636.73	265.70	507.71	86.58	208.22	86.58	2094.62	1335.33	2094.62	21	18	39	3	3	6
E. Asia &Pac	1714.93	2453.20	2112.94	1980.24	3340.60	2701.76	1.24	21.35	1.24	29896.48	27480.11	29896.48	131	155	286	22	23	45
Indonesia	1777.78	1714.43	1743.00	1683.51	1640.20	1643.41	39.56	171.74	39.56	5608.00	6110.67	6110.67	23	28	51	4	4	8
Malaysia	4473.58	7357.18	6024.20	4709.74	7510.32	6517.77	82.51	306.75	82.51	29896.48	27480.11	29896.48	98	114	212	16	17	33
Philippines	13.02	46.89	31.49	10.84	19.63	23.50	1.24	21.35	1.24	25.49	68.02	68.02	5	6	11	1	1	2
Singapore	595.36	694.29	653.07	152.71	108.31	132.19	366.40	544.86	366.40	735.20	851.25	851.25	5	7	12	1	1	2
S. Asia	829.40	1122.76	974.04	568.08	440.23	507.05	20.61	12.19	12.19	5905.57	5977.87	5977.87	91	89	180	13	13	26
Bangladesh	1231.09	1434.06	1332.57	1386.50	1444.36	1410.87	140.49	90.80	90.80	5905.57	5977.87	5977.87	42	42	84	6	6	12
Pakistan	427.71	811.47	615.50	599.43	898.17	780.61	20.61	12.19	12.19	2825.28	3203.37	3203.37	49	47	96	7	7	14
EU &C. Asia	3133.65	4290.28	3787.48	3882.37	5015.34	4548.25	11.10	12.68	11.10	1639.51	15281.33	15281.33	53	62	115	8	9	17
UK	388.40	743.90	571.38	431.67	918.98	741.35	11.10	12.68	11.10	1639.51	3575.79	3575.79	33	35	68	5	5	10
Turkey	5878.90	7836.66	7003.57	2840.50	4111.17	3720.63	1768.50	1419.69	1419.69	12107.30	15281.33	15281.33	20	27	47	3	4	7
Total	3387.36	5182.39	4095.57	5180.00	6502.28	6075.67	1.24	12.19	1.24	71302.03	92085.36	92085.36	657	630	1287	104	95	199

Note: Size is measured by total assets. The sample consists of 199 banks covering 21 countries from 4 regions. Middle East & North Africa (MENA): United Arab Emirates (UAE), Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, Sudan, Syria, Tunisia and Yemen. East Asia & Pacific (E.Asia&Pac): Indonesia, Malaysia, Philippines and Singapore. South Asia (S.Asia): Bangladesh and Pakistan. Europe and Central Asia (EU & C. Asia): The United Kingdom (UK) and Turkey. The data are extracted from BankScope database for 7 years from 2006 to 2012 inclusive. Fore descriptive statistcs based on Logarithm Total Assets (Ln TA) see Appendix 4

Based on table 4.3 and Appendix 3, it can be seen that the majority of banks among the top ten banks are from the MENA countries, particularly from the GCC. In other words, nine of the ten biggest Islamic banks, in terms of assets, are from the GCC (UAE, Saudi Arabia, Qatar, Bahrain and Kuwait). These Countries are considered wealthy since their economies depend majorly on oil export. Bank efficiency in this region, MENA, is expected to have a positive association with bank size, thus, taking advantage of economies of scale by sharing costs in the production process.

Chapter Summary

The chapter examined the socio-economic backgrounds and the banking history of the 21 countries covered by this research. Moreover, It presents how each country's banking system developed over time and the role played by the each country's government policies and regulations in the establishment of both foreign and domestic banks. The chapter has shown, also, the existence of diversity in Islamic banking and in the financial sectors of those countries that operated Islamic banking. Countries, which operated Islamic banking, ranged from less developed to developed economies and they had different socio-economic and political backgrounds. Although most of these countries required sustenance for Islamic banking and, more specifically, countries, like Malaysia, developed and promoted legal forms and financial institutions for both conventional and Islamic banking.

Chapter 5 Research Methodology and Data

This study examines a cross-sectional data assembled from the financial reports of 199 banks in 21 countries. These countries represent all the countries that host all the world's Islamic banks. The countries include Arab Emirates, Bahrain, Bangladesh, Egypt, Great Britain, Indonesia, Iraq, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sudan, Syria, Tunisia, Turkey and Yemen.

We used the Bankscope database to assemble the data for this study covering the entire period from 2006 to2012. We were unable to find earlier data because of the restructuring of the BankScope database based on the International Financial Reporting Standards (IFRS) which were adopted from 2006 to replace the many different national accounting standards. We based our selection of the sample period on the following two factors: (i) Collection of the greatest term of BankScope financial data available for Islamic banks under the IFRS; and (ii) Assessment of the banks' performance during the financial turmoil (2007-2009).

The data, which we used in this research, is mainly the banks' balance sheets and income statements available from the BankScope database developed by Bureau Van Dijk. BankScope presents the financial details in the original currencies of the individual countries. It gives, also, the option to convert the financial value of the currency to any other currency including US Dollars. In this study, we used the US Dollars-based values for the given sample.

This study employed the Data Envelopment Analysis (DEA), and the Generalized Least Squares (GLS) estimator with the Random Effects (RE) model. This section outlines the DEA approach, and it reports the input and output variables selected for this study.

5.1 Data Envelopment Analysis (DEA)

Efficiency is among the factors that evaluate an organization's performance (Matias et al., 2009). Normally, efficiency is measured as the ratio of outputs to inputs (Porcelli, 2009). However, this formula usually becomes inconsistent when there are numerous inputs and outputs associated with different resources, activities and environmental factors (John, 2014). This method, which Farrel (1957) addressed and developed further by Farrel and Fieldhouse (1962), is able to measure the comparative efficiency when there are several possible disproportionate inputs and outputs. This method focuses on constructing a theoretical efficient unit as a weighted average of efficient units in order to perform as a benchmark for an inefficient unit. This representation is written as the ratio of the weighted sum of outputs to the weighted sum of inputs (Matias et al., 2009). Afterwards, Charnes, Cooper and Rhodes (1978) issued the original DEA (hereafter referred to as the CCR model), under input-oriented and constant returns in order to scale (CRS) presumptions; and to compute the efficiency of each Decision-Making Unit (DMU) acquired as a minimum of a ratio of weighted inputs to weighted outputs (Input orientation) (Coelli et al., 2005).

The DEA Input-oriented approach attempts to maximize the relative reduction in input variables while staying within the envelopment space (Murillo-Zamorano, 2004). This denotes that the fewer inputs consumed to produce the given outputs, the higher the efficiency of the production technology (Sufian, 2004). A restriction is imposed on the calculation whereby the similar ratios for every DMU have to be less than or equal to unity (i.e. equals 1) (Murillo-Zamorano, 2004). This restriction is applied in order to determine the adequate weights for the DMU ratio (Murillo-Zamorano, 2004). This representation of efficiency enables the calculation of multiple outputs and inputs without the need to predefine any weights (Sufian and Abdul Majid, 2007). Moreover, it computes numerous inputs and outputs in a way where both are reduced by virtual weights to a single virtual input and a single virtual output (Sufian and Abdul Majid, 2007). Consequently, the estimated efficiency measure is represented as a a function of the multipliers of the virtual input–output combination (Sufian, 2007).

The DEA is a linear programming method that transforms several disproportionate inputs and outputs of each DMU into a scalar measure of operational efficiency, relative to its peer DMUs (Kumar and Gulati, 2008). DEA recognizes the peer DMUs for an individual DMU and, then, measures the DMU's efficiency by comparing it to the benchmarking DMUs (i.e. efficient DMUs) (Kumar and Gelati, 2008). Among one of the DEA's common advantages is the ability to compare different sized banks with reference to a common frontier without requiring presumption of any specific functional form (Casu and Girardone, 2010). In other words, the DEA does not need to predefine a production technology in order to measure the DMU's efficiency (Pasiouras, 2008). This is considered a significant feature since there is no need to deal with any potential misspecifications due to an inconvenient functional form (Pasiouras, 2008).

In addition to the advantages of DEA mentioned above, the following three more useful features make it an effective approach when measuring efficiency (Sufian, 2007):

(i) Every DMU in the sample is given a single efficiency score that allows the DMU to be classified from the least efficient to the most efficient (Sufian and Abdul Majid, 2008).

(ii) DEA points out the improvement, which took place for each DMU, by identifying any excessive use of inputs or any deficient production of outputs (Sufian, 2007).

(iii) DEA may provide a conclusive profile about the performance of each DMU.

The DEA is based on an assessment between the efficiency of each DMU relative to benchmark set which is called, also, the reference set. This set includes the sample's efficient banks (Sufian and Abdul Majid, 2008). One should be aware that the employed technique is a comparison between the production performances of each DMU to a set of efficient DMUs. The set of efficient DMUs is called the reference set (Sufian and Abdul Majid, 2008). A DMU, which is presented more than others in this set, is referred to as a global leader (Sufian, 2007). This may provide a significant idea on a particular entity position in the market (Sufian and Abdul Majid, 2008).

On the other hand, a major drawback of the DEA is that it does not account for random error (Berger and Humphrey, 1997). In other words, it presumes that there is neither an estimation error in creating the efficient frontier or a presence of luck that provisionally provides a DMU with a better estimated efficiency one year from the next (Harker and Zenios, 2000). Additionally, DEA does not consider the inaccuracies, initiated by accounting rules, which would make studied outputs and inputs divergent from the economic outputs and inputs (Berger and Humphrey, 1997). These errors may be a serious problem if present in one of the entities that rest on the efficient frontier. Consequently, they may change the estimated efficiencies of all the DMUs; these are compared to either this particular DMU or the reference set containing this DMU (Harker and Zenios, 2000). Another disadvantage of the DEA is that it is significantly sensitive to outlying observations where one observation may alter the efficiency frontier (Wagenvoort and Schure, 1999). Furthermore, unlike SFA, DEA does not consider the panel nature of the data used in a study (Harker and Zenios, 2000).

The fundamental DEA model extends into a two-stage DEA in order to account for environmental variables. In this context, the term environmental variables refer to the conditions that can influence an entity's efficiency (Casu and Molyneux, 2003). These conditions are not regarded as conventional inputs and cannot be controlled by the bank management (Fried et al., 1995). These variables can be employed through numerous methods in the DEA. In line with Coelli et al. (1998); Sufian (2011); Molyneux et al. (2013); Johnes et al. (2014), we adopt the two-step DEA approach in this study.

This approach's first step includes measuring each DMU's efficiency scores by including traditional inputs and outputs in the DEA (Casu and Molyneux, 2003). In the second step, the efficiency scores, computed in the first stage, are regressed against the environmental variables (Casu and Molyneux, 2003). The signs of the coefficients, associated with the explanatory variables (i.e. ban and country-specific variables), present the direction of their impact on bank efficiency. The second-step analysis, which includes categorical variables, is implemented by employing the Generalized Least Squares (GLS) estimator with the random effects model.

5.1.1 DEA- Input and Output orientation

The envelopment surface and the efficient projection path to the envelopment analysis form the main constructs of the DEA (Charnes et al., 1995). The output or input-orientation models deduce the projection path to the envelope surface (Pascoe et al., 2003). The selection of input or output-oriented models relies on the production process distinguishing the entity (Pascoe et al., 2003). Hence, DEA is initiated by using two different methods: either input-orientated DEA or output-orientated DEA (Mostafa, 2009). An input-orientated approach determines the proportional reduction of inputs needed for an inefficient bank to become DEA-efficient while keeping constant the current levels of outputs constant (Kumar and Gulati, 2013). On the other hand, an output-orientated approach shows the level of outputs which an inefficient bank requires to produce in order to become DEA-efficient while keeping constant the current amount of inputs (Kumar and Gulati, 2013). Both oriented approaches always have the same values under the CRS assumption whereas distinct values are present when the VRS model is presumed (Duygun-Fethi and Pasiouras, 2010). According to Coelli, et al. (2005), the choice of the appropriate orientation is insignificant since it is in the case of econometric estimation. Consequently, the selection of the orientation approach has a slightly greater impact on the computed efficiency scores (Coelli and Perelman, 1996). We employed the input-orientation approach in this study since the bank manager's main target is to control costs rather output production (Iqbal and Molyneux, 2005). The bank's focus on cost control and the fact that outputs tend to be demand-determined has resulted in making the input-oriented approach the most frequently used approach in studying bank performance (Kumbhakar and Lozano Vivas, 2005).

5.1.2 Bootstrap technique (Re-sampling)

The definition of re-sampling is a mixture of techniques for statistical properties. The various main re-sampling methods, employed in the literature reviews, include the bootstrap, the cross-validation, and the Jackknife (Brombin and Salmaso, 2009). The concepts of bootstrap, cross-validation and Jackknife are similar (Yu, 2003). However, bootstrap overcomes the two other mentioned techniques since it is a more methodical procedure in the sense that, relative to the other two, it initiates additional

sub-samples (Yu, 2003). According to Yu (2003), when compared to the Jackknife technique, the bootstrap technique yields less biased and more reliable outcomes. Xue and Harker (1999) raised a theoretical issue about DEA. They identified a theoretical problem with DEA in that it produced efficiency scores statistically dependent on each other. The reason behind this dependency is that efficiency scores are a relative index rather than an absolute index (Casu and Molyneux, 2003). The dependency, which exists among DEA-estimated efficiency scores, violates the principal of independency-within-sample presumed by regression analysis (Casu and Molyneux, 2003). Consequently, according to Casu and Molyneux (2003), the traditional two-stage DEA procedure, employed in previous studies, is considered to be invalid. Alternatively, they suggest bootstrap as a re-sampling technique to overcome this problem (Casu and Molyneux, 2003).

The bootstrap technique, developed by Efron (1979), is a computer-based method for setting statistical properties to estimated measures (Efron and Tibshirani, 1985). Simar (1992) was probably the first to initiate the bootstrap technique for calculating confidence intervals for efficiency scores resulting from a non-parametric approach (Casu and Molyneux, 2003). Ever since then, the bootstrap technique was used frequently to provide statistical inferences to efficiency scores for each observation in the sample (Atkinson and Wilson, 1995). Recently, some studies , for instance Tortosa-Ausina et al. (2008); Matthews et al. (2009); Lee et al. (2010); Arjomandi et al. (2011); Assaf et al. (2011); Moradi-Motlagh et al. (2012a); and Moradi-Motlagh and Saleh (2014), used the bootstrap DEA method to study the productivity and efficiency of banks in a number of countries.

We extracted from Johnes' (2006) study's bootstrapping procedure which is summarize below. The vector of v inputs, employed by DMU i (i = 1 …, n), is indicated by $x_?$ and the vector of w outputs, used by the DMU, is represented by $y_?$ (Johnes, 2006). The steps (Johnes, 2006) include:

Step 1: Compute the efficiency scores for the group of DMUs and reproduce the data: DEA is implemented to the defined data on inputs and outputs in order to obtain an efficiency score for each DMU in the sample, and this is represented by $\hat{D}(x_?, y_?)$

(Johnes, 2006). These measures are reproduced around unity by calculating $2 - \hat{D}(x_?,y_?)$ for each $\hat{D}(x_?,y_?)$, j = 1 …, n, providing 2n observations in total (Johnes, 2006).

Step 2: Obtain bootstrap values

a) Create a bandwidth b in order to employ it in the extraction of the bootstrap values (refer to Simar and Wilson 1998 for additional details on initiating the bandwidth) (Johnes, 2006).

b) Derive n separately and similarly distributed observations (denoted by $\varepsilon_?^*$, where j= 1..., n) from the probability density function employed as the kernel distribution (the uniform distribution in this case) (Johnes, 2006).

c) Deduce n values (denoted by $d_?$, where j =1..., n) separately and consistently from the group of 2n represented distance function measures (Johnes, 2006). Based on these, estimate the mean (Johnes, 2006):

$$\hat{d} = \sum_{?}^{?} d_? / n \qquad \text{(Eq.1)}$$

And

$$d_?^* = \hat{d} + ? \sqrt{1/(1 + b^? / w^?)}\ (d_? + b\varepsilon_? - \hat{d}) \qquad \text{(Eq.2)}$$

Where $w^?$ is the sample variance of $v_? = d\,j + b\varepsilon_?$.

d) Compute the bootstrap values ($\hat{D}_?^*$) as (Johnes, 2006)

$$\hat{D}_?^* = ? \begin{matrix} d_?^* \text{ if } d_?^* \le 1 \\ 2 - d_?^* \text{ or else} \end{matrix} \qquad \text{(Eq.3)}$$

Step 3: Identify the pseudo data and acquire the bootstrap measures of the efficiencies Identify a pseudo data collection by input and output vectors (represented by $(x_?^*, y_?^*)$) as (Johnes, 2006):

$$x_?^* = x_? \qquad \text{(Eq.4)}$$

$$y_?^* = D_?^*\, y_? / \hat{D}\,(x_?,\ y_?) \qquad \text{(Eq.5)}$$

Derive a value of B (B = 500) which is employed in the analysis of section 6.1) bootstrap measures of the efficiency score for each DMU j (j = 1… , n) by implementing DEA to the pseudo data B times (Johnes, 2006). These bootstrap estimates can be represented for DMU l by $\{\hat{D}^{*}_{?}(x_{?}, y_{?})\}^{?}_{? ? ?}$.

Step 4: Calculate predicted confidence intervals for the efficiency scores
The 100 (1 −α) % confidence interval for the right efficiency for DMU l) is computed by deriving the values $b_{?}$ and $a_{?}$ as follows:

$$Pb\ (-b_{?} \leq \hat{D}(x_{??}\ y_{?}) - D(x_{??}\ y_{?}) \leq -a_{?}) = 1 - \alpha \qquad \text{(Eq.6)}$$

The values $b_{?}$ and $a_{?}$ are unidentified but are computed from the bootstrap measures $\{\hat{D}^{*}_{?}(x_{?}, y_{?})\}^{?}_{? ? ?}$ by organizing the values $\hat{D}^{*}_{?}(x_{?}, y_{?}) - D(x_{??}\ y_{?})$ in ascending order and removing (100α /2) % of the observations at every end of this list (Johnes, 2006). Therefore, the measures of $-b_{?}$, $-a_{?}$ (represented by $-\hat{b}_{?}$ and $-\hat{a}_{?}$) are the endpoints of the residual collection of values such that $\hat{a}_{?} \leq \hat{b}_{?}$ (Johnes, 2006). Consequently, the bootstrap estimate of equation (Eq.6) is:

$$Pb\ (-\hat{b}_{?} \leq \hat{D}(x_{??}\ y_{?}) - D(x_{??}\ y_{?}) \leq -\hat{a}_{?}) = 1 - \alpha$$

And, thus, the estimated 100(1 −α) % confidence interval for the efficiency score of DMU l is determined by calculated (Johnes, 2006):

$$[\ \hat{D}(x_{??}\ y_{?}) + \hat{a}_{?}\ ,\ \hat{D}(x_{??}\ y_{?}) + \hat{b}_{?}\ ]$$

5.1.3 DEA- CRS and VRS models

The envelopment surface varies depending on the scale assumptions supporting the model. Usually, the following two scale presumptions are used: Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) (Pascoe et al., 2003). CRS considers that outputs will vary by an equivalent change in the amounts of the inputs (e.g. a doubling of inputs will consequently double outputs). On the other hand, VRS represents the fact that a firm can have production technology that may show

increasing, constant and declining returns to scale (Pascoe et al., 2003). The CCR model makes the CRS assumption which considers that there is no major correlation between the scale of operations (or firm size) and Overall Technical Efficiency (OTE) (Berger and Humphrey, 1997). The efficiency, derived from the CCR model, represents the OTE (Rosman et al., 2014). The CRS supposition is merely valid when the entire DMUs in the sample are working at an optimal scale (Rosman et al., 2014). However, in real life, this optimal performance does not happen frequently because of numerous conditions such as imperfect competition, dissimilarity of market power, restricts on finances etc. (Murillo-Zamorano, 2004). Consequently, operating DMUs may encounter either economies or diseconomies of scale (Rosman et al., 2014). Accordingly, if we presume the CRS-DEA model when the DMUs are not running entirely on the optimal scale, the estimated OTE scores will be biased by scale efficiency (Rosman et al., 2014). This significant weakness is rectified by Färe, Grosskopf and Lovell (1983), Byrnes, Färe and Grosskopf (1984), and Banker Charnes and Cooper (1984) who extended DEA to include the Variable Returns to Scale (VRS) model (Murillo-Zamorano, 2004). The VRS-DEA model is employed by counting the convexity restriction $\Sigma\mu j=1$ to the CRS-DEA model (Murillo-Zamorano, 2004). Consequently, this basic constraint ensures that every DMU is compared with counterparts of homogenous size (Murillo-Zamorano, 2004). This method prevents the detrimental effect of scale efficiency on the estimated OTE scores (Murillo-Zamorano, 2004).

The consequential model, called the BCC model and extended by Banker et al. (1984), is used to evaluate the efficiency of the DMU based on VRS. Under the VRS assumption, the computed efficiency represents the Pure Technical Efficiency (PTE); this is the measurement of technical efficiency free from the influence of scale efficiency (Rosman et al., 2014). Any existing difference between a specific DMU's OTE and PTE scores reveals the presence of scale inefficiency (Rosman et al., 2014). It should be mentioned that Coelli et al. (1998) reported that, since the beginning of the 1990's, BCC was the most commonly used model.

A bank can run either under CRS or VRS assumptions. The CRS approach means that an increase in inputs leads to a proportionate increase in outputs (Berger and

Humphrey, 1997). On the other hand, VRS signifies that an increase in inputs generates an unbalanced increase in outputs (Berger and Humphrey, 1997). A bank following VRS approach can be exhibiting additionally either IRS or DRS (Rosman et al., 2014). IRS denotes that an increase in inputs leads to a superior increase in outputs, whereas DRS states that a growth in inputs ends up in a smaller increase in outputs (Noor et al., 2010). Moreover, IRS implies that a DMU can become more efficient by increasing the production of outputs whereas DRS suggest that a reduction in the scale of production increases efficiency (Kumar and Gulati, 2008).

The normal method to compute scale efficiency is by running both DEA models CRS and VRS. Afterwards, Scale efficiency is determined by dividing the CRS-efficiency scores by the VRS-efficiency scores for each DMU (Rosman et al., 2014). The efficiency scores derived from the VRS are normally higher since the DMU points are enveloped tighter (Sufian, 2006). Hence, the scale efficiency scores will range between 0 and 1 (Sufian, 2006). An advantageous attribute of comparing the DEA-VRS model to the DEA-CRS model is that it reveals the operating mode of a DMU (i.e. IRS or CRS or DRS) (Sufian, 2006). The constant returns to scale approach is used when the slope of the efficient frontier and the ratio of inputs to outputs are equal (Kumar and Gulati, 2008). This happens when the CRS efficient frontier is tangential to the VRS efficient frontier (Cooper et al., 2000). On the other hand, IRS is deployed when the slope of the efficient frontier is superior to the average rate of conversion (Rosman et al., 2014). In other words, it is used when it is below the level on which CRS is applicable (Sufian, 2006). Moreover, the DRS approach is exercised above the level at which CRS is considered applicable (Sufian, 2006). DMUs, which are not found on the efficient frontier, must be predicted primarily against the efficient frontier prior to the determination of their returns to scale mode (Rosman et al., 2014).

5.2 Measurement of Overall Technical, Pure Technical, and Scale Efficiencies

As explained earlier, we can observe from two angles Technical efficiency (TE), derived from DEA (Coelli, 1996b). Firstly, under the input-orientation approach, TE examines the feasibility of reducing inputs to generate a specified amount of outputs (Kumar and Gulati, 2008). Secondly, under the output orientation, TE views the

potential growth in outputs for a particular set of inputs (Kumar and Gulati, 2008). We can measure a DMU's TE by dividing the actual amount of outputs with the maximum potential outputs on the assumption of the output-orientation. Alternatively, under the input-orientation, we can determine TE by calculating the ratio of minimum potential inputs to the actual inputs. In order to determine an estimate of TE, we have to find the variance between actual production and potential production on the possible production set (Kumar and Gulati, 2008). This set represents the entire potential production technology of converting an entity's available inputs into outputs. An entity or a DMU is considered to be technically efficient if its production exists inside this particular technology set. A DMU is technically inefficient if production occurs within the interior of this production set (Kumar and Gulati, 2008). As mentioned previously, we can measure the Scale Efficiency (SE) by comparing the OTE and the PTE results from CRS and VRS approaches respectively. The OTE, derived from DEA-CRS approach, computes inefficiency related to the input and output configuration and the scale of operations (Kumar and Gulati, 2008). However, the PTE, derived from DEA-VRS approach, determines inefficiency related merely to managerial underperformance (Avkiran, 1999). SE is calculated by dividing OTE by PTE.

In DEA, TE can have a value which ranges between zero and one inclusive. A value, which is close to zero, signifies that a DMU is more inefficient whereas a value of one means that DMU is entirely efficient. For instance, a value of 0.8 indicates that a bank is 80% efficient relative to its best-performing peers and that the same amount of outputs could be produced by employing a 20% smaller amount of inputs.

Under the input-oriented assumption, the DEA-VRS approach can be written in the linear programming equation below (see for example, Murillo-Zamorano, 2004):

Min φ, λ, φ (Eq. 1)

subject to − φ?$_?$ + Yλ, ≥0

?$_?$ – Xλ ≥ 0

N1' λ=1

And $\lambda \geq 0$

where,

λ is an $N \times 1$ density vector of constants and φ is a scalar ($1 \geq \varphi \leq \infty$). $N1$ is an $N \times 1$ vector of ones (see for example, Coelli, 1996). For N number of banks, *yi* represents the $M \times N$ output vectors and ?$_?$ represents the $K \times N$ input vectors. Y consists of the data for all the N banks. Given a fixed level of inputs for the ith firm, the corresponding growth in outputs to be attained by the bank is represented by $\varphi - 1$. Eq. (1), representing VRS approach, turns into a DEA-CRS model if the convexity constraint $N1' \lambda = 1$ is not counted (Coelli, 1996). This restraint, imposed on DEA, suggests that there is an assessment of an inefficient bank against other banks of similar size. As a result, the predicted point for that bank on the DEA frontier is a convex combination of the examined banks (Sufian, 2006). It is considred that a bank operates at CRS if TE scores are the same with or without the convexity constraint imposed on DEA. On the other hand, a bank operates at VRS if these TE scores are dissimilar (Sufian, 2006). The operating mode, at which a DMU should follow to become efficient, needs to be defined. Therefore, one should determine whether the bank operates at IRS or DRS (Sufian, 2006).This is done by presuming a Non-Increasing Returns to Scale (NIRS) model is applied in Eq.(1) and the convexity constraint $N1' \lambda = 1$ is replaced by $N1' \lambda \leq 1$. This is shown in the following equation (Sufian, 2006):

Min $\varphi, \lambda, \varphi$ (Eq. 2)

Subject to $-?_? - Y\lambda, \geq 0,$

$\varphi ?_? - X\lambda \geq 0,$

$N1'\lambda \leq 1$

$\lambda \geq 0.$

The outcome of Eq. (2) discloses the mode of the SE (IRS or DRS). If the TE scores, derived from the NIRS model, are different from the PTE resulting from the VRS model then the particular bank is operating with IRS. On the other hand, it is

considered that the given bank operates with DRS if the NIRS-efficiency scores and PTE are equal (Sufian, 2006; Rosman, et al., 2014).

As discussed earlier, OTE is used to determine inefficiency resulting from pure technical inefficiency due to managerial deficiency and scale inefficiency as a result of the incorrect choice of scale size (Kumar and Gulati, 2008). On the other hand, unlike OTE, the PTE, obtained from the BCC model, is not influenced by the DMU scale/size. Consequently, the PTE shows that entire inefficiency is only due to inappropriate management practices and misplaced selection of input combination (Kumar and Gulati, 2008).

A non-parametric DEA is employed by applying both CCR and BCC models in order to derive OTE and PTE scores under CRS and VRS assumptions respectively. These models are used to determine the input-oriented efficiency (OTE, PTE and SE) of the Islamic banks when compared to their conventional counterparts at the global level.

In line with the studies conducted by Charnes et al. (1990); Bhattacharyya, Lovell and Sahay (1997) and Sathye (2001); Hassan and Hussein (2003); Hassan (2005); Sufian (2006); Sufian et al. (2008); Mokhtar et al. (2008); Casu and Girardone, (2009); Johnes et al. (2014); and Rosman et al. (2014), the intermediation approach was applied to the selection of inputs and outputs used in the DEA first-stage of this research study. An additional reason for adopting the intermediation approach rather than the production approach is that the latter is more appropriate to study the efficiency of branches which are involved mainly in handling customer documents and bank funding (Berger and Humphrey, 1997).

5.4 First stage analysis: estimation of efficiencies

We based our selection of the variables used for determining TE via DEA approach on previous studies and the availability of the data. Appendix 4 shows the frequency of the use of variables in previous researches. We assumed that the banks performed as an intermediary between deficit units (borrowers) and surplus units (depositors) (Pasiouras, 2008) and that they used:

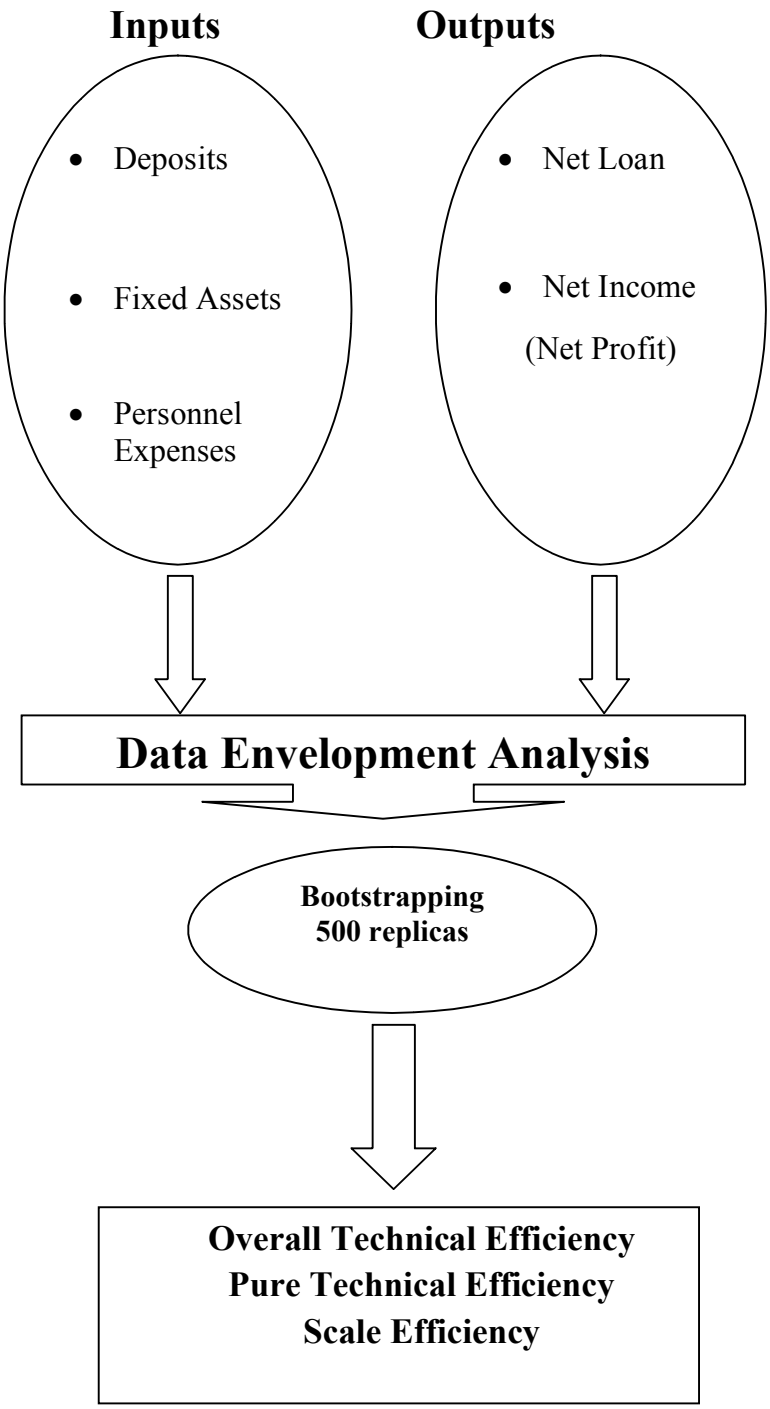
i. Deposits and short-term funding
ii. Fixed assets
iii. Personnel expenses,
as inputs to produce:

i. Net loans
ii. Net income (Net profit)
as outputs.

This study examines three inputs and two outputs in order to observe the efficiency of Islamic banks versus their conventional counterparts at the global level during the period from 2006 to 2012. The inputs include deposits and short-term funding, fixed assets, and personnel expenses whereas the outputs comprise net loans and net income. We initiated the efficiency frontier by implementing an unbalanced sample of 104 Islamic banks and 95 conventional counterparts (= 199 Banks) operating in 21 countries over the period. This yielded 1125 bank year observations. We derived data for the seven years from the BankScope database, and the variables, which we used in the study, are shown in millions of US dollars. Moreover, based on BankScope, these variables were deflated against the inflation rates of their own countries. We excluded observations with non-positive net income and partially available data (less than 4 years financial data). Moreover, we excluded from this study Iran – which is considered to be a leading country for Islamic banking and finance and which has the highest number of Islamic banks in the world- because its banking system consists entirely of banks that conform only to Islamic laws.

Appendix 4 shows the frequency of Inputs and Outputs, which were used in previous literature reviews.

Figure 5.1: Detailed conceptual frameworkdetermining the impact of macroeconomics variables (country-specific factors) and financial variables (Bank-specific factors) on pure technical efficiency (PTE).



Source: Own Figure

Based on the input and output-used frequency table (see Appendix 4), the most-used inputs in previous literature are employees, labor, physical capital, capital, and personnel expenses. Employees and labor are different terms with the same meaningwhich reflect the number of workers contributing in the production process. However, "personnel expenses" input is used as an alternative to employee/ labor since, while both are used to extract the required monetary-value inputs, there is no readily available data on either the number of workers or the cost for working hours. Physical capital and capital have the same meaning to describe the "fixed assets" input which we used as a variable input variable in our study. In the study, we used fixed assets as a replacement for the capital input and we employed personnel expenses as a proxy for labor. Although personnel expenses may not be an ideal representation of labor, they are assumed to provide a better measure than others like employee numbers or wage expenditures since it is easy to access (Johnes et al., 2014). Moreover, it was used as a proxy for labor in previous literature such as Locano-Vivas et al. (2002), Drake and Hall (2003), Staub et al. (2010), Chortareas et al. (2012), and Johnes et al. (2014). The last input, which we used for measuring efficiency, is "deposits and short-term funding". Apart of being one of the most-used inputs in previous researches, we selected "deposit and short-term funding" as an input for the DEA conducted under the intermediation approach. As stated previously, this approach considers the financial institutions to have an intermediary role of channeling funds between depositors and borrowers (Berger and Humphrey, 1997). The funds (inputs) available to finance the production of banks, i.e., financial instruments (outputs), are represented mostly by deposits and short-term funding.

The two selected outputs, which we included in the DEA, are "net loans" and "net income" (or net profit). We selected "Net loans" as one of the two outputs for determining the bank efficiency because it was the most frequently used output in previous researches under the intermediation approach (see Appendix 4). Islamic banks provide loans differently than conventional banks, and "net loans" is a broad term chosen to include the equity financing products which they initiate (Johnes et al, 2014). Moreover, conventional and Islamic banks generate money from loans in different ways. While conventional banks depend on the spread between the lending return rate and borrowing cost rate to earn money, Islamic banks count on the profit

and loss sharing ratio between the entrepreneurs or investors and the depositors (Johnes et al., 2014). Another significant reason, why we selected "net loans" as an output for our efficiency analysis, was because loans dominated the financial instruments issued by banks and were the major source of earnings for banks. We did not select either "Number of transactions" or "deposits" because these entries were outputs when conducting the DEA under the production approach.

The DEA is sensitive to the number of variables selected as inputs and outputs (Mostafa, 2009). The greater the number of variables included in the DEA the lower is the capability to differentiate between the DMUs (Mostafa, 2009). According to Smith (1997), the more variables used, the higher the probability of influencing a number of inefficient DMUs and changing them to be efficient. Therefore, the number of variables should remain at a rational level in order to maintain the DEA's preferential advantage (Mostafa, 2009). Galagedera and Silvapulle (2003) claimed that no analytic examinations for model misspecification in DEA resulted from the wrong selection of the variables. However, as provided by Raab and Lichty (2002), there is a general rule that recommends that the minimum number of DMUs should be greater than three times the number of inputs plus outputs. Based on this principle, the minimum recommended set for this study should be 15 DMUs and, with 199 DMUs, this study is consistent with this rule. Cooper et al. (2007) suggested an additional rule written as follows: $n \geq \max \{m \times s; 3(m + s)\}$ where n=number of DMUs, m=number of inputs and s=number of outputs. This rule suggests that the sample size should be greater than or equal to the product of inputs and outputs (Mostafa, 2009). Based on this rule, our study's sample size should be at least 6 DMUs. Therefore, this study's sample size (n= 199 DMUs) is feasible and appropriate to determining the given banks' TE scores.

5.5 Second stage analysis: determinants of efficiency

In the second stage of this study, we assess the impact of the bank and country-specific variables on Islamic and conventional banks' efficiency. In our study, we define the dependent variable as the relative scores of PTE derived from the DEA-first stage. The value of the dependent variable (i.e. estimated PTE) ranges between 0 and

1 inclusive. Banks, with PTE values of less than 1, are seen as inefficient whereas banks with PTE values equal to 1 are considered to be efficient. The independent variables are the factors that can influence the given banks' efficiency scores. This study considers two general factors: firstly, there are the bank-specific factors that represent a bank's inner conditions or features that may influence its efficiency. Secondly, there are the country-specific factors that include the macro-environmental conditions over which bank managers have no control (Johnes et al., 2014).

In the first stage, we pooled together the given banks in order to determine each bank's TE score. We did this by computing the distance of each DMU's efficiency from the efficient frontier. In the second stage, we employed the panel data technique in order to investigate the relationship between the banks' efficiency and the explanatory variables of the 199 banks and the 21 countries.

Panel data or longitudinal data comprises a set of entities examined during several periods of time (Brooks, 2008). In other words, panel data is seen as a mixture of cross-sectional data and time series data (Brook, 2008). Panel data is written econometrically as follows (see Brooks, 2008):

$$?_{??} = \alpha + \beta\, ?_{??} + ?_{??}$$

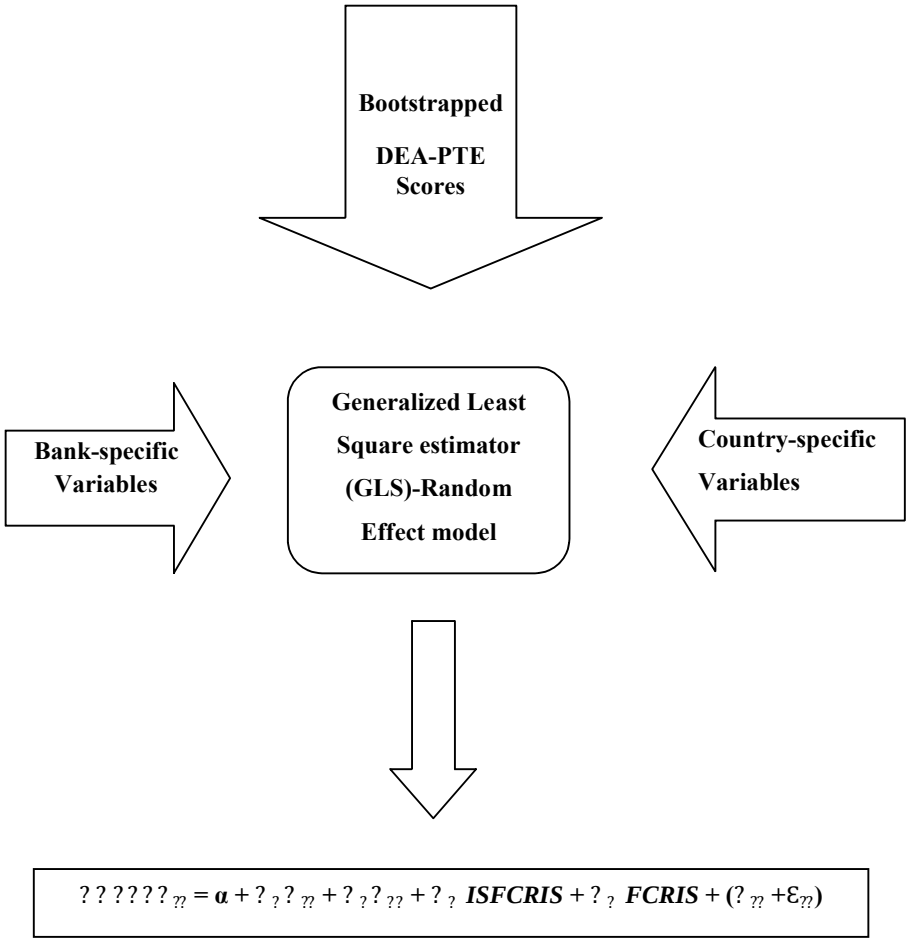
where,

$?_{??}$ represents the dependent variable, α is the intercept term, β and $?_{??}$ are $k \times 1$ vectors of parameters, to be determined, and observations on the independent variables, respectively. Moreover, t= 1…,T and i= 1,…,N (see for example, Brooks, 2008).

The easiest method to handle such data is to determine a pooled regression. This involves the simultaneous evaluation of a single equation on the entire sample (Brooks, 2008). Consequently, the observations assigned to the dependent variable and independent variables are each stacked up into a single column each in the y and x matrixes respectively. Afterwards, this equation may be determined by employing the simple Ordinary Least Squares (OLS) regression analysis model. However, this

traditional method suffers from significant shortcoming which assumes that the relationship between variables and their average values are stable over time and through the data set (Brooks, 2008). Time series regression of each entity or unit can be determined individually. Nevertheless, this method is considered to be inadequate since it does not consider any common structure found in the desired series. On the other hand, panel data can be a convenient method for running regression analysis since the relationship between the variables and their movement over time can be observed simply. Panel data can reduce, also, the problem of multicollinearity that might arise from conducting time series analysis separately (Brooks, 2008). Moreover, panel data can be effective in eliminating the influence of the omitted variables bias that might exist in regression.

Figure 5.3: Detailed conceptual framework determining the impact of macroeconomics variables (country-specific factors) and financial variables (Bank-specific factors) on pure technical efficiency (PTE).



Source: own figure

Panel data is divided into two models: balanced panel and unbalanced panel. The balanced panel data comprises N×T dimensions without any omitted observations. On the other hand, the unbalanced panel data includes N×T dimensions with few unavailable observations. Figure (5.3) presents the study's theoretical framework.

In panel analysis, the major challenge is to tackle the unobserved heterogeneity between individuals (Brooks, 2008). This problem is avoided by presuming that all units are distributed independently over time. Accordingly, the data is be pooled by employing OLS regression (Brooks, 2008). However, the estimators, derived from the OLS regression, are biased since unobserved heterogeneity may exist. Alternatively, panel data is effective and flexible in modeling and handling unobserved heterogeneity (Brooks, 2008). We used a fixed effects model and a random effects model as the two models of panel data estimators for this purpose. The fixed effects model permits the intercept in the regression analysis to be variable at cross-sectional level but constant over time (Brooks, 2008). This is done while maintaining all the estimates of slope constant at the temporal and cross-sectional levels.

The equation of fixed effects model for a variable y_{it} is written as follows (Brooks, 2008):

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it} \quad \text{(Eq. 4.4)}$$

μ_i is considered to enclose the variables that affect y_{it} cross-sectionally but do not vary over time (Brooks, 2008). Therefore, the heterogeneity, included in μ_i, can be captured by employing a model that considers distinct intercepts for every cross-sectional element. This model is computed by conducting the Least Squares Dummy Variable (LSDV) approach is be represented as follows (Brooks, 2008):

$$y_{it} = \alpha + \beta x_{it} + \mu_1 D1_i + \mu_2 D2_i + \mu_3 D3_i + \cdots + \mu_N DN_i + v_{it} \quad \text{(Eq. 4.5)}$$

where,

$D1_i$ is a dummy variable that has the value of 1 for the total observations of a specific individual- the first institution in the sample. Otherwise, it takes the value of 0 for others. $D2_i$ is, also, a dummy variable that has a value equal to 1 for the total

observations of a second particular individual- the second institution in the sample. Otherwise, it takes a value of zero and so on for the remaining dummy variables (D3, D4…DN). Equation 4.5 represents a standard regression model which can be determined using OLS estimators (Brooks, 2008).

In Equation 4.4, the estimation of N+K parameters would be difficult to determine if there were a large number of observed entities. Therefore, we applied a transformation, known as "the within transformation" in order to refrain from estimating too many dummy variable parameters (Brooks, 2008). This process requires the time-mean of each unit to be taken away from the values of the variable. Firstly, □i=$\frac{?}{?}$ $\sum_{??\,?}^{?}$ $y_{??}$ is identified as the time-mean of the observations on y for cross-sectional unit i and the means of the given explanatory variables are computed (Brookes, 2008). Afterwards, the time-means from each variable are subtracted to derive a regression model consisting simply of demeaned variables. We should mention that now a regression does not necessitate an intercept term since, by construction, the dependent variable takes a mean value of zero. This particular model can be written as follows (Brooks, 2008):

$?_{??} - \bar{y}_{?} = \beta\,(?_{??} - ?_{?}) + ?_{??} - \bar{u}_{?}$ (Eq. 4.6)

$\ddot{y}_{??} = \beta\ddot{x}_{??} + \ddot{u}_{??}$ (Eq. 4.7)

where,
The variables with double dots represent the demeaned values.

The Random Effects (RE) model is an alternative model to the fixed effects model. The RE model is referred to, also, as the error components model. Similar to the fixed effects estimator, the RE model defines several intercept terms for each individual which are constant over time. This is achieved by assuming that the relationships between the explanatory and explained variables are constant at cross-sectional and temporal levels.

Nevertheless, unlike the fixed effects model, the random effects model presumes that the intercepts for each cross-sectional unit derived from a common intercept α plus a random variable (Brooks, 2008). As mentioned previously, the common intercept (α) is equal to all units at the cross-sectional and temporal levels. However, the random variable (ε_I), which computes the random variation of every unit's intercept term from the common intercept term (α), is fixed over time (Brooks, 2008). The random effects model is presented as follows (Brooks, 2008):

$$y_{it} = \alpha + \beta x_{it} + \omega_{it} \quad , \quad \omega_{it} = \varepsilon_i + v_{it} \quad \text{(Eq. 4.8)}$$

where,

? represents 1 × k vector of explanatory variables. In the RE model, the ε terms account for the heterogeneity (variation) at the cross-sectional level, instead of the dummy variables in the case of fixed effects model (Brooks, 2008). This structure assumes that the derived cross-sectional error term, ε has a mean equals to 0; has constant variance ?; and is independent of the explanatory variables (?) and the individual observation error term (?) (Brroks, 2008). If the OLS model is employed, the parameters (α and β) would be determined persistently but inefficiently. Moreover, the regular formulae would have to be altered since cross-correlations exist between error terms for a given unit at cross-sectional and temporal levels (Brooks, 2008). Accordingly, as an alternative, a Generalized Least Squares model is employed usually. The conversion process, considered in the GLS model, includes the subtraction of a partial weighted mean of the y over time (Brooks, 2008). The 'quasi-demeaned' data is interpreted as ?= ? − θ ȳ and ?= ? − θ ?̄ , where ȳ and ?̄ are the means of the observations of ? and ? respectively (Brooks, 2008). θ represents a function of both variance of the observation error term (?) and the entity-specific error term (?)

? = 1 − ? / (? ? + ? ? ?) (Eq. 4.9)

Consequently, this conversion eliminates the serial correlation among error terms and permits the equation to be determined by using a feasible GLS estimator. This model is known as a RE model. Under the RE, the explanatory variables, which are constant

over time, are not be eliminated and, therefore, their effects on the function ($y_{??}$) are calculated. Hence, the RE overcomes the fixed effects model in deriving better estimates when time-invariant variables exist (Greene, 2012).

On the other hand, the random effects estimator suffers from a main disadvantage that the RE model is invalid unless the components, resulting from the components of error term (? $_{??}$) and the explanatory variable, are uncorrelated (Brooks, 2008). This presumption is more rigorous than the one in the fixed effects model since the RE model necessitates that both $\varepsilon_{?}$ and $v_{??}$, and any unobserved or omitted variables are uncorrelated with the entire explanatory variables(? $_{??}$) (Brooks, 2008). If this factor exists then the RE model is applied or else it would be better to employ the fixed effects model.

Generally, the fixed effects model cannot be estimated when the data contain time invariant variables (Greene, 2012). The reason is that within the groups transformation, used to fit the coefficients, regression of (? $_{??}$ - $\bar{y}_{?}$) on (? $_{??}$ - ? $_{?}$) with no constant term produces a column of zeros for every time invariant variable. This is a problem of perfect collinearity since a time invariant variable is only a multiple of the individual specific dummy variable. The recent literature contains a thread of results on a Fixed Effects Vector Decomposition (FEVD) estimator; this argues the solution to the shortcoming of time-invariant variables in a fixed effects model (Plumper and Troeger, 2007 and 2011; Greene, 2012). However, the so-called FEVD estimator is not a solution to this multicollinearity problem since it reformulates the model so that it is essentially a RE model (Greene, 2012).

Therefore, the RE model's major benefit over a fixed-effect model is that it accounts for time-invariant features in the analysis. On the other hand, the RE estimator's main drawback is that, unlike the fixed effects model, the entire composite error terms have to be independent of the explanatory variables.

Accordingly, since the regression analysis uses a time-invariant dummy variable, called ISMDUM which is included to reveal whether or not the bank is classified by

BankScope as a fully-fledged Islamic bank, we chose RE over the fixed effects model as the parameters' estimator in this study.

The core model is a random effects panel regression, with heteroscedasticity-adjusted standard errors, of the form:

$$???500_{??} = \alpha + \beta_? X_{??} + \beta_? Z_{??} + \beta_? \ ISFCRIS + \beta_? \ FCRIS + (\mu_{??} + \varepsilon_{??}) \quad \text{(Eq. 4.10)}$$

where,

i = 1, . . . N, symbolizes banks; t = 1, . . ., T corresponds to time; c = 1, . . ., C describes country; c ⊆ n. The dependent variable VRS500 denotes PTE. α is the intercept term and refers to the mean of the unobserved heterogeneity; $?_{??} \sim$ IID (0, $?_?^?$) refers to the random heterogeneity specific to the nth bank and is fixed temporally (i.e. it represents the unobserved variables which change across banks but not over time); $\varepsilon_{??} \sim$ IID (0, $?_\varepsilon^?$) is a distinctive error term and is uncorrelated overtime. $?_{??}$ is an I × 7 matrix of bank-level explanatory variables (i.e. a vector of bank-specific control variables which may affect the dependent variable) (See section 5.4.1). $Z_{??}$ is an N × 5 matrix of country-level explanatory variables (i.e. a vector of variables capturing the macroeconomic conditions in the home country) (see Section 5.4.1). "FCrisis" is a dummy variable taking the value of 1 for the period of the financial crisis (2007-2009). ISFCRIS is a dummy variable taking the value of 1 for Islamic banks during the financial crisis (2007-2009).

The next chapter describes the definition of the variables included in the regression analysis. Moreover, it examines the orientation of the relationship between PTE and the bank and country-specific variables.

5.5.1 Bank-specific and Country variables

This section introduces the set of potential determinants that are expected to affect the efficiency, particularly the PTE, of both Islamic and conventional banks. We consider two broad categories, namely, bank and country-specific factors. We used World Governance Indicators (WGI) as one of the added- value country-specific variables in

the regression models. This is the first time on which this estimate is used in a study of the determinants of efficiency, and this represents particular contribution to the literature review of efficiency. The index is a part of the six WGI which we collected from the World Bank's official website. The WGI are the aggregate and individual governance indicators for six dimensions of governance used by 215 economies in the period from 1996 to2013 (World Bank, 2015). These are:

- Voice and Accountability
- Political Stability and Absence of Violence
- Government Effectiveness
- Regulatory Quality
- Rule of Law
- Control of Corruption

1. Voice and Accountability (VACC) is a variable reflecting awareness of the degree to which a country's citizens are capable of taking part in choosing their government as well as freedom of expression (Kaufmann et. al., 2010). The specified indicator is presented in percentile rank terms among all countries (varying from the lowest rank (i.e. 0) to the highest rank (i.e. 100) (Kaufmann et al., 2010). The higher value indicates the better degree of voice and accountability degree. For instance, the less responsive that the government is to the people's demands, the more likely that it will fall peacefully in a democratic society but, probably, would be more violent in a non-democratic one (World Bank, 2015). This means that a significant level of VACC would help the banking industry to progress. Hence, there is expected to be a positive relationship with bank efficiency.

2. Control of Corruption (CORRUP) indicates the level of awareness of the public power executed to seek a private gain. This includes both small and main types of corruption, and "capture of the state" by private firms (World Bank, 2015). The political corruption damages the economy and the financial system and reduces the efficiency of governmental and business operations by allowing people to acquire positions of power via favoritism (i.e. patronage) rather than through their skills and qualifications. It initiates, also, an intrinsic volatility into the political procedure

(Brink, 2004). Political volatility and corruption have been found to have a damaging impact on financial growth in low-income countries (Detragiache et al., 2005; Ayyagari et al., 2005). Accordingly, the restraint of corruption would have a positive influence on bank efficiency. On the other hand, Barth et al. (2004) claimed that excessive supervision might cause corruption and obstruct banking activities. The most frequent type of corruption, encountered directly by a business, consists of financial corruption that includes requests for particular expenses and bribes associated with import and export licenses, exchange controls, tax evaluations, police security, and loans (Brink, 2004). Such types of corruption can make it difficult to run a business adequately. It may oblige, also, the withdrawal and restraining of investments. A score of 0 % represents minimum control of the level of corruption (Worst) while 100 % indicates maximum control of the level of corruption (Best).

3. Political Stability and Absence of Violence/Terrorism (POLTC) reveals insights of the probability that the government will be weakened or will be over-thrown by illegitimate or brutal methods (e.g. politically driven violence, terrorist acts etc.). The given indicator is shown in percentile rank terms among all countries, ranging from zero (worst) to 100 (best). The higher value indicates better political stability and the absence of the level of violence. This indicator represents those circumstances that threaten political stability including clashes based on social, religious, ethnic, and territorial backgrounds, violence related secretive political groups and external public security. Revolutions, political terrorism, political assassination, major urban riots, armed clashes, state of emergency or martial law, demonstrations, strikes, and the risk of a military coup and street violence represent other primary determinants of this indicator. Accordingly, it is expected that this indicator demonstrates a positive relationship between efficiency and Political Stability and Absence of Violence/Terrorism (POLTC).

4. Government Effectiveness (GOVEFF) shows awareness of the quality of the public and civil services and the level of their independence from political pressures. Moreover, GOVEFF covers the quality of policy initiation and execution and the government's integrity to such policies (World Bank, 2015).

5. Regulatory Quality (REGQ) indicates perceptions of the government's capability to create and execute sound policies and regulations that enables and stimulates the growth of the private sector (World Bank, 2015). Accordingly, there is an expectation of a positive relationship between banks efficiency and Regulatory Quality (REGQ). In other words, banks, operating in countries with high degrees of financial freedom and adequate governance, show a higher level of efficiency. Clarke et al. (2000) and Claessens et al. (2001) concluded that more foreign penetration and openness in the banking market reduced bank margins and enhanced the efficiency of the banking system. Similarly, Chortareas et al. (2012) indicated that the effect of governmental supervision and intervention on bank performance appeared to change with the type of regulation. The findings show a positive correlation between the financial freedom index and bank efficiency. Moreover, they suggest that extreme government intervention in the activities of financial institutions may have a negative influence on bank efficiency. On the other hand, Barth et al. (2006) studied the way in which more than 150 countries regulated banks. They claimed that increasing capital standards or strengthening supervision did not stimulate bank performance. There were debates in the aftermath of the 2007-09 global financial crisis on various issues such as governmental supervision and regulations of the financial sector and capital requirements (Chortareas et al., 2012). An approach refers to the deregulation of financial services and institutions as the essential cause behind the financial crisis (Chortareas et al., 2012). Nevertheless, other approaches regard a particular set of excessive regulation was the main cause of the crisis. Accordingly, such limited financial freedom is claimed to encourage financial institutions to create unclear instruments and to miscalculate risk (Chortareas et al., 2012).

6. Rule of Law (RLAW) indicates awareness of the degree to which individuals or organizations have confidence in and obey the society's laws. The determinants of this indicator include, also, the quality of law enforcement, property rights, the courts, and the probability of crime and violence (World Bank, 2015). Previous findings (e.g. Beck et al., (2005); Djankov et al., (2007)) concluded that an effective civil law contributed to financial growth. Therefore, there is expected to be a positive relationship between PTE and bank efficiency.

The WGI consist of a research dataset outlining the opinions on the quality of governance given by a large number of firms, individuals and specialists in developed and developing countries (World Bank, 2015). These pieces of data were collected from a set of survey done with experts, non-governmental institutions, global organizations, and privately owned businesses (World Bank, 2015). All countries' stated indicators are displayed in terms of percentile rank ranging from zero (worst) to 100 (best). Despite the fact that the measures take into account each country's margin, the WGIs' developers claim that the WGI allow significant cross-country comparisons and the tracking of developments over time. (Kaufmann, et al., 2009)

Five variables reflect bank-level characteristics. The following discuss the observed explanatory variables and their possible influences on PTE:

1. NL/TA referred to as the ratio of Net Loans to Total Assets. While banks with larger loans to total assets ratios might have grown immediately, they might not be well diversified (Ben Naceur et al., 2011). Accordingly, compared to their counterparts, these banks are more exposed to credit risk. Furthermore, they would incur additional costs (or losses) due to nonperforming loans and bad management. As a result, efficiency is affected negatively and the banks would become less efficient (Ben Naceur et al., 2011). On the other hand, given the size of their lending books, these banks may be better at assessing risks (i.e. good management) and better able to exploit economies of scale. In turn, this would have a positive impact on efficiency (Ben Naceur et al., 2011).

2. EQ/TA is the ratio of equity to total assets that controls for capital strength. Within the regression analysis, it determines the relationship between efficiency and bank capitalization. Bank capitalization is known to be an attribute that enables a significant description of a bank's performance (Allen, 2012). A greater level of equity diminishes the risk of insolvency and, primarily, the cost of borrowed capitals (Ben Naceur et al., 2011). This is in line with the findings of Reda and Isik (2006), Pasiouras and Kosmidou (2007), and Kosmidou (2008). Therefore, there is an expectation of a positive association between PTE and capitalization. However,

previous studies showed an ambiguous relationship between capitalization and performance. One might suppose a negative coefficient on the equity to total assets ratio since lower capitalization indicates a relatively precarious position (Berger, 1995).

3. We used the SIZERT variable (represented by the logarithm of Total Assets) in the regression analysis as a proxy measure of bank size. This is in line with the studies conducted by Allen and Rai (1996), Bashir (1999), Milbourn et al. (1999), Gjirja (2003), Altunbas et al. (2007), Olson and Zoubi (2011), and El Moussawi and Obeid (2011). We found that the literature reviews presented vague theories and evidence on the relationship between size and efficiency. For instance, Allen and Rai (1996) and Olson and Zoubi (2011) found a positive relationship between the efficiency and a bank's total assets. They claimed that large banks could benefit from economies of scale by spreading costs in the production process. Larger banks pay less for their inputs due to their perceived market power. In other words, they may exhibit an increasing return to scale model through the distribution of fixed costs over a high volume of goods or from gaining efficiency through a specialized workforce (Hauner, 2005). On the other hand, Beck et al. (2013) showed that there emerged a negative relationship between the Islamic banks' cost efficiency and size. Moreover, Berger and Hannan (1994) argued that larger banks might be relatively less efficient since their managements sought a "quiet life". Johnes et al. (2014) claimed that several banks (and nearly all Islamic banks) experienced an advance relationship between gross and net efficiency and size.

4. LLP/GL is known as the ratio of Loan Loss Provision to that of Gross Loans. This variable is a proxy for a credit risk measure. The greater the LLP/GL ratio, the lower is the credit risk. It is argued that there is a theoretical relationship between efficiency and LLP arising from the fact that managers do not supervise and manage their operations sufficiently. According to Berger and DeYoung (1997) and Shawtari (2015), a low-cost efficiency can reflect a signal of bad management, inadequate supervision of loan activities and poor evaluation skills of resources. Accordingly, a bank may encounter a greater volume of non-performing loans. This is in line with Miller and Noulas' (1997) findings which state that the higher the exposure to the

financial institutions to credit risk, the higher is the amount of unpaid loans and, consequently, the lower the level of profitability. These arguments support the hypothesis that attributes lower efficiency to non-performing loans which should be buffered by a higher level of loan loss provision. Moreover, a bank may be subject to additional costs resulting from the management of increasing credit risk. Consequently, the bank may suffer from lower efficiency (Barajas et al., 1999). On the other hand, Miller and Noulas (1997) argued that a lower ratio might lead to a higher level of efficiency since it was associated with increased profit margins (Miller and Noulas, 1997). Thakor (1987) noted that the level of loan loss provisions was a sign of a bank's asset quality and it might indicate changes in the future performance. However, previous results, extracted from a study conducted by Staikouras et al. (2008), concluded that there was no significant relationship between the ratio of loan loss provision and loans and efficiency (Staikouras et al., 2008).

5. ISMDUM is a binary variable to indicate whether Bankscope categorizes a bank Bankscope as a fully-fledged Islamic bank. It takes the value of 1 if the bank is Islamic or zero if it is not. We used this variable in the regression analysis to determine whether any differences in efficiency between the two types of banks persisted after we considered the bank and country-specific factors.

We included the following two other variables in order to capture the financial crisis dimension of the data:

1. ISFCRIS is a dummy variable introduced to catch, particularly for Islamic banks, any impact and interactions of the financial crisis which occurred from 2007 to 2009. This variable takes on the value of one for the Islamic banks during the years 2007, 2008 and 2009.

2. FCRIS is a dummy variable to account for the impact of the financial crisis (2007-2009) on both Islamic and conventional banks. Moreover, it distinguishes between the effect of the crisis (2007-2009) and the remaining years of the study (2006, 2010, 2011 and 2012). In other words, we included it to assess whether or not there were

any differences in efficiency between the years of the global crisis (2007-2009) and the other years (2006, 2010, 2011 and 2012) covered by the study.

We considered the following four variables, collected from World Bank (WB) databases, in order to capture the overall country characteristics:

1. The Herfindahl–Hirschman Index (HHI) indicates the degree of competitiveness within each country's banking sector (Johnes et al., 2014). The index is calculated by using all the banks operating in a particular country. Therefore, Islamic and conventional banks are assumed to compete against each other. The empirical literature provides mixed evidence on the impact of market concentration on efficiency. Ben Naceur et al. (2011) argued that concentration might reduce competition and restrain efficiency since it enhanced a bank's market power. According to Berger and Hannan (1998), a high market concentration is connected usually with lower deposit rates and higher loan rates; this could be an indication of great inefficiency. Moreover, banks with higher market power may encounter larger cost inefficiencies as managers chase other goals instead of maximizing efficiency. This behaviour is described by the "quiet life theory" (Berger and Humphrey, 1997). The theory argues that an increase in the market concentration is associated with a lower technical efficiency since bank managers have little incentives to improve efficiency when competition is weak (Berger and Mester, 1997).

Nevertheless, if economies of scale are attributed to bank mergers and acquisitions, the high concentration in the banking sector may enhance efficiency (Casu and Girardone, 2009; Ben Naceur et al., 2011). Moreover, the efficient structure theory argues that there is a positive relationship between concentration and efficiency (Demsetz, 1974). Based on the efficiency structure theory, banks with higher efficiency benefit from lower costs this promotes profits in successive years (Chang et al., 2014). Accordingly, the most efficient banks are capable of increasing their market shares; in turn, this leads to a higher concentration (Casu and Girardone, 2009). Studies done by Yudistira (2004) and Staikouras et al. (2008) on the efficiency of conventional banks promoted the "quiet life theory". Others conducted by Dietsch

and Lozano-Vivas (2000) and Koutsomanoli-Filippakiet al. (2009) supported the "efficiency structure theory".

2. We used Growth in real GDP (YGR) and Inflation (INFL) variables in the regression analysis to account for the resilience of the economy in which the bank operated (Johnes et al., 2014). In general, an increase in economic growth motivates banks to issue more loans at a higher rate while further enhancing the quality of their assets (Johnes et al., 2014). On the other hand, during a recession, a bank's profits drop since the GDP growth declines and the credit quality worsens (Suffian and Habibullah, 2012). Empirical evidence, derived from the literature (e.g. Kablan, 2007; Staikouras et al., 2008; Awdeh and El Moussawi, 2009; Johnes et al., 2014), showed that there was a positive relationship between GDP growth and bank efficiency. We included include the Inflation rate (INFL), also, in the regression analysis in order to reflect the macroeconomic risk. The degree to which the rate of inflation influences bank efficiency is determined by the banks' abilities to anticipate precisely the future movement of inflation. Banks, which forecast accurately the rate of inflation, are capable of generating more revenues (Sufian, 2012). However, an unpredicted change could increase costs resulting from an inadequate adjustment in the interest rate (Perry, 1992). The literature provides mixed evidence on the impact of inflation on bank efficiency. For instance, Bourke (1989), Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999) found a positive relationship between inflation and bank performance (Flamini et al., 2009). On the other hand, Bond and Hughes (2013) showed that inflation had a negative effect on bank efficiency.

3. Per capita GDP (YPCRAT) is a variable shows the general income level in a particular country. We used it as a proxy to determine the overall level of progress including the level of expertise and institutional development. Moreover, this variable reflects the state of demand and supply in the market in which the bank operates (Johnes et al., 2014). A higher income level is more likely to be associated with a more developed banking sector and improvement in public institutions (Chen, 2009). As a result, banks might benefit from additional profit margins and a reduction in total costs. Also, they might offer more competitive rates of interest (Kablan, 2010). We found mixed previous findings concerning the effect of this variable on efficiency.

Fries and Taci (2005) did not observe any statistically significant relationship between GDP per capita and efficiency. Nevertheless, Dietsch and Lozano-Vivas (2000), Grigorian and Manole (2002), and Košak and Zajc, (2006) concluded that per capita GDP had a positive influence on efficiency.

4. MKTCY is the degree of market capitalization i.e. the percentage valuation of listed firms across all sectors relative to the country's GDP. MKTCY is used to determine the importance of the banking sector to the country's economy. The index of stock liquidity proxies the growth rate of the stock market; this is represented by the ratio of the stock exchange's market capitalization to GDP. The empirical evidence shows that as countries progress, the financial structure and systems change and tend to be more market-oriented (Ben Naceur et al., 2011). Countries with well-developed stock markets are likely to have more efficient financial intermediaries. Diamond (1991) claimed that a "life cycle" influence arose from borrowing funds from intermediaries. On the other hand, current borrowers may raise money through leverage without depending on an intermediary. Accordingly, the type of clients, who borrow from banks, changes as the stock markets grow (Ben Naceur et al., 2011). The exact effect of this variable on efficiency is theoretically ambiguous. Demirguc-Kunt and Levine (1996) and Dietsch and Lozano-Vivas (2000) concluded that MKTCY exhibited a positive relationship with efficiency, whereas Johnes et al. (2014) suggested that there was a negative relationship between both variables. Therefore, in line with the arguments provided by Ben Naceur et al., 2011), market capitalization is expected to have a positive relationship with bank efficiency if the banking sector and capital market are complementary to each other. On the other hand, there is an anticipated negative impact in the case of competition between them.

5.6 Chapter Summary

This chapter summarized the methodological approaches thatwe conducted in order to estimate the different efficiencies of Islamic and conventional banks, in 21 countries over the period from 2006 to 2012. We employed the DEA methodology to derive the efficiency scores (OTE, PTE and SE) of Islamic and conventional banks. Afterward, we used the bootstrapping technique to assess the robustness of the obtained results.

We employed, also, the GLS regression model and efficiency scores, computed using the DEA models, to explore further the possible drivers of PTE. We used the intermediation approach to define the inputs and outputs on which we based the estimation of the production function for Islamic and conventional banks. This chapter described, also, the variables and the dataset used in our empirical analysis. After examining the previous literature and considering the particular features of our data, we employed the RE model in order to estimate the parameters of regressions. Furthermore, in our regression models, we used the following eleven environmental models as potential drivers of banking efficiency. These were: the ratio of Net Loans to Total Assets (NL/TA); the ratio of Equity over Total Assets (EQ/TA); Bank Size (SIZERT); the ratio of Loan Loss Provision to Gross Loans (LLP/GL); the Herfindahl–Hirschman Index (HHI); Growth in Real GDP (YGR); Inflation (INFL); Per Capita GDP (YPCRAT); Market Capitalization (MKTCY); Voice and Accountability (VACC); and Regulation Quality (REGQ). We based our empirical analysis on a sample of 199 Banks in 21 countries over the period from 2006 to 2012. The following chapter reports the empirical results obtained by analyzing the efficiency of these banks.

Chapter 6 Findings and Discussion

The previous chapter detailed the methodology and data used to answer the research questions. This chapter consists of two sections; each section shows the research questions and the answers to these questions. The first section shows the answers to the questions:

> "At the global level, how efficient is Islamic banking when compared to conventional banking?"
>
> "Are Islamic banks more efficient than conventional banks or vice versa?"

The second section shows the answers to the questions:

> "In the 21 countries, what are the respective determinants of Islamic and conventional banking's pure technical efficiency?"
>
> Are Islamic banks or conventional banks more efficient in Muslim or non-Muslim countries?"

This chapter's first section discusses the three different efficiency measures used to proxy the performance of banks operating in 21 countries over the period from 2006 to 2012. These banks' OTE, PTE and scale were used to identify and assess the best performing banks.

The second section investigates the impact of bank and country-specific variables on the pure technical efficiency of Islamic and conventional banks. These variables include:

- Ratio of Net Loans to Total Assets;
- Ratio of Equity over Total Assets;
- Bank Size;
- Ratio of Loan Loss Provision to Gross Loans;
- The Herfindahl–Hirschman Index (HHI);
- Growth in Real GDP, inflation;
- Per Capita GDP;
- Market Capitalization (MKTCY);

- Voice and Accountability (VACC); and
- Regulation Quality (REGQ).

6.1 First stage analysis: Estimation of DEA-Efficiencies

In this section, through using the methodology explained in chapter four, we analyze empirically the efficiency scores of Islamic and conventional banking sectors during the period of study from 2006 to 2012. This section discusses and analyses the results of the efficiency scores (PTE, OTE and SE) which we obtained by applying the DEA approach and the bootstrapping technique. Moreover, it reports the most efficient banking sector operating in the 21 countries.

Section 6.2 investigates the impact of country-specific and bank-specific variables on Islamic and conventional bank performance (i.e. pure technical efficiency). In order to calculate each bank's efficiency in a given year, we built a "common frontier" by pooling the observations of the 7 years (from 2006 to 2012) rather than building a "year specific" best-practice frontier. By pooling the data across these years, we assumed that, during the period of study, all banks operated in the same environment. However, one may argue that, since the banks operated in different years, the macroeconomic indicators, which existed in those years, could have had an effect on their respective performance. Consequently, in the second stage of this research, we analyze the impact of these environmental variables on efficiency. By creating a pooled frontier, it is possible to measure and compare for each of the years between 2006 and 2012 each banking sector relative to the same frontier by treating each sector as a different entity in each period. Furthermore, a "common frontier" approach can indicate a trend in the efficiency of a banking sector (as single entity); this would be unavailable if we had applied a "year specific frontier" approach was applied. Therefore, over time, the "common frontier" approach provides variations in the banks' efficiency. We applied this comparison across time by using the same principle as that related to the global frontier in Portela and Thanassoulis (2010). We measured the correlations between the inputs and outputs of the DEA model in order to certify that the inputs and outputs were isotonic. According to Avkiran (2006), a

high correlation is preferable. Table 6.2 shows correlation coefficients between an input and an output pair.

Table 6.1a: Descriptive statistics for the first stage variables' original values (three inputs and two outputs)

Variable	Mean	Standard Deviation	Minimum	Maximum	Cases	Missing values
DEPSTF	3655.404	7321.008	0	79761.15	1256	137
FXASSET	62.75741	193.3967	0	2753.051	1250	143
PEREXP	44.64251	80.10163	0.1	691.49	1223	170
NLOANS	2732.374	5148.302	0	45928.96	1227	166
NINCOME	72.39466	214.5395	-757.3	2102.59	1284	109

Note: All variables are reported in US $ millions. The number of observations in each year are 104 Islamic banks and 95 conventional banks**.** The number of observations in each year varies because of data availability. DEPSTF: Deposits and Short-term funding, FXASSET: Fixed Assets, PEREXP: Personnel Expenses, NLOANS: Net Loans, NINCOME: Net Income

Table 6.1b: Descriptive statistics for the first stage variables' adjusted positive values (three inputs and two outputs)

Variable	Mean	Standard Deviation	Minimum	Maximum	Cases	Missing values
DEPSTF	3655.404	7321.008	0	79761.15	1256	137
FXASSET	62.75741	193.3967	0	2753.051	1250	143
PEREXP	44.64251	80.10163	0.1	691.49	1223	170
NLOANS	2732.374	5148.302	0	45928.96	1227	166
NINCOME	829.6947	214.5395	0.0	2859.89	1284	109

Note: A value of USD 757.3 million is added to the net income observations in order to offset negative values and consequently obtain values ≥ 0.

Table 6.2: Correlation coefficient between inputs and outputs

Cor.Mat.	DEPSTF	FXASSET	PEREXP	NLOANS	NINCOME
DEPSTF	1.00000	0.63515	0.91315	0.97332	0.48325
FXASSET	0.63515	1.00000	0.68412	0.65825	0.48938
PEREXP	0.91315	0.68412	1.00000	0.91796	0.96843
NLOANS	0.97332	0.65825	0.91796	1.00000	0.54528
NINCOME	0.48325	0.48938	0.50385	0.54528	1.00000

Table 6.2 shows that, for all pairs, the correlation coefficients between an input and an output pair are more than 0.49. The outcomes cannot be considered to be a low correlation and, therefore, it can be claimed that the variables pass the isotonicity test.

Tables 6.1, 6.2 and 6.3 respectively report estimated overall and technical efficiency and scale efficiency. These show that, on average, the overall technical efficiency of Islamic Banks (referred hereinafter as IBs) is 0.4016 and ranges from 0.3540 to 0.4460, while the pure technical efficiency averages 0.4330 and ranges from 0.3915 to

0.4778. These estimates suggest that, if the IBs were operating on the most efficient frontier under the CRS and VRS models respectively, the same levels of output can be produced with 40.16% and 43.30% of their current inputs. On the other hand, the overall technical efficiency of conventional banks is, on average, 0.3073 and ranges from 0.2614 to 0.3549, whereas the pure technical efficiency is, on average, 0.4188 and ranges between 0.3889 and 0.4681. These outcomes suggest that, if operating on the efficient frontier, the conventional banks could produce the same levels of output by using 30.73% and 41.88% of their current inputs under CRS and VRS respectively. Based on these results, the IBs show higher average overall technical efficiency (CRS) and pure technical efficiency (VRS) than their conventional counterparts. As mentioned previously, the CRS assumption is justifiable only when all the decision-making units operate at an optimal scale. However, in the real world, often this optimal behaviour is unachievable due to a variety of circumstances such as different types of market power, constraints on finances, externalities, imperfect competition, etc.

The CRS specification, as produced by Charnes, Cooper and Rhodes (1978), yields misleading measures of technical efficiency in the sense that technical efficiency scores, reported under that set of constraints, are biased by scale efficiencies. Therefore, under the VRS assumption, we used pure technical efficiency as the major measure to assess the technical efficiency. However, we conducted the CCR model, run under the CRS assumption, to extract the scale efficiency. The difference between the calculated overall technical efficiency (CRS) and pure technical efficiency (VRS) indicates that the firm has scale inefficiency. Therefore, the calculation of scale efficiency is done by deconstructing overall technical efficiency into pure technical efficiency and scale efficiency; namely, CRS efficiency= VRS efficiency x Scale efficiency. Accordingly, the IBs' estimated average efficiency scale would be 0.9274 and 0.7335 for their conventional counterparts. The deconstruction of overall efficiency into its pure technical and scale efficiency components seem to suggest that, in the entire Islamic banking sector, pure technical inefficiency outweighs scale inefficiency in determining the overall technical inefficiency. The findings imply that, although overall IBs were operating at a relatively optimal scale of operations, they were managerially inefficient in controlling their operating costs and utilizing to the

fullest their resources in terms of deposits, capital (as Fixed asset) and labour (as personnel expense). Therefore, annually for both Islamic and conventional banks, we attributed bank inefficiency to Pure Technical Efficiency (PTE) rather than to scale inefficiency.

Table 6.2's results show that, during the entire period of study, the PTE values of IBs and conventional banks were very close. IBs demonstrated slightly higher mean in pure technical efficiency for each year 2006 (0.4778), 2007 (0.4540), 2008 (0.4431), 2009 (0.4221), 2011 (0.3983) and 2012 (0.4442) when compared to conventional banks 2006 (0.4681), 2007 (0.4293), 2008 (0.4219), 2009 (0.3917), 2011 (0.3889) and 2012 (0.4389). However, in 2010, the conventional banks showed a slightly higher PTE of 0.3926 as compared to the IBs' 0.3915. As noted, the IBs' PTE scores followed a declining trend from 2006 to 2010. The IBs' worst year was 2010 when the PTE was at lowest level scoring 39.15 % and was slightly below the conventional banks' average PTE of 39.26 %. During the 2008 financial crisis, the gap between the Islamic and conventional banks' PTE widened since the impact of the first wave of the world financial crisis (2007–2008) hit the conventional banks severely because they were exposed directly to subprime mortgage portfolios (Toxic assets). For instance, in 2007−08, the Gulf International Bank (GIB, a Bahraini wholesale CB) incurred losses of about US$1.3 billion in securities investments in debt-based toxic assets (mortgage backed collateralized debt obligations) and in American banks such as Lehman Brothers. The GIB's shareholders injected US$1 billion of new capital and bought toxic asset-backed securities worth $4.8 billion.

The Arab Banking Corporation (a Bahraini wholesale CB) incurred losses of $1.2 billion due to similar investments and its shareholders injected $1 billion of new capital. In addition, the Gulf Bank (a Kuwaiti CB) incurred losses of $1.4 billion due mainly to derivatives activities, with the bank's shareholders and the Kuwait Investment Authority injecting an equivalent amount of capital. In 2008, the National Commercial Bank (NCB), the largest Saudi conventional bank, lost more than one billion riyal on changes in fair value for financial instruments (Hassan and Dridi, 2010). In contrast, when compared to their conventional counterparts, IBs wereprohibited from dealing or trading in derivatives. Therefore, this made them

relatively resilient to the impact of the first wave of the global crisis (2007-2008). Consequently, the conventional banks' PTE declined to attain a lowest level of 39.17%. However, these banks were able to restrain the second round effects of the global crisis (economic wave), and showed a stable PTE trend during 2010 (39.26%) and 2011 (38.89%) followed by a significant recovery with, on average, PTE increasing to 43.89%. However, many IBs, which are financed by way of *Murabahah*, determine their profit or mark-up on the basis of the current interest rate; they use mostly LIBOR (London Inter-bank offered rate) as the criterion (Usmani, 2007).

No doubt, it cannot be considered to be desirable to use the rate of interest to determine a halal profit. Certainly, at least in appearance, it makes the transaction resemble an interest-based financial item and, keeping in view the severity of prohibition of interest, even this apparent resemblance should be avoided as far as possible. However, one should not ignore the fact that the most important requirement for validity of *Murabahah* is that it is a genuine sale with all its ingredients and necessary consequences. If a *Murabahah* transaction fulfils all the conditions of *Sharia'* compliance, merely using the interest rate as a benchmark for determining the profit of *Murabahah* does not render the transaction to be either invalid, *haram* or prohibited. This is because the deal itself does not contain interest. During the global crisis, the cost of funds (interest rate) increased due to liquidity's scarcity and default risk (vulnerability). For these reasons, Islamic banks were entitled to a higher payment obligation towards investors; in other words, they needed to pay a higher profit share ratio to fund suppliers. Consequently, the IBs' PTE declined slightly from 44.31% (2008) to 42.21% (2009).

IBs had shown more resilience to the direct subprime exposure (Financial wave). However, starting from 2009, they were subject to the second round effect of the global crisis, the so-called economic wave, (The Economist, 2009; El-Said and Ziemba, 2009). IBs were unaffected since the global financial crisis originated from sub-prime mortgage portfolios that were spun off into securitized instruments and these were offered subsequently as investments. This was because Islamic finance was based on a close link between financial and productive flows. However, the protacted duration of the financial crisis effected IBs because, rather than these

institutions being exposed directly to derivative instruments, Islamic banking contracts were based on asset-backed transactions. With the downturn in the global economy, there was a decline in the property markets of a number of countries where IBs had a significant presence. This carries negative implications for these banks since a large number of contracts are backed by real estate and property as collateral. In such a situation, there was increased credit risk due to the erosion in the value of the collateral and especially in highly leveraged countries, like the UAE (Dubai) and Qatar, where a large share of financing was channeled to the once-booming real estate market (Hasan and Dridi, 2010).

The findings imply that, when compared to conventional banks, IBs showed significant higher mean Overall Technical Efficiency (OTE) and Scale Efficiency (SE) previous to, during and post-crisis. On the other hand, the Islamic and conventional banks' PTE scores demonstrated insignificant difference since their values were very close and showed similar trends over the years. This is in line with conclusions from previous studies derived using SFA and DEA (Bader, 2008; Hassan et al., 2009; Grigorian and Manole, 2005; Belanes and Hassiki, 2012).

Table 6.3 shows descriptive statistics for different regions and countries based on total assets (in millions of USD) for 7 years from 2006 to 2012. Please see Appendix 15 for the number of year observations for each country and each year.

Figure 6.1: Average Overall Technical Efficiency: Islamic versus Conventional Banks

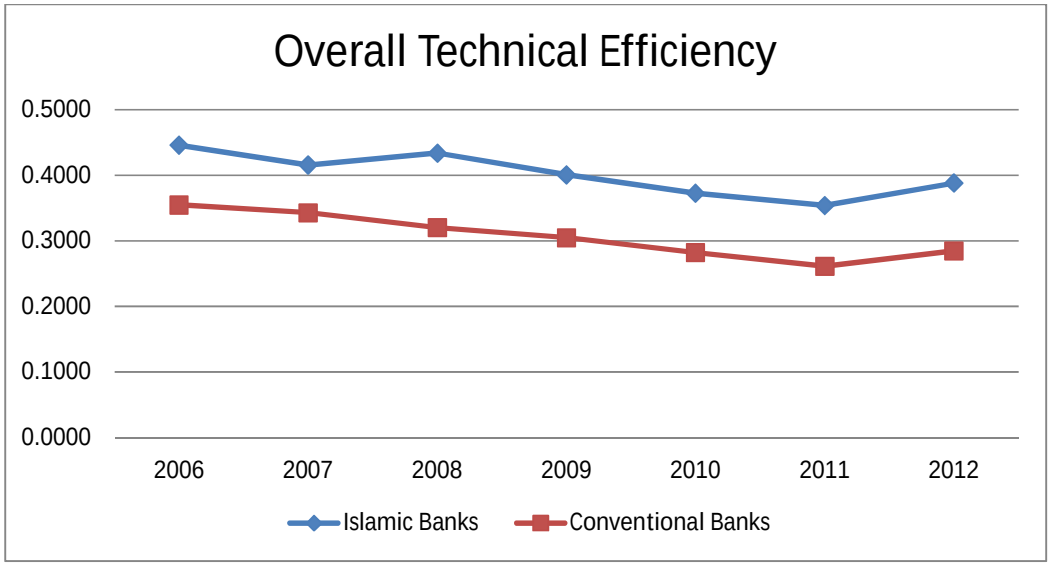


Table 6.3: Average Overall Technical Efficiency (OTE) for Islamic and conventional banks

	Average Overall Technical Efficiency	
Year	**Islamic Banks**	**Conventional Banks**
2006	0.4460	0.3549
2007	0.4157	0.3430
2008	0.4338	0.3202
2009	0.4007	0.3048
2010	0.3726	0.2822
2011	0.3540	0.2614
2012	0.3882	0.2848
Mean	0.4016	0.3073

Figure 6.2: Average Pure Technical Efficiency: Islamic versus Conventional Banks

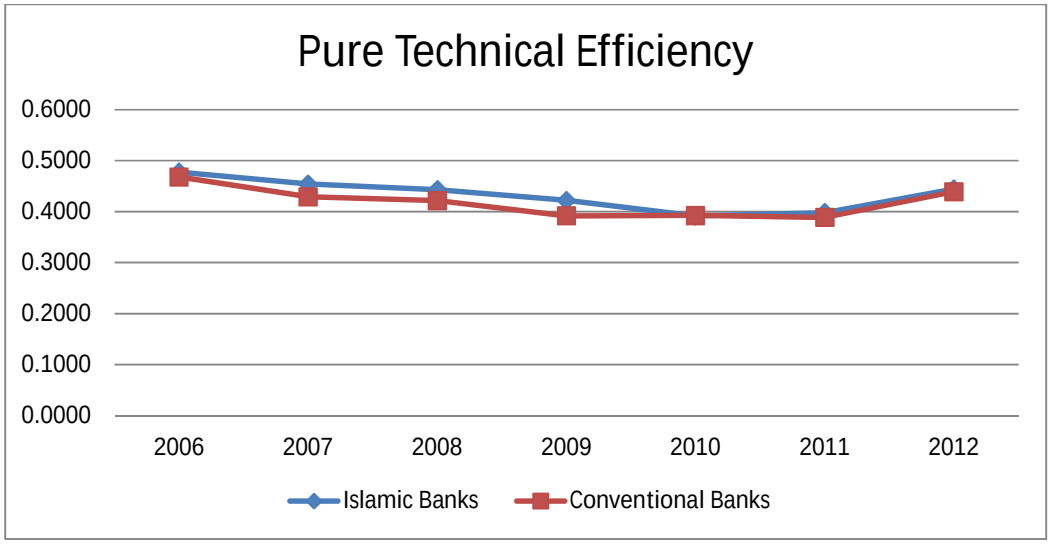


Table 6.4: Average Pure Technical Efficiency (PTE) for Islamic and conventional banks

	Average Pure Technical Efficiency	
Year	**Islamic Banks**	**Conventional Banks**
2006	0.4778	0.4681
2007	0.4540	0.4293
2008	0.4431	0.4219
2009	0.4221	0.3917
2010	0.3915	0.3926
2011	0.3983	0.3889
2012	0.4442	0.4389
Mean	0.4330	0.4188

Figure 6.3: Average Scale Efficiency: Islamic versus Conventional Banks

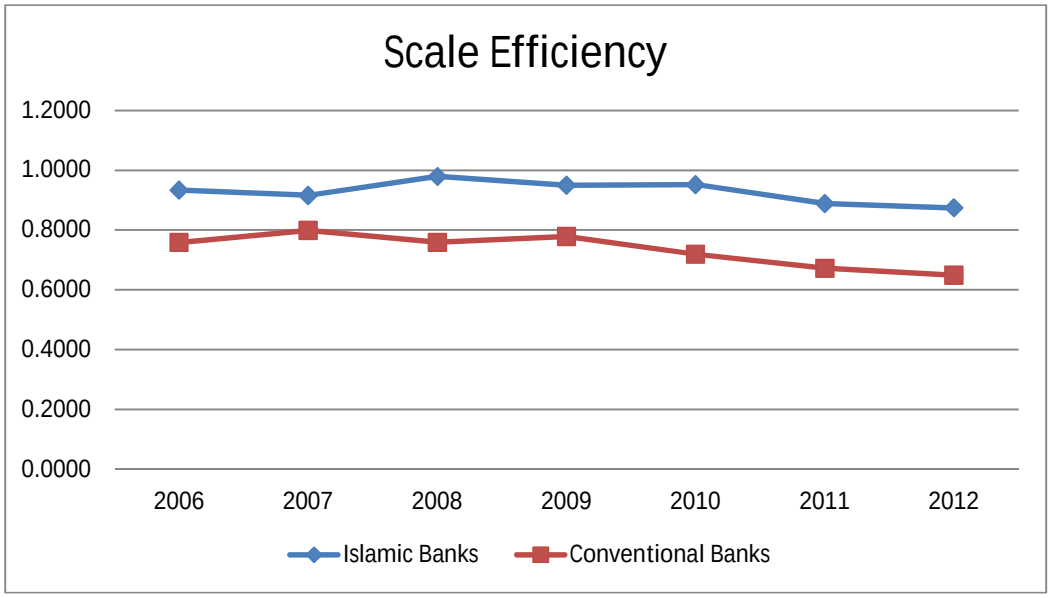


Table 6.5: Average Scale Efficiency (SE) for Islamic and conventional banks

	Average Scale Efficiency	
Year	**Islamic Banks**	**Conventional Banks**
2006	0.9334	0.7582
2007	0.9156	0.7988
2008	0.9791	0.7590
2009	0.9492	0.7784
2010	0.9518	0.7190
2011	0.8888	0.6723
2012	0.8738	0.6488
Mean	0.9274	0.7335

6.2 Second-stage results: PTE Determinants

This second section investigates across 21 countries and 199 banks during the period of study the impact of environmental variables on the efficiency of its banks. We use PTE as the dependent variable. There are two popular statistical models for analysis of panel data: namely, the fixed-effect model and the random-effect model. Although these two models employ similar sets of formulas to compute statistics, these two models are fundamentally different. We decided on the selection of an appropriate model by running Hausman's test (1978). However, we selected and used the random effects model because, unlike the fixed effects model, it had the advantage of including and enabling time-invariant variables to play a role as explanatory variables (Greene, 1997). In the fixed effects model, the intercept absorbs these variables.

In this study, we replaced the estimators of the DEA estimates with bootstrapped estimators in order to calculate the standard errors of these estimates and to minimize the bias arising from the inherent dependency problem. We bootstrapped OTE and PTE scores, extracted from DEA, for 150, 250, 500, 750, and 1000 replicas. We conducted correlation analyses in order to select the most convenient number of bootstrap replications. Based on the results from the correlation analyses, it is seen that all bootstrap replications correlated highly correlated and ranged between 0.9 and 1.00 (These are shown in Tables 6.7 and 6.8). Hence, in the DEA'S second stage, the selection of any of the bootstrap replications will be sufficiently consistent to run the regression analysis. In this study, we chose CRS and VRS models for the DEA estimators and replicated them 500 times.

Table 6.6: Correlation analyses for bootstrapped PTE scores, at 150, 250, 500, 750 & 1000 replicas

Cor. Mat.	BIAS150	BIAS250	BIAS500	BIAS750	BIAS1000
BIAS150	1.00000	0.93998	0.95410	0.94595	0.96329
BIAS250	.93998	1.00000	0.96292	0.94866	0.95792
BIAS500	.95410	0.94866	0.96810	1.00000	0.96843
BIAS750	.94595	0.94866	0.96810	1.00000	0.96843
BIAS1000	.96329	0.95792	0.96978	0.96843	1.00000

Note: Bias150, Bias250, Bias500, Bias750 and Bias1000 are pure technical efficiency scores bootstrapped for 150, 250, 500,750 and 1000 replications respectively.

Table 6.7: Correlation analyses for bootstrapped OTE scores, at 150, 250, 500, 750 & 1000 replicas

Cor.Mat.	BIAS150	BIAS250	BIAS500	BIAS750	BIAS1000
BIAS150	1.00000	0.98343	0.98407	0.98754	0.98821
BIAS250	0.98343	1.00000	0.99375	0.99370	0.99390
BIAS500	0.98407	0.99375	1.00000	0.99453	0.99469
BIAS750	0.98754	0.99370	0.99453	1.00000	0.99486
BIAS1000	0.98821	0.99390	0.99469	0.99486	1.00000

Note: Bias150, Bias250, Bias500, Bias750 and Bias1000 are overall technical efficiency scores bootstrapped for 150, 250, 500,750 and 1000 replications respectively.

We used the function – Tst (VRS500,Yfit) to test for equality of means and to check that the estimated model (Yfit) and the observed data (VRS500) were drawn from the same distributions, i.e. there were no significant differences between the two populations. The standard t-statistic test was used as the basis of this test, known as the t-test. The findings imply that the null hypothesis is accepted at the 5% level of significance and confirm that there is no significant difference between the two models (see Table 6.8 below).

Table 6.8: T-test results (between VRS500 and YFIT)

Two sample test of equality of means with unequal variances				
YFit and VRS500: Test of equal means				
Group	**Mean**	**Std. Dev.**	**Std. Error**	**Sample**
YFIT	0.42991	0.09565	0.00328	850
VRS500	0.42333	0.27849	0.00831	1124
Difference	0.00658		0.00893	1974
Confidence interval for difference based on standard normal: -.01093 to .02408				
Test statistic = 0 .737				
P value = 0.46149				
Degrees of freedom (Satterthwaite) = 1453				

Note: Significant at 5% level; t test tests the null hypothesis that the means of the two samples- the estimated model (YFIT) and the observed model (VRS500)- are equal (equal variances are not assumed). VRS500 refers to efficiency bootstrapped for 500 replications under variable return to scale (VRS).

Based on Table 6.9, we selected Voice and Accountability (VACC) from the six worldwide governance indicators (WGI), as the independent variable for inclusion in the second stage analysis. We based our choice on the outcomes of the correlation analyses conducted for these six indicators. As presented in Table 6.10, the results show that there is a very high correlation between the five indicators varying between 0.75 and 0.96. Therefore, this finding enables us to choose at random one of these five indicators, namely, the Regulator Quality (RQ) indicator.

The VACC indicator proves to have a low to moderate correlation with the remaining indicators. Hence, we selected only the Voice and Accountability and Regulator Quality indicators in studying the determinants of pure technical efficiency.

Table 6.9: Correlation matrix of WGI

Cor.Mat.	VACC	POLTC	GOVEFF	REGQ	RLAW	CORRUP
VACC	1.00	0.32	0.50	0.53	0.50	0.43
POLTC	0.32	1.00	0.82	0.75	0.82	0.87
GOVEFF	0.50	0.82	1.00	0.95	0.94	0.93
REGQ	0.53	0.75	0.95	1.00	0.96	0.94
RLAW	0.50	0.82	0.94	0.96	1.00	0.96
CORRUP	0.43	0.87	0.93	0.94	0.96	1.00

Note: VACC: Voice & Accountability. POLTC: Political Stability. GOVEFF: Government Effectiveness. REGQ: Regulation Quality. RLAW: Rule of Law. CORRUP: Corruption Control. Five indicators- voice and accountability, political stability, regulation quality, government effectiveness, rule of law and corruption control- show a high correlation ranging from 0.75 to 0.96. We conducted regression analyses for each of the former five WGI with the potential to be determinants of pure technical efficiency. The findings imply that regulatory quality has a more significant influence on the pure technical efficiency. Consequently, we selected the regulatory quality indicator as a potential explanatory variable in the random effects model. Moreover, we chose the least correlated indicator, voice and accountability, as the second WGI included in the second stage analysis.

We conducted correlation analyses for the selected explanatory variables; these show that the Regulator Quality variable has a strong correlation with the Per Capita GDP variable (0.73) (see Table 6.10). Consequently, we exempted the Government Effectiveness indicator from the second stage analysis. Tables 6.10 and 6.11 show two different correlation analyses (Table 6.9: among the WGI; Table 6.10: VACC and REGQ and the potential explanatory variables). We conducted the correlation analyses in order to determine the least correlated variables that might avoid the multicollinearity problem.

Appendices (5, 6, 7 and 8) present the four RE models that include, individually and respectively, the four WGI (i.e POLTC, GOVEFF, RLAW, and CORRUP respectively) which we used to determine the drivers of PTE. In addition, Appendix 9 shows the regression analyses of pooled PTE whereby we used six year dummy variables to capture potential trend and significance on the PTE during 2007, 2008, 2009, 2010, 2011, and 2012.

Table 6.10: Correlation analyses of the 6 WGI and potential explanatory variables used in the second stage analysis

Cor.Mat.	NL_TA	LLP_GL	EQ_TA	SIZERT	YPCRAT	YGR	HHI	INFL	MKTCY	VACC	POLTC	GOVEFF	REGQ	RLAW	CORRUP
NL_TA	1.00	-0.09	-0.29	0.34	-0.05	0.05	0.26	0.09	-0.25	-0.10	0.05	-0.08	-0.17	-0.10	-0.03
LLP_GL	-0.09	1.00	0.08	-0.09	0.00	0.03	-0.04	-0.01	-0.03	0.01	-0.05	-0.03	-0.02	-0.04	-0.05
EQ_TA	-0.29	0.08	1.00	-0.29	0.22	0.01	-0.12	-0.01	0.08	0.02	0.10	0.12	0.22	0.18	0.19
SIZERT	0.34	-0.09	-0.29	1.00	0.44	0.06	0.01	-0.08	0.10	-0.25	0.38	0.31	0.28	0.38	0.39
YPCRAT	-0.05	0.00	0.22	0.44	1.00	0.05	-0.10	-0.19	0.32	-0.02	0.74	0.65	0.73	0.75	0.81
YGR	0.05	0.03	0.01	0.06	0.05	1.00	0.41	0.37	0.16	-0.19	0.09	-0.07	-0.05	-0.02	-0.01
HHI	0.26	-0.04	-0.12	0.01	-0.10	0.41	1.00	0.16	-0.09	-0.16	0.17	-0.11	-0.25	-0.12	-0.06
INFL	0.09	-0.01	-0.01	-0.08	-0.19	0.37	0.16	1.00	-0.33	-0.14	-0.19	-0.30	-0.25	-0.28	-0.21
MKTCY	-0.25	-0.03	0.08	0.10	0.32	0.16	-0.09	-0.33	1.00	0.07	0.33	0.45	0.44	0.47	0.37
VACC	-0.10	0.01	0.02	-0.25	-0.02	-0.19	-0.16	-0.14	0.07	1.00	0.09	0.27	0.30	0.25	0.18
POLTC	0.05	-0.05	0.10	0.38	0.74	0.09	0.17	-0.19	0.33	0.09	1.00	0.81	0.74	0.80	0.87
GOVEFF	-0.08	-0.03	0.12	0.31	0.65	-0.07	-0.11	-0.30	0.45	0.27	0.81	1.00	0.92	0.90	0.90
REGQ	-0.17	-0.02	0.22	0.28	0.73	-0.05	-0.25	-0.25	0.44	0.30	0.74	0.92	1.00	0.95	0.93
RLAW	-0.10	-0.04	0.18	0.38	0.75	-0.02	-0.12	-0.28	0.47	0.25	0.80	0.90	0.95	1.00	0.95
CORRUP	-0.03	-0.05	0.19	0.39	0.81	-0.01	-0.06	-0.21	0.37	0.18	0.87	0.90	0.93	0.95	1.00

Note: GDP per capita (YPCRAT) show high correlation with five WGI- Political Stability (POLTC), Regulation Quality (REGQ), Government Effectiveness (GOVEFF), Rule of Law (RLAW) and Corruption Control (CORRUP). As this variable (YPCRAT) is significant, based on literature review, we have run orthogonalization technique between GDP per capita and the selected WGI (Regulatory Quality) to offset the fact of high correlation between these two variables. The residual values of GDP per capita, resulted from the orthogonalization technique, are referred to as RES_YPC.

In order to test the relationship between the earlier described bank efficiency and the bank and country- specific determinants, we estimated a linear regression model and applied the Generalized Least Square (GLS) method. We used White's (1980) transformation to calculate the standard errors and to control for cross-section heteroskedasticity. We used the GLS method because the sample was not distributed normally and the data might have either a heteroskedasticity problem or an autocorrelation problem or both. According to Gujarati (2003), the use of the GLS overcomes all these problems. Our work on the GLS estimator is in line with the studies of Isik and Hassan (2002), Sufian (2011), and Tanna (2009).

Table 6.12 presents the outcomes of the second stage analysis. Having taking account into the bank, institutional development and country-specific factors, the main finding is that, in terms of pure technical efficiency, there is no significant difference between Islamic and conventional banks. This result is consistent with our previous outcomes discussed earlier in section 6.1. Moreover, being an IB was not be seen as being advantageous factor in a bank avoiding the negative effects of the global crisis. Therefore, similar to their conventional counterparts, Islamic Banks were not immune to the financial crisis that occurred between 2007 and 2009.

Table 6.11: Descriptive statistics for the second-stage variables (three inputs and two outputs)

Variable	Mean	Standard Deviation	Minimum	Maximum	Cases	Missing Values
VRS500	0.42333	0.27849	0.0409	1.5633	1124	269
NL_TA	46.43039	23.63961	0	98.91697	1227	166
LLP_GL	672.5521	21529.16	-81.6425	699600	1056	337
EQ_TA	20.30835	33.21289	-669.479	100	1294	99
SIZERT	7.176541	1.75255	0.215111	11.43047	1287	106
YPCRAT	8.923005	1.420087	6.206078	11.43821	1375	18
RES_YPC	0.0	.956881	-1.75876	3.9569	1375	18
YGR	4.679409	4.207611	-15.0884	26.1704	1375	18
HHI	0.084492	0.047026	0.033858	0.27536	1153	240
INFL	7.711989	8.771664	-24.2186	39.81269	1375	18
MKTCY	76.08719	51.99398	5.026881	240.8822	1177	216
VACC	27.95768	18.98143	2.843602	93.75	1393	0
REGQ	52.01965	25.05352	4.30622	100.0	1393	0

Note: VRS500 refers to pure technical efficiency scores bootstrapped for 500 replications

Table 6.12 Random Effects model to study the determinants of the pooled PTE

VRS500	Coefficient	Standard Error	Z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.02187	0.02994	-0.73	0.4651	-0.08056	0.03681
ISMDUM	-0.01693	0.02929	-0.58	0.5632	-0.07434	0.04048
ISFCRIS	0.02209	0.04331	0.51	0.6101	-0.06279	0.10697
NL_TA	0.00163***	0.00053	3.07	0.0021	0.00059	0.00267
LLP_GL	-0.12159D-04	0.4540D-04	-0.27	-0.7888	0.10114D-03	0.76821D-04
EQ_TA	0.00307***	0.00078	3.94	0.0001	0.00154	0.0046
SIZERT	0.02765***	0.0086	3.21	0.0013	0.01078	0.04451
RES_YPC	-0.00699	0.01259	-0.56	0.5788	-0.03167	0.01769
YGR	-0.00222	0.00321	-0.69	0.4887	-0.00852	0.00407
HHI	0.58471**	0.26154	2.24	0.0254	0.0721	1.09732
INFL	-0.00074	0.00162	-0.46	0.6463	-0.00391	0.00243
MKTCY	0.00052**	0.00023	2.22	0.0264	0.00006	0.00097
VACC	-0.00149**	0.00073	-2.03	0.0426	-0.00292	-0.00005
REGQ	0.00218***	0.00071	3.08	0.0021	0.00079	0.00357
Constant	-0.05488	0.0808	-0.68	0.497	-0.21325	0.10348

***, **, * ==> Significance at 1%, 5%, 10% level

1393 observations

Parameters of model:

Random Effects Model: v(i,t)	=	e(i,t) + u(i)
Estimates: Var[e]	=	0.061418
SD.[e]	=	0.247826
Var[u]	=	0.006187
SD.[u]	=	0.078659
Corr[v(i,t),v(i,s)]	=	0.091520
Sum of Squares		0.278284E+09
R-squared		-0.231732
[1 degrees of freedom, prob. Value	=	0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

When considering bank specific variables, the capitalization variable (EQ/TA) displays the expected relationship with bank efficiency. The coefficient on EQTA is both positive and statistically significant at the 1% level; this indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan (2003); Staikouras and Wood (2004); Goddard et al. (2004); Reda and Isik, 2006; Pasiouras and Kosmidou (2007); and Kosmidou (2008)). This finding is explained by the fact that high capital requirements may result in higher levels of equity capital. Thereby, this reduces the probability of financial distress and, in turn, reduces costs by lowering the risk premiums on substitutes for other potential more costly risk management activities (Berger and Bonaccorsi di Patti, 2006; Casu and Molyneux 2000). In other words, the result gives support to the argument that well capitalized banks face lower costs of

going bankrupt and face lower their cost of funding which, thereby, results in higher efficiency levels. In addition, some studies (Isik and Hassan, 2003), which found that high capital requirements increased the banks' efficiency, support the argument in favour of the moral hazard theory (Srairi, 2009). This positive relationship between PTE and bank capitalization may indicate, also, that, because there is less capital at stake, the shareholders of less capitalized banks have lower incentives to monitor their banks' management (Naceur, 2011).

The results show that the relationship between PTE and bank size (SIZERT) is both positive and statistically significant at the 1% level. The results indicate clearly that the larger banks tend to exhibit a higher level of PTE. This result is consistent with the findings of Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), and Sufian et al. (2012), which concluded that the larger the total assets, the greater the degree of efficiency. The large banks can take advantage of economies of scale by sharing costs in the production process. The greater efficiency of larger banks can be due to the smaller differences between the bank's capital size and its history (Hassan et al., 2009). Therefore, this follows the theory of Conventional Economic Efficiency whereby, with the increment of bank size, banks are able to produce outputs at lower costs and, subsequently, increase their overall performance and efficiency. Moreover, compared to their small and medium sized peers, the large banks tend to report improvements in efficiency because incurred higher costs tend to be offset by higher revenues received via quality services (Sufian, 2012).

The coefficient on ratio of Net Loans to Total Assets (NL/TA) is both positive and significant at the 1% level of significance. Therefore, this indicates that, when the bank's portfolio increases (hence exposing the bank to more credit risk), the bank's manager may have incentives to better control costs (Fuentes and Vergara, 2003). For instance, by using a stochastic frontier model for a panel of 481 banks in Latin American countries, Carvallo and Kasman (2005) found a positive relationship between the loans to assets ratio and cost efficiency. Therefore, they argue that banks, which engage in greater amounts of lending activity, have the ability to manage

operations more productively. This enables them to have lower production costs and, consequently, they tend to operate more efficiently.

Four macroeconomic (country-level) variables are significant in the pure technical efficiency equations. Firstly, this is in line with the findings of Olson and Zoubi (2012) and Figueira et al. (2009) who report a positive and statistically significant relationship between efficiency and concentration (HHI) at the 5% level of significance level. This result is consistent with the Efficient Structure Theory (EST). ESH's main idea is that an industry will become more concentrated under competitive conditions if some firms expand their outputs. Such expansion will increase the degree of concentration at the same time since it increases the rate of return. The result may be better products that satisfy demand at a lower cost. In this case, efficient firms tend to achieve a larger market share, leading to increased concentration within the industry. The firms' success is reflected in higher returns and stock prices and not through higher input prices (Demsetz, 1973 and 1974). In other words, the best-managed firms (i.e. efficient banks) have the lowest costs and the largest market shares lead to a higher degree of concentration. Secondly, the market capitalization variable (MKTCY) relates both positively and significantly to pure technical efficiency at the 5% level of significance. Therefore, as expected, an increase in market capitalization may lead to an improvement in pure technical efficiency. This result implies that, during the period under study, the stock market acted as a complement to rather than substitute for potential borrowers (banking sector). This is in line with the findings of Demirguc-Kunt and Levine (1996), Beck et al. (2000), and Dietsch and Lozano-Vivas (2000) which suggest a positive relationship between efficiency and market capitalization.

The two World Governance Indicators (WGI) variables show different significant influences on the Pure Technical Efficiency (PTE). - Voice and Accountability (VACC) is significantly negative while Regulation Quality (REGQ) is positive. Firstly, with regard to the relevance of voice and accountability, the findings show that, at the 5% level of significance, a higher level of media independence has a negative influence on pure technical efficiency. This outcome might be justified by the fact that effective supervision on media might prevent negative rumours which,

regardless of their validity, could damage a bank's reputation and could have a negative effect on the investors' (lenders or depositors) sentiments and result in a run on the bank and deterioration of bank's performance. Thus, a greater level of effective supervision on media independence promotes a bank's pure technical efficiency. This is consistent with the findings of Asongu and Nwachukwu (2015) which show a negative impact for Voice and accountability on the Foreign Direct Investment (FDI). Secondly, at the 1% level of significance, REGQ exhibits a positive relationship with the PTE. This may be explained by the fact that often government intervention is justified in order to prevent the development of monopoly power and excessive risk taking by banks (e.g. Freixas and Santomero, 2004). Namely, this variable indicates good regulation and not more regulation. One approach points to the deregulation of financial services and institutions as being a fundamental reason that led to the crisis (Chortareas et al., 2012).

6.2.1 Regional Analyses

In addition to our previous pooled-model analysis, we conducted five regression analyses for four different regions (MENA, East Asia and Pacific, South Asia, and EU and Central Asia) and one pooled region (MENA, East Asia and Pacific, South Asia). Appendices 11, 12, 13 and 14 present four RE models that include, individually, the former four-region dummy variables in order to determine the drivers of PTE. Moreover, Appendix 10 shows the four region dummy variables pooled into a single RE in order to estimate the determinants of PTE.

6.2.1.1. MENA Model

Similar to our previous findings, three bank- and one country-level variables exhibit positive relationships to the PTE. The coefficient on the capitalization variable (EQ/TA) is positive and statistically significant at the 1% level. This indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan, 2003; Berger and Bonaccorsi di Patti, 2006; Reda and Isik, 2006; Naceur, 2011). Moreover, the coefficient on ratio of Net Loans to Total Assets (NT/TA) is both positive and significant at the 1% level of

significance; this is consistent with the findings of Fuentes and Vergara, 2003, and Carvallo and Kasman, 2005.

Table 6.13: Determinants of PTE of MENA

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
ISMDUM	-0.04256	0.04921	-0.86	0.3871	-0.139	0.05388
ISFCRIS	0.0358	0.03426	1.04	0.296	-0.03134	0.10294
FCRISIS	-0.01494	0.02361	-0.63	0.5268	-0.06121	0.03133
NL_TA	.00408***	0.00099	4.12	0	0.00214	0.00602
LLP_GL	.27696D-04	0.4156D-04	0.67	-0.5051	0.53754D-04	0.10914D-03
EQ_TA	.00633***	0.00135	4.7	0	0.00369	0.00897
SIZERT	.08499***	0.01652	5.14	0	0.05261	0.11737
RES_YPC	-0.0041	0.01804	-0.23	0.8204	-0.03946	0.03126
YGR	-0.00317	0.00349	-0.91	0.3635	-0.01002	0.00367
HHI	0.51486	0.41434	1.24	0.214	-0.29722	1.32694
INFL	0.00094	0.00121	0.77	0.4386	-0.00143	0.0033
MKTCY	0.00121***	0.00033	3.67	0.0002	0.00056	0.00185
VACC	0.00018	0.00197	0.09	0.9267	-0.00368	0.00404
REGQ	-0.00131	0.00147	-0.89	0.3713	-0.00419	0.00156
Constant	-0.62221***	0.16238	-3.83	0.0001	-0.94046	-0.30396
***, **, * ==> Significance at 1%, 5%, 10% level						
777 observations						
Random Effects Model: v(i,t) = e(i,t) + u(i)						
Estimates: Var[e] = 0.021056						
SD.[e] = 0.145107						
Var[u] = 0.030502						
SD.[u] = 0 .174648						
Corr[v(i,t),v(i,s)] = 0.591605						
Sum of Squares 17.0256						
R-squared 0.332510						
[1 degrees of freedom, prob. Value = 0.000000]						

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Since the higher figures of the ratio denote lower liquidity (level of liquid assets held by the bank), the results imply that the relatively less (more) liquid banks tend to exhibit higher (lower) efficiency levels. The results show, also, that the relationship between PTE and bank size (SIZERT) is positive (and statistically significant at the 1% level). The result is consistent with the findings of Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), Sufian et al. (2012) which concluded that the larger the total assets, the greater the efficiency. The large banks can take advantage of economies of scale by sharing costs in the production process. At the country-level, the market capitalization variable (MKTCY) relates both positively and significantly related to pure technical efficiency at the 1% level of significance level. This is in line with the findings of Demirguc-Kunt and Levine (1996), Beck et al. (2000), and Dietsch and Lozano-Vivas (2000) which suggest that the stock market acts as a complement to, rather than substitute to potential borrowers (banking sector).

6.2.1.2 East Asia and Pacific Model

Similar to previous findings, the PTE of East Asia and Pacific region show positive relationships with three bank-level variables (i.e. Net loans-to-Total Assets ratio (NL/TA), Equity-to-Total Assets ratio (EQ/TA), and Bank Size (SIZERT)). However, in addition to these former variables, a particular variable, namely the Islamic Banks-During Crisis dummy (ISFCRIS), shows both a positive and significant influence on the pure technical efficiency of East Asia and Pacific banks. This suggests that, in the countries of East Asia and the Pacific region, the Islamic banks showed resilience towards the crisis (2007-2009). Moreover, (by 0.07) the IBs are more efficient than conventional banks. This outperformance is explained by the fact that Islamic banks transactions and instruments may comply with *Shari'ah* law, and are well regulated and supervised by responsible financial authorities.

Table 6.14: Determinants of PTE of East Asia and Pacific countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
ISMDUM	-0.11625	0.07575	-1.53	0.1249	-0.26472	0.03221
ISFCRIS	.07371**	0.0329	2.24	0.0251	0.00922	0.13819
FCRISIS	-0.04292	0.03067	-1.4	0.1616	-0.10303	0.01718
NL_TA	.00223**	0.00098	2.27	0.0231	0.0003	0.00415
LLP_GL	0.00096	0.00303	0.32	0.7511	-0.00497	0.00689
EQ_TA	.00758***	0.00167	4.53	0	0.0043	0.01087
SIZERT	.07149***	0.0249	2.87	0.0041	0.02269	0.12028
RES_YPC	0.03861	0.02749	1.4	0.1601	-0.01526	0.09249
YGR	0.00051	0.0062	0.08	0.934	-0.01163	0.01266
HHI	-0.50074	1.36598	-0.37	0.7139	-3.17802	2.17653
INFL	-0.0004	0.00352	-0.11	0.9102	-0.00729	0.0065
MKTCY	-0.00014	0.00037	-0.38	0.7076	-0.00087	0.00059
VACC	-0.00275	0.00432	-0.64	0.5245	-0.01122	0.00572
REGQ	0.00244	0.00252	0.97	0.3339	-0.00251	0.00738
Constant	-0.16227	0.35813	-0.45	0.6505	-0.86421	0.53966

*****, **, *** ==> Significance at 1%, 5%, 10% level

315 observations

Random Effects Model: v(i,t)	=	e(i,t) + u(i)
Estimates: Var[e]	=	0.015392
SD.[e]	=	0.124065
Var[u]	=	0.054454
SD.[u]	=	0.233354
Corr[v(i,t),v(i,s)]	=	0.779628
Sum of Squares		0.395607E+08
R-squared		0.098889
[1 degrees of freedom, prob. value =		0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

6.2.1.3 South Asia Model

In the South Asia region, Bank Size (SIZERT) was the only explanatory variables that had a significant effect on the banks' PTE. This outcome may suggest that the countries of South Asia region are considered to be poor and underdeveloped and that they encounter adverse socioeconomic conditions. Unlike previous findings, SIZERT exhibits a negative relationship with PTE. This is in line with the findings of Berger and Hannan (1994), Beck et al. (2013) and Johnes et al. (2014). This result might be explained by the fact that larger banks may tend to be less efficient due to their managements seeking quiet lives by pursuing other objectives or by maintaining the advantages which their market power produces (Berger and Hannan, 1994).

Table 6.15: Determinants of PTE of South Asia countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
ISMDUM	0.06204	0.06531	0.95	0.3422	-0.06596	0.19004
ISFCRIS	-0.02679	0.02443	-1.1	0.2727	-0.07467	0.02108
FCRISIS	-0.00704	0.02118	-0.33	0.7398	-0.04855	0.03448
NL_TA	0.00129	0.00105	1.23	0.2185	-0.00076	0.00334
LLP_GL	0.0016	0.00125	1.29	0.198	-0.00084	0.00405
EQ_TA	0.00119	0.00103	1.15	0.2497	-0.00084	0.00321
SIZERT	-.08538***	0.0163	-5.24	0	-0.11733	-0.05343
RES_YPC	-0.0312	0.08996	-0.35	0.7287	-0.20753	0.14512
YGR	0.00768	0.00992	0.77	0.4389	-0.01177	0.02713
HHI	-0.124	0.48215	-0.26	0.797	-1.06899	0.82099
INFL	-0.00048	0.00304	-0.16	0.8735	-0.00645	0.00548
MKTCY	0.00021	0.00185	0.11	0.9111	-0.00343	0.00384
VACC	0.00035	0.00356	0.1	0.9223	-0.00664	0.00733
REGQ	-0.00436	0.00972	-0.45	0.6534	-0.02341	0.01468
Constant	.78845***	0.24144	3.27	0.0011	0.31524	1.26165

***, **, * ==> Significance at 1%, 5%, 10% level

182 observations

Random Effects Model: v(i,t)	=	e(i,t) + u(i)
Estimates: Var[e]	=	0.004937
SD.[e]	=	0.070266
Var[u]	=	0.023552
SD.[u]	=	0.153465
Corr[v(i,t),v(i,s)]	=	0.826694
Sum of Squares		4.97527
R-squared		0.415404
[1 degrees of freedom, prob. value =		0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

6.2.1.4 EU and Central Asia Model

Similar to previous findings, Bank Size (SIZERT), Equity-to-Total Assets ratio (EQ/TA), and the Herfindahl–Hirschman Index (HHI) are the three explanatory variables which have a significant effect on the PTE, the former at the 1% level of

significance and the latter two latter at the 5% level of significance. These three variables exhibit positive relationship with the PTE. This was in line with the findings of Olson and Zoubi (2011) and Figueira et al. (2009) who reported both a positive and statistically significant relationship between efficiency and concentration (HHI); Berger and Mester (1997), Isik and Hassan (2003), Berger and Bonaccorsi di Patti (2006), Reda and Isik (2006) and Naceur (2011) who presented both a positive significant relationship between efficiency and Capitalization (EQ/TA); and Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), Sufian et al. (2012)- who concluded that the larger the total assets (SIZERT) the greater the efficiency.

Table 6.16: Determinants of PTE of EU and Central Asia countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
ISMDUM	0.0006	0.0552	0.01	0.9913	-0.10759	0.1088
ISFCRIS	-0.00216	0.03671	-0.06	0.9531	-0.0741	0.06979
FCRISIS	-0.03646	0.03432	-1.06	0.2882	-0.10373	0.03082
NL_TA	0.00202	0.00124	1.63	0.1025	-0.00041	0.00445
LLP_GL	.00511*	0.00305	1.68	0.0935	-0.00086	0.01109
EQ_TA	.00335**	0.00138	2.42	0.0156	0.00063	0.00606
SIZERT	.11626***	0.03125	3.72	0.0002	0.05502	0.1775
RES_YPC	-0.0471	0.0393	-1.2	0.2307	-0.12412	0.02993
YGR	0.00371	0.00343	1.08	0.2801	-0.00302	0.01043
HHI	.98305**	0.47871	2.05	0.04	0.04481	1.9213
INFL	-0.00576	0.0053	-1.09	0.2769	-0.01615	0.00462
MKTCY	-.00131**	0.00057	-2.28	0.0227	-0.00243	-0.00018
VACC	.01805***	0.00352	5.12	0	0.01115	0.02496
REGQ	-.01141***	0.00374	-3.05	0.0023	-0.01875	-0.00408
Constant	-.96813***	0.36658	-2.64	0.0083	-1.68661	-0.24966

***, **, * ==> Significance at 1%, 5%, 10% level

119 observations

Random Effects Model: v(i,t)	=	e(i,t) + u(i)
Estimates: Var[e]	=	0.004868
SD.[e]	=	0.069772
Var[u]	=	0.007440
SD.[u]	=	0.086257
Corr[v(i,t),v(i,s)]	=	0.604489
Sum of Squares		0.802277
R-squared		0.504480
[1 degrees of freedom, prob. value =		0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

On the other hand, three macroeconomic (country-level) variables (voice and accountability, regulation quality, and market capitalization) show different significant relationships with PTE. Relative to our previous findings- at the 1% level of significance level- the former (VACC) exhibit both a negative and statistically significant influence on the pure technical efficiency of EU and Central Asia banks whereas the latter two variables (REGQ) and (MKTCY) show a positive relationship with the PTE at the 1% and 5% levels of significance respectively. Unlike our

previous findings, VACC suggests that more developed and democratic systems are conducive to the more efficient operations of financial institutions. It implies, also, that the capacity of government to formulate effectively, implement sound policies, and promote socially desirable investments can enhance efficiency in the industry and the welfare of the economy. Despite our previous outcomes, the negative relationship between REGQ and PTE may be explained by the fact that banks' greater independence from government control allows the bank boards to be accountable to their shareholders while limited financial freedom can distort the incentives of bankers' boards accountable to government bodies and which strive to meet particular government imposed regulations. Moreover, limited financial freedom may encourage financial institutions to create opaque new instruments and miscalculate risk. In addition, the banking sector and the capital market are complementary and government imposed regulations may have a negative impact in the case of competition between them. As for Market capitalization variable, the result shows that higher levels of market capitalization lead to lower PTE of EU and Central Asia banks; this suggests that that there is competition between the banking sector and the capital market (stock market) . This is in line with the findings of Johnes et al. (2014). In addition to the previous findings' variables, the ratio of LLP/Total Loans shows significant positive influence on the PTE at 10% significance level. In this case, the higher the level of reserves (and, hence, the greater degree of protection for the bank from bad loans) provides more PTE. This suggests that banks, which behave prudently in terms of insuring against bad loans, reap rewards in terms of PTE.

6.2.1.5 MENA-East Asia and Pacific-South Asia Region Model

Similar to our previous findings, three bank-level (i.e. Net loans-to-Total Assets ratio (NL/TA), Equity-to-Total Assets ratio (EQ/TA), and Bank Size (SIZERT)) and three country-level variables (i.e. the Herfindahl–Hirschman Index (HHI), Market Capitalization (MKT) and Voice and Accountability (VACC)) exhibit significant relationships to pure technical efficiency. The coefficient on ratio of Net Loans to Total Assets (NT/TA) is both positive and significant at the 1% level; this is consistent with the findings of Fuentes and Vergara, 2003, and Carvallo and Kasman, 2005. Since the higher figures denote lower liquidity (level of liquid assets held by the bank), the results imply that the relatively less (more) liquid banks tend to exhibit

higher (lower) efficiency levels. Moreover, the coefficient on the capitalization variable (EQ/TA) is both positive and statistically significant at the 1% level; this indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan, 2003; Berger and Bonaccorsi di Patti, 2006; Reda and Isik, 2006; Naceur, 2011).

Table 6.17: Determinants of PTE of MENA-East Asia and Pacific-South Asia region

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
ISMDUM	-0.04958	0.04246	-1.17	0.2429	-0.13279	0.03364
ISFCRIS	0.03194	0.01999	1.6	0.1101	-0.00725	0.07112
FCRISIS	-0.01678	0.01347	-1.25	0.2129	-0.04318	0.00962
NL_TA	.00310***	0.00064	4.83	0	0.00184	0.00436
LLP_GL	-.21397D-04	.4689D-04	-0.46	-0.6482	.11330D-03	.70508D-04
EQ_TA	.00571***	0.00086	6.62	0	0.00402	0.0074
SIZERT	.04020***	0.01282	3.14	0.0017	0.01508	0.06533
RES_YPC	0.00223	0.01058	0.21	0.8331	-0.0185	0.02296
YGR	-.00551**	0.00228	-2.42	0.0156	-0.00997	-0.00104
HHI	.58028***	0.19376	2.99	0.0027	0.20051	0.96005
INFL	.00160*	0.0009	1.78	0.0755	-0.00016	0.00337
MKTCY	.00043**	0.00017	2.54	0.0112	0.0001	0.00077
VACC	-.00318**	0.00139	-2.28	0.0227	-0.00044	-0.00591
REGQ	0.0013	0.00101	1.29	0.1983	-0.00068	0.00329
Constant	-.32212***	0.11827	-2.72	0.0065	-0.55393	-0.09031

***, **, * ==> Significance at 1%, 5%, 10% level

1274 observations

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.016560
SD.[e] = 0.128685
Var[u] = 0.055247
SD.[u] = 0.235047
Corr[v(i,t),v(i,s)] = 0.769384
Sum of Squares 0.242987E+09
R-squared -0.226190
[1 degrees of freedom, prob. value = 0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Also, the results show that the relationship between PTE and bank size (SIZERT) is positive (statistically significant at the 1% level). The result is consistent with the findings of Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), Sufian et al. (2012); they concluded that the larger the total assets, the higher the efficiency. The large banks can take advantage of economies of scale by sharing costs in the production process. At the country-level, the market capitalization variable (MKTCY) is related both positively and significantly to PTE at the 5% level of significance. This is in line with the findings of Demirguc-Kunt and Levine (1996), Beck et al. (2000), and Dietsch and Lozano-Vivas (2000); they suggest that the stock market acts as a complement to rather than substitute to potential borrowers (banking sector). The HHI relates positively and significantly to

pure technical efficiency at the 10% level of significance. This supports the efficient structure theory, which states that the most efficient firms will be able to increase their market share, resulting in higher concentration. This is in line with the findings of Figueira et al. (2009) and Olson and Zoubi (2011). Regarding the relevance of Voice and Accountability (VACC), the findings show that, at the 5% level of significance, a higher level of media independence has a negative influence on pure technical efficiency. This outcome may be justified by the fact that effective supervision on media may prevent negative rumors, regardless of their validity, which can damage a bank's reputation and can have a negative effect on the investors' (lenders or depositors) sentiments and result in a run on the bank and deterioration in its performance. Thus, a higher level of effective supervision on media independence promotes a bank's PTE. This is consistent with the findings of Asongu and Nwachukwu (2015).

In addition to the previous findings' variables, three macroeconomic (country-level) variables show significance in the PTE equations. Firstly, the coefficient of the Growth in real GDP (YGR) variable shows a negative sign (statistically significant at the 5% level). This suggests that, under expansive demand conditions, banks may feel less pressure to control their inputs and, thus, become less efficient. This is in line with Pasiouras (2008) who found a negative relationship between the growth of GDP and efficiency. Secondly, at the 10% level of significance, inflation shows both a significant and positive influence on PTE. This suggests that a full anticipation of the rate of inflation may raise profits since banks can appropriately adjust interest rates to increase revenues. This is consistent with the findings of Bourke (1989), Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999).

6.2.2 Analyses of Muslim versus non-Muslim Countries

We ran the following four regression analyses in order to differentiate between the determinants of banks based in Muslim and non-Muslim countries. The four models were: IBs in non-Muslim countries; conventional banks in Muslim countries; IBs in Muslim countries; and conventional banks in non-Muslim countries. Appendices 16 and 17 present two random effects models which include dummy variables

(CBINMC and CBINNMC in N.6, and IBINMC and IBINNMC in O.6) in order to determine the drivers of PTE, particularly the influence of these dummy variables on PTE, based in Muslim and non-Muslim countries.

Table 6.18: Sample Distribution by Region and by Type of Bank

	2006	2007	2008	2009	2010	2011	2012	Total number of Observations
Islamic Banks in Muslim Countries	57	66	76	81	82	85	73	520
Islamic Banks in Non-Muslim Countries	2	7	7	6	6	4	2	34
Conventional Banks in Muslim Countries	68	74	78	80	78	80	70	528
Conventional Banks in Non-Muslim Countries	6	6	7	7	7	5	5	43
Total Ob./ year	133	153	168	174	173	174	150	1125

6.2.2.1 Islamic Banks in non-Muslim Countries Model

Similar to our previous findings, three variables determine the PTE of Islamic banks in non-Muslim countries. These determinants are the ratio of Net Loans to Total Assets (NL/TA), the ratio of Equity to Total Assets (EQ/TA), and Market Capitalization (MKTCY). The coefficient on the capitalization variable (EQ/TA) is both positive and statistically significant at the 5% level; this indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan, 2003; Berger and Bonaccorsi di Patti, 2006; Reda and Isik, 2006; Naceur, 2011). Moreover, the coefficient on ratio of Net Loans to Total Assets (NT/TA) is both positive and significant at the 1% level of significance. This is consistent with the findings of Fuentes and Vergara, 2003, and Carvallo and Kasman, 2005.

Table 6.19: Determinants of PTE of Islamic banks in non-Muslim countries

VRS500	Coefficient	Standard Error	Z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	0.04448	0.03149	1.41	0.1578	-0.01723	0.10619
NL_TA	0.00599***	0.00133	4.49	0	0.00337	0.0086
LLP_GL	-.75896D-04**	0.3173D-04	-2.39	0.0168	-0.13810D-03	-0.13697D-04
EQ_TA	0.00424**	0.00176	2.41	0.0162	0.00079	0.0077
SIZERT	-0.07911	0.0759	-1.04	0.2973	-0.22788	0.06966
RES_YPC	0.31289***	0.08592	3.64	0.0003	0.14448	0.4813
YGR	0.00689*	0.00358	1.93	0.054	-0.00012	0.0139
HHI	-51.1896***	7.95698	-6.43	0	-66.785	-35.5942
INFL	-0.00166	0.00888	-0.19	0.8517	-0.01906	0.01574
MKTCY	0.00122***	0.00046	2.64	0.0082	0.00031	0.00212
VACC	0.00615**	0.00281	2.19	0.0289	0.00063	0.01166
REGQ	0.0038	0.00452	0.84	0.401	-0.00506	0.01266
Constant	2.31479***	0.5777	4.01	0.0001	1.18251	3.44706

*****, **, *** ==> Significance at 1%, 5%, 10% level

63 observations

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.001747
SD.[e] = 0.041792
Var[u] = 0.010996
SD.[u] = 0.104864
Corr[v(i,t),v(i,s)] = 0.862937
Sum of Squares 0.314854
R-squared 0.607522
[1 degrees of freedom, prob. value = 0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Since the ratio's higher figures denote lower liquidity (level of liquid assets held by the bank), the results imply that the relatively less (more) liquid banks tend to exhibit higher (lower) efficiency levels. At the country-level, the market capitalization variable (MKTCY) is related both positively and significantly at the 1% level of significance to PTE. This is in line with the findings of Demirguc-Kunt and Levine (1996), Beck et al. (2000), and Dietsch and Lozano-Vivas (2000); these suggest that the stock market acts as a complement to rather than substitute to potential borrowers (banking sector). On the other hand, when compared to previous findings, two macroeconomic variables (the normalized (HHI) and VACC) show different influences on pure technical efficiency. Firstly, at the 1% level of significance, the significantly negative coefficient on HHI provides support for the 'quiet life' hypothesis. This is in line with the findings of Berger and Humphrey (1997), and Berger and Hannan (1998), Yudistira (2004), and Staikouras et al. (2008). Secondly, at the 5% level of significance, VACC exhibits a positive relationship with the PTE. This suggests that more developed and democratic systems are conducive for banking operations that are more efficient. It implies, also, that the capacity of government to effectively formulate and implement sound policies and promote socially desirable investments can enhance the efficiency in the banking industry and the welfare of the economy.

In addition to the previous findings, one bank-level variable and two country-level variables exhibit a relationship with the PTE of IBs based in non-Muslim countries. At the 5% level of significance, the coefficient of the Loan Loss Provision-to-Gross Loans ratio (LLP/GL) variable is negative and this suggests that banks with higher credit risk tend to exhibit lower efficiency levels. This is consistent with the findings of Thakor (1987), and Miller and Noulas (1997). Moreover, at the 1% level of significance, the coefficient on GDP per Capita (RES_YPC) is positive. This may be explained by the fact that, in wealthy countries (with high GDP per capita), demand for loans may be lower relative to the non-wealthy countries (with low to medium GDP per capita). The coefficient of the Growth in real GDP (YGR) variable entered the regression model with a positive sign (statistically significant at the 1% level). Thus, it supports the argument of the association between economic growth and the performance of the banking sector. Countries, with higher per capita income, have banking systems which operate in a more mature environment; this results in more competitive interest rates and profit margins. Moreover, costs may reduce with overall development because of corresponding improvements in the quality of state institutions. This finding is in line with Dietsch and Lozano-Vivas (2000), and Grigorian and Manole (2002).

6.2.2.2 Conventional Banks in Muslim Countries Model

Similar to the previous findings, the PTE of the East Asia and Pacific regions show positive relationships with three bank-level and three country-level variables (i.e. NL/TA, EQ/TA and SIZERT) and the HHI, MKTCY and REGQ). The coefficient on the ratio of NT/TA is both positive and significant at the 5% level of significance; this is consistent with the findings of Fuentes and Vergara, 2003, and Carvallo and Kasman, 2005. Moreover, the coefficient on EQ/TA is both positive and statistically significant at the 1% level; this indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan, 2003; Berger and Bonaccorsi di Patti, 2006; Reda and Isik, 2006; Naceur, 2011). The results show, also, that the relationship between PTE and bank size (SIZERT) is both positive and statistically significant at the 1% level.

Table 6.20: Determinants of PTE of conventional banks in Muslim countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.0203	0.01289	-1.58	0.1151	-0.04556	0.00495
NL_TA	.00212**	0.00088	2.4	0.0165	0.00039	0.00384
LLP_GL	-0.00091	0.00285	-0.32	0.7505	-0.00648	0.00467
EQ_TA	0.00700***	0.00186	3.77	0.0002	0.00336	0.01065
SIZERT	0.04892***	0.01626	3.01	0.0026	0.01704	0.08079
RES_YPC	0.01242	0.01279	0.97	0.3312	-0.01264	0.03749
YGR	-0.00556**	0.00261	-2.13	0.0332	-0.01067	-0.00044
HHI	0.60043***	0.23202	2.59	0.0097	0.14569	1.05517
INFL	0.00148	0.0011	1.35	0.1778	-0.00067	0.00364
MKTCY	0.00042**	0.00021	1.98	0.0477	0	0.00083
VACC	0.00176	0.00173	1.02	0.3081	-0.00162	0.00514
REGQ	0.00223*	0.0013	1.71	0.0866	-0.00032	0.00478
Constant	-0.38971**	0.15416	-2.53	0.0115	-0.69186	-0.08757

***, **, * ==> Significance at 1%, 5%, 10% level

602 observations

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.014624
SD.[e] = 0.120928
Var[u] = 0.038040
SD.[u] = 0.195038
Corr[v(i,t),v(i,s)] = 0.722319
Sum of Squares 22.1061
R-squared 0.180196
[1 degrees of freedom, prob. Value = 0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

The result is consistent with the findings of Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), Sufian et al. (2012). They concluded that the larger the total assets, the higher the efficiency. The large banks can take advantage of economies of scale by sharing costs in the production process. At the country-level and at the 5% level of significance, the market MKTCY variable is related positively and significantly to PTE. This is in line with the findings of Demirguc-Kunt and Levine (1996), Beck et al. (2000), and Dietsch and Lozano-Vivas (2000); they suggest that the stock market acts as a complement to rather than an substitute to potential borrowers (banking sector). Moreover, two macroeconomic variables (the HHI and REGQ) show a positive influence on PTE. Firstly, at the 1% level of significance, the significantly positive coefficient on HHI, provides support for the efficient structure theory. This is in line with the findings of Figueira et al. (2009) and Olson and Zoubi (2011). Secondly, at the 19% level of significance, REGQ exhibits a positive relationship with the PTE. This is explained by the fact that often government intervention is justified in order to prevent the development of banks' monopoly power and excessive risk taking (e.g., Freixas and Santomero, 2004). One approach points to the deregulation of financial services and institutions as a fundamental reason which led to the crisis. Thirdly, the coefficient of the YGR

variable shows a negative sign (statistically significant at the 5% level); this suggests that, under expansive demand conditions, banks may feel less pressure to control their inputs and, thus, become less efficient. This is in line with Pasiouras (2008) who found a negative relationship between growth of GDP and efficiency.

6.2.2.3. Islamic Banks in Muslim Countries Model

Three bank- and one country-level variables exhibit positive relationships to the PTE. The coefficient on the ratio of NT/TA is positive and significant at the 1% level; this is consistent with the findings of Fuentes and Vergara, 2003, and Carvallo and Kasman, 2005. Since the higher figures denote lower liquidity (level of liquid assets held by the bank), the results imply that the relatively less (more) liquid banks tend to exhibit higher (lower) efficiency levels. Moreover, the coefficient on the EQ/TA variable is both positive and statistically significant at the 1% level; this indicates that well capitalized banks are more efficient. This result is in line with previous studies (Berger and Mester, 1997; Isik and Hassan, 2003; Berger and Bonaccorsi di Patti, 2006; Reda and Isik, 2006; Naceur, 2011).

The results show, also, that the relationship between PTE and bank size (SIZERT) is both positive and statistically significant at the 1% level. The result is consistent with the findings of Akhavein et al. (1997), Cornett et al. (2006), Al-Sharkas et al. (2008), Olson and Zoubi (2011), Sufian et al. (2012); they concluded that the larger the total assets, the higher the efficiency. The large banks can take advantage of economies of scale by sharing costs in the production process. At the country-level and at the 1% level of significance, the significantly positive coefficient on HHI provides support for the efficient structure theory. This is in line with the findings of this is in line with the findings of Figueira et al. (2009) and Olson and Zoubi (2011).

Table 6.21: Determinants of PTE of Islamic banks in Muslim countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	0.00886	0.01698	0.52	0.6017	-0.02442	0.04215
NL_TA	.00398***	0.00098	4.04	0.0001	0.00205	0.00591
LLP_GL	-0.00043	0.00027	-1.59	0.1123	-0.00096	0.0001
EQ_TA	0.00664***	0.00115	5.79	0	0.00439	0.00888
SIZERT	0.05547***	0.01987	2.79	0.0053	0.01652	0.09443
RES_YPC	-0.02164	0.01666	-1.3	0.1939	-0.05428	0.01101
YGR	-0.0018	0.00338	-0.53	0.5934	-0.00843	0.00482
HHI	0.82802***	0.29146	2.84	0.0045	0.25677	1.39927
INFL	0.00023	0.0014	0.16	0.8697	-0.00251	0.00297
MKTCY	0.00035	0.00028	1.28	0.2	-0.00019	0.00089
VACC	0.00167	0.00216	0.77	0.4404	-0.00257	0.00591
REGQ	-0.00058	0.00157	-0.37	0.7103	-0.00365	0.00249
Constant	-0.42842**	0.18036	-2.38	0.0175	-0.78192	-0.07493

***, **, * ==> Significance at 1%, 5%, 10% level

665 observations

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.018470
SD.[e] = 0.135905
Var[u] = 0.064414
SD.[u] = 0.253800
Corr[v(i,t),v(i,s)] = 0.777156
Sum of Squares 29.8721
R-squared 0.039854
[1 degrees of freedom, prob. Value = 0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

6.2.2.4. Conventional Banks in non-Muslim Countries Model

At the bank level and at the 1% level of significance, the coefficient LLP/GL variable shows both a positive and significant influence on pure technical efficiency. In this case the higher the reserves (and, hence, the higher the protection for the bank from bad loans) the higher pure technical efficiency. Unlike previous findings, at the 10% level of significance, SIZERT exhibits a negative relationship with PTE. This is in line with the findings of Berger and Hannan (1994), Beck et al. (2013) and Johnes et al. (2014). This result might be explained by the fact that larger banks may tend to be less efficient due to their managements seeking quiet lives by pursuing other objectives or by maintaining the advantages which their market power produces (Berger and Hannan, 1994).

Table 6.22: Determinants of PTE of conventional banks in non-Muslim countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	0.00085	0.03471	0.02	0.9806	-0.06719	0.06888
NL_TA	-0.00031	0.00181	-0.17	0.8658	-0.00385	0.00324
LLP_GL	0.01233***	0.00456	2.71	0.0068	0.0034	0.02126
EQ_TA	-0.00255	0.00167	-1.53	0.1262	-0.00581	0.00072
SIZERT	-0.08252*	0.04377	-1.89	0.0594	-0.1683	0.00326
RES_YPC	-.13189***	0.04685	-2.82	0.0049	-0.22371	-0.04006
YGR	0.00099	0.00481	0.21	0.8374	-0.00845	0.01042
HHI	3.10328***	1.01959	3.04	0.0023	1.10493	5.10163
INFL	-0.00474	0.0056	-0.85	0.3973	-0.01573	0.00624
MKTCY	0.00049	0.00038	1.3	0.1951	-0.00025	0.00124
VACC	-.000361**	0.0017	-2.12	0.0336	-0.00694	-0.00028
REGQ	0.00627***	0.00233	2.69	0.0071	0.0017	0.01084
Constant	0.49102**	0.22867	2.15	0.0318	0.04284	0.9392

***, **, * ==> Significance at 1%, 5%, 10% level

63 observations observations

Random Effects Model: v(i,t)	=	e(i,t) + u(i)
Estimates: Var[e]	=	0.003352
SD.[e]	=	0.057899
Var[u]	=	0.004984
SD.[u]	=	0.070601
Corr[v(i,t),v(i,s)]	=	0.597889
Sum of Squares		0.275331
R-squared		0.843215
[1 degrees of freedom, prob. Value	=	0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

At the country-level and at the 1% level of significance, the significantly positive coefficient on HHI provides support for the efficient structure theory. This is in line with the findings of Figueira et al. (2009) and Olson and Zoubi (2011). Regarding the relevance of the VACC variable, the findings show, at the 5% level of significance, a negative relationship between this variable and the PTE; this suggests that a higher level of media independence has a negative influence on PTE. This outcome may be justified by the fact that effective supervision on media may prevent negative rumours, regardless of their validity, which can damage a bank's reputation and can have a negative effect on the investors' (lenders or depositors) sentiments resulting in a run on the bank and deterioration of the bank's performance. Thus, a higher level of effective supervision on media independence promotes a bank's pure technical efficiency. This is consistent with the findings of Asongu and Nwachukwu (2015). At the 1% level of significance, REGQ exhibits a positive relationship with the PTE. This may be explained by the fact that often government intervention is justified in order to prevent the development of the banks' monopoly power and excessive risk taking (e.g., Freixas and Santomero, 2004). One approach points to the deregulation of financial services and institutions as a fundamental reason that led to the crisis. At

the 1% level of significance, the coefficient on RES_YPC is negative. This may be explained by the fact that relative to the non-wealthy countries (with low to medium GDP per capita), there is lower demand for loans in wealthy countries (with high GDP per capita). In other words, people, earning high incomes, may have lower tendencies to borrow money. In order to enhance the level of borrowings or demand for loans, banks may reduce their returns on loans; this would result in narrowing the net interest spread. Therefore, banks may incur a decline in their earnings and subsequently in their profits, leading to lower efficiency. The findings are consistent with Grigorian and Manole (2002), and Dietsch and Lozano-Vivas (2000).

6.3 Chapter Summary

This chapter reported the empirical results from the methodologies summarized in the previous chapter. It consisted of two sections; the first section measured at the global level (21 countries) the three types of efficiency (OTE, PTE and SE) of Islamic and conventional banks over the period of study from 2006 to2012. The second section investigated the impact of bank and country-level variables on the banks' efficiency (PTE); this was based on three different analysis models (i.e. pooled analysis, regional analysis and an analysis of Muslim compared with non-Muslim countries).

The first section measured the overall technical efficiency, pure technical efficiency and scale efficiency by applying a non-parametric approach- Data Envelopment Analysis (DEA). We employed the bootstrap method In order to reach the best-statistically efficiency scores and to enhance the statistical inferences. We estimated a common frontier for a panel of 199 banks (104 Islamic banks and 95 conventional banks). The findings implied that, when compared to conventional banks, IBs showed significant higher mean Overall Technical Efficiency (OTE) and Scale Efficiency (SE) previous to, during and post-crisis. Although, relative to conventional banks, IBs showed more resilience previous to crisis- during crisis- and post crisis periods, the DEA results provided evidence that, on average, there were no significant differences in pure technical efficiency between conventional and IBs. This result is in line with a number of previous studies (El-Gamal and Inanoglu, 2005, Mokhtar et al., 2006, Bader, 2008 and Hassan et al., 2009).

The second section examined the determinants of the IBs' and conventional banks' pooled PTE. The findings implied that, during the financial crisis (2007-2009), IBs had no significance on pooled PTE and showed no significant differences in performance (efficiency) relative to conventional banks. Moreover, the larger Net Loans-to-Total Assets ratio (NT/TA), Bank Capitalization (EQ/TA), Bank Size (SIZERT), Market Concentration (HHI), Market Capitalization (MKTCY) and Regulation Quality (REGQ) tended to improve efficiency. However, less dependency of media and democracy (VACC) resulted in better bank efficiency.

Under the regional analyses, we conducted five models in order to determine the drivers of the PTE in the Middle East and North Africa (MENA), East Asia and Pacific, South Asia, Europe (EU) and Central Asia, and MENA-East Asia and Pacific-South Asia regions. The outcomes of four regional regression analyses showed similar determinants to our previous findings which were (pooled PTE) for the PTE of the MENA region (NL/TA, EQ/TA, SIZERT, and MKTCY), East Asia and Pacific region (NL/TA, EQ/TA, and SIZERT), EU and Central Asia region (EQ/TA, SIZERT, HHI VACC and REGQ), and MENA-East Asia and Pacific-South Asia region-North Africa region (NL/TA, EQ/TA, SIZERT, HHI, MKTCY, and VACC). In addition to these explored determinants, the ISFCRIS dummy variable presented a positive-statistically influence on the PTE of the East Asia and Pacific regions. This suggested that, when compared to conventional banks, IBs were more efficient during the financial crisis (2007-2009). Moreover, LLP/GL ratio reported a positive influence on the pure technical efficiency of EU and Central Asia. Unlike the pooled pure technical efficiency's findings, the Growth in Real GDP (YGR) and Inflation (INFL) were the two variables which displayed statistical-significance on the PTE of MENA-East Asia and Pacific-South Asia - North Africa region, the former negatively and the latter positively. On the other hand, only one variable (SIZERT) exhibited a significant relationship with the PTE of the South Asia region; this was negative unlike our previous results. Additionally, two variables (VACC and REGQ) showed significant relationships with the PTE of EU and Central Asia regions,; these were, also, opposite to the pooled PTE's findings.

As for the comparison of Muslim with non-Muslim countries' analyses, we used four random effects models to examine the determinants of pure technical efficiency of IBs in Non-Muslim Countries (IBINNMC), Conventional Banks in Muslim Countries (CBINMC), Islamic Banks in Muslim Countries (IBINMC), and Conventional Banks in Non-Muslim Countries (CBINNMC). The four regression analyses noted similar determinants to our previous findings (pooled PTE) for the pure technical efficiency of IBINNMC (NL/TA, EQ/TA and MKTCY), CBINMC (NL/TA, EQ/TA, SIZERT, HHI, MKTCY, and REGQ), IBINMC (NL/TA, EQ/TA, SIZERT and HHI,), and CBINNMC (HHI, VACC and REGQ).

Further to our previous findings, two variables (i.e. Loan Loss Provision-to-Gross loans ratio and GDP per Capita) presented statistically-significant relationships with both pure technical efficiency of IBINNMC and CBINNMC- Loan Loss Provision-to-Gross loans ratio (LLP/GL) affect the former (IBINNMC) negatively and the latter (CBINNMC) positively, whereas GDP per Capita (RES_YPC) influenced the former positively and the latter negatively. Moreover, the Growth in real GDP (YGR) showed significance in the PTE of IBINNMC, stating that YGR led to higher pure technical efficiency. On the other hand and compared to our previous findings, two macroeconomic variables, namely showed different influences on the PTE of IBINNMC-; the HHI negatively, and VACC positively.

Chapter 7 Conclusion

This chapter considers the conclusions, contributions and implications of the thesis' findings as well as limitations and suggestions for future research. We arrived at the conclusions after taking into account the results and the discussion of the findings and conclusions in previous chapters. As one of the fastest growing segments in global financial services, Islamic banking has become systemically significant in many markets and too big to ignore in others. While conventional banks are largely debt-based and allow for risk transfer, IBs, in contrast, are asset-based and concentrate on sharing risk. In addition to providing IBs with additional buffers, these features make their activities more closely related to the real economy and tend to reduce their contribution to excesses and bubbles.

The development of modern Islamic banking arose from Muslims' rejection of the interest element in conventional banking. IBs, which started to operate in the early 1970s, were concentrated initially in the Middle East before spreading to other regions such as Asia and Europe. This was due to demand from the Muslim communities as well as providing banking choices to bank customers. Nowadays, Islamic banking services are offered by both conventional banks that choose to operate Islamic banking windows and full-fledged IBs. They can be either foreign or domestic-owned.

Since Islamic banking has been in operation for over 30 years and was viewed as an alternative to interest-based banking, there is a need to assess the performance of Islamic banking. In addition, since Islamic banking is part of a country's banking system, the performance of Islamic banks may affect the soundness and stability of the banking system. Moreover, Islamic banking influences the performance of conventional banks if they choose to operate Islamic banking windows in addition to conventional windows. Therefore, evaluation of the relative performance of Islamic to conventional banks will help policy makers to devise policies in order to improve the performance of a country's banking system. In addition, the increase in number of Islamic banks has boosted the competition between Islamic and conventional banks. Consequently, the determination of their relative performances will encourage both

Islamic and conventional bank managers to improve their performance in order to compete with each other.

7.1 Summary of the Research Questions, Objectives and Methodology

7.1.1 Research Questions:

This study seeks to tackle these following questions:

1. Do the scale efficiency and the overall and pure technical efficiency vary across the two different bank types over 2006-2012?
2. How efficient are Islamic banks at the global level when compared to conventional banks during 2006-2012, particularly during the financial crisis (i.e. 2007-2009)? In other words, is there any significance between both types of banks?
3. What are the determinants of efficiency for Islamic and conventional banks, at the pooled level?
4. Do the determinants of bank efficiency differ across regions and in Muslim countries when compared to non-Muslim countries? Do the determinants of Islamic and conventional banks vary in Muslim countries and in non-Muslim ones?
5. Do the World Governance Indicators (WGIs) have any influence on the pure technical efficiency of banks?

The findings of this research indicate that Islamic banks outperform conventional counterparts in terms of scale efficiency and overall technical efficiency during the entire study period (2006-2012). Despite the fact that Islamic banks demonstrate more resilience during the financial crisis (2007-2009) at the managerial level (i.e. in terms of pure technical efficiency), both of Islamic and conventional banks show insignificant difference since their pure technical values were approximate and showed similar pattern during 2006-2012. Another finding of this thesis, which follows from investigating the determinants of bank pure technical efficiency, is that worldwide governance indicators (i.e. voice and accountability and regulatory quality)

and other variables- capital strength, bank size, market capitalisation, market concentration (i.e. HHI), Growth in Real GDP, GDP per Capita, and inflation- show distinct influences on bank pure technical efficiency. These variables vary across different levels- pooled, regional and religion-based levels. For instance, Islamic banks in Muslim countries and non-Muslim counterparts present similar PTE determinants in terms of Net Loans to Total Assets (NL/TA), Capital Strength (EQ/TA). On the other hand, five additional variables influence particularly the PTE of Islamic banks in non-Muslim countries- such as proxy of Credit Risk (LLP/GL), GDP per Capita (RES_YPC), Growth in Real GDP (YGR), Market Capitalisation (MKTCY) and Voice and Accountability (VACC). Only one distinct variable, which is Bank Size (SIZERT), determine uniquely the PTE of Islamic banks in Muslim countries. Moreover, the Market Concentration (HHI) shows positive significance on PTE of Islamic banks in Muslim countries whereas it is negative in non-Muslim countries.

Conventional banks in Muslim countries and non-Muslim counterparts show two common determinants of bank PTE, which are positively significance. These variables are Market Concentration (HHI) and Regulatory Quality (REGQ). However, five variables- Net Loans to Total Assets (NL/TA), Capital Strength (EQ/TA), Bank Size (SIZERT), Growth in Real GDP (YGR) and Market Capitalisation (MKTCY)- have influence on the PTE of conventional banks in Muslim countries only. However, proxy of Credit Risk (LLP/GL), GDP per Capita (RES_YPC), and Voice and Accountability (VACC) are statistically significant on PTE of conventional banks in non-Muslim countries exceptionally.

Under the regional analyses, the research conducts five models in order to determine the drivers of PTE in the Middle East and North Africa (MENA), East Asia and Pacific, South Asia, Europe (EU) and Central Asia, and MENA-East Asia and Pacific-South Asia regions. The findings show that the determinants of bank PTE vary across the four regions. In addition, some of them might have various influences depending on the region

7.1.2 Objectives

Given the above issues, the research's first objective was to measure the efficiency (i.e. overall and pure technical efficiency, and scale efficiency) of Islamic banks relative to conventional counterparts- before the financial crisis, during the crisis and after the crisis. The study examines 104 Islamic and 95 conventional banks operating in 21 countries, which host particularly Islamic banking. The second objective was to determine the environmental factors, including the Worldwide Governance Indicators (WGI), which influenced their PTE. To the best of the researcher's knowledge, this is the first study that investigates any potential association between the WGI and the efficiency of Islamic and conventional banks, mainly at the global level. The third objective was to capture possible different regional influences on the PTE determinants. For this reason, the study classifies the 21 countries into four regions: Middle and North Africa, East Asia & Pacific, South Asia, and Europe & Central Asia. Lastly, the thesis examines whether there are different determinants of bank efficiency for Islamic and conventional banks operating in Muslim countries and non-Muslim countries. This was done by dividing the sample into Muslim countries and non-Muslim countries, and conducting many regression models to capture any significance on PTE.

7.1.3 Methodology

In achieving the first objective of how IBs performed relative to conventional banks globally, we applied a DEA in chapter 6. In addition, we employed a bootstrap procedure to provide statistical properties of efficiency estimates. We investigated the relative efficiency, i.e. pure technical, overall technical and scale efficiency, of Islamic and conventional b in all the 21 countries which operated Islamic banking. These were, namely, Arab Emirates, Bahrain, Bangladesh, Egypt, Great Britain, Indonesia, Iraq, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sudan, Syria, Tunisia, Turkey and Yemen. The study excluded Iran since it operated only Islamic banking.

Before conducting the DEA approach, we decided that it was essential to identify significant inputs and outputs. In the literature of banking efficiency, we utilized different approaches to select the inputs and outputs. After reviewing the literature, we selected an intermediation approach for this research study. Under this approach, banks were mediator agents (intermediaries) between the demand for, and the supply of funds. Deposits and short-term funds, fixed assets, and personal expenses composed the input vector while Total loans and net income shaped this study's output vector.

Chapter 6 examined the second objective of determining the influence of bank- and country- specific factors on the PTE of Islamic and conventional banks. As mentioned in chapter 5 about the regression model, we conducted this by including environmental variables. We employed the Random Effects (RE) model to examine the relationship between bootstrapped efficiency scores, derived from the DEA, and a set of explanatory variables. We selected the RE model since it had the advantage of including and enabling time-invariant variables to play a role as the explanatory variables. Moreover, we conducted additional RE models in order to determine and analyse the influence of potential variables on PTE. This was based on regions' (MENA, East Asia & Pacific, South Asia and Europe and Central Asia) and a comparison of the approaches of Muslim and non-Muslim countries.

7.2 Summary of findings

This section summarises this thesis' findings as presented and discussed in the different sections of chapter six. By using DEA, the first section analysed and compared the OTE, PTE and SE of IBs as compared to conventional banks in the 21 countries that host Islamic banking. The second section discussed the impact of the environmental variables on the banks' PTE.

Having used CRS and VRS technology, the empirical findings suggest the existence of scale inefficiency among Islamic and conventional banks during the entire period of the study (2006-2012). However, before crisis, during crisis and after crisis periods, PTE seemed to outweigh SE in determining the OTE of Islamic and conventional

banks. The findings imply that, when compared to conventional banks, Islamic banks showed significant higher mean OTE and SE pre-crisis, during crisis and post-crisis. On the other hand, although, relative to conventional banks, IBs showed more resilience during the pre- crisis- and post crisis periods, the PTE scores of Islamic and conventional banks demonstrated insignificant differences since their values were very close and showed similar trend over the years- On average, Islamic and conventional banks achieve respectively 0.43 and 0.42 of PTE. For both Islamic and conventional banks, bank inefficiency related to PTE rather than to scale inefficiency for each year of the entire study (2006-2012). Consequently, they were managerially inefficient in controlling their operating costs and in making full use of their resources in terms of deposits, capital (as fixed asset) and labour (as personnel expenses).

The DEA results provided evidence that, although IBs were proven to be more resilient during the financial crisis, there were, on average, no significant differences in PTE between conventional and Islamic banks. This result is in line with a number of previous studies (El-Gamal and Inanoglu, 2005, Mokhtar et al., 2006, Bader, 2008 and Hassan et al., 2009).

In a second stage analysis, we investigated the determinants of PTE in order to provide more information to managers and policy-makers regarding ways of improving performance. The findings imply that Islamic banks had no significance on pooled PTE and, during the entire period of the study including the financial crisis (2007 to 2009), showed no significant difference in performance (efficiency) relative to conventional banks. Moreover, the results from the random effects analysis suggested that PTE was associated both positively and significantly with loans intensity. This suggested that banks, with higher net loans-to-asset ratio, exhibited higher efficiency scores. Moreover, banks, which are more managerially efficient, tend to have larger market shares. This supports the efficient structure theory that states the most efficient firms will be able to increase their market share, resulting in higher concentration. The findings indicate, also, that large and well-capitalized banks display higher PTE; this suggests that banks, with sound capital positions, face lower bankruptcy costs.

Furthermore, the results demonstrate that banks, with larger assets, size tend to improve their efficiency and consequently, the large banks can take advantage of economies of scale by sharing costs in the production process. Similarly, there is, also, a positive relationship between market capitalization (MKTY) and PTE. This is explained by the fact that the banking sector and capital market are a complement to rather than a substitute to potential borrowers (Banking sector). The findings imply, also, that the capacity of the government to effectively formulate and implement sound policies and to promote socially desirable investments can enhance efficiency in the banking industry and the welfare of the economy. This is proxied by the RQ variable. On the other hand, the VACC variable has a negative impact on efficiency. This suggests that freedom of speech, accountability and press reporting on matters such as minimum wages, health and safety, environmental controls, tax evasion and human rights abuse may not favour returns to direct investment.

We expanded the study to observe the influence of countries on PTE; we did so by comparing Muslim with non-Muslim countries. We used four random effects models to examine the determinants of IBs' PTE in Non-Muslim Countries (IBINNMC), Conventional Banks in Muslim Countries (CBINMC), Islamic Banks in Muslim Countries (IBINMC), and Conventional Banks in Non-Muslim Countries (CBINNMC). The four regression analyses noted similar determinants to our previous findings (pooled PTE) for the PTE of IBINNMC (NL/TA, EQ/TA and MKTCY), CBINMC (NL/TA, EQ/TA, SIZERT, HHI, MKTCY, and REGQ), IBINMC (NL/TA, EQ/TA, SIZERT and HHI,), and CBINNMC (HHI, VACC and REGQ).

Further to our previous findings, two variables (i.e. Loan Loss Provision-to-Gross loans ratio and GDP per Capita) presented statistically significant relationships with the PTE of both IBINNMC and CBINNMC. Loan Loss Provision-to-Gross loans ratio (LLP/GL) affected the former (IBINNMC) negatively and the latter (CBINNMC) positively whereas GDP per Capita (RES_YPC) influenced the former positively and the latter negatively. Moreover, the Growth in real GDP (YGR) showed significance in the PTE of IBINNMC; this stated that YGR led to higher PTE. On the other hand, compared to previous findings, two macroeconomic variables showed different influences on the IBINNMC's PTE - the HHI negatively and VACC positively.

Under the regional analyses, we conducted five models in order to determine the drivers of PTE in the Middle East and North Africa (MENA), East Asia and Pacific, South Asia, Europe (EU) and Central Asia, and MENA-East Asia and Pacific-South Asia regions. The outcomes of the four regional regression analyses showed similar determinants to our previous findings which were (pooled PTE) for the MENA region's PTE (NL/TA, EQ/TA, SIZERT, and MKTCY), East Asia and Pacific region (NL/TA, EQ/TA, and SIZERT), EU and Central Asia region (EQ/TA, SIZERT, HHI VACC and REGQ), and MENA-East Asia and Pacific-South Asia region-North Africa region (NL/TA, EQ/TA, SIZERT, HHI, MKTCY, and VACC). In addition to these explored determinants, the ISFCRIS dummy variable presented both a positive and a statistically significant influence on the PTE of East Asia and Pacific region. This suggested that, when compared to conventional banks, IBs were more efficient during the financial crisis (2007-2009). Moreover, Loan Loss Provision-to-Gross loans ratio (LLP/GL) reported a positive influence on the PTE of EU and Central Asia. Unlike the pooled PTE's findings, Growth in Real GDP (YGR) and Inflation (INFL) were two variables which displayed statistical significance on the PTE of MENA-East Asia and Pacific-South Asia - North Africa regions, the former negatively and the latter positively. On the other hand, only one variable (SIZERT) exhibited a significant relationship with the PTE of South Asia region, unlike our previous results, this was negative. Additionally, two variables (VACC and REGQ) showed significant relationships with the PTE of the EU and Central Asia regions. These were, also, opposite to the pooled PTE's findings.

7.3 Research Implications

The significant message that might be derived from the study's findings is that managers should implement effective strategies to mitigate risks, reduce unnecessary costs, and explore better ways of operating banks. In addition, regulators need to set-up a separate entity, which might be a pillar of their central bank, to supervise uniquely the Islamic banks and monitor their activities and financial products, and ensure majorly their compliancy with Shari'ah. Moreover, this body would be responsible for issuing policies and laws that are dedicated to Islamic banks. Based

on the random effects model, at the pooled level, findings reveal that the voice and accountability has a significant influence on the bank efficiency. Therefore, policy makers are advised to conduct effective supervision on media while maintaining and promoting healthy democracy. In terms of enhancing bank efficiency, the regulatory quality's results suggest that adequate and appropriate regulatory intervention, which is not excessive, may contribute significantly in promoting bank performance. This is to prevent any development of monopoly power, banks' excessive exposure to risks, and potential stress in the market, and therefore, to guarantee soundness of banking system.

7.4 Research contributions

This thesis contributes to the literature from three different perspectives. First, it is the first study to examine the performance of banks that operate in all countries that host both Islamic banks and conventional counterparts, based on BankScope database. The study period is 7 years representing three stages: before-crisis (2006), during crisis (2007-2009), and after-crisis (2010-2012). Second, to the best knowledge of the researcher, this is the first research to observe any potential influence of the Worldwide Governance Indicators (WGI) on bank efficiency, particularly at the global level. Third, regional analyses were conducted separately to examine any difference in the determinants of bank efficiency between regions. Moreover, this study implemented various models, based on countries' religion aspect, to observe any variations between banks in Muslim-countries and non-Muslim countries.

7.5 Research Limitations

While there are limitations attached to this research's findings, such shortcomings can motivate potential research. Although the chosen techniques, which we employed in the thesis, were appropriate, consistent with the scope, sample and data of the studies, we employed only in our research study a non-parametric model- data envelopment analysis (DEA). Different techniques such as parametric model- Stochastic Frontier Analysis (SFA) would be an interesting direction for further research in order to estimate the relative efficiency of IBs compared to conventional banks. This would

enhance, also, the methodological cross-checking procedures which have been so valuable to researchers and policy makers in assessing the robustness of empirically estimated efficiency levels in this area of the literature

This study's other limitation was the number of observations included in dataset sample. Since this study considered only banks with at least 4 years observations, we omitted from the dataset a large number of banks that misses 4 years of data covered by the study's seven-year period. Moreover, this study's other limitation was the unavailability of data for some countries. For instance, for banks operating in Lebanon, data was available only for the period from 2006 to2010 since IBs were small in size and few in number (two Islamic banks with asset size below 250 million USD).

In addition, the Islamic banks, which are covered in this study and are referred as fully- fledge Islamic banks by BankScope, might not comply with *Shari'ah.* For instance, many Islamic banks depend on LIBOR to determine the percentage of profits, and this practice violates the Islamic principles. Consequently, these banks should not be considered as Islamic banks.

7.6 Recommendations for future research

This study examines the performance of banks by conducting non-parametric technique- the Data Envelopment Analysis (DEA). However, parametric techniques, such as the stochastic frontier approach, could be applied as an additional technique to support the outcomes of this research. Moreover, it could provide more insight into the pros and cons of various techniques.

Although the techniques that we applied in this research for measuring the performance of banks are valid, the results of this application are specific to the used data. Different datasets (input and output variables, banks and period) could produce different efficiency scores. Therefore, this study's other limitation is the availability of data used to produce the efficiency score. Within the area of a cross-country study, it may be useful in future to extend the research by using two approaches, namely,

classification of the 21 countries into country (s) with the most efficient Islamic and conventional banks; and ranking the countries' banks based on the level of efficiency scores (from highest to least efficient).

References

Abd Karim, M. Z. (2001). 'Comparative bank efficiency across select ASEAN countries.' ASEAN Economic Bulletin 18(3): 289-304.

Abdel Karim, Rifaat Ahmed. "International accounting harmonization, banking regulation, and Islamic banks." The International Journal of Accounting (2001): 169-93.

Abdul-Majid, M., Saal, D.S., Battisti, G., 2008. The efficiency and productivity of Malaysian banks: an output distance function approach. Aston BusinessSchool Research Paper R, P0815.

Abdul-Majid, M., Saal, D.S., Battisti, G., 2010. Efficiency in Islamic and conventional banking: an international comparison. Journal of Productivity Analysis34 (1), 25–43.

Abdul-Majid, M., Saal, D.S., Battisti, G., 2011. The impact of Islamic banking on the cost efficiency and productivity change of Malaysian commercial banks.Applied Economics 43 (16), 2033–3054.

Abu Dhabi Isalmic Bank. UNDERSTANDING ISLAMIC BANKING. Retrieved 05 13, 2015, from Adib: http://adib.ae/en/Pages/Understanding_Islamic_Banking.aspx

Agoraki, M.K., Delis, M.D. and Pasiouras, F. (2011). "Regulations, competition and bank risk-taking in transition countries." Journal of Financial Stability 7, 38–48.

Ahmad, Abu Umar Faruq, and M. Kabir Hassan (2007). "*Riba and Islamic banking*." Journal of Islamic Economics, Banking and Finance 3:1: 1–33.

Akmal, M. and Saleem, M. (2008) "Technical Efficiency of the banking sector in Pakistan", SBP Research Bulletin, vol. 4, no. 1, pp. 61-80.

Altunbas, Y., Carbo, S., Gardener, E. P. M., & Molyneux, P. (2007). Examining the relationships between capital, risk and efficiency in European banking. European Financial Management, 13(1), 49-70. http://dx.doi.org/10.1111%2Fj.1468-036X.2006.00285.x

Ahamed, M. (2014). Retrieved September 19, 2015, from http://jbbc.co.jp/wp content/uploads/2014/08/A-report-on-Banking-Sector-of-Bangladesh.pdf.

Akhavein, J.D., Berger, A.N. and Humphrey D.B. (1997). The Effects of Megamergers on Efficiency and Prices: Evidence from a Bank Profit Function, Review of Industrial Organization 12: 95-139.

Alam, Mohammed N., (2003). Micro Credit through 'Bai-Mujjal' Mode of Islamic Banking Financing System, conference of SANABEL (Canada).

Al-Baraka Bank (2015). Learn Islamic Banking | Al Baraka Bank (Pakistan) Ltd, http://www.albaraka.com.pk/learn-islamic-banking (accessed August 13, 2016).

Al-Faraj, T. N., Alidi, A. S., and Bu-Bshait, K. A. (1993). Evaluation of Bank Branches by Means of Data Envelopment Analysis. International Journal of Operations & Production Management, 13(9), 45-52.

Al-Jarrah, I. 2007. The use of DEA in measuring efficiency in Arabian banking. Banks and Bank Systems Journal. 2(4) :21-30.

Al-Jarrah, I. and Molyneux, P. (2003). Efficiency in Arabian banking. Paper presented at the International Conference on Financial Development in Arab Countries, Abu Dhabi, UAE.

Al-Jarrah, Idries, and Philip Molyneux (2005). "Efficiency in Arabian banking." Islamic perspectives on wealth creation. - Edinburgh : Edinburgh University: 97-117.

Al-Muharrami, S. (2007) "The causes of productivity change in GCC banking industry", International Journal of Productivity and Performance Management, vol. 56, no. 8, pp. 731-743.

Al-Shammari, S.H. (2003). "Structure-Conduct-Performance and Efficiency in Gulf Cooperation Council." PhD Thesis. University of Wales: Bangor.

Al-Shammari, M. and Salimi, A. (1998), "*Modeling the operating efficiency of banks: a nonparametric methodology*", *Logistics Information Management*, Vol. 11, pp. 5-12.

Al-Sharkas, A.A., Hassan, M.K. and Lawrence, S. (2008) The Impact of Mergers and Acquisitions on the Efficiency of the US Banking Industry: Further Evidence, Journal of Business Finance & Accounting 35: 50-70.

Allen, L. and Rai, A. (1996). "Operational Efficiency in banking: An international comparison", Journal of banking and finance 20, 655-672.

Allen, S. L. (2012). Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk (2nd ed., Vol. 721). John Wiley & Sons.

Allen, L. And Rai A. (1996). Operational Efficiency in banking: An international comparison. Journal of banking and finance, 20, 655-672. 2.

Alpay, S. and Hassan, K. M. (2006). "A Comparative Efficiency Analysis of Interest FreeFinancial Institutions and Conventional Banks: A Case Study on Turkey." Paperpresented at the ERF 13th Annual Conference, Kuwait.

Altunbas, Y. and S. V. Chakravarty (1998). "Efficiency measures and the banking structure in Europe".Economics Letters 60(2): 205-208.

Altunbas, Y. and P. Molyneux (1996), "Cost Economies in EU Banking Systems", Journal of Business and Economics, 48,217–230.

Ariff, M., Iqbal, M., & Mohamad, S. (2012). Islamic debt market for sukuk securities: the theory and practice of profit sharing investment. Cheltenham: Edward Elgar.

Ariff, M. and Can, L. (2008) "Cost and profit efficiency of Chinese banks: a nonparametric analysis", China Economic Review, vol. 19, no. 2, pp. 260-273.

Asongu, S. A., & Nwachukwu, J. C., (2015). "Drivers of FDI in Fast Growing Developing Countries: Evidence from Bundling and Unbundling Governance", African Governance and Development Institute Working Paper No. 15/001.

Assaf, G., Barros, C. and Matousek, R. 2011, 'Technical efficiency in Saudi banks', *Expert Systems with Applications*, vol. **38**, no. 5, pp.5781–5786.

Assaf, A.; C. P. Barros; and R. Matousek. 2009. "Bayesian Approach to Estimating Banks Efficiency: Lessons from New EU Countries", Paper presented at the CICM Conference on "20 Years of Transition in Central and Eastern Europe: Money, Banking and Financial Markets", London Metropolitan Business School, London, September.

Ataullah, A. and Le, H. (2006). "Economic Reforms and Bank Efficiency in Developing Countries: the Case of the Indian Banking Industry." Applied Financial Economics 16 (9): 653-663.

Athanassopoulos, A. and Curram, S. (1996), "A comparison of data envelopment analysis and artificial neural networks as tools for assessing the efficiency of decision making units", Journal of the Operational Research Society, Vol. 47, pp. 1000-16

Athanassopoulos, A.D. (1997). "Service quality and operating efficiency synergies for management control in the provision of financial services: evidence from Greek bank branches", European Journal of Operational Research, vol. 98, no. 2, pp. 300-313.

Avkiran, N. K. (2006), Productivity Analysis in the Service Sector with Data Envelopment Analysis (3rd eds), Australia.

Avkiran, N. K. (2011), "Association of DEA Super-efficiency estimates with Financial Ratios: Investigating the Case for Chinese banks", Omega, 39(3), 323-334.

Avkiran, N.K. (2009). Opening the black box of efficiency analysis: an illustration with UAE banks. Omega 37 (4), 930–941.

Avkiran, Necmi K. (1999). "Decomposing the Technical Efficiency of Trading Banks in the Deregulated Period." 12th Australasian Finance and Banking Conference 16–17 December, The University of New South Wales, Sydney.

Awdeh, A. and C. El Moussawi (2009). 'Bank efficiency and foreign ownership in the Lebanese banking sector.' Review of Middle East Economics and Finance 5(2): 1-22.

Ayadi, F., Adebayo, A. and Omolehinwa, E. (1998), "Bank performance measurement in a developing economy: an application of data envelopment analysis", Managerial Finance, Vol. 24, pp. 5-16

Aysan, A.F. and S. P. Ceyhan (2008). "What determines the banking sector performance in globalized financial markets? The case of Turkey." Physica A: Statistical Mechanics and its Applications 387(7): 1593-1602

Ayyagari, M., A. Demirgüç-Kunt, and M. Maksimovic (2005). "How important are financing constraints? The role of finance in the business environment." World Bank.

Bader, M. K. (2008). ”Cost, revenue, and profit efficiency of Islamic versus conventional banks: international evidence using data envelopment analysis”. Islamic Economic Studies15(2): 23-76.

Bader, M. K. (2007). Cost, revenue, and profit efficiency of conventional banks: Evidence from nineteen developing countries. In Capital Markets in Emerging Markets: Malaysia, ed. M. Ariff, M. Shamsher, and T. Hassan, pp. (chapter 25). Kuala Lumpur: McGraw-Hill (InPress).

Bader, M. K., Ariff, M. and Taufiq, H. (2007). Efficiency of Islamic banks: International evidence. Paper presented in the 14th Annual Global Finance Conference GFC, April 1-4, 2007 in Melbourne, Australia.

Bader, M. K., M. Shamsher, M. Ariff and H. Taufiq (2007), “Cost, Revenue and Profit Efficiency of Islamic Versus Conventional Banks: International Evidence Using Financial Ratios Approach”, paper submitted to the Special Issue on Performance Analysis of the Islamic Banking and Financial Industry, Review ofIslamic Economics 11(1).

Banker RD, A Charnes and WW Cooper (1984). “Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis.” Management Science 30(9): 1078-1092.

Banker, R. D. and Morey, R. C. (1986). "The Use of Categorical Variables in Data Envelopment Analysis," Management Science, 32 (12): 1613-1627.

Banque du Liban. (2007). History of BDL. Beirut, LEbanon. Retrieved March 2014, from http://www.bdl.gov.lb/about-banque-du-liban.html

Bashir, Abdel-Hameed M. (1999). "Risk and Profitability Measures in Islamic Banks: The Case of Two Sudanese Banks." Islamic Economic Studies, 6:2, pp. 1-24.

Bashir, A.H.M. (2001). Assessing the Performance of Islamic Banks: Some Evidence from the Middle East. Topics in Middle Eastern and North African Economies. Unpublished paper. Proceedings of the Middle East Economic Association.

Barth, J. R., Caprio, G. Jr., and R. Levine. (2004). “Bank Supervision and Regulation: What Works Best?” Journal of Financial Intermediation, forthcoming.

Barros, C., Chen, Z., Liang Q., and Peypoch, N. (2011), “Technical efficiency in the Chinese banking sector”, Economic Modelling, 28(5), 2083–2089.

Barros, C.P., Managi, S. and Matousek, R. (2012) "The technical efficiency of the Japanese banks: non-radial directional performance measurement with undesirable output", Omega, vol. 40, no. 1, pp. 1-8.

Bauer, P. W., & Hancock, D. (1993). The efficiency of the Federal Reserve in providing check processing services. Journal of Banking & Finance , 287-311.

BBC. (2015, September 11). BBC News. Retrieved September 25, 2015, from http://www.bbc.co.uk/news/world-asia-pacific-15356257.

BBC (2015, December 08). Turkey country profile - BBC News. (n.d.). Retrieved from http://www.bbc.co.uk/news/world-europe-17988453

Beccalli E., Casu B. and Girardone C., (2006), Efficiency and Stock Performance in European Banking, Journal of Business Finance and Accounting, 33, 245-262.

Beck, T., Demirgüc Kunt, A., Levine, R. (2000). A new database on financial development and structure. World Bank Economic Review 14, 597–605. Beck, T., Levine, R., Loayza, N. (2000). Finance and the sources of growth. Journal of Financial Economics 58, 261–300.

Beck, T., Demirgüc¸ -Kunt, A., Merrouche, O., (2013). Islamic vs. conventional banking: business model, efficiency and stability. Journal of Banking and Finance 37 (2), 433–447.

Beck, T., (2008). Competition and financial stability: friends or foes? In: Bank Indonesia and Banco de Mexico (Eds.), Competition in the Financial Sector.

Beck, T., Demirgüç-Kunt, A., Levine, R., (2006). Bank concentration, competition, and crises: first results. Journal of Banking and Finance 30, 1581–1603.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2005). "Law and Firms' Access to Finance." American Law and Economics Review 7, 211–252.

Beck, Thorsten, Asli, Demirguc-Kunt, and Ouarda , Merrouche (2010). Islamic vs. conventional banking business model, efficiency and stability. Washington, D.C.: World Bank.

Belanes, A., & Hassiki, S. (2012). Efficiency in Islamic and conventional banks: A comparative analysis in the MENA region. Bankers, Markets and Investors, 120, 36-49.

Bems, R. and Sorsa, P. (2008). "Efficiency of the Slovenian Banking Sector in the EU context", Bančni vestnik (The Journal for Money and Banking) 57, no. 11, Bank Association of Slovenia, Ljubljana

Ben Naceur, S.; Ben-Khedhiri, H., and Casu, B. (2011). "What Drives the Performance of Selected MENA Banks? A Meta-Frontier Analysis", IMF Working Papers, pp. 1-31.

Ben Naceur, S. (2003) The determinants of the Tunisian banking industry profitability: panel evidence, Paper presented at the Economic Research Forum (ERF) 10th Annual Conference, Marrakesh-Morocco, 16-18 December.

Benston, G. J. 1965. Branch Banking and Economies of Scale. The Journal of Finance 20: 312-331.

Berg, S., Førsund, F., Hjalmarsson, L. and Suominen, M. (1993). "Banking Efficiency in the Nordic Countries", Journal of Banking and Finance 17, 371-88.

Berg, Sigbjorn Atle, Finn R. Forsund, and Eilev S. Jansen. (1992). "Malmquist Indices of Productivity Growth during the Deregulation of Norwegian Banking, 1980-89." Scandinavian Journal of Economics, 94:Supplement, pp. 211-28.

Berger, A.N. (1995). The relationship between capital and earnings in banking. Journal of Money, Credit, and Banking 27, 432–456

Berger, A.N., Hanweck, G.A. and Humphrey, D.B. (1987). "Competitive Viability in Banking: Scale, Scope, and Product Mix Economies," Journal of Monetary Economics 20: 501-520.

Berger, A. N. and Humphrey, D. B. (1991). 'The dominance of inefficiencies over scale and product mix economies in banking.' Journal of Monetary Economics 28: 117-148.

Berger, A.N., and Bonaccorsi di Patti, E. (2006) Capital structure and firm performance: a new approach to testing agency theory and an application to the banking industry. J Bank Financ 30:1065–1102.

Berger, A.N. and R. DeYoung (1996). Problem loans and cost efficiency in commercial banks, Working paper, Board of Governors of the Federal Reserve System.

Berger, A. N., Hunter, W.C. and Timme, S.G. (1993). "The Efficiency of Financial Institutions: A Review and Preview of Research Past, Present, and Future", Journal of Banking and Finance, 17: 22149.

Berger, A.N., Hancock, D. and Humphrey, D.B. (1993). "Bank efficiency derived from the profit function", Journal of Banking & Finance, vol. 17, no. 2, pp. 317-347.

Berger, A.N., and Hannan, T., (1994). The efficiency cost of market power in the banking industry: a test of the 'Quiet Life' and related hypotheses Working Paper 94–29, Vol. 2006: Financial Institutions Center, The What School, University of Pennsylvania (1994).

Berger, A.N.; DeYoung, H.B. (1997). Efficiency of financial intuitions: international survey and directions for future research European Journal of Operational Research, 98 (2), pp. 175–212.

Berger, A. N., and L. J. Mester, (1997). "Inside the black box: What explains differences in the efficiencies of financial institutions?" Journal of Banking & Finance. Vol. 21(7), pp. 895-947.

Berger, A.N., and DeYonng, R. (1997). "Problem loans and cost efficiency in commercial banks", Journal of Banking and Finance 21.

Berger, A., T. Hannan (1998), "The Efficiency Cost of Market Power in the Banking Industry: A Test of the "Quiet Life" and Related Hypotheses", Review of Economics and Statistics 27(2), 404-431.

Berger, Allen N., and Humphrey, David B. (1997). Efficiency of Financial Institutions: International Survey and Directions for Future Research. Washington, D.C.: Division of Research and Statistics, Division of Monetary Affairs, Federal Reserve Board.

Bergstrom, M. (2010). Sound Banking in Lebanon. Retrieved from https://libertariansabroad.wordpress.com/2010/08/17/sound-banking-in-lebanon.

Bhattacharyya, A., Lovell, C.A.K. and Sahay, P. (1997) The impact of liberalization on the productive efficiency of Indian commercial banks, European Journal of Operational Research, Vol. 98, No. 2, pp. 332- 345.

Bhattacharyya, A., Bhattacharyya, A., and Kumbhakar, Subal C. (1997). "Changes in Economic Regime and Productivity Growth: A Study of Indian Public Sector Banks," Journal of Comparative Economics, Elsevier, vol. 25(2), pages 196-219, October.

Bhattacharya, A., Lovell, C. and Sahay, P. (1997). "The impact of liberalization on the productive efficiency of Indian commercial banks", European Journal of Operational Research, Vol. 98, pp. 332□45.

Bloomberg Business, (2015). Retrieved September 18, 2015, from Bloomberg: http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=25216984 (accessed August 13, 2015)

Bloomberg Business, (2015). State Bank Of Pakistan: Private Company Information http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=25216984 (accessed August 13, 2015)

Bloomberg Business, (2015). Bank of England: Private Company Information - Businessweek, http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=874036 (accessed February 13, 2016).

Bonin, J. P., I. Hasan and P. Wachtel (2005). 'Bank performance, efficiency and ownership in transition countries.' Journal of Banking and Finance 29(1): 31-53.

Bos, J. W. B. and Kool, C. J. M. (2006). Bank efficiency: The role of bank strategy and local market conditions, Journal of Banking and Finance, 30, 1953-1974.

Bos, J. W. B. and H. Schmiedel (2007). 'Is there a single frontier in a single European banking market?' Journal of Banking and Finance 31(7): 2081-2102.

Boubakri, N., Cosset, J.-C., Fischer, K. and Guedhami, O. 2005. Privatization and Bank Performance in Developing Countries, Journal of Banking and Finance 29, 2015-2041.

Bourke, P. (1989), Concentration and other Determinants of Bank Profitability in Europe North America and Australia. Journal of Banking and Finance, 13(1), 66-79.

Brink, C. H. (2004). *Measuring Political Risk: Risks to Foreign Investment.* Ashgate Publishing, Ltd.pp 85-88.

Brissimis, S. N., M. D. Delis and N. I. Papanikolaou (2008). 'Exploring the nexus between banking sector reform and performance: Evidence from newly acceded EU countries.' Journal of Banking and Finance 32(12): 2674-2683.

Brockett, P. L, Charnes, A., Cooper, W. W., Huang, Z. M., & Sun, D. B. (1997). Data transformations in DEA cone ratio envelopment approaches for monitoring bank performances. European Journal of Operational Research, 98, 250-268.

Brombin C, Salmaso L (2009) Multi-aspect permutation tests in shape analysis with small sample size. Computational Statistics & Data Analysis 53:3921–3931.

Brooks, C. (2008) Introductory Econometrics for Finance, 2nd edn., Cambridge University Press, Cambridge, UK.

Brown, Kym. (2003). "Islamic banking comparative analysis", Arab Bank Review, Vol. 5, No. 2, pp. 43-50.

Brown, K. and Skully, M. (2003). "A Comparative Analysis of Islamic Bank Efficiency." Paperpresented at the International Banking Conference, Prato, Italy, 9-10 September 2003.

Brown, K. and Skully, M. (2005). Islamic banks: A cross-country study of cost efficiency performance, Accounting, Commerce & Finance.The Islamic Perspective Journal, 8 (1-2), 43-79.

BTI, 2014. Country Reports: Transformationsindex - bti-project.org. http://www.bti-project.org/reports/country-reports/mena/syr/index.nc (accessed August 13, 2015)

BTI, 2014. Turkey Country Report Retrieved 20 September 2015 from http://www.btiproject.de/fileadmin/Inhalte/reports/2014/pdf/BTI%202014%20Turkey

BTI, 2014. Egypt Country Report Retrieved 29 September 2015 from http://www.bti-project.org/reports/country-reports/mena/egy/

Bukh, P. N. D., Berg, S. A., and Førsund F. R. (1995). Banking efficiency in the Nordic countries: A four-country Malmquist index analysis. Working Paper, University of Aarhus, Denmark

Canhoto, A. and J. Dermine (2003). 'A note on banking efficiency in Portugal, New vs. Old banks ' Journal of Banking and Finance 27(11): 2087-2098.

Carbo S., Gardener E.P.M., Williams J., (2002), Efficiency in Banking: Empirical evidence from the savings banks sector, The Manchester School, 70, 204-228.

Carvallo O., Kasman A., (2005), Cost efficiency in the Latin American and Caribbean banking systems, Journal of International Financial Markets, Institutions and Money, 15, 55-72.

Casu, B., and P. Molyneux (2000). A Comparative Study of Efficiency in European Banking. School of Accounting, Banking and Economics. University of Wales (Bangor). Mimeo.

Casu, B and Molyneux, P., (2003). Comparative study of efficiency in European Banking. Wharton school research Paper no 17.

Casu, B. & Girardone, C. (2002) "A Comparative Study of the Cost Efficiency of Italian Bank Conglomerates." Managerial Finance 28(9): 3-23.

Casu, B., Girardone, C. and Molyneux, P. (2004), "Productivity change in European banking: a comparison of parametric and non-parametric approach", Journal of Banking & Finance, Vol. 28, pp. 2521-2540.

Casu, B. and C. Giradone (2004). 'Large banks' efficiency in the single European market.' The Service Industries Journal 24(6): 129-142.

Casu, B. and C. Girardone (2009) Does Competition Lead to Efficiency? The Case of EU Commercial Banks, Cass Business School, Working Paper Series, WP 01/09.

Casu, B. & Girardone, C. (2010). Integration and efficiency convergence in EU banking markets. Omega, 38(5), pp. 260-267.

Cavallo L., Rossi S.P.S., (2002), Do environmental variables affect the performance and technical efficiency of the European banking systems? A parametric analysis using the stochastic frontier approach, The European Journal of Finance, 8, 123- 146.

Caves, D. W., Christensen, L. R. and Tretheway, M. W., 1980. Flexible Cost Functions for Multiproduct Firms. Review of Economics and Statistics 62(3), 477–482.

Central Bank of Yemen (2015). Retrieved September 2015 from - http://www.centralbank.gov.ye/cby.aspx?KeyID=108&pid=1&lang=1&cattype=1

Chaffai M. E. (1997). Estimating Input-Specific Technical Inefficiency: The Case of the Tunisian Banking Industry? European Journal of Operational Research, 98, 314-331.

Chapra, M. Umer (1985). Towards a just monetary system: A discussion of money, banking, and monetary policy in the light of Islamic teachings. Leicester, UK: Islamic Foundation.

Chang, C.C., Ho, K.Y., Hsiao, Y.J. and Peng, L.T., (2014). Regulations, Market Power and Bank Efficiency in European Countries.

Chang TC and YH Chiu (2006). "Affecting Factors on Risk-Adjusted Efficiency in Taiwan's Banking Industry." Contemporary Economic Policy 24(4): 634-648.

Charnes, A., Cooper, W.W. and Rhodes, E. (1978). Measuring the efficiency of decision making units. European Journal of Operational Research 2 (6), 429–444.

Charnes A., Cooper W.W., and Rhodes, E. (1981) Evaluating program and managerial efficiency: an application of data envelopment analysis to program follow through. Manag Sci 27(6):668–697.

Charnes, A., Huang, Z.M. and Sun, D.B., (1990). Polyhedral cone-ratio DEA models with an illustrative application to larger commercial banks. Journal of Econometrics 46 (1/2), 73–91.

Chen, T. and Yeh, T. (2000) "A measurement of bank efficiency, ownership and productivity changes in Taiwan", Service Industries Journal, vol. 20, no. 1, pp. 95- 109.

Chen, X., Skully, M. and Brown, K. (2005) "Banking efficiency in China: Application of DEA to pre-and post-deregulation eras: 1993–2000", China Economic Review, vol. 16, no. 3, pp. 229-245.

Chen, C. (2009) Bank Efficiency in Sub-Saharan African Middle-Income Countries. IMF Working Paper No. 14.

Chortareas, GE, Girardone, C and Ventouri, A (2012). "Financial freedom and bank efficiency: Evidence from the European Union". Journal of Banking and Finance.

CIA (2015) - The World Factbook: Kuwait. Retrieved September 2015 from https://www.cia.gov/library/publications/the-world-factbook/geos/ku.html

CIA (2015) - The World Factbook: Egypt. Retrieved September 2015 from https://www.cia.gov/library/publications/the-world-factbook/geos/eg.html

CIA (2015). The World Factbook - Welcome to the CIA Web Site, https://www.cia.gov/library/publications/resources/the-world-factbook/geos/uk.ht (accessed December 13, 2015).

Claessens, Stijn, Asli Demirguc-Kunt, and Harry Huizinga. 2001. "How Does Foreign Entry ffect Domestic Banking Markets?" Journal of Banking and Finance 25, no. 5 (May): 891-911.

Clarke, G., Robert Cull, L. D'Amato, and A. Molinari. (2000). "On the Kindness of Strangers? The Impact of Foreign Entry on Domestic Banks in Argentina." In S. Claessens and M. Jansen, eds., The Internationalization of Financial Services: Issues and Lessons for Developing Countries, 331-54. Doredrecht, the Netherlands: Kluwer Academic.

Clarke, G. R. G., Cull, R., & Shirley, M. M. (2005). Bank privatization in developing countries: A summary of lessons and findings. Journal of Banking and Finance, 29(8–9), 1095–1930.

Coelli, T.J. (1996a), "A Guide to FRONTIER Version 4.1: A Computer Program for Frontier Production Function Estimation", CEP A Working Paper 96/07, Department of Econometrics, University of Ne w England, Armidalem.

Coelli, T.J.(1996b), "A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program", CEPA Working Paper 96/08, Department of Econometrics, University of New England, Armidale.

Coelli, T.J. and Perelman, S.A (1996) Comparison of Parametric and Non-parametric Distance Functions: With Application to European Railways, CREPP Discussion Paper no 1996/11, University of Liege, Liege.

Coelli T., Prasada Rao D.S. and Battese G. E. (1998). An Introduction to Efficiency and Productivity Analysis, Kluwer Academic Publishers.

Coelli, Tim, Antonio Estache, Sergio Perelman, and Lourdes Trujillo (2003). A Primer on Efficiency Measurementfor Utilities and Transport Regulators. Washington: The World Bank.

Coelli, T.J., Prasada Rao, D., O'Donnell, C.J. and Battese, G.E. (2005) "Data Envelopment Analysis", An Introduction to Efficiency and Productivity Analysis, pp. 161-181.

Coelli, T.J., Rao, D.P., O'Donnell, C.J. and Battese, G.E. (2005). An introduction to efficiency and productivity analysis, Springer Science Business Media.

Cooper, William W., Lawrence M. Seiford, and Joe Zhu (2004). "Data Envelopment Analysis: History, Models, and Interpretations." In Handbook on Data Envelopment Analysis. Boston: Kluwer Academic.

Cooper, W., Seiford, L.M., Tone, K., 2007. Data Envelopment Analysis: A Comprehensive Text with Models Applications. Springer Science, New York

Cornett, M.M., McNutt, J.J. and Tehranian, H. (2006) Performance Changes Around Bank Mergers: Revenue Enhancements Versus Cost Reductions, Journal of Money, Credit, and Banking 38: 1013-1050.

Cummins, J. D. and Weiss, M. A. (2011). Analyzing Firm Performance in the Insurance Industry Using Frontier Efficiency Methods. In: Dionne, G., ed., Handbook of Insurance Economics. Kluwer Academic Publishers, Boston, MA.

Cummins, J.D. and Zi, H. (1998). Comparison of frontier e ciency methods: An application to the US life insurance industry. Journal of Productivity Analysis.

Damodar N. Gujarati, 2003 "Basic Econometrics" fourth edition McGraw-Hill, New York.

Debnath, R.M. and Shankar, R. (2008) "Measuring performance of Indian banks: an application data envelopment analysis", International Journal of Business Performance Management, vol. 10, no. 1, pp. 57-85.

Debreu, G. (1951). The coefficient of resource utilization. Econometrica, 19(3):273–292.

Delis, M.D. and Papanikolaou, N.I. (2009) "Determinants of bank efficiency: evidence from a semi-parametric methodology", Managerial Finance, vol. 35, no. 3, pp. 260-275.

Delis M.D., Koutsomanoli-Fillipaki K., Staikouras C.K., Gerogiannaki K. (2008). Evaluating cost and profit efficiency: a comparison of parametric and nonparametric methodologies, Applied Financial Economics.

Demirguc-Kunt, A. and Huizinga, H. (2000). "Financial structure and bank profitability." World Bank Mimeo.

Deminguc-Kunt, Harry Huixinga,1999, "Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence", The World Bank Economic Review,(13):379-408

Demirgüç-Kunt, A., and Levine, R. (1996). "Stock market development and financial intermediaries: stylized facts." World Bank Economic Review, 13:379-408.

Demsetz, H. (1973). Industry Structure, Market Rivalry and Public Policy, Journal of Law and Economics, Vol.16, N°.1.

Demsetz H. (1974). "Two Systems of Belief about Monopoly", in Goldschmid H.J., Mann H.M. and J.F. Weston (eds), Industrial Concentration: The New Learning, 164-184, Boston: Little Brown.

Detragiache, E., Gupta, P. and Tressel, T. (2005). 'Finance in lower-income countries: An empirical exploration', International Monetary Fund Working Paper 05/167.

Devaney, M. and W. L. Weber (2000). 'Productivity growth, market structure, and technological change: evidence from the rural banking sector.' Applied Financial Economics 10: 587-595.

DeYoung, R. (1997), "A Diagnostic Test for the Distribution-free Efficiency Estimator: An Example Using U.S. Commercial Bank Data", European Journal of Operational Research, vol. 98, no. 2, pp. 243-249.

Diamond D. (1991). Monitoring and reputation: the choice between bank loans and directly placed debt. Journal of Political Economy 99(4): 689-721.

Dietsch, M. and A. Lozano-Vivas (2000). 'How the environment determines banking efficiency: A comparison between French and Spanish industries.' Journal of Banking and Finance 24(6): 985-1004.

Djankov, S., C. McLiesh, and A. Shleifer (2007). Private credit in 129 countries, Journal of Financial Economics 84, 299-329.

Dogan E., Fausten D.K., (2003), Productivity and Technical Change in Malaysian Banking: 1989-1998, Asia-Pacific Financial Markets, 10, 205-237.

Drake, L. and Howcroft, B. (1999), "Measuring the relative efficiency of the selling function: an application of data envelopment analysis to UK bank branches", Journal of Financial Services Marketing, Vol. 3, pp. 297□315.

Drake, L. & Hall, M.J.B. (2003) "Efficiency in Japanese Banking: An Empirical Analysis." Journal of Banking and Finance 27(5): 891–917.

Drake L., Hall M.J.B., Simper R., (2006). The impact of macroeconomic and regulatory factors on bank efficiency: A non-parametric analysis of Hong Kong's banking system, Journal of Banking and Finance, 30, 1443-1466.

Drake, L.M., Hall, M.J. and Simper, R. (2003) "The impact of macroeconomic and regulatory factors on bank efficiency: a non-parametric analysis of Hong Kong's financial services sector".

DTZ (2008). "Islamic Finance and Real Estate", London: DTZ. EPRA (2008), Global REIT Survey, Brussels: EPRA.

El-Gamal, Mahmoud A. and Hulusi Inanoglu (2005). "Inefficiency and Heterogeneity in Turkish Banking: 1990-2000". Journal of Applied Econometrics 20, no. 5: 641-65.

Ellahi, N., Khattak, N. A., Ur-Rehman, K., & Jamil, N. (2011, December Saturday). Testing Technical and Cost Efficiency of Pakistani Islamic Banking System. Retrieved 8 2014, from Islamic Economics & Finance Pedia : http://www.iefpedia.com/english/?p=6523

El-Moussawi, C. and Obeid, H. (2011) "Evaluating the productive efficiency of Islamic banking in GCC: A non-parametric approach", International Management Review, vol. 7, no. 1, pp. 10-21.

Efron B., 1979, Bootstrap Methods: Another look at the Jackknife, Annals of Statistics, 7, 1- 26.

Efron, B., and R. Tibshirani1985 “The bootstrap method forassessing statistical accuracy.” Behaviormetrika, 17:1–35

Eling, M. and Luhnen, M. (2010). “Frontier Efficiency Methodologies to Measure Performance in the Insurance Industry”. Geneva Papers on Risk and Insurance, Vol. 35 (2010), No. 2, S. 217-265.

El Said A., and Ziemba R., 2009, ―Stress-testing Islamic Finance, Roubini Global Economics, May 10, 2009.

Emrouznejad A. and A. L. Anouze (2010), DEA/C&R: DEA with classification and regression tree: a case of banking efficiency, Expert Systems, in Press.

English, M, S. Grosskopf, K. Hayes, and S. Yaisawarng (1993). "Output Allocative and Technical Efficiency of Banks”. Journal of Banking and Finance, 17, pp. 349-66.

Erkoc, Taptuk Emre (2012). "Estimation Methodology of Economic Efficiency: Stochastic Frontier Analysis vs Data Envelopment Analysis." International Journal of Academic Research in Economics and Management Sciences.

Eveleth, S., & Shoraka, J. (2005). Retrieved September 19, 2015, from http://pdf.usaid.gov/pdf_docs/pnabf648.pdf.

Farooq, M., & Zaheer, S. (2015). Are Islamic Banks More Resilient during. IMF Working Paper , 3-18.

Farrell, M. J. (1957). The measurement of productive efficiency. Journal of the Royal Statistical Society, 120(3):253–281.

Federal Research Division. (2004). Kuwait a Country Study. Kessinger Publishing

Fethi, Meryem Duygun and Pasiouras, Fotios (2010). "Assessing bank efficiency and performance with operational research and artificial intelligence techniques: A survey," European Journal of Operational Research, Elsevier, vol. 204(2), pages 189-198, July.

Ferrier, Gary D., Shawna Grosskopf, Kathy J.Hayes, and Suthathip Yaisawarng. (1993). “Economies of Diversification in the Banking Industry: A Frontier Approach.” Journal of Monetary Economics 31, 229-249.

Ferrier G. and Lovell C.A.K. (1990). "Measuring Cost Efficiency in Banking: Econometric and Linear Programming Evidence", Journal of Econometrics 46, 229--245.

Figueira, C., Nellis, J. and Parker, D. (2009) "The effects of ownership on bank efficiency in Latin America", Applied Economics, vol. 41, no. 18, pp. 2353-2368.

Fiordelisi F., (2008), Efficiency and shareholder return in banking, International Journal of Banking, Accounting and Finance, 1, 114- 132.

Flamini, V., Schumacher, M.L. and McDonald, M.C.A. (2009). The determinants of commercial bank profitability in Sub-Saharan Africa (No. 9-15). International Monetary Fund.

Freixas, X. and Santomero, A. M. (2004). “Regulation of Financial Intermediaries: A Discussion”, in S. Bhattacharya, A. W. A. Boot, and A. V. Thakor (eds),

Credit, Intermediation, and the Macroeconomy, Oxford, Oxford University Press.

Fried H.O.,Schmidt S.S. and S. Yaisawarng, 1995, Incorporating the Operating Environment into a Measure of Technical Efficiency, mimeo, (Union College, Schenecdaty).

Fries, S. and Taci, A. (2005): "Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries", Journal of Banking and Finance, Vol. 29, pp. 55-81.

Fuentes, R., & Vergara, M. (2003). Explaining Bank Efficiency: Bank Size or Ownership Structure? Paper presented at the Proceedings of the VIII Meeting of the Research Network of Central Banks of the Americas, Venezuela.

Fukuyama, H. (1993). "Technical and Scale Efficiency of Japanese Commercial Banks: A Non-Parametric Approach." Appl Econ 25(8): 1101-1112.

Fukuyama, H., Weber, W.L. (2009). A directional slacks-based measure of technical inefficiency. Socio Econ. Plan. Sci. 43, 274–287.

Fung, M. K. (2006). 'Scale economies, X-efficiency, and convergence of productivity among bank holding companies.' Journal of Banking and Finance 30(10): 2857-2874.

Galagedera D U A, Silvapulle P (2003). Experimental Evidence on Robustness of Data Envelopment Analysis.Journal of the Operational Research Society; 54(6):654–60.

Gallant, A. R. (1982). Unbiased Determination of Production Technologies. Journal of Econometrics 20(2), 285– 323. Gardner, L.

Gardener, E., Molyneux, P. and Nguyen-Linh, H. (2011). Determinants of efficiency in South East Asian banking,The Service Industries Journal,31, 2693–719. doi:10.1080/02642069.2010.512659

Giokas, D. (1991). Bank Branches Operating Efficiency: A Comparative Application of DEA and Loglinear Model. Omega, 19, 549-557.

Gjirja, M. (2003). Assessing the efficiency effects of bank mergers in Sweden: A panel-based Stochastic Frontier Analysis. Working Paper, University of Göteborg.

Goddard, J., Molyneux, P., Wilson, J., (2004), «The profitability of European Banks: a cross- sectional and dynamic panel analysis», Manchester School 72 (3), 363–381.

Goitein, S.D. (1971). A Mediterranean Society. Berkley and Los Angeles: University of California Press.

Golany, B. and Storbeck, J. (1999), "*A data envelopment analysis of the operational efficiency of bank branches*", *Interfaces*, Vol. 29, pp. 14-26.

Gonzalez, F. (2009) "Determinants of Bank Market Structure: Efficiency and Political Economy Variables", Journal of Money, Credit and Banking, vol. 41, no. 4, pp.735-754.

Gujarati, D.N. 2003. Basic econometrics (4th edn.). Singapore: McGraw-Hill.

Grais, W., and Z. Kantur (2003). “The Changing Financial Landscape: Opportunities and Challenges for the Middle East and North Africa.” World Bank Policy Research Working Paper no. 3050, Washington, DC.

Greene, W.H. (1990), "A gamma-distributed stochastic frontier model", Journal of Econometrics 46, 141-163.

Greene, W. H. (1997). Frontier production functions. In Pesaran, M. H. and Shmidt, P., editors, Handbook of Applied Econometrics, volume II: Microeconometrics. Blackwell Publishers Ltd.

Greene, William H. (2012). Econometric Analysis, 7th ed. Harlow: Pearson.

Grigorian, D. A. and Manole, V. (2002): “Determinants of Commercial Bank Performance in Transition: An Application of Data Envelopment Analysis”. IMF Working Paper No. 146. World Bank.

Grigorian, D. A. and V. Manole (2005). 'A Cross-Country Nonparametric Analysis of Bahrain’s Banking System.' IMF Working Paper WP/05/117 International Monetary Fund, Washington DC.

Gulati, R., and Kumar, S. (2012). Deregulation and Efficiency of Indian Banks, Springer Science Business Media.

Halkos, G. "Efficiency Measurement of the Greek Commercial Banks with the Use of Financial Ratios: A Data Envelopment Analysis Approach." Management Accounting Research 15, no. 2 (June 2004): 201-24.

Hall, M.J., Kenjegalieva, K.A. and Simper, R. (2012) "Environmental factors affecting Hong Kong banking: A post-Asian financial crisis efficiency analysis", Global Finance Journal,

Habibullah MS, Makmur MI, Azman-Saini WNW, Radam A, and Ong HB (2005). Bank efficiency and the efficient market hypothesis: The case for bank stock prices in KLSE. Savings and Development; 29(4):363-390.

Hahn F.R., (2007a), Domestic mergers in the Austrian banking sector: a performance analysis, Applied Financial Economics, 17, 185-196.

Hahn, F.R., (2007b), Environmental determinants of banking efficiency in Austria, Empirica, 34, 231-245.

Hamid, M. A. (1999). "Islamic Banking in Bangladesh: Expectations and Realities." Paper presented atthe International Conference on Islamic Economics in the 21st Century, Kuala Lumpur,Malaysia., 9-12 August.

Hamim S. Ahmed Mokhtar, Naziruddin Abdullah, Syed M.Al- Habshi (2006), ‘Efficiency of Islamic Banking in Malaysian: A Stochastic Frontier Approach’, Journal of Islamic Corporation, 27 (2), 37-70.

Hamim S., A.M., A. Naziruddin, and M.A. Syed, Efficiency and competition of Islamic banking in Malaysia. Humanomics, 2008. 24(1): p. 28-48.

Hancock, D. (1986). A Model of the Financial Firm with Imperfect Asset and Deposit Elasticities. Journal of Banking and Finance,10, 37-54.

Harker, P. T. (2012). The Service Productivity and Quality Challenge (Vol. Volume 5 of International Studies in the Service Economy). Springer Science & Business Media.

Harker, P. T., & Zenios, S. A. (2000). Performance of Financial Institutions: Efficiency, Innovation, Regulation. Cambridge University Press.

Hasan, M., & Dridi, J. (2010). The effects of the global crisis on Islamic and conventional banks: A comparative study. IMF Working Paper, WP/10/201.

Hassan, K. (2005). The Cost, Profit and X-Efficiency of Islamic Banks. Presented at ERF's (Economic Research forum) 12th Annual Conference, Cairo, Egypt.

Hassan, M.K. and Hussein, K.A. (2003). Static and dynamic efficiency in the Sudanese banking system. Review of Islamic Economics 14, 5–48.

Hassan, M. Kabir. (1999). "Islamic Banking in Theory and Practice: The Experience of Bangladesh." Managerial Finance, 25:5, pp. 60-113.

Hassan, M. Kabir, and Abdel-Hameed M. Bashir (2003). "Determinants of Islamic BankingProfitability." Paper presented at the 10th Annual Conference, Marrakesh.http://www.erf.org.eg/tenthconf/Financial_Markets_Presented/Kabir_Bashir.pdf 2003.

Hassan, M. Kabir and Mervyn Lewis (2009). Handbook of Islamic Banking. Cheltenham: Edward Elgar, pp. 96–115

Hassan, Taufiq, Shamsher Mohamad, and Mohammed Khaled I. Bader (2009). "Efficiency of conventional versus Islamic banks: Evidence from the Middle East." International Journal of Islamic and Middle Eastern Finance and Management 2: 46-65.

Hassoune, Anouar (2002). "Islamic Banks' Profitability in an Interest Rate Cycle". The Arab Bank REVIEW 4, no. 2: 54-58.

Hausman, J.A. (1978) "Specification tests in econometrics", Econometrica: Journal of the Econometric Society, pp. 1251-1271.

Hauner, D. (2005). Explaining efficiency differences among large German and Austrian bank Appl. Econ., 37 (9) (2005), pp. 969–980.

Hermes, N. and Nhung, V.T.H. (2010) "The impact of financial liberalization on bank efficiency: evidence from Latin America and Asia", Applied Economics, vol. 42, no. 26, pp. 3351-3365.

Hjalmarsson, L., Andersson, I., and Mlima, A., (2000) “Swedish Banking Efficiency and Productivity in an International Perspective.” Estocolmo: Supplement Number 28 to the Government Inquiry on the International Competitiveness of the Swedish Financial Sector.

Ho, C. T. and Zhu D.S. (2004). “Performance measurement of Taiwan's commercial banks”. International Journal of Productivity and Performance Management 53(5/6): 425-434.

Hoff, A., 2007. Second stage DEA: comparison of approaches for modelling the DEA score. European Journal of Operational Research 181 (1), 425–435.

Howland M and J Rowse (2006). “Measuring Bank Branch Efficiency Using Data Envelopment Analysis: Managerial and Implementation Issues.” INFOR 44(1): 49-63.

Humphrey, D. B. (1985) “Costs and Scale Economies in Bank Intermediation”, In Aspinwall, R. C. & Eisenbeis, R. A. (Ed.), Handbook for Banking Strategy, pp. 745-783, New York: John Wiley and Sons.

Humphrey, D. B. (1993). “Cost and Technical Change: Effects from Bank Deregulation”, Journal of Productivity Analysis, 4 : 5-34.

Hussels, S. and Ward, D.R. (2006). The Impact of Deregulation on the German and UK Life Insurance Markets: An Analysis of Efficiency and Productivity between 1991 and 2002. Working Paper.

Hussein, K. H. (2004). Banking efficiency in Bahrain: Islamic versus conventional banks.Islamic Development Bank, Islamic Research and Training Institute, Research Paper, No. 68.

Hussein, K.A. (2003) Operational Efficiency in Islamic Banking: The Sudanese Experience, Islamic Research and Training Institute (IRTI), Islamic Development Bank.

Iqbal, M. (2001), “Islamic and Conventional Banking in the Nineties: A Comparative Study”, Islamic Economic Studies, 8 (2), 1-27.

Iqbal, M. (2013). Islamic finance: An attractive new way of financial. International Journal of Banking and Finance , 1-23.

Iqbal, M., & Llewellyn, David T. (2002). Islamic Banking and Finance: New Perspectives on Profit Sharing and Risk. Cheltenham, UK: Edward Elgar.

Iqbal, Munawar, and Philip Molyneux (2005). Thirty years of Islamic banking: History, performance, and prospects. Houndmills: Palgrave Macmillan.

Iqbal, Zahid, Kizhanathan V Ramaswamy, and Aigbe Akhigbe (1999). "The Output Efficiency of Minority-Owned Banks in the United States." International Review of Economics & Finance., 8:1, pp. 105.

International Monetary Fund. (2013). Saudi Arabia: Financial Sector Assessment Program Update—Detailed Assessment of. Washington, D.C.: International Monetary Fund - Publication Services.

Isik I., (2007), Bank ownership and productivity developments: evidence from Turkey, Studies in Economics and Finance, 24, 115-139.

Isik I. and Hassan M.K., (2002), Technical, scale and allocative efficiencies of Turkish banking industry, Journal of Banking and Finance, 26, 719-766

Isik I. and Hassan MK (2003) Efficiency, ownership and market structure, corporate control and governance in the Turkish banking industry. J Bus Financ Account 30:1363–1421.

Islamic Development Bank. (2013, May). 39 YEARS IN THE SERVICE OF DEVELOPMENT. Kingdom of Saudi Arabia.

Jobst, Andreas A. The economics of Islamic finance and securitization (2007). Washington, D.C.: International Monetary Fund, Monetary and Capital Markets Dept.

Johnes, J. (2006) Data envelopment analysis and its application to the measurement of efficiency in higher education. Economics of Education Review, 25 (3).

pp. 273-288. ISSN 0272-7757 This version is available at http://eprints.hud.ac.uk/23581/

Johnes, J., Izzeldin, M., Pappas, V (2014). A comparison of performance of Islamic and conventional banks 2004 to 2009. 07/2014 In: Journal of Economic Behavior and Organization. 103, Supplement, p. S93-S107. 15 p.

Kablan., S. (2007). "Banking Efficiency and Financial Development in Sub-Saharan Africa" IMF Working Paper WP/09/1 (Washington: International Monetary Fund).

Kaffash, S. (2014). Bank Performance and Oil price changes in Middle East. Retrieved from http://bura.brunel.ac.uk/bitstream/2438/9193/1/FulltextThesis.pdf

Kamali, H.M (2007). "A Shariah Analysis of Issues in Islamic Leasing" Islamic Econ vol, 20 (1), 3-22. The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

Kamaruddin, Badrul Hisham, Safa , Mohammad Samaun and Mohd , and Rohani (2008). "Assessing production efficiency of Islamic banks and conventional bank Islamic windows inMalaysia". International Journal of Business and Management,1 (1), 31-48.

Kaparakis, E. I., Miller, S. M., & Noulas, A. G. (1994). Short-Run Cost Inefficiency of Commercial Banks: A Flexible Frontier Approach. Journal of Money, Credit and Banking, 26(4), 875-893. http://dx.doi.org/10.2307/2077953

Kashyap, Amit K (2014). Indian Banking: Contemporary Issues in Law and Challenges. New Delhi: Allied Publishers Pvt. Ltd., 2014.

Kasman, A. (2005). "Efficiency and Scale Economies in Transition Economies." Emerging Markets Finance & Trade, 41:2, pp. 6081.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance Matters VIII: Aggregate and Individual Governance Indicators.

Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper No. 5430. Available at SSRN: http://ssrn.com/abstract=1682130.

Kaparakis, E. I., Miller, S. M., and Noulas, A. G. (1994). Short-Run Cost Inefficiency of Commercial Banks: A Flexible Frontier Approach. Journal of Money, Credit and Banking, 26(4), 875-893. http://dx.doi.org/10.2307/2077953.

Kenjegalieva, K, Simper, R, Weyman Jones, TG, Zelenyuk, V (2009) Comparative Analysis of Banking Production Frameworks in Eastern European Financial Markets, *The European Journal of Operations Research*, 198(1), pp.Pp.326-340, DOI: 10.1016/j.ejor.2008.09.002.

Khediri, K. B., Charfeddine, L., Ben Youssef, S. (2015). Islamic versus conventional banks in the GCC countries: A comparative study using classication techniques. Research in International Business and Finance 33, 7598.

Koopmans, T. C. (1951). An analysis of production as an efficient combination of activities. In Koopmans, T. C., editor, Activity Analysis of Production and Allocation. Jhon Wiley and Sons, Inc.

Košak, M. and Zajc, P. (2006). "The East-West efficiency gap in European banking." In Balling M., Lierman F. and Mullineux A. (eds.): Competition and Profitability in European Financial Services. Strategic, systemic and policy issues." Routledge / SUERF, pp. 63-79.

Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration, Managerial Finance ,Vol. 34 No. 3, 2008 pp. 146-159

Koutsoyiannis, A. (1979). Modern Microeconomics, Second Edition, St. Martin's Press, New York.

Koutsomanoli-Filippaki, A., D. Margaritis and C. Staikouras (2009). 'Efficiency and productivity growth in the banking industry of Central and Eastern Europe.' Journal of Banking and Finance 33(3): 557-567.

Kumar, S., & Gulati, R. (2008). An Examination of Technical, Pure Technical, and Scale Efficiencies in Indian Public Sector Banks using Data Envelopment Analysis. Eurasian Journal of Business and Economics.

Kumar, S., & Gulati, R. (2013). Deregulation and Efficiency of Indian Banks. Springer Science & Business Media.

Kumbhakar, S. and Lozano-Vivas, A. (2005). "Deregulation and Productivity: The Case of Spanish Banks," Journal of Regulatory Economics, Springer, vol. 27(3), pages 331-351, 01.

Kumbhakar, S.C., Lovell, C.K. (2003). Stochastic frontier analysis. Cambridge University Press.

Kumbhakar, S.C. and A. Lozano-Vivas (2004). Does Deregulation Make Markets More Competitive? Evidence Of Mark-Ups In Spanish Savings Banks, Applied Financial Economics, 14, 507-515.

Kuussaari, H., and J. Vesala (1995). "The Efficiency of Finnish Banks in Producing Payment and Account Transactionsa, working paper, Bank of Finland, Finland.

Kyj L., Isik I., (2008), Bank x-efficiency in Ukraine: An analysis of service characteristics and ownership, Journal of Economics and Business, 60, 369-393.

Lang, G., Welzel, P. (1996), Efficiency and Technical Progress in Banking. Empirical Results for a Panel of German Cooperative Banks, Journal of Banking and Finance 20, 1003-1023.

Laurenceson, J. and Qin, F., (2008), Has minority foreign investment in China's banks improved their cost efficiency? China and World Economy, 16, 3, 57-74.

Lessambo, F. (2013). The International Banking System: Capital Adequacy, Core Businesses and Risk Management. Palgrave Macmillan.

Lovell, C.K. and Eeckaut, P.V. (1993) Frontier tales: DEA and FDH, Springer.

Lovell, C. K. (1993). Production frontiers and productive efficiency. In Fried, A. O., Lovell, A. K., and Schmidt, S. S., editors, The Measurement of Productive Efficiency, chapter 1, pages 3 – 67. Oxford University Press.

Lozano-Vivas, A. (1997). 'Profit efficiency for Spanish savings banks.' European Journal of Operational Research 98: 381-394.

Lozano-Vivas, A., Pastor, T. J, Pastor, M. J., (2002), An Efficiency Comparison of European Banking Systems Operating Ander Different Environmental Conditions, Journal of Productivity Analysis, 18, 59-77.

Lozano-Vivas A., Pastor J.T. and Hasan I., (2001), European Bank Performance Beyond Country Borders: What Really Matters, European Finance Review, 5, 141-165.

Mahesh, H. and Rajeev, M. (2008). "Producing Financial Services: An Efficiency Analysis Of Indian Commercial Banks". Journal of Services Research, vol. 8, no. 2. Matias, Á., Peter, N., & Manuela, S. (2009). Advances in Tourism Economics: New Developments. Springer Science & Business Media.

Maudos J., Pastor J.M. and Perez F., (2002), Competition and efficiency in the Spanish banking sector: the importante of specialization, Applied Financial Economics, 12, 505-516.

McAllister, P.H., and D.A. McManus (1993). “Resolving the Scale Efficiency Puzzle in Banking,” Journal of Banking and Finance, 17: 389-405.

McDonald, J., 2009. Using least squares and tobit in second stage DEA efficiency analyses. European Journal of Operational Research 197 (2), 792–798.

Mester, L.J. (1996). A study of bank efficiency taking into account risk preferences. Journal of Banking and Finance, 20, pp. 1025–1045.

Mester, L. J. (1997). 'Measuring efficiency at US banks: accounting for heterogeneity is important.' European Journal of Operational Research 98: 230-242.

Metwally, M. M. (1997). "Differences between the Financial Characteristics ofInterest-Free Banks and Conventional Banks." European Business Review, 97:2.

Mejía, A. L., Aljabrin, S., Awad, R., Norat, M., & Song, I. (2014). Regulation and Supervision of Islamic Banks. IMF Working Paper .

Milbourn, T., Boot, A.W.A., Thakor, A.V. (1999). Megamergers and expanded scope, theories of banking size and activity diversity. Working paper. Journal of Banking and Finance 23, 195± 214, this issue.

Miller, S.M., and Noulas, A.G. (1997). Portfolio mix and large-bank probability in the USA. Applied Economics 29 (4), 505–512.

Mokhtar, Hamim S. Ahmad, Naziruddin Abdullah, and Syed M. Al-Habshi (2006). "Efficiency of Islamic Banking in Malaysia: A Stochastic Frontier Approach". Journal of Economic Cooperation 27, no. 2: 37-70.

Mokhtar, H.S.A., Abdullah, N., Alhabshi, S.M., 2007. Technical and cost efficiency of Islamic banking in Malaysia. Review of Islamic Economics 11 (1), 5–40.

Mokhtar, H.S.A., Abdullah, N. and Alhabshi, S.M. (2008) "Efficiency and competition of Islamic banking in Malaysia", Humanomics, vol. 24, no. 1, pp. 28-48.

Molyneux, P., Nguyen, L.H. and Xie, R. (2013) "Foreign bank entry in South East Asia",International Review of Financial Analysis, vol. 30, pp. 26-35.

Molyneux, P., Altunbas, Y. and Gardener, E.P. (1996) Efficiency in European banking, Wiley Chichester.

Molyneux, P. and J. Thornton (1992). "Determinants of European bank profitability: A note." Journal of Banking and Finance 16, 1173-1178.

Molyneux, P, Thornton, J, and D.M. Lloyd-Williams (1996) Competition and market contestability in Japanese commercial banking system, Journal of Economics and Business, 48, 33-45.

Morrison, C. J., Berndt, E. R. (1982). Short-Run Labor Productivity in a Dynamic Model. Journal of Econometrics 16(3), 339–365.

Mostafa, M. (2007). "Modeling the efficiency of GCC banks: a data envelopment analysis approach". International Journal of Productivity and Performance Management 56(7): 623-643.

Moradi-Motlagh, A., Abdekhodaee, A., Saleh, A.S. and Ektesabi, M. (2012), 'Efficiency analysis of US banks', The Business Review, Cambridge, vol. 20, no. 1, pp. 90–99.

Moradi-Motlagh, A. and Saleh, A.S. (2014) Re-Examining the Technical efficiency of Australian Banks: A Bootstrap DEA Approach, Australian Economics Papers, 53 (1-2): 112-128.

Mostafa, M.M. (2009): "Modeling the competitive market efficiency of Egyptian companies: A probabilistic neural network analysis", Expert Systems with Applications, 36(5), 8839-8848.

Mostafa, M. (2009). "Modeling the Efficiency of Top Arab Banks: A DEA–neural Network Approach". Expert Systems with Applications 36, no. 1: 309-20.

Murillo-Zamorano, Luis R. (2004). "Economic Efficiency and Frontier Techniques." Journal of Economic Surveys 18, no. 1: 33-77.

Mukherjee, K., Ray, S.C. and Millar, S.M. (2001). Productivity growth in large US banks: The initial postderegulation experience. Journal of Banking and Finance 25 (5), 913–939.

Mukherjee A, Nath P and Pal MN (2002). "Performance benchmarking and strategic homogeneity of Indian banks," Int. J. Bank Market. 20(3):122-139.

Nienhaus, Volker (1988). "The Performance of Islamic Banks: Trends and Cases." In Islamic Law and Finance, edited by Chibli Mallat, 160. London: Graham and Trotman.

Noman, Abdullah M. (2002). Imperatives of Financial Innovation for Islamic Banks: International Journal of Islamic Financial Services, Vol.4, No.3

Noor, M. A., & bt Ahmad, N. H. (2011). Measuring MENA Islamic Banks Efficiency: Does Country Income Level Have an Impact?

Noor, M.A.N.M., Ahmad, N.H.B. and Sufian, F (2010).”The efficiency of Islamic banks: Empirical Evidence from Asian countries Islamic banking sectors”.

Olson, D. and Zoubi, T.A. (2011). "Efficiency and bank profitability in MENA countries", Emerging markets review, vol. 12, no. 2, pp. 94-110.

OFT (2010). Review of barriers to entry, expansion and exit in retail banking, p 35, para 3.23.

Omar,M.A., Majid, M.S.A., and Rulindo, R (2007).Efficiency and productivity performance of the national private banks in Indonesia Gadjah Mada International Journal of Business, 9 (1), pp. 1–18.

Oral, M., & Yolalan, R. (1990). An Empirical Study on Measuring Operating Efficiency and Profitability of Bank Branches. European Journal of Operational Research, 46(3), 282-294.

Orea, Luis. (2002). "Parametric Decomposition of a Generalized Malmquist Productivity Index." Journal of Productivity Analysis, 18:1, pp. 5-22.

Pancurova, D. and Lyocsa, S. (2013) "Determinants of Commercial Banks’Efficiency: Evidence from 11 CEE Countries",Czech Journal of Economics and Finance (Finance a uver),vol. 63, no. 2, pp. 152-179.

Parkan, C. (1987). Measuring the Efficiency of Service Operations: An Application to Bank Branches. Engineering Costs and Production Economics, 12(1-4), 237-242.

Parsons, D.J., Gottlieb, C.C., and Denny, M. (1993) “Productivity and computers inCanadian banking,” Journal of Productivity Analysis, 4:91–110.

Pascoe, S., Kirkley, J. E., Gréboval, D., & Morrison, C. J. (2003). Measuring and Assessing Capacity in Fisheries: Issues and methods. Rome: FAO.

Pasiouras, F., (2008a). "Estimating the technical and scale efficiency of Greek commercial banks: the impact of credit risk, off-balance sheet activities, and international operations", Research in International Business and Finance, vol. 22, no. 3, pp. 301-318.

Pasiouras F., (2008a), International evidence on the impact of regulations and supervision on banks’ technical efficiency: an application of two-stage data envelopment analysis, Review of Quantitative Finance and Accounting, 30, 187-223.

Pasiouras, F. (2013). Efficiency and Productivity Growth: Modelling in the Financial Services Industry. John Wiley & Sons.

Pasiouras, F. and Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial bnaks in the European Union, International Business and Finance, 21, 222-237.

Pasiouras F., Liadaki A. and Zopounidis C., (2008), Bank efficiency and share performance: evidence from Greece, Applied Financial Economics, 18, 1121-1130.

Pastor, Jose-Manuel, Francisco Perez, and Javier Quesada (1997). "Efficiency Analysis in Banking Firms: An International Comparison." European Journal of Operational Research, 98:2, pp. 395-407.

Pastor, J. M. (1999). Efficiency and Risk Management in Spanish Banking: A Method to Decompose Risk. Applied Financial Economics, 9(4): 371-385.

Pastor J.M., (2002), Credit risk and efficiency in the European banking system: A three-stage analysis, Applied Financial Economics, 12, 895-911.

Pavero, C. A. and Papi, L. (1995). »Technical Efficiency and Scale Efficiency in the Italian Banking Sector: a Non-Parametric Approach". Applied Economics. Vol. 27. Num. 4. Págs: 385-395.

Perry, P. 1992. Do banks gain or lose from inflation. Journal of Retail Banking, Vol. 14 No. 2, pp. 25-40

Plümper, T., and V. Troeger (2007). Efficient estimation of time-invariant and rarely changing variables in finite sample panel analyses with unit fixed effects. *Political Analysis*, 15,124–39.

Plümper, T., and V. Troeger (2011). Fixed effects vector decomposition: properties, reliability and instruments. *Political Analysis*, 19, 147–64.

Porcelli, Francesco. "Measurement of Technical Efficiency (2009). A Brief Survey on Parametric and Non-parametric Techniques".

Portela, Maria C.A.S. & Thanassoulis, Emmanuel, 2010. "Malmquist-type indices in the presence of negative data: An application to bank branches," Journal of Banking & Finance, Elsevier, vol. 34(7), pages 1472-1483, July.

Pulley, L. B., Braunstein, Y. (1992). A Composite Cost Function for Multiproduct Firms with an Application to Economies of Scope in Banking. Review of Economics and Statistics 74(2), 221–230. http://www.pwc.co.uk/services/economics-policy/insights/uk-economic-outlook/ukeo-july2014-theuks-standing-in-the-world.html

Raab, R. and Lichty, R. (2002), "Identifying sub□areas that comprise a greater metropolitan area: the criterion of county relative efficiency", Journal of Regional Science, Vol. 42, pp. 579-94.

Reda, M., and I. Isik (2006). "Efficiency and Productivity Change of Egyptian Commercial Banks 1995-2003," ERF 13th Annual Conference, Kuwait, December 2006.

Resti, A. (1997). "Evaluating the cost□efficiency of the Italian banking system: what can be learned from the joint application of parametric and nonparametric techniques", Journal of Banking & Finance, Vol. 21, pp. 221□50

Rosman, R., Wahab, N.A., Zainol, Z., (2014). Efficiency of Islamic banks during the financial crisis: An analysis of Middle Eastern and Asian countries. Pacific-Basin Finance Journal.

Saeed, Abdullah (1996). Islamic banking and interest: A study of the prohibition of riba and its contemporary interpretation.

Şakar, B. (2006). A study on efficiency and productivity of Turkish banks in Istanbul stock exchange using malmquist DEA. Journal of American Academy of Business, 8(2), 145-155.

Samad, A. (1999) Relative Performance of Conventional banking vis-à-vis Islamic Bank in Malaysia. IIUM Journal of Economics and Management. 7 (1), 1-25.

Samad, A. and Hassan, M. K. (1999). The performance of Malaysian Islamic bank during 1984-1997: An exploratory study.International Journal of Islamic Financial Services, 1 (3),1-14.

Samad, Abdus (2004). "Performance of Interest-Free Islamic Banks Vis-a-Vis Interest-Based Conventional Banks of Bahrain". IIUM Journal of Economics and Management 12, no. 2: 115-29.

San, O., Theng, L.Y. and Teh, B. (2011) "A Comparison on efficiency of Domestic and Foreign Banks in Malaysia: DEA approach", Journal of Business management Dynamics, vol. 1, no. 4, pp. 3-49.

Sanyal, P. and Shankar, R. (2011), "Ownership, competition and bank productivity: an analysis of Indian banking in the post reform period", International Review of Economics and Finance, Vol. 20 No. 2, pp. 225-247.

Sathya. M. (2001) X-efficiency in Australian banking; an empirical investigation, Journal of Banking and Finance, Vol. 25, pp.613-630.

Saxonhouse, G.R. (1976). Estimated parameters as dependent variables. The American Economic Review, 66 (1976), pp. 178–183.

Schaffnit, C., Rosen, D. and Paradi, J. (1997), "Best practice analysis of bank branches: an application of DEA in a large Canadian bank", European Journal of Operational Research, Vol. 98, pp. 269□89.

Sealey, C.W. Jr. & Lindley, J.T. (1977) "Inputs, Outputs, and a Theory of Production and Cost at Depository Financial Institutions." Journal of Finance 32(4): 1251-1266.

Seiford, L. and Zhu, J. (1999), "Profitability and marketability of the top 55 US commercial banks",Management Science, Vol. 45, pp. 1270□88.

Shamshad Akhtar, (2007). Islamic finance: sustainability and challenges. Business Recorder, 20 October 2007.

Shamsher, M., H. Taufiq and Mohammad Ariff (2007). "Research in an emerging Malaysian capital market: a guide to future direction", International Journal of Economics and Management, 1(2), June, 173–202.

Sharma, M. (2008). Dynamics of Indian Banking: Views and Vistas. Atlantic Publishers & Dist.

Shoaib, N. (2007). 'Top 500 Islamic financial institutions'. The Banker.

Siddiqi, Mohammad Enjatuliah (2006). "Islamic Banking and Finance in Theory and Practice: A Survey of State the Art".

Simar L., 1992, Estimating Efficiency from Frontier Models with Panel Data: A Comparison of Parametric, Non-Parametric and Semi-Parametric Methods with Bootstrapping, Journal of Productivity Analysis, 3, ½, 171-191.

Shawtari, F.A., Saiti, B., Abdul Razak, S.H., and Ariff, M. (2015). The impact of efficiency on discretionary loans/finance loss provision: A comparative study of Islamic and conventional banks.

Sherman, H., & Gold, F. (1985). Bank branch operating efficiency: Evaluation with data envelopment analysis. Journal of Banking and Finance, 9, 297–315.

Sherman, H., & Ladino, G. (1995). Managing bank productivity using data envelopment analysis (DEA). Interfaces, 9, 297–315.

Smith, H. (1997): "Matching with Multiple Controls to Estimate Treatment Effects in Observational Studies," Sociological Methodology, 27, 325–353

Srairi, S. (2009). A comparison of the profitability of Islamic and conventional banks: The case of GCC countries, Bankers, Markets, Investors, 98, pp.16-27.

Srairi, S.A. (2010). Cost and profit efficiency of conventional and Islamic banks in GCC countries. Journal of Productivity Analysis 34 (1), 45–62.

Staikouras, C., Wood, G. (2004). «The determinants of European bank profitability», International Business and Economics Research Journal 3 (6), 57–68.

Staikouras, C., Mamatzakis, E., Koutsomanoli-Filippaki, A., (2008). Cost efficiency of the banking industry in the South Eastern European region. Journal ofInternational Financial Markets, Institutions and Money 18 (5), 483–497.

Staub, R.B., De Souza, G. and Tabak, B.M. (2010), "Evolution of bank efficiency in Brazil: a DEA approach", European Journal of Operational Research, Vol. 202, pp. 204-213.

Sufian, F. (2012). "Determinants of multinational banks' subsidiary performance: the host and home country effects," Journal of Economic and Administrative Sciences, Emerald Group Publishing, vol. 28(2), pages 130-155, August.

Sufian, F. (2006). The efficiency of the Islamic banking industry in Malaysia: foreign vs domestic banks. Review of Islamic Economics 10 (2), 27–53.

Sufian, F. (2011), "Banks total factor productivity change in a developing economy: does ownership and origins matter?", Journal of Asian Economics, Vol. 22 No. 1, pp. 84-98.

Sufian, F. (2010). "The impact of the Asian financial crisis on bank efficiency: The 1997 experience of Malaysia and Thailand," Journal of International Development, John Wiley & Sons, Ltd., vol. 22(7), pages 866-889.

Sufian, F., and Abdul Majid, M.-Z. (2007). X-efficiency and share prices n the singaporean banking sector: a dea window analysis approach. Investment Management and Financial Innovations .

Sufian, F., & Abdul Majid, M.-Z. (2008). Bank Ownership, Characteristics, and Performance: A Comparative Analysis of Domestic and Foreign Islamic Banks in Malaysia. Islamic Economic Studies .

Sufian, F. (2009a). "Determinants of bank efficiency during unstable macroeconomic environment: Empirical evidence from Malaysia", Research in International Business and Finance, vol. 23, no. 1, pp. 54-77.

Sufian, F. (2009b). The Impact of the Asian Financial Crisis on Bank Efficiency: The 1997 Experience of Malaysia and Thailand, Journal of International Development, 22, 866-889.

Sufian, F. (2009c). 'The determinants of Islamic banks' efficiency changes: Empirical evidence from the MENA and Asian banking sectors.' International

Journal of Islamic and Middle Eastern Finance and Management 2(2): 120-138.

Sufian, F. and Noor, M. A. N. M (2009), "The Determinants of Islamic Bank's Efficiency Changes: Empirical Evidence from MENA and Asian Banking Sectors", International Journal of Islamic and Middle Eastern Finance and Management,2 (1), 120–138.

Sufian, Fadzlan, Mohammad, A.M Noor and Mohammed-Zulkhibri, Abdul Majid (2008),The Efficiency of Islamic Banks: Empirical Evidence from the MENA and Asian Countries Islamic Banking Sectors', Munich Repec Personal Archive (MRPA-Paper No: 19072).

Sufian, Fadzlan, and Mohamad Akbar Noor Mohamad Noor (2009). "The determinants of Islamic banks' efficiency changes: Empirical evidence from the MENA and Asian banking sectors." International Journal of Islamic and Middle Eastern Finance and Management 2 : 120-38.

Sufian, F., Kamarudin, F., Noor, N. (2012), Determinants of Revenue Efficiency in the Malaysian Islamic Banking Sector. Journal of King Abdulaziz University, 25(2), 195-224.

Tanna, S. (2009) "The impact of foreign direct investment on total factor productivity growth: International evidence from the banking industry", Managerial Finance, vol. 35, no. 3, pp. 297-311.

Tahir, I. M., & Haron, S. (2008). Technical Efficiency of the Malaysian Commercial Banks: a stochastic frontier approach. 3 (4), 65-72.

Tecles, P.L. and Tabak, B.M. (2010) "Determinants of bank efficiency: The case of Brazil", European Journal of Operational Research, vol. 207, no. 3, pp. 1587- 1598.

Thanassoulis, E. (1993) "A comparison of regression analysis and data envelopment analysis as alternative methods for performance assessments", Journal of the Operational Research Society, pp. 1129-1144.

Thoraneenitiyan, N., & Avkiran, N. K. (2009). Measuring the impact of reMeasuring Bank Performance in the Current Evolving Financial Marketplace 13 structuring and country-specific factors on the efficiency of post-crisis East Asian banking systems: Integrating DEA with SFA. Socio-Economic Planning Sciences, 43(4), 240-252.

The Economist Online. (2014, 09 13). Big interest, no interest. KUALA LUMPUR, Malaysia. Retrieved from http://www.economist.com/news/finance-and-economics/21617014-market-islamic-financial-products-growing-fast-big-interest-no-interest

The Economist online. (2012, 04 10). Islamic finance. Retrieved from http://www.economist.com/blogs/graphicdetail/2012/04/focus-2

The Economist, (2009). Middle East finance: Shine comes off Islamic banks, September 24.

The Telegraph, 2015. Britain 'will become biggest economy in Europe'. Retrieved 29 December,2015from:http://www.telegraph.co.uk/finance/economics/10537773/Britain-will-become-biggest-economy-in-Europe.html

Tortosa-Ausina, E., Grifell-Tatje, E., Armero, C. and Conesa, D. (2008). 'Sensitivity analysis of efficiency and Malmquist productivity indices: An application to Spanish savings banks', European Journal of Operational Research, vol. 184, no. 3, pp. 1062–1084.

Transformation Index BTI 2014. (2014). Retrieved September 19, 2015, from bertelsmann-stiftung:http://www.bti-project.org/reports/country reports/aso/pak/index.nc#chap6.

Thakor, A. (1987). Journal of Finance, 42 (3) (1987), pp. 661–663

Tulkens, H. (1993), "On FDH efficiency analysis: Some methodological issues and applications to retail banking, courts, and urban transit", Journal of Productivity Analysis 4, 183-210.

Usmani, Taqi. (2007). "Sukuk and their Contemporary Applications", available at http://www.failaka.com/customer/resources.html

Vassiloglou, M., & Giokas, D. (1990). A Study of the Relative Efficiency of Bank Branches: An Application of Data Envelopment Analysis. Journal of the Operational Research Society, 41(7), 591-597.

Wagenvoort, R., & Schure, P. (1999). Economic and Financial Reports. Luxembourg: European Investment Bank.

Wahida Ahmad, Robin H. Luo (2010), Comparison of banking efficiency in Europe: Islamic versus conventional banks, in Suk-Joong Kim, Michael D. Mckenzie (ed.) International Banking in the New Era: Post-Crisis Challenges and Opportunities (International Finance Review, Volume 11), Emerald Group Publishing Limited, pp.361-389.

Wang M-H and Huang T-H., (2007), A study on the persistence of Farrell's efficiency measure under a dynamic framework, European Journal of Operational Research, 180, 1302-1316

Wang, J. (2014). Encyclopedia of Business Analytics and Optimization. GI Global.

Weill, L. (2007). "Is there a gap in bank efficiency between CEE and Western European countries?" Comparative Economic Studies 47: 101–127.

Weill, L. (2004). Measuring cost efficiency in European banking: A comparison of frontier techniques. Journal of Productivity Analysis, 21, 133–152.

Wheelock, D.C. and Wilson, P.W. (1999) "Technical progress, inefficiency, and productivity change in US banking, 1984-1993", Journal of Money, Credit, and Banking, pp. 212-234.

Wheelock D.C., Wilson P.W., (2000). Why do banks disappear? The determinants of U.S. bank failures and acquisitions, The Review of Economics and Statistics, 82, 127-138.

Wilde, F. (2011). Worldwide development of nuclear Energy - Strategic deployment of German Consultancies in the Arabian Market. Diplomica Verlag.

Wilson, R. (2007). Islamic finance in Europe, RSCAS policy papers 2007/02, Robert Schuman Centre for Advanced Studies, European University Institute,Florence, Musmine-Muslim Minorities in Europe.

Williams, Jonathan, and Nghia Nguyen (2005). "Financial Liberalization, Crisis, and Restructuring: A Comparative Study of Bank Performance and Bank Governance in South East Asia." Journal of Banking and Finance 29(8-9): 2119-54.

World Bank. (2015). The Worldwide Governance Indicators. Retrieved February 2015, from http://info.worldbank.org/governance/wgi/index.aspx#home.

Worthington, A. C. and Dollery, B. (2000). An empirical survey of frontier efficiency measurement tehniques in local government. Local Government Studies, 26(2):23–52.

Wu, D., Yang, Z., & Liang, L. (2006). Using DEA-neural network approach to evaluate branch efficiency of a large Canadian bank. Expert Systems with Applications, 31(1), 108-115. http://dx.doi.org/10.1016/j.eswa.2005.09.034

Xue M. and P.T. Harker (1999). Overcoming the Inherent Dependency of DEA Efficiency Scores: A Bootstrap Approach, Working paper 99 –17 (Financial Institution Center, The Wharton School, University of Pennsylvania).

Yao, S., Z. Han and G. Feng (2008), "Ownership reform, foreign competition and efficiency of Chinese commercial banks: A non-parametric approach", World Economy, 31(10), 1310–1326.

Yao, S., C. Jiang, G. Feng, and D. Willenbockel (2007), "On the efficiency of Chinese banks and WTO challenges", Applied Economics, 39, 629-643.

Yu, Chong Ho (2003). Resampling methods: concepts, applications, and justification. Practical Assessment, Research & Evaluation, 8(19).

Yudistira, D. (2004). "Efficiency in Islamic Banking: An Empirical Analysis of Eighteen Banks". Islamic Economic Studies 12, no. 1.

Zenios, C. V., Zenios S. A., Agathocleous K. and Soteriou A. (1999). "Benchmarks of the efficiency of bank branches". Interfaces, 29 (3): 37-51.

Zhao, T. and V. Murinde (2011). 'Bank deregulation and performance in Nigeria.' African Development Review 23(1): 30-43.

Appendices

Appendix 1: OTE, PTE and SE for banks in 21 countries

Bankname	Year	PTE	OTE	SE
Dubai Islamic Bank plc	2006	0.5654	0.1908	0.33746
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2006	0.4552	0.2564	0.563269
Emirates Islamic Bank PJSC	2006	0.2291	0.1940	0.846792
Al Hilal Bank PJSC	2006	.	.	.
Sharjah Islamic Bank	2006	0.2852	0.2473	0.867111
Noor Islamic Bank	2006	.	.	.
Tamweel PJSC	2006	1.0000	0.3784	0.3784
Ajman Bank	2006	.	.	.
Albaraka Banking Group B.S.C.	2006	0.3059	0.1760	0.575351
Arcapita Bank B.S.C.	2006	.	.	.
Al-Salam Bank-Bahrain B.S.C.	2006	.	.	.
Bahrain Islamic Bank B.S.C.	2006	.	.	.
First energy bank	2006	.	.	.
Khaleeji Commercial Bank	2006	0.3784	0.3114	0.822939
ABC Islamic Bank (E.C.)	2006	0.9091	1.4703	1.617314
Gulf Finance House BSC	2006	1.5577	0.2337	0.150029
Bank Alkhair BSC	2006	.	.	.
Elaf Bank	2006	.	.	.
Seera Investment Bank BSC	2006	.	.	.
Venture Capital Bank BSC (c)-VCBank	2006	1.0000	1.3468	1.3468
International Investment Bank BSC-IIB	2006	.	.	.
Global Banking Corporation BSC	2006	.	.	.
Capivest	2006	0.3839	0.3497	0.910914
Investors Bank BSC	2006	1.0000	1.4956	1.4956
Citi Islamic Investment Bank	2006	.	.	.
Islami Bank Bangladesh Limited	2006	0.2461	0.2120	0.861438
Al-Arafah Islami Bank Ltd.	2006	0.3734	0.3730	0.998929
Shahjalal Islami Bank Ltd	2006	0.4887	0.4884	0.999386
First Security Islami Bank Limited	2006	0.4756	0.4720	0.992431
Social Islami Bank Ltd	2006	0.3734	0.3712	0.994108
ICB Islamic Bank Limited	2006	0.3842	0.3666	0.954191
Faisal Islamic Bank of Egypt	2006	.	.	.
Al Baraka Bank Egypt SAE	2006	.	.	.
Bank of London and The Middle East Plc-BLME	2006	.	.	.
Islamic Bank of Britain Plc	2006	0.1147	0.1118	0.974717
Gatehouse Bank Plc	2006	.	.	.
European Islamic Investment Bank Plc	2006	0.6289	0.6271	0.997138
DD&Co. Limited	2006	.	.	.
Bank Syariah Mandiri	2006	0.1875	0.1870	0.997333
PT Bank Muamalat Indonesia Tbk	2006	0.1999	0.1995	0.997999
PT Bank BRI Syariah	2006	.	.	.
PT Bank Maybank Syariah Indonesia	2006	0.7555	0.7466	0.98822
Kurdistan International Bank for Investment and Development	2006	0.6250	0.6221	0.99536
Al-Bilad Islamic Bank for Investments & Financing	2006	.	.	.
Cihan Bank for Islamic Investment and Finance P.S.C	2006	.	.	.

Elaf Islamic Bank	2006	.	.	.
Jordan Islamic Bank	2006	0.1738	0.1722	0.990794
Islamic International Arab Bank	2006	0.3316	0.3301	0.995476
Jordan Dubai Islamic Bank	2006	0.6623	0.5047	0.762041
Kuwait Finance House	2006	0.5302	0.1706	0.321765
Boubyan Bank KSC	2006	0.1252	0.0781	0.623802
Kuwait International Bank	2006	0.2453	0.2118	0.863433
First Investment Company K.S.C.C.	2006	.	.	.
A'Ayan Leasing & Investment Company	2006	0.1485	0.0863	0.581145
Al Baraka Bank Lebanon SAL	2006	.	.	.
Arab Finance House sal	2006	.	.	.
Maybank Islamic Berhad	2006	.	.	.
CIMB Islamic Bank Berhad	2006	0.3515	0.3492	0.993457
Bank Islam Malaysia Berhad	2006	0.2240	0.1805	0.805804
AmIslamic Bank Berhad	2006	.	.	.
Public Islamic Bank Berhad	2006	.	.	.
RHB Islamic Bank Berhad	2006	0.3465	0.3427	0.989033
Hong Leong Islamic Bank Berhad	2006	.	.	.
Bank Muamalat Malaysia Berhad	2006	0.1908	0.1855	0.972222
HSBC Amanah Malaysia Berhad	2006	.	.	.
Affin Islamic Bank Berhad	2006	0.9583	1.5802	1.648962
Kuwait Finance House (Malaysia) Berhad	2006	0.2025	0.2020	0.997531
Standard Chartered Saadiq Berhad	2006	.	.	.
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2006	0.2564	0.2479	0.966849
OCBC Al-Amin Bank Berhad	2006	.	.	.
Alliance Islamic Bank Berhad	2006	.	.	.
Asian Finance Bank Berhad	2006	1.5404	1.6461	1.068619
Meezan Bank Limited	2006	0.2449	0.2446	0.998775
BankIslami Pakistan Limited	2006	0.5435	0.5405	0.99448
Albaraka Bank (Pakistan) Limited	2006	0.5952	0.5907	0.99244
Dubai Islamic Bank Pakistan Limited	2006	0.1459	0.1442	0.988348
Standard Chartered Modaraba	2006	0.9207	1.4899	1.618225
First Habib Modaraba	2006	.	.	.
First National Bank Modaraba	2006	1.0000	1.6453	1.6453
Al-Amanah Islamic Investment Bank of the Philippines	2006	.	.	.
Qatar Islamic Bank SAQ	2006	0.5053	0.2035	0.402731
Masraf Al Rayan (Q.S.C.)	2006	.	.	.
Qatar International Islamic Bank	2006	0.4798	0.3331	0.694248
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2006	1.0000	0.2221	0.2221
Islamic Development Bank	2006	.	.	.
Alinma Bank	2006	.	.	.
Bank AlBilad	2006	0.2316	0.1912	0.825561
Islamic Bank of Asia (The)	2006	.	.	.
Bank of Khartoum	2006	.	.	.
Faisal Islamic Bank (Sudan)	2006	0.2739	0.2351	0.858342
Tadamon Islamic Bank	2006	0.1717	0.1227	0.714619

Al Salam Bank	2006	0.6618	0.4714	0.7123
Al Baraka Bank Sudan	2006	0.0855	0.0850	0.994152
United Capital Bank	2006	.	.	.
Al Shamal Islamic Bank	2006	.	.	.
Syria International Islamic Bank	2006	.	.	.
Cham Islamic Bank SA	2006	.	.	.
Albaraka Bank Tunisia	2006	0.2842	0.2818	0.991555
Asya Katilim Bankasi AS-Bank Asya	2006	.	.	.
Kuveyt Turk Katilim Bankasi A.S.	2006	0.1578	0.1508	0.95564
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2006	.	.	.
Tadhamon International Islamic Bank	2006	0.3966	0.3961	0.998739
Saba Islamic Bank	2006	0.2652	0.2648	0.998492
Shamil Bank of Yemen & Bahrain	2006	0.5375	0.5368	0.998698
Dubai Islamic Bank plc	2007	0.6809	0.1632	0.239683
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2007	0.4297	0.2173	0.505702
Emirates Islamic Bank PJSC	2007	0.2815	0.1974	0.701243
Al Hilal Bank PJSC	2007	.	.	.
Sharjah Islamic Bank	2007	0.2509	0.1868	0.74452
Noor Islamic Bank	2007	.	.	.
Tamweel PJSC	2007	0.4560	0.2586	0.567105
Ajman Bank	2007	.	.	.
Albaraka Banking Group B.S.C.	2007	0.3715	0.1907	0.513324
Arcapita Bank B.S.C.	2007	0.4506	0.0133	0.029516
Al-Salam Bank-Bahrain B.S.C.	2007	.	.	.
Bahrain Islamic Bank B.S.C.	2007	.	.	.
First energy bank	2007	.	.	.
Khaleeji Commercial Bank	2007	0.4066	0.2280	0.560748
ABC Islamic Bank (E.C.)	2007	1.0000	1.6497	1.6497
Gulf Finance House BSC	2007	.	.	.
Bank Alkhair BSC	2007	0.5308	0.0327	0.061605
Elaf Bank	2007	.	.	.
Seera Investment Bank BSC	2007	.	.	.
Venture Capital Bank BSC (c)-VCBank	2007	1.0000	0.2598	0.2598
International Investment Bank BSC-IIB	2007	.	.	.
Global Banking Corporation BSC	2007	.	.	.
Capivest	2007	0.4142	0.4061	0.980444
Investors Bank BSC	2007	0.4437	0.4359	0.982421
Citi Islamic Investment Bank	2007	.	.	.
Islami Bank Bangladesh Limited	2007	0.2954	0.2411	0.816181
Al-Arafah Islami Bank Ltd.	2007	0.3012	0.3004	0.997344
Shahjalal Islami Bank Ltd	2007	0.4833	0.4816	0.996483
First Security Islami Bank Limited	2007	0.4450	0.4428	0.995056
Social Islami Bank Ltd	2007	0.3450	0.3435	0.995652
ICB Islamic Bank Limited	2007	0.3992	0.3936	0.985972
Faisal Islamic Bank of Egypt	2007	.	.	.
Al Baraka Bank Egypt SAE	2007	.	.	.

Bank of London and The Middle East Plc-BLME	2007	0.3413	0.3385	0.991796
Islamic Bank of Britain Plc	2007	0.1280	0.1258	0.982813
Gatehouse Bank Plc	2007	.	.	.
European Islamic Investment Bank Plc	2007	0.5556	0.5393	0.970662
DD&Co. Limited	2007	.	.	.
Bank Syariah Mandiri	2007	0.1798	0.1793	0.997219
PT Bank Muamalat Indonesia Tbk	2007	0.1987	0.1983	0.997987
PT Bank BRI Syariah	2007	.	.	.
PT Bank Maybank Syariah Indonesia	2007	0.8469	1.3082	1.544692
Kurdistan International Bank for Investment and Development	2007	0.4836	0.4791	0.990695
Al-Bilad Islamic Bank for Investments & Financing	2007	.	.	.
Cihan Bank for Islamic Investment and Finance P.S.C	2007	.	.	.
Elaf Islamic Bank	2007	.	.	.
Jordan Islamic Bank	2007	0.1861	0.1791	0.962386
Islamic International Arab Bank	2007	0.3513	0.3366	0.958155
Jordan Dubai Islamic Bank	2007	1.5350	1.4989	0.976482
Kuwait Finance House	2007	0.8239	0.2267	0.275155
Boubyan Bank KSC	2007	0.1226	0.0812	0.662316
Kuwait International Bank	2007	0.2632	0.2021	0.767857
First Investment Company K.S.C.C.	2007	.	.	.
A'Ayan Leasing & Investment Company	2007	0.1133	0.0617	0.544572
Al Baraka Bank Lebanon SAL	2007	0.2368	0.2350	0.992399
Arab Finance House sal	2007	0.2439	0.2433	0.99754
Maybank Islamic Berhad	2007	.	.	.
CIMB Islamic Bank Berhad	2007	0.4878	0.4834	0.99098
Bank Islam Malaysia Berhad	2007	0.2231	0.1529	0.685343
AmIslamic Bank Berhad	2007	0.9381	1.4785	1.576058
Public Islamic Bank Berhad	2007	.	.	.
RHB Islamic Bank Berhad	2007	0.3456	0.3325	0.962095
Hong Leong Islamic Bank Berhad	2007	.	.	.
Bank Muamalat Malaysia Berhad	2007	0.1971	0.1830	0.928463
HSBC Amanah Malaysia Berhad	2007	.	.	.
Affin Islamic Bank Berhad	2007	0.9217	1.4901	1.616687
Kuwait Finance House (Malaysia) Berhad	2007	0.1898	0.1888	0.994731
Standard Chartered Saadiq Berhad	2007	.	.	.
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2007	0.1842	0.1820	0.988056
OCBC Al-Amin Bank Berhad	2007	.	.	.
Alliance Islamic Bank Berhad	2007	.	.	.
Asian Finance Bank Berhad	2007	0.3891	0.3887	0.998972
Meezan Bank Limited	2007	0.1650	0.1637	0.992121
BankIslami Pakistan Limited	2007	0.2601	0.2587	0.994617
Albaraka Bank (Pakistan) Limited	2007	0.2885	0.2866	0.993414
Dubai Islamic Bank Pakistan Limited	2007	0.1178	0.1168	0.991511
Standard Chartered Modaraba	2007	0.9766	1.5888	1.626869
First Habib Modaraba	2007	.	.	.
First National Bank Modaraba	2007	1.0000	1.6423	1.6423

Al-Amanah Islamic Investment Bank of the Philippines	2007	0.9804	1.6073	1.639433
Qatar Islamic Bank SAQ	2007	0.7839	0.2137	0.272611
Masraf Al Rayan (Q.S.C.)	2007	1.5350	0.3516	0.229055
Qatar International Islamic Bank	2007	0.4370	0.2373	0.543021
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2007	1.0000	0.2143	0.2143
Islamic Development Bank	2007	1.0000	1.4657	1.4657
Alinma Bank	2007	.	.	.
Bank AlBilad	2007	0.2498	0.1759	0.704163
Islamic Bank of Asia (The)	2007	0.5042	0.5038	0.999207
Bank of Khartoum	2007	0.1055	0.1054	0.999052
Faisal Islamic Bank (Sudan)	2007	0.1900	0.1583	0.833158
Tadamon Islamic Bank	2007	0.1320	0.0897	0.679545
Al Salam Bank	2007	0.5669	0.4971	0.876874
Al Baraka Bank Sudan	2007	0.1024	0.1021	0.99707
United Capital Bank	2007	.	.	.
Al Shamal Islamic Bank	2007	0.2738	0.2728	0.996348
Syria International Islamic Bank	2007	0.5556	0.5494	0.988841
Cham Islamic Bank SA	2007	0.3906	0.3861	0.988479
Albaraka Bank Tunisia	2007	0.2743	0.2743	1
Asya Katilim Bankasi AS-Bank Asya	2007	0.3126	0.1636	0.523353
Kuveyt Turk Katilim Bankasi A.S.	2007	0.1900	0.1566	0.824211
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2007	0.2594	0.1928	0.743254
Tadhamon International Islamic Bank	2007	0.3355	0.3350	0.99851
Saba Islamic Bank	2007	0.2363	0.2361	0.999154
Shamil Bank of Yemen & Bahrain	2007	0.4464	0.4441	0.994848
Dubai Islamic Bank plc	2008	0.6726	0.2076	0.308653
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2008	0.5769	0.2250	0.390016
Emirates Islamic Bank PJSC	2008	0.6655	0.2478	0.372352
Al Hilal Bank PJSC	2008	0.0809	0.0794	0.981459
Sharjah Islamic Bank	2008	0.2880	0.2106	0.73125
Noor Islamic Bank	2008	0.2357	0.1436	0.609249
Tamweel PJSC	2008	0.6467	0.3440	0.531931
Ajman Bank	2008	1.5297	1.6624	1.086749
Albaraka Banking Group B.S.C.	2008	0.3476	0.1784	0.513234
Arcapita Bank B.S.C.	2008	0.5604	0.0160	0.028551
Al-Salam Bank-Bahrain B.S.C.	2008	0.2450	0.1361	0.55551
Bahrain Islamic Bank B.S.C.	2008	.	.	.
First energy bank	2008	1.0000	1.6553	1.6553
Khaleeji Commercial Bank	2008	0.1888	0.0926	0.490466
ABC Islamic Bank (E.C.)	2008	1.0000	1.6600	1.66
Gulf Finance House BSC	2008	.	.	.
Bank Alkhair BSC	2008	.	.	.
Elaf Bank	2008	.	.	.
Seera Investment Bank BSC	2008	.	.	.
Venture Capital Bank BSC (c)-VCBank	2008	.	.	.
International Investment Bank BSC-IIB	2008	.	.	.

Global Banking Corporation BSC	2008	.	.	.
Capivest	2008	0.1281	0.0861	0.672131
Investors Bank BSC	2008	0.4369	0.4153	0.950561
Citi Islamic Investment Bank	2008	.	.	.
Islami Bank Bangladesh Limited	2008	0.2983	0.2225	0.745893
Al-Arafah Islami Bank Ltd.	2008	0.2825	0.2823	0.999292
Shahjalal Islami Bank Ltd	2008	0.3898	0.3897	0.999743
First Security Islami Bank Limited	2008	0.4418	0.4398	0.995473
Social Islami Bank Ltd	2008	0.2814	0.2804	0.996446
ICB Islamic Bank Limited	2008	0.3801	0.3751	0.986846
Faisal Islamic Bank of Egypt	2008	.	.	.
Al Baraka Bank Egypt SAE	2008	.	.	.
Bank of London and The Middle East Plc-BLME	2008	0.2967	0.2884	0.972026
Islamic Bank of Britain Plc	2008	0.1767	0.1749	0.989813
Gatehouse Bank Plc	2008	.	.	.
European Islamic Investment Bank Plc	2008	0.6944	0.6659	0.958957
DD&Co. Limited	2008	.	.	.
Bank Syariah Mandiri	2008	0.1696	0.1692	0.997642
PT Bank Muamalat Indonesia Tbk	2008	0.2486	0.2484	0.999195
PT Bank BRI Syariah	2008	.	.	.
PT Bank Maybank Syariah Indonesia	2008	0.7736	0.7679	0.992632
Kurdistan International Bank for Investment and Development	2008	0.3885	0.3423	0.881081
Al-Bilad Islamic Bank for Investments & Financing	2008	0.4913	0.4883	0.993894
Cihan Bank for Islamic Investment and Finance P.S.C	2008	.	.	.
Elaf Islamic Bank	2008	.	.	.
Jordan Islamic Bank	2008	0.2104	0.1845	0.876901
Islamic International Arab Bank	2008	0.3553	0.3547	0.998311
Jordan Dubai Islamic Bank	2008	0.3896	0.3889	0.998203
Kuwait Finance House	2008	0.7340	0.2125	0.28951
Boubyan Bank KSC	2008	0.1927	0.1630	0.845874
Kuwait International Bank	2008	0.2988	0.2152	0.720214
First Investment Company K.S.C.C.	2008	0.5798	0.5715	0.985685
A'Ayan Leasing & Investment Company	2008	0.0571	0.0570	0.998249
Al Baraka Bank Lebanon SAL	2008	0.1980	0.1966	0.992929
Arab Finance House sal	2008	0.1931	0.1929	0.998964
Maybank Islamic Berhad	2008	.	.	.
CIMB Islamic Bank Berhad	2008	0.4843	0.4737	0.978113
Bank Islam Malaysia Berhad	2008	0.2188	0.1403	0.641225
AmIslamic Bank Berhad	2008	1.0000	1.6130	1.613
Public Islamic Bank Berhad	2008	1.0000	1.6447	1.6447
RHB Islamic Bank Berhad	2008	0.3216	0.3102	0.964552
Hong Leong Islamic Bank Berhad	2008	0.6616	0.6543	0.988966
Bank Muamalat Malaysia Berhad	2008	0.2052	0.1840	0.896686
HSBC Amanah Malaysia Berhad	2008	0.6430	0.6417	0.997978
Affin Islamic Bank Berhad	2008	0.5208	0.5092	0.977727
Kuwait Finance House (Malaysia) Berhad	2008	0.2447	0.2110	0.86228

Standard Chartered Saadiq Berhad	2008	.	.	.
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2008	0.1903	0.1882	0.988965
OCBC Al-Amin Bank Berhad	2008	0.9063	1.4732	1.62551
Alliance Islamic Bank Berhad	2008	1.5372	1.6523	1.074876
Asian Finance Bank Berhad	2008	0.3953	0.3877	0.980774
Meezan Bank Limited	2008	0.1433	0.1429	0.997209
BankIslami Pakistan Limited	2008	0.2052	0.2041	0.994639
Albaraka Bank (Pakistan) Limited	2008	0.2170	0.2153	0.992166
Dubai Islamic Bank Pakistan Limited	2008	0.1343	0.1336	0.994788
Standard Chartered Modaraba	2008	0.9627	1.5609	1.621377
First Habib Modaraba	2008	.	.	.
First National Bank Modaraba	2008	0.9831	1.6151	1.642864
Al-Amanah Islamic Investment Bank of the Philippines	2008	1.0000	1.6445	1.6445
Qatar Islamic Bank SAQ	2008	0.7742	0.2268	0.292948
Masraf Al Rayan (Q.S.C.)	2008	0.8651	0.4301	0.497168
Qatar International Islamic Bank	2008	0.5183	0.3281	0.633031
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2008	0.9893	0.2290	0.231477
Islamic Development Bank	2008	.	.	.
Alinma Bank	2008	.	.	.
Bank AlBilad	2008	0.1160	0.1056	0.910345
Islamic Bank of Asia (The)	2008	0.3622	0.3620	0.999448
Bank of Khartoum	2008	0.1019	0.1014	0.995093
Faisal Islamic Bank (Sudan)	2008	0.1747	0.1421	0.813394
Tadamon Islamic Bank	2008	0.1548	0.0977	0.631137
Al Salam Bank	2008	0.4784	0.4783	0.999791
Al Baraka Bank Sudan	2008	0.1018	0.0974	0.956778
United Capital Bank	2008	0.3305	0.3017	0.912859
Al Shamal Islamic Bank	2008	0.1948	0.1941	0.996407
Syria International Islamic Bank	2008	0.3261	0.3249	0.99632
Cham Islamic Bank SA	2008	0.3359	0.3334	0.992557
Albaraka Bank Tunisia	2008	0.2592	0.2529	0.975694
Asya Katilim Bankasi AS-Bank Asya	2008	0.2663	0.1648	0.618851
Kuveyt Turk Katilim Bankasi A.S.	2008	0.1962	0.1516	0.772681
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2008	0.2616	0.1843	0.704511
Tadhamon International Islamic Bank	2008	0.2077	0.2076	0.999519
Saba Islamic Bank	2008	0.1886	0.1880	0.996819
Shamil Bank of Yemen & Bahrain	2008	0.4740	0.4734	0.998734
Dubai Islamic Bank plc	2009	0.6257	0.2126	0.339779
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2009	0.5919	0.2223	0.37557
Emirates Islamic Bank PJSC	2009	0.5932	0.2090	0.352326
Al Hilal Bank PJSC	2009	0.2322	0.1670	0.719208
Sharjah Islamic Bank	2009	0.2716	0.1959	0.721281
Noor Islamic Bank	2009	0.3100	0.2039	0.657742
Tamweel PJSC	2009	0.9072	0.4732	0.521605
Ajman Bank	2009	0.0749	0.0747	0.99733
Albaraka Banking Group B.S.C.	2009	0.3361	0.1709	0.50848

Arcapita Bank B.S.C.	2009	0.0457	0.0446	0.97593
Al-Salam Bank-Bahrain B.S.C.	2009	0.1993	0.1464	0.734571
Bahrain Islamic Bank B.S.C.	2009	.	.	.
First energy bank	2009	0.1258	0.1009	0.802067
Khaleeji Commercial Bank	2009	0.1570	0.1567	0.998089
ABC Islamic Bank (E.C.)	2009	0.8980	1.4532	1.618263
Gulf Finance House BSC	2009	.	.	.
Bank Alkhair BSC	2009	.	.	.
Elaf Bank	2009	.	.	.
Seera Investment Bank BSC	2009	.	.	.
Venture Capital Bank BSC (c)-VCBank	2009	.	.	.
International Investment Bank BSC-IIB	2009	.	.	.
Global Banking Corporation BSC	2009	.	.	.
Capivest	2009	0.0990	0.0952	0.961616
Investors Bank BSC	2009	.	.	.
Citi Islamic Investment Bank	2009	.	.	.
Islami Bank Bangladesh Limited	2009	0.3381	0.2355	0.696539
Al-Arafah Islami Bank Ltd.	2009	0.2863	0.2862	0.999651
Shahjalal Islami Bank Ltd	2009	0.3090	0.3090	1
First Security Islami Bank Limited	2009	0.4275	0.4259	0.996257
Social Islami Bank Ltd	2009	0.2749	0.2742	0.997454
ICB Islamic Bank Limited	2009	0.2679	0.2601	0.970885
Faisal Islamic Bank of Egypt	2009	.	.	.
Al Baraka Bank Egypt SAE	2009	0.1922	0.1891	0.983871
Bank of London and The Middle East Plc-BLME	2009	0.3436	0.3230	0.940047
Islamic Bank of Britain Plc	2009	0.1862	0.1819	0.976907
Gatehouse Bank Plc	2009	.	.	.
European Islamic Investment Bank Plc	2009	0.7576	0.7206	0.951162
DD&Co. Limited	2009	.	.	.
Bank Syariah Mandiri	2009	0.1687	0.1545	0.915827
PT Bank Muamalat Indonesia Tbk	2009	0.2008	0.1949	0.970618
PT Bank BRI Syariah	2009	0.1759	0.1752	0.99602
PT Bank Maybank Syariah Indonesia	2009	.	.	.
Kurdistan International Bank for Investment and Development	2009	0.3579	0.2876	0.803576
Al-Bilad Islamic Bank for Investments & Financing	2009	0.3389	0.3265	0.963411
Cihan Bank for Islamic Investment and Finance P.S.C	2009	0.7705	0.7702	0.999611
Elaf Islamic Bank	2009	1.5450	1.5239	0.986343
Jordan Islamic Bank	2009	0.2074	0.1859	0.896336
Islamic International Arab Bank	2009	0.4841	0.4832	0.998141
Jordan Dubai Islamic Bank	2009	0.4640	0.4639	0.999784
Kuwait Finance House	2009	0.7557	0.1996	0.264126
Boubyan Bank KSC	2009	0.2258	0.1864	0.825509
Kuwait International Bank	2009	0.3057	0.2323	0.759895
First Investment Company K.S.C.C.	2009	0.7415	0.6417	0.865408
A'Ayan Leasing & Investment Company	2009	0.0628	0.0528	0.840764
Al Baraka Bank Lebanon SAL	2009	.	.	.

Arab Finance House sal	2009	0.1495	0.1477	0.98796
Maybank Islamic Berhad	2009	.	.	.
CIMB Islamic Bank Berhad	2009	0.7047	0.6956	0.987087
Bank Islam Malaysia Berhad	2009	0.1739	0.1370	0.787809
AmIslamic Bank Berhad	2009	0.9729	1.5779	1.621852
Public Islamic Bank Berhad	2009	1.5633	1.6706	1.068637
RHB Islamic Bank Berhad	2009	0.3050	0.2863	0.938689
Hong Leong Islamic Bank Berhad	2009	0.6773	0.6753	0.997047
Bank Muamalat Malaysia Berhad	2009	0.2144	0.1878	0.875933
HSBC Amanah Malaysia Berhad	2009	0.4641	0.4638	0.999354
Affin Islamic Bank Berhad	2009	0.4484	0.4393	0.979706
Kuwait Finance House (Malaysia) Berhad	2009	0.3299	0.2550	0.772962
Standard Chartered Saadiq Berhad	2009	.	.	.
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2009	0.2016	0.2009	0.996528
OCBC Al-Amin Bank Berhad	2009	0.3587	0.3553	0.990521
Alliance Islamic Bank Berhad	2009	0.8403	1.3059	1.554088
Asian Finance Bank Berhad	2009	0.3876	0.3830	0.988132
Meezan Bank Limited	2009	0.1132	0.1131	0.999117
BankIslami Pakistan Limited	2009	0.1644	0.1631	0.992092
Albaraka Bank (Pakistan) Limited	2009	0.1801	0.1781	0.988895
Dubai Islamic Bank Pakistan Limited	2009	0.1654	0.1648	0.996372
Standard Chartered Modaraba	2009	0.9989	1.6292	1.630994
First Habib Modaraba	2009	0.8333	0.8322	0.99868
First National Bank Modaraba	2009	0.9524	1.5439	1.621063
Al-Amanah Islamic Investment Bank of the Philippines	2009	1.0000	1.6605	1.6605
Qatar Islamic Bank SAQ	2009	0.6206	0.2637	0.424911
Masraf Al Rayan (Q.S.C.)	2009	0.8319	0.4242	0.509917
Qatar International Islamic Bank	2009	0.5680	0.3659	0.64419
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2009	1.0000	0.2293	0.2293
Islamic Development Bank	2009	1.0000	1.6628	1.6628
Alinma Bank	2009	0.5515	0.0395	0.071623
Bank AlBilad	2009	0.1698	0.1299	0.765018
Islamic Bank of Asia (The)	2009	0.3704	0.3291	0.888499
Bank of Khartoum	2009	0.0957	0.0954	0.996865
Faisal Islamic Bank (Sudan)	2009	0.2086	0.1629	0.78092
Tadamon Islamic Bank	2009	0.1699	0.0953	0.560918
Al Salam Bank	2009	0.4666	0.4664	0.999571
Al Baraka Bank Sudan	2009	0.0873	0.0867	0.993127
United Capital Bank	2009	0.2524	0.2509	0.994057
Al Shamal Islamic Bank	2009	0.1751	0.1745	0.996573
Syria International Islamic Bank	2009	0.2501	0.2495	0.997601
Cham Islamic Bank SA	2009	0.3119	0.3077	0.986534
Albaraka Bank Tunisia	2009	0.2881	0.2724	0.945505
Asya Katilim Bankasi AS-Bank Asya	2009	0.2884	0.1610	0.558252
Kuveyt Turk Katilim Bankasi A.S.	2009	0.2157	0.1464	0.67872
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2009	0.2483	0.1733	0.697946

Tadhamon International Islamic Bank	2009	0.1380	0.1378	0.998551
Saba Islamic Bank	2009	0.1587	0.1584	0.99811
Shamil Bank of Yemen & Bahrain	2009	0.3985	0.3968	0.995734
Dubai Islamic Bank plc	2010	0.7647	0.2407	0.314764
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2010	0.6341	0.2139	0.337328
Emirates Islamic Bank PJSC	2010	0.3485	0.1769	0.507604
Al Hilal Bank PJSC	2010	0.2864	0.1809	0.631634
Sharjah Islamic Bank	2010	0.2528	0.1823	0.721123
Noor Islamic Bank	2010	0.3388	0.2329	0.687426
Tamweel PJSC	2010	0.6394	0.5097	0.797154
Ajman Bank	2010	0.1122	0.1118	0.996435
Albaraka Banking Group B.S.C.	2010	0.4164	0.1822	0.43756
Arcapita Bank B.S.C.	2010	0.0409	0.0384	0.938875
Al-Salam Bank-Bahrain B.S.C.	2010	0.1659	0.1658	0.999397
Bahrain Islamic Bank B.S.C.	2010	.	.	.
First energy bank	2010	0.1684	0.1678	0.996437
Khaleeji Commercial Bank	2010	0.1669	0.1648	0.987418
ABC Islamic Bank (E.C.)	2010	0.8926	1.4333	1.605758
Gulf Finance House BSC	2010	.	.	.
Bank Alkhair BSC	2010	0.1235	0.0905	0.732794
Elaf Bank	2010	.	.	.
Seera Investment Bank BSC	2010	.	.	.
Venture Capital Bank BSC (c)-VCBank	2010	.	.	.
International Investment Bank BSC-IIB	2010	.	.	.
Global Banking Corporation BSC	2010	.	.	.
Capivest	2010	0.0926	0.0865	0.934125
Investors Bank BSC	2010	.	.	.
Citi Islamic Investment Bank	2010	.	.	.
Islami Bank Bangladesh Limited	2010	0.3384	0.2162	0.638889
Al-Arafah Islami Bank Ltd.	2010	0.3012	0.2908	0.965471
Shahjalal Islami Bank Ltd	2010	0.2934	0.2818	0.960464
First Security Islami Bank Limited	2010	0.3665	0.3653	0.996726
Social Islami Bank Ltd	2010	0.2244	0.2240	0.998217
ICB Islamic Bank Limited	2010	0.2500	0.2449	0.9796
Faisal Islamic Bank of Egypt	2010	0.1235	0.0797	0.645344
Al Baraka Bank Egypt SAE	2010	0.1907	0.1906	0.999476
Bank of London and The Middle East Plc-BLME	2010	0.4525	0.4409	0.974365
Islamic Bank of Britain Plc	2010	0.2519	0.2461	0.976975
Gatehouse Bank Plc	2010	.	.	.
European Islamic Investment Bank Plc	2010	0.7634	0.7531	0.986508
DD&Co. Limited	2010	.	.	.
Bank Syariah Mandiri	2010	0.1975	0.1522	0.770633
PT Bank Muamalat Indonesia Tbk	2010	0.2372	0.2043	0.861298
PT Bank BRI Syariah	2010	0.1378	0.1373	0.996372
PT Bank Maybank Syariah Indonesia	2010	.	.	.
Kurdistan International Bank for Investment and Development	2010	0.2967	0.2812	0.947759

Al-Bilad Islamic Bank for Investments & Financing	2010	0.3065	0.3062	0.999021
Cihan Bank for Islamic Investment and Finance P.S.C	2010	0.6556	0.6517	0.994051
Elaf Islamic Bank	2010	0.6113	0.5239	0.857026
Jordan Islamic Bank	2010	0.2265	0.1999	0.882561
Islamic International Arab Bank	2010	0.4369	0.4365	0.999084
Jordan Dubai Islamic Bank	2010	0.2517	0.2509	0.996822
Kuwait Finance House	2010	0.7575	0.2055	0.271287
Boubyan Bank KSC	2010	0.3737	0.2127	0.569173
Kuwait International Bank	2010	0.2946	0.2261	0.767481
First Investment Company K.S.C.C.	2010	0.7373	0.6850	0.929066
A'Ayan Leasing & Investment Company	2010	0.0613	0.0577	0.941272
Al Baraka Bank Lebanon SAL	2010	.	.	.
Arab Finance House sal	2010	0.1383	0.1357	0.9812
Maybank Islamic Berhad	2010	.	.	.
CIMB Islamic Bank Berhad	2010	1.0000	1.6320	1.632
Bank Islam Malaysia Berhad	2010	0.2462	0.1009	0.409829
AmIslamic Bank Berhad	2010	1.0000	1.6623	1.6623
Public Islamic Bank Berhad	2010	1.0000	1.3736	1.3736
RHB Islamic Bank Berhad	2010	0.4660	0.3798	0.815021
Hong Leong Islamic Bank Berhad	2010	0.6379	0.6364	0.997649
Bank Muamalat Malaysia Berhad	2010	0.1706	0.1433	0.839977
HSBC Amanah Malaysia Berhad	2010	0.4518	0.4502	0.996459
Affin Islamic Bank Berhad	2010	0.5958	0.5825	0.977677
Kuwait Finance House (Malaysia) Berhad	2010	0.3473	0.2221	0.639505
Standard Chartered Saadiq Berhad	2010	.	.	.
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2010	0.2286	0.2165	0.947069
OCBC Al-Amin Bank Berhad	2010	0.3063	0.3053	0.996735
Alliance Islamic Bank Berhad	2010	0.8475	1.3510	1.5941
Asian Finance Bank Berhad	2010	0.4115	0.3930	0.955043
Meezan Bank Limited	2010	0.1166	0.1154	0.989708
BankIslami Pakistan Limited	2010	0.1767	0.1759	0.995473
Albaraka Bank (Pakistan) Limited	2010	0.2237	0.2209	0.987483
Dubai Islamic Bank Pakistan Limited	2010	0.1440	0.1435	0.996528
Standard Chartered Modaraba	2010	1.0000	1.6510	1.651
First Habib Modaraba	2010	0.8130	1.2965	1.594711
First National Bank Modaraba	2010	0.9524	1.5562	1.633977
Al-Amanah Islamic Investment Bank of the Philippines	2010	0.6536	0.6494	0.993574
Qatar Islamic Bank SAQ	2010	0.6627	0.3053	0.460691
Masraf Al Rayan (Q.S.C.)	2010	0.9988	0.4926	0.493192
Qatar International Islamic Bank	2010	0.4494	0.2836	0.631064
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2010	0.9681	0.2377	0.245532
Islamic Development Bank	2010	.	.	.
Alinma Bank	2010	0.3357	0.2299	0.684838
Bank AlBilad	2010	0.1915	0.1344	0.701828
Islamic Bank of Asia (The)	2010	0.4762	0.4515	0.948131
Bank of Khartoum	2010	0.0995	0.0994	0.998995

Faisal Islamic Bank (Sudan)	2010	0.2513	0.1815	0.722244
Tadamon Islamic Bank	2010	0.1829	0.1146	0.626572
Al Salam Bank	2010	0.3566	0.3371	0.945317
Al Baraka Bank Sudan	2010	0.1052	0.1003	0.953422
United Capital Bank	2010	0.2958	0.2689	0.90906
Al Shamal Islamic Bank	2010	0.1585	0.1569	0.989905
Syria International Islamic Bank	2010	0.1669	0.1292	0.774116
Cham Islamic Bank SA	2010	0.3659	0.3647	0.99672
Albaraka Bank Tunisia	2010	0.3000	0.2820	0.94
Asya Katilim Bankasi AS-Bank Asya	2010	0.3182	0.1805	0.567253
Kuveyt Turk Katilim Bankasi A.S.	2010	0.3054	0.1736	0.568435
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2010	0.3114	0.1931	0.620103
Tadhamon International Islamic Bank	2010	0.1362	0.1356	0.995595
Saba Islamic Bank	2010	0.1572	0.1558	0.991094
Shamil Bank of Yemen & Bahrain	2010	0.3484	0.3469	0.995695
Dubai Islamic Bank plc	2011	0.6260	0.1991	0.318051
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2011	0.5999	0.1973	0.328888
Emirates Islamic Bank PJSC	2011	0.3742	0.1572	0.420096
Al Hilal Bank PJSC	2011	0.3405	0.2005	0.58884
Sharjah Islamic Bank	2011	0.2644	0.1897	0.717474
Noor Islamic Bank	2011	0.2776	0.2002	0.721182
Tamweel PJSC	2011	0.6500	0.4827	0.742615
Ajman Bank	2011	0.1538	0.1532	0.996099
Albaraka Banking Group B.S.C.	2011	0.3514	0.1573	0.447638
Arcapita Bank B.S.C.	2011	0.0640	0.0440	0.6875
Al-Salam Bank-Bahrain B.S.C.	2011	0.2545	0.2466	0.968959
Bahrain Islamic Bank B.S.C.	2011	.	.	.
First energy bank	2011	0.2729	0.2727	0.999267
Khaleeji Commercial Bank	2011	0.1459	0.1451	0.994517
ABC Islamic Bank (E.C.)	2011	1.0000	1.6516	1.6516
Gulf Finance House BSC	2011	.	.	.
Bank Alkhair BSC	2011	0.1538	0.1537	0.99935
Elaf Bank	2011	.	.	.
Seera Investment Bank BSC	2011	.	.	.
Venture Capital Bank BSC (c)-VCBank	2011	.	.	.
International Investment Bank BSC-IIB	2011	.	.	.
Global Banking Corporation BSC	2011	.	.	.
Capivest	2011	0.3476	0.1313	0.377733
Investors Bank BSC	2011	.	.	.
Citi Islamic Investment Bank	2011	.	.	.
Islami Bank Bangladesh Limited	2011	0.3433	0.2232	0.65016
Al-Arafah Islami Bank Ltd.	2011	0.2597	0.2585	0.995379
Shahjalal Islami Bank Ltd	2011	0.2674	0.2669	0.99813
First Security Islami Bank Limited	2011	0.3414	0.3401	0.996192
Social Islami Bank Ltd	2011	0.2188	0.2186	0.999086
ICB Islamic Bank Limited	2011	0.2631	0.2567	0.975675

Faisal Islamic Bank of Egypt	2011	0.0687	0.0591	0.860262
Al Baraka Bank Egypt SAE	2011	0.1653	0.1651	0.99879
Bank of London and The Middle East Plc-BLME	2011	0.5882	0.5587	0.949847
Islamic Bank of Britain Plc	2011	0.2882	0.2806	0.973629
Gatehouse Bank Plc	2011	.	.	.
European Islamic Investment Bank Plc	2011	.	.	.
DD&Co. Limited	2011	.	.	.
Bank Syariah Mandiri	2011	0.2722	0.1552	0.570169
PT Bank Muamalat Indonesia Tbk	2011	0.2353	0.1850	0.78623
PT Bank BRI Syariah	2011	0.1413	0.1407	0.995754
PT Bank Maybank Syariah Indonesia	2011	0.4642	0.4633	0.998061
Kurdistan International Bank for Investment and Development	2011	0.3647	0.2410	0.660817
Al-Bilad Islamic Bank for Investments & Financing	2011	0.3078	0.2899	0.941845
Cihan Bank for Islamic Investment and Finance P.S.C	2011	0.7424	0.6656	0.896552
Elaf Islamic Bank	2011	0.6175	0.4331	0.701377
Jordan Islamic Bank	2011	0.2044	0.1769	0.86546
Islamic International Arab Bank	2011	0.2811	0.2806	0.998221
Jordan Dubai Islamic Bank	2011	0.2839	0.2838	0.999648
Kuwait Finance House	2011	0.7724	0.2018	0.261264
Boubyan Bank KSC	2011	0.4637	0.2257	0.486737
Kuwait International Bank	2011	0.2726	0.2133	0.782465
First Investment Company K.S.C.C.	2011	0.2189	0.1917	0.875742
A'Ayan Leasing & Investment Company	2011	0.0488	0.0462	0.946721
Al Baraka Bank Lebanon SAL	2011	.	.	.
Arab Finance House sal	2011	.	.	.
Maybank Islamic Berhad	2011	.	.	.
CIMB Islamic Bank Berhad	2011	0.9760	1.3771	1.410963
Bank Islam Malaysia Berhad	2011	0.2814	0.1442	0.512438
AmIslamic Bank Berhad	2011	0.9280	1.4948	1.610776
Public Islamic Bank Berhad	2011	1.0000	1.4169	1.4169
RHB Islamic Bank Berhad	2011	0.5411	0.4209	0.77786
Hong Leong Islamic Bank Berhad	2011	0.5012	0.5012	1
Bank Muamalat Malaysia Berhad	2011	0.1815	0.1481	0.815978
HSBC Amanah Malaysia Berhad	2011	0.6027	0.5608	0.93048
Affin Islamic Bank Berhad	2011	0.5202	0.5102	0.980777
Kuwait Finance House (Malaysia) Berhad	2011	0.2527	0.1747	0.691334
Standard Chartered Saadiq Berhad	2011	0.5068	0.5065	0.999408
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2011	0.1887	0.1884	0.99841
OCBC Al-Amin Bank Berhad	2011	0.3425	0.3342	0.975766
Alliance Islamic Bank Berhad	2011	0.8910	1.4175	1.590909
Asian Finance Bank Berhad	2011	0.3984	0.3890	0.976406
Meezan Bank Limited	2011	0.1057	0.0969	0.916746
BankIslami Pakistan Limited	2011	0.1597	0.1590	0.995617
Albaraka Bank (Pakistan) Limited	2011	0.1824	0.1819	0.997259
Dubai Islamic Bank Pakistan Limited	2011	0.1455	0.1449	0.995876
Standard Chartered Modaraba	2011	1.5409	1.6478	1.069375

First Habib Modaraba	2011	0.7874	0.7866	0.998984
First National Bank Modaraba	2011	0.9615	1.5717	1.634633
Al-Amanah Islamic Investment Bank of the Philippines	2011	0.5882	0.5844	0.99354
Qatar Islamic Bank SAQ	2011	0.5272	0.2307	0.437595
Masraf Al Rayan (Q.S.C.)	2011	0.8914	0.4398	0.493381
Qatar International Islamic Bank	2011	0.4406	0.2647	0.600772
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2011	0.9693	0.2416	0.249252
Islamic Development Bank	2011	0.4072	0.2378	0.583988
Alinma Bank	2011	0.2220	0.1213	0.546396
Bank AlBilad	2011	0.6790	0.6722	0.989985
Islamic Bank of Asia (The)	2011	0.1160	0.1158	0.998276
Bank of Khartoum	2011	0.2352	0.1323	0.5625
Faisal Islamic Bank (Sudan)	2011	0.1672	0.1042	0.623206
Tadamon Islamic Bank	2011	0.2961	0.2658	0.89767
Al Salam Bank	2011	0.1012	0.0957	0.945652
Al Baraka Bank Sudan	2011	0.2665	0.2374	0.890807
United Capital Bank	2011	0.1401	0.1397	0.997145
Al Shamal Islamic Bank	2011	0.1431	0.1116	0.779874
Syria International Islamic Bank	2011	0.3722	0.3692	0.99194
Cham Islamic Bank SA	2011	0.2313	0.2313	1
Albaraka Bank Tunisia	2011	0.3392	0.1952	0.575472
Asya Katilim Bankasi AS-Bank Asya	2011	0.4118	0.1889	0.458718
Kuveyt Turk Katilim Bankasi A.S.	2011	0.2931	0.1829	0.624019
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2011	0.0926	0.0916	0.989201
Tadhamon International Islamic Bank	2011	0.1298	0.1291	0.994607
Saba Islamic Bank	2011	0.3344	0.3327	0.994916
Shamil Bank of Yemen & Bahrain	2011	0.6826	0.2099	0.307501
Dubai Islamic Bank plc	2012	0.5778	0.1945	0.336622
Abu Dhabi Islamic Bank - Public Joint Stock Co.	2012	0.5355	0.2350	0.438842
Emirates Islamic Bank PJSC	2012	0.3690	0.2097	0.568293
Al Hilal Bank PJSC	2012	0.2627	0.1848	0.703464
Sharjah Islamic Bank	2012	0.2987	0.2306	0.772012
Noor Islamic Bank	2012	0.6962	0.5106	0.73341
Tamweel PJSC	2012	0.1892	0.1884	0.995772
Ajman Bank	2012	0.4561	0.1686	0.369656
Albaraka Banking Group B.S.C.	2012	.	.	.
Arcapita Bank B.S.C.	2012	.	.	.
Al-Salam Bank-Bahrain B.S.C.	2012	0.3204	0.3202	0.999376
Bahrain Islamic Bank B.S.C.	2012	.	.	.
First energy bank	2012	0.6047	0.1049	0.173474
Khaleeji Commercial Bank	2012	0.2012	0.2002	0.99503
ABC Islamic Bank (E.C.)	2012	1.0000	1.6551	1.6551
Gulf Finance House BSC	2012	.	.	.
Bank Alkhair BSC	2012	0.3030	0.2851	0.940924
Elaf Bank	2012	0.1235	0.1208	0.978138
Seera Investment Bank BSC	2012	0.2166	0.2048	0.945522

Venture Capital Bank BSC (c)-VCBank	2012	.	.	.
International Investment Bank BSC-IIB	2012	.	.	.
Global Banking Corporation BSC	2012	.	.	.
Capivest	2012	.	.	.
Investors Bank BSC	2012	.	.	.
Citi Islamic Investment Bank	2012	.	.	.
Islami Bank Bangladesh Limited	2012	0.3544	0.2145	0.605248
Al-Arafah Islami Bank Ltd.	2012	0.1755	0.1718	0.978917
Shahjalal Islami Bank Ltd	2012	0.2758	0.2757	0.999637
First Security Islami Bank Limited	2012	0.3188	0.3181	0.997804
Social Islami Bank Ltd	2012	0.2220	0.2218	0.999099
ICB Islamic Bank Limited	2012	0.2316	0.2276	0.982729
Faisal Islamic Bank of Egypt	2012	0.1062	0.0502	0.472693
Al Baraka Bank Egypt SAE	2012	0.1626	0.1625	0.999385
Bank of London and The Middle East Plc-BLME	2012	0.6098	0.5946	0.975074
Islamic Bank of Britain Plc	2012	0.4425	0.4271	0.965198
Gatehouse Bank Plc	2012	.	.	.
European Islamic Investment Bank Plc	2012	.	.	.
DD&Co. Limited	2012	.	.	.
Bank Syariah Mandiri	2012	0.2928	0.1806	0.616803
PT Bank Muamalat Indonesia Tbk	2012	0.3088	0.2057	0.666127
PT Bank BRI Syariah	2012	0.1503	0.1501	0.998669
PT Bank Maybank Syariah Indonesia	2012	0.5379	0.5370	0.998327
Kurdistan International Bank for Investment and Development	2012	0.3632	0.2011	0.553689
Al-Bilad Islamic Bank for Investments & Financing	2012	.	.	.
Cihan Bank for Islamic Investment and Finance P.S.C	2012	0.6210	0.3759	0.605314
Elaf Islamic Bank	2012	0.3826	0.3400	0.888657
Jordan Islamic Bank	2012	0.3272	0.2459	0.751528
Islamic International Arab Bank	2012	0.2275	0.2272	0.998681
Jordan Dubai Islamic Bank	2012	0.1761	0.1754	0.996025
Kuwait Finance House	2012	0.8183	0.2109	0.257729
Boubyan Bank KSC	2012	0.5288	0.2458	0.464826
Kuwait International Bank	2012	0.2916	0.2153	0.73834
First Investment Company K.S.C.C.	2012	.	.	.
A'Ayan Leasing & Investment Company	2012	0.0479	0.0476	0.993737
Al Baraka Bank Lebanon SAL	2012	.	.	.
Arab Finance House sal	2012	.	.	.
Maybank Islamic Berhad	2012	.	.	.
CIMB Islamic Bank Berhad	2012	1.0000	1.3429	1.3429
Bank Islam Malaysia Berhad	2012	0.3949	0.1721	0.435807
AmIslamic Bank Berhad	2012	1.0000	1.6449	1.6449
Public Islamic Bank Berhad	2012	1.5375	1.6614	1.080585
RHB Islamic Bank Berhad	2012	0.7774	0.5285	0.67983
Hong Leong Islamic Bank Berhad	2012	0.6071	0.5704	0.939549
Bank Muamalat Malaysia Berhad	2012	0.2460	0.1712	0.695935
HSBC Amanah Malaysia Berhad	2012	0.5796	0.5144	0.887509

Affin Islamic Bank Berhad	2012	0.5153	0.5066	0.983117
Kuwait Finance House (Malaysia) Berhad	2012	.	.	.
Standard Chartered Saadiq Berhad	2012	0.5332	0.5331	0.999812
Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2012	0.2128	0.1964	0.922932
OCBC Al-Amin Bank Berhad	2012	0.3299	0.3278	0.993634
Alliance Islamic Bank Berhad	2012	0.9193	1.4768	1.60644
Asian Finance Bank Berhad	2012	0.4525	0.4364	0.96442
Meezan Bank Limited	2012	0.1009	0.0950	0.941526
BankIslami Pakistan Limited	2012	0.1699	0.1691	0.995291
Albaraka Bank (Pakistan) Limited	2012	0.1764	0.1748	0.99093
Dubai Islamic Bank Pakistan Limited	2012	0.1301	0.1297	0.996925
Standard Chartered Modaraba	2012	0.9911	1.6165	1.631016
First Habib Modaraba	2012	0.7937	1.2581	1.585108
First National Bank Modaraba	2012	0.9346	1.5171	1.623261
Al-Amanah Islamic Investment Bank of the Philippines	2012	.	.	.
Qatar Islamic Bank SAQ	2012	0.6881	0.2862	0.415928
Masraf Al Rayan (Q.S.C.)	2012	1.0000	0.4948	0.4948
Qatar International Islamic Bank	2012	0.5713	0.3493	0.611413
Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	2012	1.0000	0.2668	0.2668
Islamic Development Bank	2012	.	.	.
Alinma Bank	2012	0.6202	0.2771	0.446791
Bank AlBilad	2012	0.4141	0.1460	0.352572
Islamic Bank of Asia (The)	2012	.	.	.
Bank of Khartoum	2012	0.1521	0.1365	0.897436
Faisal Islamic Bank (Sudan)	2012	0.2359	0.1778	0.753709
Tadamon Islamic Bank	2012	0.1868	0.1437	0.769272
Al Salam Bank	2012	.	.	.
Al Baraka Bank Sudan	2012	.	.	.
United Capital Bank	2012	.	0.2386	.
Al Shamal Islamic Bank	2012	.	.	.
Syria International Islamic Bank	2012	.	.	.
Cham Islamic Bank SA	2012	.	.	.
Albaraka Bank Tunisia	2012	.	.	.
Asya Katilim Bankasi AS-Bank Asya	2012	0.6947	0.1989	0.286311
Kuveyt Turk Katilim Bankasi A.S.	2012	0.3625	0.1681	0.463724
Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	2012	0.2905	0.1750	0.60241
Tadhamon International Islamic Bank	2012	0.0925	0.0876	0.947027
Saba Islamic Bank	2012	0.1495	0.1492	0.997993
Shamil Bank of Yemen & Bahrain	2012	0.3268	0.3251	0.994798
Commercial Bank of Dubai P.S.C.	2006	0.4255	0.2346	0.551351
Invest Bank P.S.C.	2006	0.3724	0.2646	0.710526
Mashreqbank	2006	0.6987	0.1732	0.247889
National Bank of Fujairah	2006	0.2859	0.2289	0.80063
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2006	0.2487	0.2048	0.823482
National Bank of Umm Al-Qaiwain	2006	0.3562	0.3561	0.999719
Union National Bank	2006	0.6689	0.3299	0.493198

United Arab Bank PJSC	2006	0.1934	0.1905	0.985005
Addax Bank BSC	2006	.	.	.
Alubaf Arab International Bank	2006	.	.	.
Bahrain Commercial Facilities Company BSC	2006	.	.	.
BBK B.S.C.	2006	0.3022	0.2112	0.698875
BMI Bank BSC	2006	0.2623	0.2619	0.998475
Future Bank B.S.C.	2006	0.5626	0.5618	0.998578
Gulf International Bank BSC	2006	0.4555	0.2173	0.477058
National Bank of Bahrain	2006	0.2552	0.1814	0.710815
Bangladesh Commerce Bank Ltd	2006	0.7407	0.7372	0.995275
City Bank Ltd	2006	0.1774	0.1767	0.996054
Dhaka Bank Limited	2006	0.3046	0.3040	0.99803
Eastern Bank Limited	2006	0.3061	0.3056	0.998367
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2006	0.1971	0.1912	0.970066
Janata Bank Limited	2006	0.2041	0.1619	0.793239
Ahli United Bank (Egypt) SAE	2006	.	.	.
Bank of Alexandria	2006	.	.	.
Allied Bank Philippines (UK) Plc	2006	0.8545	0.8543	0.999766
Melli Bank Plc	2006	0.8117	0.7346	0.905014
National Bank of Kuwait (International) PLC	2006	0.3571	0.3513	0.983758
Reliance Bank Limited	2006	0.4739	0.4730	0.998101
Wesleyan Bank Ltd	2006	.	.	.
Bank BNP Paribas Indonesia PT	2006	0.6199	0.6165	0.994515
Bank DBS Indonesia	2006	0.1864	0.1863	0.999464
Bank Tabungan Pensiunan Nasional PT	2006	0.1180	0.1179	0.999153
PT Bank Resona Perdania	2006	0.2856	0.2792	0.977591
Bank of Baghdad	2006	.	.	.
Investment Bank of Iraq SA Co	2006	.	.	.
National Bank of Iraq	2006	.	.	.
North Bank	2006	.	.	.
Capital Bank of Jordan	2006	0.3300	0.3156	0.956364
Jordan Ahli Bank Plc	2006	0.0987	0.0987	1
Jordan Commercial Bank	2006	0.2467	0.2387	0.967572
Commercial Bank of Kuwait SAK (The)	2006	0.6685	0.3043	0.455198
National Bank of Kuwait S.A.K.	2006	0.7410	0.2402	0.324157
Jammal Trust Bank SAL	2006	.	.	.
Near East Commercial Bank SAL	2006	.	.	.
Affin Bank	2006	0.3756	0.2430	0.646965
Alliance Bank Malaysia Berhad	2006	0.3780	0.2091	0.553175
AmBank (M) Berhad	2006	0.7405	0.3371	0.455233
Bangkok Bank Berhad	2006	0.3983	0.5135	1.289229
Bank of China (Malaysia) Berhad	2006	0.8333	1.3124	1.574943
Bank of Nova Scotia Berhad	2006	0.7246	0.7205	0.994342
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2006	0.3249	0.2787	0.857802
CIMB Bank (L) Limited (2011)	2006	0.8344	0.7810	0.936002
Citibank Berhad	2006	0.5595	0.2061	0.368365

Deutsche Bank (Malaysia) Bhd.	2006	0.3223	0.3219	0.998759
HSBC Bank Malaysia Berhad	2006	0.4067	0.1882	0.462749
JP Morgan Chase Bank Berhad	2006	0.5813	0.5755	0.990022
Maybank International (L) Ltd	2006	0.9844	0.7927	0.805262
RHB Bank (L) Ltd	2006	0.5145	.	.
Royal Bank of Scotland Berhad (The)	2006	0.4950	0.4849	0.979596
Standard Chartered Bank Malaysia Berhad	2006	0.5458	0.2499	0.45786
United Overseas Bank (Malaysia) Bhd.	2006	0.4976	0.3161	0.635249
Bank of Khyber	2006	0.1571	0.3074	1.956715
First Dawood Investment Bank Limited	2006	0.8221	1.3048	1.587155
First Women Bank Limited	2006	.	.	.
Habib Metropolitan Bank Limited	2006	0.2015	0.3826	1.898759
KASB Bank Limited	2006	0.2031	0.2008	0.988676
Samba Bank Limited	2006	.	0.1543	.
Silkbank Limited	2006	0.3077	0.2015	0.654859
United Overseas Bank Philippines	2006	0.6408	0.6398	0.998439
Commercial Bank of Qatar (The) QSC	2006	0.4950	0.2499	0.504848
Doha Bank	2006	0.5385	0.2979	0.553203
International Bank of Qatar Q.S.C.	2006	0.3835	0.3509	0.914993
Bank Al-Jazira	2006	1.5546	0.0959	0.061688
National Commercial Bank (The)	2006	1.5461	0.1881	0.121661
Saudi Hollandi Bank	2006	0.5713	0.2533	0.443375
Saudi Investment Bank (The)	2006	0.8398	0.2470	0.294118
Far Eastern Bank Limited	2006	0.8145	0.7942	0.975077
Al Jazeera Sudanese Jordanian Bank	2006	.	.	.
Blue Nile Mashreq Bank Ltd	2006	.	.	.
Byblos Bank Africa Ltd	2006	0.3974	0.3802	0.956719
Elnilein Bank	2006	.	.	.
Farmers Commercial Bank	2006	.	.	.
Omdurman National Bank	2006	0.5133	0.3843	0.748685
Saudi Sudanese Bank	2006	0.1914	0.1897	0.991118
Sudanese French Bank (The)	2006	0.1046	0.0915	0.874761
Bank Audi Syria	2006	0.3281	0.3264	0.994819
Byblos Bank Syria SA	2006	0.4899	0.4862	0.992447
North Africa International Bank - NAIB	2006	0.3681	0.3666	0.995925
Alternatifbank A.S.	2006	0.2444	0.2437	0.997136
HSBC Bank A.S	2006	.	.	.
ING Bank A.S.	2006	0.2571	0.1498	0.582653
Sekerbank T.A.S.	2006	0.0740	0.0740	1
International Bank of Yemen YSC	2006	.	.	.
National Bank of Yemen	2006	.	.	.
Yemen Commercial Bank	2006	0.2708	0.2697	0.995938
Commercial Bank of Dubai P.S.C.	2007	0.5250	0.2580	0.491429
Invest Bank P.S.C.	2007	0.3289	0.2544	0.773487
Mashreqbank	2007	0.7275	0.1619	0.222543
National Bank of Fujairah	2007	0.3075	0.2220	0.721951

National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2007	0.2701	0.1792	0.663458
National Bank of Umm Al-Qaiwain	2007	0.3326	0.2370	0.712568
Union National Bank	2007	0.7260	0.3466	0.47741
United Arab Bank PJSC	2007	0.1996	0.1752	0.877756
Addax Bank BSC	2007	.	.	.
Alubaf Arab International Bank	2007	1.5398	1.6747	1.087609
Bahrain Commercial Facilities Company BSC	2007	0.2876	0.2624	0.912378
BBK B.S.C.	2007	0.3158	0.2163	0.684927
BMI Bank BSC	2007	0.2729	0.2723	0.997801
Future Bank B.S.C.	2007	0.2789	0.2052	0.735748
Gulf International Bank BSC	2007	0.6731	0.3143	0.466944
National Bank of Bahrain	2007	0.2699	0.1784	0.660986
Bangladesh Commerce Bank Ltd	2007	0.6452	0.6431	0.996745
City Bank Ltd	2007	0.1457	0.1453	0.997255
Dhaka Bank Limited	2007	0.2705	0.2700	0.998152
Eastern Bank Limited	2007	0.2900	0.2892	0.997241
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2007	0.1681	0.1670	0.993456
Janata Bank Limited	2007	0.1569	0.1337	0.852135
Ahli United Bank (Egypt) SAE	2007	.	.	.
Bank of Alexandria	2007	.	.	.
Allied Bank Philippines (UK) Plc	2007	0.8533	1.3508	1.583031
Melli Bank Plc	2007	1.0000	1.6485	1.6485
National Bank of Kuwait (International) PLC	2007	0.4000	0.3918	0.9795
Reliance Bank Limited	2007	0.4408	0.4400	0.998185
Wesleyan Bank Ltd	2007	.	.	.
Bank BNP Paribas Indonesia PT	2007	0.6036	0.6012	0.996024
Bank DBS Indonesia	2007	0.2675	0.2365	0.884112
Bank Tabungan Pensiunan Nasional PT	2007	0.1192	0.1038	0.870805
PT Bank Resona Perdania	2007	0.3447	0.3411	0.989556
Bank of Baghdad	2007	.	.	.
Investment Bank of Iraq SA Co	2007	.	.	.
National Bank of Iraq	2007	.	.	.
North Bank	2007	0.4814	0.3986	0.828002
Capital Bank of Jordan	2007	0.2630	0.2604	0.990114
Jordan Ahli Bank Plc	2007	0.1013	0.1010	0.997038
Jordan Commercial Bank	2007	0.2375	0.2275	0.957895
Commercial Bank of Kuwait SAK (The)	2007	0.8608	0.3432	0.398699
National Bank of Kuwait S.A.K.	2007	0.8732	0.2627	0.300847
Jammal Trust Bank SAL	2007	0.1971	0.1969	0.998985
Near East Commercial Bank SAL	2007	.	.	.
Affin Bank	2007	0.3512	0.2162	0.615604
Alliance Bank Malaysia Berhad	2007	0.3579	0.1726	0.482258
AmBank (M) Berhad	2007	0.8179	0.3367	0.411664
Bangkok Bank Berhad	2007	0.3773	0.3758	0.996024
Bank of China (Malaysia) Berhad	2007	0.7143	0.7093	0.993
Bank of Nova Scotia Berhad	2007	0.4542	0.4494	0.989432

Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2007	0.3021	0.2935	0.971533
CIMB Bank (L) Limited (2011)	2007	0.8854	0.7658	0.86492
Citibank Berhad	2007	0.4903	0.2069	0.421987
Deutsche Bank (Malaysia) Bhd.	2007	0.3763	0.3677	0.977146
HSBC Bank Malaysia Berhad	2007	0.4618	0.1831	0.396492
JP Morgan Chase Bank Berhad	2007	0.5289	0.5283	0.998866
Maybank International (L) Ltd	2007	0.9055	0.7698	0.850138
RHB Bank (L) Ltd	2007	.	.	.
Royal Bank of Scotland Berhad (The)	2007	0.0937	0.0937	1
Standard Chartered Bank Malaysia Berhad	2007	0.5288	0.2377	0.449508
United Overseas Bank (Malaysia) Bhd.	2007	0.5495	0.3244	0.590355
Bank of Khyber	2007	0.2572	0.2565	0.997278
First Dawood Investment Bank Limited	2007	0.8526	1.3594	1.594417
First Women Bank Limited	2007	.	.	.
Habib Metropolitan Bank Limited	2007	0.2893	0.2646	0.914622
KASB Bank Limited	2007	0.1981	0.1970	0.994447
Samba Bank Limited	2007	0.1202	0.1170	0.973378
Silkbank Limited	2007	0.1872	0.1817	0.97062
United Overseas Bank Philippines	2007	.	.	.
Commercial Bank of Qatar (The) QSC	2007	0.7036	0.2951	0.419414
Doha Bank	2007	0.5163	0.2575	0.498741
International Bank of Qatar Q.S.C.	2007	0.4136	0.3451	0.834381
Bank Al-Jazira	2007	0.2222	0.1141	0.513501
National Commercial Bank (The)	2007	0.9328	0.1808	0.193825
Saudi Hollandi Bank	2007	0.5379	0.2211	0.411043
Saudi Investment Bank (The)	2007	0.4521	0.2469	0.546118
Far Eastern Bank Limited	2007	0.7470	0.7343	0.982999
Al Jazeera Sudanese Jordanian Bank	2007	.	.	.
Blue Nile Mashreq Bank Ltd	2007	0.3978	0.3638	0.91453
Byblos Bank Africa Ltd	2007	0.3511	0.3207	0.913415
Elnilein Bank	2007	.	.	.
Farmers Commercial Bank	2007	0.1176	0.1176	1
Omdurman National Bank	2007	0.4011	0.4009	0.999501
Saudi Sudanese Bank	2007	0.2106	0.2063	0.979582
Sudanese French Bank (The)	2007	0.1060	0.0933	0.880189
Bank Audi Syria	2007	0.2281	0.2278	0.998685
Byblos Bank Syria SA	2007	0.3051	0.3037	0.995411
North Africa International Bank - NAIB	2007	0.2961	0.2946	0.994934
Alternatifbank A.S.	2007	0.2310	0.1593	0.68961
HSBC Bank A.S	2007	0.5128	0.1442	0.281201
ING Bank A.S.	2007	0.4069	0.1470	0.361268
Sekerbank T.A.S.	2007	0.1289	0.0958	0.743212
International Bank of Yemen YSC	2007	.	.	.
National Bank of Yemen	2007	.	.	.
Yemen Commercial Bank	2007	0.2534	0.2498	0.985793
Commercial Bank of Dubai P.S.C.	2008	0.5628	0.2896	0.51457

Invest Bank P.S.C.	2008	0.3564	0.3100	0.869809
Mashreqbank	2008	0.7917	0.1846	0.233169
National Bank of Fujairah	2008	0.3056	0.2361	0.772579
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2008	0.2610	0.1597	0.611877
National Bank of Umm Al-Qaiwain	2008	0.4909	0.3601	0.733551
Union National Bank	2008	1.4993	0.3814	0.254385
United Arab Bank PJSC	2008	0.2454	0.1928	0.785656
Addax Bank BSC	2008	.	.	.
Alubaf Arab International Bank	2008	0.5796	0.5631	0.971532
Bahrain Commercial Facilities Company BSC	2008	0.3003	0.2546	0.847819
BBK B.S.C.	2008	0.3377	0.2213	0.655315
BMI Bank BSC	2008	0.2089	0.1955	0.935854
Future Bank B.S.C.	2008	0.2663	0.1998	0.750282
Gulf International Bank BSC	2008	0.8047	0.3573	0.444016
National Bank of Bahrain	2008	0.2911	0.1995	0.685332
Bangladesh Commerce Bank Ltd	2008	0.6494	0.6475	0.997074
City Bank Ltd	2008	0.1517	0.1513	0.997363
Dhaka Bank Limited	2008	0.2571	0.2567	0.998444
Eastern Bank Limited	2008	0.2407	0.2404	0.998754
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2008	0.1716	0.1710	0.996503
Janata Bank Limited	2008	0.1679	0.1379	0.821322
Ahli United Bank (Egypt) SAE	2008	.	.	.
Bank of Alexandria	2008	.	.	.
Allied Bank Philippines (UK) Plc	2008	.	.	.
Melli Bank Plc	2008	0.3630	0.3628	0.999449
National Bank of Kuwait (International) PLC	2008	0.3704	0.3604	0.973002
Reliance Bank Limited	2008	0.3722	0.3718	0.998925
Wesleyan Bank Ltd	2008	.	.	.
Bank BNP Paribas Indonesia PT	2008	0.6218	0.6134	0.986491
Bank DBS Indonesia	2008	0.2031	0.1878	0.924668
Bank Tabungan Pensiunan Nasional PT	2008	0.1185	0.1137	0.959494
PT Bank Resona Perdania	2008	0.3656	0.3645	0.996991
Bank of Baghdad	2008	.	.	.
Investment Bank of Iraq SA Co	2008	.	.	.
National Bank of Iraq	2008	0.3884	0.3700	0.952626
North Bank	2008	0.3613	0.2999	0.830058
Capital Bank of Jordan	2008	0.2359	0.2341	0.99237
Jordan Ahli Bank Plc	2008	0.1140	0.1128	0.989474
Jordan Commercial Bank	2008	0.2223	0.2222	0.99955
Commercial Bank of Kuwait SAK (The)	2008	0.7099	0.3445	0.48528
National Bank of Kuwait S.A.K.	2008	0.8157	0.2438	0.298884
Jammal Trust Bank SAL	2008	0.1962	0.1955	0.996432
Near East Commercial Bank SAL	2008	0.3110	0.3109	0.999678
Affin Bank	2008	0.4311	0.2538	0.588727
Alliance Bank Malaysia Berhad	2008	0.3788	0.1920	0.506864
AmBank (M) Berhad	2008	0.9697	0.3386	0.34918

Bangkok Bank Berhad	2008	0.4312	0.4302	0.997681
Bank of China (Malaysia) Berhad	2008	0.6211	0.6181	0.99517
Bank of Nova Scotia Berhad	2008	0.5469	0.5447	0.995977
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2008	0.3314	0.2939	0.886844
CIMB Bank (L) Limited (2011)	2008	0.8377	0.7848	0.936851
Citibank Berhad	2008	0.5497	0.2422	0.440604
Deutsche Bank (Malaysia) Bhd.	2008	0.3826	0.3707	0.968897
HSBC Bank Malaysia Berhad	2008	0.5206	0.2004	0.38494
JP Morgan Chase Bank Berhad	2008	0.5566	0.5491	0.986525
Maybank International (L) Ltd	2008	0.9853	0.8319	0.844311
RHB Bank (L) Ltd	2008	0.8754	1.4008	1.600183
Royal Bank of Scotland Berhad (The)	2008	0.1575	0.0998	0.633651
Standard Chartered Bank Malaysia Berhad	2008	0.5679	0.2438	0.429301
United Overseas Bank (Malaysia) Bhd.	2008	0.5583	0.3131	0.56081
Bank of Khyber	2008	0.2971	0.2968	0.99899
First Dawood Investment Bank Limited	2008	0.6431	0.6413	0.997201
First Women Bank Limited	2008	0.3340	0.3333	0.997904
Habib Metropolitan Bank Limited	2008	0.2622	0.2341	0.89283
KASB Bank Limited	2008	0.1710	0.1689	0.987719
Samba Bank Limited	2008	0.1119	0.1104	0.986595
Silkbank Limited	2008	0.1486	0.1466	0.986541
United Overseas Bank Philippines	2008	0.8555	1.3500	1.578025
Commercial Bank of Qatar (The) QSC	2008	0.7036	0.2802	0.398238
Doha Bank	2008	0.5498	0.2758	0.501637
International Bank of Qatar Q.S.C.	2008	0.4615	0.3461	0.749946
Bank Al-Jazira	2008	0.2161	0.1385	0.640907
National Commercial Bank (The)	2008	0.7235	0.1800	0.248791
Saudi Hollandi Bank	2008	0.6418	0.2877	0.44827
Saudi Investment Bank (The)	2008	0.5115	0.2991	0.584751
Far Eastern Bank Limited	2008	0.7325	0.7288	0.994949
Al Jazeera Sudanese Jordanian Bank	2008	0.3788	0.3769	0.994984
Blue Nile Mashreq Bank Ltd	2008	0.5071	0.3869	0.762966
Byblos Bank Africa Ltd	2008	.	.	.
Elnilein Bank	2008	.	.	.
Farmers Commercial Bank	2008	0.1122	0.1110	0.989305
Omdurman National Bank	2008	0.3732	0.3727	0.99866
Saudi Sudanese Bank	2008	0.2305	0.2305	1
Sudanese French Bank (The)	2008	0.1171	0.0929	0.793339
Bank Audi Syria	2008	0.1929	0.1926	0.998445
Byblos Bank Syria SA	2008	0.2530	0.2523	0.997233
North Africa International Bank - NAIB	2008	0.3157	0.3149	0.997466
Alternatifbank A.S.	2008	0.1777	0.1537	0.864941
HSBC Bank A.S	2008	0.4773	0.1366	0.286193
ING Bank A.S.	2008	0.4236	0.1608	0.379603
Sekerbank T.A.S.	2008	0.1259	0.0969	0.769658
International Bank of Yemen YSC	2008	.	.	.

National Bank of Yemen	2008	0.1848	0.1786	0.96645
Yemen Commercial Bank	2008	0.2187	0.2184	0.998628
Commercial Bank of Dubai P.S.C.	2009	0.5312	0.2655	0.499812
Invest Bank P.S.C.	2009	0.3779	0.2857	0.75602
Mashreqbank	2009	0.4928	0.1743	0.353693
National Bank of Fujairah	2009	0.2338	0.1972	0.843456
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2009	0.2902	0.1659	0.571675
National Bank of Umm Al-Qaiwain	2009	0.4201	0.2995	0.712925
Union National Bank	2009	0.9371	0.3721	0.397076
United Arab Bank PJSC	2009	0.2105	0.1706	0.810451
Addax Bank BSC	2009	.	.	.
Alubaf Arab International Bank	2009	0.3598	0.3510	0.975542
Bahrain Commercial Facilities Company BSC	2009	0.2966	0.2488	0.83884
BBK B.S.C.	2009	0.2628	0.1644	0.625571
BMI Bank BSC	2009	0.1731	0.1726	0.997111
Future Bank B.S.C.	2009	0.2430	0.2027	0.834156
Gulf International Bank BSC	2009	0.8010	0.3627	0.452809
National Bank of Bahrain	2009	0.3100	0.1989	0.641613
Bangladesh Commerce Bank Ltd	2009	0.6410	0.6383	0.995788
City Bank Ltd	2009	0.1456	0.1454	0.998626
Dhaka Bank Limited	2009	0.2455	0.2452	0.998778
Eastern Bank Limited	2009	0.2059	0.2010	0.976202
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2009	0.1557	0.1556	0.999358
Janata Bank Limited	2009	0.1816	0.1446	0.796256
Ahli United Bank (Egypt) SAE	2009	.	.	.
Bank of Alexandria	2009	0.2582	0.1270	0.491867
Allied Bank Philippines (UK) Plc	2009	.	.	.
Melli Bank Plc	2009	0.2600	0.2585	0.994231
National Bank of Kuwait (International) PLC	2009	0.4000	0.3917	0.97925
Reliance Bank Limited	2009	0.4041	0.4034	0.998268
Wesleyan Bank Ltd	2009	.	.	.
Bank BNP Paribas Indonesia PT	2009	0.6750	0.5255	0.778519
Bank DBS Indonesia	2009	0.1952	0.1733	0.887807
Bank Tabungan Pensiunan Nasional PT	2009	0.1041	0.1014	0.974063
PT Bank Resona Perdania	2009	0.3364	0.3266	0.970868
Bank of Baghdad	2009	.	.	.
Investment Bank of Iraq SA Co	2009	.	.	.
National Bank of Iraq	2009	0.3636	0.3601	0.990374
North Bank	2009	0.3245	0.2573	0.792912
Capital Bank of Jordan	2009	0.2141	0.2130	0.994862
Jordan Ahli Bank Plc	2009	0.1239	0.1163	0.93866
Jordan Commercial Bank	2009	0.1989	0.1985	0.997989
Commercial Bank of Kuwait SAK (The)	2009	0.6513	0.3714	0.570244
National Bank of Kuwait S.A.K.	2009	0.9007	0.2715	0.301432
Jammal Trust Bank SAL	2009	0.1761	0.1755	0.996593
Near East Commercial Bank SAL	2009	0.2790	0.2768	0.992115

Affin Bank	2009	0.5160	0.2702	0.523643
Alliance Bank Malaysia Berhad	2009	0.4162	0.2101	0.504805
AmBank (M) Berhad	2009	0.9063	0.3245	0.358049
Bangkok Bank Berhad	2009	0.3927	0.3911	0.995926
Bank of China (Malaysia) Berhad	2009	0.4079	0.4077	0.99951
Bank of Nova Scotia Berhad	2009	0.5896	0.5870	0.99559
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2009	0.2835	0.2627	0.926631
CIMB Bank (L) Limited (2011)	2009	1.0000	1.3123	1.3123
Citibank Berhad	2009	0.5266	0.2160	0.410179
Deutsche Bank (Malaysia) Bhd.	2009	0.4860	0.4848	0.997531
HSBC Bank Malaysia Berhad	2009	0.4562	0.1797	0.393906
JP Morgan Chase Bank Berhad	2009	0.5236	0.5221	0.997135
Maybank International (L) Ltd	2009	0.7938	0.7863	0.990552
RHB Bank (L) Ltd	2009	0.9069	1.4648	1.615173
Royal Bank of Scotland Berhad (The)	2009	0.0994	0.0994	1
Standard Chartered Bank Malaysia Berhad	2009	0.6360	0.2656	0.41761
United Overseas Bank (Malaysia) Bhd.	2009	0.7395	0.3079	0.416362
Bank of Khyber	2009	0.2019	0.1996	0.988608
First Dawood Investment Bank Limited	2009	0.6947	0.6711	0.966029
First Women Bank Limited	2009	0.3166	0.3152	0.995578
Habib Metropolitan Bank Limited	2009	0.1903	0.1848	0.971098
KASB Bank Limited	2009	0.1204	0.1177	0.977575
Samba Bank Limited	2009	0.1456	0.1440	0.989011
Silkbank Limited	2009	0.1198	0.1177	0.982471
United Overseas Bank Philippines	2009	0.8403	1.3232	1.574676
Commercial Bank of Qatar (The) QSC	2009	0.6718	0.2659	0.395802
Doha Bank	2009	0.5172	0.2598	0.50232
International Bank of Qatar Q.S.C.	2009	0.3756	0.2580	0.686901
Bank Al-Jazira	2009	0.2330	0.1428	0.612876
National Commercial Bank (The)	2009	0.7215	0.1687	0.233818
Saudi Hollandi Bank	2009	0.5985	0.2633	0.439933
Saudi Investment Bank (The)	2009	0.5165	0.2926	0.566505
Far Eastern Bank Limited	2009	0.7587	0.7573	0.998155
Al Jazeera Sudanese Jordanian Bank	2009	0.3106	0.3105	0.999678
Blue Nile Mashreq Bank Ltd	2009	0.4363	0.3161	0.724501
Byblos Bank Africa Ltd	2009	.	.	.
Elnilein Bank	2009	.	.	.
Farmers Commercial Bank	2009	0.1332	0.1331	0.999249
Omdurman National Bank	2009	0.3930	0.3924	0.998473
Saudi Sudanese Bank	2009	0.1469	0.1467	0.998639
Sudanese French Bank (The)	2009	0.0906	0.0843	0.930464
Bank Audi Syria	2009	0.1937	0.1936	0.999484
Byblos Bank Syria SA	2009	0.2520	0.2511	0.996429
North Africa International Bank - NAIB	2009	0.3006	0.2987	0.993679
Alternatifbank A.S.	2009	0.2649	0.1613	0.608909
HSBC Bank A.S	2009	0.3167	0.1196	0.377644

ING Bank A.S.	2009	0.4055	0.1611	0.397287
Sekerbank T.A.S.	2009	0.1569	0.1057	0.673678
International Bank of Yemen YSC	2009	0.2092	0.1878	0.897706
National Bank of Yemen	2009	0.1763	0.1719	0.975043
Yemen Commercial Bank	2009	0.2043	0.2040	0.998532
Commercial Bank of Dubai P.S.C.	2010	0.5131	0.2569	0.500682
Invest Bank P.S.C.	2010	0.4201	0.3125	0.743871
Mashreqbank	2010	0.4003	0.1577	0.393955
National Bank of Fujairah	2010	0.2722	0.2137	0.785084
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2010	0.3193	0.1639	0.51331
National Bank of Umm Al-Qaiwain	2010	0.3798	0.2666	0.701948
Union National Bank	2010	0.9937	0.3804	0.382812
United Arab Bank PJSC	2010	0.2477	0.1885	0.761001
Addax Bank BSC	2010	.	.	.
Alubaf Arab International Bank	2010	0.2883	0.2591	0.898717
Bahrain Commercial Facilities Company BSC	2010	0.2772	0.2377	0.857504
BBK B.S.C.	2010	0.2598	0.1596	0.614319
BMI Bank BSC	2010	0.1366	0.1340	0.980966
Future Bank B.S.C.	2010	0.2613	0.2260	0.864906
Gulf International Bank BSC	2010	0.6789	0.3524	0.519075
National Bank of Bahrain	2010	0.2418	0.1609	0.665426
Bangladesh Commerce Bank Ltd	2010	0.5952	0.5915	0.993784
City Bank Ltd	2010	0.1529	0.1525	0.997384
Dhaka Bank Limited	2010	0.2270	0.2237	0.985463
Eastern Bank Limited	2010	0.1992	0.1902	0.954819
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2010	0.1541	0.1538	0.998053
Janata Bank Limited	2010	0.2332	0.1619	0.694254
Ahli United Bank (Egypt) SAE	2010	0.2520	0.2441	0.968651
Bank of Alexandria	2010	0.3068	0.1288	0.419817
Allied Bank Philippines (UK) Plc	2010	.	.	.
Melli Bank Plc	2010	0.2520	0.2498	0.99127
National Bank of Kuwait (International) PLC	2010	0.4167	0.4053	0.972642
Reliance Bank Limited	2010	0.4760	0.4741	0.996008
Wesleyan Bank Ltd	2010	.	.	.
Bank BNP Paribas Indonesia PT	2010	0.5771	0.5769	0.999653
Bank DBS Indonesia	2010	0.2454	0.1985	0.808883
Bank Tabungan Pensiunan Nasional PT	2010	0.2478	0.1190	0.480226
PT Bank Resona Perdania	2010	0.3833	0.3696	0.964258
Bank of Baghdad	2010	.	.	.
Investment Bank of Iraq SA Co	2010	0.3297	0.3050	0.925083
National Bank of Iraq	2010	0.3356	0.3345	0.996722
North Bank	2010	0.3104	0.2395	0.771585
Capital Bank of Jordan	2010	0.2224	0.2215	0.995953
Jordan Ahli Bank Plc	2010	0.1345	0.1193	0.886989
Jordan Commercial Bank	2010	0.1977	0.1971	0.996965
Commercial Bank of Kuwait SAK (The)	2010	0.6425	0.3679	0.572607

National Bank of Kuwait S.A.K.	2010	0.9435	0.2806	0.297403
Jammal Trust Bank SAL	2010	0.1772	0.1767	0.997178
Near East Commercial Bank SAL	2010	0.2745	0.2733	0.995628
Affin Bank	2010	0.5845	0.2713	0.464157
Alliance Bank Malaysia Berhad	2010	0.5127	0.2277	0.444119
AmBank (M) Berhad	2010	1.5404	0.3036	0.197092
Bangkok Bank Berhad	2010	0.3451	0.3439	0.996523
Bank of China (Malaysia) Berhad	2010	0.3181	0.3173	0.997485
Bank of Nova Scotia Berhad	2010	0.6238	0.6238	1
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2010	0.3061	0.2862	0.934989
CIMB Bank (L) Limited (2011)	2010	.	.	.
Citibank Berhad	2010	0.5355	0.1819	0.339683
Deutsche Bank (Malaysia) Bhd.	2010	0.4893	0.4792	0.979358
HSBC Bank Malaysia Berhad	2010	0.5058	0.2038	0.402926
JP Morgan Chase Bank Berhad	2010	0.4673	0.4567	0.977316
Maybank International (L) Ltd	2010	.	.	.
RHB Bank (L) Ltd	2010	.	.	.
Royal Bank of Scotland Berhad (The)	2010	0.1276	0.1265	0.991379
Standard Chartered Bank Malaysia Berhad	2010	0.8264	0.3451	0.417594
United Overseas Bank (Malaysia) Bhd.	2010	0.8480	0.3230	0.380896
Bank of Khyber	2010	0.1885	0.1884	0.999469
First Dawood Investment Bank Limited	2010	0.9449	1.4922	1.579215
First Women Bank Limited	2010	0.3247	0.3235	0.996304
Habib Metropolitan Bank Limited	2010	0.2010	0.1857	0.923881
KASB Bank Limited	2010	0.1155	0.1137	0.984416
Samba Bank Limited	2010	0.1535	0.1525	0.993485
Silkbank Limited	2010	0.1305	0.1291	0.989272
United Overseas Bank Philippines	2010	0.8197	1.2856	1.568379
Commercial Bank of Qatar (The) QSC	2010	0.7017	0.2752	0.39219
Doha Bank	2010	0.5138	0.2489	0.48443
International Bank of Qatar Q.S.C.	2010	0.4542	0.2886	0.635403
Bank Al-Jazira	2010	0.2657	0.1554	0.58487
National Commercial Bank (The)	2010	0.8344	0.1760	0.21093
Saudi Hollandi Bank	2010	0.5854	0.2825	0.482576
Saudi Investment Bank (The)	2010	0.5214	0.2872	0.550825
Far Eastern Bank Limited	2010	0.7359	0.7343	0.997826
Al Jazeera Sudanese Jordanian Bank	2010	0.2528	0.2503	0.990111
Blue Nile Mashreq Bank Ltd	2010	0.4179	0.2642	0.632209
Byblos Bank Africa Ltd	2010	.	.	.
Elnilein Bank	2010	.	.	.
Farmers Commercial Bank	2010	.	.	.
Omdurman National Bank	2010	0.3778	0.3775	0.999206
Saudi Sudanese Bank	2010	0.1506	0.1505	0.999336
Sudanese French Bank (The)	2010	0.0841	0.0798	0.94887
Bank Audi Syria	2010	0.2065	0.2061	0.998063
Byblos Bank Syria SA	2010	0.2512	0.2503	0.996417

North Africa International Bank - NAIB	2010	0.2535	0.2516	0.992505
Alternatifbank A.S.	2010	0.2999	0.1716	0.572191
HSBC Bank A.S	2010	0.3641	0.1146	0.314749
ING Bank A.S.	2010	0.4016	0.1705	0.424552
Sekerbank T.A.S.	2010	0.2165	0.1276	0.589376
International Bank of Yemen YSC	2010	0.2151	0.1822	0.847048
National Bank of Yemen	2010	0.1805	0.1633	0.904709
Yemen Commercial Bank	2010	0.1971	0.1959	0.993912
Commercial Bank of Dubai P.S.C.	2011	0.4878	0.2417	0.49549
Invest Bank P.S.C.	2011	0.4261	0.3055	0.716968
Mashreqbank	2011	0.3434	0.1490	0.433896
National Bank of Fujairah	2011	0.3560	0.2128	0.597753
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2011	0.3461	0.1583	0.457382
National Bank of Umm Al-Qaiwain	2011	0.3257	0.2315	0.710777
Union National Bank	2011	1.0000	0.3728	0.3728
United Arab Bank PJSC	2011	0.3100	0.2169	0.699677
Addax Bank BSC	2011	.	.	.
Alubaf Arab International Bank	2011	0.3558	0.2730	0.767285
Bahrain Commercial Facilities Company BSC	2011	0.2753	0.2393	0.869234
BBK B.S.C.	2011	0.2614	0.1669	0.638485
BMI Bank BSC	2011	0.1504	0.1495	0.994016
Future Bank B.S.C.	2011	0.2623	0.2276	0.867709
Gulf International Bank BSC	2011	0.5736	0.2642	0.4606
National Bank of Bahrain	2011	0.2471	0.1618	0.654796
Bangladesh Commerce Bank Ltd	2011	0.4695	0.4681	0.997018
City Bank Ltd	2011	0.1706	0.1702	0.997655
Dhaka Bank Limited	2011	0.2440	0.2377	0.97418
Eastern Bank Limited	2011	0.1996	0.1932	0.967936
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2011	0.1696	0.1689	0.995873
Janata Bank Limited	2011	0.2397	0.1659	0.692115
Ahli United Bank (Egypt) SAE	2011	0.2407	0.2282	0.948068
Bank of Alexandria	2011	0.3039	0.1178	0.387628
Allied Bank Philippines (UK) Plc	2011	.	.	.
Melli Bank Plc	2011	0.3722	0.3707	0.99597
National Bank of Kuwait (International) PLC	2011	0.4545	0.4432	0.975138
Reliance Bank Limited	2011	0.4282	0.4262	0.995329
Wesleyan Bank Ltd	2011	.	.	.
Bank BNP Paribas Indonesia PT	2011	0.6683	0.6647	0.994613
Bank DBS Indonesia	2011	0.3804	0.1968	0.51735
Bank Tabungan Pensiunan Nasional PT	2011	0.3630	0.1203	0.331405
PT Bank Resona Perdania	2011	0.3609	0.3449	0.955666
Bank of Baghdad	2011	0.1738	0.1259	0.724396
Investment Bank of Iraq SA Co	2011	0.3254	0.3041	0.934542
National Bank of Iraq	2011	0.2573	0.2570	0.998834
North Bank	2011	0.3035	0.2137	0.704119
Capital Bank of Jordan	2011	0.1884	0.1874	0.994692

Jordan Ahli Bank Plc	2011	0.1453	0.1262	0.868548
Jordan Commercial Bank	2011	0.1936	0.1924	0.993802
Commercial Bank of Kuwait SAK (The)	2011	0.5879	0.3552	0.604184
National Bank of Kuwait S.A.K.	2011	0.9477	0.2814	0.296929
Jammal Trust Bank SAL	2011	.	.	.
Near East Commercial Bank SAL	2011	.	.	.
Affin Bank	2011	0.6129	0.2984	0.486866
Alliance Bank Malaysia Berhad	2011	0.5597	0.2397	0.428265
AmBank (M) Berhad	2011	0.9756	0.2723	0.27911
Bangkok Bank Berhad	2011	0.3332	0.3319	0.996098
Bank of China (Malaysia) Berhad	2011	0.3368	0.3366	0.999406
Bank of Nova Scotia Berhad	2011	0.6648	0.6572	0.988568
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2011	0.2588	0.2429	0.938563
CIMB Bank (L) Limited (2011)	2011	.	.	.
Citibank Berhad	2011	0.4772	0.1669	0.349749
Deutsche Bank (Malaysia) Bhd.	2011	0.4695	0.4646	0.989563
HSBC Bank Malaysia Berhad	2011	0.5303	0.2082	0.392608
JP Morgan Chase Bank Berhad	2011	0.4762	0.4717	0.99055
Maybank International (L) Ltd	2011	.	.	.
RHB Bank (L) Ltd	2011	.	.	.
Royal Bank of Scotland Berhad (The)	2011	0.1773	0.1702	0.959955
Standard Chartered Bank Malaysia Berhad	2011	0.8369	0.3504	0.418688
United Overseas Bank (Malaysia) Bhd.	2011	0.8783	0.3418	0.389161
Bank of Khyber	2011	0.1367	0.1346	0.984638
First Dawood Investment Bank Limited	2011	0.6803	0.6762	0.993973
First Women Bank Limited	2011	0.3025	0.3018	0.997686
Habib Metropolitan Bank Limited	2011	0.1532	0.1443	0.941906
KASB Bank Limited	2011	0.1169	0.1144	0.978614
Samba Bank Limited	2011	0.1648	0.1644	0.997573
Silkbank Limited	2011	0.1234	0.1229	0.995948
United Overseas Bank Philippines	2011	0.7194	0.7181	0.998193
Commercial Bank of Qatar (The) QSC	2011	0.8184	0.3170	0.387341
Doha Bank	2011	0.5434	0.2445	0.449945
International Bank of Qatar Q.S.C.	2011	0.4808	0.2803	0.582987
Bank Al-Jazira	2011	0.3342	0.1727	0.516756
National Commercial Bank (The)	2011	0.9198	0.1785	0.194064
Saudi Hollandi Bank	2011	0.6368	0.2902	0.455716
Saudi Investment Bank (The)	2011	0.4236	0.2339	0.552172
Far Eastern Bank Limited	2011	0.7782	0.7744	0.995117
Al Jazeera Sudanese Jordanian Bank	2011	0.2159	0.2156	0.99861
Blue Nile Mashreq Bank Ltd	2011	0.5091	0.3044	0.597918
Byblos Bank Africa Ltd	2011	.	.	.
Elnilein Bank	2011	.	.	.
Farmers Commercial Bank	2011	0.1277	0.1276	0.999217
Omdurman National Bank	2011	0.3107	0.3107	1
Saudi Sudanese Bank	2011	0.1562	0.1545	0.989117

Sudanese French Bank (The)	2011	0.0756	0.0734	0.970899
Bank Audi Syria	2011	0.2146	0.2135	0.994874
Byblos Bank Syria SA	2011	0.2911	0.2898	0.995534
North Africa International Bank - NAIB	2011	0.2450	0.2369	0.966939
Alternatifbank A.S.	2011	0.3011	0.1665	0.552972
HSBC Bank A.S	2011	0.5277	0.1352	0.256206
ING Bank A.S.	2011	0.4915	0.2066	0.420346
Sekerbank T.A.S.	2011	0.2321	0.1452	0.625592
International Bank of Yemen YSC	2011	0.1829	0.1656	0.905413
National Bank of Yemen	2011	0.1471	0.1271	0.864038
Yemen Commercial Bank	2011	0.1962	0.1961	0.99949
Commercial Bank of Dubai P.S.C.	2012	0.4976	0.2458	0.493971
Invest Bank P.S.C.	2012	0.4095	0.2980	0.727717
Mashreqbank	2012	0.4261	0.1558	0.365642
National Bank of Fujairah	2012	0.4275	0.2101	0.491462
National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK	2012	0.3834	0.1558	0.406364
National Bank of Umm Al-Qaiwain	2012	0.3425	0.2432	0.710073
Union National Bank	2012	0.9703	0.3474	0.358034
United Arab Bank PJSC	2012	.	.	.
Addax Bank BSC	2012	.	.	.
Alubaf Arab International Bank	2012	0.3612	0.2854	0.790144
Bahrain Commercial Facilities Company BSC	2012	0.2752	0.2170	0.788517
BBK B.S.C.	2012	0.2717	0.1607	0.591461
BMI Bank BSC	2012	0.2070	0.1924	0.929469
Future Bank B.S.C.	2012	0.2304	0.1941	0.842448
Gulf International Bank BSC	2012	0.5491	0.2369	0.431433
National Bank of Bahrain	2012	0.2157	0.1419	0.657858
Bangladesh Commerce Bank Ltd	2012	0.3270	0.3263	0.997859
City Bank Ltd	2012	0.1533	0.1525	0.994781
Dhaka Bank Limited	2012	0.2341	0.2335	0.997437
Eastern Bank Limited	2012	0.1991	0.1900	0.954294
IFIC Bank Limited-International Finance Investment and Commerce Bank Limited	2012	0.1666	0.1658	0.995198
Janata Bank Limited	2012	0.2609	0.1757	0.673438
Ahli United Bank (Egypt) SAE	2012	0.2634	0.2479	0.941154
Bank of Alexandria	2012	0.2199	0.1027	0.46703
Allied Bank Philippines (UK) Plc	2012	.	.	.
Melli Bank Plc	2012	0.3756	0.3698	0.984558
National Bank of Kuwait (International) PLC	2012	0.4762	0.4687	0.98425
Reliance Bank Limited	2012	0.4308	0.4292	0.996286
Wesleyan Bank Ltd	2012	.	.	.
Bank BNP Paribas Indonesia PT	2012	0.7572	0.7467	0.986133
Bank DBS Indonesia	2012	0.6045	0.3732	0.61737
Bank Tabungan Pensiunan Nasional PT	2012	0.4406	0.1195	0.271221
PT Bank Resona Perdania	2012	0.5417	0.5404	0.9976
Bank of Baghdad	2012	0.1455	0.0968	0.665292
Investment Bank of Iraq SA Co	2012	.	.	.

National Bank of Iraq	2012	.	.	.
North Bank	2012	.	.	.
Capital Bank of Jordan	2012	0.1702	0.1628	0.956522
Jordan Ahli Bank Plc	2012	0.1502	0.1301	0.866178
Jordan Commercial Bank	2012	0.1975	0.1966	0.995443
Commercial Bank of Kuwait SAK (The)	2012	0.5877	0.3607	0.613749
National Bank of Kuwait S.A.K.	2012	1.0000	0.2953	0.2953
Jammal Trust Bank SAL	2012	.	.	.
Near East Commercial Bank SAL	2012	.	.	.
Affin Bank	2012	0.6888	0.3055	0.443525
Alliance Bank Malaysia Berhad	2012	0.6103	0.2371	0.388497
AmBank (M) Berhad	2012	1.0000	0.3122	0.3122
Bangkok Bank Berhad	2012	0.3226	0.3213	0.99597
Bank of China (Malaysia) Berhad	2012	0.2867	0.2867	1
Bank of Nova Scotia Berhad	2012	0.7201	0.7199	0.999722
Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2012	0.2393	0.2121	0.886335
CIMB Bank (L) Limited (2011)	2012	.	.	.
Citibank Berhad	2012	0.5150	0.1574	0.305631
Deutsche Bank (Malaysia) Bhd.	2012	0.4673	0.4635	0.991868
HSBC Bank Malaysia Berhad	2012	0.6420	0.2250	0.350467
JP Morgan Chase Bank Berhad	2012	0.4386	0.4300	0.980392
Maybank International (L) Ltd	2012	.	.	.
RHB Bank (L) Ltd	2012	.	.	.
Royal Bank of Scotland Berhad (The)	2012	0.2288	0.2242	0.979895
Standard Chartered Bank Malaysia Berhad	2012	0.8479	0.3306	0.389904
United Overseas Bank (Malaysia) Bhd.	2012	1.0000	0.3540	0.354
Bank of Khyber	2012	0.1459	0.1427	0.978067
First Dawood Investment Bank Limited	2012	0.9586	1.5575	1.624765
First Women Bank Limited	2012	0.2984	0.2979	0.998324
Habib Metropolitan Bank Limited	2012	0.1290	0.1236	0.95814
KASB Bank Limited	2012	0.1026	0.1016	0.990253
Samba Bank Limited	2012	0.1652	0.1647	0.996973
Silkbank Limited	2012	0.1095	0.1086	0.991781
United Overseas Bank Philippines	2012	0.6904	0.6900	0.999421
Commercial Bank of Qatar (The) QSC	2012	0.8780	0.3186	0.36287
Doha Bank	2012	0.6023	0.2670	0.443301
International Bank of Qatar Q.S.C.	2012	0.4868	0.2861	0.587716
Bank Al-Jazira	2012	0.3931	0.1818	0.462478
National Commercial Bank (The)	2012	1.0000	0.2011	0.2011
Saudi Hollandi Bank	2012	0.7918	0.3180	0.401617
Saudi Investment Bank (The)	2012	0.5627	0.2893	0.514128
Far Eastern Bank Limited	2012	0.7609	0.7608	0.999869
Al Jazeera Sudanese Jordanian Bank	2012	0.2309	0.2308	0.999567
Blue Nile Mashreq Bank Ltd	2012	0.5576	0.3322	0.595768
Byblos Bank Africa Ltd	2012	.	.	.
Elnilein Bank	2012	.	.	.

Farmers Commercial Bank	2012	.	.	.
Omdurman National Bank	2012	0.2827	0.2824	0.998939
Saudi Sudanese Bank	2012	.	.	.
Sudanese French Bank (The)	2012	.	.	.
Bank Audi Syria	2012	.	.	.
Byblos Bank Syria SA	2012	0.2159	0.2145	0.993516
North Africa International Bank - NAIB	2012	.	.	.
Alternatifbank A.S.	2012	0.4115	0.1953	0.474605
HSBC Bank A.S	2012	0.4657	0.1179	0.253167
ING Bank A.S.	2012	0.7140	0.2129	0.298179
Sekerbank T.A.S.	2012	0.2503	0.1549	0.618857
International Bank of Yemen YSC	2012	0.3296	0.1740	0.527913
National Bank of Yemen	2012	0.1061	0.0846	0.797361
Yemen Commercial Bank	2012	.	.	.

Appemdix 2; Descriptive statistics for different regions and countries based on Logarithm of total assets (in USD millions)

Region/Country	Mean			St. Dev			Minimum			Maximum			No. Year Obs.			No. of Banks		
	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T	ISB	CB	T
MENA	7.05	7.41	7.19	1.41	1.60	1.45	2.49	3.80	2.49	11.17	11.43	11.43	382.00	324.00	706.00	61.00	50.00	111.00
UAE	8.59	8.62	8.61	1.07	0.90	0.98	5.63	7.17	5.63	9.86	10.31	10.16	50	56	106	8	8	16
Bahrain	6.27	7.43	6.65	1.62	1.65	1.71	2.49	3.80	2.49	8.78	8.83	10.31	110	54	164	17	8	25
Egypt	8.04	8.00	8.02	0.51	0.81	0.67	7.16	6.56	6.56	6.79	7.02	8.83	14	14	28	2	2	4
Iraq	5.55	5.53	5.54	0.74	0.90	0.82	4.01	4.09	4.01	8.36	8.23	7.02	20	23	43	4	4	8
Jordan	6.93	7.42	7.18	1.08	0.54	0.88	5.08	6.59	5.08	10.86	10.98	8.36	21	21	42	3	3	6
Kuwait	8.25	10.08	8.78	1.35	0.65	1.45	6.18	9.22	6.18	5.55	6.32	10.98	34	14	48	5	2	7
Lebanon	4.95	5.66	5.31	0.58	0.57	0.66	4.01	4.96	4.01	9.91	10.00	6.32	8	8	16	2	2	4
Qatar	8.84	9.16	9.00	0.66	0.62	0.65	7.74	7.52	7.52	11.17	11.43	10.00	20	21	41	3	3	6
Saudi A.	9.44	9.79	9.62	0.93	0.84	0.89	8.01	8.34	8.01	7.53	8.12	11.43	26	28	54	4	4	8
Sudan	6.29	5.98	6.12	0.64	0.95	0.83	5.40	4.22	4.22	7.41	7.60	8.12	42	48	90	7	8	15
Syria	6.11	6.59	6.38	0.89	0.66	0.79	5.01	5.27	5.01	6.39	6.23	7.60	10	13	23	2	2	4
Tunisia	6.18	5.85	6.02	0.21	0.32	0.31	5.86	5.40	5.40	7.65	7.20	6.39	6	6	12	1	1	2
Yemen	6.21	6.22	6.22	1.06	0.43	0.82	4.46	5.34	4.46	10.16	10.16	7.65	21	18	39	3	3	6
E. Asia &Pac	5.80	6.38	6.12	2.62	1.89	2.22	0.22	3.06	0.22	10.31	10.22	10.31	131	155	286	22	23	45
Indonesia	6.87	6.96	6.92	1.35	1.06	1.18	3.68	5.15	3.68	8.63	8.72	8.72	23	28	51	4	4	8
Malaysia	7.97	8.26	8.12	1.01	1.24	1.15	4.41	5.73	4.41	10.31	10.22	10.31	98	114	212	16	17	33
Philippines	1.99	3.76	2.96	1.42	0.49	1.33	0.22	3.06	0.22	3.24	4.22	4.22	5	6	11	1	1	2
Singapore	6.36	6.53	6.46	0.29	0.16	0.23	5.90	6.30	5.90	6.60	6.75	6.75	5	7	12	1	1	2
S. Asia	5.87	6.44	6.16	1.06	0.51	0.80	3.03	2.50	2.50	8.68	8.70	8.70	91	89	180	13	13	26
Bangladesh	6.62	6.81	6.72	0.98	1.04	1.01	4.95	4.51	4.51	8.68	8.70	8.70	42	42	84	6	6	12
Pakistan	5.12	6.08	5.59	1.45	1.27	1.44	3.03	2.50	2.50	7.95	8.07	8.07	49	47	96	7	7	14
EU &C. Asia	6.85	7.20	7.04	2.42	2.24	2.34	2.41	2.54	2.41	9.40	9.63	9.63	53	62	115	8	9	17
UK	5.14	5.62	5.38	1.56	1.72	1.65	2.41	2.54	2.41	7.40	8.18	8.18	33	35	68	5	5	10
Turkey	8.56	8.78	8.69	0.52	0.67	0.62	7.48	7.26	7.26	9.40	9.63	9.63	20	27	47	3	4	7
Total	6.68	7.10	6.87	1.70	1.60	1.59	0.22	2.50	0.22	11.17	11.43	11.43	657	630	1287	104	95	199

Note: Size is measured by logarithm of total assets (Ln TA). The sample consists of 199 banks covering 21 countries from 4 regions Middle East & North Africa (MENA): United Arab Emirates (UAE), Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, Sudan, Syria, Tunisia and Yemen. East Asia & Pacific (E.Asia&Pac): Indonesia, Malaysia, Philippines and Singapore. South Asia (S.Asia): Bangladesh and Pakistan. Europe and Central Asia (EU & C. Asia):The United Kingdom (UK) and Turkey. The data are extracted from BankScope database for 7 years from 2006 to 2012 inclusive.

Appendix 3: Total assets of the selected Islamic and conventional banks (in USD millions)

Country Name	Islamic bank	Islamic total assets mil USD	Conventional total assets mil USD	Conventional bank
Arab Emirates	Dubai Islamic Bank plc	25,967.24	23,727	Union National Bank
	Abu Dhabi Islamic Bank - Public Joint Stock Co.	23,325.96	20,799	Mashreqbank
	Emirates Islamic Bank PJSC	10,146.71	10,747	Commercial Bank of Dubai P.S.C.
	Al Hilal Bank PJSC	8,746.60	7,420	National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK
	Sharjah Islamic Bank	4,987.39	4,777	National Bank of Fujairah
	Noor Islamic Bank	4,888.93	4,088	United Arab Bank PJSC
	Tamweel PJSC	2,980.78	3,333	National Bank of Umm Al-Qaiwain
	Ajman Bank	1,494.81	3,107	Invest Bank P.S.C.
Bangladesh	Islami Bank Bangladesh Limited	5,905.57	5,978	Janata Bank Limited
	Al-Arafah Islami Bank Ltd.	1,848.31	1,842	Eastern Bank Limited
	Shahjalal Islami Bank Ltd	1,637.85	1,631	Dhaka Bank Limited
	First Security Islami Bank Limited	1,603.56	1,575	City Bank Ltd
	Social Islami Bank Ltd	1,417.99	1,400	IFIC Bank Limited-International Finance Investment and Commerce Bank Limited
	ICB Islamic Bank Limited	140.49	245	Bangladesh Commerce Bank Ltd
Bahrain	Albaraka Banking Group B.S.C.	19,055.10	17,705	Gulf International Bank BSC
	Arcapita Bank B.S.C. (2011)	3,718.30	8,265	BBK B.S.C.
	Al-Salam Bank-Bahrain B.S.C.	2,505.85	7,060	National Bank of Bahrain
	Bahrain Islamic Bank B.S.C.	2,214.89	2,005	BMI Bank BSC
	First energy bank	1,400.50	1,453	Future Bank B.S.C.
	Khaleeji Commercial Bank	1,258.40	1,112	Alubaf Arab International Bank
	ABC Islamic Bank (E.C.)	1,066.80	515	Bahrain Commercial Facilities Company BSC
	Gulf Finance House BSC	890.40	57	Addax Bank BSC
	Bank Alkhair BSC	483.00		
	Elaf Bank	382.80		
	Seera Investment Bank BSC	360.30		
	Venture Capital Bank BSC (c)-VCBank	209.51		
	International Investment Bank BSC-IIB	165.30		
	Global Banking Corporation BSC	141.00		
	Capivest	133.60		
	Investors Bank BSC	42.50		
	Citi Islamic Investment Bank	16.10		
Egypt	Faisal Islamic Bank of Egypt	6,514.77	6,520	Bank of Alexandria
	Al Baraka Bank Egypt SAE	2,468.36	2,473	Ahli United Bank (Egypt) SAE
Great Britain	Bank of London and The Middle East Plc-BLME	1,639.51	1,785	National Bank of Kuwait (International) PLC
	Islamic Bank of Britain Plc	412.02	458	Melli Bank Plc
	Gatehouse Bank Plc	309.14	314	Reliance Bank Limited
	European Islamic Investment Bank Plc	270.95	298	Wesleyan Bank Ltd
	DD&Co. Limited (2011)	14.00	19	Allied Bank Philippines (UK) Plc
Indonesia	Bank Syariah Mandiri	5,367.44	6,111	Bank Tabungan Pensiunan Nasional PT

	PT Bank Muamalat Indonesia Tbk	4,638.51	4,311	Bank DBS Indonesia
	PT Bank BRI Syariah	1,456.97	1,238	PT Bank Resona Perdania
	PT Bank Maybank Syariah Indonesia	213.29	436	Bank BNP Paribas Indonesia PT
Iraq	Kurdistan International Bank for Investment and Development	884.91	1,115	Bank of Baghdad
	Al-Bilad Islamic Bank for Investments & Financing	450.85	771	North Bank
	Cihan Bank for Islamic Investment and Finance P.S.C	401.26	280	Investment Bank of Iraq SA Co (12/2011)
	Elaf Islamic Bank	326.46	144	National Bank of Iraq (12/2011)
Jordan	Jordan Islamic Bank	4,254.23	3,733	Jordan Ahli Bank Plc
	Islamic International Arab Bank	1,653.80	2,263	Capital Bank of Jordan
	Jordan Dubai Islamic Bank	669.32	1,189	Jordan Commercial Bank
Kuwait	Kuwait Finance House	52,287.70	58,409	National Bank of Kuwait S.A.K.
	Boubyan Bank KSC	6,702.35	13,044	Commercial Bank of Kuwait SAK (The)
	Kuwait International Bank	4,443.46		
	First Investment Company K.S.C.C. (2011)	591.53		
	A'Ayan Leasing & Investment Company	1,454.48		
Lebanon	Al Baraka Bank Lebanon SAL (2010)	226.31	554	Jammal Trust Bank SAL
	Arab Finance House sal (Islamic Bank) (2010)	121.12	236	Near East Commercial Bank SAL
Malaysia	Maybank Islamic Berhad	29,896.48	26,357	United Overseas Bank (Malaysia) Bhd.
	CIMB Islamic Bank Berhad	16,749.51	26,301	AmBank (M) Berhad
	Bank Islam Malaysia Berhad	12,236.50	25,055	HSBC Bank Malaysia Berhad
	AmIslamic Bank Berhad	10,524.59	17,037	Affin Bank
	Public Islamic Bank Berhad	9,580.19	16,891	Standard Chartered Bank Malaysia Berhad
	RHB Islamic Bank Berhad	8,373.84	12,935	Alliance Bank Malaysia Berhad
	Hong Leong Islamic Bank Berhad	6,867.06	12,573	Citibank Berhad
	Bank Muamalat Malaysia Berhad	6,683.18	3,533	Maybank International (L) Ltd (2011)
	HSBC Amanah Malaysia Berhad	3,971.55	3,507	Deutsche Bank (Malaysia) Bhd.
	Affin Islamic Bank Berhad	3,833.53	3,451	Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad
	Kuwait Finance House (Malaysia) Berhad (2011)	2,974.43	2,399	CIMB Bank (L) Limited (2011)
	Standard Chartered Saadiq Berhad	2,396.72	1,905	JP Morgan Chase Bank Berhad
	Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	2,286.98	1,499	Royal Bank of Scotland Berhad (The)
	OCBC Al-Amin Bank Berhad	2,275.55	1,496	Bank of China (Malaysia) Berhad
	Alliance Islamic Bank Berhad	2,121.32	1,444	Bank of Nova Scotia Berhad
	Asian Finance Bank Berhad	918.98	1,012	RHB Bank (L) Ltd (2011)
			852	Bangkok Bank Berhad (2011)
Philippines	Al-Amanah Islamic Investment Bank of the Philippines (2011)	17.25	68	United Overseas Bank Philippines
Pakistan	Meezan Bank Limited	2,825.28	3,096	Habib Metropolitan Bank Limited
	BankIslami Pakistan Limited	764.25	929	KASB Bank Limited
	Albaraka Bank (Pakistan) Limited	760.47	917	Silkbank Limited
	Dubai Islamic Bank Pakistan Limited	653.73	846	Bank of Khyber
	Standard Chartered Modaraba	64.80	348	Samba Bank Limited
	First Habib Modaraba	48.25	232	First Women Bank Limited

	First National Bank Modaraba	20.74	12	First Dawood Investment Bank Limited
Qatar	Qatar Islamic Bank SAQ	20,107.72	21,988	Commercial Bank of Qatar (The) QSC
	Masraf Al Rayan (Q.S.C.)	16,930.88	15,168	Doha Bank
	Qatar International Islamic Bank	7,845.88	8,844	International Bank of Qatar Q.S.C.
Saudi Arabia	Al Rajhi Banking & Investment Corporation-Al Rajhi Bank	71,302.03	92,085	National Commercial Bank (The)
	Islamic Development Bank	17,478.74	18,268	Saudi Hollandi Bank
	Alinma Bank	14,403.87	15,751	Saudi Investment Bank (The)
	Bank AlBilad	7,940.67	13,588	Bank Al-Jazira
Sudan	Bank of Khartoum	1,534.90	2,068	Omdurman National Bank (2011)
	Faisal Islamic Bank (Sudan)	1,261.49	594	Sudanese French Bank (The) (2011)
	Tadamon Islamic Bank	694.50	494	Farmers Commercial Bank (2011)
	Al Salam Bank (2011)	536.48	441	Elnilein Bank
	Al Baraka Bank Sudan (2011)	351.26	352	Blue Nile Mashreq Bank Ltd
	United Capital Bank	339.33	295	Byblos Bank Africa Ltd
	Al Shamal Islamic Bank (2011)	303.00	252	Saudi Sudanese Bank (2011)
			160	Al Jazeera Sudanese Jordanian Bank
Singapore	Islamic Bank of Asia (The) (2011)	366.40	768	Far Eastern Bank Limited
Syria	Syria International Islamic Bank (2011)	1,151.31	1,153	Bank Audi Syria (2011)
	Cham Islamic Bank SA (2011)	237.23	622	Byblos Bank Syria SA
Tunisia	Albaraka Bank Tunisia (2011)	592.30	509	North Africa International Bank - NAIB (2011)
Turkey	Asya Katilim Bankasi AS-Bank Asya	12,107.30	15,281	ING Bank A.S.
	Kuveyt Turk Katilim Bankasi A.S.	10,436.08	14,218	HSBC Bank A.S
	Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	6,918.26	8,447	Sekerbank T.A.S.
			4,506	Alternatifbank A.S.
Yemen	Tadhamon International Islamic Bank	2,094.62	1,335	International Bank of Yemen YSC
	Saba Islamic Bank	836.08	592	National Bank of Yemen
	Shamil Bank of Yemen & Bahrain	224.45	495	Yemen Commercial Bank
Total Assets		897,927.60	659,778	

Appendix 4: Frequency of Inputs & Outputs used in literature review

Inputs	Freq.	Outputs	Freq.
Employees	20	Loans	12
Labour	13	Deposits	10
Physical capital	7	Number of transactions	7
Capital	6	Non-interest income	6
Expenses	5	Total loans	5
Space	5	Net profit	3
Deposits	5	Real estate loans	3
Assets	5	Commercial loans	3
Terminals	4	Number of branches	3
Total deposits	4	Advances	3
number of branches	4	Investments	3
Rent	3	Interest income	3
Credit applications	2	Industrial loans	2
Capital stock	2	Bonds	2
capital (book value of machinery and equipment)	2	Consumer loans	2
Location	2	ROA	2
Interest on deposits	2	ROE	2
Borrowing	2	Customers response	1
ATMs	2	Error corrections	1
Price of labour	2	Demand deposits	1
Buildings	2	Time deposits	1
Networth	1	Short- term loans	1
Operating expense	1	Long-term loans	1
Number of accounts	1	Other services	1
Suppliers	1	Index of quantities of each service provided i.e. checks debit and credit loans, deposits.	1
Computer	1	Balance of current accounts	1
Machine	1	Savings account	1
Automatic teller machines	1	Loans sales	1
Materials	1	Short term loans to nonbanks	1
Capital (book value)	1	loans to banks	1
Acquired equipment	1	Private loans to individuals	1
Funds from customers	1	Loan revenue	1
Windows	1	Other revenues	1
Price of deposits	1	Value of demand deposits	1
Volume of deposits	1	Small time and saving deposits	1
Time deposits	1	Installment loans	1
Interest expenses on deposits	1	Automatic teller machine operations	1
Interest on purchased funds	1	International operations	1
loanable funds	1	Stocks	1
Counter transactions	1	Credit operations	1
Potential market	1	Opening of new accounts	1
Total cost	1	Special services	1
Price of capital	1	Business loans	1
Volume of labour	1	Total deposits	1
Volume of deposits	1	Guarantees given to customers	1
Expenses for federal funds purchased and repurchased in domestic offices salaries	1	Investments in securities	1
Furniture	1	Loans sales	1
Equipment	1	Liability sale	1
Borrowed funds	1	Investments and insurance policies sold	1
Funding	1	Fixed deposits	1
Interest cost	1	Current deposits	1
Not-interest cost	1	Investments income	1
Expenses on personnel	1	Short term loans to nonbanks	1

Selected financial ratios	1	loans to banks	1
Fixed assets	1	Cash	1
Operation costs	1	Real estate	1
Interest expenses	1	Fees	1
Materials (non-labour, non-capital)	1	Commissions	1
Marketing	1	Revenue from sales	1
Number of loans accounts	1	Number of offices.	1
Number of mortgage account	1	Total loans Interest	1
Number of cheque accounts	1	Fees on loans	1
Current accounts	1	Income on federal funds sold and repurchases in domestic offices	1
Savings accounts	1	Allowances for loan losses	1
Employees per branch	1	Net of unearned income	1
loans	1	Transactions deposits	1
Non sales FTE	1	Fee-based income	1
Sales FTE	1	Lease financing receivable	1
Size and city employment rate	1	Agricultural loans	1
Equity	1	Other loans	1
Total overhead expenses	1	Private loans to individuals	1
		Transactions	1
		Maintenance	1
		Selected financial ratios	1
		Investments interest income	1
		Public loans	1
		Guarantees	1
		Revenue	1
		Profits	1
		Accounts per customer and satisfaction	1
		Personal loans	1
		New cheque account	1
		Mortgage loans	1
		Insurance commission and change in " marketed balances"	1
		Sales	1
		Assets	1
		Operating income	1
		Revenues	1
		Average number of products/customer	1
		Customer loyalty	1
		Income	1
		Other earning assets	1
		Off-balance sheet items	1
		Total earning assets	1
		Securities	1

Source: Own Table

Appendix 5: Determinants of PTE including only one of the 6 WGI (Political stability)

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.02456	0.02939	-0.84	0.4034	-0.08215	0.03304
ISMDUM	-0.01805	0.02877	-0.63	0.5304	-0.07444	0.03834
ISFCRIS	0.02291	0.04254	0.54	0.5901	-0.06046	0.10629
NL_TA	.00146***	0.00052	2.78	0.0055	0.00043	0.00249
LLP_GL	-.89700D-05	.4531D-04	-0.2	0.8431	-0.97768D-04	0.79828D-04
EQ_TA	.00323***	0.00075	4.31	0	0.00176	0.00471
SIZERT	.02846***	0.00826	3.45	0.0006	0.01228	0.04464
RES_YPC	-.02292*	0.01338	-1.71	0.0867	-0.04914	0.0033
YGR	-0.00143	0.00319	-0.45	0.6529	-0.00768	0.00481
HHI	0.14256	0.27083	0.53	0.5986	-0.38826	0.67339
INFL	-0.00063	0.0016	-0.4	0.6923	-0.00377	0.0025
MKTCY	.00054**	0.00022	2.39	0.0171	0.0001	0.00098
VACC	-.00147**	0.0007	-2.09	0.0364	-0.00284	-0.00009
POLTC	.00207***	0.00052	3.99	0.0001	0.00106	0.00309
Constant	0.02392	0.08223	0.29	0.7711	-0.13724	0.18509

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061614
SD.[e] = 0.248222
Var[u] = 0 .005565
SD.[u] = 0 .074596
Corr[v(i,t),v(i,s)] = 0 .082832
Sum of Squares 0 .250585E+09
R-squared 0 .021414
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 6: Determinants of PTE including only one of the 6 WGI (Government Effectiveness)

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.02326	0.02953	-0.79	0.4309	-0.08114	0.03462
ISMDUM	-0.01704	0.0289	-0.59	0.5554	-0.0737	0.03961
ISFCRIS	0.02355	0.04274	0.55	0.5816	-0.06021	0.10732
NL_TA	.00155***	0.00052	2.96	0.0031	0.00052	0.00257
LLP_GL	-.12023D-04	.4512D-04	-0.27	0.7899	-0.10045D-03	0.76406D-04
EQ_TA	.00305***	0.00076	4.04	0.0001	0.00157	0.00453
SIZERT	.02433***	0.00846	2.88	0.004	0.00776	0.04091
RES_YPC	-0.00483	0.0124	-0.39	0.6968	-0.02913	0.01947
YGR	-0.00119	0.00319	-0.37	0.7089	-0.00744	0.00506
HHI	0.40782	0.25781	1.58	0.1137	-0.09748	0.91311
INFL	-0.00027	0.00161	-0.17	0.8673	-0.00342	0.00288
MKTCY	.00040*	0.00023	1.72	0.0857	-0.00006	0.00086
VACC	-.00171**	0.00071	-2.4	0.0166	-0.00311	-0.00031
GOVEFF	.00260***	0.00059	4.42	0	0.00145	0.00375
Constant	-0.0382	0.08015	-0.48	0.6336	-0.1953	0.11889

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.060953
SD.[e] = 0.246887
Var[u] = 0.005883
SD.[u] = 0.076701
Corr[v(i,t),v(i,s)] = 0.088021
Sum of Squares 0.256570E+09
R-squared -0.090095
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 7: Determinants of PTE including only one of the 6 WGI (Rule of Law)

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.02013	0.02993	-0.67	0.5011	-0.07879	0.03852
ISMDUM	-0.01864	0.02929	-0.64	0.5245	-0.07606	0.03877
ISFCRIS	0.02089	0.0433	0.48	0.6295	-0.06397	0.10575
NL_TA	.00162***	0.00053	3.06	0.0022	0.00058	0.00266
LLP_GL	.87763D-05	.4543D-04	-0.19	0.8468	-.97808D-04	0.80255D-04
EQ_TA	.00307***	0.00078	3.94	0.0001	0.00154	0.0046
SIZERT	.02527***	0.00892	2.83	0.0046	0.00779	0.04275
RES_YPC	-0.00846	0.01265	-0.67	0.5037	-0.03325	0.01633
YGR	-0.00176	0.00321	-0.55	0.5851	-0.00805	0.00454
HHI	0.42662	0.26	1.64	0.1008	-0.08297	0.93621
INFL	-0.00061	0.00162	-0.37	0.708	-0.00378	0.00257
MKTCY	.00048**	0.00024	2.02	0.0439	0.00001	0.00094
VACC	-.00149**	0.00073	-2.04	0.0416	-0.00293	-0.00006
RLAW	.00225***	0.00073	3.1	0.0019	0.00083	0.00368
Constant	-0.02046	0.0812	-0.25	0.801	-0.17962	0.13869

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061481
SD.[e] = 0.247953
Var[u] = 0.006272
SD.[u] = 0.079193
Corr[v(i,t),v(i,s)] = 0.092567
Sum of Squares 0.258022E+09
R-squared -0.101789
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 8: Determinants of PTE including only one of the 6 WGI (Corruption Control)

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
FCRISIS	-0.0237	0.03005	-0.79	0.4302	-0.0826	0.03519
ISMDUM	-0.01739	0.02935	-0.59	0.5536	-0.07492	0.04014
ISFCRIS	0.02186	0.04339	0.5	0.6145	-0.06319	0.10691
NL_TA	.00149***	0.00053	2.82	0.0049	0.00045	0.00253
LLP_GL	-.10087D-04	.4559D-04	-0.22	0.8249	-.99435D-04	0.79261D-04
EQ_TA	.00330***	0.00078	4.24	0	0.00178	0.00483
SIZERT	.03021***	0.00871	3.47	0.0005	0.01315	0.04727
RES_YPC	-0.01028	0.01302	-0.79	0.4302	-0.0358	0.01525
YGR	-0.00176	0.00322	-0.54	0.5862	-0.00808	0.00457
HHI	.43683*	0.26095	1.67	0.0941	-0.07462	0.94829
INFL	-0.00093	0.00162	-0.57	0.5676	-0.0041	0.00225
MKTCY	.00060***	0.00023	2.62	0.0089	0.00015	0.00106
VACC	-0.00116	0.00072	-1.61	0.108	-0.00257	0.00025
RLAW	.00123**	0.00056	2.2	0.0275	0.00014	0.00232
Constant	-0.01654	0.08217	-0.2	0.8405	-0.1776	0.14452

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061906
SD.[e] = 0.248809
Var[u] = 0.006268
SD.[u] = 0.079168
Corr[v(i,t),v(i,s)] = 0.091935
Sum of Squares 0.258093E+09
R-squared -0.105291
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 9: Determinants of pooled PTE of Islamic and conventional banks, including each year dummy variable

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
P07	-0.02133	0.04443	-0.48	0.6312	-0.10842	0.06576
P08	0.00528	0.045	0.12	0.9066	-0.08293	0.09348
P09	-0.04287	0.05217	-0.82	0.4112	-0.14511	0.05937
P10	-0.0311	0.04133	-0.75	0.4518	-0.1121	0.0499
P11	-0.02137	0.04181	-0.51	0.6092	-0.10332	0.06057
P12	.09293*	0.04837	1.92	0.0547	-0.00188	0.18774
ISMDUM	0.0006	0.0552	0.01	0.9913	-0.10759	0.1088
ISFCRIS	-0.00216	0.03671	-0.06	0.9531	-0.0741	0.06979
FCRISIS	-0.03646	0.03432	-1.06	0.2882	-0.10373	0.03082
NL_TA	0.00202	0.00124	1.63	0.1025	-0.00041	0.00445
LLP_GL	.00511*	0.00305	1.68	0.0935	-0.00086	0.01109
EQ_TA	.00335**	0.00138	2.42	0.0156	0.00063	0.00606
SIZERT	.11626***	0.03125	3.72	0.0002	0.05502	0.1775
RES_YPC	-0.0471	0.0393	-1.2	0.2307	-0.12412	0.02993
YGR	0.00371	0.00343	1.08	0.2801	-0.00302	0.01043
HHI	.98305**	0.47871	2.05	0.04	0.04481	1.9213
INFL	-0.00576	0.0053	-1.09	0.2769	-0.01615	0.00462
MKTCY	-.00131**	0.00057	-2.28	0.0227	-0.00243	-0.00018
VACC	.01805***	0.00352	5.12	0	0.01115	0.02496
REGQ	-.01141***	0.00374	-3.05	0.0023	-0.01875	-0.00408
Constant	-.96813***	0.36658	-2.64	0.0083	-1.68661	-0.24966

***, **, * ==> Significance at 1%, 5%, 10% level

1393 observations

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061871
SD.[e] = 0.248738
Var[u] = 0.005002
SD.[u] = 0.070725
Corr[v(i,t),v(i,s)] = 0.074799
Sum of Squares 0.265621E+09
R-squared -0.154731
[1 degrees of freedom, prob. value = 0.000000]

Note: We estimated the model by using bank random effects; standard errors are heteroscedasticity adjusted. The dummy variables P07, P08, P09, P10, P11 and P12 represent the year period 2007, 2008, 2009, 2010, 2011 and 2012 respectively.

Appendix 10: Determinants of PTE including dummy variables for 4 regions

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
MENA	0.02965	0.1551	0.19	0.8484	-0.27434	0.33364
EASIA_PF	0.21703	0.16031	1.35	0.1758	-0.09718	0.53124
SOUTH_AS	0.17453	0.15447	1.13	0.2585	-0.12822	0.47727
EU_CASIA	0.04872	0.17301	0.28	0.7783	-0.29038	0.38781
NL_TA	0.00128**	0.00052	2.47	0.0137	0.00026	0.0023
LLP_GL	-0.47740D-05	0.4432D-04	-0.11	.9142	-0.91645D-04	0.82097D-04
EQ_TA	0.00361***	0.00076	4.76	0	0.00212	0.0051
SIZERT	0.03057***	0.0088	3.47	0.0005	0.01333	0.04781
RES_YPC	0.03072**	0.01444	2.13	0.0333	0.00242	0.05901
YGR	-0.00116	0.00302	-0.38	0.7019	-0.00707	0.00476
HHI	0.66190**	0.25889	2.56	0.0106	0.15448	1.16932
INFL	-0.0004	0.00152	-0.26	0.7924	-0.00337	0.00257
MKTCY	0.76218D-04	0.00024	0.32	0.7490	-0.39072D-03	0.54316D-03
VACC	-0.00249**	0.00104	-2.39	0.0168	-0.00452	-0.00045
REGQ	0.00347***	0.00094	3.69	0.0002	0.00163	0.00532
Constant	-0.21696	0.15004	-1.45	0.1482	-0.51103	0.07711

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.060312
SD.[e] = 0.245585
Var[u] = 0.003289
SD.[u] = 0.057346
Corr[v(i,t),v(i,s)] = 0.051707
Sum of Squares 0.292235E+09
R-squared -0.310931
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 11: Determinants of PTE including dummy variables for MENA

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
MENA	-.016598***	0.03078	-5.39	0	-0.22632	-0.10565
NL_TA	0.00126**	0.00052	2.42	0.0156	0.00024	0.00229
LLP_GL	.69285D-06	.4466D-04	0.02	.9876	-0.86843D-04	.88228D-04
EQ_TA	0.00346***	0.00076	4.53	0	0.00196	0.00496
SIZERT	0.02936***	0.00844	3.48	0.0005	0.01282	0.0459
RES_YPC	0.0183	0.01296	1.41	0.1579	-0.0071	0.04371
YGR	-0.00113	0.00302	-0.37	0.7088	-0.00705	0.0048
HHI	0.81074***	0.25544	3.17	0.0015	0.31009	1.31138
INFL	-0.00056	0.00152	-0.37	0.7151	-0.00354	0.00243
MKTCY	0.00025	0.00023	1.12	0.2633	-0.00019	0.0007
VACC	-0.00431***	0.00087	-4.94	0	-0.00601	-0.0026
REGQ	0.00386***	0.00076	5.09	0	0.00237	0.00534
Constant	-0.01242	0.07701	-0.16	0.8719	-0.16336	0.13852

***, **, * ==> Significance at 1%, 5%, 10% level

Parameters of model:
Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061404
SD.[e] = 0.247799
Var[u] = 0.003367
SD.[u] = 0.058029
Corr[v(i,t),v(i,s)] = 0.051989
Sum of Squares 0.328292E+09
R-squared -0.497840
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 12: Determinants of PTE including dummy variables for East Asia and Pacific

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
EASIA_PF	0.14750***	0.02474	5.96	0	0.09901	0.19598
NL_TA	0.00131**	0.00052	2.52	0.0116	0.00029	0.00233
LLP_GL	-0.13561D-04	0.4433D-04	-0.31	0.7597	-0.10045D-03	0.73329D-04
EQ_TA	0.00339***	0.00076	4.46	0	0.0019	0.00487
SIZERT	0.02621***	0.00841	3.12	0.0018	0.00972	0.04269
RES_YPC	0.01486	0.01262	1.18	0.2393	-0.00989	0.0396
YGR	-0.00163	0.00303	-0.54	0.5903	-0.00758	0.00431
HHI	0.68906***	0.25193	2.74	0.0062	0.1953	1.18283
INFL	-0.20231D-04	0.00154	-0.01	0.9895	-.030290D-02	0.29885D-02
MKTCY	0.99793D-04	0.00023	0.43	0.6701	-0.35938D-03	0.55897D-03
VACC	-0.00194***	0.00071	-2.75	0.006	-0.00333	-0.00056
REGQ	0.00184***	0.00068	2.69	0.0071	0.0005	0.00318
Constant	-0.04100	0.07639	-0.54	0.5914	-0.19071	0.10871

***, **, * ==> Significance at 1%, 5%, 10% level

Parameters of model:
Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061404
SD.[e] = 0.247799
Var[u] = 0.003367
SD.[u] = 0.058029
Corr[v(i,t),v(i,s)] = 0.051989
Sum of Squares 0.328292E+09
R-squared -0.497840
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 13: Determinants of PTE including dummy variables for South Asia

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
SOUTH_A	0.01207	0.04405	0.27	0.784	-0.07427	0.09842
NL_TA	.00165***	0.00053	3.11	0.0018	0.00061	0.00268
LLP_GL	-.11659D-04	.4524D-04	-0.26	-0.7966	10032D-03	0.77003D-04
EQ_TA	.00307***	0.00077	3.96	0.0001	0.00155	0.00459
SIZERT	.02806***	0.0087	3.23	0.0013	0.01101	0.04512
RES_YPC	-0.00582	0.01293	-0.45	0.6524	-0.03116	0.01951
YGR	-0.00201	0.00318	-0.63	0.527	-0.00825	0.00422
HHI	.56996**	0.26156	2.18	0.0293	0.05732	1.0826
INFL	-0.00073	0.00163	-0.45	0.6554	-0.00393	0.00247
MKTCY	.00051**	0.00023	2.18	0.0294	0.00005	0.00097
VACC	-.00148**	0.00074	-2	0.045	-0.00292	-0.00003
REGQ	.00234***	0.0009	2.61	0.0091	0.00058	0.00409
Constant	-0.08259	0.09236	-0.89	0.3712	-0.26363	0.09844

*****, **, *** ==> Significance at 1%, 5%, 10% level

Parameters of model:
Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.060845
SD.[e] = 0.246669
Var[u] = 0.006820
SD.[u] = 0.082583
Corr[v(i,t),v(i,s)] = 0.100790
Sum of Squares 0.275676E+09
R-squared -0.216782
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 14: Determinants of PTE including dummy variables for Europe and Central Asia

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
EU_CASIA	-0.16749***	0.04823	-3.47	0.0005	-0.26201	-0.07296
NL_TA	0.00168***	0.00053	3.18	0.0015	0.00064	0.00271
LLP_GL	-0.16628D-04	.4497D-04	-0.37	0.7116	-0.10477D-03	0.71518D-04
EQ_TA	0.00319***	0.00077	4.15	0	0.00168	0.0047
SIZERT	0.03242***	0.00862	3.76	0.0002	0.01553	0.04931
RES_YPC	-0.00316	0.01247	-0.25	0.7997	-0.0276	0.02127
YGR	-0.00134	0.00313	-0.43	0.6692	-0.00748	0.0048
HHI	0.39189	0.26226	1.49	0.1351	-0.12213	0.90592
INFL	-0.00067	0.00159	-0.42	0.6713	-0.00379	0.00244
MKTCY	0.00033	0.00024	1.41	0.1598	-0.00013	0.0008
VACC	0.0006	0.00094	0.64	0.5206	-0.00124	0.00245
REGQ	0.00240***	0.00071	3.41	0.0007	0.00102	0.00378
Constant	-0.14427*	0.08093	-1.78	0.0746	-0.30289	0.01435

***, **, * ==> Significance at 1%, 5%, 10% level

Parameters of model:
Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.060984
SD.[e] = 0.246949
Var[u] = 0.005654
SD.[u] = 0.075194
Corr[v(i,t),v(i,s)] = 0.084848
Sum of Squares 0.253755E+09
R-squared -0.073853
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 15: Sample Distribution by Country and Year: number of observations

Country	2006	2007	2008	2009	2010	2011	2012	Total Ob /country
Arab Emirates	13	13	16	16	16	16	15	105
Bahrain	13	15	15	14	15	15	14	101
Bangladesh	12	12	12	12	12	12	12	84
Egypt	0	0	0	2	4	4	4	14
Great Britain	6	7	6	6	6	5	5	41
Indonesia	7	7	7	7	7	8	8	51
Iraq	1	2	4	6	7	8	4	32
Jordan	6	6	6	6	6	6	6	42
Kuwait	6	6	7	7	7	7	6	46
Lebanon	0	3	4	3	3	0	0	13
Malaysia	25	25	31	31	28	29	28	197
Pakistan	11	12	13	14	14	14	14	92
Philippines	1	1	2	2	2	2	1	11
Qatar	5	6	6	6	6	6	6	41
Saudi Arabia	6	7	6	8	7	8	7	49
Singapore	1	2	2	2	2	2	1	12
Sudan	8	12	13	13	12	13	6	77
Syria	2	4	4	4	4	4	1	23
Tunisia	2	2	2	2	2	2	0	12
Turkey	4	7	7	7	7	7	7	46
Yemen	4	4	5	6	6	6	5	36
Total Ob/year	133	153	168	174	173	174	150	1125

Appendix 16: Determinants of PTE including dummy variables for Conventional banks in Muslim (CBINMC) and Non-Muslim (CBINNMC) countries

VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
CBINMC	-0.01043	0.02184	-0.48	0.6331	-0.05323	0.03238
CBINNMC	0.21215***	0.05759	3.68	0.0002	0.09928	0.32501
NL_TA	0.00208***	0.00054	3.84	0.0001	0.00102	0.00314
LLP_GL	-0.30337D-05	0.4504D-04	-0.07	0.9463	-0.91313D-04	0.85246D-04
EQ_TA	0.00332***	0.00077	4.29	0	0.00181	0.00484
SIZERT	0.03532***	0.00874	4.04	0.0001	0.01819	0.05246
YGR	-0.00315	0.00315	-1	0.3177	-0.00931	0.00302
RES_YPC	-0.01086	0.01246	-0.87	0.3835	-0.03527	0.01356
HHI	0.58692**	0.25735	2.28	0.0226	0.08252	1.09132
INFL	-0.54997D-04	0.0016	-0.03	0.9725	-0.31847D-02	0.30747D-02
MKTCY	0.00067***	0.00023	2.86	0.0042	0.00021	0.00112
REGQ	0.00163**	0.00071	2.29	0.0221	0.00023	0.00303
VACC	-0.00227***	0.00075	-3.02	0.0025	-0.00375	-0.0008
Constant	-0.11355	0.07957	-1.43	0.1536	-0.26951	0.04241

***, **, * ==> Significance at 1%, 5%, 10% level

Random Effects Model: v (i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061311
SD.[e] = 0.247611
Var[u] = 0.005643
SD.[u] = 0.075117
Corr[v(i,t),v(i,s)] = 0.084275
Sum of Squares 0.265316E+09
R-squared -0.157996
[1 degrees of freedom, prob. value = 0.005373]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted.

Appendix 17; Determinants of PTE including dummy variables for Islamic banks in Muslim (IBINMC) and Non-Muslim (IBINNMC) countries

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VRS500	Coefficient	Standard Error	z	Prob |z|>Z*	95% Confidence Interval	
IBINMC	-0.00158	0.02205	-0.07	0.9429	-0.04479	0.04163
IBINNMC	-0.10641	0.0725	-1.47	0.1422	-0.2485	0.03568
NL_TA	0.00160***	0.00053	3.01	0.0026	0.00056	0.00264
LLP_GL	0.33596D-05	0.4658D-04	0.07	0.9425 -.8	7941D-04	0.94660D-04
EQ_TA	0.00326***	0.00079	4.14	0	0.00172	0.0048
SIZERT	0.02710***	0.0086	3.15	0.0016	0.01024	0.04396
YGR	-0.00219	0.00317	-0.69	0.4891	-0.0084	0.00402
RES_YPC	-0.00553	0.01258	-0.44	0.6605	-0.03019	0.01914
HHI	0.58485**	0.25998	2.25	0.0245	0.07531	1.0944
INFL	-0.00065	0.00161	-0.4	0.6863	-0.0038	0.0025
MKTCY	0.00052**	0.00023	2.21	0.0268	0.00006	0.00097
REGQ	0.00234***	0.00072	3.26	0.0011	0.00093	0.00375
VACC	-0.00096	0.00081	-1.18	0.2361	-0.00255	0.00063
Constant	-0.08701	0.08049	-1.08	0.2797	-0.24477	0.07074

***, **, * ==> Significance at 1%, 5%, 10% level

Parameters of model:

Random Effects Model: v(i,t) = e(i,t) + u(i)
Estimates: Var[e] = 0.061418
SD.[e] = 0.247826
Var[u] = 0.006187
SD.[u] = 0.078659
Corr[v(i,t),v(i,s)] = 0.091520
Sum of Squares 0.278284E+09
R-squared -0.231732
[1 degrees of freedom, prob. value = 0.000000]

Note: We stimated the model by using bank random effects; standard errors are heteroscedasticity adjusted