Comparison of Efficiency and Productivity between Islamic Banks in the GCC region

A quantitative study using DEA and Malmquist index

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Abstract

The global financial crisis in 2008 had a significant impact on the performance of financial institutions and the competition within the financial systems, which led to global doubt of the performance and stability of western banking systems. This study examines an alternative financial model, Islamic banking, focusing on the efficiency and productivity of Islamic banks within the Gulf Cooperation Council (GCC).

The primary purpose of this research paper is to figure out 'what the total factor productivity change of Islamic banks in the GCC region' is. The study is conducted, using a quantitative research strategy, by collecting secondary data of eleven large banks from six countries in the Gulf region and applying non-parametric Data Envelopment Analysis and Malmquist index to investigate the efficiency and productivity of Islamic banks and Islamic branches of conventional banks from year 2012 until 2016.

When comparing the results of our quantitative study, we were able to observe that almost every bank in the Gulf region was having an increase in the total factor productivity change, with the exception of Saudi Arabia and the U.A.E., who had a decline in its total productivity change.
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Chapter 1. Introductory Chapter

The following chapter serves as an introduction to our research topic. We discuss the problem background and argue for our choice of subject. Furthermore, on the grounds of current literature, we provide an overview of our theoretical framework and present the basis of theories and concepts relevant to our study, mainly efficiency and productivity, DEA Malmquist productivity measure, and Islamic banking in the GCC region. With the choice of our research topic we discuss how we try to fill the research gap in existing literature. Finally, we present our research question and what purpose this degree project aims to fulfill.

1.1 Subject Choice

We are both currently studying Master courses in Accounting and Finance at Umeå University. During our studies we participated in Financial Management courses, including modules like Advanced Financial Statement Analysis and Evaluation, Advanced Corporate Finance, Investments and Risk Management. While studying the modules, we extensively covered topics related to the financial crisis in 2008, that was caused by financial players in the conventional banking sector. The global financial crisis had a significant impact on the performance of financial institutions and the competition within the financial systems. (The Economist, 2013). Worldwide, the economy suffered immensely at that time, in some regions, such as the EU, the ongoing crisis and continuing banking fragilities required state support (Efthyvoulou & Yildirim, 2014, p.11), which led us to reassess the performance and stability of western banking systems. Consequently, we chose to focus on Islamic banking as a particular subject in this research paper, since we were curious to whether there are alternative financial models, which are less risky to the health of the economy of a country or to the overall global economy.

The topic of efficiency and productivity caught our attention when we searched for topics related to Islamic banking. For banks, efficiency means improved profitability, higher quality regarding prices and services for consumers and improved risk absorption due to capital buffers (Berger, Hunter, & Timme, 1993, p.221). It plays an important role in regards to policy formulation, in order to improve the performance of the banking sector. Therefore, the "measurement of efficiency and performance of the banking has been of interest to academics, practitioners, and regulators" (Andrieş & Ursu, 2016). This field’s literature mostly focuses on studying bank efficiency of developed countries, especially the US and the EU. However, during our research phase we discovered literature by Masood et. al. (2013), which compared the efficiency and productivity growth of Islamic and conventional banks in the GCC region by applying the non-parametric DEA model using Malmquist index from 1999 to 2007. We decided to apply a similar study, analyzing efficiency and productivity growth of Islamic banks within the GCC region from 2012 until 2016.

The choice of the specific region we conduct our analysis, can be justified by the fact, that most Islamic banks are clustered around the Gulf region. Therefore, it makes sense to us to focus on the GCC region, given that the countries share many common features in their political, economic, social, demographic and cultural structure (Peterson, 1988), which simplifies the efficiency and productivity comparison of banks
within our study.

From a personal perspective, we believe that our Muslim backgrounds have somewhat further contributed to the particular interest conducting a study on Islamic banking.

### 1.2 Problem Background

Various literatures can be found on Islamic finance, ranging from the relatively simple definitions of aspects like Islamic banking to more complex definitions covering all financial operations. The Islamic finance model covers different forms of banking and banking activities. The many principles and forms of contracts are wide ranging and complex, therefore we only discuss aspects relevant to our study.

According to Warde (2000, p. 5) Islamic finance is defined as follows: “Islamic financial institutions are those that are based, in their objectives and operations, on Quran’s principles (principles of the Muslims’ holy book)”. From this definition, Islamic financial companies are not only limited to banks, but also other types of financial institutions that follow Sharia principles. While in conventional financial systems the focus lies on capitalistic aspects of economic and financial processes, in Islamic finance moral and equitable resource distribution and social consideration in the society prevail (Iqbal, 1997, p.42). Therefore, according to Sharia there is no separation of mosque and state or of business and religion (Nicholas, 1994, p.10).

The Gulf Cooperation Council region (GCC) has been an important financial hub for Islamic banking for many years. According to the World Islamic Banking Competitiveness Report, countries in the GCC region gained above average growth rates in participation banking assets in 2014, with a share of 34% (Ernst and Young, 2016). However, with the increase in Islamic banking activities, more liberalized market conditions, rapidly changing technologies as well as the risks that come with globalization, GCC banks are under great pressure to be more productive and efficient and to respond quickly to changes on the market or when it comes to consumer needs (Masood, 2013, p.74).

Molyneux (2005) argues, that inefficient banks have the tendency to undertake risky decision, which may affect the entire financial system. On the other hand, banks, which reach high productivity levels operate with lower costs and do not tend to do operations that include moral hazard. In order to recognize ways for eventual improvement, certain models help to measure the level of efficiency of the banking system and identify the performance of measured units (Molyneux, 2005, p.5).

By employing a non-parametric method, data envelopment analysis (DEA), which has been developed by Fare et al. (1985), and the Malmquist productivity index (MPI), we aim to measure the total factor productivity change of eleven Islamic banks operating in the GCC region, namely Bahrain, Kuwait, Saudi Arabia, the UAE, Oman and Qatar, using. We include full-fledged Islamic banks and Islamic branches of conventional banks, and compare the efficiency and productivity from 2012 until 2016.
1.3 Theoretical Background and Research Gaps

Despite considerable development in the banking sector of Arab countries during the last decades, only a few papers have explored the productivity growth of banks in the GCC region in the past years. There are various studies, which have been conducted on the topic of productivity and efficiency of Islamic banks in comparison to conventional banks, resulting in mixed outcomes. Muharrami (2008) compares conventional to Islamic banks in the GCC region using the DEA approach and concluded, that Islamic banks are more efficient than conventional banks. Other studies, on the other hand, by Srairi (2010) or Saeed (2013) claim conventional banks are more efficient than Islamic banks. In his study Srairi compares conventional and Islamic banks in the GCC region, whereas Saeed only focuses on banks in Pakistan. One reason for different outcomes could be differences in sample size (Srairi, 2010).

Bader et al. (2008) conducted a study using the DEA model on 22 countries in Africa, the Middle East and Asia and found no significant difference between efficiency of Islamic and conventional banks. Another study by Yusdistira (2004) measured the efficiency of Islamic banks only, and found that the total inefficiency of Islamic banks is small, and that small to medium sized banks encounter diseconomies of scale. However, the issue might be resolved by merging small Islamic banks with large financial institutions, he further argues. In the 2011 study by Ahmad and Noor (2011), they conclude that world Islamic banks are technically efficient. They suggest, that Islamic banks have lower operating expenses in comparison to size, assets, equity and the level of national income and further discover a positive correlation between the technical efficiency and profitability of Islamic banks.

Through a comparison of efficiency of full-fledged Islamic banks and Islamic windows of conventional banks Mokhtar et al. (2008) concluded that the total efficiency of Islamic banks increases in Malaysia over the period 1997 to 2003. The study reveals, that the level of efficiency at full-fledged Islamic banks is higher than for Islamic windows, however lower than conventional banks.

After reviewing the literature on efficiency and productivity analysis, non-parametric DEA Malmquist index, and Islamic banking in the GCC region, we were not able to find any study that in particular examines efficiency and productivity of full-fledged Islamic banks and Islamic branches of conventional banks within the GCC region in the years from 2012 until 2016. This literature gap is very much noticeable as most of the studies focused on comparing either Islamic banks from different countries, or the efficiencies of commercial banks and Islamic banks in the same country or different countries (Bader et al., 2008). Due to gaps in literature that specifically focuses on comparing Islamic banking efficiency and productivity growth of GCC countries when it comes to the past five years, we had to refer to studies that were carried out in a similar context to our research paper. Masood et al. (2013) for example, conducted a study on productivity growth in the GCC banking industry from 1997 to 2007, comparing conventional to Islamic banks. In 2014, Svitalkova published a paper on 'comparison and evaluation of bank efficiency in selected countries in EU'. While Svitalkova only used the Data Envelopment Analysis approach, Masood et al. applied a two-stage procedure employing a "non-parametric frontier approach to calculate the Malmquist productivity index (MPI) and its components" (Masood et al. 2013, p.78).
The study by Masood et al. (2013, p. 71 – 105) has been used as a starting point of this research paper. Masood et al. (2013) compare the productivity growth of Islamic to conventional banks in the GCC banking industry from 1999 to 2007. In the course of this study, we will employ a similar approach, comparing efficiency and productivity growth of Islamic banks in the GCC region for the years 2012 to 2016.

The lack of research in that area gives us the opportunity to contribute to the topic of efficiency and productivity analysis in Islamic finance and, to some extent, fill a gap in this specific field of study. We anticipate, that our paper will contribute to literature on efficiency and productivity of banks in Islamic finance, by deploying commonly used measures on a set of banks, which to our knowledge have not been collectively investigated in such a study before. Furthermore, in the research paper we intend to give insight on main factors influencing efficiency and productivity growth of Islamic banks or banks with Islamic financial activities.

1.4 Research Question

The gap in the current literature of efficiency and productivity leads us to the following research question we aim to answer with our study:

What is the total factor productivity change of Islamic banks in comparison to each other in the GCC region from 2012 until 2016?

In the paper we examine the total factor productivity change of Islamic banks and banks with Islamic branches in the GCC region from 2012 until 2016. We do that by dividing the Malmquist index into sub-indices. Furthermore, we intend to find out, whether the total factor productivity improved in the GCC region over the years. As mentioned previously, we include conventional banking institutions in the set of our study, which carry out Islamic banking activities, also called Islamic windows. As argued in some literature, mixing such institutions with full-fledged Islamic banking activities could potentially distort the conclusions on growth, efficiency and stability (Dubai Center of Islamic Banking and Finance, 2014). Due to the fact, that the growth and stability of Islamic banking activities usually follow the growth and stability of the conventional part of the bank (Dubai Center of Islamic Banking and Finance, 2014). However, by applying the Malmquist index model, we can determine the exact input factors in the analysis, and therefore are able to at least minimize the risk of distorted results.

1.5 Purpose

The purpose of this degree project is to analyze the total factor productivity change of Islamic banks within the GCC region. For this purpose we reviewed key theories and models measuring efficiency and productivity of banks, and chose to apply the non-parametric DEA and Malmquist index in our study. By applying the DEA Malmquist index, we try to conclude, whether the overall efficiency and productivity has improved over the course of the past years, from 2012 to 2016. Furthermore, to accomplish this purpose, we have conducted a quantitative study, using data from eleven large banks within the GCC region.
1.6 Theoretical and Practical Contributions

From a theoretical perspective, our study aims to fill existing gaps in current literature on efficiency and productivity in regards to Islamic banking, since in the past years this issue has not been further explored. For students participating in Finance or Accounting courses at Umeå University, the thesis could be used as a guideline or starting point to explore other fields of Islamic banking, or to continue the research for the next years using a larger sample size.

From a practical perspective, the results of our thesis could be useful for policymakers when designing a proper institutional framework within or outside of the GCC region. Furthermore, the paper could be of interest to financial institutions included in this paper. They could draw conclusions about main factors impacting their efficiency and productivity growth.

1.7 Delimitations

The choice of the subject under study creates several delimitations. Firstly, this study only focuses on a non-parametric model and index analysis, including significant variables that have been selected accordingly. There are different approaches of analyzing efficiency and productivity of banks, which have been excluded from this study.

Secondly, the study focuses on eleven large banks, including full-fledged Islamic banks and conventional banks with Islamic banking activities. The choice of the specific banks was driven by several factors, such as highest amount of total assets of the banks within the country of operation, as well as availability of significant data needed for this research paper.

Thirdly, to the regional inconsistencies regarding culture among countries with Islamic banking, it has been decided to focus only on one shared economic area, the GCC region. As previously mentioned, this region has many common features in their political, economic, social, demographic and cultural structure (Peterson, 1988), which simplifies the efficiency and productivity comparison of banks within our study. Furthermore, it is necessary to mention, that the time period considered in this research paper is from 2012 until 2016, which corresponds to the years for which the efficiency and productivity analysis has been conducted.
Chapter 2. Scientific Method

In this chapter we first discuss the preconceptions when conducting the study. We further explain our philosophical point of view, focusing on the ontological and epistemological stances. We continue by presenting our research approach and research design, in order to see how the research was conducted from a philosophical point of view. Finally, we argue for why we chose our theories and how we found more information about our theories in the literature search.

2.1 Preconceptions

Preconceptions are defined as what we, as researchers, personally think about the subject we are studying (Bickman & Rog, 1998, p. 77). One must be aware of their preconceptions or pre-understandings when conducting research (Saunders et al., 2009, p. 151). According to Gilje and Grimn (2007) preconceptions are important because they set the direction of what the researcher will direct his or hers attention to (Gilje & Grimn, 2007, p. 179). They also reveal the researcher’s faiths and beliefs, which has an impact on how the researcher identifies a problem, what theories they choose to use, and the formulation of hypothesis (Gilje & Grimn, 2007, p. 182). Moreover, preconceptions include personal experiences, which also affect the researcher's decisions, and therefore the outcome of the research (Gilje & Grimn, 2007, p. 182). Consequently, it is important to be aware of one's preconceptions since they will have an impact on the conducted study.

As business students at Umeå University studying Financial Management courses, we have studied a substantial amount of financial theories and models, which have influenced our choice of study. The chosen DEA and Malmquist index model, which we deploy in the research, has not been studied in the course of our Master degree, nor did we have knowledge on the theory from previous studies. Therefore, the influence of preconceptions regarding the choice of the models on this study can be somewhat reduced. Another preconception we must be aware of is the choice of focusing on Islamic banking. As mentioned previously, the personal backgrounds play an essential role in selecting the specific sector. Nonetheless, we have not yet deepened our knowledge in this topic before conducting the research either, which has motivated our choice of study. In the course of this degree project, we have attempted to reduce this risk of bias by being aware of our preconceptions and by processing previous knowledge as new, in order to eliminate the influence of own values and beliefs.

2.2 Ontology

Ontology is defined as a “branch of philosophy that studies the nature of reality or being” (Saunders et al., 2009, p. 510). According to Bryman and Bell (2015, p. 32), who gives a rather explicit definition, ontology refers to the question regarding social entities, art, and nature, whether social entities should be considered as objective entities or as constructions build up on the perceptions and actions from different social actors. The two main ontological positions, which can be applied, are objectivism and constructionism (Bryman & Bell, 2015, p. 32). Objectivism is an ontological position, which implies that the existence of social phenomenon and its influence are beyond the influence of social actors, meaning that social entities exist in
reality independent from social actors (Saunders et al., 2009, p. 110). On the other hand, constructionism suggests that social phenomena and their meaning are dependent on social actors, and not only occurs as a result of social interaction, but are also in constant stage of revision (Bryman & Bell, 2015, p. 33).

In our degree project we apply objectivism as our ontological position, since the topic we investigate is a 'comparison of efficiency and productivity between Islamic banks in the GCC region', which is an external fact beyond our reach or influence. By using quantitative data from eleven banks, we want to analyze in detail the total factor productivity change of each Islamic bank in the GCC region using the non-parametric DEA and Malmquist index. Furthermore, we want to investigate, whether the total factor productivity and efficiency improved in the years between 2012 and 2016. Accordingly, we believe that objectivism suits best for the purpose of our research.

Since constructionism implies that social phenomenon is resulted through social interaction, we do not believe it fits our study. Even though our choice to examine efficiency and productivity growth of Islamic banks is partly driven by our Muslim backgrounds, we do not allow this reason to influence our study and insist on our objective stance.

2.3 Epistemology

An epistemological issue refers to what can be regarded as knowledge that is viewed as acceptable knowledge in a specific field of study (Bryman & Bell, 2011, p. 15; Saunders et al., 2009, p. 112-113). There are four main philosophies within the branch of epistemology, called positivism, realism, interpretivism and pragmatism (Saunders et al., 2009, p. 113-115). Bryman and Bell (2011, p. 15) point out that the concept of positivism is difficult to define, and explains that it differs in existing literature. Nonetheless, generally the term defines an epistemological stance where methods of natural science are applied when studying the different aspects of social reality (Bryman & Bell 2011, p. 16).

Positivism can be summarized as a doctrine for researchers who prefer gathering data of the observable reality, generating hypotheses that can be tested, searching for regularities and casual relationships, which can then be transformed into law-like generalizations (Saunders et al., 2009, p. 114). Only phenomena that are observable and measureable can be validly regarded as knowledge according to positivists. Therefore positivists try to maintain an independent and objective position (Collis & Hussey, 2014, p. 47). Another philosophical position in epistemology is realism. It is similar to positivism, as it also suggests methods of natural science, and implies that researchers should focus on external reality (Bryman & Bell, 2011, p.17). According to Saunders et al. (2009, p. 114) in realism, objective reality is to be defined by our senses, and can be interpreted in different ways. In the interpretivist doctrine the social world is seen viewed as too complex to be theorized by laws according to scientific methods (Bryman & Bell, 2011, p. 17). Interpretivism insists on existing differences between humans as social actors, meaning that the social researcher needs to capture the subjective meaning of a social act (Bryman & Bell, 2011 p. 18).
Lastly, one can also adopt pragmatism, which applies multiple epistemological positions (Saunders et al., 2009, p. 109). Authors such as Van de Ven and Poole (2005, p. 1393-1394) support this position, as according to them, regardless of different approaches or views regarding epistemological or ontological standpoints that compete or oppose one another, they should be viewed as complementary stances. The pragmatist approach mainly applies to mixed-method studies conducted with both a qualitative and quantitative method (Saunders et al., 2009, p. 109), reason being that the research question should be the most important determinant of the research philosophy (Saunders et al., 2009, p. 598).

In this degree project we apply positivism as our epistemological position, since the subject of our study, efficiency and productivity has external observable reality and can be measured in numbers. Interpretivism will not fit to our research since research on efficiency and productivity of Islamic banks is not a study of subjective reality and also we did not collect data as subjective evidence from participants by interviewing them, but have collected objective evidence. Pragmatism also does not apply in our study, since we do not conduct a mixed method study.

As positivists we believe that in this study, knowledge can be gained through measurable and observable facts, without relying on subjective evidences. We, therefore, have collected data, formulated a research question and analyzed the data to find out what the total factor productivity change of Islamic banks in the GCC region is. The aim of our study is to be able to draw generalizable conclusions, which further confirms our positivist approach. In order to draw general conclusions, we chose a sample of eleven banks from six countries that account for a representative sample for Islamic banking in the Gulf region. Despite of certain personal reasons for the choice of the topic within Islamic banking, we tried to conduct our research in a value-free way.

2.4 Axiology

The axiological assumption deals with the way researchers values the work, which guides the research and outcome of a study (Saunders et al., 2009, p. 116). According to Collis and Hussey (2013, p. 48), there are two axiological stances to be differentiated, the positivist and interpretivist stance. The positivist axiological stance views research as “free of value” and the researcher as “detached” from their research, which is in line with objectivism. Interpretivists, on the other hand, believe that researchers are not detached from their work and have specific values, influencing the result of the research and the recognition of outcomes as facts.

In this degree project, we have assumed a positivist stance on axiology, since we are not creating new theory, but are rather using existing theory. Therefore, no personal values have been included in this research that could that affect the results. Furthermore, despite of certain personal reasons for the choice of the topic within Islamic banking, we aim to conduct our research in a value-free way.
2.5 Research Approach

There are three different approaches one can apply when conducting research: deduction, induction, and abduction (Saunders et al., 2012, p. 143-145). The inductive and deductive approaches are opposites of one another. While the inductive approach is about collecting data to explore a phenomenon, identify themes and patterns in order to generate and build a theory (Saunders et al., 2012, p. 143-145). The reason behind using an inductive research approach is to “establish limited generalizations” about the observations of people and social phenomena (Blaikie, 2009, p. 83) which go from “particulars to generalisations” (Ketokivi & Mantere, 2010, p. 316). By discovering patterns and characteristics one can make generalizations (Blaikie, 2009, p. 83-84). In this degree project we will not be using an inductive research approach, since we use existing theories and we anticipate to make generalizations about our quantitative study. Saunders defines abductive research as: “collecting data to explore a phenomenon, identify themes and explain patterns, to generate a new or modify an existing theory which you subsequently test through additional data collection” (Saunders et al., 2012, p.145). While conducting abductive research one applies both approaches of induction and deduction interchangeably (Saunders et al., 2012, p. 147). Abduction helps create theory based on observing social actors (Blaikie, 2009, p. 89).

A deductive research approach is a method which “proceeds from a set of general premises to a more specific conclusion” (Ketokivi & Mantere, 2010, p. 316). Similarly, Adams et al. (2007, p. 29) defines deductive reasoning as being “universal laws are hypotheses to be “tested” against the predictions implied by these laws.” According to Blaikie (2009) a deductive research approach has six steps, where one starts with setting up a hypothesis, then use theories to draw a conclusion and finally check if the new hypothesis helps adding to the general understanding (Blaikie, 2009, p. 85). Once those steps are carried out, the data collecting can be conducted, which leads to the hypothesis being true or temporary supported or false, where the hypothesis is rejected (Blaikie, 2009, p. 84). Researchers use deductive theory when they start with a theory, and then hypothesis are developed to test ideas and to find out if they can be verified or falsified the theory (Saunders et al., 2012, pp. 144-146).

In the course of our work, we have read existing theories and literature about Islamic finance and banking, the Gulf Cooperation Council, efficiency and productivity models, in particular the DEA and Malmquist index model. Reviewing the various literature and theories gave a strong theoretical base to formulate our research question. Our aim in this research paper is to find out what the total factor productivity change of Islamic banks in the GCC region is. In order to generalize the findings and to test the theoretical models we are analyzing eleven banks from six countries. Thus, for the purpose of our study, a deductive approach applies, since we have used existing theories and models of efficiency and productivity to build our research question and subsequently test our model.

2.6 Research Design

In general, there are two main kinds of research strategies, either the quantitative or the qualitative research strategy, where choices regarding ontology, epistemology, and research design must be coherent with the type of researchers we intend to be (Bryman
The quantitative research examines the relationship between variables, which are measured in numbers and analyzed using a range of statistical measures. Quantitative research is usually applied with a deductive approach where the focus is on using data to test objective theories (Saunders et al., 2012, p. 162). With the qualitative research method, the purpose is often to create a deeper understanding of attitudes and ideas, which causes people's actions and decision making (Bryman & Bell, 2011, p. 27).

In qualitative research, the philosophy associated with it, is of interpretive nature, because researchers need to understand the subjective and socially constructed meanings expressed about the phenomenon being studied (Saunders et al., 2012, p. 163). The research design, another term for research strategies, accounts for an additional main strategy, namely mixed-method studies. Mixed-method research "combines quantitative and qualitative data collection techniques and analysis procedures as well as combining quantitative and qualitative approaches at other phases of the research" (Saunders et al., 2009, p. 153).

In this study, we are not aiming at gaining any deeper understanding of any subjective and socially constructed phenomenon. Our study objects are neither socially constructed nor subjective. Thus, qualitative research design does not suit in this study. In our study, the ontological position is objectivism, the epistemological position is positivism, and the research approach is deductive. All these standpoints give indication that a quantitative strategy is more suitable than taking a qualitative approach. Thus, we are going to analyze quantitative data by using the DEA and the Malmquist model, in order to compare efficiency and productivity of Islamic banks within the GCC region.

Depending on which literature is applied, one can further specify the research design of the study. According to Bryman & Bell (2015), one can identify five types of designs for a quantitative study: cross-sectional, longitudinal, experimental, case study, and comparative (Bryman & Bell, 2015, p. 53). Studies using the cross-sectional design are aiming to gather research data in different contexts at a single point in time (Bryman & Bell, 2015, p. 62). The longitudinal design, on the other hand, is a model that analyzes variables during a longer period of time. Within the experimental design, the study aims to find causal links between two or more groups, investigating the impact of a change in an independent variable on the dependent variable (Bryman & Bell, 2015, p. 54). The case-study design is used to study one phenomenon within its real-life context for the purpose of gaining deeper knowledge of the subject under study (Bryman & Bell, 2015, p. 67-68). Lastly, the comparative design is a model used to get better insight of social phenomena by comparing them using the same approach on more than two situations (Bryman & Bell, 2015, p. 72).

Since we aim to study the total factor productivity change of Islamic banks within the GCC region in the time period from 2012 until 2016, by investigating data from the same sample, the type of our quantitative study is longitudinal.
2.7 Literature Search

By conducting a literature review, one critically evaluates the existing body of knowledge on a topic, which guides the research and demonstrates that relevant literature that has been located and analyzed (Collis & Hussey, 2013, p. 87). Linking the research of question, findings, and discussion to the existing literature, one can demonstrate the credibility of the research conducted and the contribution it is making (Bryman & Bell, 2011, p. 27). Existing literature helps to identify previous work that is relevant to the thesis, and it helps to find gaps in existing literature, thus helping to provide a unique topic, so that the researchers can develop new areas of research based on previous studies.

While searching for literature, we tried to understand the subject of Islamic banking and efficiency and productivity as a whole. We didn’t only focus to our specific research region of study while searching for relevant literature. This helped us to understand the existing body of knowledge more comprehensively, and also gave us a different perspective, which finally enabled us to formulate our research question. Most of our literature list refers to scientific articles that we have downloaded from either the Umeå University Library, where we had access to relevant article databases we needed, or from Google Scholar.

We have used various keywords in order to find literature that was relevant for our thesis, such as, Islamic banking, Islamic finance, Islamic banks in the GCC, efficiency and productivity measures, financial systems in the Gulf region, or DEA and Malmquist index. With time, we noticed that the literature search serves as a learning process where we improved our searching skills. As we learned how to screen reference lists in other writers' works, we rapidly got familiar with the authors, journals, and papers that were most essential in our research area. In order to carry out our research work of this thesis properly, we have used several books and academic articles on research methodology, written especially for business students in order to gain knowledge about research methods, quantitative research, sampling methods, collection of quantitative data and statistical data analysis.

2.8 Choice of Theories and Concepts

Since we are using a deductive research approach, finding relevant theories was the first and most important part of our degree project. Useful theories help organize our research questions and observations (Bickman & Rog, 1998, p. 78). Both of these reasons for doing a literature review have helped us in choosing relevant theories and concepts that are most relevant for our thesis, which in turn helped us to answer our research question.

As we are analyzing the total factor productivity change of Islamic banks within the Gulf region, we decided to first look into Islamic finance, efficiency and productivity measures, financial systems in the Gulf region, and DEA and Malmquist index in general. This helped us to understand the concepts separately before connecting them into one research work. Since both areas of the research topic, Islamic banking as well as efficiency and productivity measures are fairly complex, we decided to only focus on relevant concepts within the research areas.
2.9 Ethical and Social Considerations

Important aspects like inclusion and diversity are considered in our study, which have also a high meaning in nowadays society. That is the reason why it is very important and highly relevant for us to discuss social as well ethical issues. Ethical and unethical issues could result by carrying this research out, whereby the ethical and unethical situations can differ from each other (Saunders et al., 2009, p. 27). The main purpose of ethical issues in a research work is not primarily different from the ethical issues during the interaction in other situations with humans. All interactions are based on respect, to watch out for the humans not to get hurt and clear information flow (Oliver, 2003, p. 22). That means in more detail, that meeting these requirements are going to be challenged in the interaction with three key groups of a study- the research provider, the research user, interviewees and the respondents (Saunders et al. 2009, p. 27). As research provider we can only monitor what we are applying, since it is the nature of this kind of interaction. That is why it is important to carry out a research work, which is built on an ethical standard, where principles can result from. These points are emphasizing the importance to consider ethical issues for us as researchers.

Hence, the selection of moral regarding our behavior and our connection to other people are guided by ethical norms and standards of behavior. Summarizing, a research activity should not result in harming other individuals or in negative consequences. Thus, the objective of ethics is to guarantee this these aspects (Cooper & Schindler, 2011, p. 32). This research did not use the tool of doing interviews that is why we could not harm or sorrow interviewees or participants by disclosing their identity or impair their life in the future. Moreover, our study has not any impact on the society or the banks.
Chapter 3. Theoretical Framework

In this chapter we present the concepts and models, which we use in our study, namely efficiency and productivity measures, focusing on DEA and Malmquist index analysis, Islamic banking as well as a short presentation of the gulf region and the importance of efficiency and productivity measures in Islamic banking. As each section progresses we get more in depth about each theory or concept and get more specific about how each theory and concept relates to this degree project. We finish the chapter by describing the model we apply in our quantitative study.

3.1 Quantitative Data Analysis

There is an abundance of literature covering the topic of Productivity and Efficiency analysis. Berger and Humphrey (1997) have extensively covered the topic of efficiency of financial institutions, categorizing measures into parametric and non-parametric methods (Berger and Humphrey, 1997, p.175). Another strand of the productivity research has concerned a panel of countries. Pastor et al. (1997) used the DEA technique and Malmquist index with value-added approach, where he compared the productivity, efficiency and differences in technology of several banking systems in different countries in the EU and the US for 1992. The Malmquist index method was firstly mentioned in banking literature by Caves et al. (1982). In the study Caves aims to resolve misconceptions on comparisons using index number, as index numbers are viewed to only give consistent results with restricted structures of production (Caves et al., 1982, p. 1411).

For calculating the total factor productivity change, the Data Envelopment Analysis (DEA) and the Malmquist Index are the most commonly applied methods. Using this approach one consults the relevant input and output factors for the production process, to derive the change for example of the technical efficiency and the pure technical change. Subsequently the change of the total factor productivity is the result of those criteria. Applying the Malmquist index provides several advantages in comparison to other indices (Fisher, 1922). One of the advantages is, that it does not use any assumptions concerning the economic behavior of production unity as cost minimization as well profit maximization. Another advantage of the Malmquist productivity index is that only quantity information is required while there is no need for any information regarding prices of the input and output. Furthermore, the Malmquist – Index is providing additional productivity change information, if panel data is used. Hence, it can break down into different elements such as technical change, efficiency change, pure technical efficiency change and scale efficiency change (Masood et al., 2013, p. 78).

3.1.1 Productivity and Efficiency Analysis

The objective of this study is to analyze the productivity and efficiency of Islamic banks. This paragraph gives a brief introduction to the basic concepts and calculations approaches, but also about the complex analysis methods. For more detailed information we recommend Coelli et al. (2005).
Primarily the definition of productivity is the quotient from the result of the production (Output) and one or more used production factors (Input) (Cantner et al., 2007, p.1 – 3).

Productivity = \frac{\text{Output}}{\text{Input}} \tag{1}

The productivity as a ratio is providing an absolute view of the input and output relation. Thus, the productivity is drawing a descriptive concept (Ray, 2004, p. 12). An alone standing productivity value does not have any informative value besides the value itself. Therefore, it provides only informative values, if it is compared to another productivity values and target values (Kern, 1993, 203). According to Burger (2008, p. 6) this is only possible, if the productivity quotients are comparable in their validity. That is why it is important that the banks are going to date back to the same technology and primarily under the assumption of a constant input and output ratio all over the size categories. Feasible scale effects could not be considered by doing simple comparison of the productivity. This complies with the assumption of constant – returns – to – scale (CRS). The productivity is usually expressed by one input factor. This is called partial productivity, but it is not providing any information regarding the whole production process, since a substitution is feasible between the single input factors. The observation of the total factor productivity, including all relevant inputs and outputs, enables an understanding of the whole productivity process. During the determination of the whole productivity, the different factors have to be considered and summarized at the same time. Thereby, the possible unit could be aggregated in monetary unit or as quantity unit, but also as hybrid forms. Is a certain period subject to a review, then the valuation can be done with productivity – indices. Whereby, a valuation for a specific time point is also possible but the implementation of the evaluation of productivity – indices is not feasible. If we put the observed productivity in relation to the optimal productivity, then we can determine the efficiency. Primarily the efficiency could be described as a quotient of the actual productivity of a company and the highest possible observable productivity of another comparable company (Cantner et al., 2007, p. 6). Finally the term will be used as shown in the formula 2.

Efficiency = \frac{\text{actual productivity}}{\text{highest observable productivity}} \tag{2}

The degree of the efficiency is thus a number between zero and one. A company which is inefficient will show a quotient that is in the number range less than one but larger than zero. Efficiency is a range of 1 or larger (Allen, 2002, p. 32 – 34). Thereby, efficiency is following the model of different kinds of economic principles. The so-called maximum – principle peruses the objective to gain the highest possible income with given capital and instruments. On the other hand the minimum – principle aims for a given income with the lowest possible effort (Domschke & Scholl, 2003, p. 3).
Simultaneously it is describing the view of the possible input and output oriented measurement of efficiency (Coelli et al., 2005, p. 47).

3.1.2 Static Efficiency Analysis

There are different approaches to determine the efficiency of a specific point in time. We are going to find out the level of efficiency by applying a relative frontier function for the observed banks. The frontier function consists of the most efficient banks at a specific time. These empirical findings of the productivity of the banks are covered in a functional connection of the banks with this ideal degree of productivity. The frontier function is also named among others as production function or best – practice – production function (Cantner et. al., 2007, p. 5). Since an absolute maximum is not described by the frontier function the function is relative, because of the change of the technology, which can move to the maximum limit. In addition to that, when we go on to compare the efficiency of the banks on a timeframe, then the procedure is called a dynamic efficiency measurement (Coelli et al., 2005, p. 154 - 160).

According to Kuosmanen & Kuosmanen (2009, p. 303) the determining methods of the productivity function differentiate in a wide scientific field. These approaches can be classified in two types, which are called parametric and non-parametric approach. The first mentioned basically assumes a functional interrelationship, whereby the parameters are estimated from the data. However, the second approach does not have any restrictions regarding the functional design, except for constant or variable returns to scale. The renounce of the relationship between in- and outputs is feasible because of a closest possible approximation of the production function of all available in- and output data, which is conducted through a partial linear function process (Cantner et. al 2007, p. 22). Furthermore, these methods for the frontier analysis can be clustered in average- practice and best – practice and those can be categorized also in deterministic and stochastic approaches (Kuosmanen & Kuosmanen, 2009, p. 305). An exact preparation of the frontier function is possible by using the deterministic approach with the most efficient banks. Stochastic methods are also being applied to the most efficient banks, whereas additionally a variable will be calculated to observe fluctuations and the impact factors. An overview of the explained approaches can be seen in table 1.
Table 1: Classification of Methods. (Kuosmanen & Kuosmanen, 2009, p. 305)

<table>
<thead>
<tr>
<th></th>
<th>Parametric</th>
<th>Non – parametric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average – practice</td>
<td>Ordinary least squares</td>
<td>Convex nonparametric least squares</td>
</tr>
<tr>
<td>Best – practice,</td>
<td>Parametric programming</td>
<td>Data envelopment analysis</td>
</tr>
<tr>
<td>Deterministic</td>
<td>Corrected ordinary least squares</td>
<td>Corrected convex nonparametric least square</td>
</tr>
<tr>
<td>Best – practice</td>
<td>stochastic frontier analysis</td>
<td>Stochastic nonparametric envelopment of data</td>
</tr>
<tr>
<td>Stochastic</td>
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</table>

Current literature does not provide clear explanation and statements on which of these approaches are most expedient (Gubi, 2006, p. 20). However, the use of the best – practice approaches, the stochastic frontier analysis and the data envelopment analysis (DEA) constitute the ones applied in most cases (Cantner et al., 2007, p.264).

In the following we try to explain the static efficiency analysis in connection with the frontier function, by using a figure on the basis of an input and output example to show measurement of the efficiency (figure 1). The input is on the x – axis and the output is located on the y – axis. Moreover, one frontier function is constant and is described in the figure with FCRS and the second frontier function is marked with FVRS, whereby this one is drawing a frontier function with variable return to scale. Apart from this, the figure does not give a detailed explanation regarding the determination of the frontier function, which includes only the most efficient banks or companies. The determination has been done by applying a non-parametric method. Thus, for example the bank B is an inefficient bank, since it is under the frontier functions. Furthermore, for the determination of the efficiency degree of the bank, it has to be decided, if the point of view is output orientated or input orientated. If the point of view is input orientated, it means that the amount of the output stays the same, during the input decreases proportionally to reach a higher efficiency, otherwise it is an inefficient bank. If the point of view is output orientated, then in this case it is also possible, that the output is increasing proportionally, while the amount of input remains on the same level. Both perspectives are providing the same degree of efficiency, whereby the technology has to be a constant return to scale, in contrary to variable returns to scale (VRS) (Coelli & Rao, 2003, p. 9).
Finally, the degree of the efficiency for a constant scale to return from an input orientated point of view is calculated as \( \frac{fe}{fB} \). There is no change in the degree by applying the view of output orientation. This will be calculated as \( \frac{aB}{ac} \). By using the variable scale to return, the efficiency will be calculated as \( \frac{fd}{fB} \) with an input oriented view and \( \frac{aB}{ab} \) with an output-oriented view. Looking at the figure 1 and to FVRS, it is recognizable and predictable, that the bank B is achieving a higher amount of efficiency from the output oriented view then from the input oriented view. Hence, the bank B could increase its efficiency, if depending on the output or input consideration, it increases its output proportionally or decreases its input proportionally (Coelli, 1996, p. 7–9).

This calculated degree of efficiency is noticed in the literature as technical efficiency (Coelli et al., 2005, p. 5; Cantner et al., 2007, p. 7–8). If the degree of efficiency is being compared to each under the assumption of customer return to scale and variable return to scale, then it will be divided usually between technical efficiency (CRS) and pure technical efficiency (VRS) (Hambusch et al., 2006, p. 42–49; Jan et al., 2010, p. 87–88). If the technical efficiency will be divided through the pure technical efficiency, then the scale efficiency can be determined. According to Cantner et al. (2007, p. 8) it expresses if the ideal amount of input and output factors have been chosen by the bank, based on the assumption, that the size impacts the productivity.
3.2 Data Envelopment Analysis (DEA)

As mentioned above in table 2 there are many possibilities to determine the degree of efficiency and the frontier function. One of the approaches is the Data Envelopment Analysis (DEA), which will be explained briefly in the following paragraph. In Coelli et al. (2005) or Fare et al. (1994) there are more detailed information concerning this topic. For calculating the frontier function non-parametrically, the most used approach is the DEA. This approach is determining an efficient edge, by applying a linear optimization of the banks (Cantner et al. 2007, p. 68). Moreover, the approach applies to all the banks, in connection to their in- and outputs, a linear optimization which is determining the degree of efficiency of the bank. The quantities of the input and output are the only classification, which are used by the DEA method. Thereby, units of the measurement of the inputs and outputs can be chosen individually. Nevertheless, it needs to be a cardinal scale level, which means that the distances between units have to be interpretable. For the comparison of the inputs and outputs, the DEA necessarily is allocating those to a scale factor. A productivity ratio is thus the result of the before mentioned weighted inputs and outputs. Primarily the DEA approach tries to avoid the difficulty of the priori determination, which implies previous knowledge of the scale factors. Hence, it is determining an optimization for every bank. More precisely it means, that every observed bank is assigned with an individually scale factor, which gives the best possible overview on each bank. Furthermore, the productivity will be at a maximum point, with the help of the comparison of the banks by generating benchmarks of the productivity for all banks. A maximum productivity value of one for a bank is valid as efficient (Allen, 2002, p. 65). Those values of efficiency can be calculated as already described above, with an output or input orientation as well as a technology of constant and variable scale to return.

According to Coelli & Rao (2003, p. 12) the output orientated DEA is determining the linear optimization problem for every bank (i) in the allocated period as following:

\[
\begin{align*}
\text{max}_{\gamma, \varphi} & \varphi \\
\text{s.t.} & \varphi y_i + Y \geq 0 \\
& x_i - X \gamma \geq 0 \\
& \gamma \geq 0 \\
\end{align*}
\]

\(i\) \text{ Bank} \\
\gamma \text{ weight vector} \\
\varphi \text{ efficiency factor} \\
y_i \text{ vector for outputs of the bank} \\
x_i \text{ vectors for the inputs if the bank} \\
Y \text{ matrix of outputs of all banks} \\
X \text{ matrix of inputs of all banks}

The quotient of \(1/\varphi\) is determining the efficiency of the company. Banks, that are efficient are achieving a value of \(1/\varphi = 1\). In contrary inefficient banks are achieving a value of \(1/\varphi < 1\). The efficiency factor \(\varphi\) of the linear coding is larger or equal to 1. Hence, banks with \(\varphi > 1\) are inefficient and need to increase their output proportionally
at $\phi=1$ in order to become efficient, while the input stays as high as it was. If the bank is on the frontier function, then it is an efficient bank with $\phi = 1$ or $\frac{1}{\phi}= 1$ and a weight factor $\gamma = 0$, which means that there is no description of a more efficient bank. In contrast to that, inefficient banks show $\phi> 1$ or $\frac{1}{\phi}< 1$ and weight vector $\gamma \neq 0$, which allows a projection at a certain section of the frontier function. Finally, this linear optimization will be applied to every bank and thus for every single bank an efficiency factor and a scale factor will be calculated.

3.2.1 Dynamic Efficiency and Productivity Analysis

For answering our research questions and to fulfill the purpose of this work the non-parametric productivity analysis, which was statically orientated, is not sufficient by itself. The problem is that the productivity and efficiency differences are just observed and analyzed only in a specific timeframe. In conclusion this means more exactly, that it is not possible to describe an increase or decrease of the degree of efficiency or productivity precisely, even if the degree of efficiency as a value for one of the banks is achieved. In addition to that, it is impossible as well to make statement about increasing or decreasing of the degree of efficiency or productivity even if the degree of efficiency or productivity increases in an output orientated perspective, for example from 0.4 of one period to 0.7 to the next period. This problem occurs because of relative measurement of the efficiency, which has been conducted for every current frontier function in the chosen period. Hence, in this case it is only feasible to give a statement about the necessity of, for example, increasing the output with the same amount of input to reach a point at the frontier function. Finally, the issue is that the frontier function can move a lot respective the next period, which would result in a positive, negative or no change in the productivity for the bank.

To solve this problem and to answer our research question adequately, we need an approach, which considers a better usage of the feasible productivity or technology as well as the extension of the possible productivity through the advancement (Cantner et al., 2007, p. 247 – 248).

One approach to solve this problem is the Malmquist – Index. We also identify several specific advantages of this method for our research question and specifically for Islamic banks. One advantage is, that there is no assumption of the economical behavior of production unity needed like cost minimization or profit maximization. Another advantage is, that the prices for the input and output factors are not necessary because the Malmquist – Index is solely applying just to quantity information. In the end, the Malmquist – Index presents additional information about the special types of productivity change.

Since, we also have panel data, it is thus possible to differentiate the productivity in more categories such as technical change, which describes the shift in the frontier efficiency change, which is the catch up to the frontier, but also pure technical change for the description of the enhancement of the management practices and finally efficiency change for the enhancement regarding the optimal size (Masood et al., 2013, p. 78).
3.2.2 Malmquist – Index

Sten Malmquist (1953) first mentioned the Malmquist – Index in his work about consumer theory. Caves, Christensen and Diewert were the first ones to utilize it as a production index (Cantner et al., 2007). Basically the Malmquist – Index is called an index number, which is based on a quotient of distance functions. These distance functions are determining the distance to the efficient edge and to a frontier function and the distance functions can be defined additionally by output orientation as well as input orientation (Cantner et al., 2007, p. 250). The total factor productivity change (TFPCH) is measured by the Malmquist – Index of banks with the help of the calculation of the distance functions of the banks to their common technology (Färe et al., 1994, p. 68). The determination of the Malmquist – Index is briefly explained in the following:

K inputs are used by a bank to produce M outputs. The determination of the Malmquist – Index for a bank B has to be calculated output orientated in a period s (basic period) and period t as

\[ m^t_o(q_s, x_s, q_t, x_t) = \frac{d^s_o(q_t x_t)}{d^s_o(q_s x_s)} \]  

(4)

The distance of the observed period s to the period t is shown by \( d^t_o(q_s, x_s) \) as a distance function. Furthermore, the o in the formula above describes the output orientation of it and \( q_t \) is the output vector (M x 1) of the bank in the period t. The input vector (K x 1) is \( x_t \) in the period t. Hence, the Malmquist – Index is determined as following, if the period s is defined as the basic period:

\[ m^s_o(q_s, x_s, q_t, x_t) = \frac{d^s_o(q_t x_t)}{d^s_o(q_s x_s)} \]  

(5)

A positive change in the total factor productivity of the bank in the period s to the period t can be determined, if the value is larger than \( m_o > 1 \). In contradiction to that, a negative change is determined by \( m_o < 1 \). According to Färe et al. (1994, p. 73) the both indices the basic period s or period t are just under special circumstances equal to zero. To avoid an arbitrary choice of the both technologies is the Malmquist – index defined as the geometric mean of both indices:

\[ m^s_o(q_s, x_s, q_t, x_t) = \left[ \frac{d^s_o(q_t x_t)}{d^s_o(q_s x_s)} \times \frac{d^t_o(q_t x_t)}{d^t_o(q_s x_s)} \right]^{1/2} \]  

(6)

The purpose of the geometric mean is to solve the problem of distortions, which could result from the choice of one technology in the period t or s as the basic to measure the change of productivity (Cantner et al., 2007, p. 256). Through extend and conversion of the formula (6), it is possible to decompose the Malmquist – index in two factors, which can be interpreted economically independent from each other. This is one of the biggest advantages of the Malmquist – index, which formula can be seen in the following:

\[ m^s_o(q_s, x_s, q_t, x_t) = \frac{d^s_o(q_t x_t)}{d^s_o(q_s x_s)} \times \left[ \frac{d^s_o(q_t x_t)}{d^s_o(q_s x_s)} \times \frac{d^t_o(q_t x_t)}{d^t_o(q_s x_s)} \right]^{1/2} \]  

(7)
The first factor, which is outside the brackets, can be described and interpreted as the change of the technical efficiency (EFFCH), during the output orientation between the period $s$ the basic period and $t$. It can be also explained as catching-up effect, which presents the proximity of the bank to the frontier. In practice, the indicator of management quality is associated negatively with technical efficiency change (EFFCH) in all models. Similar results are reported by Das and Ghosh (2006) p. 211, who argue that a decline of technical efficiency is caused essentially by poor senior-management practices, which concern the use of inputs, daily operations, and loan portfolio management. Their explanation is based on the bad management hypothesis of Berger & De Young (1997).

The remaining factor can be described as the technological advancement in the technology (TECHCH). This is referring, if the analyzed bank is enhanced, stagnating or downgrading (Masood et al., 2013, p. 79). One of the reasons for this change could be because of the altering market structure such as merged banks or increased competition. Another reason could be the change of government policy like financial liberalization, regulation or deregulation. In addition to that, maybe also because of the innovation in the management or in production process. For example in customer relationship (Angelidis & Lyroudi, 2006, p. 155 - 165). Moreover, the distance function (d) will be solved with DEA for every bank of the sample, to calculate the change of the productivity between the two periods with the help of the Malmquist index (Cantner et al., 2007, p. 257). In the end the total factor productivity can be summarized as the product of technical efficiency change and the technical change. If the productivity increases, then the total factor productivity change will be larger than one, whereas values lower than 1 is referring to a downgrade and a number around one implies stagnation. This is valid for all indices (Masood et al., 2013, p. 80).

The validity of the above mentioned equations is just given during the assumption of constant scale to return. If the assumption is a variable scale of return, then the Malmquis analysis is not transferable. It is problematically to ensure the reciprocity of input and output orientated distance function and in connection to that the degree of efficiency by the use of variable scale of return. Different results could be an outcome. Nevertheless, it is possible to categorize the defined technical efficiency above during the use of variable scale to return into the change of scale efficiency and to the pure technical change of efficiency, if the determination of the distance functions of the mentioned equations above stays in their assumption of constant scale to return (Coelli et al., 2005, p. 291 – 293). In the subsequent there is the equation (8) with the index $v$, which shows it with the variable scale to return:

$$
\frac{d_v^0(q_t,x_t)}{d_v^0(q_s,x_s)} = \frac{d_v^0(q_t,x_t)}{d_v^0(q_s,x_s)} \times \left[ \frac{d_v^0(q_t,x_t)+d_v^0(q_t,x_t)}{d_v^0(q_s,x_s)+d_v^0(q_s,x_s)} \right]^{1/2}
$$

The first term after the equation is measuring the pure technical efficiency change (PEFFCH) and the second one in the brackets the scale efficiency change (SECH). Pure technical efficiency change is representing according to Chiu (2009, p 3490 –3506), that the management of the bank dealt more efficient with the input factors between the periods. However, the scale efficiency change refers to a better or worse cost control (Isik & Hassan 2003, p. 293). In the end the full equation of the Malmquist – index can be broken down as follow:
TFPCH = TECCH × PEFFCH × SECH \hspace{1cm} (9)

EFFCH = PEFFCH× SECH \hspace{1cm} (10)

Summarizing the indices TFPCH, TECHH, EFFCH, PEFFCH and SECH and their frontier functions are going to be determined by the DEA method (Coelli et al., 2005, p. 294). This means the determination of the indices has to be done by the total of the different linear problems based on the output functions. The calculation for the distance functions will be done for every bank for each chosen time range like \( t \) to \( t+1 \).

For understanding reasons we are going to give a brief example of dynamic productivity analysis with the use of the Malmquist – index. Hereby, we are applying the output - orientated approach, with the use of one input and one output.

In the figure 2 you can the distance function of the bank B with the two periods. The basic period with the index s and the next period with the index t. The frontier functions in the figure 2 shown as \( F_s \) and \( F_t \) for the periods s and t arising through the origin of the input – output – combination of the bank with its average productivity. This fact of the origin is because of the calculation of the change of the technical efficiency, which has to be done because of the assumption of constant scale to return. Whereby, the detailed determination of the frontier functions will be not described. The output orientated calculation of the distance function has to been done vertically and is resulting for the bank B the following figure 2 (Cantner et al., 2007, p. 260 – 261):

**Figure 2: Instance for the Malmquist – index (output orientated, CRS)**

\[
d_o^s (q_s, x_s) = eB_s \div ea \\
d_o^t (q_s, x_s) = eB_s \div ec
\]

degree of efficiency of the Bank \( B_s \) in the period \( s \)
degree of efficiency of the Bank \( B_s \) in the period \( t \)
degree of efficiency of the Bank $B_t$ in the period $t$

degree of efficiency of the Bank $B_s$ in the period $s$

Thus, the calculation of the total factor productivity can determined with the help of the Malmquist – index based on degree of the efficiency of the bank from the specific time $s$ and $t$ by the use of frontier functions $F_s$ and $F_t$. In addition to that, the technical change as seen as follows:

\[
\text{TFPCH} = \text{EFFCH} \times \text{TECCH}
\]  \hspace{1cm} (11)

Finally, the bank B in figure 2 is showing of an enhancement of the efficiency. By analyzing the figure 2 it can be seen that the bank B is in the period t closer to the frontier function than in period s. Based on this the change of the efficiency (EFFCH) is larger than 1. Moreover, the frontier function has moved up, in order that the technical change is also larger than 1. Furthermore, the change of the frontier function is not allocated to the bank B, but more because of the influence of other banks. In the end, the total factor productivity of bank B has been increased from the period s to the period t. For the sake of completeness we are going to describe also the analysis of the Malmquist – indices with the application of the variable scale to return. In this case the technical efficiency (EFFCH) will be sub categorized in the change of scale efficiency (SECH) and the pure change of technical efficiency (PECH) as can be seen in figure 3:

**Figure 3: Instance for the Malmquist – Index (output orientated, VRS)**
EFFCH = PECH × SECH

\[
\frac{d^t_f(q_t,x_t)}{d^s_f(q_s,x_s)} = \frac{d^t_f(q_t,x_t)}{d^s_f(q_s,x_s)} \times \left[ \frac{d^t_f(q_t,x_t)+d^s_f(q_t,x_t)}{d^t_f(q_s,x_s)+d^s_f(q_s,x_s)} \right]^{1/2} \quad (8)
\]

\[
\frac{fB_t+fd}{eB_s+ea} = \frac{fB_t+ej}{eB_s+eg} \times \left[ \frac{(fB_t/fj)+(fB_t/fg)}{(eB_s/eh)+(eB_s/ec)} \times \frac{(fB_t/fj)+(fB_t/fg)}{(eB_s/eh)+(eB_s/ec)} \right]^{1/2} \quad (13)
\]

Now it is also feasible to analyze the equation under variable scale to return assumptions, which can be done because of decomposing the change of technical efficiency. For instance the figure is drawing a positive change of the pure technical efficiency, because of the higher efficiency degree of bank B in both periods fB_t ÷ fj and eB_s ÷ eg. Finally, the first factor is defined as the change of the technical efficiency under the variable scale to return. The second part consists of the quotient of the distance between the frontier functions under the assumption of constant and variable scale to return, whereby for the period t in the numerator and for the period s in the denominator (Cantner et al., 2009, p. 261 – 264).

3.3 Islamic Banking

Islamic banking is a wide-ranging and complex concept within Islamic finance. For the purpose of this degree project, we will only discuss the general, most relevant features of Islamic banking.

Islamic banking, or sharia-compliant finance, is defined as banking or banking activity that follows the principles of Islamic law, called Sharia and its practical application through the development of Islamic economics (Mastoor, 2014, p. 440).

According to Prof. S.D. Goitein, the basis for Islamic finance dates back to the twelfth and thirteenth centuries in the Mediterranean region, where partnership and profit-sharing was preferred over interest-based borrowing and lending (as cited in Iqbal et. Molyneux 2005, p.36). However, banking institutions, as known today, started emerging in the 1960s. MitGhamar, was a pioneer in cooperating Islamic principles into the financial sector in Egypt in 1963 until 1967. The first interest-free institution with ‘bank’ in its name, Nasser Social Bank, was also established in Egypt in 1971.

The period between 1975 and 1990 was the most important period in the history of development of Islamic financial industry. The Islamic Development Bank (IDB) was established in 1975 as an international financial institution in pursuance of the declaration of intent issued by a conference of finance ministers of Islamic countries held in Jeddah, Saudi Arabia, in December 1973 and started functioning in 1975 (Iqbal et. Molyneux, 2005, p.38).

In the 1990s, while the growth of the banking industry continued (though at a slower rate), attention was also given to non-bank financial institutions. Islamic financial institutions other than banks started coming on the scene in increasing numbers. These
included insurance companies and investment funds. While the Islamic insurance sector has not registered sufficient growth, Islamic investment funds have witnessed significant progress (Iqbal et. Molyneux, 2005, p.38).

According to Khan and Mirakhor, Islamic Banking is based on profit and loss sharing (PLS) between the borrower and the bank (Khan & Mirakhor, 1987). Islamic Banks maintain profit by mixing investment and commercial banking operations to engage in acceptable rates of return for depositors but in accordance to Islamic rules and principles. The three main practices clearly prohibited in the Quran and the prophet’s sayings are: Riba (Interest), Gharar (Uncertainty), and Maysir (Betting) (Khan & Mirakhor, 1987).

The payment and receipt of Riba is defined as any "conditional increase in the principal of a loan or a debt in return for deferred payment" (Zineb & Bellalah, 2013, p.15). Generally, Riba refers to all earnings from loans and debts and anything over or above the principal of loans and debts, and covers all forms of interest on conventional commercial or personal loans. However, it does not mean refuse to recognize that time has a strong influence on economic activity and decisions. One is allowed to increase the item’s price for deferred payment in the case of sale contract. Nonetheless, in Islamic finance the role of time is perceived differently from sale contract to loan or debt contract. This dual perception of time in financial processes, that is directed according to Islamic law seems different to the uniform treatment of time in conventional banking where one considers an installment sale as a dual operation of sale-cum-loan (Zineb & Bellalah, 2013, p.15).

According to Zineb and Bellalah, the second feature that is banned and certainly condemned by Islamic law, is 'economic dealings entailed uncertainty' or Gharar (Zineb & Bellalah, 2013, p. 20). The latter includes ambiguity about the end result of a contract and the nature, quality and specification of the subject matter of the contract or the rights and obligations of the parties, possession and delivery of the item of exchange.

In order to ensure business ethics and justice among all participants, the use of Gharar is prohibited in Islamic commercial transactions. "It limits possibilities of deception and leaves no space for speculation and asymmetry of information that contribute to the lack of confidence as well as to the deterioration of moral values, elements that were noticed during the current financial crisis" (Zineb & Bellalah, 2013, p.20). Even though Islamic law strongly prohibits transactions with high uncertainty levels, in some cases it is accepted. Such case may occur with prepaid forward sale, called Salam contract, where the contract is concluded with the existence of the object of sale (Zineb & Bellalah, 2013 pp. 20- 21).

The reason behind prohibiting Gharar in Islam is similar to that for the forbidding of Maysir or gambling. Accordingly, the forbidden trading in risk is defined as "the sale of probable items whose existence or characteristics are not certain" (Zineb & Bellalah, 2013, pp. 20-21), in other words due to the risky nature of the transaction it compares to gambling. Putting one's money at stake, where the amount being risked may bring huge sums of wins or may suffer losses, is therefore ignorant of the result of the gamble (Zineb & Bellalah, 2013, pp. 20-21).
For Islamic banks to find a balance, where they can make profit and at the same time satisfy the borrowers’ needs of cash, they have to conduct transactions that do not violate Islamic rules by looking for allowed contracts that can achieve the required goal (Ali & Ahmad, 2004 p.54).

3.4 Gulf Cooperation Council (GCC) Overview

The Gulf Cooperation Council (GCC) was established in 1981 and consists of six member states, including Saudi Arabia, United Arab Emirates, Bahrain, Kuwait, Qatar and Oman. One of the main reasons behind establishing a common economic region was to promote financial market development and to increase competitiveness of the countries' banking sector (Masood, 2013, p. 71).

With around 50 million inhabitants, the GCC accounts for an aggregate GDP of nearly$1.6 trillion (GCC-Stat, 2014). The oil and gas sector is the largest contributor to GCC’s economy, accounting for more than one half of the GDP. The rest of the GDP is comprised of sectors such as construction, tourism and banking (World Bank Group, 2015, p. 4). Some significant differences between countries within the region are the population size and aggregate output. According to the World Bank Group, Saudi Arabia is the largest of the six countries with the majority of 29 million inhabitants and accounting for more than half of total GCC GDP. The UAE, next in population size, comprises of around 9.3 million people and contributes about one quarter of total GCC's GDP (World Bank Group, 2015, p. 4).

According to Peterson (1988) the GCC countries share an amount of similar economic features regarding their political, economic, social, demographic and cultural structures (as cited in Srairi, 2013, p.72). The oil and energy sector is the largest contributor to economic development and growth of GCC members. Regardless of efforts of diversification into different sectors, the region's economic wellbeing remains highly dependent on the particular industry (Sairi, 2013, p.72). With a young and fast-growing labor force, the GCC countries are facing issues with creating employment opportunities in the non-oil sector to ensure future development and growth of their economies (World Bank Group, 2015, p.5).

Many countries in the GCC region have made the development of the financial sector to a policy priority in the past years. The development of the financial sector in that region has been closely associated with the policy objectives of economic diversification, privatization, and liberalization, where financial markets now play a key role in these strategies. A thriving financial sector makes sure that resources are allocated efficiently toward growing enterprises and with that contributes to employment generation, productive investment and, through that, economic diversification. In this respect, aspirations to build financial centers to recycle global savings have been high in many GCC countries (World Bank Group, 2015, p.5).

Promoting financial sector development in the GCC is particularly important given global economic events of recent years. On the one hand, the global financial crisis has affected the financial services industry and has taken its toll on business sentiment and growth. On the other hand, looking at the current growth model, which is anchored in
rising oil prices and government spending will no longer work. Instead, countries will need to further diversify their economies and enable the private sector to become a self-sufficient engine of growth and jobs (World Bank Group, 2015, pp. 7-9).

The degree of openness in the banking system in GCC states varies from one country to another. In Bahrain, Oman, Qatar and the UAE, several international banks have been operating for many years without any restrictions, whereas Saudi Arabia and Kuwait started receiving branches of foreign banks only from 2004 (Abdelbaki, 2010, p.140).

3.5 Importance of Efficiency and Productivity Measures in Islamic Banking

Molyneux (2005) argues that the study of the efficiency of Islamic banks is important for three reasons. First, improving the cost efficiency means reaching higher profits and enhances the possibility to survive in deregulated and competitive markets. Since Islamic banks stand in direct competition with conventional banks, it is of particular importance. Second, customers are interested in knowing the prices and the quality of bank services as well as new services that banks could offer, and these are strongly influenced by a bank’s overall efficiency of operations. Lastly, being aware of efficiency factors is relevant to support policy makers in formulating policies that affect the banking industry as a whole. Moreover, it is of high importance, for competition and mergers analysis, to know the effects of market concentration and past mergers on banking efficiency. In particular it would be interesting to know whether one type of financial model (such as Islamic banking) is more efficient than the other, and "whether inefficiency manifests itself in the form of poor production decisions, risk management decisions, or both" (Molyneux, 2005, p.89). The information obtained from the evaluation of Islamic banks’ performance can also be used to improve managerial performance by identifying best and worst practice firms (Molyneux, 2005, p.89).

In the course of this study, we implement the non-parametric DEA method with combination of Malmquist index, in order to determine the total factor productivity change if Islamic banks within the GCC region.

In order to summarize the concept of our study, figure 4 displays the design of the model and its application within our research. We can see that our concept uses the two variables of input and output to determine the Malmquist – Index with the help of the Data Envelopment Analysis Model. Therefore, we are going to use the free software Data Envelopment Analysis Program version 2.1 of Tim Coelli. By doing so, we receive the total factor productivity change, which can be decomposed into the four indices TECCH, PEFFCH, SECH and EFFCH.
Figure 4: Conceptual model

Variable: INPUTS
X1 LABOUR & RELATED EXPENSES
X2 OTHER EXPENSES
X3 LOAN LOSS AND PROVISIONS

Variable: OUTPUTS
Y1 NET INTEREST INCOME
Y2 FEES AND COMMISSIONS

USING DEA MODEL IN ORDER TO GET THE MALMQUIST INDEX

MALMQUIST INDEX

TOTAL FACTOR PRODUCTIVITY CHANGE

TECCH PEFFCH SECH EFFCH
Chapter 4. Practical Method

In this chapter we describe how we collected data for our quantitative research study. We continue by explaining our chosen data sample and give relevant information on the sample set we used. Furthermore, we present the variables chosen for the analysis and explain why we have chosen the variables of our input and output for our research. Lastly, we highlight the time horizon of the study and the data process.

4.1 Data Collection

According to Bickman and Rog (1998, p.23) there are two types of data: primary data and secondary data. The first is data, which are collected for a special purpose, like a specific research study. The latter is data, which have already been collected before and are then reused for another study (Blaikie, 2009, p. 161). There are different types of secondary data, which consist of raw and compiled data (Saunders et al., 2009 p. 256). In addition to that, it is feasible to use the secondary data for descriptive and explanatory research, since it can include quantitative as well as qualitative data (Saunders et al., 2009, p. 258). One of the main advantages of using secondary data is the saving of resources like investing money and time in comparison to primary data (Shiu et al., 2009, p. 141). On the other hand there are also disadvantages like the collected data are used for a purpose that differs from the original goal of collection. Hence, it may be not appropriate for our research objectives. Another problem could be the limitation of access to the data for the researcher, whose feasibility to control the quality of the data is restricted (Saunders et al., 2009, p. 269-271).

Concerning our data collection we considered both options of utilizing secondary and primary data, whereby we took into account the advantages and disadvantages of collecting approaches. Hence, we focused on the specific background of the study, our research question, but also on the current situation as well as availability of the data. We justify the chosen approach based on the type of our study, in which the results of productivity and efficiency of the Islamic banks in the Gulf region in the period of 2012 – 2016 are subject to a comparison. Taking into consideration former research that compared the efficiency and productivity by using secondary data, for example from Bankscope Database of Bureau Van Dijk’s Company, as we have red in several literatures and articles like Masood et al. (2013, p. 71 – 105) and Svitalkova (2014) show, who compared the efficiency and productivity by using secondary data for example from Bankscope Database of Bureau Van Dijk’s Company. Thus, we concluded that we were going to collect secondary data.

Based on these further researches and their data collecting methods, we also gathered our data from Thomas Reuters Eikon (2010). The Eikon system from Thomas Reuters includes a database of economical and financial data such as the income statements or balance sheets. In addition to that, according to Thomas Reuters Eikon (2010) the database of Thomas Reuters is world – famous for being one of the largest global databases of economic data, which covers forty years of history and releases. That leads us to the assumption that the provided data is of high quality and reliable. Nevertheless, during the collection of the data we identified some gaps in the dataset concerning some periods for a number of Islamic banks, which were essential for the analysis. Therefore, we searched for the annual reports of the banks for the lacking
data on their homepages in order to include the missing information, but also to verify the provided data. Finally, we converted all annual values to U.S. Dollar, since not all countries share the same currency. Thereby, we used an adjusted average exchange rate for every year, which was provided by Thomas Reuters Eikon (2010). Moreover, we deflated all values of every country to enhance and to ensure the comparability of the data of all observed countries. The deflation had been done to the year 2012 with the application of the consumer price index of each country.

4.2 Data Sample

In conformity to Saunders et al. (2009, p. 213) and Bryman & Bell (2011, p. 173) there are two types of sampling. On the one hand there is probability sampling and on the other hand non-probability sampling. In the first approach everyone in the population has the same probability to be chosen by the researcher. However, the second method is not a random selection, because some entities have a higher likelihood to be selected than others (Bryman & Bell, 2011, p. 176).

In order to answer our research question and meet the requirements of this study we used the non-probability method to choose our sample. The application of this approach seems more appropriate for this research, since time and costs are limited. Furthermore, we are considering a homogeneous population, since we are taking into the account the Gulf region alone. Thus, we have noted six of eight countries of this region and are in the suggested area from a sample size of four to twelve according to Saunders et al. (2009, p. 233). The sample contains eleven Islamic banks from the Gulf region, whereby we tried to take into the account the biggest banks, based on the basic parameters and characteristics in the banking sector. These basic parameters are presented in the table 2 below and show the arithmetic mean and standard deviations of the selected variables. Although the standard deviations of many variables are pretty large, which implies that we have large and small banks in our sample, they are nevertheless the largest banks in their countries.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Qatar</th>
<th>Kuwait</th>
<th>Oman</th>
<th>UAE</th>
<th>Bahrain</th>
<th>Saudi Arabia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>24,633.4</td>
<td>54,723</td>
<td>16,812.9</td>
<td>26,047</td>
<td>13,097.4</td>
<td>80,525</td>
<td>35,973</td>
</tr>
<tr>
<td>Std. D.</td>
<td>7004.01</td>
<td>2365.85</td>
<td>9952.44</td>
<td>11375.9</td>
<td>9346.12</td>
<td>7682.21</td>
<td>3157.37</td>
</tr>
<tr>
<td>Mean</td>
<td>21,633.4</td>
<td>54,723</td>
<td>16,812.9</td>
<td>26,047</td>
<td>13,097.4</td>
<td>80,525</td>
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<td>11375.9</td>
<td>9346.12</td>
<td>7682.21</td>
<td>3157.37</td>
</tr>
</tbody>
</table>

Table 2: Basic Parameters from 2012 until 2016
In order to provide a general understanding of the banking sectors, the following parts will cover information on the financial sector of the chosen GCC countries. Furthermore, brief presentation of the eleven banks under study will be given.

4.2.1 Qatar's Banking Sector

There are a total of eleven local banks and seven foreign banks operating in the local market in Qatar (Export.gov, 2016). The Qatari banking sector is dominated by Qatar National Bank (QNB, 50% state-owned), which is the oldest and largest Qatari bank and has 50.48% share of the banking sector’s total assets as of December 2013. The banking sector in Qatar has grown very rapidly over the past few years on the back of a robust economy with high rates of GDP growth. Presently, the share of Islamic banking practice represents billion $49.4 total assets of the Qatari financial industry (DCIBF, 2014).

One of the banks we analyze in this research paper is Qatar Islamic Bank (QIB). It is the first established Islamic financial institution in Qatar. Its products and operations are supervised by a Sharia board, which ensures that the Bank follows to Islamic finance and banking principles. Within the country, it counts as the largest Shariacompliant lender with a 35% share of the Islamic sector and a 9% share of the banking market overall. It has over 170,000 retail clients and more than 3,000 corporate clients. The bank conducts its domestic business through 32 branches spread throughout the entire country (Qatar Islamic Bank, 2017).

Masraf Al Rayan (MAR) is another Qatar-based Islamic bank providing banking, financial, investment and brokerage services through a network of 12 branches located across Qatar. By market value, MAR is the second largest Islamic bank in Qatar (Al Rayan Bank, 2017).
4.2.2 Kuwait's Banking Sector

In Kuwait, there are eleven local commercial banks, which include five Islamic banks, the largest bank being the National Bank of Kuwait (NBK). Generally, the banks are under the supervision of the Kuwait Central Bank (National Bank of Kuwait, 2017).

The bank we examine in this paper is the Kuwait Finance House (KFH), Kuwait's second-largest bank, and also the second-largest Islamic financial institution in the world, with assets of KD17.2bn ($59.26bn) at the end of 2014, and reported profits of KD126.5m ($435.8m). As a sharia-compliant bank, KFH distributes most of its annual profits among its shareholders (Oxford Business Group, 2015). KFH is active in numerous markets, including the UAE, Bahrain, Saudi Arabia, Malaysia and Turkey, among others. In order to upgrade the corporate governance and risk management departments, and diversifying the firm’s revenue streams, the bank has implemented initiatives under a transformation program (Oxford Business Group, 2015).

4.2.3 Oman's Banking Sector

Sharia-compliant banking was rather late in coming to Oman in 2012, being the last among the six-state GCC to do so. The law allows for the licensing of purely Islamic entities, or else for conventional banks to establish independent Islamic finance windows (The Business Year, 2016). According to Thomson Reuters, these operations in Oman already account for over 4% of total banking assets over the past two years, and could reach 8% by 2018 (Reuters, 2016).

Today, two pure Islamic banks and six Islamic windows provide service, with combined assets of $2.9 billion as of 2014, according to the Times of Oman, thus marked below the approximately 25% market share Islamic banks hold in the Gulf Arab region (Times of Oman, 2014). In 2014, the Central Bank of Oman established a centralized sharia supervisory board to oversee strict compliance among the Islamic banking community (Central Bank of Oman, 2017).

The National Bank of Oman, which is being used in this study, provides various banking products and services through a network of 61 branches in Oman, the United Arab Emirates, and Egypt (National Bank of Oman, 2017). The National Bank of Oman recorded a net profit of RO 60.1 million, which is an increase of 20 per cent compared to the year before and the highest net profit recorded in the bank’s history. The bank’s total assets increased by 10 per cent in 2015, its loan, advances and financing activities increased by 9 per cent, while its net interest income and net income from Islamic financing grew by 16 per cent (Oxford Business Group, 2016).

Another bank, the Bank Muscat SAOG provides various commercial and investment banking services through a network of approximately 154 branches in the Sultanate of Oman with assets worth over US$ 15 billion (Bank Muscat, 2017). The bank posted a net income of RO 177.04 million and revenue of 401.68 million in 2017 (Financial Times, 2017).
4.2.4 UAE's Banking Sector


Islamic banking has expanded considerably in recent years and has become an important element in the U.A.E. banking industry. The number of dedicated Islamic banks in the country has now risen to seven. In addition, a number of conventional banks offer Islamic banking and financial services. Traditionally, trade and building sectors receive a major share of bank loans. Banks lend to the services, trade, and building sectors due to the scarcity of major investment scope in other productive sectors (Central Bank of U.A.E., 2017).

The first U.A.E. bank in this research paper is the Emirates Islamic Bank Public Joint Stock Company. It provides commercial and banking services and operates through Corporate and Investments, Retail, and Treasury segments. In addition, the company offers various products through Islamic financing and investing instruments in accordance with Islamic Sharia, as well as invests in investment securities, sukuk, funds, and real estate sector. Sukuk can be compared or referred to sharia-compliant bonds. The company operates through 61 branches in the United Arab Emirates (Emirates Islamic Bank, 2017).

The second bank is the Dubai Islamic Bank (DIB), which is the first Islamic bank to have incorporated the principles of Islam in all its practices and is the largest Islamic bank in the UAE (Dubai Islamic Bank, 2017). DIB is a public joint stock company, and currently operates 90 branches in the UAE. Moreover, it is involved in local and international partnerships, mainly in Pakistan and Turkey (Dubai Islamic Bank, 2017).

The third bank we examine in our study is the Abu Dhabi Islamic Bank PJSC, together with its subsidiaries, provides banking, financing, and investing services to small and medium businesses, individuals, corporate and institutional customers, and high net worth individuals. The company operates through 86 branches in the United Arab Emirates and 3 overseas branches in Iraq, Qatar, and Sudan. Mainly, the banks' operation focuses on Global Retail Banking, Global Wholesale Banking, Private Banking, Treasury, and Real Estate Segments. In addition, like other banks in our study, the company offers Islamic Banking solutions (Abu Dhabi Islamic Bank, 2017).

4.2.5 Bahrain's Banking Sector

Bahrain's banking system consists of both conventional and Islamic banks and is the largest area of the financial system, accounting for over 85% of total financial assets. The conventional segment includes 23 retail banks, 69 wholesale banks, 2 specialized banks as well as 36 representative offices of overseas banks. The Islamic segment, offers Sharia compliant products and services including 6 retail banks and 18 wholesale banks (Central Bank of Bahrain, 2016).

The banking sector has played an important role in the emergence of Bahrain as a
leading financial center in the region. Recent growth in the sector has been backed by gains in the oil industry and the resulting increases in liquidity. Thus, banks are playing a major role in reinvesting earnings from surplus oil and offering financing opportunities to other segments of the economy (International Monetary Fund, 2016).

We include the Al Salam Bank-Bahrain B.S.C. in our study. The company offers its products and services through approximately 10 branches and provides various Islamic banking products and services in the Kingdom of Bahrain and Seychelles and operates through Banking, Treasury, and Investments segments. It also provides various retail banking products and solutions (Al Salam Bank, 2017).

Another Bahraini bank, called Al Baraka Banking Group, is part of the study. It offers retail, corporate and investment banking and treasury services in accordance with the principles of the Sharia in 15 countries (Al Baraka Bank, 2013).

4.2.6 Saudi Arabia's Banking Sector

Saudi Arabia's financial system consists of the Saudi Arabia Monetary Agency (Central bank, also referred to as SAMA), the commercial banks, specialized lending institutions, and the stock market (SAMA, 2017). SAMA was established to supervise banks and financial institutions, manage monetary policy, oversee the financial system and insurance, and to maintain stability within the banking system. The government’s stake in commercial banks is less than 10%, as adequate monetary flows enable fair price funding (SAMA, 2016).

There are twelve domestic banks licensed in Saudi Arabia. In the financial services sector, the Capital Market Authority (CMA) licensed 91 foreign and local companies, such as Goldman Sachs and JP Morgan to provide financial and brokerage services. During 2013, there were five IPOs in Saudi Arabia valued at USD 506 million (Reuters, 2016).

Unlike other GCC and Arab states, there is no distinction between Islamic financial institutions and conventional ones, in the sense that there is no local bank called or identified as an Islamic bank, as we see with Islamic banks in Bahrain and the UAE for example. This could be since all banking transactions, theoretically, have to be Sharia compliant and by identifying a specific bank as an Islamic bank may indicate that there are other banks that are non-Islamic, which arguably SAMA tries to avoid (SAMA, 2016).

In this study we include the Al Rajhi Bank, a Saudi Arabian bank and the world's largest Islamic bank by capital based on 2015 data (Islamic Finance, 2015). With over SR 330.5 billion in AUM ($88 billion) and over 600 branches, the bank accounts as a major investor in Saudi Arabia's business and is one of the largest joint stock companies in the Kingdom (Islamic Finance, 2015).

Al Rajhi Bank offers a variety of banking services such as deposits, loans, investment advice, securities trading, remittances, credit cards, and consumer financing, all
offered according to Islamic requirements (Al Rajhi Bank, 2017). As of 2016, 70 percent of Al Rajhi's assets and 55 to 60 percent of its revenue were generated from consumer banking, and the bank has an 18 percent share of the mortgage market in the Kingdom (Al Rajhi Bank, 2017).

4.3 Time Horizon

According to Saunders et al. (2012, p. 190) the selection of the time – period depends on the chosen approaches such as cross sectional or longitudinal analysis. This thesis is focusing on the time – horizon from 2012 until 2016, that why we have chosen the longitudinal approach as mentioned and explained in the previous chapters. Moreover, we did not find to our best knowledge any other information for this time horizon, which supported us in the decision to take this time frame.

4.3.1 Determination of the Inputs and Outputs

After the explanation of the Malmquist – index approach we are going to define the inputs and outputs. According to the literature and research studies there is no conformance about what the banks are producing and which resources banks are using for the process of creating the product (Berger & Humphrey, 1992, p. 197 – 198). The determination of the inputs and outputs of financial institutions was done mostly by two methods, which are named intermediation and production method. These methods were used in many banking studies for the definition of inputs and outputs. Intermediary approach is treating the financial institutions as an intermediary between savers and borrowers. It is defining loans and other earning assets as outputs and various funding sources like deposits and other liabilities, but also labor and physical capital as inputs. In contrary the production approach is considers capital and labor as inputs to produce loans and deposit accounts as outputs. Thus, the numbers of accounts services are measured as outputs by using the approach of production. However, the intermediate method is measuring the output in value terms (Berger & Humphrey, 1997, p. 197).

Finally, according to Berger & Master (2003, p. 65 – 69) the use of the profit – orientated approach is the one they suggested. This approach is recognizing the revenue elements as the outputs and inputs are representing the cost elements. This approach is helping to take into account unmeasured changes in the quality of banking service, since it is considering higher paid revenues for the enhanced quality but also to record the objective of profit maximization during the consideration of the revenues and costs (Berger & Mester, 2003, p. 80). Another advantage for the use of the profit – orientated approach is that the understanding of the use of the banks concerning their strategies to respond to the changes in environment is better (Pasiouras, 2008, p. 306).

Based on inter alia Pasiouras (2008), Drake et al. (2006) and Sturm & Williams (2004) we decided to apply the profit-orientated approach in our work to determine inputs and outputs. In the end, we have chosen three inputs and two outputs to calculate the Malmquist – indices. The inputs are constituted by the vectors x1 labor and related expenses, x2 loan loss provisions and x3 other operating expenses. To take into account the cost of the risk taking in lending we implemented the second mentioned input (Leightner& Lovell, 1998, p. 123).
According inter alia to Pasiouras (2008, p. 302) banks like ones in the gulf region which are involved in non – traditional activities in the last years, can be considered with the determination of non – interest income to proxy these non – traditional business activities. Moreover, we decided to consider the outputs net interest income, like mentioned before, and other operating income (fees and commission), since neglecting these activities outside the balance sheet in the model could understate bank efficiency (Rogers, 1998, p. 468 – 469).

Sample means and standard deviations of every country and its each input and output factors are presented in the table 3. The benchmarks for the variables are in U.S. dollars. By the analysis of the data in table 3 we can emphasize one relevant fact. It can be observed that the inputs and outputs are having a relevant difference between each other. This issue is pointing out that we have bigger and smaller banks in the sample. This statement is supported by the issue, that the standard deviations of all variables are pretty large.

Table 3: Summary Statistics of Dataset used in the Study from 2012 until 2016 (average values) Variables in US$ million.

<table>
<thead>
<tr>
<th>Variables / Countries</th>
<th>output / net interest income</th>
<th>output / fees and commissions</th>
<th>input / Labor &amp; related expenses</th>
<th>input / other expenses</th>
<th>input / loan loss provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qatar</td>
<td>503.93</td>
<td>61.07</td>
<td>-109.36</td>
<td>-70.32</td>
<td>17.68</td>
</tr>
<tr>
<td>Kuwait</td>
<td>1197.3</td>
<td>252.85</td>
<td>-526.71</td>
<td>-322.88</td>
<td>529.81</td>
</tr>
<tr>
<td>Oman</td>
<td>430.89</td>
<td>417.97</td>
<td>-149.97</td>
<td>-388.59</td>
<td>49.61</td>
</tr>
<tr>
<td>U.A.E.</td>
<td>781.56</td>
<td>127.38</td>
<td>-266.57</td>
<td>-172.53</td>
<td>194.85</td>
</tr>
<tr>
<td>Bahrain</td>
<td>291.75</td>
<td>93.92</td>
<td>-159.34</td>
<td>-69.90</td>
<td>46.94</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2399.52</td>
<td>847.45</td>
<td>-601.36</td>
<td>-598.90</td>
<td>539.98</td>
</tr>
<tr>
<td>Total mean</td>
<td>934.17</td>
<td>300.11</td>
<td>-302.22</td>
<td>-270.52</td>
<td>229.81</td>
</tr>
</tbody>
</table>

| Standard deviation    |                             |                               |                                 |                       |                             |
| Qatar                 | 70.98                       | 24.21                         | 43.51                           | 25.21                 | 23.55                       |
| Kuwait                | 87.25                       | 25.93                         | 71.18                           | 89.11                 | 284.51                      |
| Oman                  | 229.22                      | 931.78                        | 75.62                           | 936.29                | 35.58                       |
| U.A.E.                | 325.47                      | 56.03                         | 110.57                          | 81.53                 | 59.30                       |
| Bahrain               | 201.50                      | 81.31                         | 121.09                          | 38.03                 | 33.04                       |
4.3.2 Data Process

In the following we are going to apply our chosen variables of inputs and outputs in the formula we explained in the methodology part of this work. Based on our explanation we are going to use the following formula in order to determine the total factor productivity change and to sub – categorize this result in the indices TECCH, PEFFCH, SECH and EFFCH.

\[
\text{TFPCH} = \frac{d^*_v(q_t,x_t)}{d^*_v(q_s,x_s)} \times \left[ \frac{d^*_v(q_t,x_t) + d^*_v(q_t,x_t) - d^*_v(q_t,x_t) - d^*_v(q_t,x_t)}{d^*_v(q_s,x_s) + d^*_v(q_s,x_s) - d^*_v(q_s,x_s) - d^*_v(q_s,x_s)} \right]^{1/2}
\]  

(8)

This determination will be done like mentioned in the methodology part with the use of the DEA model. Therefore, we have used the software Data Envelopment Analysis Program version 2.1 of Tim Coelli from the University of Queensland in Australia, who provide us his free software.

Before we could put the variables in the program we had to deflate them like mentioned in the methodology part and then put it in the program excel in order to structure it appropriately and prepare it for the used software. After the preparation of our data we applied the program and received the results in the form of the Malmquist – Index and its sub – categories.
Chapter 5. Results

In this chapter we state the results of our analysis from the previous chapter. We then describe the results of productivity indices of the banks in further detail.

5.1 Presentation of Results

In the beginning we determined the productivity of the banks in the gulf region by applying the output oriented Malmquist – index. After that we categorized our sample to the location they belong to. Based on this we analyzed the relationship between productivity growths and tried to investigate the reasons of productivity change in each group. Furthermore, we tried to analyze the influence of the liberalization and regulation or deregulations in the gulf region by comparing the Malmquist – indices. Table 4 is representing the results of the analysis.

Table 4: Malmquist productivity indices of the banks in GCC countries, consecutive years of 2012 – 2016

All indexes are geometric averages, TFPCH = TECCH X EFFCH, EFFCH = PEFFCH X SECH

<table>
<thead>
<tr>
<th>Qatar</th>
<th>Technical Efficiency Change (EFFCH)</th>
<th>Technical Change (TECCH)</th>
<th>Pure Technical Efficiency Change (PEFFCH)</th>
<th>Scale Efficiency Change (SECH)</th>
<th>Total Factor Productivity Change (TFPCH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td>0.95</td>
<td>1.46</td>
<td>0.94</td>
<td>1.01</td>
<td>1.38</td>
</tr>
<tr>
<td>2013-2014</td>
<td>1.10</td>
<td>1.02</td>
<td>1.08</td>
<td>1.02</td>
<td>1.12</td>
</tr>
<tr>
<td>2014-2015</td>
<td>1.00</td>
<td>1.94</td>
<td>1.00</td>
<td>1.00</td>
<td>1.94</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1.00</td>
<td>0.87</td>
<td>1.00</td>
<td>1.00</td>
<td>0.87</td>
</tr>
<tr>
<td>Mean</td>
<td>1.01</td>
<td>1.26</td>
<td>1.00</td>
<td>1.01</td>
<td>1.27</td>
</tr>
</tbody>
</table>

<p>| Kuwait                 |                                     |                          |                                          |                                 |                                          |
| Years                  |                                     |                          |                                          |                                 |                                          |
| 2012-2013              | 1.07                                | 0.96                     | 1.08                                     | 0.99                            | 1.02                                     |
| 2013-                  | 1.00                                | 1.04                     | 1.00                                     | 1.00                            | 1.04                                     |</p>
<table>
<thead>
<tr>
<th>Years</th>
<th>EFFCH</th>
<th>TECCH</th>
<th>PEFFCH</th>
<th>SECH</th>
<th>TFPCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>1.51</td>
<td>0.95</td>
<td>1.28</td>
<td>1.18</td>
<td>1.44</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1.00</td>
<td>0.85</td>
<td>1.00</td>
<td>1.00</td>
<td>0.85</td>
</tr>
<tr>
<td>Mean</td>
<td>1.13</td>
<td>0.95</td>
<td>1.08</td>
<td>1.04</td>
<td>1.07</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>EFFCH</th>
<th>TECCH</th>
<th>PEFFCH</th>
<th>SECH</th>
<th>TFPCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oman</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td>1.02</td>
<td>2.16</td>
<td>1.08</td>
<td>0.94</td>
<td>2.21</td>
</tr>
<tr>
<td>2013-2014</td>
<td>1.09</td>
<td>0.50</td>
<td>1.00</td>
<td>1.09</td>
<td>0.55</td>
</tr>
<tr>
<td>2014-2015</td>
<td>1.08</td>
<td>0.93</td>
<td>1.00</td>
<td>1.08</td>
<td>1.00</td>
</tr>
<tr>
<td>2015-2016</td>
<td>0.93</td>
<td>0.94</td>
<td>1.00</td>
<td>0.93</td>
<td>0.87</td>
</tr>
<tr>
<td>Mean</td>
<td>1.03</td>
<td>0.99</td>
<td>1.02</td>
<td>1.01</td>
<td>1.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>EFFCH</th>
<th>TECCH</th>
<th>PEFFCH</th>
<th>SECH</th>
<th>TFPCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.A.E.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td>0.65</td>
<td>1.07</td>
<td>0.78</td>
<td>0.83</td>
<td>0.70</td>
</tr>
<tr>
<td>2013-2014</td>
<td>1.31</td>
<td>0.95</td>
<td>1.32</td>
<td>0.99</td>
<td>1.25</td>
</tr>
<tr>
<td>2014-2015</td>
<td>1.16</td>
<td>0.91</td>
<td>0.94</td>
<td>1.24</td>
<td>1.06</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1.01</td>
<td>0.99</td>
<td>1.00</td>
<td>1.01</td>
<td>1.00</td>
</tr>
<tr>
<td>Mean</td>
<td>1.00</td>
<td>0.98</td>
<td>0.99</td>
<td>1.01</td>
<td>0.98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>EFFCH</th>
<th>TECCH</th>
<th>PEFFCH</th>
<th>SECH</th>
<th>TFPCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td>2.58</td>
<td>1.01</td>
<td>1.03</td>
<td>2.49</td>
<td>2.60</td>
</tr>
</tbody>
</table>
By observing the indices of Qatar it is been noted that there is no big fluctuations. We can only find two bigger fluctuations. The first bigger fluctuation is from 2012 until 2016 for the total factor productivity change with a geometric mean of growth of 27%. The second one can be noted in the technical change, where we can see bigger fluctuations from the period 2012 until 2016. Thereby, the technical change increases in an amount of 26%. Other indices like technical efficiency change, pure technical efficiency change and scale efficiency change are pretty much constant between 0% and 1% of growth. We have just a decline in the period of 2012 until 2013 for the EFFCH in the amount of 5% and 6% for PEFFCH.

If we have a look at Kuwait we can see outliers in the period 2014 until 2015 in all indices except of the TECCH. Generally, the indices are pretty much stable except of this period. Finally, we can find a growth for all indices in the range of 7% until 13%, except of the TECCH, where we can see a decrease of 5%. In addition to that, the largest decline is here 15% in the period 2015 until 2016 for the indices TFPCH and TECCH.

During the view of the indices of Oman there are striking out four values of two indices in two sequential periods from 2012 until 2014. We can see an increase for

<table>
<thead>
<tr>
<th>Years</th>
<th>2013-2014</th>
<th>2014-2015</th>
<th>2015-2016</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>0.55</td>
<td>1.04</td>
<td>1.00</td>
<td>0.55</td>
</tr>
<tr>
<td>2014-2015</td>
<td>1.27</td>
<td>0.86</td>
<td>1.00</td>
<td>1.27</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1.06</td>
<td>0.94</td>
<td>1.00</td>
<td>1.06</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>1.18</strong></td>
<td><strong>0.96</strong></td>
<td><strong>1.01</strong></td>
<td><strong>1.17</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>2012-2013</th>
<th>2013-2014</th>
<th>2014-2015</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2013</td>
<td>1.00</td>
<td>0.93</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2013-2014</td>
<td>1.00</td>
<td>0.93</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2014-2015</td>
<td>1.00</td>
<td>0.79</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>1.00</strong></td>
<td><strong>0.91</strong></td>
<td><strong>1.00</strong></td>
<td><strong>0.91</strong></td>
</tr>
</tbody>
</table>

5.2 Descriptive Presentation of the Results

By observing the indices of Qatar it is been noted that there is no big fluctuations. We can only find two bigger fluctuations. The first bigger fluctuation is from 2012 until 2016 for the total factor productivity change with a geometric mean of growth of 27%. The second one can be noted in the technical change, where we can see bigger fluctuations from the period 2012 until 2016. Thereby, the technical change increases in an amount of 26%. Other indices like technical efficiency change, pure technical efficiency change and scale efficiency change are pretty much constant between 0% and 1% of growth. We have just a decline in the period of 2012 until 2013 for the EFFCH in the amount of 5% and 6% for PEFFCH.

If we have a look at Kuwait we can see outliers in the period 2014 until 2015 in all indices except of the TECCH. Generally, the indices are pretty much stable except of this period. Finally, we can find a growth for all indices in the range of 7% until 13%, except of the TECCH, where we can see a decrease of 5%. In addition to that, the largest decline is here 15% in the period 2015 until 2016 for the indices TFPCH and TECCH.

During the view of the indices of Oman there are striking out four values of two indices in two sequential periods from 2012 until 2014. We can see an increase for
TECCH and TFPCH for each 116 % and 121 % in the period from 2012 until 2013. The second strike out can be found from 2013 until 2014 in the same indices. Here we can see a decline of each index in the amount of 50 % for the first mentioned and 45 % for the second mentioned. The other indices are pretty much constant and we can see nevertheless a growth in the geometric mean between 1% and 3 except in the TECCH, where we can see a decrease of 1 %. Anyway, we cannot see big fluctuations in the mean.

The consideration of the U.A.E. shows a large decline from 2012 to 2013 in all indices in a range of 35 % to 17 %, followed by an increase in the next period 2013 to 2014 in an area from 25 % to 32 %. Except of the index TECCH, this seems fairly stable in the negative area. In general the means of the indices of the U.A.E. is pretty much constant between a decrease of 2 % and an increase of 1 %.

Observing the indices of Bahrain shows us irregularities in general but specifically in the period from 2012 until 2013, where we can monitor an increase between 158 % and 160% for the indices EFFCH, SECH and TECCH, followed from a large decrease in the next period from 2013 until 2014 in the range of 45 % until 43 %. Continuing with an increase of the mentioned indices between 27 % and 10 % from 2014 until 2015. All in all we can see a growth in the observed indices between 1 % and 18%, except of TECCH, where we can find a decline of 4 %.

The last monitored country Saudi Arabia is in general in all periods pretty much constant. There is just a decline of 21 % in the period 2014 until 2015 for TECCH and TFPCH. Otherwise we have here just a decrease in the TECCH and TFPCH over the observed periods from 2012 until 2015 between 21 % and 7 %, which can be seen also in the mean with an amount of 9 % decline for each in these indices. The other indices are constant without any decrease or increase.
Chapter 6. Discussion

In this chapter we discuss the findings of our study based on the theoretical framework. We make connections between the results and previous literature.

During the analysis of Qatar we have seen the changes mentioned in the previous chapter. The increase of the technical change from the period 2012 to 2016 in an amount of 26% can be interpreted with the change of the of the market structure like the liberalization of the market (Angelidis & Lyroudi, 2006, p. 155 – 165). This change is thus affecting the total productivity change. The other indices are pretty much stable, which can be interpreted as stagnation but also efficient.

In the case for Kuwait we can interpret the outliers of the TECCH in the period 2014 until 2016 and its decrease as an altering of the market structure like more competition with rise of new banks or enhancing banks (Angelidis & Lyroudi, 2006, p. 155 - 165). The growth of the other indices can be explained for example with the improvement of the management quality, which we can see especially in the period from 2014 to 2015 (Das & Ghosh, 2006, p. 211).

For the analysis of Oman we have seen a big up and down for the indices TECCH and TFPCH from the period 2012 until 2014. It starts with an increase and ends with a decrease in the next period. We can say that the decline of TFPCH can be influenced by TECCH. It can maybe be motivated through the poor condition of the production process or the low level of the innovation in the management. That could be the reason of decrease in TECCH. In addition to that, it can be interpreted that the management could not build on the performance of the last period. However, the other indices are constant but stagnating, which indicates efficiency, which we can see in the TFPCH with a little growth (Angelidis & Lyroudi, 2006, p. 155 – 165).

The big decline we can see by considering the U.A.E. of all indices in the period from 2012 to 2013 and followed with an increase in the next period can be motivated for example with the index EFFCH as a low management quality, where we can argue with poor senior – management, which is connected with the application of the inputs like daily operations and loan portfolio management (Berger & De Young, 1997, p. 11 - 12). Furthermore, the decrease of the PEFFCH can be interpreted as an inefficient management (Chiou, 2009, p 3490 – 3506). All in all the means are pretty constant because of the improvement in the next periods but anyway not efficient and decreasing.

By the analysis of Bahrain we can observe the big irregularities in the SECH and EFFCH and TECCH. The fluctuations can be a result of bad cost control, which is indicated by the fluctuation of the SECH (Isik & Hassan 2003, p. 293). Here we have also the fluctuations of the EFFCH and TECCH as described already above in the chapter, which can be a result of bad management (Berger & De Young, 1997, p. 11 – 12; Angelidis & Lyroudi, 2006, p. 155 – 165). Nevertheless, it is efficient, except in the TECCH.
Finally, by the observations and interpretation of Saudi Arabia we can say that it is all in all not efficient, since in general the indices are constant and one is even decreasing. This can be seen from the decline of total factor productivity by 9%, possibly affected from the decline of the TECCH, which indicates decreased level of innovations and to a change of government policy (Angelidis & Lyroudi, 2006, p. 155 - 165).
Chapter 7. Conclusion

In the following chapter we are going to start with the general conclusion, which is connected with the main purpose of this work and its research question. Followed by the practical contributions of our work. Afterwards it is going to be continued with the theoretical contribution. Finally, we are concluding the limitations and suggestions in this research field.

7.1 General conclusion

The main objective of this scientific work was to analyze the total factor productivity change of the Islamic banks in the Gulf region, with the help of the Malmquist – Index. The Malmquist – Index helped us also to categorize the Index in four subindices, which helped us to analyze the total factor productivity change more detailed. Based on this we analyzed a sample of the biggest banks of six countries out of eight countries of the Gulf region from the period 2012 until 2016. Summarizing the question about the total productivity change in the Gulf region takes us to the final research question:

What is the total factor productivity change (Malmquist) of Islamic banks in the GCC region from 2012 until 2016?

In general we were able to observe that almost every bank in the Gulf region was having an increase in the total factor productivity change. Except of Saudi Arabia and the U.A.E., those had a decrease of their total productivity change.

The first have a decrease of 9 %, during the second mentioned is showing of a decrease of 2 % in their total geometric mean of all observed periods. This indicates that they are inefficient and are impairing regarding our observations of the geometric mean of the total factor productivity. In contrary to the other observed banks. Those are all efficient and moreover increasing. The increase of the total productivity change of Bahrain is noticed with 13% and Qatar with 27%. While those have a double – digit growth, the other countries Oman and Kuwait are observed with a single – digit growth of 1 % for Oman and 7 % for Kuwait.

7.2 Practical contribution

Based on the decomposition of the total factor productivity we could find out, that the reasons for the change of the total productivity change could be influenced by the change of the market structure like new occurred banks, which are leading to more competition. But also the policy of the government, which could have done reforms like financial deregulation, regulation or liberalization. Finally, the increase could be a result of a low level of innovation in the management or production process like no enhancement in the customer relationship. Which we can see especially in the both countries U.A.E. and Saudi Arabia with a decrease of their total productivity change which can be rooted in the decrease of the technical change, since this indicates the mentioned interpretations. Primarily we can observe a decrease of the geometric mean of the index in all countries except of Qatar.
Furthermore, we find out, that in the case of the U.A.E., the decrease of the total productivity change is also influenced by the inefficient handling of the input factors between the periods. This was indicated by the pure technical efficiency change. In general our findings are pointing to efficiency in the case of all countries except of the U.A.E..

There are also practical contributions regarding a positive influence of the total productivity change. For example, for the country Bahrain, where we could see an improvement of the management quality. We could see this because of the increase of the technical efficiency change over the periods. From the period 2013 to 2014, where we saw a decrease, which could be interpret as a poor senior – management practice regarding the application of the inputs, daily operations and loan portfolio management, our findings shows, that these lacks seems to be recognized and enhanced. All in all this is applicable to all countries in the total geometric mean for this indicator.

Finally, the findings are representing an efficient, good and increasing cost control of the all observed bank in their total geometric mean. This information is based on the scale efficiency change, which is contributing this in a specific manner.

7.3 Societal contributions

Productivity and efficiency is affecting all the people, who are just in contact with the bank or just in general the whole environment. In our opinion we did not treated anyone of them unfair or in an unethical manner.

We think that our study could help the banks to show, that also other styles of execution of a banking system like the Islamic one could be efficient and moreover useful. Furthermore, it could show that maybe the addition of some Islamic banking structures can help to diversify the whole banking system and maybe to increase efficiency and productivity of the banks in countries, where the use of Islamic banking is not common or even never used. Our findings have shown of also the decrease of the total productivity change in countries such as Saudi Arabia. Nevertheless, we think that this study can proof that this kind of structure of the banks can also perhaps contribute efficiency and productivity but moreover to give an impulse for more researches in this field, since it could consist more advantages for other systems like the conventional banking. In addition to that, we think that it could be a positive impact for the society to see that other structures can be also efficient and productive and that maybe a combination of it could lead to a higher level of efficiency and productivity.

Finally, we think the social contribution of this work is to give a new point of view of other systems of banking, which can be also efficient and productive. Hence, we were trying to draw a trigger of more creativity regarding of the development or enhancement of the existing systems regardless where it comes from to increase the efficiency and productivity. We think that this work can help to create more synergies because of the proof that the combination of conventional banking could lead also to more productivity.
7.4 Limitations and suggestions for future research

This work was limited to eleven Islamic banks in the Gulf region. To increase the level of validity and credibility it could be helpful to widen up the region for example to Iran and Malaysia. Furthermore, an increase of the sample could be also a good tool to reach a higher level of validity and credibility, even though we were only focusing on the Gulf region. The challenge of comparability could be maybe solved with another mathematical model.

The used model DEA, which helped us to determine the Malmquist – Index could also limit our research in a certain way. Since, the DEA is working with an approximation of the production function by considering all input and output data, regardless of the outliers, it could be possible that the whole analysis can be result in a distorting effect. Moreover, the DEA is just defining the banks with the quantity of the inputs and outputs. There is no help of it for the choice of the consideration of the important input and output factors. Thus, the problem could arise that not every relevant factor is considered and that maybe factors are considered, which are not affecting the efficiency of the production process. Based on this it is possible that contortions can occur, since they could affect the frontier function and hence banks are rising up as efficient, which are not. In contrary if we consider to less factors, then the geometric mean can increase and banks, which are not efficient are getting counted as efficient.

In the end we could find out the total productivity change concerning each country in the gulf region. We recommend the analysis regarding of the influence of each input factor or other factors like the GDP, since this could be interesting. Therefore, we recommend for example a regression analysis concerning this issue. In addition to that, we recommend to analyze the efficient banks more detailed and also to reflect upon the outliers.
Chapter 8. Truth criteria

In the following we are going to explain how this work meets the quality criteria, since they are important for the reader to assess the quality of this work.

8.1 Internal & External Validity

To ensure that the results of the work are valid, it has to be asked if the measure of the concept really measures that concept. This means more clearly that there has to be a causal relationship between the variables, which are used in the study (Saunders et al., 2009, p. 157). The requirement of measurement validity should be met, since we have applied the same research methodology like inter alia Masood et al. (2013). In addition to that we have used the Data Envelopment Analysis Program version 2.1 of Tim Coelli, which is worldwide well known in the scientific and academic fields. Furthermore, the reader can find more detail information in the chapter 4.3.1 determination of inputs and outputs, where we have underpinned and supported our choice of the variables with previous researches. According to Bryman & Bell (2011, p. 171) the researcher has to deduce a hypothesis from theory that is relevant to the concept to ensure the validity. In our case it might be an issue, since we are trying to measure the total factor productivity change of the GCC region, with the chosen variables and therefore ruled out economic factors, which could have an influence of our results. Hence, we did not implement a control of economic aspects, which implies that our results might be influenced by those not controlled factors. Finally, this means that it is feasible that the results are not internal validity is not high. Nevertheless, we have built up our study on previous researches to construct validity, since we assumed a high level of importance of the theories for our concept.

The point of external validity is also a very important one. This issue is connected the generalization of the results to the world. Summarized it means that the results of the research are questioned to be applicable for other settings and other people. Our research is putting its focus on the GCC region, which means that the validity concerning the issue of internationality is doubtful.

Regarding the aspect of generalizability we have just taken the biggest banks in the GCC region, based on one of the criteria of total assets. The size of the bank could influence the generalization of our results, since we did not take into account smaller banks. However, the findings can be generalized under the assumptions we have chosen before.

8.2 Reliability

According to Saunders et al. (2009, p. 156) reliability refers to the extent which data collection methods or analysis process will gain consistent results. Moreover, reliability refers to precision of the measurement and absence of different results if the research would be repeated (Collis & Hussey, 2014, p. 217). The data we have chosen in our study is gathered from the Thomas Reuters Eikon (2010). This system is considered as pretty reliable like we mentioned in the chapter 4.1. Finally, we think that we have collected the data from a credible and reputed source, which ensure the reliability and accuracy of our data.
8.3 Replicability

Our data were gathered by secondary external data. This means that our work can be applied by other researchers. In addition to that, we have filtered our data to do it applicable for our study. These filter methods are explained in our study, which means that there is no problem to replicate his study. Moreover, the software DEAP 2.1 we have used is available as free software on the internet and therefore reachable and applicable for everyone, who wants to replicate this study.

Furthermore, bias of the observer can occur when the collected data is interpreted by researchers in different ways, who are applying the same research ((Saunders et al., 2009, p. 156). In order to avoid this we have only taken a lot of previous studies to ensure that our interpretation is not affected by our personal view. Moreover, we gathered data of high quality and applied the analysis cautious with appropriate explanations, thus the reliability of our research seems to be high.
9. Reference List


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