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A COMPARATIVE ANALYSIS OF RISK-RETURN CHARACTERISTICS BETWEEN SUKUK (ISLAMIC BONDS) AND CONVENTIONAL BONDS

By:

HEBAH SHAFEQ SHALHOOB

A thesis submitted in partial fulfilment of the

requirements of the

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"IN THE NAME OF ALLAH, THE MOST GRACIOUS, EVER MERCIFUL"

Praise be to Allah, and peace and blessings on His Noble Prophet and on his Family and Companions

DECLARATION

I declare that I am the author of this dissertation; that all references cited have been consulted by me; that the work of which this dissertation is a record has been done by me; and that this dissertation has not been submitted for the application of another degree or qualification to another university or institute of learning.

Signature:…….

Date:…….……..

DEDICATION

This thesis is dedicated to the most important person in my life, the one who believed in me and always told me to never give up on my dreams – my mother, God rest her soul. Thank you Mama for everything that you taught me; I really wish that you were here with us.

To my one love, Mohammad Al-Malki – I would like to thank you for everything that you have done for me; it's your love that keep me going day after day.

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Hebah, 2016.

ABSTRACT

Sukuk are an important mode of financing in the Islamic financial system. As usury (interest) is prohibited in Islam, conventional bonds are not suitable for investors in Islamic countries. Since their launch in the 1980s, Sukuk have gained recognition and popularity as a substitute for conventional bonds. However, their unique features mean that Sukuk are not always clearly understood.

The aim of this study is to analyse the differences and similarities between Sukuk and conventional bonds in terms of their risk and return characteristics.

In the light of a detailed literature review, a conceptual framework is developed to focus on the efficient market hypothesis, value-at-risk methodology, bond portfolio diversification and the determination of Sukuk yields.

This study employs a comparative analysis of Sukuk and conventional bonds. The data on Sukuk and conventional bonds were collected from eight countries, including Malaysia, Saudi Arabia (KSA), the United Arab Emirates (UAE), Bahrain, Qatar, Pakistan, Turkey and Kuwait. Statistical techniques include run tests, autocorrelation tests, variance ratio tests, VaR, duration and convexity, portfolio optimisation and regression analysis for Sukuk yields.

The results show that Sukuk and conventional bonds prices do not fluctuate randomly in these countries. This implies that there is an overall problem of illiquidity in these markets and it is not possible to check if the Sukuk market is less liquid than conventional bond markets. There are key differences between Sukuk and conventional bonds, and the former are found to be riskier than conventional bonds. The inclusion of Sukuk in conventional bonds portfolios appears to reduce the riskiness of a mixed portfolio. This is an important observation because if this works in the long run, Sukuk could provide a much-needed diversification opportunity to international investors in fixed-income securities. The analysis of Sukuk

yields suggests that there are certain features of Sukuk that have a significant impact on the instruments' yield-to-maturity. These features include Sukuk type, credit rating and issuer type (severing or corporate).

The findings of this study could be helpful for investors to get better risk-adjusted returns in bonds markets. For policy makers, it highlights the importance of further developments in Sukuk markets.

Key Words: Islamic finance, Islamic bonds, Sukuk, conventional bonds, value-at-risk, OLS regression, risk and return.

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ABBREVIATIONS

AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
ADF	Augmented Dickey–Fuller
ANOVA	The Analysis of Variance
APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
CESR	Committee of the European Securities Regulators
CI	Capital Intelligence
CRA	Credit Rating Agency
DJCSI	Dow Jones Citigroup Sukuk Index
ECGC	East Cameron Gas Company
EMH	Efficient Market Hypothesis
EWMA	Exponentially-Weighted Moving Averages
FAME	Financial Analysis Made Easy
FRS	Fiduciary Rating System
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GDP	Financial Services Authority
GCC	Gulf Cooperation Council
IDB	Islamic Development Bank
IFIS	Islamic Finance Information Service
IFSB	Islamic Finance Service Board
IIFM	International Islamic Financial Market Services Industry's
IIRA	Islamic International Rating Agency
IPO	Initial Public Offering
LIBOR	London Interbank Offered Rate
MARC	Malaysian Rating Corporation Berhad
MIFC	The Malaysian Islamic Financial Centre
OLS	Ordinary Least Square
P/E Ratio	Price-Earnings Ratio
PLS	Profit and Loss Sharing
QSC	Qatar Global Sukuk Company
QREIC	Qatar Real Estate Investment Company
R2	Adjusted R-Squared
RAROC	Risk Adjusted Return on Capital
S&P	Standard and Poor's
SC	Securities Commission
SPV	Special Purpose Vehicle
UAE	United Arab Emirates
US	United States of America
VaR	Value at Risk Technique

GLOSSARY OF ARABIC TERMS

Amanah	Trust/ Honesty
Al-Gharimin Fee Al-Deen	Those who are in debt
Bai Bithaman Ajil	Purchasing products with late payment
Bay' Al-Dayn	Sale of debt
Bay' Al-Inah	Sale of an asset or property
Fee Sabeel Allah	For the Cause of Allah
Fuqara	The poor
Gharar	Risk, Uncertainty and Speculative
Hadith	The reports of the teachings, deeds and sayings of the Islamic prophet Muhammad
Ibn a Sabeel	A traveller
Ijara	Rental/ lease agreement
Ijma	The consensus among religion scholars about specific issues
Ijtihad	Jurists' independent reasoning relating to the applicability of certain Shariah rules
Istisna	Progressive financing or purchase order
Khiyar Al-Ayb	Option for defect
Khiyar Al-Majlis	Option of the contracting session
Khiyar Al-Ruyat	Option after inspection
Khiyar Al-Shart	Option by condition
Khiyar Al-Tayeen	Option of determination or choice
Khiyarat	Islamic options
Masakin	The needy
Maysir	Gambling
Mudarabah	Partnership where one partner providers the capital (Rabb-Ul-Maal) to the other (Mudarib) for investment
Murabahah	Cost plus financing or Mark-Up
Musharakah	Trustee finance or partnership in an investment
Nisab	The minimum amount for a Muslim net worth to be obligated to give zakat
Qard Al Hasana	Lending money without getting any benefits
Qiyas	The use of deduction by analogy to provide an opinion on a case
Quran	The central religious text of Islam
Rab-Ul-maal	Investor
Riba	Usury/interest
Shariah	Islamic law
Sukuk	Islamic bonds
Sunnah	The habitual practice and behaviour of Prophet Muhammad
Takaful	Insurance
Wikalah	Agency
Zakah	A mandatory duty on all able Muslims who meet Nisab

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Number	Arabic name	Anglicized name	English Translation	Number of verses
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CHAPTER 1

INTRODUCTION AND RATIONALE OF THE RESEARCH

1.1 INTRODUCTION

Islamic finance has become one of the fastest-growing areas of the global financial services market. This growth is due to two reasons: first is the growing awareness among Muslims of the requirement to avoid "interest" as they try to live their lives in accordance with Islamic principles. In the past, Muslims found it challenging when Western financial institutions offered a financial system based on "interest", which is prohibited in Islam. Second, the excess liquidity in the Gulf regions owing to oil and gas-related revenues over the last three decades saw a need arise for new investment channels.

Islamic banking assets witnessed an increase of approximately 80%, mainly concentrated in Malaysia, the Gulf Cooperation Council (GCC) countries and Iran, representing less than 1% of global financial assets (IFSB, 2014). The market size of the Islamic financial institutions has been growing rapidly from $1.66 trillion in 2013 to $1.8 trillion by the end of 2014; this is expected to be $3.4 trillion by the end of 2018 (Naveed, 2015).

The core structure of Islamic financial markets is similar to conventional markets, in that they both have involve a money market and a capital market. The main feature here is that Islamic financial instruments should be traded in a way that does not conflict with Shariah principles. In other words, it should not involve any activities that are prohibited by Islamic law (Shariah) such as "interest", which represents an assertion of religious law in financial market transactions (Shahida and Sapiyi, 2013).

Sukuk are classified as Islamic bonds and are similar to some extent to instruments on conventional debt markets but for investors who do not want to invest in conventional bonds. Sukuk are now considered one of the vital tools of the global Islamic financial system. The total assets of the Sukuk market are about 14.3% of the global Islamic financial assets

(Alam et al., 2013). Sukuk issuance reached $116.4 billion in 2014 compared with $111.3 billion in 2013. Outstanding Sukuk saw growth of approximately 11.4% from the end of 2013 to the middle of 2014 (Naveed, 2015).

The aim of this research is to undertake a comparative analysis of risk-return characteristics between Sukuk and conventional bonds. This chapter will cover the research background, the rationale for this study, the research problem, the research aim and objectives, the research design, an overview of ethical issues and an overview of the structure of the study.

1.2 RESEARCH BACKGROUND

The Islamic finance industry has grown rapidly over the last thirty years and has been aiming to satisfy the financial needs of people everywhere, at all times, without falling into usury (Riba) (Warde, 2000).

Islamic financial instruments are divided into two types: first, on the basis of profit and loss sharing (PLS), are Mudarabah and Musharakah. Mudarabah is a partnership between the financier, who contributes the capital, but is not involved in the management, and the manager who contributes the knowledge and skills. Musharakah (participation) is a combination of capital and effort in terms of sharing risks and financial results. Secondly, on the basis of non-profit and loss sharing, are Murabahah, Ijara, Bai Bithaman Ajil and Qard al Hasan. Murabahah (cost plus sales) is an agreement between the buyer and the bank to buy a certain object for an agreed upon price. This includes the purchase price, the costs of a mediator and the profit margin. Ijara (rental/lease agreement) is a contract between the lenders and the banks. The bank buys the product then leases it to the lender for a specified period and for a specified amount without taking ownership in the product until the end of the lease period. Bai Bithaman Ajil means purchasing ownership of products in instalment payments or all at once at the end of the contact. Qard al Hasan is lending money without getting any benefits; it is seen as zero-return loans to the needy, without profit.

Bond markets attract many investors, mainly because there is less risk involved compared to equity markets. A bond is a debt instrument with fixed cash flows over a specified period of time issued by governments, companies, or other institutions that offers the bearer (bond holder) the right to receive an agreed-upon amount by the end of the maturity date. There are different types of bonds: for example, inflation-linked bonds, zero-coupon Bonds and convertible bonds. Bond markets provide financing to governments and corporations, and provide liquidity to financial markets. Bond markets are divided into primary markets and secondary markets.

Sukuk, also known as financial certificates, is the Arabic word (صكوك) and the plural of Sak, which refers to fixed-income and interest-bearing instruments that are comparable to conventional bonds apart from being Shariah-compliant. These instruments therefore fit with investors' and borrowers' principles and values (Adam & Thomas, 2004). The concept of Shariah compliance is what distinguishes the Islamic finance industry. According to the Accounting and Auditing Organization of Islamic Financial Institutions (AAOIFI), Sukuk are equal-value certificates of undivided shares in the ownership of tangible assets, usufructs and services (AAOIFI, 2008). In the early 1980s, Sukuk gained recognition as an investment instrument comparable to conventional bonds. In 2000, the first issue of Sukuk took place in Malaysia, followed by Bahrain in 2001. Since then, Sukuk have become an essential part of Islamic finance and a significant investment opportunity for global investors, in particular Muslim investors looking for instruments that meet their religious, social and expected economic conditions in Islamic finance.

Depending upon the Islamic financing and trading modes, Sukuk have many forms, including: certificates of ownership in leased assets, certificates of ownership of services of a specified supplier, certificates of ownership of usufructs, certificates of ownership of services to be made available in the future as per their description, Salam certificates (the pre-payment of an asset for future delivery), Istisnaa certificates (for building property to own), and Murabahah certificates, etc. Some types of Sukuk can be traded in the secondary market while the trade of others is limited

to the primary market due to the complications and uncertainties in their structures and cash flows. In other words, some Sukuk can only be exchanged at their face value. Sukuk al-ijara is the most commonly used Sukuk. Its simplicity and similarity to conventional leasing are the main factors behind its popularity.

Conventional bonds and Sukuk are similar in their primary purpose as funding tools. Both of these debt securities are considered less risky than equity securities. Both Sukuk and conventional bonds are rated by the same rating agencies. The main differences that distinguish Sukuk from conventional bonds are: first, Sukuk are entitlements in the projects that generate profits while conventional bonds are loans owed by their issuer. Second, Sukuk revenues are the result of a real profit, while conventional bonds are a commitment from the lenders with specific benefits (an interest rate) paid to the bondholder. Lastly, Sukuk are securities that represent real assets, while conventional bonds are securities representing debt to the borrower (AL-Maghlouth, 2009; Tariq, 2004). In the next chapter, the characteristics of Sukuk and conventional bonds are discussed in more detail.

1.3 RESEARCH PROBLEM AND MOTIVATION FOR THE STUDY

As discussed in the previous section, the Sukuk market has been one of the fastest-growing segments in the global financial markets over the last ten years. Despite its growth and popularity, there has been a lack of academic research focusing specifically on empirical research in the area of Sukuk. Most of the research in this area has focused on comparing Islamic and conventional bonds theoretically. There is therefore a clear gap in the academic literature and this study will take on this challenge and focus on risk in the Sukuk market. The problem here is that Sukuk in Muslim countries face several risk-return challenges that could negatively affect the Sukuk market.

This study will compare Sukuk and conventional bonds with respect to their risk-return characteristics to clarify the whole picture for the different stakeholders in this asset class.

1.4 AIM AND RESEARCH OBJECTIVES

The aim of this study is to analyse the differences and similarities between Sukuk and conventional bonds in terms of their risk-return. This will be achieved by looking at the behaviour of these securities in the secondary market, their importance in diversifying risk in portfolios, and the analysis of the determinants of yields.

To achieve this aim, the research seeks to address the following objectives:

1. To explain the structure, the development and growth of the Sukuk market.
2. To review the fundamental differences and similarities between Sukuk and conventional bonds.
3. To review the credit rating criteria of Sukuk.
4. To examine the randomness of Sukuk and conventional bonds returns to evaluate the information efficiency of these markets.
5. To analyse and compare the risk-return characteristics of Sukuk and conventional bonds.
6. To analyse the determents of Sukuk yields.

1.5 RESEARCH QUESTIONS

This research is directed by the following research questions. It is assumed that suitable answers to these questions will be a clear way for the realisation of the research objectives.

The main research question:

1. Are Sukuk less risky than conventional bonds?

The sub-research question:

2. Are Sukuk different from conventional bonds?
3. Are there any specific rating issues in relation to Sukuk? How is the rating of Sukuk different from that of conventional bonds?
4. Is the Sukuk market efficient in the context of efficient market hypothesis?
5. What are the main risks associated with Sukuk?

6. Can Sukuk be useful for portfolio diversification and risk management?
7. What are the determinants of Sukuk yields?

1.6 SIGNIFICANCE AND EXPECTED CONTRIBUTIONS OF THE STUDY

1.6.1 Benefit to the Researcher

Acquiring experience of research in the field of Islamic finance, which is a relatively new orientation for the banking and corporate sectors, together with developing understanding from research courses, will in help me to develop and further my career.

1.6.2 Contribution to Knowledge

Despite the tremendous growth of Sukuk over the last few decades, they are still considered comparatively new and at an emerging stage of development. This is despite the fact they are clearly popular enough and have been sufficiently critiqued and developed to merit their current level of maturity. Consequently, there should be attempts to make Sukuk a more notable investment alternative by having more empirical studies focusing on the risks involved with this instrument.

The main and most important contribution of this study is a comparison and analysis of the risk-return characteristics of Sukuk and conventional bonds in the main Muslims countries who feature both types of bonds simultaneously in their markets, such as Malaysia, Saudi Arabia, the United Arab Emirates, Bahrain, Qatar, Pakistan, Kuwait and Turkey. A quantitative research approach is adopted by looking at the randomness of both bonds to evaluate if Sukuk itself are less risky than conventional bonds, to examine if Sukuk are useful for bonds risk diversification, and to evaluate the determinants of Sukuk yields.

However, the aim of this study is not just to contribute to the knowledge but to provide a vital platform for understanding the framework of the Sukuk market. Due to the lack of existing empirical studies in this regard and the novelty of these securities, this study offers an academic work that might serve as a basis for conducting further research in this area.

This study is significant as it will look at Sukuk risks from a different point of view compared to conventional bonds due to the different nature of Sukuk, such as their profit and risk-sharing characteristics. Gathering these objectives together in a single study and examining the various factors statistically has not, to my knowledge, been done before.

Another contribution of this study is an attempt to provide useful information to various groups of stakeholders in the market, such as decision makers who have interest directly or indirectly in Sukuk and to help them make informal decisions and comparisons. This research can help policy makers to implement new sets of policies in relation to new instruments like Sukuk. In addition, it might help to inspire and encourage investors to increase investment in Sukuk, and provide another option to companies looking financing at the best level of yield.

This study could also benefit governments, private Islamic financial institutions, Sukuk issuers, rating agencies, savers, and banks willing to take steps forward in dealing with Sukuk, as well as corporate clients and corporations, academics – whether they are researchers or students – the AAOFI and the Shariah supervisory councils.

1.7 RESEARCH DESIGN

According to Hoque (2006), research is a discovery journey that requires collecting facts about situations or empirical data about a problem.

The process of investigating and obtaining knowledge about the world comprises various methodologies. There are two broad methodologies in research data: qualitative and quantitative. Qualitative methods can be used to gain an appreciation of human behaviour and the reasons that govern such behaviour.

In other words, it involving's gathering information that is not in a numerical form. As Hannah (2003) pointed out, content analysis, case studies, interviews and so on can be used to gather data that may contribute to answering research questions. In contrast, quantitative research involves the collection of numerical data and analysis using statistical measures to explain a phenomenon.

As the qualitative research method is normally related to descriptive data, it involves an accurate description of candidate responses, which can be difficult, and can also prove harder to analyse than the quantitative method. The quantitative research method is therefore chosen as the more appropriate method for this study to analyse and compare Sukuk and conventional bonds, as described in the research objective, questions and hypothesis. All of these elements will be explained in detail in chapter

1.7.1 Research Population and Sample

The research population is defined as the total classification of subjects that are the focus of attention in a certain research project (Polit and Hungler, 1999). The sample of the research is defined as the portion of the research population that was selected to participate in a study, representing the research population (LoBiondo-Wood and Haber, 1998).

For this study, the sample contains primary and secondary market data on Sukuk and conventional bond issuance in eight countries: Malaysia, Saudi Arabia, the UAE, Bahrain, Qatar, Pakistan, Kuwait and Turkey. The final data includes 59 Sukuk and 73 issues of conventional bonds from these eight countries. The data used in this research consists of clean prices[1] and yields to redemption of Sukuk and conventional bonds. Daily prices were obtained from Thomson Reuters DataStream from the first available date until the end of August 2013, or the earliest available date (different sample periods due to the data availability).

1.7.2 Data Analysis Methods

A mix of statistical methods is used for the data analysis in this research. For example, autocorrelation-based tests, runs tests and variance ratio tests will be used to look at the randomness of returns. This is reported in detail in Chapter 4. To analyse the risks of Sukuk and conventional bonds, the variance-co-variance based Value-at-Risk technique (VaR), the duration and convexity approach and the theory of portfolio diversification are also used, as will be reported in detail in chapter 5. In order to

[1] Clean price is a trade price less the accrued interest in between coupon payments for each bond.

evaluate the determinants of Sukuk yields, Ordinary least squares (OLS) regression analyses are conducted and explained in chapter 6.

1.8 OVERVIEW OF ETHICAL ISSUES

It is widely known that research is an extensive activity and a systematic process that leads to the acquisition of additional knowledge about different phenomena and can help in solving problems. For this reason, researchers must have ethical standards that must be applied side by side with knowledge and methodological standards, such as honesty, truthfulness and objectivity. Research ethics requires the writer to respect others' dignity, rights and opinions, whether they are researchers, participants, or colleagues in the research.

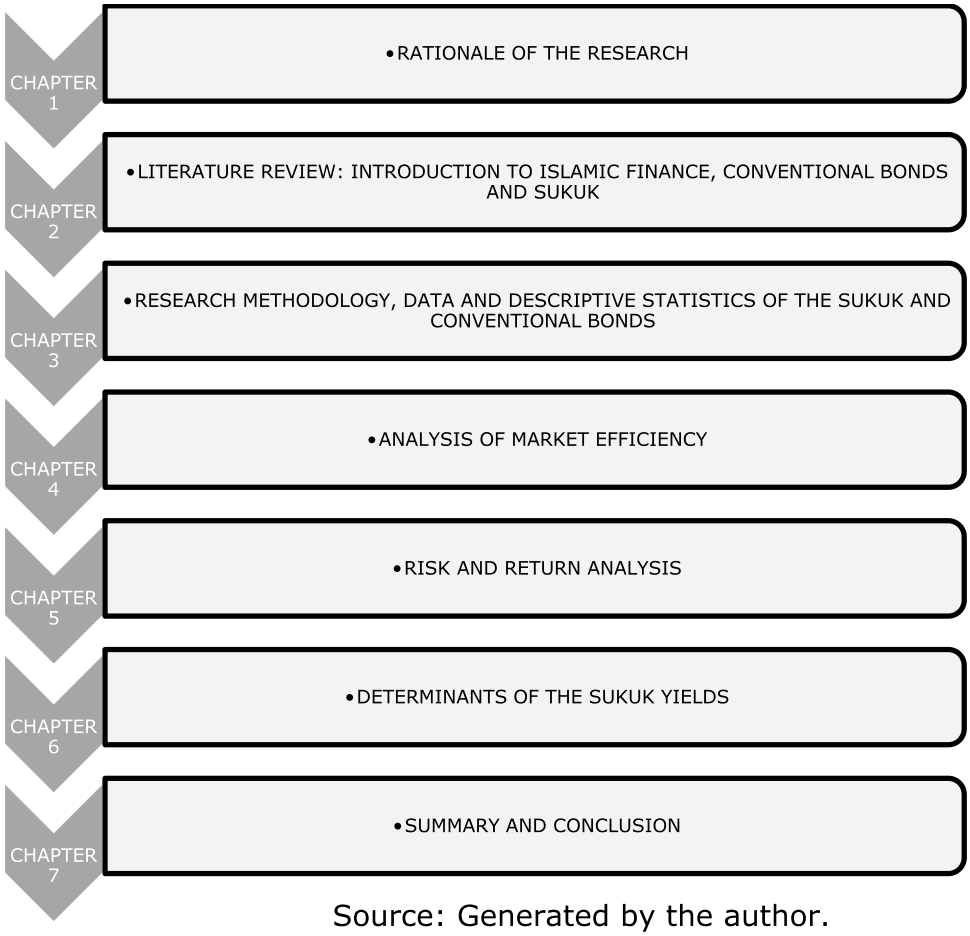
The researcher in this thesis ensured that ethical standards followed best practices, spanning from paraphrasing, plagiarism and quotation problems to publishing responsibility (Data Protection Act, 1998), and taking into account religious, cultural and moral values. In addition, the research ethics guidelines of the Robert Gordon University in Aberdeen at all times were applied at all times. Islamic ethical principles were also applied since the research was focused mainly on Sukuk, which similarly has a direct or indirect impact on accounting and finance principles and policies.

1.9 STRUCTURE OF THE THESIS

To achieve the aim of this research and to answer the research questions, this thesis is organised into seven chapters.

The research is structured as follows: chapter one presents a brief introduction of the research namely, the background of the research, the research aim and objectives, the research questions, expected contribution of the study, research design, overview of the ethical issues and the structure of the thesis. Chapter two provides readers with a brief understanding of Islamic finance in general, conventional bonds and Sukuk. In addition, it reviews the main similarities and differences between Sukuk and conventional bonds. The research methodology, the data explanation and the descriptive statistics are presented in chapter three.

Figure 1.1 Structure of the Thesis



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The next three chapters (from chapter four to six) consist of the main empirical work of this research. In chapter four, the weak form of market efficiency will be tested. This chapter will start by reviewing the theory of the efficient market hypothesis (EMH) including, the definition of EMH, factors affecting the market's efficiency, the implications of EMH, the weak, semi-strong and strong forms of market efficiency and if there are any anomalies. It then discusses the methodology, followed by a discussion of the statistical tests. Chapter five will give an overview of the risk profile and how this is related to Sukuk and conventional bonds including, the concept of risk, the risks associated with Sukuk and conventional bonds and the risk management performs in Sukuk. Then, the researcher will show the methods applied and before discussing the results. The determinants of the Sukuk yields will be discussed in chapter 6. It will start by reviewing the related literature of the term structure including an overview of the term structure and yield curve in theory as

well as the main theories related to the liquidity preference hypothesis, expectations theory, and segmented markets theory. Then, it will attempt to discuss the methodology and lastly will present the findings. The study will conclude in chapter 7 by providing the overall conclusions from the study and by discussing the limitations and recommendations for future studies related to Sukuk.

CHAPTER 2

INTRODUCTION TO ISLAMIC FINANCE, CONVENTIONAL BONDS AND SUKUK: LITERATURE REVIEW

2.1 INTRODUCTION

The size and scope of Islamic finance has grown very fast in the last fifteen years. There are certain features that distinguish the Islamic economy from the general international economy. Islamic finance aims to meet people and companies' financial needs without falling into usury. The main goal of Islamic finance is to achieve social and economic equity. Islamic financial products are, in principle, created for investors who wish to comply with the teachings of Islamic Shariah that guide the organisation of a Muslim's everyday life (Gait and Worthington, 2007). Islamic laws prohibit the application of "interest rates" and consider it immoral in Islam due to the fact that there is no real economic activity involved. Islamic law also prohibits investment in vice industries like tobacco, alcohol, gambling and weapons. These types of investments are considered the major differences between Islamic and conventional financial systems. Islamic financial products have developed over time from simple concepts like Murabahah to have Murabahah Sukuk as one of the products.

Sukuk refer to Islamic bonds (certificates), which are similar to conventional bonds except that Sukuk are Shariah-compliant instruments. Compliance with Shariah law means providing investors with ownership in the underlying asset. The aim of this chapter is to give a comprehensive review of the emergence of Sukuk, its structure and the fundamental differences between Sukuk and conventional bonds.

This chapter is organized as follows: section two reviews the concept of the Islamic financial system. Section three begins with a brief review of the concept of conventional bonds. The fourth section examines Sukuk in general and its emergence. Sukuk securitisation will be present in section five. Section six discusses the structures of the common types of Sukuk instruments. The seventh section concentrates on the Sukuk rating

methodology, definitions and processes. It also attempts to compare the distinctive rating methodologies employed by rating agencies such as Fitch Ratings, Moody's and Standard and Poor's (S&P), followed by a brief review of the Islamic International Rating Agency (IIRA) and the International Islamic Financial Market Services Industry's (IIFM). The eighth section provides a critical analysis of the similarities and differences between Sukuk and conventional bonds. The last section critically discusses some of the recent developments and challenges in the development of the Sukuk market.

2.2 THE MAIN FEATURES OF THE ISLAMIC FINANCIAL SYSTEM

Generally speaking, Islam gives great attention to society and to socio-economic justice, and does not reject, in principle, the role of market forces and the efficient allocation of resources. Islam guides and promotes an economic system that follows Islamic scripture (The Holy Quran) and traditions. The Islamic financial system is fundamentally different from capitalism and socialism (Kuran, 1995). Capitalism focuses on profit maximisation and private ownership with little emphasis on spiritual and moral values, while socialism is based on public or shared ownership of the incomes of production and stresses equality rather than achievement. The Islamic financial system is based on the concepts of human well-being, socio-economic justice, the eradication of poverty and equitable distribution of wealth (Chapra, 1985). In some ways, it fits in the middle of capitalism and socialism. According to Usmani (1998), the vital principals in Islam, in general, and in the Islamic economy are harmony, spirituality, morality and material value, while the capitalist economic system solely stresses material value.

Hersi (2009) has pointed out the fundamental difference between the Islamic and conventional finance systems in that Islamic finance is not an interest-based financing system compared to conventional financing systems.

2.2.1 The Concept of Islamic Finance

For Muslims, Islam is a complete system of life, and they follow it in order to obtain guidance on all aspects of their life. Hasan (2007) describes the

Islamic system as being based on legal and moral roles to create a system known as Shariah. Zul Kepli (2013) states that Islam derives its principles from the Holy Quran and the Hadith. The Quran refers to commands, prohibitions, guidance, principles and injunctions that deal with subjects, while the Hadith cover a much wider range of topics, as it is a record of what the Prophet Muhammad (peace be upon him) said and demonstrated to his followers. Lewis (2001) states that Islamic Shariah provides guidance on moral values in terms of commercial transactions such as Amanah (honesty) in all statements and encourages its parties to consider each other's requirements and circumstances, and refer to representations, warranties and tolerance in terms of bargaining.

2.2.2 The Root of Islamic Finance

Islamic financial organisations are defined as financial organisations that are committed to applying the provisions of Islamic law in all of their banking and investment transactions by providing financial services to both individuals and society through the application of the concept of financial intermediation based on the principle of profit and loss sharing (PLS) (Warde, 2000).

Table 2.1 Shariah Sources of Islamic Finance Definitions

Concept	Definition
The Holy Quran	The book of revelation given to the Prophet Muhammad (peace be upon him).
Hadith	The narrative relating the deeds and utterances of Prophet Muhammad (peace be upon him).
Sunnah	The habitual practice and behaviour of the Prophet Muhammad (peace be upon him) during his lifetime.
Ijma	The consensus among religion scholars about specific issues not envisaged in either the Holy Quran or the Sunnah.
Qiyas	The use of deduction by analogy to provide an opinion on a case not referred to in the Quran or the Sunnah in comparison with another case referred to in the Quran and the Sunnah.
Ijtihad	Represents a jurists' independent reasoning relating to the applicability of certain Shariah rules on cases not mentioned in either the Quran or the Sunnah.

Source: Gait and Worthington (2007, p.3).

The Quran, Hadith, Sunnah, Ijma, Qiyas and Ijtihad are the vital Shariah sources for Islamic finance and are described in Table 2.1.

Gait and Worthington (2007) suggested that Islamic financial institutions should not only include banking sector organisations but other types of financial intermediaries such as building societies, credit unions, financial advisers, insurance companies, collective investment schemes, pension funds and so on that employ Shariah principles. In other words, Islamic financial institutions should avoid limitations on products that foreign banks can provide according to Shariah, such as accepting deposits and savings accounts with no interest and provide a whole range of banking products that comply with Shariah.

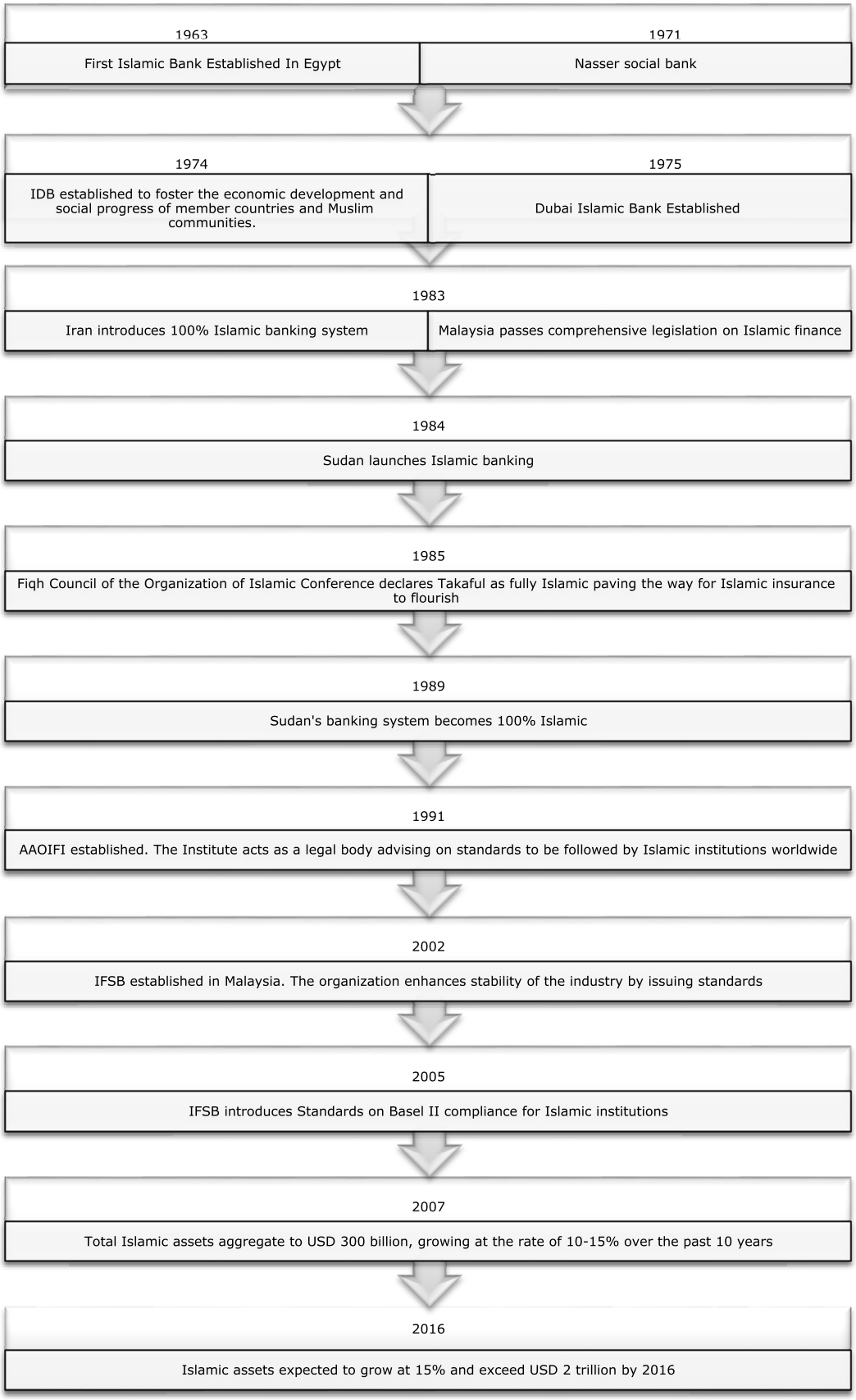
2.2.3 The Development of Islamic Finance

Islamic finance is not a recent invention. Its origins derive from the foundation of the Quran and Hadith. These constitute the primary sources of Islamic jurisprudence involving the morals and principles of Islamic finance.

Many banks and financial institutions have offered Islamic products since the 1970s in countries such as Pakistan and Sudan (Wilson, 2009; Mostafa, 2006). In other countries, such as Saudi Arabia, Egypt, Indonesia, Jordan and Malaysia, Islamic banking services work side by side with conventional banks (El Qorchi, 2005).

The first formal Islamic bank was established in 1963 by Al-Najjar (the previous head of the International Federation of Islamic Banks) called the Savings Local Bank in Mit Ghamr in the Arab Republic of Egypt. Nasser Social Bank was established in 1971 and was the first bank that prohibited dealing in interest. The establishment of Islamic banks, which operate in accordance with the provisions of Islamic law, was stipulated in the recommendations of the Conference of Islamic Foreign Ministers in Jeddah, Saudi Arabia in 1972. This identified the need to establish an international Islamic bank within Muslim countries. As a consequence, a convention to establish the Islamic Development Bank (IDB) was signed by the finance ministers of Islamic countries in 1974.

Table 2.2 TimeLine of the Development of Islamic Finance



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In 1975, Dubai Islamic Bank was established as a fully-fledged Islamic bank operating in accordance with the provisions of Shariah law. Nowadays, the total number of Islamic banks claim to have total assets of $1.8 trillion, according to S&P's Islamic Finance Outlook 2015.

Many reasons have been given to explain the huge growth seen in Islamic finance. One of the main reasons is the strong demand from a large number of Muslims to have financial services that comply with Islamic law. This extraordinary growth is also due to the increasing demand in the Gulf region for such products as a result of its oil wealth, as well as to the competitiveness of many banking products that attract both Muslim and non-Muslim investors (Wilson, 2009).

Islamic finance is playing a major role in the development of Middle Eastern economies. Nevertheless, Islamic banking services are limited to few countries compared to the conventional financial system.

2.2.4 The Principles of Islamic Finance

بسم الله الرحمن الرحيم

﴿يَا أَيُّهَا الَّذِينَ آمَنُواْ لاَ تَأْكُلُواْ أَمْوَالَكُمْ بَيْنَكُمْ بِالْبَاطِلِ إِلاَّ أَن تَكُونَ تِجَارَةً عَن تَرَاضٍ مِّنكُمْ وَلاَ تَقْتُلُواْ أَنفُسَكُمْ إِنَّ اللّهَ كَانَ بِكُمْ رَحِيمًا﴾

Allah says in the Quran: "O you who have believed, do not devour your property among yourselves falsely, except that it be trading by your mutual consent; and do not kill your people; surely Allah is Merciful to you" (Quran: Chapter 4 Surat An-Nisa' (The Women), verses 29). This Quranic verse prohibits Muslims from expropriating each other's wealth and encourages them to trade fairly. The Prophet Mohammed (peace be upon him) says in the Hadith that: Whosoever cheats are not among us (Muslim, vol. 1, p. 267, No. 147). Islamic jurisprudence includes the basic principles of Shariah law for financial transactions such as the prohibition of Riba, gambling, coercion and cheating.[1] Consequently, any transaction is valid unless it is proved that it is prohibited in Islam, as is clearly stated in the Quran and the Sunnah (Ibn Qayyim Al Jawziyyah, 1991).

[1] For more reading see: Ibn Taymiyah, 1999; Al-Kasani.

The fundamental principles of the Islamic financial system are explained in the following subsections.

2.2.4.1 The prohibition of Riba

The term "Riba", originally an Arabic word, means usury and refers to any growth or increase in the capital that is paid by the borrower to the lender to increase the primary amount of the loan, whether the increase was large or small (Siddiqi, 2004). Specifically, any fixed predetermined rate applied to the principal until maturity is considered Riba and is prohibited. Moreover, Islamic scholars argue that Riba does not cover usury, but also includes the imposition of interest as it is practised in conventional banking. Islamic scholars consider the prohibition of Riba as the primary principle of Islamic finance (Al-Jarhi and Iqbal, 2001).

2.2.4.2 Profit and loss sharing (PLS)

Islamic finance encourages lenders and borrowers to invest their money and share the profits or losses of the enterprise. The risk is based on their percentage in the capital, without any injustice to both parties.

2.2.4.3 Forbidden commodities/goods

There are certain goods that have been forbidden in Islam, as set out in the Holy Quran, including alcohol, drugs and anything that comes from pigs such as ham, etc. The Islamic financial system encourages people to invest their money according to the regulations set by Islamic law. The target of Islamic Shariah in this regard is to enhance ethical investments without adversely affecting people and society (Gait and Worthington, 2007).

2.2.4.4 The prohibition of Maysir

Maysir is defined as any type of gambling or games of chance such as lotteries, lotto, casino-type games and betting on the outcome of racing animals where a return can be obtained regardless of the type of risk (Al-Saati, 2003). Maysir is forbidden according to Shariah as it might be a source of profit and income to some people and cause others bankruptcy and loss (Iqbal and Molyneux, 2005).

2.2.4.5 The prohibition of Gharar

Gharar refers to risk, uncertainty and speculative transactions that are harmful to society. Gharar is defined as the sale of probable items whose consequences are hidden or whose existence or characteristics are uncertain. In other words, it is considered similar to gambling due to its risky nature. However, the degree of uncertainty in any profitable transaction is perceived differently among Muslim jurists to be considered Gharar.

2.2.4.6 Zakah

Zakah (a term used in Islamic finance) is defined as an obligation prescribed by God (in the Quran) that an individual who possess enough means has to donate a certain percentage of their annual wealth (Nisab) to the poor and the needy. Zakah is considered as the third pillar of Islam and targets social solidarity among people in terms of payments to the poor. Zakah requires business owners and wealthy people to help and support the poor and needy. It is said that if every person paid their annual Zakah, global poverty would be eradicated (Metwally, 2006). According to Sharia, Nisab is the amount of assets that is zakatable, estimated at 2.5%, to the eight categories in the Quran; these are: the poor (Fuqara) - this refers to someone who has no income; the needy (Masakin), referring to someone who may for instance have a job, a house and a car, but their income is below the minimum requirement; employees of Zakah; those who are inclined towards Islam, as in those who might enter or who have already entered Islam; free slaves; those who are in debt (Al-Gharimin Fee Al Deen); for the Cause of Allah (Fee Sabeel Allah), for instance for building Islamic schools or Muslim clinics and hospitals; and travellers (Ibn a Sabeel), for example someone who has lost their wallet and needs to get home.

2.2.4.7 Takaful

Takaful is defined as a mutual insurance or a co-operative that is compliant with the principles of Shariah in the Islamic system. According to Sharia, conventional insurance is forbidden in Islam because it involves

ambiguity and Gharar that affects the outcome of an insurance contract. Takaful (Islamic insurance) is the recommended way to overcome this issue (El-Gamal, 2000). It is essentially established with the concept of donation where the contributions are deposited on a voluntary basis in order to guarantee each other against loss or damage.

2.2.5 Islamic Financial Instruments

The Islamic financial system provides a framework to deal with investments in all economic sectors with Islamic financial instruments, namely Murabahah, Musharakah, Mudarabah, Ijara, Quard Hassan, etc. as well as other types of instruments suitable to all other investment activities (Iqbal, 1997).

Islamic financial law is actually based on three main fundamental principles that all Islamic financial transactions must comply with. The first principle is profit and loss sharing; the second is based on fixed service fees; the third is based on it being free of cost and having no charges.

The most common Islamic financial instruments are described below.

- Mudarabah is a partnership between two partners: a financier, who contributes to the capital, but is not involved in management, and a manager, who contributes their knowledge and skills. However, in the case of loss, the financier bears all the financial loss whilst the manager goes unrewarded.
- Musharakah is based on the participation and combination of capital and efforts in terms of sharing risk and financial results, in which the bank and the industrialist contribute jointly to the capital of a company or project to make a profit.
- Murabahah is an agreement between the buyer (lender) and the bank, to buy a certain object for an agreed upon price, which includes the purchase price, the costs of a mediator and the profit margin. It is one of the most popular modes used in the Islamic finance system in different countries to promote interest-free transactions.
- Bithaman Ajil means purchasing products on instalment payments or in a lump sum at a later date.

- Istisnaa (manufacturing contracts) is a manufacturing contract where the purchaser acquires industrial goods either with a late payment and delivery or an upfront cash payment and late delivery.
- Ijara is a contract between the borrowers and the banks, where the bank buys a product then leases it to the lender for a specified period and a specified amount without taking ownership of the product until the end of the lease period.
- Qard al Hasan is lending money without getting any benefits; it is seen as zero-return loans to the needy, with no profit to the lender.

2.2.6 Islamic Financial Services

Islamic financial systems provide several services for the development of the Islamic economy just like conventional banking and institutions in the western financial system. Islamic banking, Islamic investment funds and Sukuk (Islamic bonds) are the main forms of financing in the Islamic financial system.

2.2.6.1 Islamic banking

Islamic banking has some fundamental differences from conventional banking, which operates predominantly. The conventional system operates on the basis of financial collateral, where the viability of any business mainly depends on the borrower's financial worthiness. In contrast, the Islamic financial system is more concerned with the individual's relationship with the bank, which takes into account the viability of the proposition and what its benefit may be to society at large, irrespective of the financial contribution of the individual proposing the project to the bank (Iqbal, 1997; Haque, 2010).

2.2.6.2 Islamic investment funds

The term Islamic investment fund can be defined as a joint pool in which the investors contribute their surplus money in the form of equal participating shares/units, for the purpose of receive revenues. Islamic investment funds are, to an extent, equivalent to conventional ones, in terms of their objectives as preserving the capital, pooling investors and optimising return. The only difference is that Islamic funds must be

invested according to Shariah principles. The funds are managed on the basis of Islamic Shariah law, which represents the shareholders'/unit holders' share of the assets and entitlement to profits or losses.

2.2.6.3 Sukuk (Islamic bonds)

A bond is a contractual debt obligation, in which the issuer is obliged to pay interest and principal to the bondholders on certain pre-specified dates. Sukuk, on the other hand, refers to the Islamic equivalent of bonds, because interest-bearing bonds are forbidden in Islam. Sukuk are structured to comply with Islamic law and its investment principles.

2.3 THE MAIN FEATURES OF CONVENTIONAL BONDS

To help with understanding the differences between Sukuk and bonds, this section review the features of conventional bonds.

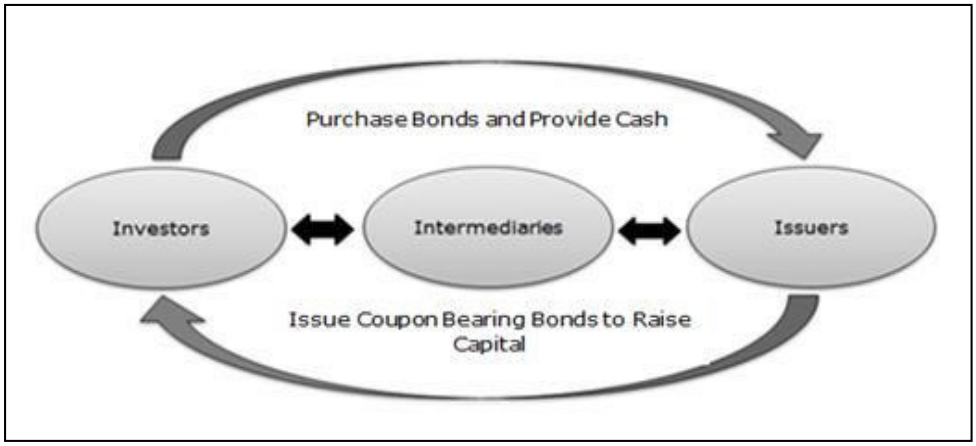
In capital markets, there are three main sources for corporate and enterprise funding: bank loans, equities and bonds. A bond can be defined as a legal document where the issuers of the bonds (corporate or government) are obliged to pay the bondholder a predetermined rate of interest over the life of the security, in addition to paying the principal amount at the maturity date. Bonds are used by companies, municipalities, governments, etc. to finance a variety of projects and activities.

2.3.1 The Primary Market of Conventional Bonds

Bond markets provide an alternative source of financing to governments and corporations to raise money. It also allows corporations and governments to borrow money from investors. These investors purchase the bonds and expect to receive interest on the face value of the bond either as coupon payments or at maturity, in addition to a return of the principal.

A summary of the process of the securitization structures of bonds can be seen in Figure 2.1.

Figure 2.1 The Securitization Structures of Conventional Bonds



Source: Generated by the author.

As can be seen above, bond markets are used directly between borrowers and savers instead of going through intermediaries, by underwriting such bonds via the book runners.

Underwriting is the main technique that enables any institution to issue their bonds to the public through a large financial service provider, as most banks or securities organisations have formed a syndicate to study the bonds, and if satisfied will buy the issue bonds from a borrower to sell them again to the investors (Alkhadhari, 2010).

The book runners are the underwriting firms who are in charge of running the books and are responsible for managing the issuance of the securities for the investors. They work with other participating firms, such as investment banks, to reduce the issuance security risks.

2.3.2 Bond Ratings

In capital markets, the credit rating of bonds is a financial indicator representing the credit worthiness of the issuer (corporate or government) rated by a specific rating agency. They are used by investment professionals to assess the likelihood of debt being repaid, as assigned by credit rating agencies.

However, some credit ratings agencies, such as S&P's and Moody's, are typically very expensive to use, so not all companies can afford yearly updates to their list, due human resource and time costs required to perform deep analysis of the company's risk ranking.

2.3.3 Different Categories of Conventional Bonds

The global bond market is enormous and is comprised of different types of bonds, such as (government bonds, callable bonds, municipal bonds, book-entry bonds, corporate bonds, serial bonds, zero-coupon bonds, war bonds, fixed rate bonds, lottery bonds, inflation linked bonds, non-callable bonds, subordinated bonds, registered bonds, bearer bonds and so on). These bonds are issued in different currencies and in terms of coupon, date of maturity and some other features. The key factors of these various types of bonds can be classified as follows:

2.3.3.1 The Issuers

1. Government bonds: Bonds that are issued by a government to finance their projects with the promise to repay the face value and the periodic interest payments on a maturity date (Hillier, 2010). They are referred to as risk-free bonds as they can raise taxes or create additional currency in order to redeem the bond at maturity. They are usually denominated in the country's own currency, whereas bonds issued by national governments in foreign currencies are normally referred to as sovereign bonds.
2. Corporate bonds: Bonds that are issued by corporations to raise money to fund or expand their business. Investors can get a wide range of bonds based on different maturities and credit ratings.

2.3.3.2 The Return/Interest Payments

1. Fixed-rate bonds: Bonds that are issued with fixed rate coupons that continue until their maturity date. The coupon is paid annually, semi-annually or quarterly, as determined by the issuer.
2. Floating-rate notes: A debt instrument with a variable interest rate or coupon according to the variables in a particular index chosen by the borrower, such as the United States (US) Treasury bill rate, London

Interbank Offered Rate (LIBOR), the Federal funds rate or the prime rate. They mainly have two- to five-year terms to maturity. These bonds protect the issuer from risk of inflation.

3. Zero-coupon bonds: Zero-coupon bonds do not pay periodical interest payments and instead are sold at a discount value to their face value. The bondholders receive a return by the gradual rise in the price of the security, which is redeemed at face value on a specified maturity date.

2.3.4 Risks Associated With Conventional Bonds

The most common risks associated with bonds are presented below:

2.3.4.1 Interest rate risk

Bonds yields have an inverse relationship with changes in interest rates. When market interest rates increase, bond prices decrease and vice versa. The longer the maturity of the bond, the higher the potential interest rate risk is.

2.3.4.2 Risk of default

This is the risk that issuers would not be able to make regular payments or repay the principal amount. Rating agencies have dedicated departments to evaluate the credibility of the bonds issuer and sell this information to investors and other stakeholders.

2.3.4.3 Inflationary risk

Inflation risk arises from the unexpected decrease in the value of assets or income cash flow, which is also known as purchasing power risk. This risk is measured in terms of purchasing power, as inflation can be higher than expected and hence decreases the purchasing power of a currency.

2.3.4.4 Liquidity risk

Bond investors could face the liquidity risk of not being able to trade their securities due to a lack of potential buyers in the secondary market.

2.3.4.5 Foreign exchange risk

A change in the exchange rate can affect the value of bonds issued in a foreign currency (Eurobonds), and hence potential losses to bond holders.

2.4 AN INTRODUCTION TO SUKUK (ISLAMIC BONDS)

Sukuk is an Islamic financial certificate that gives Sukuk holders the rights of ownership of the asset. Sukuk are commonly comparable to conventional bonds apart from being Shariah-compliant, which prohibits interest.

Sukuk are usually long-term investments that can be issued for financing purposes based on the principle of profit and loss sharing where the idea of Sukuk are similar to the Islamic funds and Islamic shares. The issuer of Sukuk can be Islamic banks or any Islamic Financial House in accordance with Shariah and the local law prevailing in the country where the issuance is occurring. Sukuk holders have the right to participate in capital, management, trading, inheritance and any other transactions in the financial markets.
The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) is established as a non-profit organization to enhance and develop Shariah standards in the Islamic finance.

According to AAOIFI, Sukuk are:

> *"… Certificates of equal value representing, after closing subscription, receipt of the value of the certificates and putting it to use as planned, common title to shares and rights in tangible assets, usufructs and services, or equity of a given project or equity of a special investment activity, however, this is true after receipt of the value of Sukuk, the closing of subscription and the employment of the funds received for the purpose for which the Sukuk were issued"* (AAOIFI, 2008, p.307).

In February 2008, the AAOIFI issued a Shariah Standard No.17 on Investment Sukuk, i.e., six recommendations for compliance with Shariah rules and regulation in trading Sukuk in the secondary market. These recommendations are as follows:

"First: Sukuk, to be tradable, must be owned by Sukuk holders, with all rights and obligations of ownership, in real assets, whether tangible, usufructs or services, capable of being owned and sold legally as well as in accordance with the rules of Sharia's, in accordance with Articles (2) and (5/1/2) of the AAOIFI Shari'ah Standard (17) on Investment Sukuk. The Manager issuing Sukuk must certify the transfer of ownership of such assets in its (Sukuk) books, and must not keep them as his own assets.

Second: Sukuk, to be tradable, must not represent receivables or debts, except in the case of a trading or financial entity selling all its assets, or a portfolio with a standing financial obligation, in which some debts, incidental to physical assets or usufruct, were included unintentionally, in accordance with the guidelines mentioned in AAOIFI Shari'ah Standard (21) on Financial Papers.

Third: It is not permissible for the Manager of Sukuk, whether the manager acts as Mudarib (investment manager), or Sharik (partner), or Wakil (agent) for investment, to undertake to offer loans to Sukuk holders, when actual earnings fall short of expected earnings. It is permissible, however, to establish a reserve account for the purpose of covering such shortfalls to the extent possible, provided the same is mentioned in the prospectus. It is not objectionable to distribute expected earnings, on account, in accordance with Article (8/8) of the AAOIFI Shari'ah Standard (13) on Mudaraba, or to obtaining project financing on account of the Sukuk holders.

Fourth: It is not permissible for the Mudarib (investment manager), sharik (partner), or wakil (agent) to undertake {now} to re-purchase the assets from Sukuk holders or from one who holds them, for its nominal value, when the Sukuk are extinguished, at the end of its maturity. It is, however, permissible to undertake the purchase on the basis of the net value of assets, its market value, fair value or a price to be agreed, at the time of their actual purchase, in accordance with Article (3/1/6/2) of AAOIFI Shari'ah Standard (12) on Sharikah (Musharaka) and Modern Corporations, and Articles (2/2/1) and (2/2/2) of the AAOIFI Shari'ah Standard (5) on Guarantees. It is known that a Sukuk manager is a guarantor of the capital, at its nominal value, in case of his negligent acts or omissions or his non-compliance with the investor's conditions, whether the manager is a Mudarib (investment manager), Sharik (partner) or Wakil (agent) for investments. In case the assets of Sukuk of al-Musharaka, Mudarabah, or Wakalah for investment are of lesser value than the leased assets of "Lease to Own" contracts (Ijarah Muntahia Bittamleek), then it is permissible for the Sukuk manager to undertake to purchase those assets - at the time the Sukuk are extinguished - for the remaining rental value of the remaining assets; since it actually represents its net value.

Fifth: It is permissible for a lessee in a Sukuk al-Ijarah to undertake to purchase the leased assets when the Sukuk are extinguished for its nominal value, provided he {lessee} is not also a partner, Mudarib, or investment agent.

Sixth: Shari'ah Supervisory Boards should not limit their role to the issuance of fatwa on the permissibility of the structure of Sukuk. All relevant contracts and documents related to the actual transaction must be carefully reviewed {by them}, and then they should oversee the actual means of implementation, and then make sure that the operation complies, at every stage, with Shari'ah guidelines and requirements as specified in the Shari'ah Standards. The investment of Sukuk proceeds and

> *the conversion of the proceeds into assets, using one of the Shari'ah compliant methods of investments, must conform to Article (5/1/8/5) of the AAOIFI Shari'ah Standard (17)"* (P.*1-4).*

From these six standards, it can be seen that, the Shariah Board recommends Islamic institutions to reduce their operations in debt, in order to achieve the objective of Shariah and to raise operations based on true partnerships of profit and loss sharing. These recommendations aim to enhance transparency and to bring the elements of Sukuk products closer to the basic principles of Shariah.

AAIOFI classified fourteen types of Sukuk, including: Sukuk Al-Mudharabah: Funds from capital providers; Sukuk Al-Ijara: Existing securitisation of tangible leased assets; Sukuk Al-Musharakah: Capital participations sale into a partnership; Sukuk Ijara Mowsufa Bi-Thima: The acquisition cost of tangible to be leased assets; Sukuk Al-Murabahah: The acquisition cost of goods to be sold under a Murabahah; Sukuk Milkiyat Al-Khadamat: The cost pre-sale of services and their expected benefits; Sukuk Al-Wakala: Capital mobilisation to acquire certain goods that are entrusted to an agent; Sukuk Manfaa Ijara: The usufruct securitisation of existing leased assets; Sukuk Al-Salam: Future delivery pre-sale of goods or commodities; Sukuk Al-Istisna'a: The cost of construction and manufacturing of specific assets; Sukuk Manfaa Ijara Mowsufa Bi-Thima: The usufruct securitisation of assets to be acquired and leased; Sukuk-Al-Muqarasa: Funds for the maintenance of land and crops; Sukuk Al-Musaqa: Funds for the irrigation (watering) trees and maintenance them; and Sukuk Al-Muzra'a: Funds for agriculture of a land (Brugnoni, 2008). Most of these issues enjoy the full recourse advantage of their originators by representing an underlying ownership interest in the asset from the Shariah point of view.

2.4.1 Asset-Based Versus Asset-Backed Sukuk

Based on the ownership of the underlying assets, Sukuk are categorised into asset-based and asset-backed. Asset-based Sukuk are investment certificates in which the underlying asset (not considered as the producer of the funds and the capital payments) is used to fulfil the Shariah requirements, where the originators retain legal ownership of the

underlying asset and pass the asset benefits to Sukuk holders. In such Sukuk, the Sukuk holders in this case cannot sell the asset to a third party and their recourse is only to the originator/obligor as they do not have a legal ownership title (Hidayat, 2013). The risk, in this regard, comes from the originator/obligor being apart from the Sukuk's underlying assets. In the case of defaults and bankruptcy, Sukuk holders are unable to have recourse to the issuers' assets, as the assets were not transferred to the investors since Sukuk only represents beneficial ownership on the underlying asset. To insure the capital is paid back, risks are measured on the issuer or obligor's creditworthiness so that investors have recourse to the obligor as they cannot have recourse to the asset (Nazar, 2013). Asset-based Sukuk are structured as follows: when the originators need funding for their projects, they may sell or transfer the assets to a Special Purpose Vehicle (SPV), which is a legal entity that is responsible for issuing Sukuk and responsible for repurchasing the underlying asset at maturity. On the other hand, the SPV is not responsible for the underlying asset, as the returns are not constrained from the cash flows generated by the underlying asset. Sukuk holders preserve beneficial ownership in the underlying asset only. The types of Sukuk instruments that fall into this type are Salam Sukuk, Sukuk Al-Istisna and Murabahah Sukuk, where these Sukuk are not allowed to be traded. An example of asset-based Sukuk is Nakheel Sukuk.

Asset-backed Sukuk, on the other hand, are considered to be the second category that consists of a true sale between the originator and the SPV. The SPV, in turn, issues the Sukuk and owns the assets. Sukuk holders, in this regard, do not have recourse to the originator where the returns are coming from assets, and asset prices might be different at all times (Hidayat, 2013). In the event of default, Sukuk holders are allowed to liquidate the underlying asset to recover most of their investments. The types of Sukuk instruments fall in this type are Sukuk Al-Musharakah, Sukuk Al-Wakala and Sukuk Al-Mudarabah. The Sukuk issued by the East Cameron Gas Company (ECGC) in 2009 is an example of an asset-backed Sukuk. Table 2.3 summarises the differences between asset-based and asset-backed Sukuk.

Table 2.3 Assets-Based versus Asset-Backed Sukuk

	Asset-based Sukuk	Asset-backed Sukuk
Issuer	Company	SPV
Process	Securitisation of receivables	Securitisation of tangible assets
Characterisation	Debt-like	Equity-like
Sources of payment	The originator/obligor's cash flows	The revenues generated by the underlying asset.
Sukuk holder's ownership	Beneficial ownership with no right to dispose of underlying assets	Legal ownership with right to dispose of underlying assets
Recourse	Sukuk holders can recourse to obligor (originator) if there is a shortfall in payments	Sukuk holders cannot recourse to the originator (recourse only to underlying assets)
Shariah nomination	This structure involves both Ba'i Al-Dayn and Ba'i Al-Inah. Hence, it is not compatible with Shariah	Because of its equity-like nature, this structure is considered Shariah compliant
Rating	Corporate rating methodology is used for asset-based transaction of Sukuk whenever a corporate obligor is the key driver affecting credit risk of Sukuk	Asset-backed rating methodology will be used for asset-backed Sukuk transaction, which involves securitisation. Here, credit risk is determined solely by the performance of underlying assets

Source: Muhamed and Mat Radzi (2011).

The asset-backed Sukuk's structure is more compliant with Shariah principles in contrast with asset-based Sukuk due to the equity-like nature of Islamic finance, which favours asset-backed transactions involving true sales and legal ownership rights to the holder of the investment certificate.

Dusuki (2009) outlined four conflicts regarding the nature of asset-based Sukuk. First, Sukuk holders do not have the right to sell the underlying asset. Second, there is conflict between the legal documentation and Shariah requirements where the underlying asset in this regard is just for the fulfilment of Shariah requirements, while in reality, the ownership of the underlying asset is not transferred to the Sukuk holders. Third is the independence of the SPV, whereby investors can get back to the originator in the case of default. Lastly, the usage of waad (purchase undertaking) in equity-based Sukuk makes that the Sukuk look like a

debt-based instrument. Waad, as an Islamic financial instrument, is only acceptable if it is used on its own without mixing it with other credit enhancements, as it could change its status from being Amanah-based to a debt security.

2.4.2 The Development of the Sukuk Market

A financial market is a place for trading financial securities such as stocks, bonds and commodities at prices that reflect supply and demand. It consists of capital and money markets. The capital market is for equity shares and long-term debt (over one year). The money market is for short-term debt securities (normally less than one year).

The first issuance of Islamic securities was Mudarabah securities in Pakistan in 1980 (Godlewski et al., 2010). In 1995, Malaysia established the first Sukuk market for trading local Islamic securities that were considered to be compliant with Islamic law. Moreover, the Bahrain Central Bank issued the first sovereign Sukuk based on the structure of Ijara in 2001. Since then, the Islamic world has witnessed huge growth in the Sukuk market. Sukuk have been used by both governments and corporations for raising alternative financing. In 2006, Malaysia launched the Malaysian Islamic Financial Centre (MIFC) to provide the impetus for the growth of the Islamic capital market, and the success of Sukuk issuance worldwide has evidenced the viability and future success of the Islamic capital market. In 2007, the Sukuk market peaked in terms of issuance volume before declining in 2008 as a result of the global financial crisis. Since 2011, Sukuk have been growing again in popularity. 2014 is considered to be a very important year for Sukuk where several non-Muslim sovereign governments issued Sukuk. The UK government issued their first Sukuk in June 2014 with orders totalling around £2.3 billion. This was followed by Luxembourg, which sold $240 million Sukuk. Hong Kong raised $1 billion and South Africa tapped the market for $500 million. In 2015, Sukuk issuance declined by about 45.4% compared to 2014; this is expected to decline further in 2016 due to the drop in oil prices. This is especially true in countries such as those in the GCC and Malaysia who mainly rely on the export of oil products, as they may have

no choice than to reduce investment spending and potentially lower issuances of both types of bonds.

The Malaysian Sukuk market is considered to be the largest market for Sukuk (Ithurbide, 2012). Rosly and Sanusi (2008) debate the design of Malaysian Sukuk contracts. As both Malaysia and Indonesia permit the selling of debt instruments (the use of Bay' Al-Inah (sale of an asset or property) and Bay' Al-Dayn (sale of debt)), as they believe Islamic law permitted these, scholars in the GCC countries do not allow trading in this type of Sukuk. Instead they offer the use of financing based on the Muqarada and Musharakah principles. Malaysia and Indonesia's methods could be interpreted as the transfer of debt at prices other than their par value, thus generating non-allowable interest (Riba) (Ithurbide, 2012).

Saad et al. (2014) note that Islamic financial markets have evolved and recognise various Islamic international organisations, like AAOIFI.

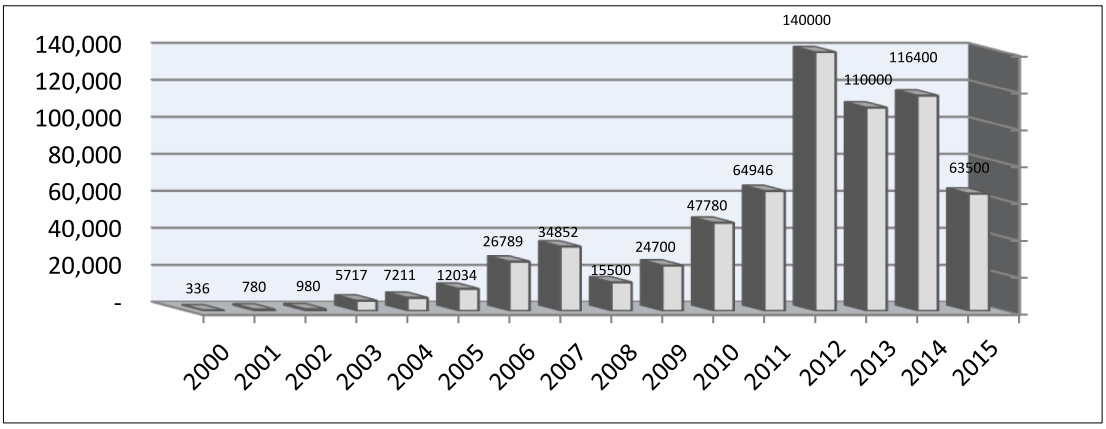
The International Islamic Financial Market (IIFM) was established to take part in the establishment, development and promotion of Islamic capital and money markets as an infrastructure institution with the collective efforts of the central banks and monetary agencies of the Islamic Development Bank in Saudi Arabia, Malaysia, Bahrain, Sudan, Indonesia and Brunei. The Islamic Financial Services Board (IFSB) acts as an international standard of regulatory and supervisory agencies and was established on 3 November 2002 in Kuala Lumpur. It commenced operations on 10 March 2003 and was assigned to ensure the soundness and stability of the Islamic financial services industry.

Islamic capital markets are gaining wider acceptance globally and performing alongside the conventional capital market.

2.4.2.1 The size and issuance volume of Sukuk primary market

The Sukuk primary market is similar to the primary markets of other bonds where securities are created and purchased directly from issuers. The only difference is the additional security to confirm that the issued securities follow Islamic law. The issuance of Sukuk has experienced high growth in recent years, as can be seen in Figure 2.2.

Figure 2.2 Global Sukuk Issues (USD Millions)



Source: Thomson Reuters Zawya (2014, p.13).

The size of the total Sukuk issued in 2000 was only $980 million but in a short span of time – just six years – this figure exceeded $26,789 million. In 2007, the issuance of Sukuk reached its peak before it declined in 2008 due to the global financial crisis. In 2009, Sukuk started to grow again. Sukuk issuances jumped by $24,700 million in 2009 to $47,780 million in 2010; at the end of 2012, the total volume was about $140 billion – a massive increase on previous years. In 2013, the numbers of Sukuk issued was less than $30 billion, while in 2014 this number increased to reach $1,164 billion before declining in 2015 to reach about $63,500 billion due to the decline in oil prices.

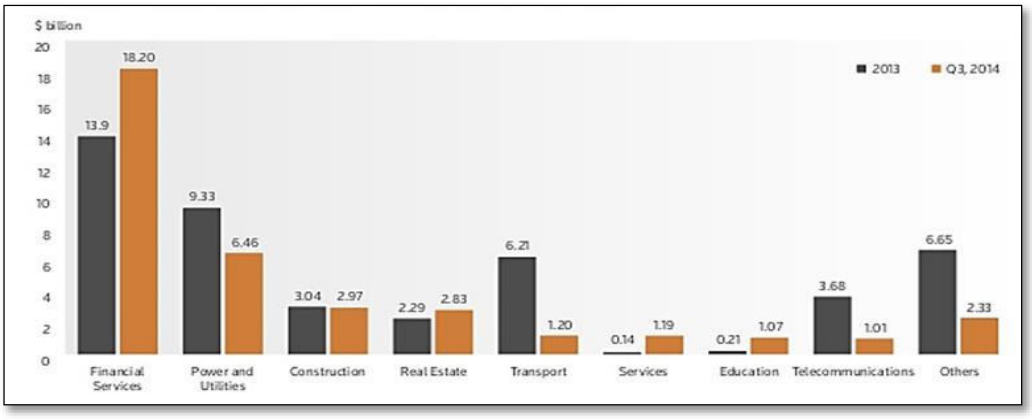
Table 2.4 Top Five Corporate Sukuk Issuance in 2014

Issuer	Domicile	Industry	Currency	Issue Size ($ Million)	Issue Date
IDB Trust services LTD	Saudi Arabia	Financials	U.S. Dollar	1500.0	27/02/14
PPSI-III	Indonesia	Financials	U.S. Dollar	1500.0	02/09/14
TNB Western Energy Berthed	Malaysia	Financials	MYR	1000.0	24/01/14
Hong Kong Sukuk 2014 LTD	Hong Kong	Financials	U.S. Dollar	1000.0	11/09/14
ICD Sukuk Company Limited	UAE	Financials	U.S. Dollar	997.9	14/05/14

Sources: Thomson Reuters Zawya, 2014.

As shown in Table 2.4, Malaysia, GCC countries, Hong Kong and Indonesia are the top countries in terms of corporate Sukuk issuance. At the global level, the Sukuk of the FWU Group was the first Sukuk issuance made by a German company, and was the largest European issuance of Islamic Sukuk at $55 million.

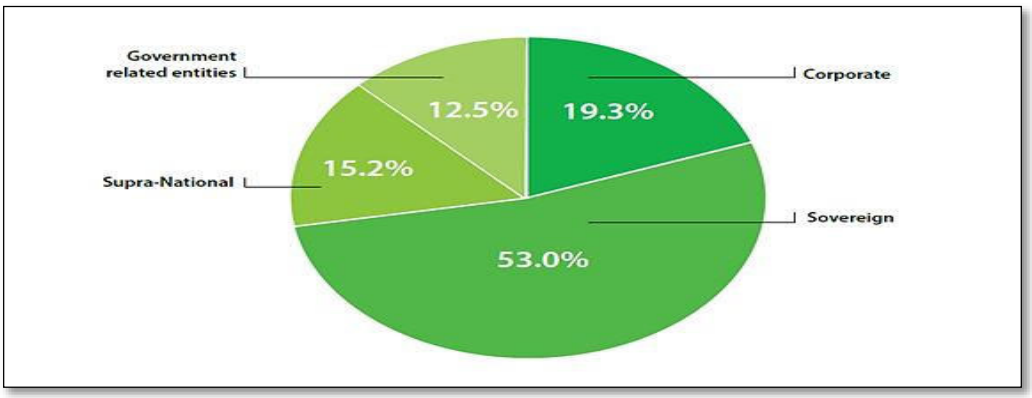
Figure 2.3 Global Corporate Sukuk Issued by Sector (2013, Q3, 2014)



Source: Thomson Reuters Zawya (2015, p.23).

Figure 2.3 shows the global Sukuk market by sector. As can be seen, financial services institutions remain the most active issuers across the globe, with transport, power and utilities companies the other main players. Demand for Sukuk issuance has been on the rise in Islamic countries with the instruments witnessing increased recognition and acceptance in global financial centres.

Figure 2.4 Global Sukuk Issuances by Issuer Type (Q1, 2015)



Source: MIFC (2015, p.3).

In Figure 2.4, it can be seen that sovereign Sukuk are at the top in terms of Sukuk issuance followed by corporate Sukuk.

2.4.2.2 An overview of the secondary market of Sukuk

A liquid secondary market is essential for the popularity and success of any financial instrument. The valuation of conventional bonds in secondary markets is influenced by changes in the interest rates and credit ratings of individual issues. In contrast to this, the valuation of Sukuk in secondary market depends on the value of the underlying assets. Sukuk indicators globally show about a 5% increase in the Sukuk secondary markets, reaching $286.41 billion in the first half of 2014. According to Rasameel Structured Finance (2014), the top five countries for the Sukuk secondary market, as shown in Table 2.5, are Malaysia, Saudi Arabia, UAE, Indonesia and Qatar.

Table 2.5 Top Five Sukuk Outstanding Volume and 2014 YTD Growth

Domicile	Currency	Volume amount (billion)	Growth rates (%)
Malaysia	U.S. Dollar	164	3.6
Saudi Arabia	U.S. Dollar	47.8	23.8
UAE	U.S. Dollar	25.7	15.0
Indonesia	U.S. Dollar	14.5	5.1
Qatar	U.S. Dollar	9.7	25.5
Pakistan	U.S. Dollar	9.7	2.5

Sources: Rasameel Structured Finance (2014).

Secondary Sukuk markets suffer from illiquidity and a lack of trading. Yean (2009) identified the following reasons behind this illiquidity: First, investors tend to keep their Sukuk until maturity; second is a lack of awareness; third, there are a limited number of issuances compared to conventional bonds.

2.4.3 The Important Role of the Sukuk Market

Sukuk play an important role by fulfilling the needs of certain segments of investors and borrowers; they complete financial markets and add

additional liquidity. Sukuk markets mobilise savings, ensure financial stability, simplify the flow of funds for investments, and broaden the base of the securities market. This has helped in the integration of the markets of Islamic countries and more efficient allocation of funds across borders. Sukuk have also promoted financial integration in the global financial system and are an important source of financing for large-scale investment projects (Alzatari, 2010).

In summary, the Sukuk market provides the followings benefits:

1. A low degree of risk due to the fact that Sukuk are guaranteed collateralised assets.
2. Sukuk operations help to improve liquidity, flow of information in the market, and the entry of many institutions in the financing process.
3. It provides foreign exchange to banks and financial institutions' creditors in the case of cross-border Sukuk; since the buyer of the asset in this case is a bank, or a foreign financial institution that will pay the local bank, the value of the deal is in foreign currency, which leads to an increase in domestic bank assets in the foreign currency.
4. It transfers illiquid assets to liquid assets in the form of cash, which can be used again to expand the size of the business or investment.

2.4.4 The Performance of Sukuk during the Global Financial Crisis (2008-2009)

In 2008, countries around the world experienced the worst financial crisis since 1930. This affected global financial markets and also the performance of Islamic financial institutions.

Ahmad and Radzi (2011) investigated the sustainability of Sukuk and conventional bond issuance in the wake of the financial crisis in Malaysia's capital market in 2007 using a sample of 20 annual observations on Sukuk and conventional bond issuance from 1990 to 2009. They found interesting trends in Sukuk issuance compared to conventional bonds in that both issuances were not parallel. Various factors determine the value of Sukuk and conventional bond issuance. In Sukuk issuance, lesser value is placed on present economic elements, for example, GDP, forex and

international liquidity (apart from gold), whereas conventional bond issuers only consider foreign exchange as the main factor. The inherent value of Sukuk was less influenced during the financial crisis. The Sukuk structure under Shariah provisions provides greater stability to that bond market than is present in conventional bond markets, which causes Sukuk to be less affected by financial crises.

Said (2011) attempted to examine the impacts of the use of Sukuk during the financial crisis on the performance of Islamic banks. He focused on a sample of 14 Islamic banks that used Sukuk as one of their instruments for the years from 2007 to 2009. His study showed that the use of Sukuk raised the mobility and liquidity in the banks' resources and operation by measuring the strength of their financial liquidity, overall efficiency, organisation, and profitability using financial ratios that can also be considered under the diversification potential of Sukuk. The study also found that Sukuk have no impact on the performance of Islamic banks by the use of regression analysis. Rusgianto and Ahmad (2013) used the Dow Jones Citigroup Sukuk Index (DJCSI) as a proxy for the global Sukuk market for the period 2007–2011 and demonstrated that structural breaks significantly alter the volatility of Sukuk behaviour. They showed that volatility in the post-crisis period was less sensitive to market events compared to the pre-crisis and contemporaneous periods.

2.4.5 Stock Market Reaction to Sukuk Issuance Announcement

Recent studies on stock market reactions on Sukuk issuance have shown that the market reaction is a mixture of significant negative and positive abnormal returns. Ibrahim and Minai (2009) studied the event windows for the announcements of Islamic debt issuance in Malaysia during the period 2000–2006 and showed that the market reaction was significantly positive during event windows [-3, 0] of firms announcing Islamic bonds and [-3, 3] of firms announcing conventional bond; these are similar to the values found in conventional bond studies and thus, their arguments are not based on the investors' preference for Islamic-compliant activities. However, Ashhari et al. (2009) insist that stock market reactions are mixed and inconclusive in relation to Sukuk issuance.

In 2010, Ameer and Othman over the period 2001-2007 in Malaysia discover significant negative abnormal returns near the announcement days with the reactions being asymmetrical to different types of bonds issuance announcements. Ardiansyah and Abdul Qoyum (2010) found a significant positive market reaction prior to companies' positive-surprise earnings announcements that caused an increase in the company's stock price due to investors reacting to positive signals about the company's future. Modirzadehbami and Mansourfar (2011), study a sample of 45 listed companies on Bursa Malaysia issuing Sukuk during 2005 to 2008, found a significant negative abnormal return occurring one day before the announcement date. Ahmad and Abd Rahim (2013) employed an event study methodology to investigate whether the market in Malaysia reacts asymmetrically to the issuance of selected Sukuk structures (Sukuk Ijara and Sukuk Musharakah) using cumulative average abnormal returns on symmetric and asymmetric events for the period 2008–2011; the study showed positive, significant and both symmetric and asymmetric market reactions to Sukuk issuance. Hence, the market reacted positively and asymmetrically to the announcements of Sukuk Ijara and Sukuk Musharakah since the onset of the recent crisis. On the other hand, Godlewski et al. (2013) investigated Malaysian stock market investors' reactions to Sukuk and conventional bonds issue announcements. They used an event methodology to examine if Sukuk and conventional bonds announcements for the different types of issues led to significant abnormal returns. They found that the stock market was neutral to the announcements of conventional bond issues, but reacted negatively to announcements of Sukuk issues.

Alam et al. (2013) investigated the announcement impact of Sukuk and conventional bonds on shareholder wealth over the period of 2004 to 2012 using 79 Sukuk and 87 conventional bonds by dividing the overall time frame into three parts: before crisis (2004 to 2006), during crisis (2007 to 2009) and after crisis (2010 to 2012). They found that the market reaction for the announcements of Sukuk during and after global financial crisis was negative, while the market reaction for announcement of conventional bond before the crisis period was positive. They concluded

that there was an absence of significant stock market reactions to Sukuk and conventional bond announcements over a long period. This is due to the fact that even if Sukuk are similar in structure to conventional bonds, the participants of the stock market distinguish these bonds as being alternative financial tools and hence react differently to their issuance.

2.5 SUKUK SECURITISATION

Securitisation is defined as the creation and issuance of tradable securities by transforming illiquid assets into tradable liquid assets, such as bonds. This allows risks to be diversified and distributed among a large number of investors who are able to choose the type of risk profile that suits their investment needs.

The securitisations of Islamic financial instruments are based on the performance of a specific set of assets that are approved by Shariah scholars. The mechanism of Sukuk securitisation shows some similarities to those of conventional bonds, especially asset-based bonds. The SPV is considered to be a trustee to generate earnings for the investors by managing the assets.

On the basis of Islamic financial ethics, it provides an alternative basis to help in avoiding speculation, market uncertainty and interest. For example, JANY Sukuk Company and Qatar Global Sukuk Company (QSC) both act as guarantors of the issue (Al Saeed, 2012).

2.5.1 Sukuk Contracts Parties

According to Alzatari (2010) and Al-Maghlouth (2009), the parties of Sukuk contracts can be divided into two categories.

A) The original parties in the securitisation contract are:

1. The Originator: The originator of Sukuk is the owner or the first seller of the assets (by selling the securitization assets) to get cash in return. The originator can be an individual, a company, a government or a financial institution.
2. The Special Purpose Vehicle (SPV): A financial institution, where the originators of Sukuk transfer the securitisation assets to the

SPV in which they play the major role of holding the asset and issuing the Sukuk. They are obligated to purchase the asset from the originator with a discount value, then issue them with their face value and earn the difference.

3. Bondholders (Investors): The general investors who are willing to purchase the Sukuk and have the right to get the face value plus the return on this Sukuk on maturity date. They could be a bank or financial institution or any other type of investors.
4. Portfolio assets: Where the financial rights and its return will be collected and deposited in a special account used to pay the bondholders at maturity.
5. Credit rating agency: Plays the main role and determines the issuers' ability to fulfil its obligations towards the bonds holders. Moody's, Fitch, Standard & Poor, the Islamic International Rating Agency (IIRA) and the Rating Agency Malaysia's (RAM) are the main rating agencies in the Sukuk market.

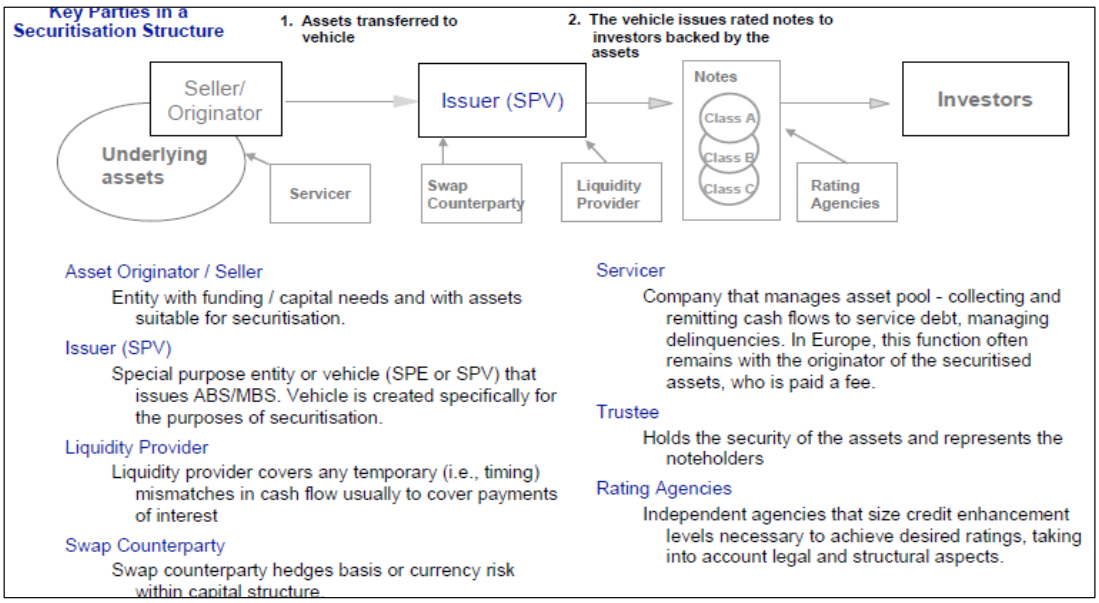
B) Other parties who perform special services for the process, such as:

1. Global liquidation agencies: As specialised agencies, they undertake an assessment of the extent of the creditworthiness and financial securities raised and characterise these as safeguards and determine the risks involved.
2. An agency that is responsible for servicing the securities, through collecting the cash flow and delivering it to the security holders, which can be the same company from the beginning, or another according to the agreement.
3. The director and the adviser of the issuers, who coordinate the various parties in the securitisation process, and assist in the preparation of the prospectus.
4. Servicer: The body that is responsible for collecting the securitisation portfolio servicer.
5. Guarantors: They guarantee the rights of the securities holders in the collection of payments, who might be one of the insurance companies or government institutions.

2.5.2 Securitisation Process

In the process of the securitisation, the main players are the originators, bond holders, issuers (SPV) and rating agencies.

Figure 2.5 The Mechanism of Sukuk Securitisation Structures



Source: Bossuyt (2008, p.5).

Zaidi (2007) explained that the Sukuk model is effectively derived from the conventional securitisation process, where a special purpose vehicle (SPV) purchases the originator's real assets and issues financial claims on the associated cash flows, as is shown in Figure 2.5.

The Sukuk process works through three key steps, as mentioned by Adam and Thomas (2004), namely:

1. Issuance: For issuance there are two steps, as explained in Alzatari (2010):

   a) The originator or Sukuk-issuing company chooses the assets that they want to issue by compiling their assets in a diversified investment pool known as a Sukuk portfolio and transfers this to the SPV to issue the Sukuk after getting the approval from the

Capital Market Authority in accordance with the conditions and procedures of Islamic law.

b) The issuance is followed by the sale of the Sukuk assets. The SPV re-classifies the assets and divides them into parts or units that should meet the needs and desires of investors and then transfers them into Sukuk and sells them to investors.

2. Servicing/Subscription: After selling Sukuk to the investors, the SPV company manages this portfolio on behalf of the investors until maturity, by collecting the revenues and incomes generated by the rotating assets and distributing them to investors, in addition to other services required in this process.
3. Redemption: Extinguishing Sukuk or repaying Sukuk holders involves paying the face value of the Sukuk at the maturity dates in addition to any profits gained. In terms of default, the holders are allowed to liquidate the underlying asset to recover most of their investments. Delayed coupons receive a specific type of payment, which will be added to the SPV. However, Shariah law recommends that these added finances be donated to charities (Tariq and Dar, 2007).

2.6 THE STRUCTURE AND DESIGN OF MOST COMMON TYPES OF SUKUK

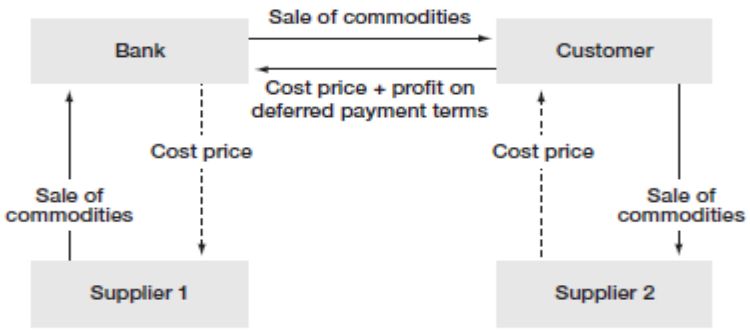
Sukuk Al-Murabahah, Al-Mudarabah, Al-Musharakah and Sukuk Al-Ijara are the most common Sukuk types in Islamic finance and the ones that this thesis will be focusing on. Sukuk Al-Salam, Sukuk Al-Istisna, Zero-coupon Sukuk and Hybrid Pooled Sukuk will also be discussed.

2.6.1 Sukuk Al-Murabahah

Murabahah Sukuk is the major financing tool used by banks, financial firms and Islamic investments that represent partial ownership in a security. The term Murabahah refers to an arrangement contract between a financier (SPV) and a purchaser (originator). The financier buys the assets or commodities that the purchaser requests and then sells the specified assets or commodities to the purchaser as deferred payment. Thus, it includes an agreement contract into which both the SPV and the originator enter. The SPV issues Sukuk Al- Murabahah to investors upon

receiving the proceeds. The SPV also purchases Murabahah assets or commodities from the suppliers and then sells them for a profit margin and the spot price to the purchaser so that they can be paid back at the cost price with the mark-up in the form of instalments. At maturity, investors obtain their profits of the Sukuk payment in addition to their principal. Figure 2.6 gives an overview of this structure.

Figure 2.6 Sukuk Al-Murabahah



Commodity *murabaha*

- The bank buys commodities from Supplier 1.
- The bank sells the commodities to the customer under a *murabaha* contract with deferred payment terms.
- To realise cash, the customer sells (usually through the bank as agent) the commodities at cost price to Supplier 2.
- Result: the customer gets financing, the bank gets a *murabaha* contract receivable (and the suppliers are paid a commission).
- Commercial cash flow achieved through netting and transfer of rights.

In a commodity *murabaha* the parties' interest does not lie in the objects to be bought and sold (so it is a *tawarruq* transaction), but rather their cash realisable value by immediately selling them. *Tawarruq* derives from the classical Arabic *'wariq'*, meaning silver. In the historical context, the purchaser in a *tawarruq* transaction was buying only the object of the sale for cash or dinars (originally, silver coins). This type of transaction is the subject of a substantial *Sharia* scholarly debate. Some scholars take the view that it is acceptable, drawing authority from the general meaning of "whereas Allah [S.W.T.] has permitted trading" in the *Quran*. Further support for the legitimacy of this type of transaction is that there is no intent to charge or receive *riba*, or interest, and it helps people to satisfy their financial needs. Scholars taking a contrary view assert that because the object of the sale is wholly irrelevant to the intended purpose of the transaction, intermediating an object for sale does not legitimise the result of the transaction: extension of credit. The Prophet Muhammad (pbuh) said: "actions are but by intentions, and each man will have but that which he intended." There is a third view that *tawarruq* is permissible, but only if certain conditions are satisfied (eg, the person is in financial need and cannot meet that need by other *Sharia*-compliant means).

Source: Ali (2011, p.11).

An example of Sukuk Al-Murabahah issuance is Arcapita Bank with $200 million issued in October 2005 to arrange a five-year Murabahah-backed

Sukuk. Arcapita Bank is completely owned by the Bahrain-based investment bank formed in 1996 as the First Islamic Investment Bank. Also, Turkcell's Sukuk issued in 2004 has secured a syndicated Murabahah facility of $100 million from a consortium arranged by the Islamic Development Bank and HSBC (Bukhari et al., 2014).

2.6.2 Sukuk Al-Mudarabah

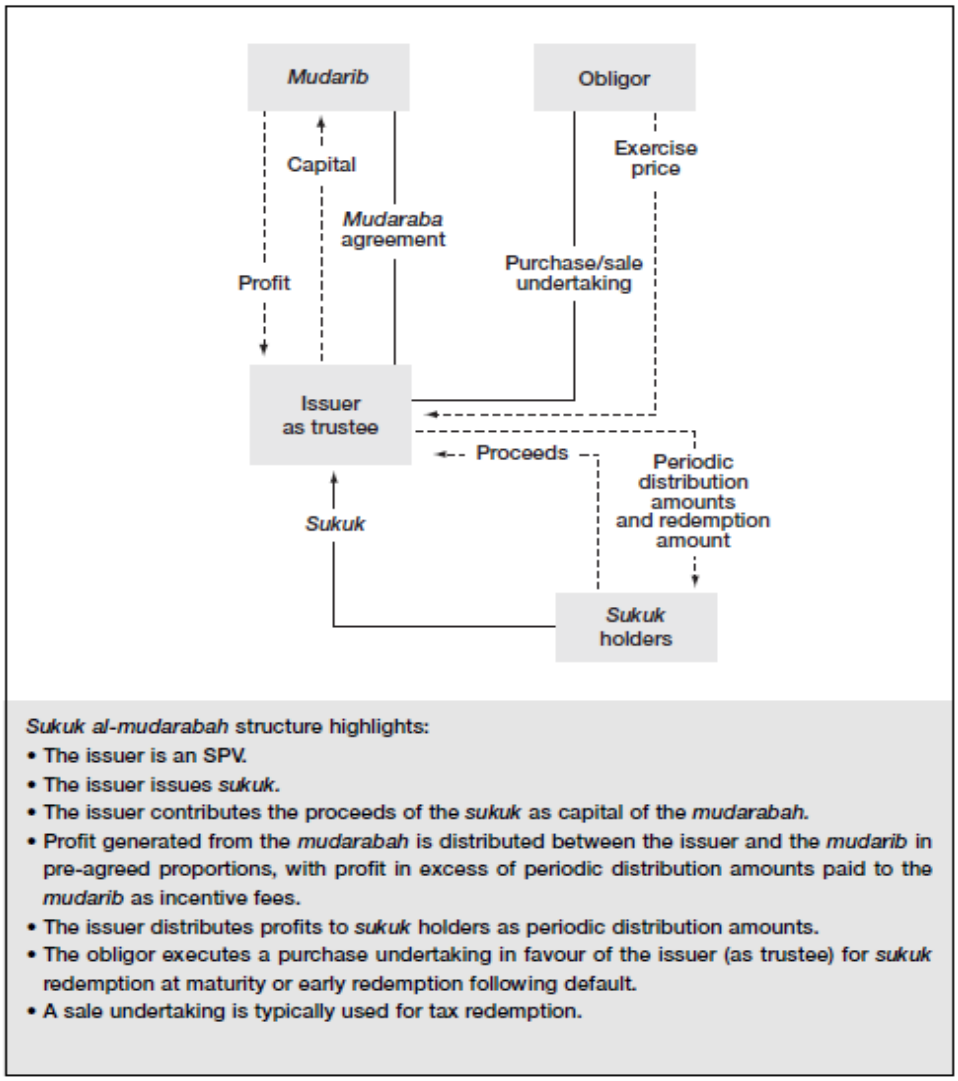
Mudarabah Sukuk represents partnership between the Rab-ul-maal (SPV through the investor) and the Mudareb (originator). Mudarbah returns are based on a specified percentage of the ownership shares in the Mudarabah equity. The issuer or the fund manager should not guarantee any profit based on any percentage of the capital, or guarantee any of the profit of the Mudarabah Sukuk. It can be traded in the secondary market as long as it represents a known object that is worked in a known activity in accordance with the Shariah. Figure 2.7 gives an overview of this structure.

An example of Sukuk Al-Mudarabah is the security issued by The Saudi Hollandi Bank in December 2009. The bank's subsidiary, Saudi Hollandi Capital, is the Sukuk holders' agent. Saudi Hollandi Bank Capital, as the agent of the Sukuk holders, entered into a Mudarabah contract on their behalf (as Rab-Al-Maal) with Saudi Hollandi Bank (as the Mudarib) and invested in Shariah-compliant activities. On behalf of the Sukuk holders, Saudi Hollandi Bank, as the issuer and the Mudarib, hold all of the assets in the Mudarabah. Based on the contract, Sukuk holders are entitled to 90% of the revenues and 10% of the profits are entitled to Saudi Hollandi Bank. The profits of the Mudarabah will be distributed periodically as fixed payments of the periodic distributions to the Sukuk holders (Salah, 2011).

2.6.3 Sukuk Al- Musharakah

Musharakah Sukuk refers to a partnership where the Musharakah partners share the profit and loss in proportion to their initial capital investment. In the secondary market, Musharakah Sukuk are bought and sold. They are also treated as negotiable instruments. Musharakah Sukuk is ideal to finance large commercial ventures.

Figure 2.7 Sukuk Al-Mudarabah



Sukuk al-mudarabah structure highlights:

- The issuer is an SPV.
- The issuer issues *sukuk*.
- The issuer contributes the proceeds of the *sukuk* as capital of the *mudarabah*.
- Profit generated from the *mudarabah* is distributed between the issuer and the *mudarib* in pre-agreed proportions, with profit in excess of periodic distribution amounts paid to the *mudarib* as incentive fees.
- The issuer distributes profits to *sukuk* holders as periodic distribution amounts.
- The obligor executes a purchase undertaking in favour of the issuer (as trustee) for *sukuk* redemption at maturity or early redemption following default.
- A sale undertaking is typically used for tax redemption.

Source: Ali (2011, p.15).

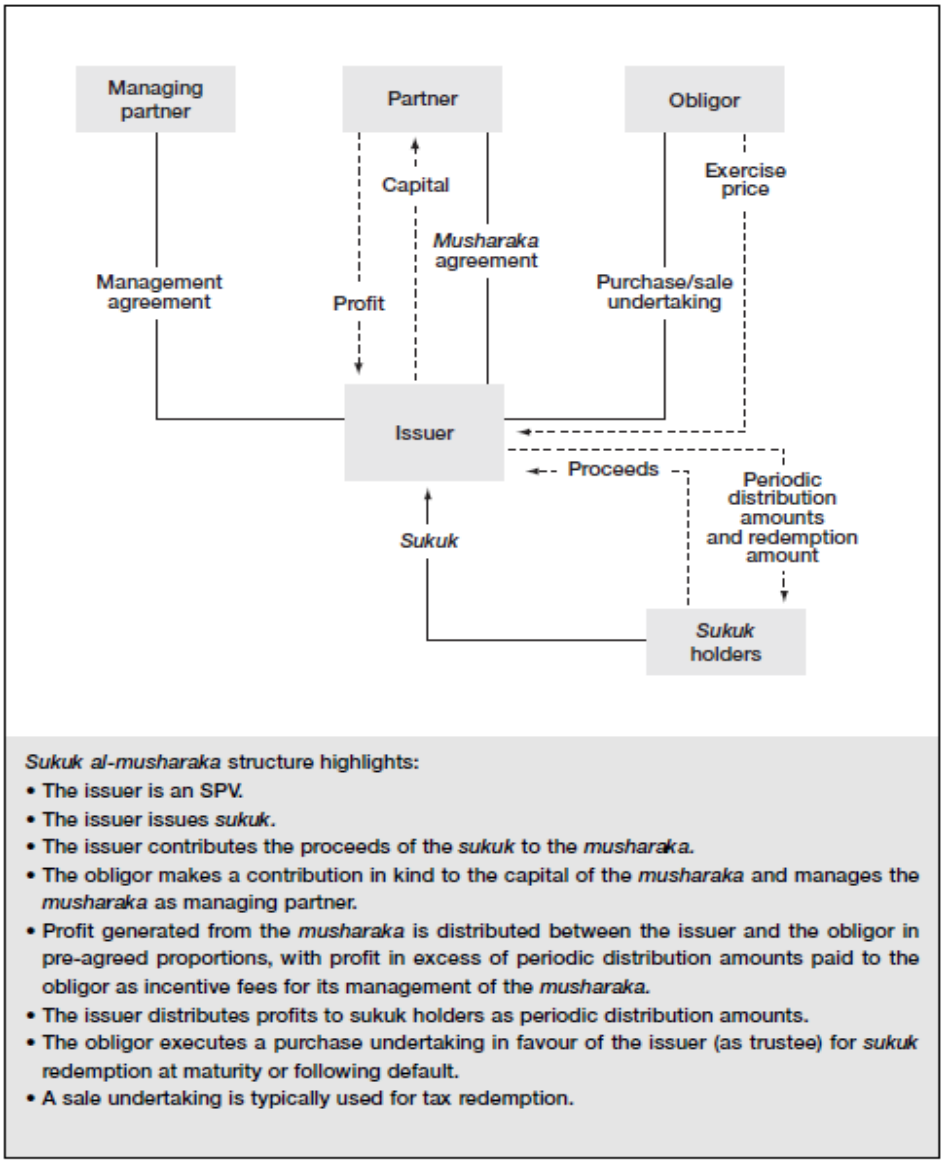
Table 2.6 Mena Al-Mudarabah Sukuk 2012

ISIN	name	type	currency	rating (S&P)	Rating Moody's	coupon	coupon type	coupon frequencies	yield%	purchase price	maturity	floater spread	modified duration	issue size	minimum piece	increment
USD																
XS0286788277 Corp ISIN	ALDAR FUNDING LTD	SUKUK AL MUDARABAH	USD	.	.	5.77	FIXED	4	.	.	40827	NR	.	2530000000	100000	1000
XS0305147851Corp ISIN	DUBAI SUKUK CENTRE	SUKUK AL MUDARABAH	USD	NR[a]	WR[b]	0.85	FLOATING	4	.	.	06/13/2012	37.5	.	1250000000	100000	1000
XS0325413218 Corp ISIN	DANA GAS SUKUK LTD	SUKUK AL MUDARABAH	USD	.	.	7.5	FIXED	4	440	79.63	10/31/2012	.	0.05	1000000000	100000	10000

a No rating.
b withdraws.

Sources: Emirates NBD, (2012).

Figure 2.8 Sukuk Al-Musharakah



Sukuk al-musharaka structure highlights:

- The issuer is an SPV.
- The issuer issues *sukuk*.
- The issuer contributes the proceeds of the *sukuk* to the *musharaka*.
- The obligor makes a contribution in kind to the capital of the *musharaka* and manages the *musharaka* as managing partner.
- Profit generated from the *musharaka* is distributed between the issuer and the obligor in pre-agreed proportions, with profit in excess of periodic distribution amounts paid to the obligor as incentive fees for its management of the *musharaka*.
- The issuer distributes profits to sukuk holders as periodic distribution amounts.
- The obligor executes a purchase undertaking in favour of the issuer (as trustee) for *sukuk* redemption at maturity or following default.
- A sale undertaking is typically used for tax redemption.

Source: Ali (2011, p.14).

Table 2.7 Mena Al-Musharakah Sukuk 2012

ISIN	name	type	currency	rating (S&P)	Rating Moody's		coupon type	coupon frequencies	yield%	purchase price	maturity	floater spread	modified duration	issue size	minimum piece	increment
USD																
XS0276617932 Corp ISIN	ADIB SUKUK CO LTD	SUKUK AL MUSHARAKAH	USD	.	WR	0.74	FLOATING	4	.	.	12/12/11	40	.	800000000	100000	10000
XS0292875977 Corp ISIN	DIB SUKUK CO LTD	SUKUK AL MUSHARAKAH	USD	NR	WR	0.9	FLOATING	4	.	.	03/22/2012	33	.	750000000	100000	10000
XS0556042405 Corp ISIN	ADIB SUKUK CO LTD	SUKUK AL MUSHARAKAH	USD	.	A2	3.75	FIXED	2	2.08	104.94	11/04/15	NR	2.87	750000000	100000	1000
XS0222233727 Corp ISIN	WINGS FZCO	SUKUK AL MUSHARAKAH	USD	.	.	1.53	FLOATING	2	.	.	06/15/2012	75	.	550000000	100000	10000
XS0313358508 Corp ISIN	QREIC SUKUK LLC	SUKUK AL MUSHARAKAH	USD	.	WR	1.2	FLOATING	4	.	.	08/02/12	73	.	300000000	100000	1000

Sources: Emirates NBD, (2012).

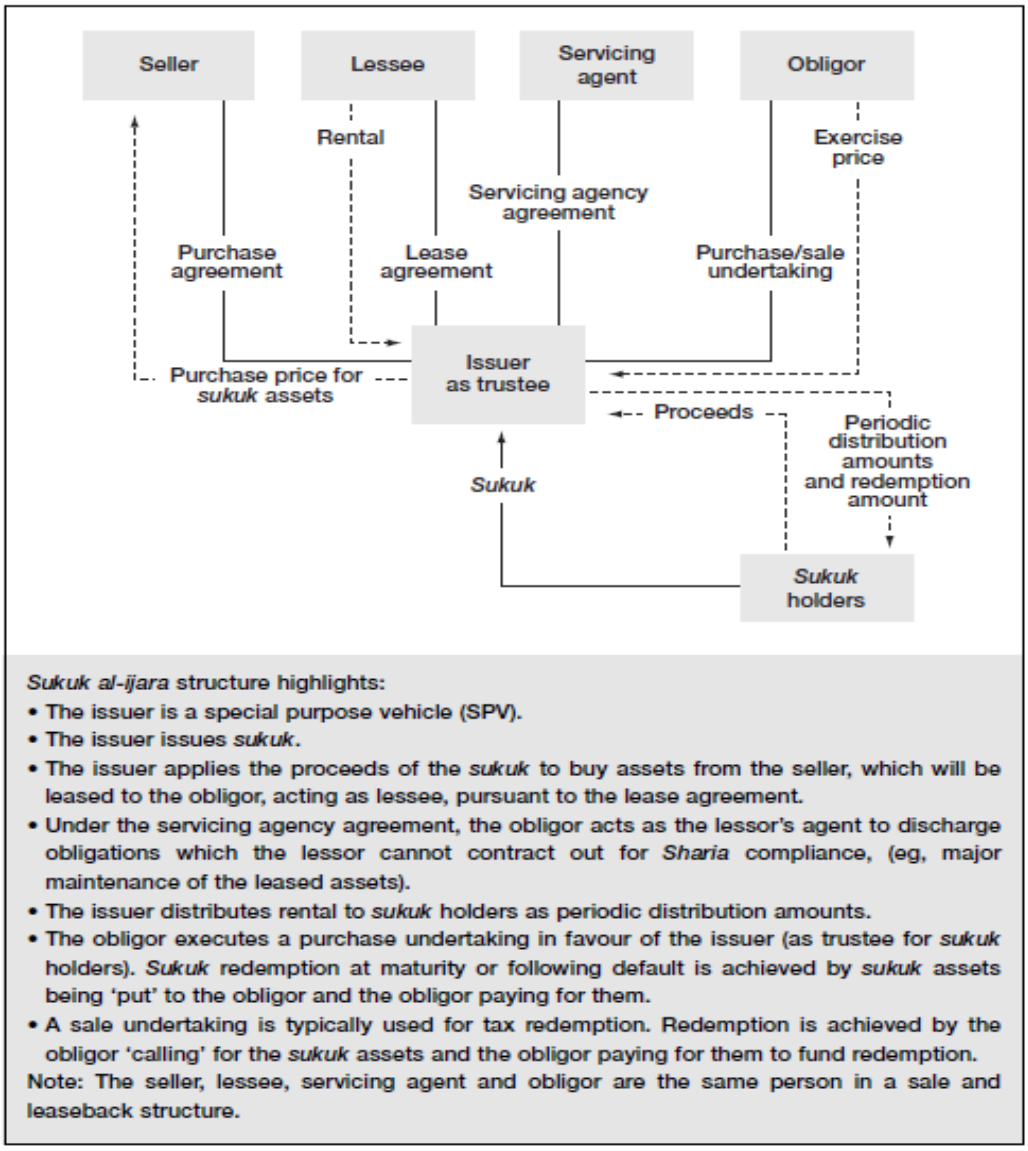
Sukuk Al-Musharakah structure involves the following procedures: based on a specific period (5 to 7 years) and a pre-defined profit-sharing ratio; and an originator and SPV participate in an agreement, where the SPV sells Musharakah shares to the corporation (originator) at regular intervals. Sukuk proceeds are contributed by the SPV, where, at the end of the specified period, there are no shares with the SPV; the corporation contributes its assets to the agreement. The corporation acts as the key agent for the development to sell them upon obtaining a fixed amount of fees and a variable incentive fee, where profits are disseminated among the Sukuk holders. Figure 2.8 gives an overview of this structure. An example of a Sukuk Al-Musharakah is Jebel Ali Free Zone FZE as an originator on the NASDAQ Dubai with an AED7500m Sukuk that was issued in November 2007. Clifford Chance LLP acted as legal counsel to the originator (DIFC, 2009).

2.6.4 Sukuk Al-Ijara

Ijara Sukuk represent partial ownership of equal shares in a rented asset. Where Sukuk Al-Ijara holders have the right to own the asset and trade their Sukuk at par, premium, or discount price in both primary and secondary markets as determined by market forces. Sukuk Al- Ijara holders bear all the cost of maintenance and damages of the asset, maintaining the underlying asset under the Ijara facility. Ijara Sukuk is the most popular type of Islamic Sukuk and its popularity is based on its simplicity, which achieves the capital protection by a binding promise to repurchase certain assets. However, with respect to leasing, Hamza (2006) referred to two key differences. First, the ownership of the item or property remains with the financier until the loan is paid, while the other party (lessee) is entitled to use it only with no right of ownership.

Second, in the case of a default or loss by the lessee to the lessor the lease agreement provides payment of a termination sum or an agreed-upon value to compensate for the loss. So, these two facts are forbidden in Islamic law due to the fact that Islamic finance is based on the profit and loss sharing principle. Owing to this, Islam urges Takaful (solidarity), by relying on their Takaful receipts, to compensate for that loss.

Figure 2.9 Sukuk Al-Ijara



Sukuk al-ijara structure highlights:

- The issuer is a special purpose vehicle (SPV).
- The issuer issues *sukuk*.
- The issuer applies the proceeds of the *sukuk* to buy assets from the seller, which will be leased to the obligor, acting as lessee, pursuant to the lease agreement.
- Under the servicing agency agreement, the obligor acts as the lessor's agent to discharge obligations which the lessor cannot contract out for *Sharia* compliance, (eg, major maintenance of the leased assets).
- The issuer distributes rental to *sukuk* holders as periodic distribution amounts.
- The obligor executes a purchase undertaking in favour of the issuer (as trustee for *sukuk* holders). *Sukuk* redemption at maturity or following default is achieved by *sukuk* assets being 'put' to the obligor and the obligor paying for them.
- A sale undertaking is typically used for tax redemption. Redemption is achieved by the obligor 'calling' for the *sukuk* assets and the obligor paying for them to fund redemption.

Note: The seller, lessee, servicing agent and obligor are the same person in a sale and leaseback structure.

Source: Ali (2011, p.13).

Table 2.8 Mena Al-Ijara Sukuk 2012

ISIN	name	type	currency	rating (S&P)	Rating Moody's	coupon	coupon type	coupon frequencies	yield%	purchase price	maturity	floater spread	modified duration	issue size	minimum piece	increment
USD																
XS0337020274 Corp ISIN	TAMWEEL FUNDING LTD	SUKUK AL IJARA	USD	,	,	4.31	FIXED	4	2.84	100.42	1/23/2013	NR	0.28	300000000	100000	10000
XS0434228127 Corp ISIN	CBB INTERNATIONAL SUKUK	SUKUK AL IJARA	USD	BBB	,	6.25	FIXED	2	1.75	107.45	6/17/2014	NR	1.59	750000000	100000	100000
XS0441229795 Corp ISIN	RAK CAPITAL	SUKUK AL IJARA	USD	A	,	8	FIXED	2	1.57	111.36	7/22/2014	NR	1.68	400000000	100000	100000
XS0457216124 Corp ISIN	TDIC SUKUK LTD	SUKUK AL IJARA	USD	AA	A1	4.95	FIXED	2	1.48	106.96	10/21/2014	NR	1.92	1000000000	100000	1000
XS0463422088 Corp ISIN	DUBAI DOF SUKUKLTD	SUKUK AL IJARA	USD	,	,	6.4	FIXED	2	2.66	107.5	11/03/14	NR	1.91	1250000000	100000	1000

Sources: Emirates NBD, (2012, p.1).

The Ijara Sukuk structure involves the following guidance: The originator, the SPV and Sukuk holders are all involved in an Ijara Sukuk contract. On a specified and defined purchase price, the originator delivers the assets to the SPV, which issues the Sukuk certificates for raising funds that are handed to the originator. The SPV and the originator enter into a lease agreement with a pre-defined time, where the originator acts as a lessee by giving back the assets. The originator pays regular rental amounts to the SPV that are dispersed to the Sukuk holders. On maturity, the SPV sells back the assets at their pre-defined value. Figure 2.9 gives an overview of this structure.

An example of Sukuk Al-Ijara is the Nakheel Sukuk whereby $3,520m was issued in December 2006 (DIFC Sukuk Guidebook). In addition, Sarawak Economic Development Corporation issued Sukuk Al-Ijara Certificates (SEDC) in 2004. Sukuk Al-Ijara Trust Certificates were issued with a maturity of five years and raised $350m from the market through its SPV for Sarawak Corporate Sukuk Inc. (SCSI). Certain assets will be purchased by the issuer from the proceeds from 1st Silicon (Malaysia); the issuer will then lease assets procured from 1st Silicon to SEDC for an agreed rental price and an agreed lease period of five years (Alsaeed, 2012).

2.6.5 Other Sukuk Instruments

Salam Sukuk, which is common in short-run financing, refers to a sale where the holders make the payment in advance while the issuer of the certificates defers the delivery of the asset and the difference between the purchase price and the sale price is the profit. Salam Sukuk certificates are non-tradable as they represent debt. It might be seen as equal to forward sale contracts, which are forbidden under Shariah unless the element of uncertainty inherent in such contracts is effectively removed.

In this regard, certain criteria must be applied to meet with Shariah recommendations (such as, the assets of Sukuk Al-Salam must be fungible goods that can be weighed and measured but cannot be gold, silver or any currency if the Salam capital was paid in gold, silver, another currency, etc.). The structures of Sukuk Al-Salam involve the following

points: the proceeds of the Sukuk are obtained by the SPV and then provided to the investors. The originator receives the proceeds and then is responsible for selling the commodity by using a forward contract. The SPV receives the commodities from the originator. In order to make a profit, the originator resells the commodities. Sukuk holders receive the sales proceeds from the commodity.

Sukuk Al-Istisna are considered non-tradable Sukuk and represent partial ownership in a project. The structure of Sukuk Al-Istisna involves the following steps: The contractor receives the proceeds collected from the issuance of the Sukuk and uses it for future projects. The SPV takes the title to the assets. The final purchaser rents or trades the project, and pays monthly installations or makes a deferred lump-sum payment when the project is completed to the SPV. Returns gained from this issuance are dispersed to the Sukuk holders. An example of Sukuk Al-Istisna is Qatar Real Estate Investment Company (QREIC), which has an Istisna component in its structure.

Zero-coupon Sukuk are sold at a discount to its face value and repaid at maturity with its full face value; they do not make periodic interest payments (Hamza, 2006). It can also be sold in the market at the current price if the holders want to dispose of them before the maturity date. The difference between the face value and the discount value represents the amount of profit achieved by the investor (Al-Maghlouth, 2009).

Hybrid Pooled Sukuk are hybrid securities that combine a broad group of different financial instruments and generally combine elements of debt and equity characteristics. They pay a predictable rate of return whether they are fixed or floating, or dividend until maturity, at which point the securities can be converted by the holders into the underlying share (Tariq, 2004). Hybrid Sukuk can also contain in its pool of assets Ijara, Istisna and Murabahah, which allows for a greater mobilisation of funds and diversification of asset class risk. In a hybrid Sukuk, at least 51% of the pool must comprise of Sukuk Al- Ijara since Murabahah and Istisna contracts cannot be traded on secondary markets as securitised instruments (AL- Amine, 2008; AL-Maghlouth, 2009). The steps to be

followed for a hybrid Sukuk are structured as follows: the originator of Islamic finance transfers the assets to the SPV. The certificates of participation are issued by the SPV to the holders of the Sukuk on receiving the funds. The SPV sells the pool of assets to the Islamic finance instigator for a specific period of time. The returns from the invested assets are obtained by the investors in the form of fixed payments.

Table 2.9 Size and Issues of Different Types of Sukuk (JAN 2010-SEP 2013)

Structure	Number of issues	Amount issued ($ Million)
Al Salaam	391	4,784.9
Al-Amanah Li Al-Istithmar	1	305.3
Al-Istithmar	16	10,310.3
Al-Wakala Bel-Istitmar	26	7,461.8
Bai Bithaman Ajil	336	59,969.0
Bai Dayn	51	274.7
Bai Inah	7	519.4
Hybrid Sukuk	135	12,491.5
Ijara	816	109,639.2
Istisna	37	5,667.3
Manfa'a	1	650.0
Mudarabah	105	15,520.2
Murabahah	1048	188,475.5
Musharakah	533	59,321.3
Wakala	40	12,781.9
Grand Total	3,543	488,172

Source: Thomson Reuters Zawya (2014, p.73).

Table 2.9 shows different types of Sukuk issued globally. As can be seen, Sukuk Al-Murabahah is the most issued Sukuk with $188,475.5 billion outstanding, followed by Sukuk Al-Ijara with $109,639.2 billion and Bai Bithaman Ajil Sukuk with $59,969 billion.

2.7 SIMILARITIES AND DIFFERENCES BETWEEN SUKUK AND EQUITY SECURITIES

2.7.1 The Difference between Sukuk and Equity/Shares

As described above, Sukuk are investment instruments based on a specific investment activity, where the owners receive a percentage from the profit of the project (if achieved) based on how much Sukuk they own.

Stocks are shares in the capital of a company, and each share represents an equal of the capital and is a document held by shareholders as proof of their ownership.

The Sukuk structure may look like stocks but in reality they are different, as follows:

(1) Shares give their owner the right to attend the General Assembly of the company, to vote, to participate in the management, supervision and so on. Sukuk do not give their holders these rights.
(2) Shares have no maturity date as these are part of the capital of a company with the aim of investing and expanding indefinitely, whereas Sukuk are often linked to specific projects that have a start and end date.
(3) Sukuk represents the ownership share in a specific asset, project or service, whereas shares are the ownership shares in the company or corporations as a whole.
(4) Sukuk holders are responsible only for the specified assets, project or service, whereas the shareholder is responsible for the whole company or corporation.

2.7.2 The Similarities and Differences between Sukuk and Conventional Bonds

Sukuk are similar to conventional bonds in terms of providing the debtors (whether they are governments or corporations) with the money needed to run their projects by obtaining funds from creditors who want to invest. Wilson (2008) argues that Sukuk are identical to conventional bonds by suggesting that Islamic finance industry is lacking in the areas of product innovation and pricing risk characteristics. From the financial perspective, he examined Murabahah, Musharakah and Ijara-based Sukuk to evaluate different Sukuk structures. He found that the formation of the SPV is essential for the successful issuance and management of Sukuk.

Lahsasna and Lin (2012) argue that Sukuk are structured in a similar way to conventional bonds. They expressed doubt concerning the uniqueness of Sukuk and stated that:

> *"Sukuk continue to be associated as Islamic bonds and are not able to establish itself as a new class of asset, there will be a never ending process of sorting out new Shariah issues as and when innovations are overworked to replicate conventional bonds"* (p.16).

Credit rating agencies use similar criteria to evaluate both types of bonds and the main credit rating agencies use the same credit ratings, where (AAA to AA) is excellent, (A to BBB) is good, and (BB to B) is poor or not investment grade.

In the Islamic capital market, studies have found many differences in the structure and features of Sukuk and conventional bonds (see for example: Adam & Thomas, 2004; Afshar, 2013; Al-Maghlouth, 2009; Ariff & Safari, 2012; Ariff et al, 2012; Ashhari et al, 2009; Godlewski et al, 2011; Haider & Azhar, 2010; Hamza, 2006; Ramasamy et al, 2011; Tag El-Din, 2007; Tariq & Dar, 2007; Usmani, 2008; Yean, 2009). Ariff et al. (2013) tested in their paper whether Sukuk could be treated as conventional bonds, assuming the apparent similarity in yields of Sukuk and conventional bonds. They reported that Sukuk yields were significantly higher than conventional bonds yields even if both the Sukuk and conventional bonds were issued by the same issuers for the same term and credit rating. They also used Granger causality tests and reported that there is no causality between the yields of conventional bonds and Sukuk to support the idea that the two types of bond are not the same in their structures and trading behaviour in markets. Their results support the idea that Sukuk are different instruments from conventional bonds. Shaikh (2013) pointed out that the nature of the transaction is the basic difference between Sukuk and conventional bonds, which refers to a Sukuk holder as an investor and a conventional bond holder as creditor.

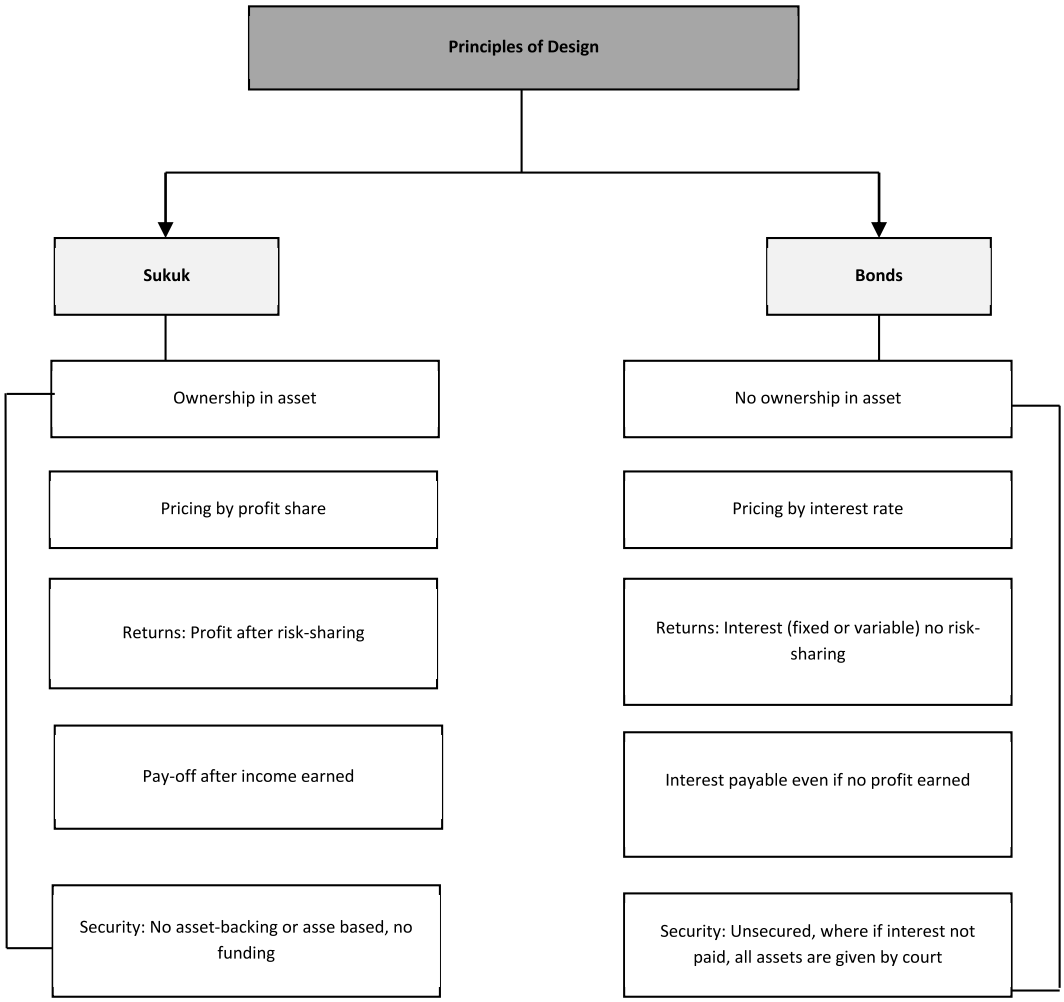
Sukuk investors have a chance to get a higher return on their invested capital (capital appreciation) in contrast to conventional bonds where the return cannot vary with the performance of the bond issuer. The aim of issuing Sukuk is to let Sukuk holders share the profits of large enterprises. On the other hand, it can be possible that there is a loss and no return on the investment made in Sukuk. Returns on Sukuk are linked to the profit of the underlying asset and not to an interest rate, which is prohibited in Islam, whether they come in a coupon or zero-coupon bonds (Tag el-din,

2007). Therefore, there is no guarantee for the capital and fixed return on Sukuk whereas the return on conventional bonds is announced and fixed without risk sharing.

The value of a Sukuk to the holder on maturity is the current market value of the assets or enterprise and not the principal originally invested. The reward is distributed to Sukuk holders only if profits are earned (no income means no distributions). In conventional bonds, the interest must be payable even if there is no profit.

Figure 2.10 shows the main differences between Sukuk and conventional bonds, as summarised by Ariff, et al. (2012).

Figure 2.10 The Main Differences between Sukuk and Conventional Bonds



Source: Ariff, et al., (2012, p.17).

In addition, there are also some other differences that differentiate Sukuk from conventional bonds.

1. In terms of security, Sukuk holders are entitled to have ownership rights to the underlying assets in the project. Conventional bonds are unsecured, where the bond holders would need the authorization of a court of law to obtain right of ownership, and it is given only if it is contested at the time of actual default of a promised pay-off. In addition, the return of principal at maturity is guaranteed by the issuer, while there is no such guarantee in Sukuk (Ariff, et al., 2012; Hamza, 2006). Sukuk funders can sell the assets by the SPV while conventional bondholders have to apply for bankruptcy (Ariff, et al., 2012).

2. Sukuk tradability depends on the nature of the underlying asset. Tradable Sukuk are Sukuk Al-Ijara, Al-Musharakah and Al-Mudarabah; non-tradable Sukuk are Salam and Murabahah, as was mentioned before. It can also be a hybrid Sukuk consisting of a mixture of different types of assets. These types will be tradable only when they meet the fulfilment conditions of tradability at a price other than par value.

3. Sukuk cannot be risk-free as some types of conventional bonds are. So, investing in a variety of derivative instruments significantly helps in reducing risk to individuals (Hamza, 2006).

In the case of a default or delay in repayment, a penalty is imposed on the Sukuk issuer. This amount is not added to the principal and no additional amount is charged. However, in conventional bonds, if the issuer fails to repay on time, interest is added to the principal, and in addition, the interest earns interest based on the length of the time the funds are utilised by the borrower.

2.8 CREDIT RATING CRITERIA AND METHODOLOGY FOR SUKUK

Credit ratings are financial indicators given to specific products that indicate their credit quality. Credit ratings are intended to offer a view about a company’s ability to meet its debt obligations in the future.

According to Zakaria et al. (2012), credit rating is a process to evaluate the possibility of the principal and interest payment of a particular debt being paid during the term and at maturity.

Credit ratings are classified into two groups: The non-investment grade includes the ratings BB, B, C and D; the investment grade include AAA, AA, A and BBB.

The main objective of ratings is to help solve investors' problems monitoring the performance of securities, and by providing information on the rated security to help reduce any information asymmetry between the originators and the investors.

2.8.1 Credit Rating Definition

According to the notes of the Committee of the European Securities Regulators (CESR) (2004), credit rating is:

> *"An opinion regarding the creditworthiness of any entity, a credit commitment, a debt or debt-like security or an issuer of such obligations, expressed using an established and defined ranking system … they are not recommendation to purchase, sell, or hold any security"* (cited in Langohr and Langohr, 2009, p.23).

The European commission (2006, p.1) defines credit rating agencies as:

> *"Opinions on the creditworthiness of a particular issuer or financial instrument. In other words, they assess the likelihood that an issuer will default either on its financial obligations generally (issuer rating) or on a particular debt or fixed income security (instrument rating)".*

Moreover, each of the main three credit rating agencies (S&P's, Moody's and Fitch) defines the credit ratings as follows:

> *"Moody's credit ratings are opinions of the credit quality of individual obligations or of an issuer's general creditworthiness (without respect to individual debt obligations or other specific securities)."* (Moody's Investor Services, 2009, p.1).

> *"A Standard & Poor's issue credit rating is a forward-looking opinion about the creditworthiness of an obligor with respect to a specific financial obligation. It takes into consideration the creditworthiness of guarantors, insurers, or other forms of credit enhancement on the obligation and takes into account the currency in which the obligation is denominated. The opinion reflects Standard & Poor's view of the obligor's capacity and willingness to meet its financial commitments as they come due, and may assess terms, such as collateral security and subordination, which could affect ultimate payment in the event of default."* (Standard and Poor's rating Services, 2012, p.7).

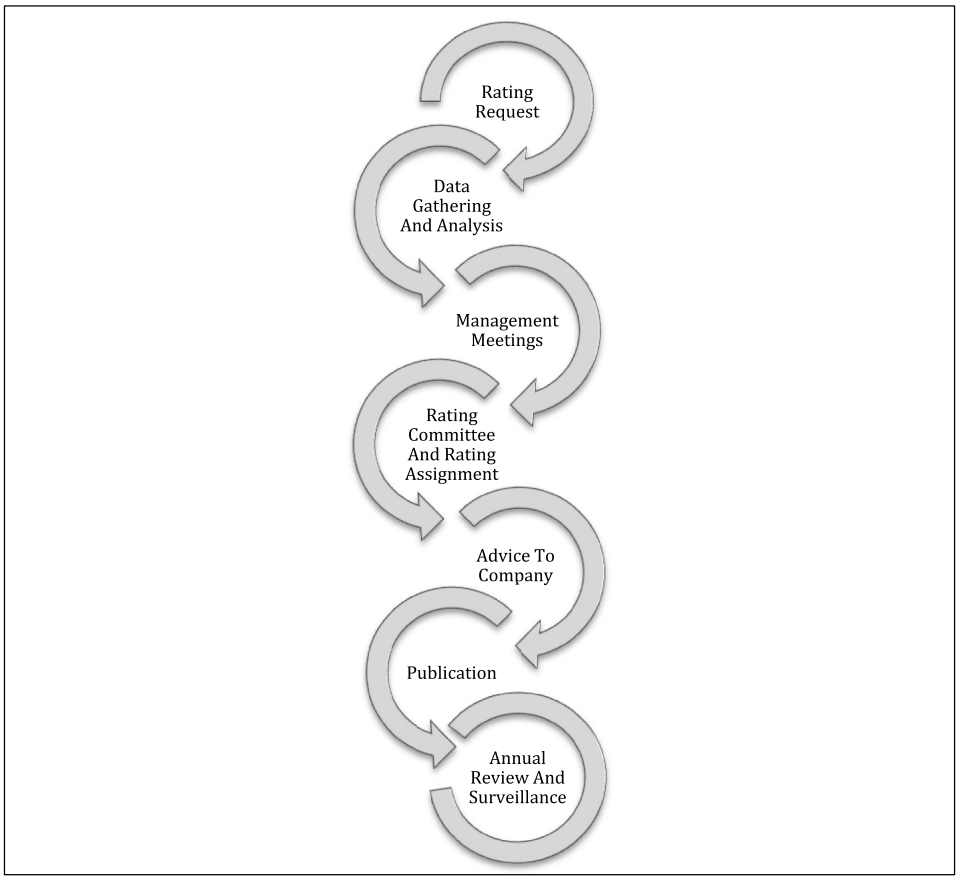
> *"Fitch Ratings' credit ratings provide an opinion on the relative ability of an entity to meet financial commitments, such as interest, preferred dividends,*

repayment of principal, insurance claims or counterparty obligations." (Fitch Ratings, 2014, p.6).

2.8.2 Credit Rating Process

The process of credit ratings starts with a request from the bond issuers (clients company) with a list of requirements for information and a framework to discuss with the analytical team.

Figure 2.11 Credit Rating Process



Source: Generated by the author.

The analytical team analyses the information relating to its cash-flow projections, financial statements and so on. After that, the management meets with the company's executives to obtain classifications and a better understanding of the client's operations. Once the analysis is complete, a careful assessment of the issuer's performance (based on both public and inside information) is made in terms of rating. When the assigned rating is

announced to the public, the issue is added to the surveillance system (Kume, 2012). However, the process of rating have many benefits to different parties include: the issuer and the borrower will enhance their transparency and ability to access the financial markets; guiding the investor and increase their confidence; and to enabling firms to access markets at low cost. Also, ratings help establish the credibility of investors and facilitate investors' access to capital markets from the perspective of issuers. Moreover, ratings provide signals to investors, permitting them to safeguard their interests and channel savings into capital markets.

2.8.3 Sukuk Rating

Sukuk rating is an analytical framework that reflects the ability and willingness of Sukuk issuers to meet their financial commitments in a full and timely manner, like conventional bonds. According to Ming (2014), Sukuk ratings do not reflect the soundness of Shariah decisions, the roles, formation and practices of Shariah advisors, or the degree of Shariah compliance. Sukuk investors can easily know about the issuer's grade and development by using the annual rating reviews that are conducted by separate rating agencies. However, any changes on Sukuk credit rating could be a significant sign of the Sukuk potentially defaulting on a certain level. Low-rated Sukuk have a higher chance of facing the risk of default compared to higher-rated ones.

The emergence of a Sukuk market as an alternative to the conventional bond market raises the issue of how to rate Sukuk. Sukuk ratings play a vital role in the development of this market and seek to help investors in international capital markets in terms of the probability of the borrower defaulting on their obligations. The first international rating agency that started assigning ratings to the Islamic financial institutions was Capital Intelligence (CI). It did so by using conventional rating methodology to rate Sukuk. After that, several top international and local rating agencies started to rate Islamic financial institutions including Moody's, Standard and Poor's, Fitch, RAM and Malaysian Rating Corporation Berhad (MARC). These rating agencies seem to use similar principles and rating methodologies to evaluate and rate Sukuk as they do for conventional

bonds. Ariff and Safari (2012) reported that most of the rating agencies use the same rating methodology that is used for conventional bonds. They also mention that the emphasis here is on whether these agencies are using similar methodologies to evaluate and rate Sukuk, as they are structured with tangible assets that generate revenue. Estimating performance and discovering the true value of securities for investment purposes therefore requires qualified expertise in the market.

According to Aleqtsadeah (2008), credit rating agencies do not take into account the Islamic principle of legality when they rate Sukuk, due to the lack of legitimate bodies to judge the legitimacy of Sukuk. It is also essential for credit rating agencies to refer to the legality of Sukuk in their reports and give this weight in their ratings. Shariah risks must also be taken into account when classifying Sukuk ratings because most Muslim investors buying Sukuk assume that these instruments and their ratings are fully Shariah-compliant.

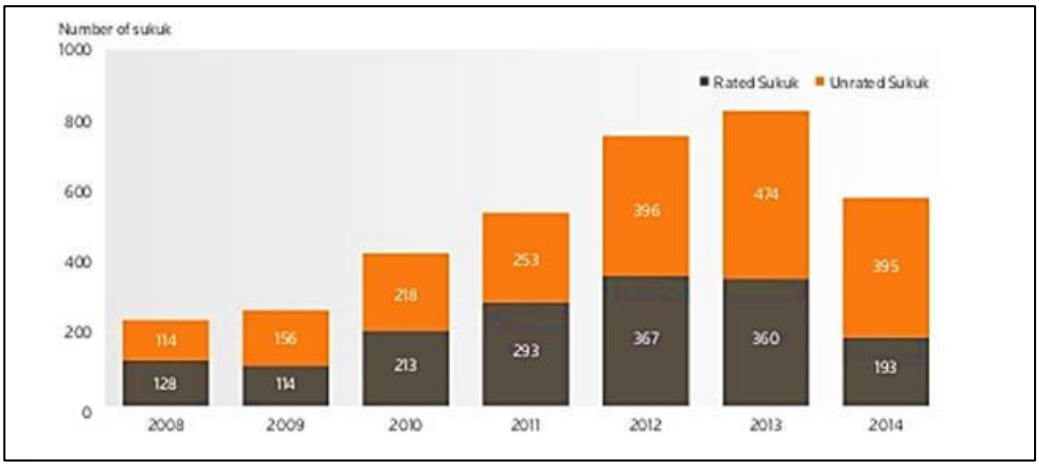
Obaidullah (2005) aimed to examine the rating methodology employed by the international rating agencies to see if there was any difference in rating methodology for Sukuk issuing institutions. He highlighted two points: first, there is a need to develop an appropriate rating methodology for Islamic financial institutions to measure and evaluate both ethical and financial performance; second, there is a need to develop a composite rating to assess Islamic financial institutions' credit risk and management quality.

Arundina et al. (2009) analyse the influence of financial performance in Sukuk ratings in Malaysia. They found that the total assets, insurance status and beta have a significant association with the Sukuk ratings using the M-Logit model. Changes in leverage, interest coverage and return on assets were found to not have any apparent effect on Sukuk ratings. Arundina and Omar (2010) tried to create a model of Sukuk ratings predictions by using Ordered Logistic Regression and Multinomial Logistic Regression. They found that 78.3% for Multinomial Logistic and 70% for Ordered Logistic of all valid cases are properly classified into their unique rating grade. Arundina et al. (2014) attempted to improve the previous

Arundina and Omar (2010) study on Sukuk rating predictions of the Malaysian Islamic capital market by including different Sukuk structures and industrial categories. They also compared the statistical (Multinomial Logistic Regression) and non-statistical techniques (Neural Network method). Their results showed a 96.18% accuracy rate for the Neural Network method and a 91.72% accuracy rate for the Multinomial Logistic method, which means that the non-statistical method (Neural Network) was stronger than the statistical method (Multinomial Logistic) for forecasting Sukuk ratings.

Usmani (2007) argued that Sukuk could be effectively rated by an Islamic regional rating agency instead of the conventional rating agencies; they also mentioned that Islamic banks should stand ready to authorise the acceptability of Sukuk. For example, in Malaysia, Sukuk ratings should be approved by a credit rating agency (CRA) for the purpose of issuing Sukuk due to the requirement by the Malaysian government that all debt securities, including Sukuk, issued be complemented by a CRA at all times. A CRA is an independent third party in Malaysia that is required to be recognized by the Securities Commission (SC) and is normally responsible for providing a credit rating based on the issuer's probability of default, as it is important to the investors for their investment decisions.

Figure 2.12 Global Sukuk Rating



Source: Thomson Reuters Zawya (2015, p.77).

In terms of the development of the use of Sukuk ratings, Figure 2.12 shows that in 2008, the number of rated Sukuk was higher compared to the number of unrated Sukuk, whereas in 2009 the number of rated Sukuk declined to 114 Sukuk. After that, in 2010, the number of rated Sukuk started to increase gradually and reached 367 Sukuk in 2012. In 2014, about 67% of rated Sukuk issued compared to 56% in 2013.

However, credit ratings are important for Sukuk investors, as when the number of rated Sukuk increased, the number of Sukuk issued also increased and vice versa.

2.8.3.1 Sukuk Rating Methodologies

The following section describes the rating methodologies of the main credit rating agencies.

2.8.3.1.1 Standard and Poor's Sukuk rating methodology

S&P define Sukuk as debt instruments that are compliant with Shariah and can be any one of the following forms: notes, certificates and bonds.

Hassoune (2007) found that Sukuk and conventional bonds were rated by S&P using the same methodology with the same definition of default applied. In other words, S&P's ratings give an opinion about the issuer's willingness and ability to meet its financial requirements in a timely manner, without any consideration of the Shariah aspects of Sukuk. Safari et al. (2014) identified the following mechanisms adapted by S&P for different types of Sukuk.

1) The mechanism of full credit-enhancement Sukuk:

Sukuk ratings with full credit-enhancement are largely dependent on the creditworthiness of the guarantor, where Sukuk get an irrevocable guarantee by a third party such as the original owner of the underlying asset. The guarantee at the maturity date covers the periodic coupons and the principal amount of the Sukuk in default events, such as if the issuer (usually an SPV) cannot make the payment, and the guarantor therefore provides Shariah-compliant shortfall amounts.

2) The mechanism of part credit-enhancement Sukuk:

This methodology combines characteristics of both types (full and no credit-enhancement Sukuk) with a third-party guarantee to absorb some of the otherwise asset-backed transaction failure.

3) The mechanisms of no credit-enhancement Sukuk:

Sukuk under this structure is similar to asset-backed security. The underlying assets pool is considered the main role of the principal payment and the coupon.

In short, the rating methodology used by S&P for the mechanisms of the full-enhancement, partial credit-enhancement and no credit-enhancement Sukuk is no different from that applicable to the classic securitization transactions, by focusing on the transaction details and the robustness of the contracts and any other special features (Al-Amine, 2012).

S&P bases their credit ratings on Sukuk Al-Ijara compliance transactions using the same techniques as used in conventional bond law. However, it does not reflect the compliance of the transaction with Islamic principles due to the unexpected outcomes in Shariah law and the fact that a transaction run only in accordance with Shariah law might be difficult to rate (Safari et al., 2014).

2.8.3.1.2 Moody’s Sukuk Rating Methodology

Moody’s ratings aim to address the credit risk based on conventional law as a reference for contractual obligations, without looking at its legal compliance with Shariah. Moody’s rating methodology is similar to S&P’s, as both are not working with Shariah scholars while rating Sukuk. Moody’s believes that Shariah is not an objective fact due to the lack of Shariah compliance (Mseddi and Naifar, 2013). In terms of income generation capacity from the underlying assets, Moody's takes into account Sukuk’s dependency on assets and adapts a special rating methodology (Ahmed et al., 2014). In this regard, Moody’s established a rating methodology whether Sukuk are asset-based or asset-backed. In the case of asset-based securities, the methodology used in rating Sukuk focuses on the creditworthiness of the sponsor, which is similar to conventional bonds.

The methodology used for asset-backed instruments applies a similar approach to securitisation transactions, in accordance with Islamic law (Finch, 2007).

2.8.3.1.3 Fitch Sukuk rating methodology

Fitch explains the structures of Sukuk and their methods of rating as an Islamic bond. Fitch believes that, irrespective of the differences between Sukuk and conventional bonds structures, the existing rating methodologies and scales they use for conventional bonds can accommodate Sukuk. This is because Islamic finance is still in the process of developing and there are important differences in structure between conventional bonds and Sukuk that need more time to be understood.

Fitch follows the Shariah principle that transactions should not be based on Riba. Fitch also believes that asset-based Sukuk are not really different from conventional bonds where the originator tends to receive the same issuer default rating in terms of cash flow or principal repayment. In the case of asset-backed Sukuk contracts, Sukuk holders have access to the assets in case of insolvency or default. In short, the methodology adopted by Fitch seems to be the same as that at Moody's and S&P.

According to Cheema and Haral (2010), in order to get a real sense of the Islamic economic system, credit rating agencies should establish a different framework to check the creditability of Sukuk and these agencies should have expertise in Islamic finance and Shariah laws.

2.8.3.2 Islamic International Rating Agency (IIRA)

In 2002, the IIRA was set up by the Central Bank of Bahrain, the Islamic Development Bank and other shareholders. IIRA started its operations in July 2005 with the aim of evaluating, rating, and analysing Islamic banks and instruments to enhance transparency in financial markets and encourage capital market development in Islamic countries. The primary objectives of IIRA are to rate Islamic financial institutions, facilitate development of a Sukuk market through national scale ratings and the mapping of ratings by IIRA and cross-border transactions.

The IIRA is the only Islamic credit rating agency and it developed the Fiduciary Rating System (FRS). The FRS is considered to be a two-dimensional rating system. The credit rating criteria are concentrated on the ability and willingness of an organisation to meet its contractual obligations in a timely manner. The fiduciary score is an analytical framework that has been developed to accommodate the unique features of IFIs and jurisdictional differences in Shariah standards. The elements of the fiduciary score set the benchmark for innovating, implementing and approving new Islamic investments for corporate governance, Shariah compliance and asset-manager quality across different countries (IIRA, 2014). The fiduciary score and credit rating are the two broad pillars of IFIS.

Islamic finance is restricted by the IIRA on the basis of interpretations of Islamic transactions rules (known as Fiqh al-Muamalat). Thus, any small problem in here could be a possible danger for IIRA. Therefore, to avoid negotiating the principles of Shariah, Islamic financing innovation should be adopted to promote new flexible contracts (Ahmed et al., 2014).

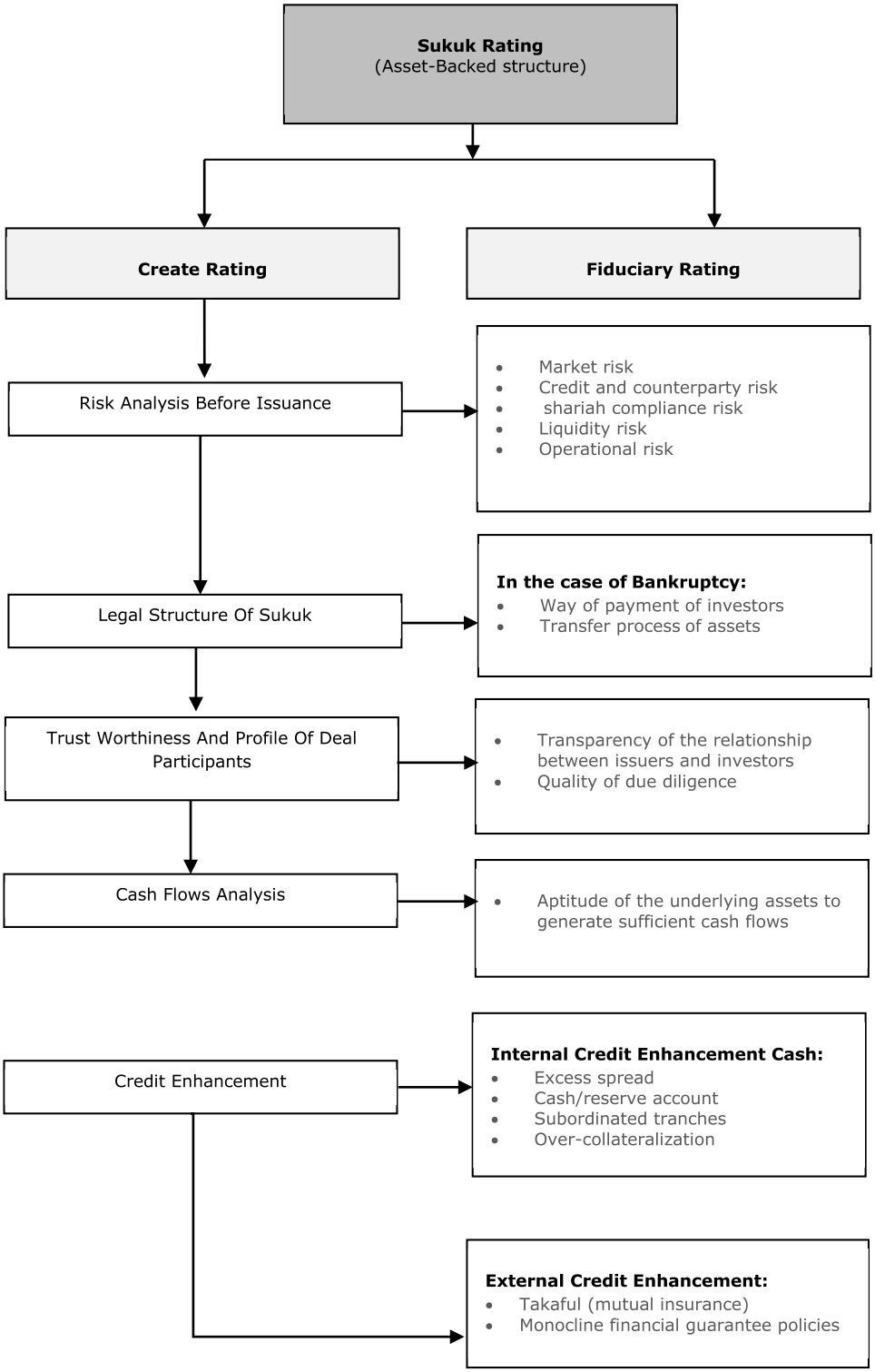
2.8.3.3 International Islamic Financial Market Services Industry (IIFM)

Another institution that addresses the issue of Shariah rating is the IIFM. It is a non-profit organization that was established by cooperative efforts of the Central Bank of Bahrain, Islamic Development Bank, Monetary Authority of Brunei Darussalam, Bank Indonesia, Central Bank of Sudan and the Bank Negara Malaysia. The IIFM is a standard-setting organisation focused on the standardisation of Shariah authorisation of new and existing financial products, documentation and related processes at the global level (IIFM, 2002).

In terms of Sukuk, it is a process designed to give an independent opinion based on Shariah compliance.

However, Haron and Leong (2012) and Mseddi and Naifar (2013) offer a comprehensive rating methodology that is appropriate for Sukuk issuers and helps financial institutions, investors and the financial market, as displayed in Figure 2.13.

Figure 2.13 Sukuk Rating Methodology



Source: Mseddi and Naifar (2013, P 14).

1. Risk analysis before Sukuk issuance:

Investors are exposed to a variety of risks such as: Market risk, credit and counterparty risk, Shariah compliance risks, liquidity risk and operational risks, all of which are not exclusive to Sukuk, and require a risk analysis before the issuance of Sukuk.

2. Analysis of the legal and basic structure of Sukuk:

A contract is essential and should be legal, valid, binding and applicable to all parties and the laws of the country in which the assets and companies are based (Yean, 2009). The valuation of Sukuk takes place on the basis of a legal structure as an asset-backed transaction and the underlying assets. They also should be backed up by a specific and tangible asset that is separate from those of the company. Also, investors must have an ownership interest in the assets that are being financed, according to Shariah perspectives. This structure will have an impact on the risk profile of the Sukuk and determines the rating methodology to be used, whether it asset-backed methodology or conventional.

3. Assessment of the trustworthiness and profile of key transaction parties:

The assessment of the trustworthiness helps to achieve the credibility. The relationship between the originators or borrowers and investors in Sukuk transactions should be clearly identified, transparent and regular. In terms of the role, credit quality and the ability to perform, the originator, guarantor, lessee, contractor, and servicer/back-up servicer are the main participants in the transaction and play the main parts in the analysis of the Sukuk rating.

4. Cash flow analysis:

Cash flow analysis is the main driver of Sukuk ratings, and is assigned to generate expected returns for the investors from the cash flows generated from the use of the assets.

5. The credit enhancement assessment:

The credit enhancement decreases Sukuk holders' risk exposure by offsetting possible losses. It is divided into two types: internal credit

enhancement and external credit enhancement. The internal credit enhancement in an agreement consists of: Cash account or reserve account, excess spread, payment waterfalls, subordinated tranches and collateral value, though the structure of these internal credit enhancements are still under debate regarding to the Shariah compliance. The external credit enhancements under the Islamic financial products may be provided by a third-party guarantor who is not involved in the securitisation process.

2.9 CURRENT ISSUES AND CHALLENGES IN THE DEVELOPMENT OF SUKUK MARKET

Sukuk have been implemented in many successful projects as important tools of monetary management (Al-Amine, 2008). What is now crucial is that Muslim jurists and economists focus their efforts on researching the different forms of Islamic bonds that are acceptable under Islamic law. However, this does not mean that the system cannot have negotiable certificates, for example Sukuk Al Salam. It does mean, however, that the possibility of reselling Salam certificates before taking possession needs to be discussed by Muslim jurists.

Rusgianto and Ahmad (2013) indicate that in order to attract investors to increase their trading activities in the secondary market, the policies need to have a greater transparency and better information disclosure and incentives to realise a more rational and efficient Sukuk market.

These challenges are summarised as follow:

- Lack of knowledge of the principles of Sukuk mechanisms among many non-Muslim investors.
- The variation of fatwa legitimacy among Shariah jurists, as Usmani (2008) stated that 85% of the Sukuk issued in the world are non-Sharia-compliant.
- Lack of qualified Shariah scholars and a lack of qualified highly trained human resources, in addition to the absence of a standard for legitimacy in each country.
- Lack of trading in the Sukuk secondary market.

- Lack of Sukuk competitiveness with conventional bonds, due to the novelty of Sukuk.
- Lack of Sukuk derivative instruments according to Shariah law.

Zaidi (2007) identified the following difficulties that face the Sukuk market in terms of liquidity and pricing; lack of standardisation of Sukuk pricing under Shariah principles; lack of adherence to international bond agreements due to settlement problem of Sukuk issues; lack of transparency as Shariah scholars should disclose their Fatwas; lack of liquidity due to the small size of secondary market; and lack of a unified Islamic benchmark rate, as developing such a rate would help in reflecting risks and pricing, issues of both existing and outstanding Sukuk.

Furthermore, the Sukuk pricing process adopted from the LIBOR benchmark is the most common benchmark in determining Sukuk pricing profit or rental-based return, but this is objectionable by Shariah law due to it being an interest-based benchmark (Ahmed et al., 2014).

CHAPTER 3

RESEARCH METHODOLOGY, DATA AND DESCRIPTIVE STATISTICS

3.1 INTRODUCTION

Research is a set of regular and thoughtful steps based on gathered information around a specific problem that is subjected to different tests and to verify theories and models. Research methodology refers to the systematic, theoretical analysis and process that is applied to an area of study in investigating knowledge about the whole world. In other words, research is a voyage of discovery carried out by a person called researcher to get facts on a problem or situation called the research topic, by following scientific methods called research methodologies, to reach solutions called results.

It is sensible to assume that research is carefully planned, research problems are investigated in-depth and analysis undertaken is comprehensive. This will likely have an impact on the accuracy of the findings of a study, which helps in generating significant implications and reliable findings and drawing conclusions. This study seeks to compare the risk and return characteristics between Sukuk and conventional bonds by employing quantitative tools.

This chapter is organised as follows: It starts with a discussion of the methodology including the research design, paradigms, research questions, hypothesis, framework, sample and sampling design, methods of data collection and analysis techniques based on quantitative research methodology. It then gives an overview of the data used in this study. Section four introduces basic descriptive statistics of the data.

3.2 RESEARCH METHODOLOGY

3.2.1 Research Design

Research design is basically setting a plan to figure out a way to answer the research questions. It is considered to be the overall plan that is used

to conduct an entire study, and helps to provide a clear set of research objectives, specifies the methods of data sources to be collected, and helps in identifying any limitations that could affect the research (Saunders et al., 2007). Research methodologies are ways or methods to investigate and obtain knowledge about the world (Hassard, 1991).

The two methods that are commonly used to collect research data are the qualitative and quantitative methods. The quantitative research method is the process that involves collecting numerical data to test hypotheses. This research method uses a mathematical method to provide reliable and easy information to analyse data collected through questionnaires, experiments and surveys. However, this method has been criticised for not providing in-depth descriptions. Qualitative methods provide an insight into a problem as well as an in-depth understanding of the issues involved. Qualitative data collection methods include interviews, focus groups, observations, case studies (Dawson, 2002). In modern research, the pluralistic method is a mixture of both qualitative and quantitative methods (Bryman and Bell, 2007).

The nature of this investigation, as well as the type of data and data collection methodology in this study all dictate the use of the quantitative research method, using statistical techniques to measure the numeric significance of whether the research questions can be answered and to what extent. The steps of our strategy are explained later in this chapter.

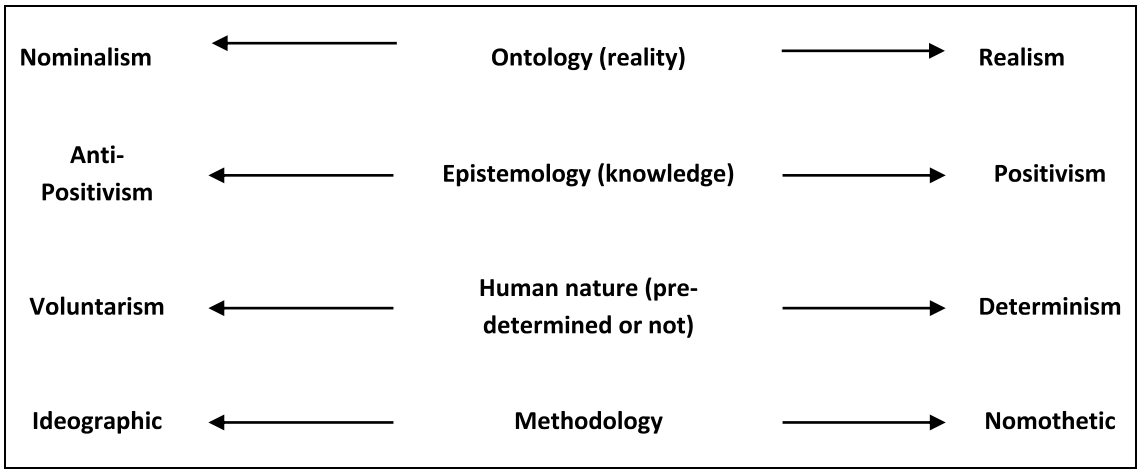
3.2.2 Research Approach

The research approach includes the research procedures and plan, and covers the steps of the research from various assumptions. The philosophical research approach can be divided into two categories: subjectivist and objectivist. These two major philosophical approaches are described by several fundamental assumptions include ontology (assumptions about the nature of reality), epistemology (assumptions about what can be known), human nature (pre-determined or not), and methodology (assumptions about what methods and procedures are allowable within the paradigm). In other words, research assumptions are mainly beliefs and ideas that are held to be true and that significantly

affect the research paradigm, methodology, methods, and overall research strategy.

Below is a brief description of each assumption, as more than one assumption can be adopted in the same research. Figure 3.1 shows the nature of the research assumptions.

Figure 3.1 The Nature of Social Science Research Assumptions



Source: Burrell and Morgan (1992, p.3).

3.2.2.1 The Subjectivist Approach

Ontology (Nominalism): Ontology places the social world into a context in which names, ideas and labels are used to identify the individual structures.

Epistemology (Anti-positivism): Researchers should involve and participate directly in the system being studied and not only rely on observation alone.

Human nature (Voluntarism): Individuals have free will and are independent.

Methodology (Ideographic): This is based on a process of considering and collecting all the details and information available about a particular topic, whether it is personal or not, in order to obtain information (Burrell and Morgan, 1992).

3.2.2.2 The Objectivist Approach

Ontology (Realism): What happens in the external world is completely separate from the individual's perceptions.

Epistemology (Positivism): refers to knowledge and understanding, where it is focused on how or whether we can gain knowledge of reality.

Human nature (Determinism): The nature of relevant individuals and their activities determine the environment where the individual lives.

Methodology (Nomothetic): Involves applying scientific methods and testing hypotheses through statistical analysis (Burrell and Morgan, 1979).

The nature of the study involves an investigation of whether observable variables are generated based on formulated hypotheses, and it questions whether they influence the researcher to choose the proper research assumptions. This identification is critically important as it determines the choice of the research design. The research philosophy adopted in this study is the objectivist approach, where the choice of realism ontology leads to positivist epistemology, which is associated with a deductive research approach and accordingly, quantitative research methods would need to be employed.

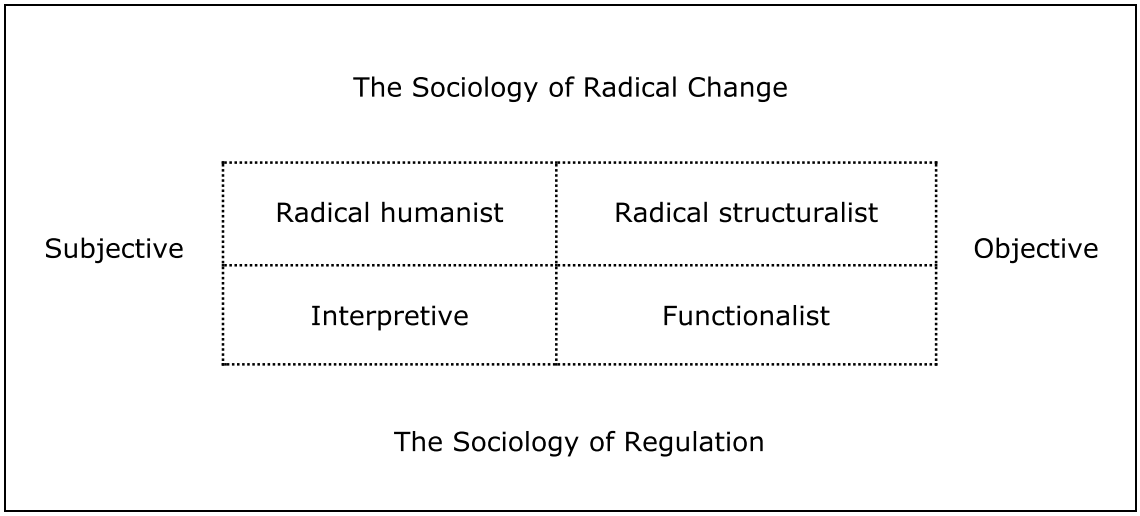
The financial system, whether Islamic or conventional, is subject to existing rules and regulations considered the foundation attic, which in turn are influenced by the realism of ontological assumptions. Moreover, it is adopting the philosophical to the philosophical ethics of the positivism approach by upholding the objectivity of the collected data and the application of statistical tools for data analysis.

3.2.3 Research Paradigms

A research paradigm is a method or style which shows how the researcher is acting within the boundaries described by a set of rules and regulations, written or unwritten (Baker, 1992). First, the functionalist paradigm uses a hypothesis testing to understand organizational behaviour by providing rational explanations of human affairs. Second, the interpretive paradigm

from the individual's viewpoint tends to explain the stability of behaviour and it assumes that social world does not exist in a real sense but is the product of the experience of the individual. Third is the radical Humanist paradigm focused on how human beings seek to be free from social constraints that restrict their energies. Fourth, the radical structuralist paradigm believes that political and economic crises and conflicts lead to generations of radical change in society (Burrell and Morgan, 1979). Figure 3.2 presented the two dimensions and the four paradigms in which help analyse the social phenomena.

Figure 3.2 Four Paradigms for the Analysis of Social Theory



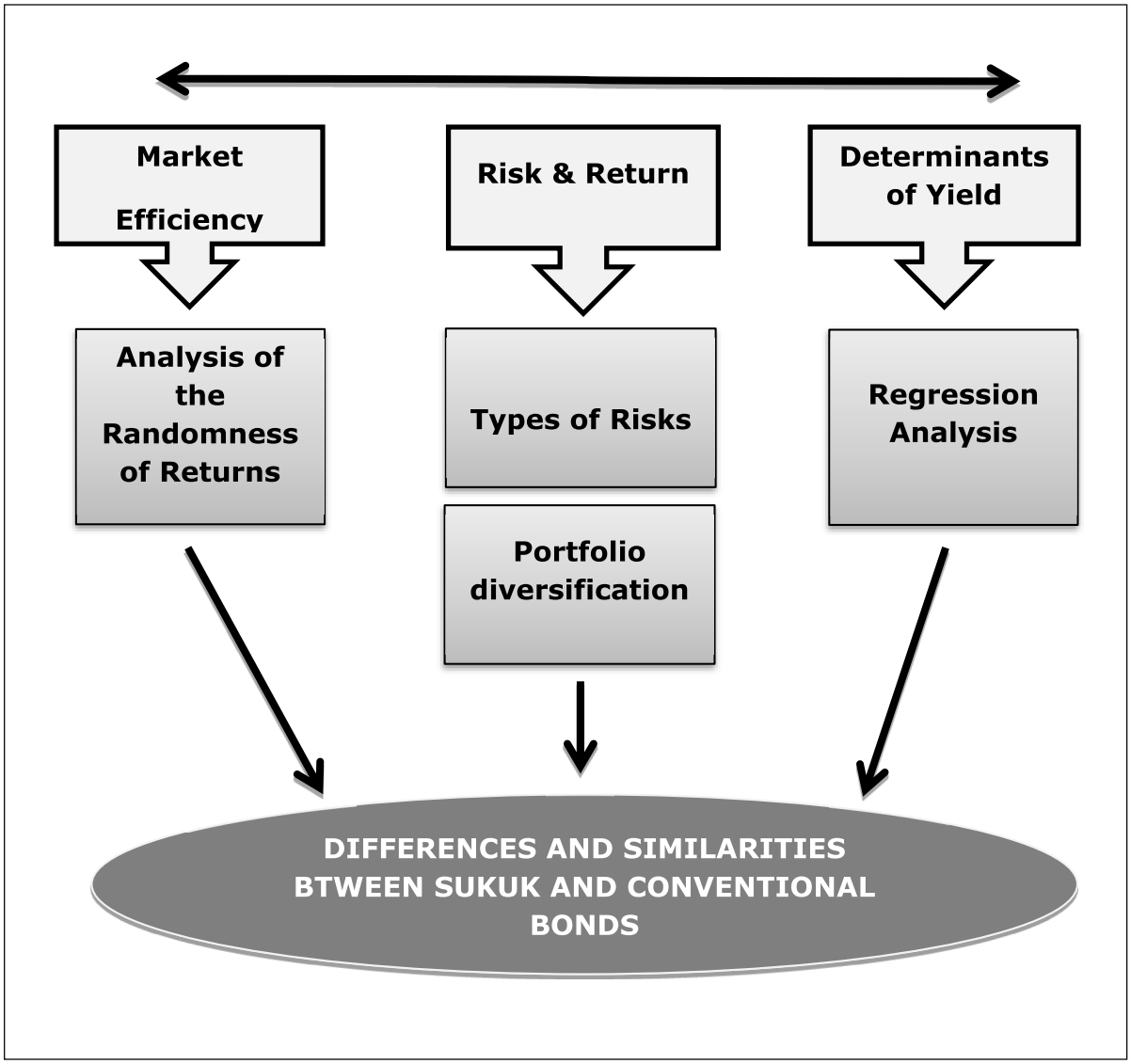
Source: Burrell and Morgan (1979).

The radical structuralist paradigm is the most associated with this level of research. It helps explain the differences between Sukuk and conventional bond risks as many forces, tensions and conflicts lead to radical change in their markets, for instance explaining what happened before, during and after the global financial crisis.

3.2.4 Research Framework

This research follows a mix of quantitative and comparative approaches that focus on analysing and comparing the risk and return characteristics between Sukuk and conventional bonds. To achieve the goal of this study and to answer the research questions, the research framework has been formulated. Figure 3.3 describes the framework of this research.

Figure 3.3 The Conceptual Framework of the Study



Source: Generated by the author.

The research framework focuses on the three main testable hypotheses: First, in light of market efficiency, it plans to compare the nature of the randomness of the secondary market returns of both bonds. This will be achieved with the application of an autocorrelation test, runs test and variance ratio test.

Second, the study attempts to assess and measure the risk and return performance of Sukuk and conventional bonds, where a VaR and duration and convexity methodologies are to be used. More specifically, it tests the

hypothesis that there is no difference between Sukuk and conventional bonds' risk characteristics. Portfolio diversification also will be analysed to investigate whether adding Sukuk into any investment portfolio can help reduce the portfolio risk.

Finally, the study looks at a list of variables to see what the main determinants of Sukuk yields are by using OLS regression analysis.

3.2.5 Sample and Sampling Design

The most appropriate technique to collect data is sampling. The process of sampling involves defining the population of concern, identifying a sampling frame, specifying sampling elements, determining the techniques of samples and sample size.

3.2.5.1 Target Population

The research population is defined as the total classification of a subject that is the focus of attention in a research project. In general, the target population is all Muslim and non-Muslim countries that are interested in Islamic finance, specifically Sukuk. Unfortunately, the entire countries of the target population cannot be measured in one study. In order to overcome this problem, a study population was found. The study population, in this study is focused on the largest Muslims countries that are invested in both Sukuk and conventional bonds.

3.2.5.2 Sampling Frame

The sample of the research is defined as a portion of the research population that was selected to participate in a study, representing the research population. The sampling frame, known as a source of list, refers to all Sukuk and conventional bonds in the world.

The sampling criteria of this study is based on all available daily prices on Sukuk and conventional bonds on Thomson Reuters DataStream from the first available date until the end of August 2013, or the earliest available date. The data used in this research consists of clean price and yields-to-redemption of Sukuk and conventional bonds.

3.2.5.3 Sampling Technique and Sample Size

In this study, the sample is secondary market data on Sukuk and conventional bonds in the following eight countries: Malaysia, Saudi Arabia, the UAE, Bahrain, Qatar, Pakistan, Kuwait and Turkey. It comprises around 132 bonds issues (59 Sukuk and 73 conventional bonds), as shown in Table 3.1.

Table 3.1 The Number of Sukuk and Conventional Bonds in This Research

	Sukuk	Conventional Bonds
Saudi Arabia	8	4
UAE	26	19
Bahrain	3	9
Turkey	2	2
Malaysia	7	17
Qatar	6	14
Pakistan	6	3
Total	59	73

Source: Generated by the author.

The sample size is small and the imbalance is due to the lack of data availability (traded information on secondary market data) on Sukuk and conventional bonds at Thomson Reuters DataStream, provided by RGU University from the first available date until the end of August 2013. The study draws only on those countries that have historical market data on Sukuk and conventional bond issuance; some bond series do not provide any price information apart from the fact that their names are listed on the DataStream.

The final data set has high representation of Sukuk and conventional bonds from UAE. This could have an impact on the findings of this study as results may show sample selection biasness. However, if all of these Sukuk and bonds from UAE are not included in the study, the remaining data set will be deemed too small.

3.2.6 Data Collection and Analysis

3.2.6.1 Data collection

Secondary data have been used to address the aims and objectives of the research.

3.2.6.1.1 Secondary data types and sources

Secondary data comprises information that exists already and has been gathered for another purpose, for instance, books, academic journals and other publications.

For this study, secondary information and statistical data were used:
1) A literature search via The Robert Gordon University (RGU) library was undertaken encompassing the areas covered in the research objectives. This included academic journals, professional materials, books, published statistics and electronic databases. The Robert Gordon University provides online databases such as Science Direct, Emerald, FAME (Financial Analysis Made Easy) and Google Scholar as well as numerous research papers and journals.

2) Secondary market data on clean price, yield to maturity, credit rating and the daily returns of each bond were collected for Sukuk and the conventional bonds for the eight countries from Thomson Reuters DataStream. A range of other sources were also used as well including Zawya, Islamic Finance Information Service and Bloomberg.

3.2.6.2 Methods of data analysis

Data analysis comes after data collection and is used to reconstruct or assemble the data collected in a comprehensive and meaningful way. Microsoft Excel, E. views and SPSS are the most commonly used statistical tools for quantitative data analysis.

A number of statistical techniques were planned to be applied in this study in order to achieve the research objectives. In this chapter, the research will begin by presenting all the data under study and then presenting the descriptive statistics for the various Sukuk and conventional bonds returns

including the Mean, Median, Maximum, Minimum, Standard Deviation, Standard Error, Sample Variance, Kurtosis, Skewness, and Range. In chapter 4, auto-correlation test runs and variance ratio testing will be used to look at the randomness of returns. In chapter 5, to compare the risks of Sukuk and conventional bonds, the VaR methodology, the duration and convexity measures, and the classical model for portfolio optimisation will be used. Finally, in chapter 6, to evaluate Sukuk yields, OLS regression analyses will also be conducted. An array of statistical tests available in Excel, SPSS and Eviews7 will be applied.

3.3 OVERVIEW OF THE DATA EXPLANATION

It is believed that a good quantitative research analysis begins with a description of the data. This part presents the characteristic features of the data in this study. The original data of this study are Sukuk and conventional bonds available at Thomson Reuters DataStream.

In general, bonds can be grouped into several categories such as: issuer type, credit rating, industry, maturity and other features like callable bonds as this type of analysis can provide more accurate results. This current study examines Sukuk and conventional bonds issued in eight geographical regions (Malaysia, Saudi Arabia, the UAE, Bahrain, Qatar, Pakistan, Kuwait and Turkey) due to shortages of traded information. The data used in this research consists of clean prices[1] and yields to redemption of Sukuk and conventional bonds, while daily prices were obtained from Thomson Reuters DataStream from the first available date until the end of August 2013, or the earliest available date (different sample periods due to the data availability). Additionally, due to this fact, Sukuk could not be restricted to one particular market.

Table 3.2 shows the number of listed Sukuk and conventional bonds that were analysed in this research. It can be seen that Sukuk were grouped based on the type of Islamic financial instruments. Sukuk Al Ijara is the most popular Sukuk with 49%, followed by 15% for Sukuk Al Wakala.

[1] Clean price is a trade price less the accrued interest in between coupon payments for each bond.

Sukuk Al Modarabah has 2%, Sukuk Al Musharakah 15% and Sukuk Al Istithmar 3%. Some of the companies had mixed instruments: 8% for Sukuk Al Wakala with Modarabah; 3% for Sukuk Al Ijara with Wakala; and lastly, 8% that did not refer to their modes of financing.

The table also shows that 66% of conventional bonds in this study were issued by corporations, 4% were issued by governments, 29% issued were sovereign[1] and only 1% issued were sub-sovereign. While in Sukuk, 20% were issued by governments, 9% issued were sovereign and the rest of the Sukuk were issued by corporate entities.

Most of the Sukuk and conventional bonds studied in this research were issued by financial institutions (51% for Sukuk and 44% for conventional bonds, respectively), (17% and 29%) for governments, (10% and 2%) in real estate and 2% of both types of bonds were from the industrial sector.

Conventional bonds had 1% in leasing, 1% in telecommunication, 4% in portfolio management 7% in electricity and energy, 2% in oil & gas, 4% in specialty retail, 6% in construction and development and 6% were not rated. In contrast, 7% of Sukuk were in electricity, 8% in sovereign, 1% in oil & gas, 2% in specialty retail and 5% were not rated. Sukuk, in general, are smaller in size and have shorter maturities compared to conventional bonds.

As discussed above, it could be said that the majority of Sukuk were issued by corporations and hence comparing Sukuk and conventional bonds on their risk-return characteristics is tremendously valuable. Conversely, the number of governments that have issued Sukuk and conventional bonds is very small, where the data availability on DataStream forces more limitations on the analysis. It is important to include both type of these securities as there are different characteristics of both types, as government bonds could be less risky because governments could increase taxes or print money to redeem the bond at

[1] The main difference between a government and sovereign bond is that a government bond is issued in the domestic currency, while a sovereign bond is issued in a foreign currency.

maturity as they pay lower rates than corporate bonds. Moreover, most of the trade in Sukuk markets is limited to the primary markets, apart from a few cases where secondary market data are existing. This study will compare the corporate Sukuk with corporate bonds and sovereign Sukuk issues with sovereign conventional bonds. These two types of securities can be mixed in portfolios as investors hold both types of risk free and risky securities in order to choose the desired trade-off between risk and return.

Table 3.2 Sukuk and Conventional Bonds Listed Companies

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
DAR AI Arkan Sukuk	Ijarah	Real Estate	2013	24/05/18	B+	WR	KSA	Asset Repackaging Five	Corporate	Financial Institution	2010	05/11	NA	NA	KSA
Saudi Electricity	Ijarah	Electricity	2013	08/04/23	AA-	A1	KSA	IDB Trust Services	Corporate	Financial Institution	2010	20/09/20	NA	NA	KSA
Saudi Electricity	Ijarah	Electricity	2013	08/04/43	AA-	A1	KSA	SAUDI BRITISH BANK 03/10 Q	Corporate	Financial Institution	2005	03/10	NA	NA	KSA
Saudi Electricity	Ijarah	Electricity	2012	03/04/17	AA-	A1	KSA	Export Import Bank Korea	Corporate	Financial Institution	2011	12/16	NA	NA	KSA
Saudi Electricity	Ijarah	Electricity	2012	03/04/22	AA-	A1	KSA	IDB TRUST SERVICES	Corporate	Financial Institution	2011	20/09/20	NA	NA	KSA
DAR Al-Arkan International	Ijarah	Real Estate	2010	18/02/15	B+	WR	KSA	Inblk for Reconstruction	Corporate	NA	2009	29/12/14	NA	NA	KSA
BSF Sukuk Limited	Wakala	Financial Institution	2012	22/05/17	A	NA	KSA	Banque Saudi Fransi	Corporate	Financial Institution	2010	30/03/15	A	Aa3	KSA
DAAR INTL. SUKUK	Ijarah	Real Estate	2007	07/03/10	B+	WR	KSA	ICICI BANK BAHRAIN	Corporate	Financial Institution	2007	03/10/12	BBB	NA	BAHRAIN
GFH Sukuk	Ijarah	Financial Institution	2007	07/18	NR	NA	BAHRAIN	HDFC BANK LTD	Corporate	Financial Institution	2013	06/03/18	BBB-	Baa2	BAHRAIN
CBB International Sukuk	Ijarah	Financial Institution	2011	22/11/18	BBB	NA	BAHRAIN	ICICI BANK BAHRAIN	Corporate	Financial Institution	2009	25/03/15	BBB-	Baa2	BAHRAIN
CBB International	Ijarah	Financial Institution	2009	17/06/14	BBB	NA	BAHRAIN	BAHRAIN KINGDOM	Sovereign	Government	2012	05/07/22	BBB	NR	BAHRAIN
BMA International Sukuk	Ijarah	Financial Institution	2004	06/09	NA	NA	BAHRAIN	FINANS BANK BAHRAIN	Corporate	Financial Institution	2006	24/03/11	NA	NA	BAHRAIN
Adcb Islamic Finance	Wakala-Modarabah	Financial Institution	2011	22/11/16	A	A1	UAE	BAHRAIN KINGDOM	Sovereign	Government	2010	31/03/20	BBB	NR	BAHRAIN
DP World Sukuk Limited	Modarabah	Industrials	2007	02/07/17	NR	Baa3	UAE	ICICI BANK BAHRAIN	Corporate	Financial Institution	2009	25/03/15	BBB-	Baa2	BAHRAIN
Dubai DOF Sukuk	Ijarah	Government	2009	03/11/14	NA	NA	UAE	BAHRAIN MUMTALAKAT	Government	Financial Institution	2010	30/06/15	BBB	NA	BAHRAIN

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
Dubai DOF Sukuk	Ijarah	Government	2012	02/05/17	NA	NA	UAE	BAHRAIN KINGDOM	Sovereign	Government	2012	05/07/22	BBB	NR	BAHRAIN
Dubai DOF Sukuk 4	Ijarah	Government	2012	02/05/22	NA	NA	UAE	ABU DHABI COML.BK	Corporate	Financial Institution	2006	21/11/13	A -	A1	UAE
Tdic Sukuk Limited	Ijarah	Government	2009	21/10/14	AA	A1	UAE	DP WORLD LTD.	Corporate	Industrials	2007	02/07/37	NR	Baa3	UAE
Anka A Sukuk Limited	Ijarah	Real Estate	2012	25/08/16	NA	NA	UAE	Emblem Finance Company	Corporate	Financial Institution	2/11/2010	07/2014	NA	NA	UAE
MAF Sukuk Limited	Wakala	Financial Institution	2012	07/02/17	BBB	NA	UAE	National Bank Abu Dhabi	Corporate	Financial Institution	NA	02/18	NA	NA	UAE
Jafz SUK 2019 Limited	Musharakah	Real Estate	2012	19/06/19	NA	Ba3	UAE	BARCLAYS BANK	Corporate	Financial Institution	2010	03/20	NA	NA	UAE
EIB Sukuk Company	Musharaka	Financial Institution	2012	18/01/17	NA	Baa1	UAE	STD.CHARTERED BANK	Corporate	Financial Institution	2008	07/10/13	NA	NA	UAE
ABU DHABI ISLAMIC	Musharaka	Financial Institution	2006	12/2011	NA	NA	UAE	XSTRATA FIN.DUBAI	Corporate	Financial Institution	2012	19/05/2016	BBB	NA	UAE
EIB SUKUK CO	Musharaka	Financial Institution	2012	11/01/2018	NA	Baa1	UAE	ADCB FINANCE CAYMAN	Corporate	Financial Institution	2009	01/2011	NA	NA	UAE
DUBAI GLOBAL SUKUK	Ijarah	Government	2004	04/11/2009	NA	NA	UAE	DUBAI	Sovereign	Government	2010	05/10/2015	NA	NA	UAE
EIB SUKUK CTD.	Musharaka	Financial Institution	2012	11/01/2018	NA	Baa1	UAE	ABU DHABI NAT	Corporate	Electricity and energy	2012	12/01/2018	A-	A3	UAE
HBME SUKUK CO.	Wakala-Modarabah	Financial Institution	2011	02/06/16	NA	A2	UAE	DUBAI	Sovereign	Government	2010	05/10/2020	NA	NA	UAE
EIB SUKUK CTD.	Musharaka	Financial Institution	2007	06/2012	NA	Baa1	UAE	EXOVA LTD.ABU DHABI	Corporate	Industry	2010	15/10/2018	B-	Caa1	UAE
DIB SUKUK CTD.	Ijarah	Financial Institution	2007	03/2012	NR	NA	UAE	NAT.BK.ABU DHABI	Corporate	Financial Institution	2011	15/07/2026	AA-	Aa3	UAE
HILAL SUKUK CO.	Wakala	Financial Institution	2009	03/11/2014	NA	Aaa	UAE	AXIS BANK LTD.DUBAI	Corporate	Financial Institution	2010	30/09/2015	BBB-	Baa2	UAE
SIB SUKUK CO.	Wakala	Financial Institution	2006	10/2011	BBB+	NA	UAE	DUI.ELTY.&. WT.AUTH.	Corporate	Electricity	2010	22/04/2015	NA	Baa3	UAE

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
RAKIA SUKUK CO.	Ijarah	Financial Institution	2007	12/2012	NA	NA	UAE	AXIS BANK LTD.DUBAI	Corporate	Financial Institution	2010	02/05/2016	BBB-	Baa2	UAE
ADIB SUKUK CO.	Musharaka	Financial Institution	2012	NA	NA	NA	UAE	DUBAI.HLDG.COML.OPS	Corporate	Construction and development	2007	01/02/2017	NR	B2	UAE
FGB Sukuk Company Limited	Wakala-Modarabah	Financial Institution	2011	02/08/16	NA	A2	UAE	Nakheel Development Limited	Corporate	Real Estate	2008	13/05/2010	NA	NA	UAE
FGB Sukuk Company Limited	Wakala-Modarabah	Financial Institution	2012	18/01/2017	NA	A2	UAE	EMBLEM FIN.CO	Corporate	Financial Institution	2008	0/2018	NA	NA	UAE
Hbme Sukuk Company	Wakala-Modarabah	Financial Institution	2011	02/06/16	NA	A2	UAE	BANK OF IRELAND	Corporate	Financial Institution	2008	07/2018	NA	NA	UAE
SIB Sukuk	Wakala	Financial Institution	2011	25/05/2016	BBB+	NA	UAE	ABU DHABI COML.BK.	Corporate	Financial Institution	2007	22/01/2017	A -	A1	UAE
Yaas Sukuk I Limited	Al-Istithmar	Financial Institution	2013	28/10/15	NA	NA	KUWAIT	NAT.BK.ABU DHABI	Corporate	Financial Institution	2009	15/09/2014	AA-	Aa3	UAE
Yaas Sukuk I Limited	Al-Istithmar	Financial Institution	2013	28/10/15	NA	NA	KUWAIT	ABU DHABI NAT	Corporate	Electricity and energy	2009	09/2019	A-	A3	UAE
URC SUKUK	Musharaka	NA	2007	06/2012	NA	NA	KUWAIT	ABU DHABI NAT	Corporate	Electricity and energy	2007	25/10/17	NA	NA	UAE
KT Turkey Sukuk Limited	Ijarah-Wakala	Financial Institution	2010	24/08/13	NA	NA	TURKEY	ABU DHABI NAT	Corporate	Electricity and energy	2006	27/10/2036	NR	A3	UAE
KT Sukuk Varlik	Ijarah-Wakala	Financial Institution	2011	31/10/2016	NA	NA	TURKEY	ABU DHABI COML.BK	Corporate	Financial Institution	2006	05/2016	A-	NA	UAE
1MALAYSIA Sukuk Global	Ijarah	Government	2010	04/06/2015	A-	A3	MALAYSIA	Dubai Electricity and Water Authority	Corporate	Electricity	2010	21/10/2016	NA	Baa3	UAE
Petronas Global Sukuk	Ijarah	Energy and Oil & Gas	2009	12/08/2014	NA	NA	MALAYSIA	DEWA FUNDING	Corporate	Financial Institution	2008	06/2013	NA	NA	UAE
1MALAYSIA Sukuk Global	Ijarah	Government	2010	04/06/2015	A-	A3	MALAYSIA	BANK OF IRELAND	Corporate	Financial Institution	2008	27/08/18	NA	NA	UAE
Wakala Global Sukuk	Wakala	Government	2011	06/07/2016	A-	A3	MALAYSIA	Dubai 2008	Sovereign	Government	2008	04/2013	NA	NA	UAE
Wakala Global Sukuk	Wakala	Government	2011	06/07/2021	A-	A3	MALAYSIA	National Bank Abu Dhabi	Corporate	Financial Institution	NA	03/2016	NA	NA	UAE

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
MBB Sukuk	Ijarah	Financial Institution	2007	04/2017	NA	NR	MALAYSIA	Kuwait Projects Cayman Islands	Corporate	Portfolio Management	2009	17/10/16	BBB-	Baa3	KUWAIT
BNM Sukuk BHD	Ijarah	Government	2011	08/2011	NA	NA	MALAYSIA	Kuwait Projects Cayman Islands	Corporate	Portfolio Management	2010	15/07/20	BBB-	Baa3	KUWAIT
Almana Sukuk	Wakala	Specialty Retail	2008	05/2013	NA	NA	QATAR	KUWAIT PRJS.CYMN	Corporate	Portfolio Management	2006	04/11	BBB-	Baa3	KUWAIT
QIB Sukuk	Ijarah	Financial Institution	2010	07/10/2015	NA	NA	QATAR	KUWAIT FINL.CTR.	Corporate	Financial Institution	2010	15/07/20	NA	NA	KUWAIT
QIB Sukuk Limited	Ijarah	Financial Institution	2012	10/10/2017	NA	NA	QATAR	TURKEY	Sovereign	Government	2009	06/08/14	NR	NR	TURKEY
Qiib Sukuk Funding Limited	Ijarah	Financial Institution	2012	18/10/2017	NA	A3	QATAR	TURKEY	Sovereign	Government	2013	23/03/2023	NA	Baa3	TURKEY
QREIC SUKUK	Musharaka	Real Estate	2006	08/16	NA	NA	QATAR	Malaysia	Sovereign	Government	2010	12/08/2015	NA	A3	MALAYSIA
Almana Sukuk	Wakala	Specialty Retail	2011	07/16	NA	NA	QATAR	HSBC BANK MALAYSIA	Corporate	Financial Institution	2007	02/11/2027	NA	NA	MALAYSIA
Pakistan	NA	Sovereign	2006	31/03/36	B -	Caa1	PAKISTAN	OCBC BK. MALAYSIA	Corporate	Financial Institution	2009	15/04/2039	NA	NA	MALAYSIA
Pakistan	NA	Sovereign	2006	31/03/16	B -	Caa1	PAKISTAN	BERJAYA INFR.	Corporate	Infrastructure and Utilities	2004	30/09/2013	NA	NA	MALAYSIA
Pakistan	NA	Sovereign	2006	31/03/16	B -	Caa1	PAKISTAN	PANGLIMA POWER SDN	Corporate	Electricity and Energy	2003	19/03/2015	NA	NR	MALAYSIA
Pakistan	NA	Sovereign	2007	01/06/17	B -	Caa1	PAKISTAN	MALAYSIA	Sovereign	Government	2003	29/01/2018	A	NR	MALAYSIA
PAK.INTL SUKUK	NA	Sovereign	2005	01/01/10	B -	Caa1	PAKISTAN	MALAYSIA	Sovereign	Government	2005	15/07/2025	NA	A3	MALAYSIA
								SABAH STATE	Sovereign	Government	2009	09/12/2014	NA	NA	MALAYSIA
								SYRKT PRSRNA NEGARA	Sovereign	Government	2003	30/11/2016	NA	NR	MALAYSIA
								MALAYSIA S	Sovereign	Government	2009	27/02/15	NA	A3	MALAYSIA

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
								STD.CHT.BANK MAL	Corporate	Financial Institution	2007	11/2017	NA	NA	MALAYSIA
								Digi Telecommunications	Corporate	Telecommunication	2009	17/07/2014	NA	NA	MALAYSIA
								Malaysia	Sovereign	Government	2009	27/02/2015	NA	A3	MALAYSIA
								Orix Leasing Malaysia	Corporate	Leasing	2011	28/01/2016	NA	NA	MALAYSIA
								Malaysia	Sovereign	Government	2011	15/07/2021	NA	A3	MALAYSIA
								Standard Chartered Bank Malaysia	Corporate	Financial Institution	2007	11/2017	NA	NA	MALAYSIA
								Bank Negara Malaysia	Sub-Sovereign	Government	2011	08/2011	NA	NA	MALAYSIA
								Qatar	Sovereign	Government	2009	09/04/2014	AA	Aa2	QATAR
								Qatar 2	Sovereign	Government	2009	20/01/2015	AA	Aa2	QATAR
								QATAR PETROLEUM	Government	Oil and Gas	2006	30/05/11	NA	NA	QATAR
								QATAR PETROLEUM	Government	Oil and Gas	2006	30/05/11	NA	NA	QATAR
								QATAR	Sovereign	Government	1999	21/05/09	AA	Aa2	QATAR
								QATAR	Sovereign	Government	2000	15/06/30	AA	Aa2	QATAR
								QATAR	Sovereign	Government	2009	20/01/2020	AA	Aa2	QATAR
								QATAR	Sovereign	Government	2009	09/04/2019	AA	Aa2	QATAR
								QATAR	Sovereign	Government	2009	09/04/2014	AA	Aa2	QATAR

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody	Contrary
								QATAR	Sovereign	Government	2009	20/01/2040	AA	Aa2	QATAR
								DOHA BANK	Corporate	Financial Institution	2006	12/2016	NA	NA	QATAR
								DOHA FINANCE LTD	Corporate	Financial Institution	2012	2017	A-	A2	QATAR
								Qatar	Sovereign	Government	2011	20/01/2017	AA	Aa2	QATAR
								Qatar	Sovereign	Government	2011	20/01/2017	AA	Aa2	QATAR
								PAKISTAN MOBL.COMMS	Corporate	NA	2006	13/11/13	B -	Caa1	PAKISTAN
								PAKISTAN MOBL.COMMS	Corporate	NA	2006	13/11/13	B -	Caa1	PAKISTAN
								PAKISTAN	Sovereign	NA	2004	19/02/09	B -	Caa1	PAKISTAN
								PACE (PAKISTAN) LTD CV	Corporate	NA	NA	27/12/12	B -	Caa1	PAKISTAN

Source: Generated by the author.

3.4 BASIC DESCRIPTIVE STATISTICS

This section describes the basic statistics (descriptive statistics) for all the Sukuk and conventional bond returns that are included in the sample. The calculations of the descriptive statistics are purely based on daily returns and follow standard calculations for Mean, Median, Maximum, Minimum, Standard Deviation, Kurtosis and Skewness. It is important to explain these basic statistics before applying the research tests in order to get a better understanding of the important features of the series "returns".

The following formula was used to calculate a time series of CCR (continuously compounded returns) for each Sukuk and conventional bond:

$$R_t = \ln(\frac{P_t}{P_{t-1}}) \quad \text{..... (Eq.1)}$$

Where: P_t = price on day "t" and P_{t-1} = price on the previouse day.

It found that the use of "ln" returns creates normalisation instead of the use of price change percentages where a decrease of a bond price (P_t) cannot be beyond 100% of that price (P_t) due to the fact that there is no negative price in this case.

Table 3.3 presents a summary of the descriptive statistics for the overall return series classified by issuing country across eight countries. On average, as the statistics suggest, the mean return of Sukuk of 0.000077, which is higher than conventional bonds' mean return of -0.00014056. This assumes that investors obtained higher risk-adjusted returns from Sukuk than conventional bonds. Pakistan has the highest average Sukuk return of 0.00053, followed by Bahrain with 0.00014. Saudi has the lowest average Sukuk return of -0.00028. On the other hand, Pakistan has the highest average conventional bond return of 0.00049, followed by Turkey with 0.00042. Malaysia has the lowest average conventional bond return of -0.00248.

Table 3.3 Descriptive Statistics of Sukuk and Conventional Bonds

	Sukuk									Conventional Bonds								
	Saudi	UAE	Kuwait	Qatar	Bahrain	Pakistan	Malaysia	Turkey	All Sukuk	Saudi	UAE	Kuwait	Qatar	Bahrain	Pakistan	Malaysia	Turkey	All Bonds
Mean	-0.00028	0.000107	0.000032250	0.00000583	0.00014	0.000539	0.0000738	0.00000144	0.000077	0.0000534	0.00008 2020	0.00016512	0.00009957771	0.000034996	0.000495	-0.00248	0.000422864	-0.00014056
Median	-0.00018	0.000015	0	0.000008133	0.000129	0	0.000026868	0	0.000000246	0	0.00002329	0.0000025005	0.000000 0769	-0.000005556	0	0.000006352	-0.000105	-0.000009791
Standard Deviation	0.004728	0.006373	0.012570614	0.003577162	0.003673	0.00926	0.003336169	0.002876273	0.005799	0.005622355	0.00646493	0.003736858	0.010025802	0.004813 08	0.019652	0.025008	0.007381618	0.010338142
Kurtosis	4.857649	36.66977	50.10183804	74.78529355	8.414745	29.25769	47.38234055	98.65143924	43.7651	16.29884201	63.17838953	16.60878853	65.19660049	96.019649	98.07614	98.59202	17.93190771	58.98779204
Skewness	-0.15178	-0.67002	2.077853519	-2.793533385	-0.29526	1.313128	1.978161 39	0.768393561	0.278367	-0.05859935	0.722706461	-0.1467761	0.869420334	-2.979 6655	1.046868	0.588238	0.160222785	0.025514405
Minimum	-0.01955	-0.0655	0.121717768	-0.03656167	-0.02587	-0.0898	-0.02490492	0.019008689	-0.01518	-0.03255634	-0.06023281	-0.0212759	-0.15206 5385	-0.0618711	0.250041	-0.22933	0.043330355	-0.03299523
Maximum	0.018384	0.056446	0.100630635	0.0336755	0.019656	0.089088	0.029607115	0.01755526	0.04563	0.032547005	0.060777273	0.022531	0.154168385	0.032737	0.263708	0.028065	0.037582408	0.079014455

Source: Generated by the author.

The median represents the middle values of the mean of the return series. The median for all Sukuk is 0.00000025, while the median for the all conventional bonds is -0.0000097.

Kuwait recorded the maximum return of Sukuk with 0.10063, while Pakistan had the minimum return of Sukuk with -0.0898. In conventional bonds, Pakistan recorded the maximum return of 0.26370, while Malaysia had the minimum return of -0.22933. Overall, all conventional bonds recorded the maximum and the minimum return of 0.07901 and -0.03299 respectively.

The standard deviation is an important statistical measure of the return series volatility. It is calculated as the square root of the variance. It is also used by investors to measure the degree of risk involved in an investment. The relationship between the standard deviation (risk) and return should be positive, represented as higher the risk higher the returns.

The standard deviation of the return of all Sukuk was, on average, lower than that of the conventional bonds at 0.00579 and 0.01033, respectively. In Sukuk, the Kuwait return has the highest standard deviation of 0.012570 when its average return was not the highest among the Sukuk. Similarly, the Turkey return has the lowest standard deviation of 0.00287 as this is the most diversified portfolio when its average return was not the lowest. In conventional bonds, the Malaysia return has the highest standard deviation of 0.02500 when its mean was not the highest. The Kuwait return has the lowest standard deviation of 0.00373 when its mean was not the lowest.

Measuring kurtosis and skewness are considered the main methods for testing normality, and are also used to explain the distributions of the return series. Kurtosis is a measure of the height of the probability distribution, where negative kurtosis points to flatter distribution and positive kurtosis indicates peaked distribution. The coefficient in a normal distribution is expected to have a kurtosis equal to 3. The kurtosis was recorded in all the return series of Sukuk with the highest recorded in

Turkey at 98.65143, followed by Qatar at 74.78529. In conventional bonds, Malaysia has the highest at 98.59202, followed by Pakistan at 98.07614. These extreme kurtoses are positive for all countries in both Sukuk and conventional bonds, which means that the distributions of returns series are leptokurtic (distributions with large positive excess kurtosis), specifying higher peaks than expected from normal distributions.

Skewness is another measure of asymmetry in data distribution, where skewness of zero indicates a symmetrical distribution. Negative value skewness indicates an asymmetrical distribution with a long tail to the left, while positive skewness means an asymmetrical distribution that has a long tail to the right. It can be seen that when skewness values are different from zero, asymmetrical skewness distribution can be found in every series. In other words, a skewness of >1 or < -1 indicates a strong deviation from being symmetrical. The return series are negatively skewed for Sukuk in Saudi, UAE and Bahrain in Sukuk, and in Saudi and Kuwait for the conventional bonds of -0.15178, -0.67002, -0.29526, -0.05859 and -0.14677 respectively. The return series are positively skewed for Turkey in Sukuk and in the UAE, Qatar, Malaysia and Turkey for the conventional bonds of 0.768393561, 0.722706461, 0.869420334, 0.588238 and 0.160222785 respectively. The skewness values are neither less than -1 nor greater than 1 and therefore do not show a strong deviation from symmetrical distribution. On the other hand, the return series are negatively less than -1 for Qatar Sukuk at -2.79353 and at -2.97796 for Bahrain conventional bonds with a strong deviation to a symmetrical distribution. The return series are positively greater than 1 for Kuwait, Pakistan, Malaysia in Sukuk and Pakistan for the conventional bonds of 2.077853519, 1.313128, 1.97816139 and 1.046868 respectively, which demonstrates significantly strong asymmetry. So, in terms of the normality test, Kurtosis and skewness for all series are significantly deferent from zero and shows an abnormal distribution of return series.

The descriptive statistics for all of the return variables used are presented in Appendixes 7-20 based on the regional data sets of the study, which also indicates that the tests of the kurtosis and skewness for all of the series do not show normal distribution.

3.5 A BRIEF BACKGROUND OF SUKUK AND CONVENTIONAL BOND MARKETS IN THE SELECTED COUNTRIES

3.5.1 Sukuk and Conventional Bond Markets in Saudi Arabia

Saudi Arabia is considered to be the largest Arab country in Western Asia and the second largest in the Arab world in terms of area, as it constitutes the biggest part of the Arabian Peninsula. The economic system in Saudi Arabia is based on the oil and gas sector, as the country holds 18% of the world's petroleum reserves and ranks as the largest exporter of petrol.

In 1988, the first Saudi Government Development Bonds were issued with fixed coupons payable to raise funds to finance the country's projects. In the 1990s, Saudi Arabia issued conventional bonds to fund budget deficits through conventional government bonds known as Saudi Government Development Bonds (Alsaeed, 2012).

Sukuk markets in Saudi Arabia can be categorised into domestic and international issuances. The domestic issuances are denominated in Saudi Ryal (SAR) where most of the institutions prefer issuing sukuk in local currency due to high liquidity, and the international issuances are mainly denominated in US dollars (USD). Saudi Arabia has traditionally preferred the Sukuk issuance route over the conventional bond, and it is the major GCC player in Sukuk issuance (SHC, 2013).

In 2004, Saudi Arabia issued its first Sukuk from HANCO Rent-A-Car, which was structured on an Ijarah basis for three years (Alshamrani, 2014). In 2006, SABIC issued Sukuk Ijarah worth $ 96.69 billion (Tadawul, 2015). In 2008, the country sought expansionary initiatives to overcome the global financial crisis. In 2009, the creation of a market for the trading of financial Sukuk and bonds in the Kingdom of Saudi Arabia was approved (SHC, 2013). This trading market has been developed constantly up to its present level of diversity and sizes (Tadawul, 2015).

Alshamrani (2014) believes that the delay in Sukuk issuance was due to the lack of an independent body governing the issuance of securities. In September 2015, Saudi Arabia issued Almarai Company Sukuk with a floating interest rate worth $426.6 million, followed by The National Shipping Company of Saudi Arabia with $1.04 billion in Sukuk.

On the other hand, the government of Saudi Arabia has been an issuer of sovereign bonds since 2007 to cover the budget deficit created by low oil prices, with a total of three issuances for $5.3 billion, $5.3 billion and $4.0 billion (Reuter, 2015).

3.5.2 Sukuk and Conventional Bond Markets in UAE

The UAE has a high standard of living that continues to attract expatriates from around the world. It is aiming to diversify its economy away from a reliance on oil and gas revenue and tourism. For this reason, the UAE has been announcing considerably increases in public spending over the last few years.

According to Torchia (2015), Dubai is the world's largest centre for listed Sukuk with $36.71 billion, exceeding Malaysia, Ireland and London.

The UAE, between 1996 and 2013, was the source of 73 Sukuk issuances for a total value of $47.9 billion that placed the UAE second only to Malaysia in terms of global Sukuk activity.

In 2010, Abu Dhabi Islamic Bank issued Sukuk of $750 million – this was the largest corporate issuance in the UAE that year and helped the country recover after the global financial crisis. It also made a significant contribution to Sukuk development in 2012 by issuing of a perpetual Sukuk based on the Mudarabah contract, which was the first sharia-compliant tier-one issue since AAOIFI issued its Sukuk guidelines in 2008. In 2013, Abu Dhabi and Dubai issued corporate Sukuk issuances worth a total of $3.35 billion, exceeding Saudi Arabia and to continuing to drive Sukuk growth within the GCC (Oxford Business Group, 2015).

As of the end of 2015, the UAE has shown a preference for conventional bond issuance over Sukuk. The Bank of Sharjah issued a five-year USD-

denominated bond at a coupon rate of 3.37% worth $500 million; the National Bank of Abu Dhabi also issued a $750 million non-call five-year perpetual Tier 1 bond at 5.25% (Rasameel, 2015).

3.5.3 Sukuk and Conventional Bond Markets in Kuwait

In recent decades, the Kuwait market has witnessed growth globally. The Kuwait debt market is still at a nascent stage, thus its Sukuk market is very small compared to that for conventional bonds.

In 2005, the first Kuwait Islamic Sukuk was issued worth $100 million. The Kuwait debt market saw a total of $ 89.112 million of bonds and Sukuk issued between 2005 and 2014 through 358 issues. Sukuk issues represented 22 of these, with a total issue size of $ 3.000 million compared to conventional bonds issues of 336 with total issue size of $ 68.111 million.

The main issuers of these Sukuk are companies and not the Central Bank of Kuwait, representing about 82% of the total amount for corporate Sukuk issued in Kuwait. The Central Bank of Kuwait's bond issuance is the reason for the large difference in the amounts between conventional bonds and Sukuk as it does not issue the latter (Trad and Bhuyan, 2015).

3.5.4 Sukuk and Conventional Bond Markets in Qatar

Qatar is significantly active in the global Islamic centres such as Malaysia. It was one of the first countries to recognise the importance of Islamic debt markets. Sukuk issuance has seen growing demand in Qatar, and the net proceeds from Sukuk issuance have been used for the country's general funding purposes, such as growing its oil and gas sector and funding various infrastructure investments.

In 2003, the Government of Qatar issued sovereign Sukuk for the first time with $700 million through a seven-year Sukuk for the construction of a hospital in Doha (Safari et.al, 2014). In 2009, Qatar sold a $3 billion two-part bond and a $7 billion three-tranche deal, which was considered the largest sovereign Sukuk sale by an emerging market.

In 2011, Qatar played a central role in the recovery from the global financial crisis, issuing around 11% of global Sukuk. In 2011, Qatar also saw the largest single issuance of a three-year batch valued at $9.06 billion. In 2012, Qatar issued Sukuk worth $4 billion. Since then, Qatar has continued issuing Sukuk with $2.35 billion in 2013 and $3.02 billion in 2014 (the third-highest in both years) (Narayanan and French, 2016).

3.5.5 Sukuk and Conventional Bond Markets in Bahrain

Bahrain has become the main global leader in Islamic finance, playing host to the largest Islamic financial institutions in the Middle East as well as to a number of organisations central to the development of Islamic finance, such as AAOIFI, IIFM and IIRA.

However, the Bahrain debt and Sukuk markets remain less developed compared to other financial markets. Despite the small size of the Bahrain debt market, Sukuk represents a large part of this market, which has led to an absence of market liquidity.

The first Sukuk were issued by Bahrain in 2001 by the Central Bank of Bahrain with the issuance of the first US-dollar-denominated Ijara Sukuk of $100 million. In recent years, government issuance has prompted growth in the national bond and Sukuk markets (Parashar, 2012).

3.5.6 Sukuk and Conventional Bond Markets in Pakistan

In 2005, Pakistan issued its first government Sukuk Al-Ijara listed on the Luxembourg Stock Exchange raising $600 million. In 2012, Sukuk issuance reached its peak before it slowed down. In 2013, the total Sukuk issued reached approximately $7 billion – almost half of 2012's value. According to the Securities and Exchange Commission of Pakistan, 80% of the total value of Pakistani Sukuk have been sovereign issues, issued by the government (Thomson Reuters Zawya, 2014).

The value and volume of Sukuk issues in Pakistan witnessed a huge increase on a year-to-year basis, where sovereign issues of Sukuk remain consistent in this regard. The Pakistan corporate sector is slowing the growth rate of Pakistan Sukuk issues and relying instead on funding raised through syndicate transactions (Thomson Reuters Zawya, 2014).

3.5.7 Sukuk and Conventional Bond Markets in Malaysia

Malaysia is currently considered the world's largest Sukuk issuer. Its Sukuk market has grown along with its wider economy, reaching more than 50% of the country's total debts. Malaysian Sukuk market liquidity and depth plays a key role in the stability of the country's financial system (Zin et.al, 2011).

In 1990, the Malaysian Sukuk market began with the first non-Islamic company to issue Sukuk. In 2002, Malaysia issued the first global sovereign Sukuk of $600 million (Sukor et.al, 2008). Between 2001 and 2007, the Malaysian Sukuk market raised more funds than its conventional bond market (Ahmad and Radzi, 2011). In 2008, during the financial crisis, Sukuk issuance declined to almost half of the level seen in 2007. However, in 2009, the Malaysian Sukuk market started to increase again with almost 65 issues. Since then, Malaysia has continued to grow, becoming the international global Sukuk benchmark and attracting investors from all over world (Ahmad and Radzi, 2011).

3.5.8 Sukuk and Conventional Bond Markets in Turkey

Turkey is one of the top 20 largest economies in the world, in spite of the fact that it is one of the newest prospects in the global Sukuk market. It is home to more than 72 million Muslims in Europe (Kayadibi et.al, 2014).

In the last decade, the total share of Islamic banking assets in the country has increased from 2% to 6%. This is due to the new strategy of giving financial institutions the responsibility of handling the sale of Islamic financial instruments in the country (Bilmen, 2013).

In 2010, Kuveyt Türk issued Turkey's first Sukuk worth $100 million. The first USD-denominated sovereign Sukuk was issued in September 2012 at a value of $1.5 billion. Furthermore, the first TRY-denominated sovereign Sukuk was issued in October 2012, at a value of $904 million and the first Turkish TRY Sukuk was issued in March 2013, by Bank Asya outside of Turkey. Ijara Sukuk is the most common Sukuk issued in Turkey.

However, there is a lack of Shariah professionals in the Turkey Sukuk market. Its plan over the next 10 years is to compete with Malaysia as the

world's top Sukuk issuer in addition to increasing the huge pool of Sukuk investors around the globe (Kayadibi et.al, 2014).

3.6 CONCLUSION

This chapter has identified and explained the reasons for selecting a quantitative approach for this study. It has also discussed the methods for data collection and analysis as well as presenting the research framework. In addition, it has described the Sukuk and conventional bond data that were used for this study. This chapter also discussed the descriptive statistics (statistical properties) of the main series under the study. The following chapters will present the adopted methodologies and the results of the main tests undertaken in this study.

CHAPTER 4

ANALYSIS OF MARKET EFFICIENCY

4.1 INTRODUCTION

The efficient markets theory, or more specifically the efficient market hypothesis (EMH), assumes that stock prices reflect all available information at any point in time. According to Fama (1970), an efficient market is important for the proper evaluation of a company's intrinsic value and has important implications for investors and financial managers. Any new information that could change a company's future profitability must be immediately reflected in the share price, as any delay in the dissemination of information into the price would lead to mispricing. This situation is not ideal, as it could lead to abnormal profits in the stock market, impacting long-term investors.

This chapter aims to test the market efficiency hypothesis for Sukuk and compare it to conventional bonds. The rest of this chapter is organised as follows: the next section reviews the related literature on the market efficiency. Section 4.3 will explain the approaches that have been used to test the weak form of efficient market hypothesis. The following section will describe and discuss the results of the statistical tests including autocorrelation test, runs test and variance ratio test. The last section concludes the findings of this chapter.

4.2 LITERATURE REVIEW OF THE EFFICIENT MARKET HYPOTHESIS

Fama (1965), in his seminal paper, introduced the EMH, although the idea of efficient markets can be traced back to Bachelier (1900). Several definitions exist in economic literature to define the EMH.

Fama (1970, p.383) defined an efficient market as:

"A market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions and investors can choose among the securities that represent ownership

of firms' activities under the assumption that security prices at any time fully reflect all available information".

The concept of efficient markets implies that market prices respond to the information available at that particular time.

Fama (1970) introduced the efficient market hypothesis (EMH) along with three sub-hypotheses depending on the information set involved. A market can be classified as either weak form, semi-strong form or strong form efficient in terms of information efficiency.

There have been several studies in developed markets on testing weak form efficiency to evaluate the proposition that price changes are random and past changes are not useful in forecasting future price changes such as; such studies include Fama (1970), Granger (1975), Hawawini (1984) and Fama (1991). In other words, these studies attempt to test the weak-form efficiency considering high transaction costs. Most of the research on the EMH has focused mainly on the US financial markets and those of European countries, while a small number have investigated the developing markets. Mobarek and Keasey (2000) report that developed markets are comparatively more efficient than emerging ones.

No formal study has as yet looked exclusively at the efficiency of the Sukuk market. Only a few studies were found regarding Islamic capital markets efficiency. Poshokwale (1996) provides empirical evidence on weak form efficiency in the Indian stock market over the period 1987-1994. The results of the run and serial correlation tests indicate that the stock market is not weak form efficient. Mobarek and Keasey's (2000) results of both non-parametric (run test) and parametric tests (Auto-correlation test) show that the share return series of the Dhaka Stock Exchange do not follow the random walk theory and that the significant autocorrelation coefficient at different lags reject the null hypothesis of weak form efficiency. Ardiansyah and Abdul Qoyum (2011) tested the semi-strong form efficiency of the Malaysian stock market in relation to the information content of dividend announcements in the Jakarta Islamic index, and concluded that it was not semi-strong form efficient. Nisar and

Hanif (2012) tested the weak form of EMH of south Asia including Pakistan, India, Srilanka and Bangladesh using monthly, weekly and daily data on index values from 1997 to 2011. They applied runs tests, serial correlation tests, unit root tests and variance ratio tests. Their findings suggest that none of the four stock markets support the random-walk hypothesis and hence all of these markets are not weak form efficient. Al-Ashikh (2012) tested the weak-form efficiency hypothesis and the day-of-the-week effect on the Saudi stock exchange using a linear regression model. His results show that the Saudi stock exchange was not weak form efficient.

4.2.1 Factors Affecting Market Efficiency

Market efficiency can be divided into operational and informational efficiency. Operational efficiency depends on liquidity (bid-ask spreads, commission levels and market depth), transparency and regulatory standards, and information flow. All other things being equal, if the transaction and other costs are high, there will be fewer trades, hence the market efficiency will be low. Informational efficiency depends on how quickly information is reflected in prices. Consequently, if the market is operationally efficient, it will help it to incorporate information efficiently and vice versa. The number of market participants is also important; if this is high, the chance pf having an efficient market is also high.

4.2.2 Types of Market Efficiency

Fama (1970) identified three types of market efficiency. These are classified as weak form, semi-strong form and strong form efficiency.

4.2.2.1 Tests of Weak Form Market Efficiency

Weak form efficiency requires that current prices reflect all information on past price patterns, volumes, interest rates and technical analysis (Fama, 1970). To test the weak form efficiency, various statistical analysis tests can be applied. These include the unit root test, auto correlation test, runs test and variance ratio test. The random walk hypothesis suggests that any changes in the prices are expected to be random (Arnold, 2008). In other words, the expected return conditional on past information is zero,

meaning that past prices cannot be used as a predictive tool for future stock price movements (Campbell et al., 1997).

4.2.2.2 Tests of Semi-Strong Form of Market Efficiency

The semi-strong form of market efficiency requires that prices reflect all past and all current publicly available information (Fama, 1970) (for instance, current economic and political news, latest earnings forecasts, stock splits, accounting information, earnings and dividend announcements, fundamental analysis, and changes in senior management). Event studies are used to see investors' reaction to public information as a way to test semi-strong forms of market efficiency. This process consists of four steps: first, identification of the event. Second, identify the stocks associated with the event. Third, measure the expected return for each of the stocks around the announcement date. Lastly, use statistical analysis to see the presence of abnormal returns for each stock based on the differential between expected and actual ones.

4.2.2.3 Tests of Strong Form of Market Efficiency

The strong form of market efficiency requires that prices reflect all public and private information. It tests whether investors can earn abnormal profits by trading on private information. This form of market efficiency is difficult to test because it is difficult to get dates for private information (Campbell et al., 1997).

4.2.3 Market Anomalies in Market Efficiency

Market anomaly refers to potential inefficiencies that cause securities to be mispriced. Market anomalies can be divided into three categories. The first type is cross-sectional phenomenon and includes size effect, value effect, book to market ratios and Price-Earnings (P/E) ratio effect. The second type includes the calendar or seasonality effects, momentum effect and overreaction. The last type includes closed-end fund discounts, the long run underperformance of initial public offerings (IPO), stock splits, return reversals (winners and losers), moving averages, etc. (Fama and French, 1995).

The size effect refers to the negative relationship between firm capitalisation and stock returns whereby large companies generate low returns compared to small companies as measured by the capitalisation differential between small and big firms.

The value effect shows that companies with high book-to-market ratios (value stocks) outperform those with low book-to-market ratios (growth stocks), as measured by high book-to-market ratios minus low ones (Ibnrubbian, 2012).

The calendar or seasonality effects are anomalies in returns related to specific days or months, for example, the January effect, weekend effect and turn-of-month effect are the most commonly known anomalies. The January effect is the most significant calendar anomaly, where stock returns in January are much higher than in other months (Al-Ashikh, 2012).

The momentum effect is based on the observation that an increase in asset prices in the past will probably continue to go up for some time in the near future. If this happens, markets are not considered weak form efficient (Fama and French, 1995).

Empirical studies show that the majority of these anomalies are not present at all the times but may come during different time periods, and if investors try to trade on these seasonal anomalies, it is not possible to earn an abnormal return once transaction costs are included (Ibnrubbian, 2012). In Muslims countries, some researchers have identified Ramadan and Hajj effects on stock volatility in the context of calendar effects. Ramadan is a time when all adult Muslims are required to fast from sunrise to sunset with an exemption from fasting for the sick or for travellers. During Ramadan, Muslims offer extra prayers and charity that causes economic activities to slow down, and business hours are reduced to five working hours per day. As a result, stock market activity cannot be excluded from the impact of Ramadan where trading volumes and liquidity tend to be at their lowest levels, although the usual business hours of the stock market do not change during the period. Hajj is a pilgrimage for all Muslim adults who are financially and physically able do so to the city of

Makah. It falls on the last month (the twelfth month) of the Islamic calendar, and has the same characteristics as Ramadan, in terms of trading volumes, with liquidity tending to be at its lowest yearly levels (Al-Ississ, 2010).

4.3 METHODOLOGY

4.3.1 The Random Walk Model

The EMH can be tested on a market using different types of testing techniques. It can be tested using the random walk model or by using the Capital Asset Pricing Model (CAPM). The CAPM model cannot be applied in this study due to a number of issues. This includes the lack of risk-free benchmarks in the Sukuk market, where the CAPM model requires the availability of a risk-free benchmark, in addition to the assumption of a well-diversified market portfolio.

Ibnrubbian (2012) states that Sukuk are basically ownership instruments, designed in such a way that they cannot be used as a benchmark for risk-free rates or as debt instruments, as they do not pay any interest. For this reason, it is difficult to apply risk-adjusted returns based models like the CAPM and other similar models in the Sukuk market.

Bachelier (1900) formulated the basis of the random walk theory that any new information that analysts used to estimate fundamental value would occur in an independent or unsystematic manner over time. Osborne (1959) extended this framework (random walk theory) by formulating the assumption that the evaluation by one analyst would not influence the evaluation of another, which means that the evaluation of the new information would be also independent. From these assumptions, it can therefore be concluded that successive market price changes should be unsystematic (Mahajan and Luthra, 2013).

According to Fama (1970), an efficient financial market is a market where all available information is reflected in prices and price changes must be a response only to new information, as the information arrives randomly and prices changes unpredictably.

The following equation describes the Random Walk model mathematically

$$P_{t+1} = P_t + e_{t+1} \quad \text{(Eq.2)}$$

Where: P_{t+1}=Price of share at time; P_t= Price of share at time; e_{t+1}= Random error with zero mean and finite variance.

The main objective of this chapter is to analyse the information efficiency of the Sukuk market and compare it with that of conventional bonds by looking at the randomness of returns in light of the EMH.

Some studies used unit root tests to evaluate the random walk hypothesis. In this study, the unit root tests will not be used as it is not designed to detect predictability (Campbell et al., 1997).

In order to test the weak form of the EMH, scholars have applied a good mix of tools, as explained in the next section.

4.3.1.1 Statistical Tests for Independence

4.3.1.1.1 Autocorrelation test

The term "autocorrelation" in the context of time series analysis can refer to lagged correlation or serial correlation in the returns data of a security. The autocorrelation test represents a statistical parametric test to identify the degree of the autocorrelation in a time series, which is considered to be the first approach in detecting the random walk of stock returns (Campbell et al., 1997). It measures the relationship between the current stock return and its value in the previous period (the current and lagged observations of the time series of stock returns). The mathematical formula used for autocorrelation test is presented in the following equation:

$$\rho_k = \frac{\sum_{t-1}^{N-K}(r_t-\bar{r})(r_{t+k}-\bar{r})}{\sum_{t=1}^{N}(r_t-\bar{r})^2} \quad \text{(Eq.3)}$$

Where ρ_k is the serial correlation coefficient of stock returns of lag k; N is the number of observations; r_t is the stock return over period t; r_{t+k} is the stock return over period $t+k$; r is the sample mean of stock returns and k is the lag of the period.

Statistically speaking, if ρ_k is significantly different from zero at a specified significance level, the null hypothesis of a random walk is rejected. This could be due to slow adjustment of prices in response to new information (a positive autocorrelation) or it might also be associated with infrequent trading. In contrast, an extensive fluctuation in the stock price around its mean value or intrinsic value shows negative autocorrelation.

The null and the alternative hypotheses can be expressed as:

H_0: Autocorrelations co-efficient at all lags are simultaneously equal to zero.

H_1: Autocorrelations co-efficient at all lags are simultaneously different from zero.

According to Campbell et al. (1997), the Ljung–Box portmanteau statistic is used to test the previous hypothesis. The following equation describes the Ljung-Box portmanteau statistic.

$$Q_{Ljung-Box} = n(n+2)\sum_{t=1}^{k} \frac{\psi^2(t)}{n-t} \quad \text{..... (Eq.4)}$$

Where *n* is the sample size; $\psi^2(t)$ is the sample autocorrelation at lag t and *k* is the number of lags being tested. This statistic tests the overall correlation based on a number of lags, instead of testing serial correlation at a specific lag.

4.3.1.1.2 The Runs Test

The runs test is a non-parametric statistical test, also known as a Geary test or Wald–Wolfowitz test. It can also be applied to test the random walk hypothesis. It looks at successive price changes, whereby the number of sequences of consecutive positive and negative returns is tabulated (Campbell et al., 1997). The runs test can be described as a sequence of consecutive price changes with the same sign, where the runs sign can be positive, negative, or have no change. The changes of stock prices of runs can be categorised into upward run, downward run and flat run. The runs test, unlike the autocorrelation tests, requires no assumptions about population distribution. Its only required assumption is

that the underlying process is continuous. The total of the expected number of runs is distributed as normal with the following mean:

$$\mu = E(r) = \frac{n+2n_A\,n_B}{n} \quad \text{..... (Eq.5)}$$

Where r is the actual runs; n is the number of observations and $n_A and\, n_B$ are the number of observations above and below the mean. The expected number of runs is normally distributed under the null hypothesis for large observations, so that successive returns are independent. The standard deviation of runs is:

$$\sigma_R = \sqrt{\frac{2n_A\,n_B\,(2n_A\,n_B\,-n)}{n^2(n-1)}} \quad \text{..... (Eq.6)}$$

The test is based on the assumption that the observed series is a random series. The null hypothesis is that the daily bond returns are fluctuating randomly.

In a runs test, Z- statistics are used to test whether the actual number of runs is consistent with the hypothesised number of runs (price changes). The null hypothesis will be rejected if the calculated Z score is greater than the critical value at an appropriate level of significance. This means that if the actual runs are greater than the expected number of runs (+Z), a negative serial correlation will appear, whereas if the actual runs (or price changes in the series) are less than the expected level (-Z), a positive serial correlation will result, since the null hypothesis implies that actual runs are not significantly different from the expected number of runs. In other words, any market will not be classified as weak form efficient unless the Z-value is greater than or equal to (+/-) 1.96, at a 5% level of significance, where the standard Z-statistic can be calculated as:

$$Z = \frac{r-\mu}{\sigma}, Z \sim N(0,1) \quad \text{..... (Eq.7)}$$

4.3.1.1.3 The Variance Ratio Test

Lo and Mackinlay (1988) developed the variance ratio test which is considered to be a more sophisticated test to check the randomness of a series. The variance ratio test is one of the various methods that many

scholars have employed to determine the predictability of stock returns. It is more reliable and powerful compared to unit root tests. It is often used to test the hypothesis that the variance of increments in the random walk series is linear in the sample interval. The null hypothesis of this test is that the variance of increments in the random walk series is linear (Smith and Ryoo, 2003). Specially, the variance of its q-differences would be q times the variance of its first differences, as:

$$Var(p_t - p_{t-q}) = qVar(p_t - p_{t-1}) \quad \text{..... (Eq.8)}$$

Where "q" is any positive integer. The variance ratio under the null hypothesis is equal to 1 and determined as follows:

$$VR(q) = \frac{\frac{1}{q}var(p_t - p_{t-q})}{var(p_t - p_{t-1})} = \frac{\sigma^2(q)}{\sigma^2(1)} = 1 \quad \text{..... (Eq.9)}$$

Where: $\sigma^2(q)$= is an unbiased estimator of the variance of the qth difference and $\sigma^2(1)$= is the estimated variance of the first difference.

The asymptotic distribution to test the null hypothesis under the estimated variance ratios provides two standard test statistics, Zq (derived under the assumption of homoscedasticity) and Z*q (derived under the assumption of heteroscedasticity) respectively, generated by Lo and MacKinlay (1988). The test statistic of heteroscedasticity in stock prices is sensitive enough to correlate changes and is robust enough to many general forms of heteroscedasticity and non-normality. This makes it useful with stock returns as they sometimes do not exhibit normal distribution. The null hypothesis that the price increment follows a random walk model and hence the stock market is weak form efficient can be tested by the following equations:

$$Z(q) = \frac{VR(q)-1}{[\emptyset(q)]1/2} \sim N(0.1) \quad \text{..... (Eq.10)}$$

$$Z^*(q) = \frac{VR(q)-1}{[\emptyset^*(q)]1/2} \sim N(0.1) \quad \text{..... (Eq.11)}$$

However, the null hypothesis would be to accept if the joint probability is greater than 5%, which means the variance ratio is equal to one and the calculated Z statistic falls between ± 1.96. So, the null hypothesis can be

rejected if the calculated value will not be equal to one and the conclusion that the stock market rejecting the EMH is not weak form efficient.

The null hypothesis of this test is that price increments follow a random walk. The null hypothesis will be rejected if the critical value is significantly lower than the calculated Zq score, which implies that the stock price does not satisfy the random walk condition, nd hence rejecting the EMH.

4.3.1.2 Technical Trading Rule-Based Tests

Generally, a technical trading rule analysis is a set of trading rules that can be used to generate buy and sell trading signals. In stock returns, the existence of serial correlation is a sign of non-randomness in returns and it is not a sufficient condition to prove that the market is not efficient. To investigate further, if any trading rule can earn abnormal profits by trading on those autocorrelations (in past data) taking into account of the transaction costs, this will be a sufficient evidence to classify that series or market as not (informationally) weak form efficient.

4.3.1.2.1 Moving Averages

Moving averages is one of the oldest and most popular techniques to get buy and sell signals from movements in stocks and bonds. There are different types of rules like simple moving average with a band, moving average crossover, dual moving average crossover and exponential moving average crossover.

4.3.1.2.2 Filter Rules

Alexander (1961, 1964) introduced the filter rules, which have been comprehensively used by many academics to improve the quality of signals for trading in bonds and shares.

Fama and Blume (1966) considered the filter rule test as the more sophisticated criterion to identify movement in stock prices. Alexander's filter rule is defined as the process where the performance of the trading rule at a certain level is compared to the strategy of buy-and-hold for a certain period. So, if today’s closing price rises or falls by at least x%

above or below its most recent low or high, it is generating a buy or sell signal; for example, one should sell the security if the daily closing price of the security moves down at least x%, until the price moves up at least x% from the previous low. However, if the market is weak form efficient, no such strategy can easily beat the passive buy and hold strategy.

4.4 RESULTS

4.4.1 Results of Autocorrelation Test

The following table shows the output obtained from the application of an autocorrelation test to the selected sample of Sukuk and conventional bonds. The argument here of whether Sukuk and conventional bonds' returns follow random walk hypothesis will be tested using daily data up to 12 lags. Ljung-Box Q-statistics are used to improve the robustness of the autocorrelation analysis by examining whether the correlation coefficient at selected lags is equal to zero. If the P-value of the Q-statistics is less than 0.05, the null hypothesis that autocorrelation coefficients are equal zero will be rejected at a 0.05 level of significance. It will be interesting to see if historical data can be used to predict future returns and more possibly earning abnormal returns.

Tables 4.1 and 4.2 show auto-correlation and Ljung-Box Q-statistics for all of the Sukuk and conventional bonds included in this study.

Table 4.1 Autocorrelation Coefficients and Ljung-Box Q-Statistics in Daily Sukuk Returns

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
Turkey	KT SUKUK	1	0.001	0.001	0.001	1	0.978
		2	0	0	0.001	2	1
		3	-0.429	-0.429	97.37	3	0
		4	-0.043	-0.052	98.35	4	0
		5	0.02	0.024	98.57	5	0
	KT SUKUK 2	1	-0.416	-0.416	20.25	1	0
		2	-0.072	-0.296	20.86	2	0
		3	0.214	0.069	26.31	3	0
		4	-0.186	-0.086	30.81	4	0
		5	0.046	-0.031	30.74	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
PAKISTAN	PAKISTAN SUKUK	1	-0.003	-0.003	0.011	1	0.918
		2	-0.112	-0.112	14.61	2	0.001
		3	0.056	0.056	18.26	3	0
		4	-0.022	-0.035	18.83	4	0.001
		5	0.054	0.068	22.26	5	0
	PAKISTAN SUKUK 2	1	0.046	0.046	2.502	1	0.114
		2	0.041	0.039	4.485	2	0.106
		3	-0.094	-0.098	14.69	3	0.002
		4	-0.051	-0.045	17.77	4	0.001
		5	0.01	0.023	17.88	5	0.003
	PAKISTAN SUKUK 3	1	0.002	0.002	0.003	1	0.956
		2	0.049	0.049	2.784	2	0.249
		3	-0.067	-0.067	7.937	3	0.047
		4	0.013	0.011	8.145	4	0.086
		5	0.009	0.016	8.248	5	0.143
	PAKISTAN INTIL SUKUK	1	-0.215	-0.215	5.934	1	0.015
		2	-0.015	-0.064	5.963	2	0.051
		3	-0.015	-0.034	5.992	3	0.112
		4	-0.015	-0.029	6.023	4	0.197
		5	-0.015	-0.028	6.054	5	0.301
	PAKISTAN SUKUK 4	1	-0.336	-0.336	121.7	1	0
		2	0.057	-0.063	125.2	2	0
		3	-0.034	-0.04	126.5	3	0
		4	-0.07	-0.104	131.8	4	0
		5	0.224	0.189	186.4	5	0
Kuwait	URCSUKUK	1	-0.044	-0.044	0.775	1	0.379
		2	0.019	0.017	0.926	2	0.629
		3	-0.01	-0.008	0.963	3	0.81
		4	0.074	0.073	3.224	4	0.521
		5	-0.082	-0.076	5.971	5	0.309
Bahrain	CBB SUKUK	1	-0.363	-0.363	142.2	1	0
		2	0.033	-0.114	143.4	2	0
		3	-0.053	-0.095	146.5	3	0
		4	-0.063	-0.135	150.8	4	0
		5	0.155	0.089	176.7	5	0
	CBB SUKUK 2	1	-0.251	0.125	24.89	1	0
		2	-0.045	0.061	25.70	2	0
		3	0.134	0.1	32.80	3	0
		4	0.022	0.061	33.00	4	0
		5	0.013	0.126	33.07	5	0
	MMB SUKUK	1	-0.107	-0.107	12.44	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
Malaysia		2	-0.067	-0.079	17.29	2	0
		3	0.025	0.009	17.95	3	0
		4	-0.023	-0.025	18.53	4	0.001
		5	0.186	0.186	55.84	5	0
	FIRST MALAYSIA SUKUK	1	-0.253	-0.253	54.43	1	0
		2	-0.067	-0.14	58.26	2	0
		3	-0.041	-0.105	59.71	3	0
		4	-0.005	-0.061	59.73	4	0
		5	-0.049	-0.091	61.78	5	0
	FISRT MALAYSIA SUKUK 2	1	-0.214	-0.214	31.91	1	0
		2	0.017	-0.03	32.11	2	0
		3	0.017	0.015	32.33	3	0
		4	0.018	0.026	32.54	4	0
		5	-0.024	-0.016	32.96	5	0
	WAKALA GLOBAL SUKUK	1	-0.2	-0.2	19.79	1	0
		2	0.046	0.006	20.85	2	0
		3	-0.083	-0.076	24.3	3	0
		4	0.047	0.016	25.38	4	0
		5	-0.03	-0.015	25.82	5	0
	WAKALA GLOBAL SUKUK 2	1	-0.33	-0.33	54.5	1	0
		2	0.104	-0.006	59.90	2	0
		3	0.012	0.05	59.97	3	0
		4	-0.02	-0.001	60.17	4	0
		5	-0.029	-0.047	60.60	5	0
	BNM SUKUK 1	1	-0.012	-0.012	0.014	1	0.907
		2	-0.016	-0.016	0.037	2	0.982
		3	-0.017	-0.018	0.064	3	0.996
		4	0.011	0.01	0.076	4	0.999
		5	0.02	0.02	0.116	5	1
	PETRONAS GLB SUKUK	1	-0.387	-0.387	158.4	1	0
		2	0.144	-0.007	180.3	2	0
		3	-0.236	-0.215	239.5	3	0
		4	0.194	0.038	279.4	4	0
		5	-0.161	-0.079	306.9	5	0
	ALMANA SUKUK	1	-0.016	-0.016	0.171	1	0.68
		2	-0.035	-0.035	0.968	2	0.616
		3	-0.046	-0.047	2.349	3	0.503
		4	0.001	-0.002	2.35	4	0.672
		5	-0.022	-0.025	2.652	5	0.753
	QIIB SUKUK	1	-0.305	-0.305	15.80	1	0
		2	-0.176	-0.297	21.11	2	0
		3	0.055	-0.127	21.64	3	0
		4	-0.114	-0.233	23.87	4	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
Qatar		5	0.078	-0.08	24.94	5	0
	QIB SUKUK	1	-0.44	-0.44	33.45	1	0
		2	-0.017	-0.261	33.50	2	0
		3	0.039	-0.113	33.77	3	0
		4	0.025	-0.01	33.88	4	0
		5	-0.073	-0.071	34.83	5	0
	ALMANA SUKUK 2	1	-0.264	-0.264	24.21	1	0
		2	0.037	-0.035	24.69	2	0
		3	0.046	0.051	25.44	3	0
		4	0.025	0.056	25.66	4	0
		5	-0.129	-0.117	31.49	5	0
	QIB SUKUK 2	1	-0.23	-0.23	40.65	1	0
		2	-0.098	-0.159	48.02	2	0
		3	-0.025	-0.095	48.50	3	0
		4	-0.039	-0.094	49.67	4	0
		5	0.033	-0.018	50.53	5	0
	QREIC SUKUK	1	-0.33	-0.33	109.6	1	0
		2	-0.005	-0.128	109.6	2	0
		3	0.007	-0.042	109.7	3	0
		4	-0.171	-0.209	139.1	4	0
		5	0.021	-0.136	139.5	5	0
UAE	DP SUKUK	1	-0.021	-0.021	0.669	1	0.413
		2	0.017	0.017	1.117	2	0.572
		3	-0.017	-0.016	1.561	3	0.668
		4	-0.028	-0.029	2.776	4	0.596
		5	-0.033	-0.034	4.519	5	0.477
	EIB SUKUK	1	0.026	0.026	0.166	1	0.683
		2	0.161	0.16	6.411	2	0.041
		3	-0.043	-0.053	6.868	3	0.076
		4	0.203	0.185	16.88	4	0.002
		5	0.125	0.136	20.71	5	0.001
	EIB SUKUK 2	1	-0.089	-0.089	2.896	1	0.089
		2	0.07	0.063	4.694	2	0.096
		3	-0.006	0.006	4.707	3	0.195
		4	-0.038	-0.043	5.244	4	0.263
		5	0.031	0.025	5.6	5	0.347
	FGB SUKUK	1	-0.236	-0.236	27.11	1	0
		2	-0.12	-0.186	34.15	2	0
		3	-0.075	-0.168	36.94	3	0
		4	-0.03	-0.137	37.38	4	0
		5	0.007	-0.092	37.41	5	0
	FGB SUKUK 2	1	-0.303	-0.303	33.37	1	0
		2	-0.117	-0.23	38.32	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		3	0.029	-0.098	38.63	3	0
		4	-0.104	-0.18	42.60	4	0
		5	0.013	-0.115	42.66	5	0
	SIB SUKUK	1	-0.465	-0.465	115.9	1	0
		2	0.051	-0.211	117.3	2	0
		3	0.012	-0.076	117.4	3	0
		4	-0.147	-0.218	128.9	4	0
		5	0.266	0.128	167.0	5	0
	HILAL SUKUK	1	-0.025	-0.025	0.429	1	0.513
		2	-0.036	-0.037	1.307	2	0.52
		3	0.049	0.048	2.939	3	0.401
		4	0.062	0.063	5.471	4	0.242
		5	0.054	0.061	7.418	5	0.191
	ADIB SUKUK	1	-0.068	-0.068	0.687	1	0.407
		2	0.083	0.079	1.716	2	0.424
		3	0.01	0.021	1.731	3	0.63
		4	0.122	0.118	3.964	4	0.411
		5	0.06	0.076	4.521	5	0.477
	MAF SUKUK	1	0.326	0.326	30.88	1	0
		2	0.237	0.146	47.3	2	0
		3	0.089	-0.028	49.64	3	0
		4	0.082	0.034	51.62	4	0
		5	0.07	0.036	53.06	5	0
	DUBAI DOF SUKUK	1	0.051	0.051	0.307	1	0.58
		2	0.213	0.211	5.672	2	0.059
		3	0.033	0.014	5.798	3	0.122
		4	0.1	0.056	6.994	4	0.136
		5	0.143	0.134	9.461	5	0.092
	DUBAI DOF SUKUK 2	1	-0.424	-0.424	21.93	1	0
		2	0.025	-0.189	22.01	2	0
		3	0.01	-0.073	22.02	3	0
		4	0.007	-0.017	22.02	4	0
		5	-0.013	-0.016	22.05	5	0.001
	JAFZ SUKUK	1	-0.005	-0.005	0.014	1	0.905
		2	0.004	0.004	0.023	2	0.988
		3	-0.092	-0.092	4.398	3	0.222
		4	-0.007	-0.008	4.423	4	0.352
		5	-0.006	-0.006	4.443	5	0.488
	ADCB ISLAMIC FIN	1	-0.06	-0.06	5.566	1	0.018
		2	0.033	0.029	7.224	2	0.027
		3	-0.015	-0.011	7.552	3	0.056
		4	-0.008	-0.01	7.642	4	0.106
		5	-0.032	-0.032	9.201	5	0.101
	HBME SUKUK	1	-0.302	-0.302	55.19	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		2	-0.137	-0.251	66.56	2	0
		3	0.234	0.124	99.63	3	0
		4	-0.157	-0.079	114.6	4	0
		5	0.065	0.064	117.2	5	0
	ABUDHABI ISLAMIC	1	0.397	0.397	10.70	1	0.001
		2	-0.036	-0.229	10.79	2	0.005
		3	-0.025	0.104	10.835	3	0.013
		4	-0.002	-0.052	10.835	4	0.028
		5	0.14	0.203	12.265	5	0.031
	DUBAI GLOBAL SUKUK	1	-0.465	-0.465	188.91	1	0
		2	-0.018	-0.298	189.18	2	0
		3	0.004	-0.203	189.20	3	0
		4	-0.041	-0.204	190.68	4	0
		5	0.1	-0.041	199.52	5	0
	RAKIA SUKUK	1	-0.297	-0.297	47.656	1	0
		2	-0.008	-0.105	47.693	2	0
		3	-0.016	-0.055	47.824	3	0
		4	-0.059	-0.091	49.718	4	0
		5	-0.026	-0.085	50.098	5	0
	SIP SUKUK	1	-0.215	-0.215	31.816	1	0
		2	-0.073	-0.125	35.542	2	0
		3	0.055	0.011	37.607	3	0
		4	-0.004	0.002	37.62	4	0
		5	0.019	0.027	37.863	5	0
	DIB SUKUK	1	-0.471	-0.471	143.48	1	0
		2	0.171	-0.065	162.42	2	0
		3	0.022	0.1	162.75	3	0
		4	-0.111	-0.066	170.77	4	0
		5	0.062	-0.045	173.31	5	0
		1	-0.441	-0.441	145.63	1	0
		2	0.016	-0.221	145.83	2	0
		3	-0.059	-0.194	148.48	3	0
		4	0.004	-0.15	148.49	4	0
		5	-0.002	-0.116	148.5	5	0
	EIB SUKUK 3	1	-0.313	-0.313	99.581	1	0
		2	-0.095	-0.214	108.68	2	0
		3	-0.001	-0.121	108.68	3	0
		4	-0.044	-0.126	110.67	4	0
		5	0.057	-0.021	114.03	5	0
	TDIC SUKUK	1	-0.036	-0.036	1.331	1	0.249
		2	0.045	0.044	3.364	2	0.186
		3	-0.16	-0.157	29.156	3	0
		4	-0.03	-0.043	30.072	4	0
		5	-0.022	-0.012	30.577	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
	DUBAI DOF SUKUK 3	1	0.045	0.045	0.631	1	0.427
		2	0.183	0.181	11.035	2	0.004
		3	0.016	0.001	11.118	3	0.011
		4	0.058	0.025	12.175	4	0.016
		5	0.072	0.068	13.818	5	0.017
	EIB SUKUK 4	1	-0.446	-0.446	119.08	1	0
		2	-0.012	-0.263	119.16	2	0
		3	0.047	-0.103	120.50	3	0
		4	-0.031	-0.072	121.09	4	0
		5	-0.001	-0.05	121.09	5	0
KSA	SAUDI ELTY	1	0.044	0.044	0.621	1	0.431
		2	0.145	0.143	7.292	2	0.026
		3	0.211	0.204	21.45	3	0
		4	0.019	-0.013	21.562	4	0
		5	0.105	0.05	25.101	5	0
	SAUDI ELTY 2	1	-0.267	-0.267	22.604	1	0
		2	0.152	0.087	29.963	2	0
		3	-0.025	0.038	30.164	3	0
		4	0.003	-0.008	30.167	4	0
		5	-0.033	-0.041	30.52	5	0
	SAUDI ELTY 3	1	-0.026	-0.026	0.036	1	0.85
		2	-0.184	-0.184	1.897	2	0.387
		3	0.019	0.009	1.917	3	0.59
		4	0.019	-0.015	1.937	4	0.747
		5	0.053	0.061	2.104	5	0.835
	SAUDI ELTY 4	1	-0.339	-0.339	6.196	1	0.013
		2	0.084	-0.035	6.583	2	0.037
		3	0.019	0.042	6.604	3	0.086
		4	0.178	0.227	8.418	4	0.077
		5	-0.012	0.141	8.427	5	0.134
	BSF	1	-0.354	-0.354	14.672	1	0
		2	-0.109	-0.269	16.087	2	0
		3	-0.02	-0.203	16.136	3	0.001
		4	0.004	-0.151	16.138	4	0.003
		5	-0.043	-0.175	16.365	5	0.006
	DAR AIARKAN	1	-0.271	-0.271	57.898	1	0
		2	0.031	-0.045	58.679	2	0
		3	0.015	0.012	58.847	3	0
		4	-0.138	-0.14	73.986	4	0
		5	0.054	-0.024	76.29	5	0
	DAAR INTL	1	-0.247	-0.247	9.546	1	0.002
		2	0.023	-0.041	9.625	2	0.008
		3	0.084	0.085	10.736	3	0.013

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		4	-0.288	-0.264	23.96	4	0
		5	0.188	0.066	29.60	5	0

a. Based on the asymptotic chi-square approximation.

Source: Generated by the author.

The Table 4.1 presents the autocorrelation coefficients and Ljung-Box Q-statistics in Sukuk daily return series. These results suggest that most of the Sukuk series have a high level of autocorrelation in daily returns. In most of the cases, the null hypothesis of no autocorrelation can easily be rejected at a 5% level of significance. This result is valid at most of the lags in the daily data in the 1st and 2nd lags of KT Sukuk in Turkey. In Pakistan, the autocorrelation at the 1st lag of Pakistan Sukuk; the 1st and the 2nd lag of Pakistan Sukuk 2; the 1st, 2nd, 4th, 5th and 6th lags of Pakistan Sukuk 3; and in Pakistan INTIL Sukuk are not equal to zero apart from the 1st lag with a p. value more than a 0.05 interval level. In Kuwait, all Kuwait URC SUKUK lags are not equal to zero apart from the 18th, 19th and 20th lags with p. values more than a 0.05 interval level. All BNM SUKUK 1 lags in Malaysia. The autocorrelation in all ALMANA SUKUK in Qatar are almost equal to zero apart from the last lag. In UAE, the first six lags of the DP SUKUK and HILAL SUKUK; the 1st and 3rd lags of EIB SUKUK; in EIB SUKUK 2 from the 3rd till 12th lags; all lags for ADCB ISLAMIC FIN are almost equal to zero apart from the 1st, 2nd ,8th ,9th ,10th and 11th lags of autocorrelation with a p. value more than the 0.05 interval level; in ABUDHABI ISLAMIC the lags from the 8th until the end are equal to zero; the 1st, 13th, 14th, 15th and 17th lags of DUBI DOF SUKUK3; the 1st and 2nd lag of TDIC Sukuk where the rest of the lags of the autocorrelation are not equal to zero with a p. value less than the 0.05 interval level; and all lags of ADIB, DUBI DOF and JAFZ Sukuk where the 9th lag of JAFZ Sukuk autocorrelation is not equal to zero. In KSA, the 1st lag in SAUDI ELTY; all lags in SAUDI ELTY 3; and all lags in SAUDI ELTY 4 are equal to zero apart from the first two lags with a p. value more than the 0.05 interval level.

Table 4.2 Autocorrelation Coefficients and Ljung-Box Q-Statistics in Daily Conventional Bonds Returns

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
Turkey	TURKEY BONDS	1	-0.255	-0.255	34.332	1	0
		2	-0.042	-0.115	35.279	2	0
		3	0.038	-0.004	36.039	3	0
		4	-0.019	-0.016	36.238	4	0
		5	-0.052	-0.062	37.648	5	0
Pakistan	PAKISTAN BONDS	1	0.046	0.046	2.477	1	0.116
		2	0.041	0.039	4.451	2	0.108
		3	-0.094	-0.098	14.639	3	0.002
		4	-0.051	-0.045	17.728	4	0.001
		5	0.01	0.023	17.844	5	0.003
	PAKISTAN MOBL	1	0.128	0.128	28.371	1	0
		2	0.138	0.123	60.954	2	0
		3	-0.061	-0.096	67.423	3	0
		4	0.042	0.045	70.454	4	0
		5	-0.042	-0.033	73.534	5	0
	PAKISTAN MOBL 2	1	-0.341	-0.341	124.265	1	0
		2	-0.019	-0.153	124.64	2	0
		3	-0.027	-0.1	125.405	3	0
		4	0.004	-0.053	125.418	4	0
		5	-0.071	-0.112	130.779	5	0
Kuwait	KUWAIT PRJS	1	0.158	0.158	21.905	1	0
		2	0.163	0.142	45.205	2	0
		3	0.085	0.042	51.489	3	0
		4	0.021	-0.02	51.859	4	0
		5	0.082	0.066	57.705	5	0
	KUWAIT PRJS 2	1	-0.412	-0.412	140.59	1	0
		2	0.059	-0.133	143.494	2	0
		3	0.053	0.032	145.847	3	0
		4	-0.087	-0.052	152.217	4	0
		5	0.194	0.17	183.649	5	0
	KUWAIT PRJS 3	1	-0.078	-0.078	2.712	1	0.1
		2	0.102	0.096	7.297	2	0.026
		3	0.132	0.149	15.031	3	0.002
		4	0.053	0.068	16.306	4	0.003
		5	0.132	0.119	24.147	5	0
	KUWAIT FINL	1	0.01	0.01	0.008	1	0.93
		2	-0.01	-0.01	0.015	2	0.992
		3	0.008	0.008	0.02	3	0.999
		4	-0.024	-0.024	0.07	4	0.999

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		5	-0.035	-0.034	0.173	5	0.999
	KUWAIT PRJS 4	1	-0.078	-0.078	2.71	1	0.1
		2	0.102	0.096	7.297	2	0.026
		3	0.132	0.149	15.028	3	0.002
		4	0.053	0.068	16.303	4	0.003
		5	0.132	0.119	24.142	5	0
Bahrain	BAHRAIN KING DOM	1	0.275	0.275	18.968	1	0
		2	0.137	0.067	23.731	2	0
		3	0.058	0.005	24.596	3	0
		4	0.166	0.153	31.63	4	0
		5	0.113	0.033	34.89	5	0
	BAHRAIN KIN GDOM 2	1	0.368	0.368	33.802	1	0
		2	0.341	0.238	62.955	2	0
		3	0.241	0.07	77.519	3	0
		4	0.207	0.053	88.296	4	0
		5	0.166	0.029	95.256	5	0
	ICICI BANK	1	-0.114	-0.114	12.094	1	0.001
		2	-0.011	-0.024	12.206	2	0.002
		3	0.034	0.03	13.26	3	0.004
		4	0.015	0.022	13.465	4	0.009
		5	-0.015	-0.009	13.662	5	0.018
	HDFC BANK	1	-0.406	-0.406	12.352	1	0
		2	-0.002	-0.199	12.352	2	0.002
		3	0.014	-0.085	12.366	3	0.006
		4	0.039	0.015	12.488	4	0.014
		5	0.019	0.06	12.518	5	0.028
	FINANS BANK	1	0.013	0.013	0.016	1	0.9
		2	-0.322	-0.322	9.255	2	0.01
		3	-0.37	-0.401	21.579	3	0
		4	-0.008	-0.193	21.584	4	0
		5	0.644	0.511	59.912	5	0
	ICICI BANK 2	1	-0.023	-0.023	0.68	1	0.41
		2	-0.018	-0.018	1.085	2	0.581
		3	-0.16	-0.161	34.371	3	0
		4	0.003	-0.005	34.386	4	0
		5	0.011	0.004	34.534	5	0
	ICICI BANK 3	1	-0.422	-0.422	184.029	1	0
		2	0.053	-0.153	186.901	2	0
		3	-0.067	-0.132	191.564	3	0
		4	0.046	-0.041	193.79	4	0
		5	-0.023	-0.03	194.348	5	0
	BAHRAIN MUMTALAKAT	1	-0.426	-0.426	158.787	1	0
		2	0.049	-0.161	160.882	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		3	-0.019	-0.079	161.192	3	0
		4	0.003	-0.038	161.201	4	0
		5	0.022	0.01	161.617	5	0
Malaysia	HSBC BANK	1	-0.143	-0.143	18.488	1	0
		2	-0.057	-0.079	21.449	2	0
		3	-0.034	-0.056	22.493	3	0
		4	-0.008	-0.028	22.558	4	0
		5	-0.053	-0.067	25.119	5	0
	OCBCBK MALAYSIA	1	-0.166	-0.166	24.876	1	0
		2	-0.089	-0.12	32.092	2	0
		3	-0.044	-0.084	33.851	3	0
		4	-0.002	-0.039	33.854	4	0
		5	0.01	-0.012	33.941	5	0
	BERJAYA	1	-0.005	-0.005	0.021	1	0.885
		2	0.001	0.001	0.021	2	0.989
		3	0	0	0.021	3	0.999
		4	0.026	0.026	0.485	4	0.975
		5	-0.004	-0.004	0.496	5	0.992
	SELIASLNG SELATAN	1	-0.38	-0.38	130.299	1	0
		2	-0.214	-0.419	171.46	2	0
		3	0.153	-0.173	192.647	3	0
		4	-0.013	-0.138	192.794	4	0
		5	-0.003	-0.043	192.799	5	0
	PANGLIMA POWER SDN	1	-0.176	-0.176	28.003	1	0
		2	0.034	0.003	29.037	2	0
		3	-0.035	-0.03	30.169	3	0
		4	0.034	0.023	31.201	4	0
		5	-0.049	-0.039	33.369	5	0
	MALAYSIA BONDS	1	-0.148	-0.148	22.215	1	0
		2	-0.221	-0.248	71.905	2	0
		3	-0.023	-0.109	72.431	3	0
		4	0.014	-0.073	72.621	4	0
		5	-0.057	-0.109	75.934	5	0
	MALAYSIA BONDS 2	1	-0.156	-0.156	24.766	1	0
		2	0.007	-0.018	24.817	2	0
		3	0.066	0.066	29.222	3	0
		4	-0.011	0.01	29.335	4	0
		5	0.021	0.021	29.778	5	0
	RCE ADVANCE SDN BHD	1	-0.038	-0.038	1.283	1	0.257
		2	-0.005	-0.006	1.304	2	0.521
		3	-0.003	-0.004	1.313	3	0.726
		4	-0.012	-0.012	1.434	4	0.838
		5	-0.037	-0.038	2.693	5	0.747

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
	SABAH	1	-0.177	-0.177	25.989	1	0
		2	-0.029	-0.063	26.702	2	0
		3	-0.154	-0.177	46.4	3	0
		4	0.118	0.057	57.982	4	0
		5	0.028	0.044	58.626	5	0
	SYR KT PRS RNA	1	-0.347	-0.347	108.396	1	0
		2	-0.002	-0.139	108.399	2	0
		3	0.007	-0.049	108.44	3	0
		4	-0.017	-0.037	108.697	4	0
		5	0.027	0.009	109.334	5	0
	MALAYSIA BONDS 3	1	0.058	0.058	3.101	1	0.078
		2	0.029	0.025	3.868	2	0.145
		3	-0.038	-0.041	5.22	3	0.156
		4	-0.015	-0.011	5.433	4	0.246
		5	-0.011	-0.007	5.542	5	0.353
	DIGI TELE COM	1	-0.098	-0.098	9.148	1	0.002
		2	0.021	0.012	9.57	2	0.008
		3	0.02	0.023	9.954	3	0.019
		4	-0.063	-0.06	13.79	4	0.008
		5	-0.054	-0.068	16.644	5	0.005
	MALAYSIA BONDS 4	1	-0.019	-0.019	0.39	1	0.532
		2	0.033	0.032	1.517	2	0.468
		3	-0.074	-0.073	7.36	3	0.061
		4	-0.001	-0.004	7.36	4	0.118
		5	0.029	0.034	8.253	5	0.143
	ORIX LSG	1	-0.065	-0.065	2.873	1	0.09
		2	-0.006	-0.01	2.898	2	0.235
		3	-0.022	-0.023	3.236	3	0.357
		4	-0.035	-0.038	4.072	4	0.396
		5	-0.043	-0.048	5.326	5	0.377
	MALAYSIA BONDS 5	1	0.109	0.109	8.287	1	0.004
		2	0.134	0.123	20.789	2	0
		3	-0.007	-0.034	20.82	3	0
		4	0.011	-0.002	20.906	4	0
		5	-0.082	-0.08	25.629	5	0
	STD.CHT.BANK	1	-0.202	-0.202	39.385	1	0
		2	-0.02	-0.064	39.789	2	0
		3	-0.003	-0.022	39.801	3	0
		4	-0.028	-0.036	40.555	4	0
		5	-0.111	-0.131	52.406	5	0
	BK. NEGARA	1	-0.012	-0.012	0.013	1	0.909
		2	0	0	0.013	2	0.993
		3	0	0	0.013	3	1
		4	-0.001	-0.001	0.013	4	1

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		5	-0.001	-0.001	0.013	5	1
Qatar	QATAR PETROLEUM	1	0.015	0.015	0.131	1	0.717
		2	-0.057	-0.058	2.193	2	0.334
		3	-0.02	-0.019	2.451	3	0.484
		4	0.02	0.017	2.696	4	0.61
		5	-0.007	-0.009	2.723	5	0.743
	QATAR BONDS	1	-0.248	-0.248	95.081	1	0
		2	-0.036	-0.104	97.129	2	0
		3	-0.064	-0.107	103.425	3	0
		4	0.016	-0.036	103.833	4	0
		5	0.012	-0.006	104.068	5	0
	QATAR PETROLEUM 2	1	0	0	0	1	0.995
		2	0.049	0.049	0.536	2	0.765
		3	0.019	0.019	0.619	3	0.892
		4	-0.141	-0.144	4.999	4	0.287
		5	0.227	0.231	16.445	5	0.006
	QATAR BONDS 2	1	-0.03	-0.03	2.393	1	0.122
		2	-0.042	-0.043	7.113	2	0.029
		3	-0.032	-0.034	9.71	3	0.021
		4	-0.177	-0.181	91.444	4	0
		5	-0.137	-0.159	140.537	5	0
	QATAR BONDS 3	1	-0.037	-0.037	1.299	1	0.254
		2	-0.002	-0.003	1.302	2	0.522
		3	0.047	0.047	3.404	3	0.333
		4	0.055	0.059	6.24	4	0.182
		5	0.044	0.049	8.025	5	0.155
	QATAR BONDS 4	1	-0.158	-0.158	27.36	1	0
		2	-0.078	-0.105	33.964	2	0
		3	0.011	-0.02	34.106	3	0
		4	0.059	0.051	37.913	4	0
		5	-0.019	0	38.291	5	0
	QATAR BONDS 5	1	-0.134	-0.134	19.578	1	0
		2	-0.02	-0.039	20.031	2	0
		3	0.019	0.011	20.425	3	0
		4	-0.021	-0.018	20.898	4	0
		5	0.05	0.046	23.608	5	0
	QATAR BONDS 6	1	-0.179	-0.179	30.033	1	0
		2	-0.003	-0.036	30.039	2	0
		3	-0.048	-0.057	32.222	3	0
		4	0.064	0.046	36.03	4	0
		5	-0.053	-0.037	38.654	5	0
	QATAR BONDS 7	1	0.031	0.031	0.899	1	0.343
		2	0.076	0.075	6.274	2	0.043

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		3	0.011	0.007	6.395	3	0.094
		4	0.01	0.004	6.487	4	0.166
		5	0.094	0.093	14.801	5	0.011
	QATAR BONDS 8	1	-0.15	-0.15	9.038	1	0.003
		2	-0.094	-0.119	12.638	2	0.002
		3	0.097	0.066	16.449	3	0.001
		4	0.021	0.038	16.629	4	0.002
		5	0.138	0.171	24.432	5	0
	QATAR BONDS 9	1	-0.176	-0.176	12.339	1	0
		2	0.052	0.022	13.418	2	0.001
		3	0.086	0.102	16.355	3	0.001
		4	-0.036	-0.005	16.871	4	0.002
		5	0.158	0.148	26.912	5	0
	QATAR BONDS 10	1	0.163	0.163	28.66	1	0
		2	-0.077	-0.106	35.058	2	0
		3	-0.171	-0.146	66.809	3	0
		4	0.003	0.052	66.818	4	0
		5	0.006	-0.03	66.853	5	0
	QATAR BONDS 11	1	-0.35	-0.35	56.181	1	0
		2	-0.065	-0.214	58.144	2	0
		3	0.023	-0.096	58.379	3	0
		4	-0.152	-0.232	69.048	4	0
		5	0.301	0.182	110.952	5	0
	QATAR BONDS 12	1	-0.129	-0.129	18.027	1	0
		2	0.029	0.012	18.913	2	0
		3	-0.043	-0.038	20.881	3	0
		4	0.024	0.014	21.511	4	0
		5	0.005	0.011	21.538	5	0.001
UAE	ABUDHABI COML	1	-0.06	-0.06	5.566	1	0.018
		2	0.033	0.029	7.224	2	0.027
		3	-0.015	-0.011	7.552	3	0.056
		4	-0.008	-0.01	7.642	4	0.106
		5	-0.032	-0.032	9.201	5	0.101
	ABUDHABI COML 2	1	-0.024	-0.024	0.383	1	0.536
		2	0.037	0.037	1.274	2	0.529
		3	0.025	0.027	1.678	3	0.642
		4	0.009	0.009	1.736	4	0.784
		5	0.025	0.024	2.137	5	0.83
	X STRATA	1	-0.005	-0.005	0.017	1	0.896
		2	0.214	0.214	38.788	2	0
		3	0.007	0.009	38.829	3	0
		4	-0.012	-0.06	38.942	4	0
		5	0.005	0.001	38.964	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
	ADCB	1	0.064	0.064	0.897	1	0.344
		2	0.257	0.253	15.251	2	0
		3	0.015	-0.015	15.299	3	0.002
		4	0.025	-0.043	15.44	4	0.004
		5	0.092	0.099	17.298	5	0.004
	DUBI BONDS	1	-0.003	-0.003	0.002	1	0.963
		2	-0.003	-0.003	0.004	2	0.998
		3	-0.011	-0.011	0.032	3	0.999
		4	-0.234	-0.234	11.858	4	0.018
		5	0	-0.002	11.858	5	0.037
	ABUDHABI NAT	1	0.07	0.07	3.743	1	0.053
		2	0.043	0.039	5.189	2	0.075
		3	0.06	0.055	7.963	3	0.047
		4	0.015	0.006	8.144	4	0.086
		5	-0.043	-0.049	9.591	5	0.088
	DUBI BONDS 2	1	-0.276	-0.276	15.518	1	0
		2	0.097	0.022	17.445	2	0
		3	-0.006	0.028	17.453	3	0.001
		4	-0.01	-0.007	17.473	4	0.002
		5	-0.077	-0.091	18.713	5	0.002
	DUBAI.HLDG. COML	1	0.221	0.221	39.594	1	0
		2	0.081	0.034	44.905	2	0
		3	0.051	0.028	47.046	3	0
		4	0.001	-0.019	47.048	4	0
		5	0.062	0.065	50.203	5	0
	AXIS BANK	1	-0.035	-0.035	0.987	1	0.321
		2	0.013	0.012	1.125	2	0.57
		3	0.009	0.01	1.193	3	0.755
		4	0.01	0.01	1.265	4	0.867
		5	-0.005	-0.005	1.286	5	0.936
	DUI.ELTY.WT. AUTH	1	-0.031	-0.031	0.884	1	0.347
		2	0.024	0.023	1.431	2	0.489
		3	0.036	0.037	2.61	3	0.456
		4	-0.024	-0.022	3.138	4	0.535
		5	0.027	0.024	3.833	5	0.574
	AXIS BANK 2	1	-0.05	-0.05	2.377	1	0.123
		2	-0.061	-0.064	5.905	2	0.052
		3	-0.041	-0.048	7.484	3	0.058
		4	0.102	0.094	17.341	4	0.002
		5	-0.015	-0.01	17.553	5	0.004
	NAT.BK. ABUDHAB	1	0.083	0.083	4.205	1	0.04
		2	0.036	0.03	5.006	2	0.082
		3	-0.082	-0.088	9.05	3	0.029
		4	-0.088	-0.076	13.735	4	0.008

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		5	0.049	0.069	15.177	5	0.01
	EXOVALTD.ABUDHABI	1	-0.256	-0.256	52.227	1	0
		2	-0.04	-0.113	53.488	2	0
		3	-0.012	-0.056	53.594	3	0
		4	-0.065	-0.096	56.968	4	0
		5	-0.082	-0.144	62.348	5	0
	NAT.BK. ABUDHAB2	1	-0.011	-0.011	0.098	1	0.755
		2	-0.035	-0.035	1.052	2	0.591
		3	0.03	0.029	1.757	3	0.624
		4	0.101	0.101	9.657	4	0.047
		5	0.029	0.034	10.292	5	0.067
	ABUDHABI NAT 2	1	-0.132	-0.132	18.78	1	0
		2	-0.073	-0.092	24.55	2	0
		3	-0.017	-0.041	24.871	3	0
		4	0.079	0.066	31.649	4	0
		5	-0.01	0.007	31.751	5	0
	ABUDHABI NAT 3	1	-0.178	-0.178	24.472	1	0
		2	0.058	0.027	27.032	2	0
		3	0.024	0.04	27.47	3	0
		4	-0.009	0	27.536	4	0
		5	0.016	0.012	27.733	5	0
	ABUDHABI NAT 4	1	-0.058	-0.058	5.215	1	0.022
		2	0.016	0.012	5.591	2	0.061
		3	-0.076	-0.075	14.597	3	0.002
		4	0.028	0.019	15.799	4	0.003
		5	-0.16	-0.157	55.414	5	0
	ABUDHABICOML.BK	1	-0.275	-0.275	84.458	1	0
		2	-0.034	-0.119	85.782	2	0
		3	-0.071	-0.126	91.407	3	0
		4	-0.015	-0.087	91.674	4	0
		5	0.059	0.014	95.627	5	0
	DUI.ELTY.WT. AUTH2	1	-0.126	-0.126	12.594	1	0
		2	0.045	0.03	14.233	2	0.001
		3	0.021	0.031	14.582	3	0.002
		4	0.036	0.041	15.594	4	0.004
		5	-0.005	0.002	15.617	5	0.008
KSA	SAUDI BRITISH BANK2	1	-0.329	-0.329	84.33	1	0
		2	0	-0.122	84.33	2	0
		3	-0.071	-0.126	88.233	3	0
		4	-0.033	-0.117	89.071	4	0
		5	0.034	-0.036	90.002	5	0
	BANQUE SAUDI FRANSI	1	-0.435	-0.435	171.568	1	0
		2	0.042	-0.181	173.208	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	P-Value a
		3	-0.04	-0.123	174.63	3	0
		4	0.006	-0.076	174.658	4	0
		5	-0.013	-0.061	174.818	5	0
	SAUDI BRITISH BANK	1	-0.137	-0.137	2.911	1	0.088
		2	-0.269	-0.293	14.284	2	0.001
		3	0.034	-0.06	14.466	3	0.002
		4	-0.066	-0.167	15.163	4	0.004
		5	-0.178	-0.261	20.231	5	0.001
	INBLK FOR RECON	1	-0.288	-0.288	75.203	1	0
		2	-0.001	-0.092	75.204	2	0
		3	-0.048	-0.082	77.307	3	0
		4	-0.104	-0.159	87.102	4	0
		5	-0.102	-0.215	96.553	5	0

a. Based on the asymptotic chi-square approximation.

Source: Generated by the author.

Table 4.2 presents the autocorrelation coefficients and Ljung-Box Q-statistics in conventional bond return series. The results are not as expected, as most of the bond prices show a high level of persistence where the null hypothesis of these autocorrelations is equal to zero, which can easily be rejected at a 5% significance level. The p-value in this case is less than 0.05, and the random walk hypothesis is also rejected.

However, some exceptions have been made in which the p-value is more than the 0.05 critical level, as in the following:

- In Pakistan, 1st and 2nd lags of PAKISTAN BONDS;
- In Kuwait, the 1st, 2nd, 3rd and 4th lags of KUWAIT FINL;
- In Bahrain, the 1st and 2nd lags of ICIC BANK 2;
- In Malaysia, all lags of BERJAYA, RCE ADVANCE SDN BHD, MALAYSIA BONDS 4, ORIX LSG and BK. NEGARA;
- In Qatar, all lags of QATAR PETROLEUM and QATAR BONDS 3; in QATAR PETROLEUM the 1st, 2nd, 3rd and 4th lags, the 1st lag of QATAR BONDS2 and the 1st, 3rd and 4th lags of QATAR BONDS 7;
- In the UAE, all lags for ABUDHABI COML 2, AXIS BANK and DUI.ELTY.WT. AUTH; the 3rd, 4th and 5th lags of ABUDHABI COML, the 1st,2nd and 3rd for DUBI BONDS and, AXIS BANK 2, in ABUDHABI NAT 1st, 2nd,4th and 5th lags, in NAT.BK. ABUDHABI 2 the

1st, 2nd, 3rd and 5th lags, and the 2nd lag of NAT.BK. ABUDHABI and ABUDHABI NAT 4.

So, the p-values generated from the Q-statistics for these lags are higher than 5% in most instances. The null hypothesis cannot be rejected in this instance. In the light of these results, it appears that secondary markets of bonds and Sukuk in these countries are illiquid due to infrequent trades and hence it is not possible to draw a comparison between Sukuk and conventional bonds based on auto correlation tests.

4.4.2 Runs Test Results

The runs test is employed to investigate the random runs of returns of Sukuk and the conventional bonds in the sample countries. Table 4.3 displays the number of runs and associated Z-statistics and p-values for each of the Sukuk and conventional bonds in the sample. The null hypothesis of random returns will be rejected at a 5% level of significance if the p-value is less than 0.05.

The runs test results tend to differentiate Sukuk from conventional bonds. The Z-statistics are found to be greater than 1.96 in 27 Sukuk out of the total number of 53 Sukuk and in 36 bonds out of the total number of 73 conventional bonds in this data classification. The null hypothesis of randomness is rejected in the 27 Sukuk and the 73 conventional bonds, which indicates evidence of persistence in around half of the series. Contrasting with this, the Z-statistics are found to be less than 1.96 in 26 Sukuk out of the total number of 53 Sukuk and 37 bonds out of the total number of 73 from the conventional bonds in this data classification where the null hypothesis of randomness is accepted.

In other words, in most of the countries included in the sample, the null hypothesis of random returns is rejected at the 5% level from most of the Sukuk. In contrast to this, the null hypothesis of random returns cannot be rejected at the 5% level of significance in nearly 50% of the conventional bonds. These results give some evidence that Sukuk returns in the secondary markets are not as random as conventional bonds in these countries.

Table 4.3 Run Test for Sukuk and Conventional Bonds

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
Bahrain	Sukuk	CBB SUKUK 2	1076	-0.000008168	0.004676478	-0.0336308	0.0225131	0	1076	626	5.854	0
		CBB SUKUK	391	0.000288646	0.002670297	-0.0181013	0.0167992	0	391	198	0.873	0.383
	Conventional Bonds	BAHRAIN KINGDOM	248	0.000219662	0.003823384	-0.0254349	0.02033	0	248	89	-1.306	0.192
		BAHRAIN KINGDOM 2	246	0.000145416	0.003467564	-0.0247535	0.0138092	0	246	105	-2.137	0.033
		ICICI BANK	927	0.000058739	0.002676185	-0.0148815	0.0298203	0	927	475	0.864	0.388
		HDFC BANK	72	-0.000153384	0.00293861	-0.0151667	0.0162298	0	72	42	1.309	0.191
		FINANS BANK	85	-0.00007692	6.11372E-05	-0.0002688	0	0	85	8	-3.577	0
		ICIC BANK 2	1302	-0.000002244	0.010516125	-0.3273872	0.0790459	0	1302	539	-1.105	0.269
		BAHRAIN KINGDOM 3	939	0.000045443	0.003729692	-0.0287982	0.0162949	0	939	412	-2.986	0.003
		ICICI BANK 3	1028	0.000034293	0.008632749	-0.0587837	0.060563	0	1028	519	0.727	0.467
		BAHRAIN MUMTALAKAT	874	0.000044306	0.007471909	-0.0613689	0.0585401	0	874	477	3.324	0.001
Kuwait	Sukuk	URC SUKUK	404	0.00003225	0.012570614	-0.1217178	0.1006306	0	404	240	4.71	0
	Conventional Bonds	KUWAIT PRJS	869	0.000122078	0.003370736	-0.0221602	0.0223358	0	869	365	-1.946	0.052
		KUWAIT PRJS 2	826	0.00018996	0.008537785	-0.04508	0.050915	0	826	420	1.677	0.094
		KUWAIT PRJS 3	441	0.000335898	0.002993962	-0.0176102	0.016578	0	441	186	1.126	0.26
		KUWAIT FINL	78	0.000012541	4.49483E-05	-0.0002532	0.0002952	0	78	3	0.162	0.871

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		KUWAIT PRJS 4	441	0.000335814	0.002994016	-0.01761	0.016578	0	441	186	1.126	0.26
Malaysia	Sukuk	MMB SUKUK	1077	0.000101955	0.003021871	-0.0267113	0.0476862	0	1077	113	-1.841	0.066
		MALAYSIA SUKUK 1	845	0.000037415	0.005152213	-0.0230723	0.0289875	0	845	465	3.46	0.001
		MALAYSIA SUKUK 1.2	696	-0.000011856	0.003043051	-0.0230988	0.0188559	0	696	394	3.485	0
		WAKALA GLOBAL SUKUK	493	0.000084942	0.002296619	-0.0130081	0.0126825	0	493	293	4.182	0
		WAKALA GLOBAL SUKUK 2	498	0.000130597	0.005103239	-0.0232831	0.0221834	0	498	299	4.507	0
		BNM SUKUK 1	88	0.0001447	0.000251284	-0.0000807	0.002323	0	88	7	0.362	0.717
		PETRONAS GLB. SUKUK	1055	0.000029436	0.00448491	-0.0650803	0.0745314	0	1055	560	2.567	0.01
	Conventional Bonds	HSBC BANK	897	0.000154885	0.004300479	-0.0308616	0.0466717	0	897	372	-3.697	0
		OCBCBK.MALAYSIA	897	0.000072593	0.006378589	-0.0432136	0.0806006	0	897	442	0.43	0.667
		BERJAYA	695	0	0.003650441	-0.0608998	0.0742308	0	695	31	-14.877	0
		SELIASLNGRSELATAN	897	0.000257556	0.005204459	-0.0708189	0.0710004	0	897	408	2.84	0.005
		PANGLIMA POWER SDN	897	-0.000088978	0.001114852	-0.0119183	0.0084941	0	897	437	0.16	0.873
		MALAYSIA BONDS	1015	0.00002366	0.002263419	-0.0297555	0.0457894	0	1015	474	0.74	0.46
		MALAYSIA BONDS 2	1015	0.000094917	0.002423779	-0.0160368	0.0174713	0	1015	505	2.49	0.013
		RCEADVANCESDNBHD	897	0.00002169	0.001107843	-0.0105321	0.0253128	0	897	400	-3.303	0.001
		SABAH	825	0.0000146	0.002703249	-0.0269387	0.0432892	0	825	376	-1.657	0.098

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		SYRKTPRSRNA	897	0.000027366	0.001671406	-0.0179453	0.0175268	0	897	400	-2.465	0.014
		MALAYSIA BONDS 3	933	0.000010695	0.000765734	-0.00424	0.0053609	0	933	456	0.985	0.325
		DIGI TELECOM1	959	0.000008344	0.001022748	-0.0113162	0.0105521	0	959	293	-6.052	0
		MALAYSIA BONDS 4	1052	0.000006211	0.000647942	-0.0037925	0.0040408	0	1052	515	0.4	0.689
		ORIX.LSG1	680	-0.00002402	0.001713726	-0.0338562	0.0088896	0	680	350	0.848	0.396
		MALAYSIA BONDS 5	695	0.00002098	0.00159	-0.0089899	0.0077437	0	695	301	-3.074	0.002
		STD.CHT.BANKMA1	959	0.000006214	0.000673726	-0.004952	0.0098213	0	959	219	-12.715	0
		BK. NEGARA	82	-0.042728313	0.387911281	-3.5125767	0.0003028	0	82	5	0.261	0.794
Pakistan	sukuk	PAKISTAN SUKUK	1160	0.000522531	0.011481693	-0.1267517	0.1000835	0	1160	402	-0.02	0.984
		PAKISTAN SUKUK 2	1160	0.000845542	0.010869196	-0.1251631	0.1300531	0	1160	400	0.192	0.848
		PAKISTAN SUKUK 3	1160	0.000836515	0.010854862	-0.1202491	0.1349193	0	1160	397	-0.9	0.368
		PAKISTAN INTIL SUKUK	125	0.000246173	0.002036402	-0.0101524	0.0103628	0	125	3	0.128	0.899
		PAKISTAN SUKUK 4	1077	0.000243964	0.011059345	-0.0666914	0.0700205	0	1077	593	5.588	0
	Conventional Bonds	PAKISTAN BONDS	1159	0.000848516	0.010873416	-0.1251631	0.1300531	0	1159	400	0.298	0.766
		PAKISTAN MOBL	1719	-0.000008618	0.016461344	-0.2513144	0.2548923	0	1719	487	-0.233	0.815
		PAKISTAN MOBL 1	1063	0.000150532	0.011969315	-0.1236052	0.1424705	0	1063	409	-0.054	0.957
Qatar	sukuk	ALMANA SUKUK	644	-0.000034429	0.000884076	-0.01876	0.002623	0	644	74	-5.679	0

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		QIIB SUKUK	167	-0.000032963	0.002780721	-0.01382	0.012614	0	167	87	1.159	0.247
		QIB SUKUK	170	-0.000036134	0.001855312	-0.01358	0.009837	0	170	108	3.497	0
		ALMANA SUKUK 2	345	0.000006549	0.001134675	-0.00558	0.008758	0	345	177	0.494	0.621
		QIB SUKUK 2	768	0.000034526	0.00224243	-0.01176	0.01212	0	768	421	3.102	0.002
		QREIC SUKUK	1002	0.000097478	0.012565757	-0.15587	0.156101	0	1002	449	6.659	0
	Conventional Bonds	QATAR PETROLEUM	622	0.000118731	0.002539122	-0.0115	0.047842	0	622	274	-2.395	0.017
		QATAR BONDS	1545	-0.000173247	0.003248397	-0.03546	0.033406	0	1545	710	2.071	0.038
		QATAR PETROLEUM 2	215	-0.000026898	0.002255363	-0.00965	0.005582	0	215	104	-0.084	0.933
		QATAR S BONDS 2	2610	0.000153273	0.03006896	-0.33291	0.333757	0	2610	447	-12.666	0
		QATAR BONDS 3	928	0.00013259	0.003416078	-0.02918	0.014742	0	928	353	-0.412	0.68
		QATAR BONDS 4	1093	0.000177268	0.004294319	-0.04066	0.018055	0	1093	595	3.593	0
		QATAR BONDS 5	1091	0.000032622	0.002216127	-0.01322	0.032705	0	1091	445	2.201	0.028
		QATAR BONDS 6	931	0.000041477	0.002042049	-0.01995	0.01005	0	931	393	2.705	0.007
		QATAR BONDS 7	928	0.000179372	0.005969068	-0.03964	0.033152	0	928	357	-1.693	0.09
		QATAR BONDS 8	401	0.00011062	0.001752132	-0.00939	0.007398	0	401	150	-0.536	0.592
		QATAR BONDS 9	395	0.000203713	0.003200778	-0.01376	0.01692	0	395	185	-0.008	0.994
		QATAR BONDS 10	1077	0.000252313	0.066370012	-1.40304	1.432092	0	1077	346	-0.147	0.883

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		QATAR BONDS 11	455	0.000092667	0.002963024	-0.01849	0.018488	0	455	237	2.607	0.009
		QATAR BONDS 12	1077	-0.000014238	0.001476656	-0.01326	0.012975	0	1077	601	3.798	0
Saudi	Sukuk	SAUDI ELTY 1	313	0.00015658	0.002176674	-0.0074343	0.0106384	0	313	163	0.943	0.346
		SAUDI ELTY 2	313	0.000066071	0.001145468	-0.0050815	0.0052606	0	313	173	2.286	0.022
		SAUDI ELTY 3	51	-0.000579643	0.004202216	-0.0124325	0.0073748	0	51	27	0.144	0.885
		SAUDI ELTY 4	51	-0.001252819	0.011433791	-0.0401802	0.0383775	0	51	22	-1.083	0.279
		BSF	114	-0.000074578	0.004206452	-0.0199844	0.0186466	0	114	54	-0.641	0.522
		DAR AIARKAN 1	11	-0.001020519	0.002433572	-0.0047564	0.0017024	0	11	6	0	1
		DAR AIARKAN 2	784	0.000043992	0.007726116	-0.051028	0.0480092	0	784	433	3.502	0
		DAAR INTL	153	0.000412934	0.004495928	-0.0155042	0.0170611	0	153	53	0.341	0.733
	Conventional Bonds	SAUDI BRITISH BANK 2	776	0.000063242	0.004334319	-0.0218386	0.0218386	0	776	404	2.233	0.026
		BANQUE SAUDI FRANSI	904	0.000033472	0.005698208	-0.0300666	0.0313039	0	904	503	5.907	0
		SAUDI BRITISH BANK	153	0.000119685	0.005252843	-0.0288541	0.0275128	0	153	76	1.148	0.251
		INBLK FORRECON	902	-0.000002644	0.007204051	-0.0494661	0.0495327	0	902	49	-1.502	0.133
Turkey	Sukuk	KT SUKUK	523	-0.000009457	0.001541028	-0.0237067	0.0224729	0	523	192	-5.696	0
		KT SUKUK 2	114	0.000012331	0.004211518	-0.0143107	0.0126377	0	114	66	2.292	0.022
	Conventional Bonds	TURKEY BONDS	523	-0.000030997	0.004793802	-0.0392207	0.0419698	0	523	256	0.226	0.821

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		TURKEY BONDS 2	175	-0.000814731	0.009969434	-0.04744	0.033195	0	175	79	-1.44	0.15
UAE	Sukuk	DP SUKUK	1547	0.000047334	0.014130913	-0.2755309	0.2029285	0	1547	777	0.527	0.598
		EIB SUKUK	237	0.000115607	0.001702067	-0.0060265	0.0080902	0	237	105	-1.427	0.154
		EIB SUKUK2	363	0.000164902	0.001693263	-0.0060054	0.0067213	0	363	188	1.149	0.25
		FGB SUKUK	484	0.00006941	0.006466693	-0.0347726	0.0326216	0	484	250	1.871	0.061
		FGB SUKUK2	360	0.000148749	0.008132988	-0.0438405	0.0532814	0	360	201	3.802	0
		SIB SUKUK	533	0.000106907	0.00629846	-0.0295817	0.0306289	0	533	313	4.434	0
		HILAL SUKUK	663	-0.000033947	0.001097121	-0.0078434	0.0067873	0	663	337	0.829	0.407
		ADIBSUKUK	145	-0.000167474	0.004187293	-0.0253349	0.0199361	0	145	80	1.423	0.155
		MAF SUKUK	288	0.000404447	0.002706903	-0.009159	0.0089787	0	288	112	-3.553	0
		DUBAI DOF SUKUK	114	-0.000216051	0.001827622	-0.0064663	0.0057707	0	114	60	0.407	0.684
		DUBAI DOF SUKUK 2	119	-0.000037188	0.002612518	-0.0114039	0.0129958	0	119	67	1.205	0.228
		JAFZ SUKUK	517	-0.000003397	0.000065637	-0.0008297	0.0004224	0	517	78	-8.639	0
		ADCB ISLAMIC FIN	1547	0.000032828	0.015918492	-0.248132	0.2173408	0	1547	832	3.342	0.001
		HBME SUKUK	601	0.000068272	0.008292689	-0.0679773	0.0679974	0	601	263	2.02	0.043
		ABUDHABI ISLAMI	65	0.000155401	0.000695758	-0.000201	0.0048368	0	65	3	0.178	0.859
		DUBAI GLOBAL	872	0.000191096	0.013899889	-0.1555333	0.1555333	0	872	149	-2.192	0.028

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		RAKIASUKUK	539	0.000150053	0.006533162	-0.0434851	0.0370115	0	539	157	-1.322	0.186
		SIP SUKUK	688	0.00016813	0.0144782	-0.2345073	0.1107744	0	688	349	4.497	0
		DIB SUKUK	644	0.000775718	0.017188211	-0.1889903	0.1889903	0	644	308	2.016	0.044
		DUBI SUKUK	746	0.000177793	0.024454898	-0.2882375	0.2881655	0	746	363	2.144	0.032
		EIB SUKUK 3	1012	0.000017	0.005471051	-0.0549324	0.0558968	0	1012	583	5.156	0
		TDIC SUKUK	1001	0.000037522	0.005584546	-0.090801	0.0510603	0	1001	522	1.692	0.091
		DUBAI DOF SUKUK 3	308	0.000021986	0.001979736	-0.0072188	0.0080902	0	308	136	-1.931	0.054
		EIB SUKUK 4	596	0.000038664	0.003515688	-0.0244926	0.0240162	0	596	345	4.189	0
	Conventional Bonds	ABUDHABI COML	1547	0.000032828	0.015918492	-0.248132	0.2173408	0	1547	832	3.342	0.001
		ABUDHABI COML 2	636	-0.000032781	0.001215911	-0.0240958	0.0070718	0	636	284	-2.76	0.006
		XSTRATA	842	0.00025034	0.005929237	-0.0747602	0.0908391	0	842	231	-8.118	0
		ADCB	214	0.000026263	0.001040332	-0.0057942	0.0030087	0	214	86	-2.676	0.007
		DUBI SUKUK	210	0.000110112	0.002196527	-0.0076825	0.0303821	0	210	10	-10.23	0
		ABUDHABI NAT	770	0.000094664	0.002779142	-0.0162977	0.0192511	0	770	328	-2.654	0.008
		DUBI SUKUK 2	200	-0.00014545	0.003959971	-0.0186244	0.0126191	0	200	115	2.043	0.041
		DUBAI.HLDG. COML	806	0.00022122	0.004523164	-0.0419642	0.0300814	0	806	295	-7.13	0
		AXIS BANK	787	0.000043659	0.004035843	-0.0438533	0.0835673	0	787	393	0.03	0.976

Country	Type	Company	N	Mean	Std. Deviation	Minimum	Maximum	Test Value [A]	Total Cases	Number of Runs	Z	Asymp. Sig. (2-tailed)
		DUI.ELTY.WT. AUTH	923	0.000066128	0.003018642	-0.0198881	0.0202596	0	923	411	-2.076	0.038
		AXIS BANK 2	939	0.000049295	0.002707111	-0.0223875	0.0146717	0	939	473	0.277	0.782
		NAT.BK. ABUDHAB	603	0.000113556	0.00256432	-0.0127426	0.0086668	0	603	287	-0.67	0.503
		EXOVALTD.ABUDHABI	792	0.00007913	0.037028541	-0.2717462	0.2717462	0	792	212	-1.476	0.14
		NAT.BK. ABUDHAB 2	769	-0.000041245	0.001120127	-0.0094032	0.0174428	0	769	381	0.686	0.493
		ABUDHABI NAT 2	1081	0.000120947	0.004770113	-0.039036	0.021695	0	1081	582	2.655	0.008
		ABUDHABI NAT 3	769	0.000097789	0.002879985	-0.019551	0.0204701	0	769	456	5.173	0
		ABUDHABI NAT 4	1547	0.000132554	0.012389665	-0.1430885	0.1578731	0	1547	846	3.814	0
		ABUDHABI COML.BK	1112	0.000232474	0.012112492	-0.1022788	0.1022788	0	1112	477	6.183	0
		DUI.ELTY.WT. AUTH2	793	0.000159533	0.003237693	-0.0230971	0.0255026	0	793	376	-1.052	0.293

Source: Generated by the author.

4.4.3 Variance Ratio Test Results

The variance ratio test is a powerful test used to test the hypothesis of random walk process under the assumption of homoscedasticity and heteroscedasticity. The null hypothesis is that price changes are random. If the series follows a random walk, then the variance ratio at each lag should be equal to one. The following table shows variance ratio test results for Sukuk using a common lag selection of 2, 4, 8, and 16.

Table 4.4 Variance Ratio Test Results for Sukuk Daily Data

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
Saudi Arabia	BSF	2	0.416782	0.26345	-2.21377	0.0268
		4	0.19383	0.408491	-1.97353	0.0484
		8	0.092101	0.488913	-1.85697	0.0633
		16	0.04504	0.606728	-1.57395	0.1155
	DAAR INT	2	0.397023	0.178873	-3.37098	0.0007
		4	0.268704	0.310019	-2.35888	0.0183
		8	0.099265	0.461411	-1.95213	0.0509
		16	0.05742	0.618685	-1.52352	0.1276
	DAR AIARKAN	2	0.879671	0.176566	-0.68149	0.4956
		4	0.820932	0.395223	-0.45308	0.6505
		8	1.579371	0.650264	0.890977	0.3729
		16	NA	0.909241	NA	NA
	DAR AIARKAN 2	2	0.381858	0.085424	-7.23619	0
		4	0.225523	0.142086	-5.45075	0
		8	0.097882	0.195611	-4.6118	0
		16	0.047574	0.260786	-3.65214	0.0003
	SAUDI ELTY	2	0.443286	0.07315	-7.61059	0
		4	0.2575	0.126174	-5.88475	0
		8	0.132272	0.182721	-4.74893	0
		16	0.056716	0.253142	-3.7263	0.0002
	SAUDI ELTY 2	2	0.322313	0.096204	-7.04424	0
		4	0.192698	0.159724	-5.05437	0
		8	0.100242	0.219539	-4.0984	0
		16	0.049378	0.28493	-3.33633	0.0008
	SAUDI ELTY 3	2	0.589814	0.198095	-2.07065	0.0384
		4	0.25954	0.344952	-2.14656	0.0318
		8	0.129323	0.53147	-1.63824	0.1014
		16	0.093301	0.709003	-1.27884	0.201
	SAUDI ELTY 4	2	0.353998	0.379136	-1.70388	0.0884
		4	0.149736	0.600324	-1.41634	0.1567
		8	0.082808	0.734702	-1.24839	0.2119
		16	0.086275	0.81552	-1.12042	0.2625

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
Bahrain	CBB	2	0.419195	0.127149	-4.56791	0
		4	0.196905	0.20089	-3.9977	0.0001
		8	0.111614	0.265013	-3.35223	0.0008
		16	0.053288	0.344268	-2.74993	0.006
	CBB 2	2	0.49474	0.152796	-3.30677	0.0009
		4	0.211303	0.242822	-3.24805	0.0012
		8	0.112401	0.308318	-2.87884	0.004
		16	0.033098	0.366864	-2.63559	0.0084
Turkey	KT	2	0.50273	0.301375	-1.65001	0.0989
		4	0.264102	0.522579	-1.4082	0.1591
		8	0.133613	0.752866	-1.15079	0.2498
		16	0.065864	0.896828	-1.0416	0.2976
	KT 2	2	0.380247	0.159359	-3.88904	0.0001
		4	0.217655	0.274275	-2.85241	0.0043
		8	0.094254	0.392448	-2.30794	0.021
		16	0.053714	0.503448	-1.87961	0.0602
Qatar Qatar	ALMANA	2	0.508025	0.353485	-1.39179	0.164
		4	0.245649	0.533443	-1.41412	0.1573
		8	0.129578	0.634773	-1.37123	0.1703
		16	0.066492	0.698623	-1.33621	0.1815
	ALMANA 2	2	0.382009	0.158838	-3.89071	0.0001
		4	0.195383	0.25139	-3.20068	0.0014
		8	0.101485	0.316322	-2.8405	0.0045
		16	0.059824	0.391025	-2.40439	0.0162
	QIB	2	0.355614	0.249921	-2.57836	0.0099
		4	0.174053	0.3864	-2.13755	0.0326
		8	0.096428	0.467168	-1.93415	0.0531
		16	0.051526	0.528569	-1.79442	0.0727
	QIB 2	2	0.447336	0.066085	-8.36292	0
		4	0.212737	0.112458	-7.00053	0
		8	0.107359	0.1582	-5.64247	0
		16	0.057562	0.221322	-4.25823	0
	QIIB	2	0.437264	0.167932	-3.35097	0.0008
		4	0.21155	0.273667	-2.88106	0.004
		8	0.100689	0.36385	-2.47165	0.0134
		16	0.045834	0.443974	-2.14915	0.0316
	QREIC	2	0.378329	0.186121	-3.34014	0.0008
		4	0.221356	0.287526	-2.70808	0.0068
		8	0.095636	0.353435	-2.55878	0.0105
		16	0.049002	0.399118	-2.38275	0.0172
Pakistan	PAKISTAN SUKUK	2	0.55528	0.091767	-4.84619	0
		4	0.255808	0.158341	-4.69994	0
		8	0.1211	0.212108	-4.14365	0
		16	0.062048	0.260233	-3.60428	0.0003
	PAKISTAN SUKUK 2	2	0.503398	0.114817	-4.32518	0

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		4	0.27698	0.194086	-3.72526	0.0002
		8	0.134937	0.26854	-3.22136	0.0013
		16	0.063375	0.337995	-2.77113	0.0056
	PAKISTAN SUKUK 3	2	0.477149	0.099982	-5.22946	0
		4	0.247538	0.173777	-4.33005	0
		8	0.128402	0.249007	-3.50029	0.0005
		16	0.060794	0.310995	-3.02	0.0025
	PAKISTAN SUKUK 4	2	0.35372	0.066203	-9.76209	0
		4	0.199675	0.108579	-7.37088	0
		8	0.091818	0.145798	-6.22904	0
		16	0.052339	0.186674	-5.07657	0
Malaysia	BNM	2	0.512463	0.42579	-1.14502	0.2522
		4	0.26064	0.641154	-1.15317	0.2488
		8	0.150478	0.756882	-1.1224	0.2617
		16	0.051656	0.839675	-1.12942	0.2587
	FIRST MALAYSIA	2	0.406102	0.080911	-7.34013	0
		4	0.203828	0.131109	-6.07259	0
		8	0.106354	0.178834	-4.99707	0
		16	0.053426	0.245486	-3.85592	0.0001
	FIRST MALAYSIA 2	2	0.426731	0.06308	-9.08797	0
		4	0.201849	0.105776	-7.5457	0
		8	0.101703	0.146489	-6.13218	0
		16	0.047137	0.195656	-4.8701	0
	MBB	2	0.482684	0.14663	-3.52804	0.0004
		4	0.232259	0.234919	-3.2681	0.0011
		8	0.110912	0.321637	-2.76426	0.0057
		16	0.053908	0.425691	-2.22249	0.0263
	PETRONAS	2	0.308824	0.2731	-2.53085	0.0114
		4	0.144951	0.452487	-1.88967	0.0588
		8	0.091933	0.635419	-1.42909	0.153
		16	0.045082	0.768371	-1.24278	0.2139
	WAKALA GLOBA	2	0.398515	0.080847	-7.43981	0
		4	0.199979	0.134511	-5.94763	0
		8	0.098844	0.189615	-4.75257	0
		16	0.056683	0.262663	-3.59137	0.0003
	WAKALA GLOBA 2	2	0.337102	0.084202	-7.87269	0
		4	0.193087	0.137772	-5.85685	0
		8	0.087395	0.190187	-4.79846	0
		16	0.048093	0.259608	-3.6667	0.0002
UAE	ABUDHABI ISLAMIC	2	0.438035	0.158449	-3.54667	0.0004
		4	0.224374	0.270097	-2.87165	0.0041
		8	0.099126	0.366129	-2.46054	0.0139
		16	0.048414	0.45994	-2.06893	0.0386
	ADCB2	2	0.458154	0.126937	-4.26861	0
		4	0.238892	0.194766	-3.90781	0.0001

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		8	0.127465	0.235941	-3.69811	0.0002
		16	0.058994	0.276533	-3.40287	0.0007
	ADCB ISLAMIC 1	2	0.347025	0.214692	-3.04146	0.0024
		4	0.181626	0.33655	-2.43166	0.015
		8	0.09892	0.41507	-2.17091	0.0299
		16	0.063024	0.476451	-1.96657	0.0492
	ADIB	2	0.433724	0.19261	-2.94001	0.0033
		4	0.209182	0.297353	-2.65953	0.0078
		8	0.117481	0.363849	-2.42551	0.0153
		16	0.066233	0.416592	-2.24144	0.025
	DIB 3	2	0.441793	0.194099	-2.87588	0.004
		4	0.207776	0.314299	-2.5206	0.0117
		8	0.117743	0.418369	-2.1088	0.035
		16	0.061508	0.534151	-1.75698	0.0789
	DP	2	0.481875	0.163809	-3.16299	0.0016
		4	0.252535	0.247515	-3.01987	0.0025
		8	0.115243	0.292512	-3.02468	0.0025
		16	0.062272	0.331642	-2.82753	0.0047
	DUBAI DOF 2	2	0.551073	0.087691	-5.11939	0
		4	0.333225	0.150047	-4.44379	0
		8	0.186654	0.212261	-3.83182	0.0001
		16	0.101923	0.292863	-3.06654	0.0022
	DUBAI DOF 3	2	0.461657	0.133274	-4.03938	0.0001
		4	0.249954	0.227929	-3.29069	0.001
		8	0.129791	0.332852	-2.6144	0.0089
		16	0.050132	0.448229	-2.11916	0.0341
	DUBAI GLOBAL	2	0.885787	0.329608	-0.34651	0.729
		4	0.456721	0.586998	-0.92552	0.3547
		8	0.262258	0.762654	-0.96734	0.3334
		16	0.186565	0.905844	-0.89799	0.3692
	DUBAI SUKUK	2	0.282674	0.256576	-2.79576	0.0052
		4	0.190587	0.416163	-1.94494	0.0518
		8	0.083315	0.522631	-1.75398	0.0794
		16	0.04468	0.588129	-1.62434	0.1043
	DUBI DOF	2	0.533425	0.085428	-5.46165	0
		4	0.282084	0.148412	-4.83731	0
		8	0.146407	0.214462	-3.98017	0.0001
		16	0.082088	0.305011	-3.00944	0.0026
	EIB	2	0.43307	0.112457	-5.04129	0
		4	0.208487	0.193846	-4.08321	0
		8	0.121153	0.275357	-3.19166	0.0014
		16	0.07653	0.361604	-2.55382	0.0107
	EIB 2	2	0.42882	0.091096	-6.27006	0
		4	0.241927	0.154805	-4.89695	0
		8	0.118577	0.215519	-4.08978	0

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		16	0.059705	0.280679	-3.35008	0.0008
	EIB 3	2	0.341485	0.253851	-2.5941	0.0095
		4	0.17368	0.391755	-2.10928	0.0349
		8	0.097533	0.47354	-1.90579	0.0567
		16	0.04459	0.570844	-1.67368	0.0942
	EIB 4	2	0.430279	0.09154	-6.22377	0
		4	0.248583	0.155066	-4.84578	0
		8	0.121347	0.22047	-3.98536	0.0001
		16	0.07595	0.30686	-3.01131	0.0026
	FGB	2	0.455008	0.129844	-4.19728	0
		4	0.210819	0.205499	-3.84032	0.0001
		8	0.106857	0.258449	-3.45579	0.0005
		16	0.050242	0.331562	-2.86449	0.0042
	FGB 2	2	0.430785	0.168021	-3.38775	0.0007
		4	0.215312	0.265051	-2.96052	0.0031
		8	0.095964	0.333954	-2.70707	0.0068
		16	0.049293	0.422356	-2.25096	0.0244
	HBME	2	0.497228	0.229236	-2.19325	0.0283
		4	0.253349	0.347264	-2.1501	0.0315
		8	0.126756	0.413767	-2.11047	0.0348
		16	0.064432	0.449613	-2.08083	0.0374
	HBME 2	2	0.350928	0.110523	-5.87274	0
		4	0.180024	0.177451	-4.62086	0
		8	0.090679	0.225844	-4.02632	0.0001
		16	0.048626	0.277745	-3.42535	0.0006
	HILAL	2	0.506769	0.093176	-5.29356	0
		4	0.230261	0.159489	-4.82628	0
		8	0.133933	0.221533	-3.90942	0.0001
		16	0.055926	0.297725	-3.17096	0.0015
	JAFZ	2	0.416266	0.174722	-3.34092	0.0008
		4	0.247034	0.292935	-2.57042	0.0102
		8	0.160232	0.407561	-2.06047	0.0394
		16	0.074494	0.536338	-1.7256	0.0844
	MAF	2	0.489323	0.229133	-2.22873	0.0258
		4	0.20387	0.363708	-2.18893	0.0286
		8	0.103435	0.443865	-2.01991	0.0434
		16	0.054918	0.487728	-1.93772	0.0527
	RAKIA	2	0.348192	0.195779	-3.32931	0.0009
		4	0.178923	0.305329	-2.68916	0.0072
		8	0.098677	0.403652	-2.23292	0.0256
		16	0.048242	0.527381	-1.80469	0.0711
	SIB	2	0.324979	0.100711	-6.70254	0
		4	0.197815	0.165962	-4.83356	0
		8	0.084971	0.229624	-3.98491	0.0001
		16	0.046028	0.311805	-3.05951	0.0022

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
	SIB 2	2	0.390262	0.122208	-4.98935	0
		4	0.206352	0.19176	-4.13876	0
		8	0.106402	0.238198	-3.75149	0.0002
		16	0.045283	0.285727	-3.34137	0.0008
	TDIC	2	0.417536	0.158094	-3.68428	0.0002
		4	0.199938	0.249017	-3.21288	0.0013
		8	0.099571	0.305898	-2.94356	0.0032
		16	0.057004	0.349644	-2.69702	0.007

Source: Generated by the author.

Table 4.4 presented the variance ratio test results of Sukuk daily data. From the results, the null hypothesis of a random walk under the assumptions of homoscedasticity is rejected in the majority return series of Sukuk. The Z-statistics and p-values are significant at 5% except in DAR ALARKAN, SAUDI ELTY 4, KT, ALMANA, BNM and DUBAI GLOBAL where Z-statistics are not greater than or equal to ± 1.96 and in which the p-values are found to be insignificant and more than 0.05, in addition to lag 4, 8 and 16 for DUBAI SUKUK and PETRONAS; lag 8 and 16 for BSF, DAARINT, SAUDI ELTY 3, QIB and EIB 3; and lag 16 for MAF, JAFZ and RAKIA. In these cases, the null hypothesis is accepted. These results seem to be in line with the autocorrelation and Ljung-Box Q-statistics tests results and run test results that rejected the null hypothesis that Sukuk returns fluctuate randomly (bond price changes are not independent over time).

The following table shows the variance ratio test results for conventional bonds included in the study.

Table 4.5 Variance Ratio Test Results for Conventional Bonds Daily Data

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
Saudi Arabia	BANQUE SAUDI FRANS	2	0.334327	0.071988	-9.24696	0
		4	0.174229	0.116824	-7.06851	0
		8	0.081228	0.157319	-5.84019	0
		16	0.048456	0.209079	-4.55111	0
	INBLK	2	0.389387	0.141628	-4.3114	0
		4	0.215649	0.219155	-3.57898	0.0003
		8	0.08572	0.28807	-3.17381	0.0015
		16	0.052851	0.412398	-2.29669	0.0216
	SAUDI BRITISH BANK	2	0.565905	0.187345	-2.31709	0.0205
		4	0.243556	0.298987	-2.53002	0.0114
		8	0.115692	0.406773	-2.17396	0.0297

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		16	0.062857	0.545547	-1.71781	0.0858
	SAUDI BRITISH BANK 2	2	0.376616	0.101838	-6.12132	0
		4	0.195426	0.172775	-4.65677	0
		8	0.095404	0.228034	-3.96693	0.0001
		16	0.046052	0.278755	-3.42217	0.0006
Bahrain	BAHRAIN KINGDOM	2	0.594532	0.159851	-2.53654	0.0112
		4	0.259385	0.266423	-2.77984	0.0054
		8	0.143811	0.366415	-2.33666	0.0195
		16	0.08368	0.448551	-2.04284	0.0411
	BAHRAIN KINGDOM 2	2	0.441407	0.103978	-5.37222	0
		4	0.26343	0.174032	-4.23238	0
		8	0.154151	0.241285	-3.5056	0.0005
		16	0.087458	0.328481	-2.77806	0.0055
	BAHRAIN KINGDOM 3	2	0.528871	0.0756	-6.2319	0
		4	0.261776	0.126095	-5.85451	0
		8	0.132804	0.172589	-5.02464	0
		16	0.074167	0.229187	-4.03964	0.0001
	BAHRAIN MUMTALAKAT	2	0.334336	0.117742	-5.65358	0
		4	0.175993	0.185388	-4.44476	0
		8	0.094934	0.229754	-3.93928	0.0001
		16	0.050124	0.272945	-3.4801	0.0005
	FINANS BANK	2	0.679017	0.134645	-2.38392	0.0171
		4	0.26709	0.216042	-3.39244	0.0007
		8	0.195675	0.3181	-2.52853	0.0115
		16	0.090169	0.466759	-1.94925	0.0513
	HDFC	2	0.364781	0.41354	-1.53605	0.1245
		4	0.18437	0.63828	-1.27786	0.2013
		8	0.104858	0.760488	-1.17706	0.2392
		16	0.061	0.83099	-1.12998	0.2585
	ICICI 2	2	0.333576	0.152372	-4.37365	0
		4	0.168553	0.258454	-3.217	0.0013
		8	0.088394	0.350662	-2.59968	0.0093
		16	0.042262	0.414483	-2.31068	0.0209
	ICICI	2	0.45473	0.093695	-5.81963	0
		4	0.222267	0.145911	-5.33018	0
		8	0.114171	0.185006	-4.78811	0
		16	0.051385	0.227133	-4.17647	0
	ICICI 3	2	0.498225	0.371398	-1.35104	0.1767
		4	0.244688	0.564786	-1.33734	0.1811
		8	0.125464	0.677425	-1.29097	0.1967
		16	0.062126	0.739084	-1.26897	0.2045
Kuwait	KUWAIT FINL	2	0.522999	0.341884	-1.39521	0.163
		4	0.279852	0.513641	-1.40205	0.1609
		8	0.14892	0.64929	-1.31079	0.1899
		16	0.074386	0.883495	-1.04767	0.2948
	KUWAIT PRJ S	2	0.498053	0.071122	-7.05751	0
		4	0.290948	0.120882	-5.86568	0
		8	0.145459	0.175479	-4.86976	0
		16	0.075732	0.239227	-3.86356	0.0001
	KUWAIT PRJS 2	2	0.33396	0.104053	-6.40098	0
		4	0.193886	0.17903	-4.50268	0
		8	0.084138	0.260134	-3.52074	0.0004
		16	0.050001	0.358482	-2.65006	0.008
	KUWAIT PRJS 4	2	0.415248	0.101028	-5.78799	0
		4	0.221146	0.167019	-4.66326	0
		8	0.101601	0.229911	-3.90759	0.0001
		16	0.062079	0.293858	-3.19175	0.0014
	KUWAIT PRJS 3	2	0.415243	0.101033	-5.7878	0
		4	0.221141	0.167027	-4.66306	0

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		8	0.101596	0.229923	-3.90741	0.0001
		16	0.062082	0.293874	-3.19157	0.0014
Turkey	TURKEY BONDS	2	0.416318	0.165201	-3.53315	0.0004
		4	0.204724	0.257436	-3.08922	0.002
		8	0.106149	0.326633	-2.73656	0.0062
		16	0.05153	0.435733	-2.17673	0.0295
	TURKEY BONDS 2	2	0.609537	0.094784	-4.1195	0
		4	0.417238	0.194553	-2.99539	0.0027
		8	0.198086	0.34115	-2.35062	0.0187
		16	0.118924	0.502403	-1.75372	0.0795
Qatar	DOHA BANK	2	0.430775	0.111836	-5.08981	0
		4	0.217071	0.175072	-4.47204	0
		8	0.112772	0.217938	-4.07101	0
		16	0.058538	0.256636	-3.66847	0.0002
	QATAR BONDS	2	0.413763	0.105918	-5.53481	0
		4	0.196814	0.16604	-4.83732	0
		8	0.100561	0.206958	-4.346	0
		16	0.051402	0.253245	-3.74577	0.0002
	QATAR BONDS 10	2	0.644409	0.305714	-1.16315	0.2448
		4	0.299341	0.479094	-1.46247	0.1436
		8	0.15077	0.594924	-1.42746	0.1534
		16	0.076647	0.672578	-1.37286	0.1698
	QATAR BONDS 11	2	0.395075	0.123851	-4.88429	0
		4	0.215699	0.211441	-3.70931	0.0002
		8	0.102259	0.295274	-3.04037	0.0024
		16	0.056121	0.397566	-2.37414	0.0176
	QATAR BONDS 2	2	NA	NA	NA	NA
		4	NA	NA	NA	NA
		8	NA	NA	NA	NA
		16	NA	NA	NA	NA
	QATAR BONDS 3	2	0.483317	0.07301	-7.0769	0
		4	0.228452	0.116802	-6.60563	0
		8	0.127644	0.153115	-5.6974	0
		16	0.063977	0.198391	-4.71808	0
	QATAR BONDS 4	2	0.465862	0.066333	-8.05238	0
		4	0.203735	0.109245	-7.28877	0
		8	0.105701	0.149856	-5.96774	0
		16	0.057552	0.198561	-4.74639	0
	QATAR BONDS 5	2	0.448962	0.106472	-5.17545	0
		4	0.225223	0.163843	-4.72877	0
		8	0.105542	0.201802	-4.43235	0
		16	0.05067	0.239579	-3.96249	0.0001
	QATAR BONDS 6	2	0.425965	0.080885	-7.09696	0
		4	0.19844	0.129845	-6.17321	0
		8	0.10411	0.176423	-5.07807	0
		16	0.054886	0.229271	-4.12225	0
	QATAR BONDS 7	2	0.477879	0.063198	-8.26163	0
		4	0.254194	0.104203	-7.15722	0
		8	0.130351	0.143331	-6.06743	0
		16	0.066452	0.189116	-4.93638	0
	QATAR BONDS 8	2	0.478089	0.077955	-6.695	0
		4	0.215105	0.131886	-5.95129	0
		8	0.105632	0.190153	-4.70342	0
		16	0.06396	0.258279	-3.62415	0.0003
	QATAR BONDS 9	2	0.404318	0.109848	-5.42281	0
		4	0.222714	0.176763	-4.39733	0
		8	0.105571	0.24121	-3.7081	0.0002
		16	0.061293	0.315357	-2.97665	0.0029
	QATAR PETROLEUM	2	0.5382	0.30505	-1.51385	0.1301

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		4	0.250973	0.459257	-1.63095	0.1029
		8	0.127711	0.538658	-1.61937	0.1054
		16	0.063849	0.583845	-1.60343	0.1088
	QATAR PETROLEUM 2	2	0.47906	0.144185	-3.613	0.0003
		4	0.291975	0.244744	-2.89292	0.0038
		8	0.140802	0.366942	-2.34151	0.0192
		16	0.070018	0.495916	-1.87528	0.0608
Pakistan	PAKISTAN BONDS	2	0.503451	0.114828	-4.3243	0
		4	0.260726	0.194106	-3.80861	0.0001
		8	0.133795	0.268567	-3.22529	0.0013
		16	0.063384	0.338028	-2.77082	0.0056
	PAKISTAN MOBL	2	0.496109	0.127313	-3.9579	0.0001
		4	0.276654	0.208946	-3.46189	0.0005
		8	0.150009	0.284815	-2.98436	0.0028
		16	0.070937	0.395345	-2.35001	0.0188
	PAKISTAN MOBL 2	2	0.380447	0.158632	-3.9056	0.0001
		4	0.186763	0.25503	-3.18879	0.0014
		8	0.095717	0.32508	-2.78172	0.0054
		16	0.048811	0.389354	-2.443	0.0146
Malaysia	BERJAYA	2	0.498316	0.360061	-1.39333	0.1635
		4	0.244356	0.540153	-1.39894	0.1618
		8	0.126872	0.630742	-1.38429	0.1663
		16	0.065049	0.676621	-1.38179	0.167
	BK NEGARA	2	0.256337	0.5	-1.48733	0.1369
		4	0.134861	0.75	-1.15352	0.2487
		8	0.07498	0.875	-1.05717	0.2904
		16	0.047203	0.9375	-1.01632	0.3095
	DIGI TELECOM	2	0.445122	0.1401	-3.96058	0.0001
		4	0.242745	0.214607	-3.52857	0.0004
		8	0.117506	0.262985	-3.35569	0.0008
		16	0.063931	0.315557	-2.9664	0.003
	HSBC	2	0.4634	0.093029	-5.76813	0
		4	0.221671	0.146674	-5.30654	0
		8	0.111966	0.188159	-4.71959	0
		16	0.058123	0.227519	-4.13978	0
	MALAYSIA BONDS	2	0.530901	0.27637	-1.69736	0.0896
		4	0.215052	0.438112	-1.79166	0.0732
		8	0.108503	0.535084	-1.66609	0.0957
		16	0.054764	0.588787	-1.6054	0.1084
	MALAYSIA BONDS 2	2	0.429878	0.084944	-6.71174	0
		4	0.219592	0.136706	-5.70865	0
		8	0.109053	0.176786	-5.03971	0
		16	0.052941	0.21865	-4.33139	0
	MALAYSIA BONDS 3	2	0.516195	0.060393	-8.01093	0
		4	0.270852	0.10266	-7.10252	0
		8	0.144704	0.145661	-5.87184	0
		16	0.068419	0.19823	-4.69949	0
	MALAYSIA BONDS 4	2	0.472664	0.069541	-7.58312	0
		4	0.245472	0.114097	-6.61307	0
		8	0.124962	0.161456	-5.41967	0
		16	0.068112	0.224344	-4.15384	0
	MALAYSIA BONDS 5	2	0.483453	0.084741	-6.09559	0
		4	0.277275	0.149931	-4.82039	0
		8	0.135585	0.212312	-4.07144	0
		16	0.064241	0.279924	-3.3429	0.0008
	OCBC	2	0.468094	0.105413	-5.04594	0
		4	0.21285	0.165484	-4.75666	0
		8	0.107332	0.207136	-4.30958	0
		16	0.053679	0.245366	-3.85677	0.0001

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
	ORIX	2	0.471916	0.274591	-1.92317	0.0545
		4	0.243912	0.413038	-1.83055	0.0672
		8	0.114883	0.485883	-1.82167	0.0685
		16	0.060327	0.531983	-1.76636	0.0773
	PANGLIMA POWERSDN	2	0.411528	0.113211	-5.19799	0
		4	0.206656	0.176537	-4.49393	0
		8	0.101615	0.221468	-4.0565	0
		16	0.058998	0.273785	-3.43701	0.0006
	RCE ADVANCE 1	2	0.485219	0.289003	-1.78123	0.0749
		4	0.245327	0.434134	-1.73834	0.0822
		8	0.125228	0.507816	-1.72262	0.085
		16	0.047766	0.549058	-1.73431	0.0829
	SABAHSTATE	2	0.424153	0.175737	-3.27676	0.0011
		4	0.18088	0.28088	-2.91627	0.0035
		8	0.088875	0.386543	-2.35712	0.0184
		16	0.046056	0.459077	-2.07796	0.0377
	SER0SELIASLNGRSELATAN 4	2	0.440571	0.243895	-2.29373	0.0218
		4	0.184621	0.389883	-2.09134	0.0365
		8	0.095062	0.494135	-1.83136	0.067
		16	0.046793	0.55613	-1.714	0.0865
	STD	2	0.425257	0.125453	-4.58134	0
		4	0.215074	0.191446	-4.09999	0
		8	0.106594	0.235362	-3.79588	0.0001
		16	0.047971	0.293545	-3.24321	0.0012
	SYRKTPRSRNA	2	0.372501	0.170119	-3.6886	0.0002
		4	0.189831	0.264186	-3.06666	0.0022
		8	0.089772	0.322457	-2.82279	0.0048
		16	0.039463	0.376396	-2.55193	0.0107
UAE	ABUDHABI COML	2	0.470787	0.303929	-1.74124	0.0816
		4	0.243205	0.45667	-1.6572	0.0975
		8	0.122615	0.535538	-1.63832	0.1014
		16	0.062063	0.580293	-1.61632	0.106
	ABUDHABI COML 2	2	0.381701	0.265265	-2.33087	0.0198
		4	0.21709	0.415192	-1.88566	0.0593
		8	0.108055	0.497369	-1.79333	0.0729
		16	0.056313	0.539662	-1.74866	0.0803
	ABUDHABI NAT	2	0.357159	0.128779	-4.99181	0
		4	0.203699	0.215091	-3.70216	0.0002
		8	0.094509	0.294319	-3.07657	0.0021
		16	0.058619	0.388289	-2.42444	0.0153
	ABUDHABI NAT 2	2	0.465782	0.078087	-6.84131	0
		4	0.230684	0.137597	-5.59109	0
		8	0.115619	0.201816	-4.38211	0
		16	0.061122	0.258695	-3.62928	0.0003
	ABUDHABI NAT 3	2	0.400949	0.071703	-8.35458	0
		4	0.215696	0.117848	-6.65521	0
		8	0.107035	0.161474	-5.53007	0
		16	0.053323	0.21344	-4.43532	0
	ADCB	2	0.502895	0.470477	-1.0566	0.2907
		4	0.317632	0.708207	-0.96352	0.3353
		8	0.071918	0.84492	-1.09843	0.272
		16	0.041705	0.920274	-1.04132	0.2977
	AXIS	2	0.506229	0.073936	-6.67837	0
		4	0.215038	0.129975	-6.03934	0
		8	0.125232	0.191843	-4.55982	0
		16	0.066423	0.260831	-3.57924	0.0003
	AXIS BANK	2	0.473868	0.100895	-5.21462	0
		4	0.249717	0.159607	-4.70083	0
		8	0.12251	0.202417	-4.33505	0

Country	Company	Period	Var. Ratio	Std. Error	z-Statistic	Probability
		16	0.059852	0.248195	-3.78794	0.0002
	DP	2	0.458154	0.126937	-4.26861	0
		4	0.238892	0.194766	-3.90781	0.0001
		8	0.127465	0.235941	-3.69811	0.0002
		16	0.058994	0.276533	-3.40287	0.0007
	DUBAI BONDS	2	0.509251	0.097165	-5.05067	0
		4	0.263471	0.159113	-4.62897	0
		8	0.130711	0.211794	-4.10441	0
		16	0.069392	0.264931	-3.51264	0.0004
	DUBAI HLDG	2	0.477692	0.273894	-1.90698	0.0565
		4	0.240953	0.411237	-1.84577	0.0649
		8	0.124925	0.480865	-1.81979	0.0688
		16	0.060909	0.517413	-1.81497	0.0695
	DUBI BONDS 2	2	0.587747	0.09037	-4.56185	0
		4	0.32103	0.149561	-4.53975	0
		8	0.148526	0.199695	-4.26387	0
		16	0.084138	0.263552	-3.47507	0.0005
	DUIELTYANDWTAUTH	2	0.523439	0.081293	-5.86224	0
		4	0.297378	0.138564	-5.07075	0
		8	0.14116	0.200794	-4.27722	0
		16	0.07254	0.274283	-3.3814	0.0007
	EXOVALTD	2	0.508012	0.168825	-2.91419	0.0036
		4	0.221268	0.258858	-3.00834	0.0026
		8	0.12367	0.318076	-2.7551	0.0059
		16	0.060999	0.375572	-2.50019	0.0124
	NAT	2	0.414873	0.128147	-4.56605	0
		4	0.213549	0.198651	-3.95895	0.0001
		8	0.099082	0.245898	-3.66378	0.0002
		16	0.047256	0.31092	-3.06427	0.0022
	NAT 2	2	0.474612	0.058464	-8.98653	0
		4	0.204146	0.096889	-8.21409	0
		8	0.105869	0.134022	-6.67151	0
		16	0.058784	0.182199	-5.16587	0
	ABUDHABI COML 4	2	0.406321	0.110078	-5.39325	0
		4	0.200153	0.175494	-4.55768	0
		8	0.097033	0.237022	-3.80964	0.0001
		16	0.053496	0.31971	-2.9605	0.0031
	XSTRATA	2	0.398085	0.189513	-3.17611	0.0015
		4	0.266065	0.334145	-2.19646	0.0281
		8	0.140686	0.473229	-1.81585	0.0694
		16	0.080948	0.616081	-1.49177	0.1358

Source: Generated by the author.

Table 4.5 presents the variance ratio test results of the conventional bonds in these countries. The p-values and Z-statistics generated in all of the series are significantly greater than 1.96, and the p-values are less than 0.05. This provides statistical evidence to reject the null hypothesis in all of the series. The series do not follow a random walk except HDFC and ICICI 3 in Bahrain, KUWAIT FINL in KUWAIT, QATAR BONDS 10 and QATAR PETROLEUM in Qatar, BERJAYA, BK NEGARA, MALAYSIA BONDS, ORIX and RCE ADVANCE 1 in Malaysia, and ABUDHABI COML, ABUDHABI

COML 2, ADCB and DUBAI HLDG in the UAE. In these cases, the null hypothesis is accepted because the Z-statistics are less than 1.96 in most of the periods and the p-values are greater than 0.05, which is evidence that these conventional bonds follow a random walk.

4.5 DISCUSSION OF THE RESULTS

The autocorrelation tests were used to assess whether there is any evidence of serial correlation in the series, which is a way of testing the random walk hypothesis. The results from this test provide evidence of serial correlation in 34 Sukuk out of the total 53, and in 45 conventional bonds out of the total 73. By this result, most of the Sukuk and conventional bonds series do not follow a random walk, which is sufficient evidence to reject the null hypothesis of weak form efficiency. This is similar to Prosocial (1996), who suggested a significant autocorrelation in most lags of the return series in the Indian stock market, which rejects the weak form efficiency hypothesis. The results of Mobarek and Keasey's (2000) autocorrelation test analysis demonstrated that the return series of Dhaka Stock Exchange shares do not follow a random walk, and that the significant autocorrelation coefficient at different lags rejects the null hypothesis of weak form efficiency. Nisar and Hanif (2012) tested the weak form in South Asia including Pakistan, India, Srilanka and Bangladesh using serial correlation tests, and suggested that none of the four stock markets support the random walk hypothesis.

A non-parametric test – a run test and variance ratio test – have also been employed to overcome the assumption of normal distribution. The results from the run test shows that the null hypothesis of random returns is rejected at 5% significant level for most of the Sukuk, which is consistent with the results of the autocorrelation test. Poshokwale (1996), also studying the Indian stock market, rejected the weak form efficiency hypothesis using a run test. Mobarek and Keasey's (2000) results of their run test analysis showed that the share return series of the Dhaka Stock Exchange do not follow a random walk and reject the null hypothesis of weak form efficiency. Moustafa (2001 cited in Moustafa, 2004, p.314) examined the UAE stock market during the period January 1999 to March

2001 using runs tests and found that UAE stock market does not support the weak form efficiency in 15 of the 18 stocks at a 5% level of significance. Nisar and Hanif (2012) applied runs tests to test the weak form of South Asia, and they found that none of the four stock markets are weak form efficient. In contrast to this, the null hypothesis of random returns cannot be rejected at a 5% level of significance in nearly 50% of the conventional bonds. The results here are similar to those of Moustafa (2004), who found that the returns in the UAE stock market follow weak-form efficiency; this result was unexpected as the UAE stock market is newly developed.

The variance ratio test results provide evidence to reject the null hypothesis of weak form efficiency in most of the series of both Sukuk and conventional bonds and then do not follow the random walk hypothesis. Smith and Ryoo (2003) rejected the random walk hypothesis and the weak form of market efficiency using variance ratio tests for Greece, Hungary, Poland and Portugal, while in Turkey the weak form of market efficiency is not rejected and follows a random walk. Charles and Darne (2009), using variance ratio test, also rejected the random walk hypothesis in five emerging markets of Latin America. Nisar and Hanif (2012) tested the weak form of Pakistan, India, Srilanka and Bangladesh using variance ratio tests and suggest that none of the four stock markets support the random walk hypothesis. The result here is consistent with the autocorrelation and Ljung-Box Q-statistics results in most of the series of both Sukuk and conventional bonds. The consistency was also extended to the runs test results, which reject the random walk hypothesis in most of the Sukuk series. This is inconsistent with the runs test results that accept the random walk hypothesis in most of the conventional bond series.

The results of this study present a very clear picture that the secondary market of both Sukuk and conventional bonds is not liquid due to infrequent trading. In contrast, Roberts (1959) and Osborne (1959) believed that developed markets are weak form efficient due to the fact that developed markets are very popular and liquid. Mobarek and Keasey

(2000) reported that developed markets are comparatively more efficient than emerging markets. Gimba (2010) argued that owing to low liquidity, lack of experienced market participants and thin infrequent trading, emerging markets are unlikely to be efficient in weak form. The results could be also influenced based on the availability of data on Sukuk and conventional bonds. Daily prices of Sukuk and conventional bonds are only available for a limited time period. as they cannot be restricted to a particular market due to the lack of secondary market information for Sukuk and conventional bonds in these countries.

4.6 CONCLUSION

This chapter investigates the weak form efficiency of Sukuk and conventional bond markets in the selected countries. The autocorrelation and Ljung-Box Q-statistics tests and the variance ratio test were applied to study the random walk hypothesis. The runs test was also used to test the randomness of returns.

It was expected that Sukuk markets might not be as liquid as conventional bond markets in these developing countries. However, the results suggest that even the conventional bonds markets are illiquid in these countries too, as high persistence is found in the daily returns of both Sukuk and conventional bonds. In light of these results, it is not possible to differentiate the Sukuk market (which is comparatively new) from the conventional bond market. The random walk hypothesis is rejected in both of these markets. It can be concluded that Sukuk and conventional bonds markets in these countries are not weak form efficient. This suggests that trading rules could exploit this high persistence and, as a result, earn abnormal returns. This is due to the high cost of the transactions, as it might not be possible for ordinary investors to earn abnormal returns.

CHAPTER 5

RISK AND RETURN ANALYSIS

5.1 INTRODUCTION

The development of the Sukuk market as an alternative to the existing conventional bond market has raised many questions about the potential risks associated with Sukuk. Due to the variety of Sukuk structures available, there are many issues surrounding Sukuk risk and return potential and hence their competitiveness. The most common types of risk in the bonds market are operational risk, foreign exchange risk, interest rate risk, credit rating, downgrade risk, counterparty risk and liquidity risk. Sukuk and conventional bonds seem to face similar risks due to the rise in base interest rates in the market. In the case of Sukuk, Shariah compliance risk is another important risk factor. Shariah compliance risk can be defined as the risk of issuers breaching their fiduciary responsibilities with respect to compliance with Shariah law.

This chapter will analyse and compare the differences between Sukuk and conventional bonds in terms of risk-return characteristics, as described in the research objectives section in chapter one. Different methods will be adopted to compare the riskiness of Sukuk and conventional bonds. This study will also explore the scope of diversification by including Sukuk in portfolios and comparing it with pure conventional bonds portfolios. The rest of this chapter is organized as follows. The next section reviews the related literature on Sukuk risks. The study methodology is discussed in the section following that. The last section will then present the results and discussion of these results in light of economic and financial theory.

5.2 LITERATURE REVIEW ON SUKUK RISKS

5.2.1 The Concept of Risk

Most investments in financial markets involve an element of risk. Even so-called risk-free investment bonds still carry risks due to changes in interest rates, credit ratings and inflation expectations. In financial analysis, risk has an important role in the understanding of bond prices

and returns. According to Hillier et al. (2010), there is no unique definition of risk as different researchers define the concept in different ways. Ridha and Alnaji (2013) define risk as the probability of unwanted and unexpected loss of funds during the investment period until the maturity date. Risk has two elements: uncertainty and exposure. Uncertainty is the probability of facing risk. Exposure is the total amount of the possible loss if such risk is faced. Shaikh (2013) identifies that in order to determine bond risks, we should take into account cash flow, the nature of the instrument and the issuers' creditworthiness. In general, bond risk can be defined as the change in the likelihood of the bond issuers' ability to pay the interest (coupon) and to repay the principal on time. Other risks associated with investing in bonds include interest rate risk, credit risk, inflation risk, downgrade risk, liquidity risk and exchange rate risk. If a bond is kept until maturity, the main risk defaults at maturity.

Sukuk are asset-backed instruments representing a degree of ownership of the underlying assets. So, the relationship between Sukuk holders and issuers represents investor/investee relationships but, as explained in chapter 2, they are different from equities. Sukuk risks can be defined as the likelihood of the originator or obligor being unable to pay back the principal sums to Sukuk holders when there are no profits to be distributed at maturity.

Risks in Sukuk could be different due to the different types or modes of Sukuk instruments and their underlying assets. For instance, Musharakah and Mudarabah Sukuk are unsafe and risky, as they rely on the outcome of a business venture that is difficult to predict (Adam and Thomas, 2004). While Ijara Sukuk's potential benefits are limited to the value of the assets (securitised), where the owner of the leased assets (SPV) will be bankruptcy-remote, this makes it more difficult to lay claim to anything more than cash flows, and in default, owners may not be in a position to repay the principal on maturity. In conventional bonds, the third party, whether it is a bank or other institution, can secure and guarantee the bondholders against any losses by suing the issuer for the missing interest and principal at maturity. However, in Islamic financial transactions, risk

is involved to ensure its compliance with Shariah law. As mentioned before, guaranteeing the principal (money) is forbidden in Islam due to its profit and loss sharing principle.

In terms of financial asset portfolios, risks can be divided into systematic and unsystematic risk. Systematic risk refers to changes in macro-economic variables, also known as undiversifiable risk or market risk. This type of risk cannot be diversified away. Systematic risk is not the same for all securities or portfolios, where different companies behave differently in response to news about the probability of recession or boom. The financial crisis in 2008 provided a significant example of systematic risk where the values of investments changed due to this economic event. Unsystematic risk, also known as idiosyncratic risk, specific risk or diversifiable risk, refers to risk associated with individual assets, and it differs from asset to asset and can be diversified away by including a number of different assets in a portfolio. Examples of unsystematic risk include losses caused by labour problems, regulatory change, management change and product recalls. In terms of Sukuk, these two risks are considered as embedded risks in Sukuk investments. Systematic risk includes exchange-rate risk, interest-rate risk, commodity-value risk and equity-value risk. Unsystematic risk includes institutional risk, credit risk, Shariah-compliance risk and operational risk. In spite of bearing certain risks, conventional bonds are considered to be relatively safer than Sukuk due to the nature of fixed coupons and holders' priority claim on assets in the case of issuer default.

5.2.2 Risks Associated with Sukuk

Losing the underlying asset is the main risk that Sukuk holders should be aware of, as this could lead to a default, meaning that Sukuk holders would not get their principal back. The underlying asset in Sukuk is a real asset, while money (debt) is the underlying asset of conventional bonds.

Tariq (2004) explored the various types of risks in Sukuk structures including credit risk, interest-rate risk, exchange-rate risk, Shariah-compliance risk, operational risks, SPV risks and the risks associated with underlying assets, and concluded that Sukuk are different from

conventional bonds but still mimic some features of bonds and returns from conventional asset-backed securities markets. Zaidi (2009) compared the risk associated with Sukuk to its conventional counterpart and found that Sukuk are much riskier, as Sukuk inherently come with certain risk factors such as market risk, risk associated with the assets underlying the Sukuk, and regulatory risk, rather than just credit risk. However, there are some common types of risks in conventional bonds and Sukuk and some others that are specific to Sukuk only. This review will focus on the main risks that are solely associated with Sukuk. These are interest-rate risk, credit risk, liquidity risks, inflation risk and Shariah-compliance risk.

5.2.2.1 Interest rate risk

There is an inverse relationship between interest rates and the market value of fixed-income securities such as bonds. Sukuk and conventional bonds are both exposed to the same interest rate risk. The rise in market interest rates (above the coupon rate) will lead Sukuk prices to fall like conventional bonds; long-maturity Sukuk are also more sensitive to changes in interest rates. In other words, the longer the maturity, the higher the risk for Sukuk investors. Cash flows to Sukuk holders should therefore reflect the actual returns of the underlying assets. Tariq (2004) explains that due to the widespread usage of LIBOR benchmarking, Sukuk are indirectly exposed to interest-rate fluctuations. Islamic financial institutions should develop a proper Islamic index in the future as an Islamic benchmark. Islamic Development Bank is in the process of designing and promoting such a benchmark for IFIs, as the development of an Islamic benchmark is considered an important factor affecting further development of the Sukuk market.

5.2.2.2 Credit and Counterparty Risk

Changes in market rates will also negatively affect issuers' creditworthiness. Credit risk (default risk) is the probability that a coupon and/or principal may not be paid due to the issuer's default. In terms of delay, there will be a specific type of payment associated with these

delayed coupons that will be added to the SPV. However, Shariah law recommends that such payments be donated to charity (Tariq and Dar, 2007).

In Sukuk, the credit and counterparty risks are unique due to the nature of Islamic financial instruments, which are the basis of Sukuk asset pools, as Sukuk do not have access to some credit risk-management mechanisms such as derivatives to cover such exposure due to Shariah restrictions (Ahmed, 2011). Tariq and Dar (2007) mentioned that Sukuk Al-Ijara, Al-Istisna, and Al-Salam are particularly exposed to this type of risk. For example, Salam contracts are exposed to the risk that commodities might not be delivered on time or may delivered in incorrect quantities.

In the case of issuer default, conventional bondholders can get their principal (or a part of it) from the residual assets of the issuer. There is no such facility for Sukuk holders in the case of default. It all depends on whether the Sukuk is asset-based or asset-backed. In asset-based Sukuk, if the originator fails to pay any amount, the holders normally have no recourse against the originator or the SPV due to the nature of this type of Sukuk, in which it does not grant the certificate holders the right to force the sale or otherwise dispose of any of the trust assets on default, as there is no real transfer of the assets. In asset-backed Sukuk, Sukuk holders can recover some value from the underlying asset. In other words, they reserve the right to sell the underlying asset to a third party. This type of Sukuk seems to be much safer than conventional bonds as they transfer the ownership of the underlying assets to the holders.

A high number of Sukuk defaults shocked the market's confidence in 2009, triggering a big debate regarding investors' protection and rights. For instance, Malaysian Ingress Sukuk Berhad, Johor Corporation, Nam Fatt Corporation Berhad and Tracoma Holdings Berhad were prominent cases of Sukuk default, despite the country being a leader in the Sukuk market. Dubai World's Nakheel Sukuk, Saad Group and Investment Dar also recorded cases of Sukuk defaults in the GCC, as well as the East Cameron Sukuk in the US. In spite of the fact that Sukuk require

underlying assets to underpin deals and in turn should be more secure than conventional bonds, Sukuk in that period were at risk of losing their its credibility as a feasible Islamic long-term financing project instrument (Majid et al., 2010).

According to Shahida et al, (2014), the probability of default is low for solvent companies issuing Sukuk, while the probability of default is very high for insolvent companies.[1]

5.2.2.3 Liquidity Risks

Liquidity risk refers to the lack of sufficient trading in the secondary market. Sukuk Al-Murabahah, Sukuk Al-Salam and Sukuk Al-Istisna are non-tradable Sukuk and hence suffer from liquidity risk. Due to the limited number of issuances of other Sukuk, investors tend to hold their securities until maturity, which reduces the liquidity of that issue. The development of the secondary market is vital for the future growth of the Sukuk market and to overcome this type of risk.

5.2.2.4 Inflation Risk

Inflation risk is one of the major risks to investors in fixed-income securities. Inflation reduces the purchasing power of future cash flows. Shariah-compliant instruments are exposed to inflation risks but not as much as conventional bonds. This is due to the fact that inflation increases the market price of the underlying assets positively. In contrast, high inflation rates can cause the yields on conventional bonds to lag behind the inflation rate.

5.2.2.5 Shariah-Compliance Risks

Shariah compliance generally makes Islamic financial securities different from their conventional counterparts. Shariah-compliance risk refers to the issuers' failure to conform to Islamic principles and standards. Shariah scholars or jurists play an essential role in the formulation of Sukuk

[1] A company that is insolvent must enter bankruptcy; a company that lacks liquidity can also be forced to enter bankruptcy even if it is solvent.

prospectuses. The problem here is that there are different interpretations of Shariah law depending on the school of thought to which jurists belong.

The lack of consensus on what constitutes compliance with Shariah represents a major risk that is affecting the growth of Sukuk market. Usmani (2008) pointed out this problem in respect of the fact that some Shariah boards issue fatwas on the permissibility of an issue in accordance with proposed structures and ignore the remaining stages of Sukuk performance. According to AAOIFI standards (2008), Shariah scholars should be active in all stages to ensure that Sukuk are Shariah-compliant until maturity. The establishment of a supervisory board or regulatory authority like AAOIFI and the Organisation of the Islamic Conference (OIC) for fiqh academy institutions is required to reduce this risk. It is very important to ensure that rules, standards and regulations are strictly followed so that Islamic finance can grow from its infancy to maturity.

5.2.2.6 Call Risk

Call risk is the risk associated when bonds have to be redeemed before their maturity date. There can be various reasons which can tempt issuers to call bonds before maturity. This could create a big problem for bondholders to reinvest the principal sooner than expected, as they will be run down from the higher original interest rate. This type of risk is more relevant to conventional bonds as most types of Sukuk are not callable.

In general, Nanaeva (2010) and Ramasamy et al. (2011) found that Sukuk are riskier than conventional bonds. They used different methods to measure Sukuk and conventional bond risks. Nanaeva (2010) applied the value at risk (VaR) approach to examine the riskiness of Sukuk and conventional bonds. Using historical data on 15 international Sukuk/Eurobonds, he showed that the average VaR of Sukuk is almost twice as high as the average VaR of conventional bonds. In contrast, Ramasamy et al. (2011) analysed the data for 93 bonds, comprising 35 conventional bonds, 31 Sukuk and 27 government bonds. By computing and comparing Sukuk, conventional bonds and government bonds in terms of their duration and convexity, they found that Sukuk are riskier than government bonds, but less risky than conventional bonds. Also,

Sukuk provided a lower return as risk and return were positively correlated.

Al-Sayed (2013) identified the following problems related to Sukuk:

1) The initial expenses associated with the Sukuk issue can be higher than conventional bonds due to the lack of standardisation and to some Shariah requirements towards Sukuk issuance. For example, IFC Al Hilal Sukuk took three years to be issued (Nanaeva, 2008).
2) In order to test Sukuk performance, there is limited historical data; there is a lack of transparency, and issuers and regulators' refusal to disclose enough information is an additional problem.
3) Sukuk may not provide tax shields because the assets can be located in one country, or in an SPV in another or with investors in a third. Also, Sukuk cannot be used to avoid double taxation.

5.2.3 Risk Management in Sukuk Portfolios

The main risk management techniques are usually based on derivatives, portfolio diversification and the management of credit and operations risk. In Islamic finance, risk management is very complex and difficult within the boundaries specified by Shariah law. Interest rate swaps and conventional forms of derivatives, such as detachable options and credit derivatives, are prohibited by Islamic law. All of these constraints make risk management more complicated than for the conventional financial system. In Islamic finance, any transaction for risk management has to be backed by a real economic asset or service. So, to manage risk in the Islamic financial system without violating the basic principles of Shariah like the prohibition of Riba (interest) and speculation, transactions should be asset-backed and Sukuk holders should have ownership in the asset.

In Islamic bonds, portfolio diversification and hedging are the two main strategies of risk management as explained below.

1) Portfolio diversification is a common technique to reduce risks by including a large number of investments in a portfolio. In other words, it helps to reduce risk by spreading investments over a variety of opportunities in which returns are not positively correlated. In Sukuk,

portfolio diversification can be an important strategy to minimize risk, but the problem is that there are not many Sukuk issues. Hence, there are limited diversification opportunities because most of Sukuk issues are concentrated in GCC countries and Malaysia and based on the real estate sector. Several studies have explored the diversification potential of Sukuk to see if risk may be reduced by adding Sukuk into an investment portfolio. In order to gauge the potential for risk reduction, Cakir and Raei (2007) used a sample of sovereign Sukuk and Eurobonds to compare the VaR of a fixed-income portfolio, including a mixture of Eurobonds and Sukuk, and a portfolio comprising only Eurobonds. They found that Sukuk reduced the VaR in the mixed portfolio while the pure Sukuk portfolio market risk was significantly high (19.9% higher than the pure bond portfolio market risk), concluding that Sukuk do provide some diversification advantages to investors. Fenech and Watson (2009) examined the impact of including Sukuk in an equity portfolio, comparing the risk and return before and after the incorporation of Sukuk in the Amana fund using weekly data from 2002–2005. They demonstrated that the inclusion of Sukuk bonds reduced the risk in the portfolio and argued that this should be attractive for funds that have a high risk profile. Hassan (2012) also supports the findings of previous studies that Sukuk provide diversification benefits for conventional bond portfolios by helping to reduce portfolio risk. However, a pure Sukuk portfolio is riskier than a pure conventional bond portfolio. This conclusion was based on a comparative evaluation of risk undertaken by employing the delta-normal VaR approach to analyse the monthly prices for two separate sovereign and corporate portfolios comprising Sukuk and conventional bonds for the same issuer in Dubai and Malaysia. Hassan added that due to Shariah restrictions on Sukuk risk management, Sukuk have higher market and credit risk than conventional bonds.

2) Hedging is another way to reduce risk by investing in another instrument that helps in managing different types of risk. A hedge involves taking an offsetting position in a related security and making an investment to reduce the risk of adverse price movements in an

asset, which is used to reduce any momentous losses suffered by individuals or organisations. A derivative is the most popular financial instrument for hedging that includes forwards, futures, options and swaps. In the case of Sukuk, most derivatives are prohibited by Shariah law; nevertheless, there are some options and swaps that can be attached to certain Islamic financial instruments. A number of derivative contracts within the bounds of Islamic finance can be used, such as Islamic options (Khiyarat) and Islamic swaps (an Islamic profit rate swap) (Obaidullah, 1999). Options refer to the promise to buy or sell an asset at a predetermined price within a specified period. Also, they imply a right without obligation and such a promise, in itself, is permissible and normally compulsory on the promisor. The purpose of an option contract is to provide the offeree with time to evaluate the main contract offer. The difference between Islamic options and conventional options is essentially ethical, where conventional options in finance include all kinds of rights without any obligations to have financial implications, but Islamic options offer the right for one or both parties to confirm or reject the contract (Alshamrani, 2014).

Several types of Islamic options have recently been recognised, including option by condition (khiyar Al-Shart); option of determination or choice (khiyar Al-Tayeen); option of the contracting session (khiyar Al-Majlis); option for defect (khiyar Al-Ayb); and option after inspection (khiyar Al-Ruyat). The two main options for risk management are option by condition (khiyar Al-Shart) and option of determination or choice (khiyar Al-Tayeen) (Elahi and Abd Aziz, 2011). Obaiadullah (2002) in his paper mention that option of condition (Khiyar al-Shart) and option of determination or choice (khiyar al-tayeen) are potentially capable in designing new financial instruments for risk management instruments in Islamic finance. Also he suggests that these options enable Islamic finance engineers to design contracts in more efficient ways. Swaps can also be used to hedge certain risks and are defined as an agreement between two enterprises to exchange cash flows at some pre-determined time in the future. This agreement will cover the nature of the cash flows to be exchanged and the timing

of the cash flows that are dependent on the valuation of future market variables.

The basic idea behind swaps is that the parties involved obtain access to markets at better terms than would be available to each one of them individually. Profit rate swaps, cross-currency swaps and total return swaps seek to achieve Shariah compliance.

In any event, the stream of cash flows involved in Shariah-compliant swaps will be created through the use of fully funded transactions by using reciprocal Murabahah transactions: commercial arrangements long accepted by Shariah scholars, unlike their conventional counterparts, where they often calculate cash flows using notional principal amounts (Jobst and Solé, 2012). Tariq (2004) mentioned that derivatives are not Shariah-compliant due to the uncertainty associated with them, and discussed the possibility of extending embedded options to fit the needs of Sukuk certificates and Shariah considerations. Tariq and Dar (2007) also identify the risks underlying Sukuk structures and suggest embedded options for mitigating such risks. Embedded options are a unique type of instrument that can be part of Islamic finance contracts, helping in Sukuk risk management and complying with Shariah principles. However, they state that these embedded options cannot be sold independently based on Shariah guidelines. They discuss the viability of a swap between floating-rate Sukuk and zero-coupon embedded Sukuk so that Sukuk can become more accessible to investors and more competitive in the market if an exchange between floating rate Sukuk and zero-coupon embedded Sukuk is made possible through creative Shariah-compatible financial engineering.

5.2.4 Sukuk Rating and Credit Risk

Credit (default) risk means that an originator or corporate borrower is unable to repay the principal and profit when they are due. The probability of this type of risk is high for highly levered debtors, even if the chances of it happening are very small, as a small warning or mistake could easily challenge the profitability of the investors and lead credit risk to happen.

The main purpose of bond or Sukuk ratings is to indicate the likelihood of defaults or delays in the payment of coupon and/or principal. Investors and regulators both depend on the credit rating agencies' opinions to make their decisions due to the complexity of the financial market and the diversity of the borrower. Consequently, any increases in the riskiness of the borrower's operating cash flows will increase the likelihood of default and vice versa.

Rating agencies have provided valuable information in terms of evaluating the risk of default, so that when the default percentage increases, the ratings grade is low and vice versa.

However, asset-backed and asset-based Sukuk are significantly different in their riskiness. The nature of the underlying assets determines the credit rating of Sukuk. Asset-backed Sukuk involves a true sale of assets, where the SPV purchases the underlying assets from the originator and holds these assets. It is considered to be a non-credit enhancement Sukuk as it is closer to equity rather than debt (Standard and Poor's, 2007). The rating assessment of the asset-backed Sukuk depends on the performance of the underlying asset that is generating cash to meet timely obligations (Arundina et al, 2014). Asset-based Sukuk, on the other hand, are closer to debt where the SPV purchases the underlying assets from the originator in the form of trust. In the case of default, the investors have no recourse to the underlying assets and Sukuk holders have no right to the underlying asset of the Sukuk. The originator of Sukuk, in this case, reflects the main risk more than the underlying assets. In fact, if the investors have an unsafe claim in the case of insolvency then it will be rated at the same level as other unsafe creditors (Arundina et al., 2014).

5.3 METHODOLOGY

5.3.1 Risk Measurements and Analysis

Risk has various definitions in modern economic literature and can be generalised as the variation or uncertainty around some average value. To assess and measure the financial risk of a bond (whether conventional or

Islamic bonds), several risk measurements and techniques can be used. These include standard deviation, variance, gap analysis, credit ratings, duration and convexity analysis, risk adjusted return on capital (RAROC) and VaR.

There are also more advanced methods in evaluating bond performance such as risk-adjusted performance evaluations, geometric rate of return, alpha-analysis, etc. Although standard deviation is the simplest and most commonly used risk measure of individual assets or portfolios, it is not an ideal risk measure since it treats profits the same way as losses and does not capture the total risk picture of return. VaR is the most common and more reliable risk measure and is considered to be the best technique for such purposes (Bohdalová, 2007; Ariffin et al., 2009).

Ariffin et al. (2009) specified the (percentage) numbers of the Islamic financial institutions using risk measurement methods, as shown in Table 5.1.

Table 5.1 Risk Measurement Tools Applied by Islamic Banks

Risk measurement	Yes (%)	No (%)	Total Islamic bankers (n)
Credit ratings	57	43	28
Gap analysis	68	32	28
Duration analysis	43	57	28
Maturity matching	82	18	28
Earnings at risk	43	57	28
Value at risk	29	71	28
Simulation techniques	18	82	28
Estimates of worst case/stress tests	43	57	28
Risk-adjusted return on capital	14	86	28
Internal-based rating system	46	54	28

Source: Ariffin et al (2009, P.161).

It shows that 43% of Islamic banks applied duration analysis, 68% applied gap analysis, 14% applied RAROC, 29% applied VaR, and 82%

applied maturity matching, which is considered, according to their research, the most popular risk measurement method applied by Islamic banks. One of the main objectives of this research is to compare the Sukuk risk profile with that of conventional bonds individually and as well as in the context of portfolio diversification. These results will be very important for global investors in Sukuk. In order to assess the riskiness of Sukuk, this study will use VaR, Duration and Convexity analysis as explained below.

5.3.1.1 Value at risk (VaR)

For better management of day-to-day risk and future risks, financial institutions in the 1980s started to search for more sophisticated risk measures. The VaR technique is a very popular method in financial applications. It emerged as a new risk measure, originally developed by JP Morgan. In 1994, JP Morgan popularized VaR among professionals by publishing its Risk Metrics Technical Document (Holton, 2002).

The value at risk measure is one of the statistical techniques that is used to quantify the worst predictable losses of a portfolio as a result of changes in interest rate or exchange rates and commodity or equity prices (risk factors) over a certain holding period at a given confidence level, under normal market conditions. It is also used to measure the risk of a bond in a company. In other words, value at risk represents the maximum amount that can be lost during a holding period in a portfolio.

Value at risk has two main parameters, a holding period and confidence level. Holding period: VaR can be calculated for any holding period. Consequently, how the resultant VaR is used will determine the choice of holding period. This means the longer the holding period, the larger the expected VaR. Confidence level: VaR is usually calculated for 95% and 98% confidence levels, which means that if it is calculated for 95% confidence, about 5% of the time the company expects to lose more than the number given by the VaR.

VaR measurements are used by investors, regulators, risk managers and traders. Regulators use VaR as a guide to capital sufficiency levels

whereas risk managers and bankers use it to help them allocate capital to more efficient sectors of the economy. It is also used as an indicator of the volatility of a portfolio; for example, high volatility will lead to a high VaR number, which means a high probability of losses.

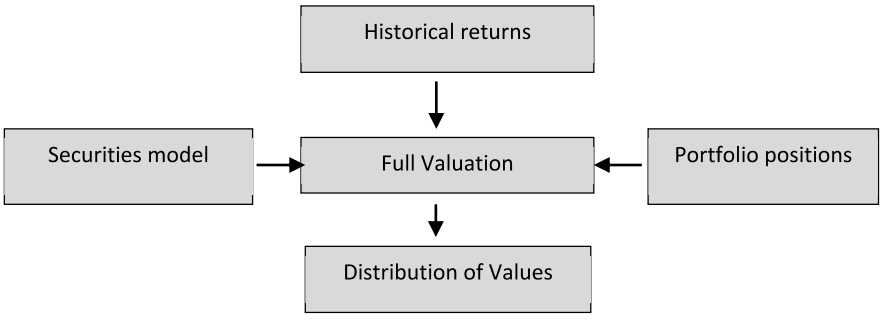
According to Fakir and Rae (2007), Nana Eva (2010), Coral (2011) and Hassan (2012), there are three distinguished methods or techniques that can be used to calculate VaR: historical, variance-covariance and Monte Carlo techniques. Each of these techniques is based on the same general steps to estimate VaR:

1. Identify the time horizon over the estimation of the potential losses.
2. After the estimation of the potential losses, select the confidence interval level and the degree of uncertainty.
3. For the instrument (bond or portfolio) under consideration, create a probability distribution of likely returns.
4. Understand the estimated VaR, which is statistically related to the confidence level that has been estimated by observing the loss from the probability distribution.

5.3.1.1.1 The historical simulation techniques

The historical simulation technique is distinguished by its simplicity. It assumes that history repeats itself by re-classify the actual historical returns from the lowest till the highest (worst to best), where this is based on historical profit and loss data held by the company.

Figure 5.1 Historical Simulation Techniques



Source: Bohdalová (2007, p.3).

However, it cannot take into account unprecedented events and their effects on a company or portfolio.

This technique helps to predict VaR by simulating the cumulative distribution function of assets' returns over time where there is no need to assume any distribution of the input data on the asset returns (Cakir and Raei, 2007).

However, the historical simulation inflicts a restriction on the estimation (assuming asset returns are independent and identically distributed) and restriction relates to time. This weakness helps financial experts develop models that are non-parametric, semi-parametric and parametric. Weakening predictability of data are further away from the present due to the equal weight applied by the historical simulation to all returns over the whole period (Cakir and Raei, 2007; Choudhry, 2001).

5.3.1.1.2 Variance co-variance techniques

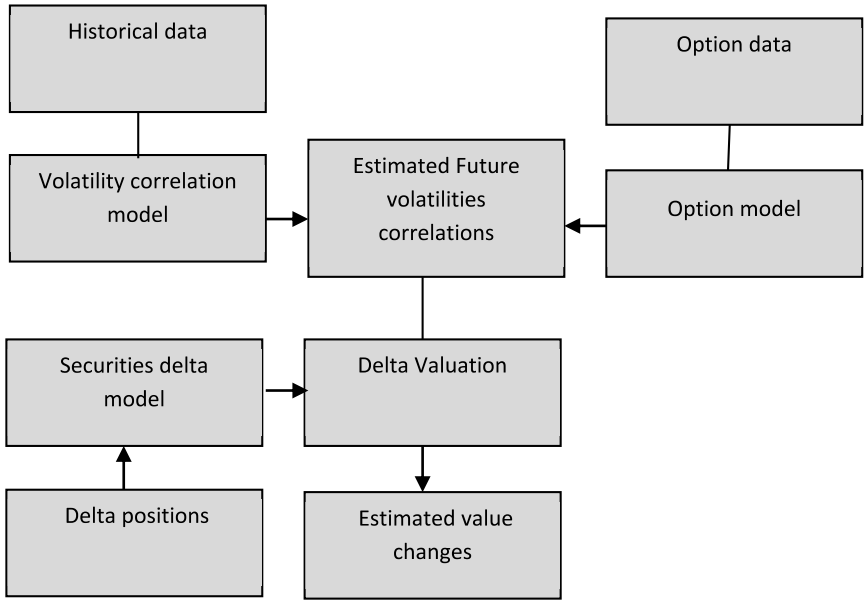
The variance-covariance approach is another commonly used technique that is similar to the concept of modern portfolio theory. The variance-covariance approach can be called by several names such as the analytic, parametric, delta-normal or delta gamma approach. It is based on the assumption that returns are normally distributed, and where the market parameters (means, standard deviations, correlations) for the overall distribution are constructed from historical data (Corkalo, 2011; Hassan, 2012).

The variance co-variance method uses the risk metrics methodology to calculate value at risk. This technique is characterised by its simplicity, flexibility, and popularity. With regards to parameters, it allows for the analysis of the sensitivity of the results and the addition of specific scenarios.

In spite of its strong analytical characteristics, this method has a number of shortcomings. First, it depends significantly on the assumption that the market parameters are normally distributed, overlooking the fact that most of the financial data were not normally distributed. Second, the change of interest rate based on the change in delta values, owing to the

specious constant correlation to derive the delta values. Third, the complication calculation methods are vital in assessing a portfolio VaR of the variance-covariance method. Last, it assumes that historical movements in a portfolio can be used to predict future volatilities and correlations between risk factors (Cakir and Raei, 2007; Nanaeva, 2010). Al of these shortcomings must be taken into consideration when using this method.

Figure 5.2 Delta-Normal Methods



Source: Bohdalová (2007, p.3).

Variance covariance computes the maximum loss using probability theory, by calculating the standard deviation of the movement of an instrument, and then assuming normal distribution, as explained in the following equations:

$VaR = \mu + Z\sigma$ ..... (Eq.12)

Where: σ= normal standard deviation (SD); μ= mean (average return of the portfolio); and Z is simply calculated as Z= X - μ / σ.

When calculating VaR for portfolio, the following formula can be used:

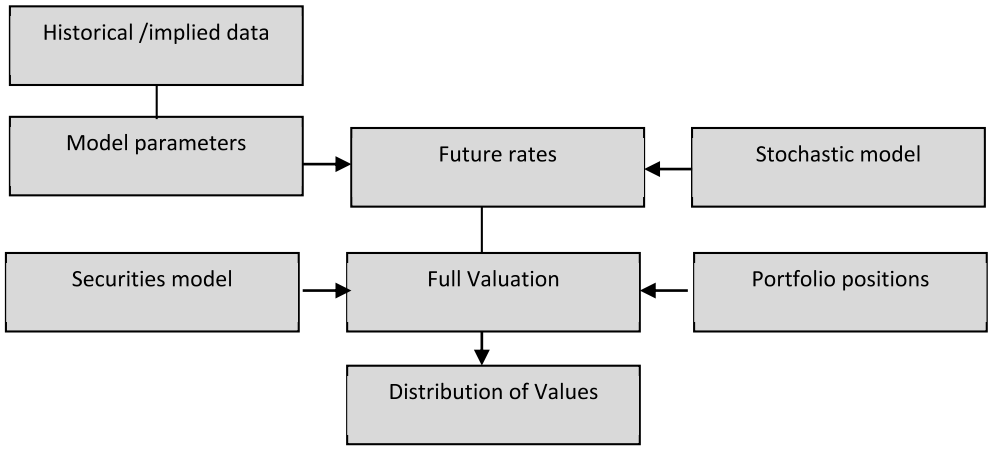
$VaR_p = (Z\ V\ P)$..... (Eq.13)

Where: Z = is standard value; V= volatility or standard deviation of asset/portfolio; P = position (portfolio) value.

5.3.1.1.3 Monte Carlo simulation techniques

The Monte Carlo, also called the stochastic method is the final method of calculating VaR. This method is distinguished from the other techniques by its flexibility as it is both realistic and accurate in estimating VaR. The freedom that this technique provides helps users to pick alternative distributions to the variables. Furthermore, instead of concentrating on the entire distribution similar to the other techniques, it focuses on the probabilities of losses beyond a specified value (Corkalo, 2011; Hassan, 2012).

Figure 5.3 Monte Carlo Simulations



Source: Bohdalová (2007, p.4).

The disadvantages of this technique are that the yields of the Monte Carlo simulation, when calculating portfolio VaR of linear instruments, gives similar results to the variance-covariance approach. In addition, it is computationally intensive (time-consuming and requiring exceptional computer capacity) (Cakir and Raei, 2007; Nanaeva, 2010).

The Monte Carlo simulation technique begins by identifying the market risks that affect the asset or assets in a portfolio and exchanging individual assets into positions in standardised instruments. These first

two steps are similar to the variance-covariance method. The simulation route must be considered when specifying the probability distributions of each factor in the market risk and explain how these factors move together as an alternative to computing the variances and covariance across market risk factors. Moreover, the simulation process starts after specifying where the distributions are in each run. Different outcomes are taken by the market risk variables and these outcomes are reflected by the value of the portfolio. So, a distribution of portfolio values will be performed after a repeated series of runs, which can be used to assess value at risk (Cakir and Raei, 2007; Nanaeva, 2010).

5.3.1.2 Bond duration

The time to maturity of a bond is one of the most important measures of its riskiness. All other things being equal, the longer the maturity, the greater the volatility of the bond price. However, this is not a good measure of risk, as it does not take into account the time value of money. In other words, the maturity of a bond gives little indication of the timing or size of its cash flows. For zero-coupon bonds, maturity measures the length of the bond exactly whereas for coupon bonds, maturity does not measure length, as some of the payments fall ahead of maturity.

Bond duration is a more sophisticated measure of a bond's length and hence its risk, as it takes into account all cash flows and the time value of money. It measures the average time to receive the cash flows. It measures the price sensitivity of bonds to yield (interest rate) changes exactly (Berk and DeMarzo, 2009). Duration can also be defined as the weighted average of the net present values of the cash flows. Additionally, it provides a better measure to compare the risk of different maturities and different coupon bearing bonds (Grantier, 1988).

The modified duration of a bond provides a measure of price sensitivity as the percentage changes in price with respect to yield, and is often referred to as the volatility of the bond, as presented in the following equations (Grantier, 1988).

% change in bond price = - (modified duration) x change in yield ..... (Eq.14)

The negative sign in the equation shows that the price moves in the opposite direction to yield.

5.3.1.2.1 Factors affecting duration

The duration of a bond is mainly affected by its time to maturity, coupon rate and yield (Berk and DeMarzo, 2009). The duration of a bond will be lower the higher its coupon is, and the higher its yield, and shorter the time left to maturity.

5.3.1.2.1.1 Bond maturity

All other things constant, the longer the maturity, the higher the duration; whereas the shorter the maturity, the lower the duration.

5.3.1.2.1.2 Coupon rate

As the coupon decreases the duration increases; whereas increases in a coupon, decreases the duration. In this regard, a bond's coupon is considered to be the key factor in calculating duration.

5.3.1.2.1.3 Yield-to-maturity

All other things constant, bonds trading at higher yield to maturity will have lower duration and vice versa.

5.3.1.3 Bond convexity

Bond convexity is another measure of bond riskiness. Convexity can be defined as the change in bond duration for a given change in its yield, or the curvature of a bond's price/yield relationship (Grantier, 1988).

Convexity can be calculated by the following formula:

Convexity = Duration/ (1 + (yield to maturity/100)) …… (Eq.15)

The convexity of a bond is positively related to the dispersion of its cash flows. A more convex bond will fall in price when yields rise, and will rise in price more when yields fall.

In summary, the duration is a good indicator of bond price changes but only for small changes in the interest rates. Major changes in the interest rates in the duration give overestimated or underestimated

approximations of the bond price due to the non-linear relationship of bond price to yield. Hence, the convexity of bonds must be taken into account when measuring interest rate risk (Čerović et al., 2014).

Using duration and convexity measures together helps to obtain a much closer estimate of changes in a bond's price for a given move in yields rather than using duration alone. As in all other risk-return relationships, a more convex bond is risker, but it also has the potential to outperform if interest rates go down. Conversely, it will lose more value if interest rates go up.

5.3.2 Portfolio Diversification Theory

Portfolio diversification is an important investment strategy that encourages investors to invest in a portfolio of assets that are not perfectly correlated to help reduce the exposure to a specific risk.

The classical theory of portfolio optimisation was first developed by Markowitz (1952), in which he provides an academic foundation for diversifying portfolios. It measures the risk of a portfolio using the means, variances and pair-wise correlations of the expected returns and is considered to be the main parameter of this theory. Based on the theory of portfolio diversification, several models have been developed. Sharpe (1964) developed the capital asset pricing model (CAPM) and Ross (1976) the arbitrage pricing theory (APT).

The covariance between each possible pair of securities must be calculated to determine the variance of the portfolio, which is known as the variance-covariance matrix. Diversification cannot deliver profit or guarantee against losses during falling markets. William F. Sharpe, in 1963, developed a simplified single index model for portfolio analysis, taking the lead from Markowitz's concept of an index for generating covariance terms. The single factor model developed by Sharpe is a useful tool for constructing an optimal portfolio.

For portfolio selection, Markowitz set up a quantitative framework called the mean-variance approach that assumed that asset returns are a multivariate normal distribution. The return of a portfolio can be described

in the context of expected return and variance. The variance covariance matrix is central to the optimisation of the returns on assets in a portfolio. Markowitz's model assumes that investors are risk-averse.

In general, this model involves the following formulas:

Expected return:

$$E(R_p) = \sum_i w_i E(R_i) \quad \text{(Eq.16)}$$

Where: R_p = is the return on the portfolio; R_i = is the return on asset *i* and w_i = is the weighting of component asset i (that is, the proportion of asset "i" in the portfolio).

Portfolio returns variance:

$$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij} \quad \text{(Eq.17)}$$

Where: ρ_{ij} = is the correlation coefficient between the returns on assets *i* and *j*.

Alternatively, the expression can be written as:

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij} \quad \text{(Eq.18)}$$

Where: $\rho_{ij} = 1$ for *i=j*.

Portfolio returns volatility (standard deviation):

$$\sigma_p = \sqrt{\sigma_p^2} \quad \text{(Eq.19)}$$

For a two asset portfolio:

Portfolio return:

$$E(R_p) = w_A E(R_A) + w_B E(R_B) = w_A E(R_A) + (1 - w_A) E(R_B) \quad \text{(Eq.20)}$$

Portfolio variance:

$$\sigma_p^2 = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2 w_A w_B \sigma_A \sigma_B \rho_{AB} \quad \text{(Eq.21)}$$

For a three asset portfolio:

Portfolio return:

$w_A E(R_A) + w_B E(R_B) + w_C E(R_C)$ ..... (Eq.22)

Portfolio variance:

$\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + w_C^2\sigma_C^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB} + 2w_A w_C \sigma_A \sigma_C \rho_{AC} +$
$2w_B w_C \sigma_B \sigma_C \rho_{BC}$ ..... (Eq.23)

The complexity of optimising portfolios requires the work to be done by a computer using SOLVER, which is an optimisation tool in Microsoft EXCEL.

5.3.2.1 The Sharpe Ratio

The Sharpe ratio (developed by William F. Sharpe in 1966) provides a good basis for comparing portfolios. It is widely used by investment firms to measure portfolio performances. It measures the risk efficiency of an investment.

The Sharpe ratio calculated as the effective return (actual return minus the risk-free rate) of an investment divided by its standard deviation (the latter being a proxy for risk).

Sharpe Ratio = effective return/standard deviation

The Sharpe Ratio was used to find the optimal weights of Sukuk and conventional bonds in a mixed portfolio (using SOLVER function in Excel).

5.4 RESULTS AND DISCUSSION

5.4.1 A Comparison between Sukuk and Conventional Bond Risks Using Different Measures

This research has adopted the VaR technique and duration and convexity methods to measure Sukuk and conventional bond riskiness. As mentioned earlier in this chapter, these measurements are viewed by both academics and practitioners as being the most widely adopted and reliable techniques available to gauge risk in the financial and industrial sectors.

The results that both techniques provide are found to be simple enough to be understood and appreciated by all levels of staff in all areas of an organisation (Bohdalová, 2007).

5.4.1.1 Value at Risk (VaR)

The VaR technique measures a portfolio's expected maximum loss, under normal market conditions, at a given confidence level, normally 95% over a certain holding period.

5.4.1.1.1 Portfolios Types, Factors and Parameters

In order to evaluate the risk return characteristics and scope of diversification, three portfolios were formed. First is a pure Sukuk portfolio, second is a pure conventional bond portfolio and third is a mixed portfolio that includes both types of bonds for at least one year.

The portfolios listed companies attempt to be classified according to their credit rating, but this is not possible because around 43% of the companies are not classified and the rest of the companies' classification are non-convergent. So, in this regard, it is impossible to classify based on the rating classification.

However, to be able to calculate the VaR correlations and covariance among the daily returns of Sukuk and conventional bonds, and to make different bonds and maturities as easy as possible to compare, the number of data observations is reduced and configured differently from the original research data.

This study is based on daily data on Sukuk and conventional bonds from 31 May 2012 to 31 May 2013 for six countries: Malaysia, Saudi Arabia, the UAE, Bahrain, Qatar and Pakistan. The choice of the holding period depends on the data availability. The total number of Sukuk and conventional bonds are 54 and a 95% confidence level is used to determine the value at risk.

The following table (Table 5.2) shows the list of Sukuk and conventional bonds including in this analysis.

Table 5.2 Sample of Sukuk and conventional bonds

Bond name	Type	Credit rating		Country
		S&P	Moody`s	
PAKISTAN MOBL	Conventional Bond	B -	Caa1	Pakistan
EXOVA LTD	Conventional Bond	B -	Caa1	UAE
ABU DHABI COML.BK	Conventional Bond	A-	NA	UAE
SAUDI BRITISH BANK	Conventional Bond	A	NA	Saudi
DUBAI DOF	Sukuk	NA	NA	UAE
NAT.BK.ABU DHABI	Conventional Bond	AA-	Aa3	UAE
DUBAI.HLDG	Conventional Bond	NR	B2	UAE
DUI.ELTY.&. WT. AUTH	Conventional Bond	NA	Baa3	UAE
AXIS BANK LTD.DUBA	Conventional Bond	BBB -	Baa2	UAE
HILAL	Sukuk	NA	Aaa	UAE
ABU DHABI NAT	Conventional Bond	A-	A3	UAE
ABU DHABI NAT	Conventional Bond	NA	NA	UAE
TDIC	Sukuk	AA	A1	UAE
ABU DHABI COM BK	Conventional Bond	A	A1	UAE
CBB	Sukuk	BBB	NA	Bahrain
QATAR	Conventional Bond	AA	Aa2	Qatar
ABU DHABI NAT	Conventional Bond	NR	A3	UAE
PETRONAS	Sukuk	A -	A1	Malaysia
MBB SUKUK	Sukuk	NA	NR	Malaysia
STD.CHT.BANK MAL	Conventional Bond	NA	NA	Malaysia
DIGI TELECOM	Conventional Bond	NA	NA	Malaysia
INBLK	Conventional Bond	NA	Aaa	Saudi
BANQUE SAUDI FRANSI	Conventional Bond	A	Aa3	Saudi
ICIC BANK	Conventional Bond	BBB -	Baa2	Bahrain
DUBAI	Conventional Bond	NA	NA	UAE
QIB	Sukuk	NA	NA	Qatar
QREIC SUKUK LLC	Sukuk	NA	NA	Qatar
ALMANA SUKUK	Sukuk	NA	NA	Qatar
1 MALAYSIA	Sukuk	A -	A3	Malaysia
MALAYSIA	Conventional Bond	NA	A3	Malaysia
HBME	Sukuk	NA	A2	UAE
FGB	Sukuk	NA	A2	UAE
SIB	UAE Sukuk	BBB+	NA	UAE
SYRKT PRSRNA NEGARA	Conventional Bond	NA	NR	Malaysia
SAUDI ELTY	Sukuk	AA -	A1	Saudi
DOHA BANK	Conventional Bond	NA	NA	Qatar

Bond name	Type	Credit rating		Country
		S&P	Moody`s	
EIB	Sukuk	NA	Baa1	UAE
DP WORLD	Sukuk	NR	Baa3	UAE
MAF	Sukuk	BBB	NA	UAE
GFH SUKUK	Sukuk	NR	NA	Bahrain
WAKALA GLOBAL	Sukuk	A-	A3	Malaysia
DP WORLD	Conventional Bond	NR	Baa3	UAE

Source: Generated by the author.

5.4.1.1.2 VaR calculation

In order to estimate the VaR of the three different portfolios (the pure Sukuk portfolio, pure conventional bond portfolio and the mixed portfolio), this study adopted the following three steps.

1. Calculate the standard deviation of each return by calculating the difference between each observation and the mean, and squaring it. All of these squared differences are added together and then divided by the number of observations minus one. The square root of this figure is the standard deviation.

   The following formula issued to calculate the standard deviations:

   $\sigma = \sqrt{\frac{\varepsilon(x-\bar{x})^2}{N}}$ ..... (Eq.24)

   Where: σ = standard deviations; ε = sum of; x= an observation in the series; $\bar{x}$= mean; and N = number of observations.

2. The next step involved the weighting of the assets within the portfolio. It represents the amount of the portfolio invested in each asset as a value or as a percentage.

3. The final step is to calculate the correlation between the assets within the portfolio. It depended on how the prices of the assets move in relation to each other.

The VaR is the value of the portfolio (assets) multiplied by the portfolio volatility; where the formula of the portfolio volatility of a two-asset portfolio is given by:

$$Vol_P = \sqrt{w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB}} \quad \text{..... (Eq. 25)}$$

Where: w_A= is the weighting of the first asset; w_B= is the weighting of the second asset; σ_A= is the standard deviation or volatility of the first asset; σ_B= is the standard deviation or volatility of the second asset and P= is the correlation coefficient between the two assets.

The VaR can be calculated by:

$$VaR_{1-\alpha} = P \times \sigma \times Z_\alpha \quad \text{..... (Eq.26)}$$

Where: $VaR_{1-\alpha}$= is the estimated VaR at the confidence level 95 % (100 × $(1-\alpha)$ %); P= is the correlation coefficient between the two assets; σ = is the standard deviation and Z_α= represents the number of standard deviations on the left side of the mean.

The following table presents the results of the variance covariance VaR method for the three portfolios:

Table 5.3 Value at Risk of Sukuk and Conventional Portfolio

	Sukuk portfolio		Conventional bonds portfolio		Mixed bonds portfolio	
	St. d	VaR	St. d	VaR	St. d	VaR
Full sample	0.001197	196.988	0.001192	196.015	0.000892	146.771
Saudi	0.0012	198.338	0.0020	332.245	0.0013	218.391
UAE	0.0026	434.499	0.0022	363.119	0.0018	292.353
Qatar	0.0006	102.240	0.0018	293.519	0.0011	185.885
Bahrain	0.0019	319.036	0.0035	574.818	0.0025	408.531
Pakistan	0.0052	852.589	0.0049	811.689	0.0039	635.377
Malaysia	0.0015	253.023	0.0004	63.044	0.0008	129.110

Source: Generated by the author.

5.4.1.1.3 Discussion

This analysis highlights some interesting aspects of these three different types of portfolio. For the full sample, the VaR of the pure Sukuk portfolio is 196.988 with a 95% significance level. Its standard deviation is 0.001197. The VaR of the pure conventional bond portfolio is about 196.015 with 95% certainty and a standard deviation of 0.001192. The UAE VaR of the pure Sukuk portfolio is 434.499 with a 95% significance level. Its standard deviation is 0.0026. The VaR of the pure UAE

conventional bond portfolio is about 363.119 with 95% certainty and a 0.0022 standard deviation. The VaR of the Pakistan Sukuk portfolio is 852.589 with a 95% significance level. Its standard deviation is 0.0052. The VaR of the pure Pakistan conventional bond portfolio is about 811.689 with 95% certainty and a 0.0049 standard deviation. The VaR of the Malaysian pure Sukuk portfolio is 253.023 with a 95% significance level. Its standard deviation is 0.0015. The VaR of the pure Malaysia conventional bond portfolio is about 63.044 with 95% certainty and a 0.0004 standard deviation. As they show that the volatility and VaR of pure Sukuk portfolio is higher as compared to the conventional bonds portfolio. The pure Sukuk portfolio market risk is significantly higher than the pure conventional bond portfolio market risk. The high VaR estimate for the pure Sukuk portfolio indicates that Sukuk invested in the pure Sukuk portfolio are riskier than the conventional bonds invested in the pure conventional bond portfolio. This result is similar to Zaidi (2006). With the exception of Saudi Arabia, Qatar and Bahrain, the risk and VaR of pure Sukuk portfolios are lower than in pure conventional bonds, which signifies a higher risk of conventional bonds. For Saudi, the VaR of the pure Sukuk portfolio is 198.338 with a 95% significance level. Its standard deviation is 0.0012. The VaR of the pure conventional bond portfolio is about 332.245 with 95% certainty and a 0.0020 standard deviation. The VaR of the Qatar pure Sukuk portfolio is 102.240 with 95% significant level. Its standard deviation is 0.0006. The VaR of the pure conventional bond portfolio is about 293.519 with 95% certainty and a 0.0018 standard deviation. The VaR of the Bahrain pure Sukuk portfolio is 319.036 with a 95% significance level. Its standard deviation is 0.0019. The VaR of the pure conventional bond portfolio is about 574.818 with 95% certainty and a 0.0035 standard deviation.

Interestingly, the diversified portfolio of both Sukuk and conventional bonds has a much lower VaR and standard deviation. This is an important observation because if this is applying over a longer term, the introduction of Sukuk seems to have increased the diversification options for investors in the financial markets. With the exception of Malaysia, the risk and VaR of a mixed portfolio is higher than a portfolio of pure conventional bonds,

which in this case implies that conventional bonds reduce the risk of the mixed portfolio. The highest VaR in the mixed portfolio is 635.377 for Pakistan, while Malaysia has the lowest at 129.110.

In other words, the introduction of Sukuk into conventional bond portfolios seems to help in reducing the risk of the mixed portfolios in each country in the sample, apart from Malaysia, and indicates that Sukuk and conventional bonds behave differently in the secondary market. Hence, investing in a mix portfolio between Sukuk and conventional bonds reduces portfolio market risk. This result supports Hassan's (2012) study that Sukuk provide diversification benefits for investors interested in conventional bonds. Cakir and Raei (2007) also have similar observations on the potential diversification, which Sukuk can offer to bond investors.

Overall, the assumption that there is no difference between Sukuk and conventional bonds in terms of risk and return characteristics or that Sukuk are less risky than conventional bonds is rejected in light of the results from this sample. This result is similar to Nanaeva's (2010) study, which showed that Sukuk are almost twice as risky as conventional bonds. The findings of Zaidi (2006) also support that a pure Sukuk portfolio is riskier than a pure conventional bond portfolio.

However, as is mentioned in the previous chapter, most Sukuk issues originate from emerging markets with inefficient capital markets and immature risk management mechanisms. Also, it is important to mention getting better results when comparing the VaR of Sukuk and conventional bonds requires more information, taking into account different maturities, industries and similar issues.

5.4.1.2 Analysis of Duration and Convexity of Sukuk and Conventional Bonds

One of the main concerns for Sukuk and conventional bonds investors is interest-rate risk. This is the risk of how a bond price changes in response to changes in interest rates or required rate of return – in other words, how sensitive a bond's price is when interest rates rise. Modified duration

and convexity together provide the best approximation of the sensitivity of bond prices to changes in interest rates (Grantier, 1988).

The aim of this section is to analyse and compare the duration and convexity of Sukuk against those of conventional bonds in order to evaluate the riskiness of these different types of securities.

This section will explore the null hypotheses that there is no difference between the duration and convexity of Sukuk and conventional bonds. The sample in this section is comprised of 38 Sukuk and 57 conventional bonds. This change in data set is due to the lack of data on duration and convexity of some of the bonds and Sukuk in the original sample.

Appendix 24 presents the duration and convexity measures of Sukuk and conventional bonds included in this study.

A direct comparison of Sukuk and conventional bonds convexity and volatility is only possible if both types of securities are issued by the same company (same rating) and both securities have the same maturity. Unfortunately, this sort of perfect data is not available. In order to make some comparison between Sukuk and conventional bonds convexity, this study will look at the average values in each of the countries under study. The results of the descriptive statistics for the duration and convexity of Sukuk and conventional bonds are stated in the table 5.4.

Table 5.4 Duration and Convexity statistics of Sukuk and Conventional Bonds

		Sukuk				Conventional Bonds				Differences	
		Maturity	Duration	Mod. Duration	Convexity	Maturity	Duration	Mod. Duration	Convexity	Mod. Duration	Convexity
Bahrain	Count	2	2	2	2	5	5	5	5		
	Mean	3.07915	2.71585	2.6686	13.03415	5.5066	4.4605	4.35134	27.66948	-1.68274	-14.6353
Qatar	Count	2	2	2	2	12	12	12	12		
	Mean	3.18335	3.0212	2.9789	12.51825	7.2726608	5.300875	5.216875	45.401275	-2.23798	-32.883
Malaysia	Count	5	5	5	5	13	13	13	13		
	Mean	3.12166	2.8012	2.7647	13.95416	4.9717538	3.616607692	3.539031	27.470354	-0.774331	-13.5162
Pakistan	Count	4	4	4	4	2	2	2	2		
	Mean	8.013175	4.446725	4.2458	27.2563	0.2764	0.2779	0.26705	0.31785	3.97875	26.93845
UAE	Count	15	15	15	15	18	18	18	18		
	Mean	3.576307	3.19596	3.142293	14.39302	6.0778444	4.473672222	4.375938 89	34.960589	-1.23365	-20.567

		Sukuk				Conventional Bonds				Differences	
		Maturity	Duration	Mod. Duration	Convexity	Maturity	Duration	Mod. Duration	Convexity	Mod. Duration	Convexity
											6
KSA	Count	8	8	8	8						
	Mean	7.996113	5.67665	5.572238	51.29546	1.7764	1.7108	1.6958	4.53735	3.876438	46.75811
Turkey	Count	2	2	2	2	3	3	3	3		
	Mean	1.76665	1.62915	1.5976	5.90445	3.9293	3.351166667	3.25846667	22.516867	-1.66087	-16.6124
Kuwait	Count					2	2	2	2		
	Mean					4.95555	3.97935	3.87015	19.1096		
Mix Bonds	Count	38	38	38	38	57	57	57	57		
	Mean	4.771916	3.680997	3.605505	22.84128	5.5311093	4.130607018	4.045173684	31.359295	-0.43966841	-8.51801

Source: Generated by the author.

Based on this simple analysis, it appears that modified duration and convexity of Sukuk are lower than its conventional counterpart overall, apart from Saudi Arabia and Pakistan. The mean of the duration and convexity differs by 0.45 and 8.52 approximately. In the light of this very simple comparison of modified duration and convexity that Sukuk are less risky as compared to conventional bonds. This is due to the fact that neither duration nor convexity are good indicators of the sensitivity of the bond price to interest rate changes (Čerović et al., 2014). Unfortunately, this sort of perfect data is not available. Thus, despite these limitations, duration and convexity are still widely used in bond management. In order to make draw comparisons between Sukuk and conventional bonds in terms of duration and convexity, this study will look at the average values in each country studied.

Based on this analysis, it can be seen that the maturity, duration, modified duration and convexity of Bahrain Sukuk were significantly lower than their conventional counterparts, and that the differences in modified duration and convexity were significant. The duration is less by 1.68274 and the convexity is less by 14.6353 for Sukuk. The maturity, duration, modified duration and convexity of Qatar Sukuk were significantly lower than their conventional counterparts, with the differences in the modified duration and convexity being significant. The duration is less by 2.23798 and the convexity is less by 32.883 for Sukuk. In Malaysia, the maturity,

duration, modified duration and convexity of Malaysian Sukuk were significantly lower than their conventional counterparts, although the different of the modified duration was not as significant as convexity. The duration is less by 0.774331 and the convexity is less by 13.5162 for Sukuk but the duration is close to the Malaysian conventional bonds average. The maturity, duration, modified duration and convexity of the UAE Sukuk were significantly lower than their conventional counterparts, and the differences in modified duration and convexity were significant. The duration is less by 1.23365 and the convexity is less by 20.5676 for Sukuk. The maturity, duration, modified duration and convexity of Turkey Sukuk were significantly lower than their conventional counterparts, and the differences in the modified duration and convexity were significant. The duration is less by 1.66087 and the convexity is less by 16.6124 for Sukuk. Lastly, the maturity, duration, modified duration and convexity in the mixed Sukuk portfolio were significantly lower than their conventional counterparts, and the difference of modified duration was not as significant as that of convexity. The duration is less by 0.43966841 and the convexity is less by 8.51801 for Sukuk but the duration is close to the Malaysian conventional bonds average.

On the other hand, the maturity, duration, modified duration and convexity of Pakistan Sukuk were significantly higher than their conventional counterparts, with significant differences in modified duration and convexity. The duration is higher by 3.97875 and the convexity is higher by 26.93845 for Sukuk. The maturity, duration, modified duration and convexity of Saudi Arabia Sukuk were significantly higher than their conventional counterparts, with significant differences in modified duration and convexity. The duration is higher by 3.876438 and the convexity is higher by 46.75811 for Sukuk. Whereas, in Kuwait, this type of comparison cannot be made as the maturity, duration, modified duration and convexity of Sukuk are not available for comparison with conventional bonds.

Finally, it is observed that the duration and convexity were lower for most of the Sukuk than for most of the conventional bonds, thus the null

hypotheses of there being no difference between the duration and convexity of Sukuk and conventional bonds is rejected. This means that Sukuk are less risky than conventional bonds in most cases. This result is consistent with the empirical results reported by Ramasamy et al. (2011). They found that Sukuk are less risky than conventional bonds and that the values of Sukuk are directly related to cash flows, which will be discounted at yield returns to find reasonable value, duration and convexity.

5.4.2 The Contribution of Sukuk in the Context of Bond Portfolio Diversification

This section will determine whether Sukuk could provide diversification opportunities for investors in bond portfolios. This is only possible if Sukuk returns are not highly correlated with the returns of conventional bonds. Therefore, if this is true, the inclusion of Sukuk could reduce the volatility and risk of a mixed portfolio compared to a conventional bond portfolio.

To be able to calculate the variance/co-variance matrix and the Sharpe ratio, the data in this section also differ from the original data of this research. This is again due to limitations in terms of data availability on DataStream. This analysis is based on monthly data returns of Sukuk and conventional bonds that are available in each country studied (UAE, Malaysia, Qatar, Bahrain, Pakistan and Saudi Arabia) over the time period from 28 November 2010 to 28 November 2013.

Table 5.5 shows the risk-return statistics in the context of portfolio optimisation of Sukuk and conventional bonds portfolios. The first section in the table displays the equally weighted risk and return diversification of each portfolio of each country of Sukuk and conventional bonds. The central section of the table displays the optimal risk-adjusted return of the portfolios based on maximising the value of the portfolio Sharpe ratio. The last column shows the equally weighted and the optimal risk-adjusted return of a diversified portfolio including both Sukuk and conventional. In other words, this analysis looks at equally weighted diversified portfolios of Sukuk, conventional bonds and mixed-type bonds. It also used the optimal weights in Sukuk and conventional bonds to get the best trade-off between risk and return in these portfolios. The Sharpe ratio was used to

rank these portfolios. All other things being equal, the higher the Sharpe ratio, the higher the risk-adjusted reward expected from that portfolio, if all goes as expected.

Table 5.5 Portfolio Optimisation of Sukuk and Conventional Bonds

		Equally weighted				Optimal allocation				Mix portfolio			
		Sukuk		conventional bonds		Sukuk		conventional bonds		Equally weighted		Optimal allocation	
		Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual
UAE	Portfolio Return	0.00010	0%	0.00274	3%	0.00143	2%	0.00361	4%	0.0022	3%	0.00318	4%
	Portfolio St. d	0.00607	2%	0.01022	4%	0.00996	3%	0.00795	3%	0.00886	3%	0.006882	2%
	Sharp Ratio	0.01713		0.26817		0.14369		0.45438		0.25365		0.462465	
Malaysia	Portfolio Return	-0.00028	0%	-3E-05	0%	5.32E-05	0%	0.00347	4%	-8.7883E-05	0%	0.003441	4%
	Portfolio St. d	0.00514	2%	0.00363	1%	0.00250	1%	0.00332	1%	0.00301	1%	0.003283	1%
	Sharp Ratio	-0.0539		-0.00816		0.02125		1.04762		-0.02914		1.048041	
Qatar	Portfolio Return	0.0008	1%	-0.00015	0%	0.00099	1%	0.00089	1%	3.83437E-05	0%	0.000966	1%
	Portfolio St. d	0.03778	13%	0.07341	25%	0.03265	11%	0.07233	25%	0.01015	4%	0.004973	2%
	Sharp Ratio	0.02116		-0.00207		0.03046		0.01233		0.00377		0.194283	
Bahrain	Portfolio Return	-0.00214	-3%	0.00012	0%	-0.00214	-3%	0.00057	1%	-0.0003	0%	0.00057	1%
	Portfolio St. d	0.00948	3%	0.08536	30%	0.00948	3%	0.13945	48%	0.01274	4%	0.02324	8%
	Sharp Ratio	-0.22570		0.0014		-0.22570		0.00413		-0.0260		0.02482	
Pakistan	Portfolio Return	0.00177	2%	0.00075	1%	0.00251	3%	0.00078	1%	0.00143	2%	0.00138	2%
	Portfolio St. d	0.03503	12%	0.08329	29%	0.03678	13%	0.0838	29%	0.02381	8%	0.01406	5%
	Sharp Ratio	0.05058		0.00910		0.06844		0.00937		0.06023		0.098378	
KSA	Portfolio Return	0.00197	2%	0.00014	0%	0.00197	2%	0.00134	2%	0.00060	1%	0.00147	2%
	Portfolio St. d	0.02552	9%	0.00841	3%	0.02552	9%	0.01069	4%	0.00999	3%	0.00994	3%
	Sharp Ratio	0.07737		0.01738		0.07737		0.12607		0.06040		0.14869	
All	Portfolio Return	0.00051	1%	0.00084	1%	0.00107	1%	0.00275	3%	0.00076	1%	0.00200	2%
	Portfolio St. d	0.01047	4%	0.00645	2%	0.00501	2%	0.00176	1%	0.00665	2%	0.00081	0%
	Sharp Ratio	0.04915		0.13141		0.21443		1.55666		0.11455		2.46408	

Source: Generated by the author.

First, on the level of the mixed portfolios, the optimal allocation of the Malaysia mixed portfolio has the highest return with 0.003441, the lowest risk of 0.003283 and the highest Sharpe ratio (1.0480). Whereas, the Bahrain mixed portfolio has the lowest return of 0.00057, the highest risk with 0.02324 and the lowest Sharpe ratio (0.0248). Appendix 25 shows

that the highest percentage of the optimal weight for the mixed portfolio is the SELIA SLNGR SELATAN with 43%. Second, on the level of Sukuk portfolios, Pakistan has the highest return of the optimal allocation portfolio with 0.002518 and the highest risk of 0.036786, while the UAE has the highest Sharpe ratio (0.143692). On the other hand, Malaysia has the lowest return portfolio of 0.00005321, the lowest risk of 0.002504 and the lowest Sharpe ratio (0.0212). It is also important to mention that the Bahrain and Saudi Sukuk portfolios only contain one Sukuk issue; this lack of data justifies their exclusion from the comparison. Third, on the level of conventional bond portfolios, the optimal allocation of the UAE has the highest return of 0.003614 while Bahrain has the lowest return portfolio of 0.000577. Bahrain has the riskiest portfolio of 0.139451 and the lowest Sharpe ratio (0.004138). The Malaysia portfolio has less risk at 0.00332 and the highest Sharpe Ratio (1.047625). Lastly, the optimal allocation of all Sukuk portfolio returns is less than that of conventional bond portfolios, whereas the risk is higher for Sukuk. This result is similar to Fathurahman and Fitriati's (2013) analysis of the ratio between the returns on Sukuk and conventional bonds using a portfolio optimisation model, and determines that the return of Sukuk is greater than the return of conventional bonds, while Sukuk have higher risk than conventional bonds. The portfolio of all Sukuk and conventional bonds shows an ideal portfolio with a 2% portfolio return and almost 0% portfolio risk.

To conclude, the Sharpe ratios in the optimal mixed portfolios for all of the countries are higher than the single portfolios of both Sukuk and conventional bonds. This is again an important observation as this implies that mixing Sukuk with conventional bonds produces the best risk-adjusted returns in each of the countries under study. This suggests that the growth and developments of Sukuk market is very important as it seems to offer diversification opportunities to international investors in the bond markets. These results support Cakir and Raei's (2007) results, which suggest the benefits of Sukuk in terms of bond portfolio diversification. Ramadhan and Nugroho (2014) also found that (using the portfolio optimisation approach) having a portfolio of Shariah-compliant stocks could make an optimal portfolio with a low standard deviation and

high level of return. Adding Sukuk to the portfolio of Shariah stocks could lower the portfolio risk much more and add diversification. Usmani (2008) stated that portfolio diversification and expertise are the main elements of risk minimisation; accordingly, Islamic investors should make their decisions based on risk and return.

5.5 CONCLUSION

This chapter analysed the risk and return characteristics of Sukuk and their comparison with conventional bonds. The value at risk analysis suggests that pure Sukuk portfolios are riskier than pure conventional bond portfolios. This observation was retested again when the equally weighted and optimal portfolios of the pure Sukuk and pure conventional bonds were analysed. The conventional bond portfolios offered better risk-adjusted returns. These initial results appear to be a setback for Sukuk, as these securities consequently seem less competitive than conventional bonds.When the analysis was extended to mixed portfolios, the value at risk results showed that the inclusion of both Sukuk and conventional bonds appears to reduce risk. This suggests that Sukuk and conventional bond markets are not highly positively correlated. In other words, Sukuk seem to provide diversification benefits to international bond portfolios.

Similar result was obtained when the Sharpe ratio was used to analyse the risk-adjusted returns of Sukuk and conventional bonds. The equally weighted and optimal weight portfolios of Sukuk were riskier than conventional bonds. The best risk-adjusted returns were found in optimally weighted mixed portfolios of Sukuk and conventional bonds.

This reinforced earlier observations that Sukuk seem to offer enormous diversification opportunities to international bonds investors. In the context of increased volatility in global financial markets, this (additional) diversification opportunity is highly valuable. This should encourage policy makers to take all necessary steps to remove any obstacles to the development and growth of Sukuk markets across the globe.

CHAPTER 6

DETERMINANTS OF SUKUK YIELDS

6.1 INTRODUCTION

Investors should be concerned about how well their investments are performing, thus knowing how to measure such performance is vital in finance. It is therefore important to understanding the determinants that influence bond yields.

Yield is referred to as investment earnings without considering capital gains. It is used to measure the performance of bond income. Yield to maturity is the rate of return that is earned by an investor from coupon and principal payment at maturity by the bond issuer. The yields on different maturities by government bonds give the term structure of the interest rates of that country. The term structure of interest rates provides an important benchmark for that financial system. The yield to maturity is not constant over time. The yield to maturity of a bond changes whenever its price changes in response to any news about its issuer or due to any change in the rating of that issuer. Sukuk have attracted a huge number of investors around the world, therefore encouraging recent studies about the determinants of their yield.

This chapter aims to investigate the determinants of Sukuk yields in the Sukuk market. This is due to the fact that Sukuk structures are more complicated than conventional bonds. In other words, this chapter aims to identify a number of factors that can be used to demonstrate the relationships between bond yields. The main variables that affect bond yields are maturity, risk, Sukuk type, credit rating and issue size. The presence of any relationship of Sukuk yields with these variables is tested using the ordinary least square (OLS) model. This analysis will provide an understanding of the factors that significantly affect Sukuk yields. This will help investors and issuers improve their investment decisions, and minimize the perceived risks in Sukuk markets. This chapter will contribute to the existing literature on Sukuk by providing fresh evidence on the determinants of Sukuk yields.

The rest of this chapter is organised as follows: The next section reviews the relevant literature. The following section will identify the appropriate methodology and the OLS model to analyse the determinants of Sukuk yields. The last section will present the results of the OLS model and discuss these results in light of their importance to investors and policy makers.

6.2 LITERATURE REVIEW

Only a few studies have examined the determinants of Sukuk yields in the Sukuk market. Ang and Piazzesi (2001), under the asset pricing model, determined the influences of inflation and real economic activity on the yield curve and found that including inflation and real activity is useful in predicting the yield curve's movement. Saad and Mohamad (2012) examined the performance of 49 listed companies that issued Sukuk for the period 2005-2010 to investigate the relationship between Sukuk yields and their features (types of Sukuk, issuance, tenure, rating and payment) by using a multivariate regression model. Their results showed that Sukuk features are important in explaining Sukuk yields. Rahmana et al. (2013) highlight the factors that influence Sukuk yield spreads by employing the GARCH model to document evidence of Sukuk spreads and volatility. They found that changes in Sukuk spreads are negatively related to interest rates and the slope of the yield curve. Fathurahman and Fitriati (2013) analysed the ratio between the yield to maturity on Sukuk and conventional bonds listed on the Indonesian stock market. They found that the average of the Sukuk and conventional bonds significantly differ overall, and that the average of the Sukuk yield to maturity is greater than conventional bonds in three out of the ten groups studied. Ariff et al. (2013) show a significant difference between the yields of Sukuk and conventional bonds of the same issuers for the same term and rating. Granger causality tests show no causality between the yields of these two types of bonds. Naifar and Mseddi (2013) examined the determinants of Sukuk yield spreads using a regression technique for equity market variables and macroeconomic variables. They found that the model is well specified with explanatory power of more than 47%, and that it has

several implications for investors, risk managers and the development of Islamic financial markets. Said and Grassa (2013) examined the influence of economic and macroeconomic factors, global financial crises, financial systems, institutional environments, legal origins and religion and social factors on the development of the Sukuk market over the period 2003-2012 for Saudi Arabia, Kuwait, UAE, Bahrain, Qatar, Indonesia, Malaysia, Brunei, Pakistan, and Gambia. They found that the quality of regulatory and macroeconomic factors (GDP, economic size, trade openness, and percentage of Muslims) have a positive influence on the development of the Sukuk market. The financial crisis was found to have a significant negative effect as the total number of Sukuk issued in those years declined significantly. Saad et al. (2014) used a multivariate regression method to investigate the relationship between the main characteristics of Sukuk issuances (tenure, price, coupon, payment style, rating, producer price index and the issue size) and Sukuk yields and listed issuers (weighted average cost of capital), which is considered to be a new model representing risk. Their sample consists of 104 listed firms in Malaysia covering the period 2002-2012 from the RAM newsletters and Bank Negara Malaysia's bond information hub. Their results show that only tenure, coupon and producer price index showed a significant relationship with Sukuk yields and risks. So, yields have a relationship of up to a 10% confidence level with five out of nine variables (tenure, coupon rates, payment styles, producer price index and sales growth). Alternatively, the weighted average cost of capital shows that six out of nine variables were significant, also at a 10% confidence level (tenure, coupon rate, log size of issuances, producer price index and assets growth).

From the conventional bonds side, many studies have examined the determinants of bonds from different angles. Min (1998) examined the major macroeconomic variables that determined bond yield spreads in emerging markets. His result reported that strong macroeconomic fundamentals in a country – such as increased foreign assets, low domestic inflation rates and improved terms of trade – were associated with lower yield spreads. Whereas higher yield spreads are associated with weak liquidity variables, a high debt service ratio, a low export and a

high import growth rate, a low ratio of foreign reserves to GDP, and a high debt to GDP ratio. Batten et al. (2006) determine the extent factors that affect the changes in credit spreads by examining the yield spread between the sovereign bonds issued in international markets in China, Korea, Malaysia, Philippines and Thailand, matched with near-maturity benchmark U.S. Treasury bonds of 2-, 5- and 10-year maturities. They found that the country's growth rate, interest rates, inflation rate and stock market are the main independent variables to the changes of bond yield spreads. Siklos (2011) examines the determinants of bond yield spreads in emerging markets, using domestic, external and global factors. He found that two common factors in all countries are volatility and central bank transparency, which depend on the geographic location of the emerging markets. Comelli (2012) used a set of country-specific and global factors to determine sovereign bond yield spreads for 28 emerging market economies. He found that the country-specific and global explanatory variables on bond yield spreads vary across time and regions. Bengoechea (2012) tested the relationship of sovereign bond yields spreads and macroeconomic variables in the Eurozone. He found no constant relationships between macroeconomic variables and sovereign bond yield spreads. Cheikh and Amadou (2013) studied the determinants of US interest rates on emerging markets bond spreads. They found a negative relationship between US interest rates and emerging market bond spreads. Chowdhury et al. (2013) examined the determinants of emerging markets bond indexes by using regression analysis consisting of a fixed-effect model and a random-effect model. They found a positive relationship between bond index spreads, foreign direct investment and inflation, and a negative relationship between bond index spreads, GDP and reserves in total external debt.

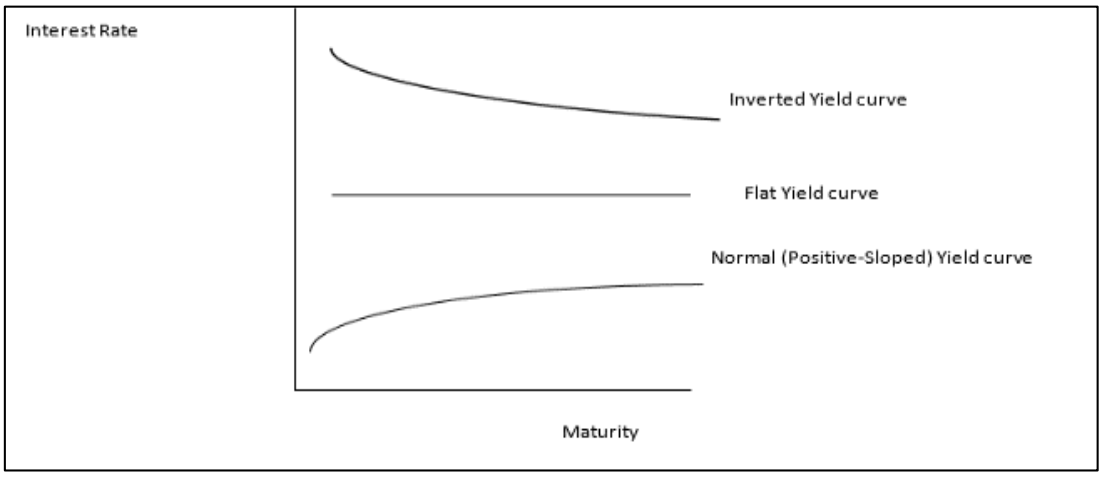
6.2.1 The Term Structure of Interest Rate and Yield Curve

Interest rates on government bonds are very important as they are considered to be the benchmark of the financial system. The relationship between interest rates in the market and their maturities is known as the term structure of interest rates. A diagram displaying the term structure of the interest rates of a particular country at a particular point in time is

called the yield curve of that financial system. The yield curve is considered to be an important tool. Any changes in the slope and level of the yield curve could potentially signal changes in expectations about inflation, interest rates and economic activity. Hence, it is followed by market practitioners to stay a step ahead of their competitors. The shape of the yield curve reflects the market's expectation for interest rates and potential changes in monetary policy, which makes the term structure of interest rates very important to investors and other participants in financial markets. The term structure is also used to identify differences in the theoretical value of securities relative to their market value. It can also be used to set a coupon rate on new bond issues and others financial securities.

The yield curve can have several shapes depending on the sentiments in the market. The shape of the yield curve is influenced by interest rate expectations and is determined by economic fundamentals and technical factors. The economic fundamentals are expectations hypotheses, liquidity preference hypotheses and market segmentation hypotheses, which will be explained later in this chapter. The technical factors are market sentiments, demand of risk-free bonds at any particular maturity and the supply of bonds at any particular maturity. Figure 6.1 shows the different shapes of yield curves.

Figure 6.1 Common Shapes of Yield Curves



Source: Nos'hy and Rofael (2008, p.6).

The yield curve will be upwards-sloping when the long-term interest rates are above the short-term interest rates, and this shape is considered to be the most common types of yield curve. It reflects investor expectations for the economy to grow in the future (positive slope). A flat yield curve is observed when long-term and short-term interest rates are the same. This is a signal of uncertainty in the economic outlook. Finally, a yield curve will be downwards-sloping when long-term interest rates are less than short-term interest rates. This indicates a worsening economic situation when investors seek protection in safe-haven government bonds. This also implies that inflation is likely to remain low in future. Under this abnormal situation, long-term investors think that in the future the economy will grow slowly and they will settle for lower yields.

6.2.1.1 Theories of Term Structure of Interest Rates

Different theories have been developed about the term structure of interest rates that explain the relationship between the interest rate and maturity of bonds. The main theories that tend to explain the term structure of interest rates are the expectations theory, liquidity preference hypothesis, the segmented markets theory and the preferred-habitat theory.

6.2.1.1.1 The Expectations Theory

The main logic behind the expectations theory is that investors' expectations about inflation are the major determinants of the yield curve, assuming that bonds of different maturities are perfect substitutes. The long-term interest rate is an average of the current-plus-expected future short-term rates. For example, the yield curve will be climbing when investors’ expectations about future interest rates are rising (Russell, 1992).

6.2.1.1.2 The Liquidity Premium Theory and Preferred Habitat Theory

The liquidity premium theory and preferred habitat theory explain why long-term rates are almost always higher than short-term rates, and why the shape of the curve is often dependent on the short-term interest rate. The liquidity premium theory is also known as the Biased Expectations

Theory, as it accepts the basic intuition underlying the pure expectations theory, except that long-term bonds carry a higher risk of fluctuation compared to short-term bonds (Irturk, 2006).

A similar conclusion by the preferred habitat theory through slightly different reasoning is that short-term bonds are preferred by investors who are interested in increasing liquidity and decreasing interest-rate risk (upwards-sloping yield curve). Therefore, if the long-term bonds pay the same return on short-term bonds during the maturity dates, no one will tend to have long-term bonds. It is well known that investors prefer to increase liquidity, and that long-term rates are normally higher than short-term rates, and therefore do not need to provide sufficient premium to attract long-term investment.

6.2.1.1.3 The Market Segmentation Theory

The market segmentation theory states that markets of bonds for different maturities are separated and divided, assuming that the markets are segmented when investors are expected to have a personal preference holding period.

In other words, the bond market is segmented by maturity range and there are no spill-over effects between each market segment. The yield curve is therefore determined by supply and demand conditions in each market segment without reference to conditions in other segments (Irturk, 2006).

Table 6.1 Sukuk Index Profile

Description	# of Issues	Par Amount*	Market Value*	Market Weight (%)	Average Coupon (%)	Average Life (Years)	Yield to Maturity (%)	Effective Duration	OAS (bps)
Sukuk Index	**65**	**53.19**	**55.53**	**100.00**	**3.64**	**5.36**	**2.58**	**4.37**	**123**
1-3 Years	27	18.89	19.61	35.32	3.42	2.16	1.79	1.94	92
3-5 Years	22	18.55	19.35	34.85	3.46	4.01	2.50	3.73	117
5-7 Years	3	1.90	2.02	3.63	4.25	6.12	3.37	5.35	169
7-10 Years	11	11.85	12.39	22.31	3.89	8.55	3.42	7.23	151
10+ Years	2	2.00	2.16	3.89	5.28	28.52	4.93	14.78	261
Government	23	25.30	26.20	47.17	3.14	4.77	2.41	4.20	104
Regional Government	1	0.50	0.53	0.95	3.30	3.56	2.05	3.33	78
Corporate	41	27.39	28.81	51.87	4.11	5.94	2.75	4.54	142

*In USD billions

Source: Citigroup index (2015, p.1).

Tables 6.1 and 6.2 show the maturity and yield to maturity measures of Sukuk and conventional bonds index of investment-grade fixed income securities. Specifically, the yield to maturity column shows an increase in the presenting yield to maturity for both indexes, from 1.79% for 1-3 years to 4.93 for 10+ years for Sukuk yield to maturity and from 0.49% for 1-3 years to 2.03 for 10+ years for conventional bonds' yield to maturity. On the other hand, it can be seen that Sukuk have a higher percentage of yield to maturity compared to conventional bonds.

Table 6.2 The Conventional Bonds Index Profile

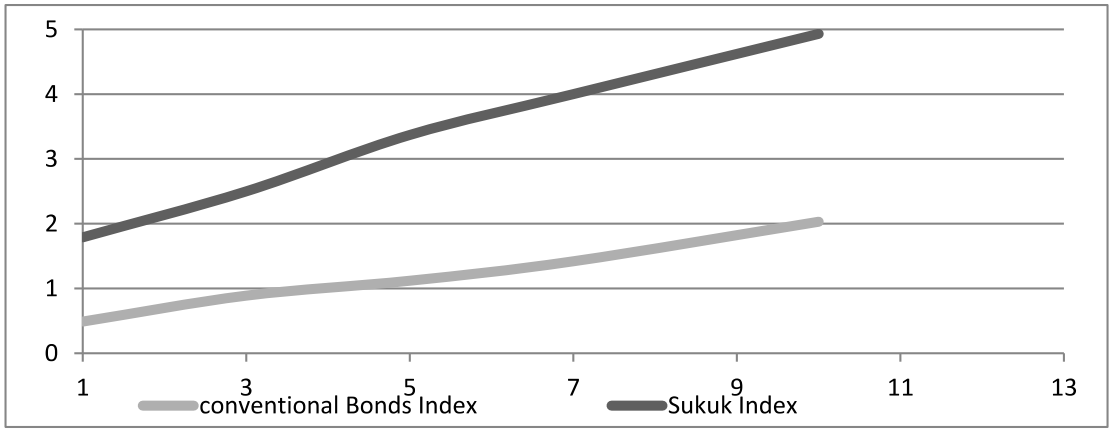
Description	# of Issues	Par Amount*	Market Value*	Market Weight (%)	Average Coupon (%)	Average Life (Years)	Yield to Maturity (%)	Effective Duration	OAS (bps)
WorldBIG	**8,815**	**30,569.92**	**34,186.73**	**100.00**	**3.02**	**7.64**	**1.26**	**6.47**	**28**
Non-MBS WorldBIG	8,562	26,197.34	29,517.03	86.34	2.88	8.19	1.18	7.02	32
1-3 Years	2,172	7,529.32	7,839.53	22.93	2.25	1.96	0.49	1.91	11
3-5 Years	1,802	5,316.24	5,712.74	16.71	2.58	4.04	0.89	3.84	23
5-7 Years	1,310	3,761.07	4,201.13	12.29	3.00	6.01	1.12	5.53	34
7-10 Years	1,488	3,821.01	4,280.69	12.52	2.85	8.51	1.42	7.64	49
10+ Years	1,790	5,769.71	7,482.94	21.89	3.92	21.34	2.03	15.28	51
WorldBIG 1-10 Yrs incl. MBS	7,025	24,800.21	26,703.79	78.11	2.81	4.45	1.05	4.00	21
Domestic Sovereign	993	17,433.55	19,741.16	57.75	2.51	8.42	0.91	7.50	8
Foreign Sov./Sov. Gtd.	568	1,089.62	1,222.60	3.58	3.50	7.30	1.51	5.69	69
Govt. Spon./Regional Govt.	933	1,706.77	1,901.23	5.56	2.66	5.59	0.87	5.16	22
Collateralized	977	5,251.15	5,663.18	16.57	3.70	4.45	1.52	3.27	3
Corporate	5,344	5,088.83	5,658.56	16.55	4.05	9.03	2.30	6.70	115

*In USD billions

Source: Citigroup index (2015, p.1).

Figure 6.2 presents the yield curves of Sukuk and conventional bonds' fixed income securities index as on 31/03/2015.

Figure 6.2 The Yield Curve of Global Fixed Income Securities Index (Sukuk vs. Conventional)



Source: Citigroup Index (2015).

A comparison of the yield curves of Sukuk and conventional bonds' fixed income securities index shows normal upwards-sloping yield curves. The yield to maturity on Sukuk is higher than for conventional bonds at all maturities. It seems to follow the expectations hypothesis, as future interest rates are expected to rise, then the yield curve slopes upwards, with longer-term bonds paying higher yields.

6.3 RESEARCH METHODOLOGY

6.3.1 Regression Analysis

Regression analysis is a statistical procedure for estimating the relationships between variables. It focuses on the relationship between a dependent variable and one or more independent variables.

6.3.1.1 Ordinary least squares regression method (OLS)

The ordinary least squares regression method (OLS) is a statistical technique used to fit a function with data. In other words, it is used to find the best fit for a function with data by minimising the sum of the squared errors in the data. Single or multiple explanatory variables can be applied in this technique.

The OLS regression model shows the relationship between two variables as follows:

$Y = a + bx + \varepsilon$ …… (Eq.27)

Where: Y = dependent variable; X = independent variable; a = intercept of regression line; b = slope of regression line; ε = error term.

This equation shows that Y is dependent on X and the slope b indicates the unit changes in Y for every unit change in X.

However, by adding additional variables to the OLS regression equation, it can be extended to include multiple explanatory variables:

6.3.1.1.1 Multiple OLS regression

A multiple OLS regression is one of the most common models in business and economics used to model the relationship between a series of

independent variables and a dependent variable. This allows the analyst to control the multiple factors that at the same time affect a dependent variable.

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_mx_m + \varepsilon \quad \text{(Eq.28)}$$

While the OLS regression equation is estimated as follows:

$$E(y) = a + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_mx_m \quad \text{(Eq.29)}$$

The parameters (α and b) from the multiple OLS regression equation are the same as for the OLS regression equation, where the relationship in the multiple OLS cannot be graphed on a single scatter plot. The variable (Y) is also the same as the OLS regression equation, but this time Y is predicted by multiple explanatory variables (x_1 to x_m), and coefficients b_1 to b_m = are slope coefficients.

The OLS regression model should follow the hypothesis of the classical regression, as the error-term value of the mean is zero, independent and must be normally distributed, without any heteroscedasticity problems, multicollinearity problems, autocorrelation and or specification bias (Gujarati & Porter, 2009).

6.3.1.1.2 Multicollinearity

Multicollinearity in multiple regression analysis refers to correlation among independent variables, which can show how well the entire bundle of predictors predicts the outcome variable, but may not give valid results about which individual predictor analysts are terminated with respect to others, as it difficult to determine which independent variables influence the dependent variable. Multicollinearity results in the independent variable being insignificant in explaining the dependent variable (Gujarati & Porter, 2009).

The multicollinearity problem can be detected by examining the adjusted R-squared (R^2) and variance inflation factor (VIF). If R^2 is high and VIF is larger than 10 for the independent variables, multicollinearity is probably an issue.

Several methods can be used to avoid multicollinearity problems in multiple regression analysis, such as deleting one of the explanatory variables, which may help to produce a model with significant coefficients. Other solutions are avoiding falling into the dummy variable trap or avoiding including a constant term in the regression, which together guarantees perfect multicollinearity. More data can also be gathered (if possible) to produce more detailed parameter estimates with lower standard errors (Baguley, 2012).

6.3.2 Data and Model Estimations

The primary purpose of this chapter is to determine the yields of Sukuk. The bond determinants are maturity, size, risks, type of bond, credit rating and the nature of the bonds.

Quantitative data is employed for this chapter in order to determine the cause and effect relationships easily. The following table (6.3) presents the preliminary data on 36 Sukuk included in this analysis. The sample size is reduced due to the data availability for all of the relevant variables. Data were collected from Thomson Reuters DataStream.

Table 6.3 Preliminary Data for Sukuk

SUKUK	ytm	m	sz	r	t1	t2	t3	t4	t5	sc1	sc2	rt1	rt2	rt3
DAR AI Arkan Sukuk	6.39	5	13.02	0.002	1	0	0	0	0	0	1	0	0	0
Saudi Electricity	3.71	10	13.82	0.004	1	0	0	0	0	0	1	0	1	0
Saudi Electricity	5.39	30	13.82	0.011	1	0	0	0	0	0	1	1	0	0
Saudi Electricity	1.95	4	13.12	0.001	1	0	0	0	0	0	1	1	0	0
Saudi Electricity	3.64	9	13.82	0.002	1	0	0	0	0	0	1	1	0	0
DAR Al-Arkan International	7.53	2	13.02	0.008	1	0	0	0	0	0	1	0	1	0
BSF Sukuk Limited	3.11	4	13.53	0.004	0	0	0	1	0	0	1	1	0	0
CBB International Sukuk Company	2.07	5	13.53	0.003	1	0	0	0	0	0	1	0	1	0
CBB International	3.77	4	13.53	0.005	1	0	0	0	0	0	1	0	1	0
Adcb Islamic Finance	2.41	3	13.12	0.003	0	0	0	0	1	0	1	1	0	0
DP World Sukuk Limited	3.67	4	13.82	0.014	0	0	1	0	0	0	1	0	0	1
Dubai DOF Sukuk	2.39	1	13.82	0.006	1	0	0	0	0	1	0	0	0	1
Dubai DOF Sukuk	3.67	4	13.30	0.002	1	0	0	0	0	1	0	0	0	1
Dubai DOF Sukuk	5.18	9	13.38	0.003	1	0	0	0	0	1	0	0	0	1
Tdic Sukuk Limited	1.46	1	13.82	0.005	1	0	0	0	0	1	0	1	0	0
MAF Sukuk Limited	3.70	4	12.90	0.011	0	0	0	1	0	0	1	0	1	0
Jafz SUK 2019 Limited	4.98	6	13.38	0.002	0	1	0	0	0	0	1	0	0	1
EIB Sukuk Company	3.22	4	13.12	0.002	0	1	0	0	0	0	1	0	0	1

SUKUK	ytm	m	sz	r	t1	t2	t3	t4	t5	sc1	sc2	rt1	rt2	rt3
EIB SUKUK	3.99	5	13.12	0.002	0	1	0	0	0	0	1	0	0	1
HILAL SUKUK	1.50	1	11.51	0.001	0	0	0	1	0	0	1	0	0	1
FGB Sukuk Company Limited	2.32	3	13.38	0.006	0	0	0	0	1	0	1	0	0	1
FGB Sukuk Company Limited	2.38	4	13.12	0.008	0	0	0	0	1	0	1	0	0	1
Hbme Sukuk Company	2.24	3	13.12	0.004	0	0	0	0	1	0	1	0	0	1
SIB Sukuk	2.84	3	12.90	0.006	0	0	0	1	0	0	1	0	1	0
KT Sukuk Varlik	3.87	3	12.77	0.004	0	0	0	0	1	0	1	0	0	1
1MALAYSIA Sukuk Global	1.37	2	13.82	0.005	1	0	0	0	0	1	0	1	0	0
Petronas Global Sukuk	1.23	1	13.82	0.004	1	0	0	0	0	0	1	0	0	1
1MALAYSIA Sukuk Global	1.56	1	13.82	0.003	1	0	0	0	0	1	0	1	0	0
Wakala Global Sukuk	1.67	3	13.82	0.002	0	0	0	1	0	1	0	1	0	0
Wakala Global Sukuk	3.87	8	13.59	0.005	0	0	0	1	0	1	0	1	0	0
QIB Sukuk Funding	2.06	1	13.53	0.002	1	0	0	0	0	0	1	0	0	1
Qiib Sukuk Funding Limited	3.21	4	13.53	0.003	1	0	0	0	0	0	1	0	0	1
Pakistan Sukuk 1	10.13	23	12.61	0.011	0	0	0	0	1	1	0	0	1	0
Pakistan Sukuk 2	8.99	3	13.12	0.011	0	0	0	0	1	1	0	0	1	0
Pakistan Sukuk 3	8.66	3	13.12	0.011	0	0	0	0	1	1	0	0	1	0
Pakistan Sukuk 4	8.54	4	13.53	0.011	0	0	0	0	1	1	0	0	1	0

Source: Generated by the author.

The determination of Sukuk yield mostly depends on the studies conducted by Ang and Piazzesi (2001), Saad and Mohamad (2012), Rahmana et al. (2013), Naifar and Mseddi (2013), and Saad et al. (2014). Modelling the equation involves the factors that could determine the yield of Sukuk, including maturity, size, risks, type of bond (Ijara, Musharakah, Modarabah, Wakala and mixed), credit rating (A is the highest grade, B rating is good grade, or NA is none available rating grade) and the nature of the bond (sovereign or corporate). The reasons behind the selection are: first, some of these variables are selected based on the literature review. Particular reference was made to Saad et al. (2014) (tenure, price, rating and the issue size), Said and Grassa (2013) (macroeconomic variables, indicators of the financial system, institutional quality, global financial crisis, market regulation, legal origin, religion and society) and Saad and Mohamad (2012) (types of Sukuk, issuance, tenure and rating). Second, this study aimed to choose all of the available economic factors that could be obtained from the data to run this test. However, in conventional bond literature, most studies use the major macroeconomic variables, such as gross domestic product (GDP), unemployment rate, and

inflation rate. The definition and expected sign[1] for each of the independent variables in this study are therefore explained as follows:

a) Sukuk maturity is positively related to Sukuk yield, as mentioned by Saad et al. (2014) in their results. The longer the maturity date, the higher yields.

b) Sukuk size is positively related to Sukuk yield. It is measured as the value of bonds issuance to GDP, as mentioned by Saad et al. (2014) in their results.

c) Sukuk risks are positively related to Sukuk yield. The higher the risk, the higher the yield and therefore the higher the expected return.

d) Type of bonds is positively related to Sukuk yield, as is mentioned by Saad and Mohamad (2012) in their results. They found that Bai Bithaman Ajil generate a high yield compared to Murabahah Sukuk.

e) Credit rating is an assessment carried out by a private rating agency to indicate the level of risk. It assumes that credit rating is positively related to Sukuk yield, as is mentioned by Said and Grassa (2013). The higher the credit rating, the higher the yield and thus the expected return.

f) The relationship between the nature of the bonds and Sukuk yield looks to be unclear here. It examines whether sovereign or corporate Sukuk have an effect on Sukuk yield. Normally, corporate bonds are considered to have higher risk than government bonds.

The model derived from the multiple regression model analysis to see the impact of the different variables on Sukuk yields is as follows:

$$YTM = a + b_1 m + b_2 sz + b_3 r + b_4 t_1 + b_5 t_2 + b_6 t_3 + b_7 t_4 + b_8 t_5 + b_9 sc_1 + b_{10} sc_2 + b_{11} rt_1 + b_{12} rt_2 + b_{13} rt_3 + \varepsilon \quad \text{(Eq.30)}$$

Where: YTM= yield to maturity; m= maturity; sz= size; r= risk; t_1= Ijara; t_2= Musharakah; t_3= Modarabah; t_4= Wakala; t_5= mix; rt_1= A credit rating; rt_2= B credit rating; rt_3= NA credit rating; sc_1 = sovereign bonds;

[1] The sign of the correlation coefficient defines the direction of the relationship, either positive or negative. A positive correlation coefficient means that as the value of one variable increases, the value of the other variable increases; as one decreases the other decreases. A negative correlation coefficient indicates that as one variable increases, the other decreases, and vice-versa.

sc_2 = corporate bonds; ε = the stochastic error term; and coefficients b_1 to b_{13} = are slope coefficients for all n=13.

In this chapter, the null and alternate hypotheses were developed to fit with the regression model:

H_0: The maturity, size, risks, types of bonds, credit rating and the nature of the bonds have no impact on Sukuk yield.

H_1: The maturity, size, risks, types of bonds, credit rating and the nature of the bonds have a significance impact on Sukuk yield.

The null hypothesis therefore states that there is no relationship between the dependent variable (Sukuk yield), and the independent variables (maturity, size, risks, types of bonds, credit rating and the nature of the bonds). It means that, if the null hypothesis is rejected, the overall relationship between the yields and the independent variables is significant, where at least one or more of the parameters are not equal to zero.

The multiple regressions are estimated through the OLS method, as the model fit tested by the coefficient, probability (t-tests), F-ratio, R^2 value and the VIF will be biased. To reflect the strength and type of the relationship of the explanatory variables to the dependent variable, the coefficient for each explanatory variable is used. The positive coefficient sign implies a direct correlation while the negative implies an inverse relationship between the dependent and independent variables. In other words, to confirm the parameters effect on the existence of at least one of the dummy variable coefficients is statistically significant. The value of the dummy variables for the types of bonds (t_1, t_2, t_3, t_4 and t_5), credit rating (rt_1, rt_2 and rt_3) and the nature of the bonds (sc_1 and sc_2) represent categorical variables of 0 and 1 where it is 1 if the criterion is satisfied and 0 if not. The t-test is used to assess each variable's assumption and its significance – in other words, to evaluate whether the individual independent variable is significant in explaining the changes in dependent variables. This means that the individual independent variable is significant when the p-value is smaller than the significance level or the t-

test statistic value is smaller or greater than the critical value in influencing the dependent variable. The hypothesis testing for the t-test implies that:

H_0: $b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = b_8 = b_9 = b_{10} = b_{11} = b_{12} = b_{13} = 0$

H_1: $b_n \neq 0$

where n=1,2,3,4,5,6,7,8,9,10,11,12,13.

The F-ratio is used to assess if the overall model is reliable and significant. In other words, it examines whether at least one of the independent variables or more independent variables are significant to the regression model. Therefore, if the p-value is smaller than the significance level, the null hypothesis is rejected. The hypothesis testing for the F-ratio implies that:

H_0: $b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = b_8 = b_9 = b_{10} = b_{11} = b_{12} = b_{13}$

H_1: at least one of the $b_n \neq 0$

where n=1,2,3,4,5,6,7,8,9,10,11,12,13.

The VIF measures redundancy between explanatory variables and should be smaller than 10 for each of the independent variables. The adjusted R-squared is used to correct the tendency for R^2 to approach for more than one independent variables.

6.4 RESULTS

Tables 6.4, 6.5, 6.6, 6.7 and 6.8 present the regression results of the relationship between the yields of Sukuk and the independent variable. In order to have a better understanding of this relationship, the regression analysis has been run four times: first, the model was run involving all 13 independent variables without including the constant. Second, the model was run involving the type of bonds (Ijarah, Musharaka, Modarabah, Wakala and mixed). Third, the model involves credit rating (A or B). And last, the model involves the nature of the bonds (Sovereign or Corporate).

Hence, the reason for running the test 3 more times was to avoid the dummy variable trap.[1]

6.4.1 Results of the Model Involving All 13 Independent

Table 6.4 Model Summary of the OLS Regression Involving All 13 Independent

Model	R	R^2	adj R^2	Std. Error of the Estimate		Durbin-Watson
1	.971\\a	.942	.913	1.32639		1.446
Model	Sum of Squares	df	Mean Square	F		Sig.
Regression	687.867	12	57.322	32.582		.000\\a
Residual	42.224	24	1.759			
Total	730.090	36				
Model	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.	VIF
	B	Std. Error	Beta			
m	.120	.047	.203	2.558	.017**	2.623
sz	-.880	.676	-2.608	-1.302	.205	1665.527
r	166.362	124.081	.232	1.341	.193	12.400
t1	16.925	8.887	2.583	1.904	.069*	763.231
t2	18.979	8.854	1.217	2.144	.042**	133.683
t3	17.255	9.112	.639	1.894	.070*	47.193
t4	16.076	8.484	1.457	1.895	.070*	245.472
t5	17.745	8.569	1.970	2.071	.049**	375.645
sc1	1.517	.534	.194	2.841	.0098***	1.945
rt1	-4.326	1.520	-.506	-2.846	.009***	13.137
rt2	-2.141	1.529	-.251	-1.400	.174	13.290
rt3	-4.218	1.430	-.605	-2.950	.007***	17.433

a. Predictors: rt3, rt2, rt1, t3, t2, t4, t5, sc1, m, r, t1, sz.

*** significant at 1%, ** significant at 5% and * significant at 10%.

Source: Generated by the author.

[1] The dummy variable trap is a scenario in which the independent variables are highly correlated.

The OLS regression output shows that the R^2 value is 94%, which is high for the estimated regression equation with these independent variables and the adj R^2 value is 91% as these results indicate a good fit of regression line in the data set. The Durbin–Watson statistic is less than 2, which is evidence of a positive serial correlation. The residual mean square of 1.759 also indicates a good fit and the value of the F ratio is statistically significant. The F-ratio is 32.582 and the p-value is 0.0000. The p-value is smaller than 0.05, which indicates that this model is significant at a 5% significance level. The p. values of the maturity, types of bonds, credit rating, NA credit rating and the nature of the bonds are significant at 1%, 5% and 10%, and the null hypothesis is rejected. The p. values of the size, risk and the B credit rating are insignificant at 1%, 5% and 10%.

The estimated regression coefficient for the risk variable (166.362) is positive (highest) and insignificant at 1%, 5% and 10% significance levels, whereas the regression coefficient for the A credit rating dummy variable (-4.326) is negative (lowest) and statistically significant at the 1% significance level. The VIF for the size, risk, Ijarah, Musharakah, Modarabah, Wakala, mix Sukuk, A credit rating, B credit rating and NA credit rating are larger than 10 and, simultaneously, suggest that a high degree of multicollinearity is present.

In terms of the multicollinearity problem, Eq.30 shows a clear issue of multicollinearity.

$$YTM = a + b_1 m + b_2 sz + b_3 r + b_4 t_1 + b_5 t_2 + b_6 t_3 + b_7 t_4 + b_8 t_5 + b_9 sc_1 + b_{10} sc_2 + b_{11} rt_1 + b_{12} rt_2 + \varepsilon \quad \text{.....(Eq.31)}$$

To resolve this problem, one of the independent variables will be excluded (n-1).

In this regard, this test has been runs 13 times, each time with one of the independent variables excluded until it was found that the exclusion of the last independent variable NA credit rating (rt3) and the inclusion of the constant was the best solution to avoid multicollinearity. This can be seen in the following table.

Table 6.5 Model Summary of the OLS Regression Involving All 12 Independent

Model	R	R Square	adj R^2	Std. Error of the Estimate		Durbin-Watson
1	.839a	.704	.586	1.51700		1.392
Model	Sum of Squares	df	Mean Square	F		Sig.
Regression	136.999	10	13.700	5.953		.000a
Residual	57.532	25	2.301			
Total	194.531	35				
Model	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	18.513	10.263		1.804	.083*	
m	.126	.053	.310	2.367	.026**	1.451
sz	-1.169	.765	-.234	-1.528	.139	1.978
r	153.180	141.819	.232	1.080	.290	3.895
t2	1.519	1.025	.181	1.483	.151	1.255
t3	.137	2.248	.010	.061	.952	2.135
t4	-1.168	.894	-.187	-1.306	.203	1.737
t5	.485	.849	.090	.571	.573	2.112
sc2	-1.460	.610	-.296	-2.393	.025**	1.295
rt1	-.346	.801	-.067	-.432	.669	2.014
rt2	1.836	.825	.354	2.226	.035**	2.135

a. Predictors: rt3, rt2, rt1, t3, t2, t4, t5, sc1, m, r, t1, sz.

** significant at 5% and * significant at 10%.

Source: Generated by the author.

The OLS regression output shows that the R^2 value is 70%, which is high for the estimated regression equation with these independent variables, and the adj R^2 value is 58% as these results indicate a good fit of regression line in the data set. The Durbin–Watson statistic is less than 2, which is evidence of a positive serial correlation. The error term (residual) is normally distributed with a mean close to zero and constant variance. The residual mean square of 2.30 also indicates a good fit and the value

of the F ratio is statistically significant. The F-ratio is 5.953 and the p-value is 0.0000. The p-value is smaller than 0.05, which indicates that this model is significant at a 5% significance level.

The estimated regression coefficient for the risk variable (153.180) is positive (highest) and insignificant at the 5% level, whereas the regression coefficient for a corporate bonds dummy variable (-1.460) is negative (lowest) and statistically significant at the 5% level. The null hypothesis in this model is that there is no significant linear correlation in the series. The p-value from the result in most cases is greater than 5% and 10%, and the null hypothesis is to be accepted. While in maturity, size, corporate Sukuk and B credit rating are significant at 5% and 10%, and the null hypothesis is rejected. The VIF for the variables are less than 5, indicating that the multicollinearity problem has been solved.

6.4.2 Results of The Sukuk Types Effect

Table 6.6 Model Summary of the Sukuk Types Effect

Model	R	R Square	adj R^2	Std. Error of the Estimate		Durbin-Watson
1	.432a	.186	.081	2.25950		1.060
Model	Sum of Squares	df	Mean Square	F		Sig.
Regression	36.265	4	9.066	1.776		.159a
Residual	158.266	31	5.105			
Total	194.531	35				
Model	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	3.334	.548		6.085	.000*	
t2	.732	1.415	.087	.518	.608	1.078
t3	.345	2.325	.024	.148	.883	1.029
t4	-.550	1.073	-.088	-.512	.612	1.127
t5	2.175	.931	.405	2.335	.026**	1.147

a. Predictors: rt3, rt2, rt1, t3, t2, t4, t5, sc1, m, r, t1, sz.

** significant at 5% and * significant at 1%.

Source: Generated by the author.

The results from Table 6.6 show that the R^2 value is 19%, which is low for the estimated regression equation for the types of the Sukuk effect and adj R^2 is 8% as these results indicate a bad fit of the regression line in the data set. The Durbin–Watson statistic is less than 2, which is evidence of a positive serial correlation. The error term (residual) is normally distributed with a mean close to zero and constant variance. The F-ratio is 1.776 and p-value is 0.159. The p-value is higher than 0.05, which indicates that this model is insignificant at 5% significance level. The estimated regression coefficient for the constant (3.334) is positive (highest) and statistically significant at the 1% level, whereas regression coefficient for Wakala dummy variable (-0.550) is negative (lowest) and statistically not significant at the 5% or 1% significant level. The other dummy variables are positive and insignificant at the 5% level for Musharakah, and Modarabah, where it is significant at 5% for the mixed Sukuk. The VIF for the variables are less than 5, indicating no multicollinearity problem.

6.4.3 Results of the Credit Rating Effect

Table 6.7 Model Summary of the Credit Rating Effect

Model	R	R Square	adj R^2	Std. Error of the Estimate		Durbin-Watson
1	.582a	.339	.299	1.97365		1.516
Model	Sum of Squares	df	Mean Square	F		Sig.
Regression	65.986	2	32.993	8.470		.001a
Residual	128.545	33	3.895			
Total	194.531	35				
Model	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	3.273	.493		6.634	.000	
rt1	-.625	.796	-.120	-.786	.438	1.174
rt2	2.727	.796	.525	3.427	.002	1.174

a. Predictors: rt3, rt2, rt1, t3, t2, t4, t5, sc1, m, r, t1, sz.

Source: Generated by the author.

The results from Table 6.7 show that the R^2 value is 33%, which is low for the estimated regression equation for the credit rating effect and adj R^2 is 29% as these results indicate a bad fit of regression line in the data set. The Durbin–Watson statistic is less than 2, which is evidence of a positive serial correlation. The error term (residual) is normally distributed with a mean close to zero and constant variance. The F-ratio is 8.470 and the p-value is 0.001. The p-value is smaller than 0.05, which indicates that this model is significant at 5% significance level.

The estimated regression coefficient for the constant (3.273) is positive (highest) and statistically insignificant at 1% significant level; the regression coefficient for the B credit rating dummy variable (-0.625) is negative (lowest) and statistically insignificant at 1%, 5% or 10% significance levels. The unrated Sukuk dummy variable (2.727) is positive and significant at the 1% significant level. The VIF for the variables are less than 5, indicating no multicollinearity problem.

6.4.4 Results of the Nature of Sukuk Effect

Table 6.8 Model Summary of the Nature of Sukuk Effect

Model	R	R Square	adj R^2	Std. Error of the Estimate		Durbin-Watson
1	.286a	.082	.055	2.29235		.979
Model	Sum of Squares	df	Mean Square	F		Sig.
Regression	15.866	1	15.866	3.019		.091a
Residual	178.665	34	5.255			
Total	194.531	35				
Model	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	3.388	.468		7.240	.000*	
sc1	1.408	.810	.286	1.738	.091**	1.000

a. Predictors: rt3, rt2, rt1, t3, t2, t4, t5, sc1, m, r, t1, sz.

** significant at 10% and * significant at 1%.

Source: Generated by the author.

The results from Table 6.8 show that the R^2 value is 8%, which is low for the estimated regression equation for the nature of Sukuk effect and adj R^2 is 5% as these results indicate a bad fit of regression line in the data set. The Durbin–Watson statistic is less than 2, which is evidence of a positive serial correlation. The error term (residual) is normally distributed with a mean close to zero and constant variance. The F-ratio is 3.019 and the p-value is 0.091. The p-value is smaller than 0.1, which indicates that this model is significant at a 10% significance level. The estimated regression coefficient for the constant (3.388) is positive (highest) and statistically significant at the 1% significant level, whereas the regression coefficient for the sovereign dummy variable (1.408) is positive (lowest) and statistically significant at the 10% significant level. The VIF for the variables is less than 5, indicating no multicollinearity problem.

6.5 DISCUSSION OF THE RESULTS

The results generated from the OLS regression analysis present the relationship between factors such as maturity, size, risks, type of bonds, credit rating and the nature of bonds and Sukuk yield.

The first independent variable is maturity. Bond maturities are different, such as short-term bonds maturities for 5 years or less, medium-term bond maturities that have a maturity period between 5 to 10 years, and long-term bond maturities that are usually 10 years or above. In general, the longer the time to maturity, the greater its yield rate due to the risks associated with time. This relationship is called the term structure of interest rates. Ariff and Safari (2013) examined the differences between the yields of Sukuk and conventional bonds for different maturities ranging from 3 months to 20 years. They suggest that with long-term maturities (15 or 20 years), Sukuk yield is lower than conventional bonds, while it is higher than conventional bonds with maturities of less than 10 years. Based on the result of the OLS regression involving all 13 independents, and the result of the OLS regression involving all 12 independents after solving the multicollinearity problem, Sukuk maturity is found to be significantly positively related to Sukuk yield. This result is

consistent with the findings of Saad et al. (2014) which suggested that Sukuk maturity is positively related to Sukuk yield.

The second independent variable is size. Size is measured as the value of bond issuance to GDP as it is always described in the literature (Said and Grassa, 2013). According to Saad et al. (2014), the size of Sukuk issuance increased considerably, generating revenues in both the public and private sectors. The result of the OLS analysis involving all 13 independents and the result of the OLS analysis involving all 12 independents after solving the multicollinearity problem shows that Sukuk size is insignificantly negatively related to Sukuk yield. This result is inconsistent with the findings of Said and Grassa (2013) and Saad et al. (2014) where Sukuk size was found to have a significant positive impact on the yields and risks of the Sukuk market. Ahmad and Radzi (2011) also found that Sukuk performance rises when the GDP of the Sukuk-issuing country increases, while the performance of the Sukuk will decline when the GDP of the Sukuk-issuing country decreases. Similarly, Elkarim (2012) posits a significant correlation between GDP and the performance of conventional bonds. However, the result in this study regarding Sukuk size is inconsistent with the theory of supply and demand whereby any increase in size will allow demand for the bond to rise, as increasing the economy generates more wealth for the population.

The third independent variable is risk. Bond returns are dependent on several variables, including different types of risk. The main risk in the bond market is interest rate risk. Therefore if interest-rate risks rise (higher risk), the bond yield also increases, raising the expected return. Haral (2010) stressed that the identification of the risks associated with Sukuk in developing and managing Sukuk markets is essential. Al-Amine (2012) suggested that any decrease in interest-rate risk leads Sukuk returns to increase. Nanaeva (2010) proposed that Sukuk and conventional bonds have different levels of risk. The result of the OLS regression involving all 13 independents and the result of the result of the OLS regression involving all 12 independents after solving the multicollinearity problem shows that Sukuk risk is insignificantly and

positively related to Sukuk yield. This result is inconsistent with the findings of Abdul Rauf (2014) who found a significant impact of market risk, credit risk, operational risk and liquidity risk on the total Sukuk returns.

The fourth independent variable is the effect of Sukuk type. There are different types of Sukuk contract, as described above, that comply with Islamic principles and standards in the capital market. Based on the results of the OLS analysis involving all 13 independent variables, it is found that all Sukuk types (Ijara, Musharakah, Modarabah, Wakala and mixed Sukuk) are significantly positively related to Sukuk yield. In terms of their relationship to Sukuk yield, the results of the OLS analysis involving all 12 independent variables are insignificantly positive for Musharakah, Modarabah and mixed Sukuk, and insignificantly negative for Wakala. Also, the results of the Sukuk-type effects show Musharakah and Modarabah to be insignificantly positive related to Sukuk yield, with Wakala having an insignificantly negative impact, and mixed Sukuk a significant positive impact. Saad and Mohamad (2012) suggested that Sukuk type is positively related to Sukuk yield. They found that Bai Bithaman Ajil generate a higher yield than Murabahah Sukuk. Godlewski et al. (2014) also investigated the influence of Sukuk type (Ijara, Mudarabah and Murabahah) on the stock market reaction to their issuance. They found that issuing Ijara Sukuk is significantly more positive across most estimations compared to other Sukuk structures such as Musharaka or Mudaraba. Mudaraba and Murabaha are not significant in all estimations as investors do not react differently to these types of Sukuk. Ariff and Safari (2013) also found that Ijara Sukuk have a significant effect on the risk behaviour of the issuing company.

The fifth independent variable is credit rating (A, B or NA). This refers to an assessment done by a private rating agency such as Standard & Poor's or Moody's to indicate the level of risk. Interest rates are factored in to determine the creditworthiness of the issuer. Based on the result of the OLS involving all 13 independents, the credit ratings for A and NA-rated Sukuk are significantly negative related to Sukuk yield. The result of the B

credit rating is insignificantly negative related to the Sukuk yield. In contrast, the result of the OLS involving all 12 independents and the result of the credit rating effect shows an insignificant negative relationship between the A credit rating and Sukuk yield. A significant positive relationship is found between the B credit rating and Sukuk yield. Saad and Mohamad (2012) and Saad et al. (2014) both indicated that credit rating significantly affects Sukuk yield. According to Ariff et al. (2013), Sukuk yields are significantly higher than conventional bond yields even if they have the same credit rating quality. However, Godlewski et al. (2014) included more variables in their model to control the credit worthiness of the issuer. They found that the credit rating of the issuer has a significant positive impact on the stock market reaction in some specifications. On the other hand, Said and Grassa (2013) pointed out that credit rating has had no effect on the development of the Sukuk market. Rahmana et al. (2013) found that the credit rating of the issuers has an insignificant relationship with the uncertainty and volatility of Sukuk spreads for all ratings apart from BB3, indicating that lower-grade bonds are subject to more changes in the asset factor.

The last independent variable is the nature of Sukuk (sovereign or corporate). Ariff and Safari (2013) investigated the differences between the yields of Sukuk and conventional bonds for different types of issuers such as, sovereigns, quasi- sovereigns, financial institutions and corporations. They suggest that issuer type may have some impact on Sukuk yields. The first sovereign issue was in 2002 by the Malaysian Global Sukuk; since then the sovereign Sukuk market has witnessed institutional and geographical diversity, in which Bahrain, Pakistan, Malaysia and Qatar are the main national issuers (Jobst et al., 2008). As indicated in chapters 2 and 3, sovereign Sukuk are more common than corporate, while conventional bonds are more often corporate rather than sovereign. Corporate bond markets have become more important for the economy, reaching $49 trillion in 2013. Adesina-Uthman (2011) analysed three different credit classes of corporate Sukuk (two are high investment grades and one is low) and government Sukuk in Malaysia and found that the high-grade corporate Sukuk performed better than the government

Sukuk, while the low-grade Sukuk had a higher yield relative to the GII benchmark rate. The OLS test involving all 13 independent variables showed sovereign Sukuk to be significantly positively related to higher Sukuk yield. The result of the OLS rest involving all 12 independent variables after solving the multicollinearity problem shows a significantly negative relationship between sovereign Sukuk and Sukuk yield.

6.6 CONCLUSION

The general objective of this chapter is to analyse the determinants of Sukuk yields. In this regard, OLS multiple regression analysis was chosen to examine the relationship between 13 independent variables and a dependent variable.

The results from the regression analysis suggested that maturity, size, Ijara, sovereign Sukuk, and credit rating have a significant bearing on Sukuk yield. Hence, the estimation results rejected the null hypothesis that there is no relationship between the dependent variable (Sukuk yield), and the independent variables (maturity, size, risks, types of bonds, credit rating and the nature of the bonds). This indicates that these variables are important and useful for the industry players, especially the issuers and portfolio managers in articulating the strategies involving in structuring Sukuk; they are also important to the investors and traders in making capital financing or investment decisions due to their impact on Sukuk yields.

Interestingly, risk factor was found not to be significant, which is an unexpected result, as risk is considered an important factor in explaining the yield differentials in conventional bonds.

By understanding the significant factors that could affect Sukuk yields, this chapter may also assist policy makers in designing proper financial rules to encourage the development of the Sukuk market, as well as help company managers design new Sukuk issues for future financing requirements.

The study in this chapter could be extended to include more economic variables and more Sukuk issues in order to validate the finding.

CHAPTER 7

SUMMARY AND CONCLUSION

7.1 INTRODUCTION

This research focused on the risk and return characteristics of Sukuk and conventional bonds with the aim of understanding the differences and similarities between the two types of fixed-income securities. An attempt has been made to review the foundations of Islamic finance and the concept of bonds in the Islamic financial system with the aim of understanding the nature of the challenges in the development of a liquid Sukuk market. It has also compared the main characteristics of Sukuk with those of conventional bonds to see whether Sukuk are different from conventional bonds or if Sukuk just replicate conventional fixed-income securities. Adam & Thomas (2004), Afshar (2013), Al-Maghlouth (2009) and Ariff et al. (2012) provide supporting evidence that Sukuk are different from conventional bonds. On the other hand, Wilson (2008) and Lahsasna and Lin (2012) contend that Sukuk are no different to conventional bonds. Against the backdrop of the low volatility in the Sukuk market during the global financial crisis of 2008-9, there was a gap in the literature to study the risk profile of Sukuk and compare it with conventional bonds.

This research has evaluated the credit-rating criteria of Sukuk and looked at the hurdles in the credit rating of Sukuk by rating agencies. The methodologies used by rating agencies and researchers to rate Sukuk and conventional bonds were also compared.

From the empirical perspective, this research has attempted to evaluate the hypothesis that in terms of risk, Sukuk are no different to conventional bonds, and that Sukuk can be used by both Islamic and non-Islamic investors as perfect substitutes. In order to evaluate the riskiness of Sukuk and conventional bonds, this research employed the value-at-risk (VaR) methodology and the concepts of duration and convexity along with other tools and techniques. The OLS-regression technique was used to evaluate the determinants of Sukuk yields. In this context, the yield to

maturity was taken as a dependent variable and maturity, size, risks, type of bonds (Ijara, Musharakah, Modarabah, Wakala and mixed), credit rating and the nature of the bonds (sovereign or corporate) as independent variables in the regression model. Moreover, it investigated the efficiency and the liquidity of Sukuk in the secondary market and compared it with conventional bonds. This research also looked at the randomness of the returns in light of the efficient market hypothesis by using the three most advanced tests, including the auto-correlation test, the runs test and the Variance Ratio test.

In essence, the research questions were:

"How are Sukuk different from conventional bonds?"; "Are there any specific rating issues in relation to Sukuk?", "How is the rating of Sukuk different from that of conventional bonds?"; "Is Sukuk market efficient in the context of efficient market hypothesis?"; "What are the mean risks associated to Sukuk?"; "Can Sukuk be useful for portfolio diversification and risk management?"; "Are Sukuk less risky than conventional bonds?"; "What are the determinants of Sukuk yields?".

This chapter will highlight and review the key findings and provide a summary of the work undertaken in this. research project It will also provide a reflection on the study findings as well as the limitations and suggestions for future research.

7.2 REFLECTIONS ON THE STUDY

In Muslim countries, Sukuk have emerged as a substitute for conventional bonds as long-term Shariah-compliant instruments. According to AAOIFI, Sukuk convey the ownership of tangible assets, usufructs and services. The Sukuk market has been growing rapidly in recent years and continues to play an important role in the development of an Islamic capital market within the global financial market. These developments include increasing the number of Islamic banks participating in the management of Sukuk issues, oversubscription of major Sukuk issues, the involvement of conventional financial institutions, increasing interest from non-Muslim borrowers in the market, and broadening geographical distribution.

This research is aimed to compare and analyse the differences and similarities between Sukuk and conventional bonds in terms of their risk-return characteristics. The objectives of the study were to explain the emergence of Sukuk and the fundamental differences between Sukuk and conventional bonds to evaluate the credit-rating criteria of Sukuk; to examine the randomness of returns in light of efficient market hypothesis for Sukuk and conventional bonds; to analyse and compare the degree of riskiness of Sukuk and conventional bonds; and to conduct an analysis of the determinants' of Sukuk yields. The main motivation behind this study was to clarify the misconceptions about Sukuk and how these new securities differentiate from conventional bonds. Another motivation was to evaluate if Sukuk could compete with conventional bonds, which have dominated the fixed income market since its inception. The scope of the study was identified by highlighting the research questions that have were set out in the first chapter of the study, which will be discussed in the following sections.

7.2.1 Are Sukuk Different from Conventional Bonds?

In order to evaluate the above questions, it was hypothesised that there is no difference between Sukuk and conventional bonds in terms of their risk-return characteristics. This study has shown that Sukuk are very different from conventional bonds and have emerged as a new type of instrument. The main difference is that Sukuk are asset-backed instruments while conventional bonds are debt-based instruments that are structured on the basis of debt. Although these two type of securities (Sukuk and conventional bonds) fall in the same asset class, there are fundamental differences in their structures. These findings identify that both Sukuk and conventional bonds offer quite different solutions to the same financial problem. Conventional bonds represent debt, whereas Sukuk represent ownership of assets and cash flows. In other words, Sukuk income is generated from assets while conventional bond cash flows are fixed debt obligations. Conventional bond returns are pre-determined whereas Sukuk returns are estimated from underlying assets. In conventional bonds, the yield to maturity is fixed, while in Sukuk there is a chance of capital appreciation. Conventional bonds guarantee the

return at maturity while that is not the case with Sukuk. The major risk in Sukuk lies with the underlying assets, whereas the major risk in conventional bonds is issuer creditworthiness. Conventional bond contracts are based on a borrower-lender relationship whereas Sukuk are based on a seller-buyer relationship.

7.2.2 Are There Any Specific Rating Issues in Relation to Sukuk? How is the Rating of Sukuk Different from that of Conventional Bonds?

To answer these questions, the research found that Sukuk ratings are an analytical framework that reflects the ability and willingness of Sukuk issuers to meet the financial commitments in a full and timely manner, exactly like conventional bonds without looking at the Shariah side. However, the main issue here is how to rate Sukuk. Most rating agencies, such as S&P, Moody's, and Fitch, were found to use the same rating methodology and criteria for Sukuk as they do for conventional bonds. Capital Intelligence (CI) is considered to be the first international rating agency to assign ratings to Islamic financial institutions. Several international rating agencies have since started to rate Islamic financial institutions such as The Islamic International Rating Agency (IIRA), RAM and Malaysian Rating Corporation (MARC).

7.2.3 Is the Sukuk Market Efficient in the Context of the Efficient Market Hypothesis?

To answer this question, autocorrelation, runs and variance ratio tests were employed to measure the efficiency of the secondary markets of Sukuk and conventional bonds.

The results generated by the autocorrelation test provide evidence of evidence of serial correlation in 34 Sukuk out of the total number of 53 Sukuk, and in 45 conventional bonds out of the total number of 73. By this result, most of the Sukuk and conventional bonds series do not follow the random walk model, which is evidence of a rejection of the hypothesis of weak form efficiency. Non-parametric tests – a run test and a variance ratio test – were also employed to overcome the assumption of normal distribution in daily returns. The results from the run test indicated that

the null hypothesis of random returns is rejected at the 5% level for most Sukuk, which is consistent with the results of the autocorrelation test. On the other hand, it accepted the null hypothesis of random returns at a 5% level of significance in nearly 50% of the conventional bonds. According to the variance ratio test results, the null hypothesis of weak form efficiency was rejected in most of the series of both Sukuk and conventional bonds. All of these results indicate that the secondary market of Sukuk and conventional bonds in the selected countries are not weak form efficient, thus the null hypothesis of random returns was rejected.

Based on these findings, the overall secondary markets of both bonds (Sukuk and conventional bonds) were illiquid in the listed countries due to the size of the outstanding issuance in both bonds and Sukuk due to infrequent trading. Consequently, this issue of illiquidity enforces extra risk on investors, mainly during times of volatility.

7.2.4 What Are the Main Risks Associated with Sukuk? Are Sukuk Less Risky than Conventional Bonds? Can Sukuk Be Useful for Portfolio Diversification and Risk Management?

Sukuk are exposed to several types of risks. The most common types of risks are interest-rate risk, commodity risk, foreign-exchange risk and credit risk, in which they are similar to conventional bonds. Conversely, there are many other risks unique to Sukuk only, such as regulatory risk, Shariah risk, operational risks and risks related to the underlying assets. Portfolio diversification and hedging are considered to be the two main techniques of risk management.

This paper investigated whether Sukuk are less risky than conventional bonds, and if Sukuk would be useful for portfolio diversification and risk management. The results generated from the VaR analysis demonstrated that the VaR results of the pure Sukuk portfolio were higher than the VaR results of the conventional bonds portfolio, except for Saudi Arabia, Qatar and Bahrain. Therefore, the VaR results of the pure Sukuk portfolios were lower compared to conventional bonds, which signifies a higher risk in conventional bond portfolios. However, when the analysis was extended to mixed portfolios, the VaR results showed that the inclusion of Sukuk and

conventional bonds appears to reduce the riskiness of mixed portfolios. This suggested that Sukuk and conventional bonds markets are not highly positively correlated. In other words, Sukuk seem to provide diversification benefits to international bond portfolios. Similar results were obtained when the Sharpe ratio was employed to analyse the risk-adjusted returns of Sukuk and conventional bonds portfolios. The findings suggested that equally weighted and optimal weight portfolios of Sukuk are riskier than conventional bonds. The best risk-adjusted returns were found in optimally weighted mixed portfolio of Sukuk and conventional bonds. This reinforced earlier observations that Sukuk offer enormous diversification opportunities to international bond investors. In the context of increased volatility in the global financial markets, this (additional) diversification opportunity could be highly valuable. This should encourage policy makers to take all necessary steps to remove obstacles to the development and growth of Sukuk markets across the globe.

7.2.5 What Are the Determinants of Sukuk Yields?

The last question of the study was on the determinants of Sukuk yields, and if there were any features or variables that are significant in the determination of Sukuk yields. The OLS regression analysis indicated that maturity, size, Ijara, sovereign Sukuk, and credit rating are significant with Sukuk yield. This means that the null hypothesis is rejected and that these variables influence Sukuk yields. The size of Sukuk issue and Sukuk convexity (risk) does not appear to influence Sukuk yields, which is a surprising outcome as these are vital factors in explaining the yield differentials in conventional bond literature. Demonstrating the impact of these variables on Sukuk yields in articulating the strategies involving in structuring Sukuk and in making capital financing or investment decision.

7.3 LIMITATIONS OF THE RESEARCH

Sukuk are a relatively new type of security in the financial markets. This presents a mixture of challenges and opportunities for academic research. Based on this research experience, a numbers of limitations and difficulties were encountered. This section highlights the limitations of this study, which are as follows: first, there was a lack of relevant literature on

the analysis of risk and return characteristics in Sukuk. Therefore, there were not enough previous studies with which the findings of this research could be compared. Secondly, the time period of the available data on Sukuk is very short and sometimes the quality of the data is also poor. The daily prices of Sukuk are only available for a limited period of time. Thirdly, there is no data where the same company issued both Sukuk and conventional bonds with similar maturities. This was very important for comparing these two types of securities. Data on credit ratings was also not available on DataStream.

Every effort was made to obtain more data from many different sources such as Zawya, IFIS, KFH Research Limited, Eurobonds and Bloomberg, but the funding problems hindered the efforts to obtain more data.

7.4 SUGGESTIONS FOR FUTURE RESEARCH

Based on the experience of this study, some recommendations have been suggested to improve future research in this area. First, to get more clear results about the riskiness of Sukuk and conventional bonds, it is recommended to increase the sample population of Sukuk and conventional bonds. It would also be better if Sukuk could be grouped according to their industry, region or maturity, and both bonds and Sukuk should be classified according to their credit rating. Second, for the duration and convexity analysis of Sukuk and conventional bonds, more sophisticated tests like the t-test could be applied. Third, it is recommended to consider more independent variables in the regression modelling. Fourth, it is recommended to distinguish the risk associated with different types of Sukuk. It would also be interesting to examine the correlation between Sukuk and conventional bond market indexes and to evaluate the effect of this correlation on bond portfolios. Researchers may also look into the operational side of Sukuk and examine if they are fully Shariah-compliant in terms of Islamic teachings and Shariah objectives. Fifth, in terms of credit-rating agencies, different rating methodologies should be employed in the assessment of Sukuk than for conventional bonds due to the unique features and different types of Sukuk. Lastly, in response to global developments in Islamic finance over the next few

years, it is expected that the Sukuk market will have a low number of issuances. This is due to the drop in the oil price, which could drain liquidity from international and national markets. Many Sukuk-issuing countries may therefore turn to the conventional market. The decrease in the oil price may also negatively affect the investment rating grade of Sukuk in oil-producing countries among the GCC and Malaysia compared to other non-oil-related countries. More research into Sukuk would be a valuable addition for both academics and practitioners as huge developments and strong progress are expected in this emerging and rapidly growing field.

7.5 CLOSING REMARKS

This study has attempted to fill the gap in the literature on Sukuk risk and return analysis. It provides detailed information on the development of the Sukuk market and a comparative analysis of the risk-return characteristics and performance of Sukuk and conventional bonds as an alternative investment.

However, due to some limitations in this study, further research in this area is essential. It is hoped that the recommendations suggested herein will be taken into account, and that this research will be an important baseline for future studies of Sukuk, which is no doubt an important and valuable addition to the global financial markets.

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APPENDIX

Appendix 1: Research Direction

Aim of the Study	Research Objectives	Research Theory	Applied Research Method	Covering	Related Chapters
To investigate the similarities and differences between Sukuk and conventional bonds in terms of the market efficacy and risks-return characteristics	1. Explain the emergence of Sukuk and the fundamentals differences between Sukuk and conventional bonds	————————	Secondary/Literature Research	• The concept of Islamic finance. • The concept of conventional bonds. • The concept of Sukuk. • The differences between Sukuk and equity. • The main similarities and differences between Sukuk and conventional bonds systems.	Chapter.2
	2. Analyse the operational and informational efficient of Sukuk market.	Efficient market theory	Statistical tests to test weak form efficacy as follows: • Autocorrelation • Runs Test • Variance Ratio	• The main differences between Sukuk and conventional bonds systems in terms of the primary markets issues. • The main differences between Sukuk and conventional bonds systems in terms of the secondary market returns behaviors. • The theory of EMH • To look at the randomness of returns in light of efficient market hypothesis.	Chapter.3 and 4

				• To look at the seasonality issues in Sukuk or any other anomalies. • Previous studies on the empirical part	
	3. Attempt to clarify risks performance underlying Sukuk.	• Value-at-Risk framework	Statistical tests as fallow: • St division • Variance and co variance.	• Risk associated with sukuk and conventional bonds. • Risk measurement. • Previous studies on the empirical part	Chapter.3
	4. Evaluate the yield curve estimation and implications for Sukuk and for overall financial system.	Theory of Term Structure of Interest Rates: 1. The Pure Expectations Theory 2. The Liquidity Premium Theory 3. The Market Segmentation Theory	Statistical tests as fallow: • Regression analyses	• Yield curve in theory. • The term Structure of Interest Rates. • Previous studies on the empirical part	Chapter.4
	5. Evaluate the credit rating criteria's of Sukuk		Secondary/Literature Research	• Rating issues. • Rating agencies. • Credit rating.	Chapter.6
	6. Compare the performance of Sukuk bonds and conventional bonds during the global financial crisis.		Secondary/Literature Research	By describing credit crisis behaviors and its effects of Islamic finance specially Sukuk.	Chapter.3

Appendix 2: Difference of Conventional Bonds vs. Sukuk

	Sukuk	Conventional Bonds	Comments	Author And Year
Basic Requirements:	Sukuk purely based on the financial Islamic laws. Where the interests "Riba" are prohibited and considered as the main differences that distinguish Islamic Finance in general. In addition to avoid Gharar, Casino, gambling, alcohol, tobacco, pork products and any other transactions that prohibited according to Sharee'ah. Therefore generally, Islamic Finance focuses on ethical side in their transactions. So, the proceeds from Sukuk cannot be used for any unethical or in any activity or business results any harm or damage to the society as a whole.	Conventional bonds are based on the capitalistic system of economics. Where the interest /return considered as the basis of their transactions and do not give any attention to the ethical side.		AL-MAGHLOUTH, A. K., 2009. Sukuk: An inside study of its background, structures, challenges & Cases. and HAIDER, J. and AZHAR, M., 2010. Islamic Capital Market: Sukuk and its Risk Management in the Current Scenario.
Contract Type:	Sukuk is a contract based on lease or a defined business undertaking between the Sukuk holders and the Sukuk Issuers	Conventional bonds are a contract subject to earn money from money (Riba) by creating a Lender/Borrower relationship.		AL-MAGHLOUTH, A. K., 2009. Sukuk: An inside study of its background, structures, challenges & Cases
Asset Based :	Sukuk are an asset-based financing system where it represents ownership stakes in tangible	Conventional bonds are an interest-bearing bonds (debt-based securities) representing a pure debt on		AL-MAGHLOUTH, A. K., 2009. Sukuk: An inside study of its background, structures, challenges &

	Sukuk	Conventional Bonds	Comments	Author And Year
	assets (sale of a share of assets, business activity or project). However, these assets, businesses or projects must be of a nature that is permissible in Islamic law.	the issuer. Where it doesn't matter if it has been issued for illegitimate purposes.		Cases. HAIDER, J. and AZHAR, M., 2010. Islamic Capital Market: Sukuk and its Risk Management in the Current Scenario.
Ownership As Opposed To Lending:	"Sukuk represent ownership shares in assets that bring profits or revenues, like leased assets, or commercial or industrial enterprises, or investment vehicles that may include a number of projects. For example, the assets in the Sukuk may be shares of companies that do not confer true ownership but which merely offer Sukuk holders a right to returns. Such Sukuk are no more than the purchase of returns from shares; and this is not lawful from a Shariah perspective". 1	Conventional bonds, the investors do not have an ownership interest in the underlying asset .2.		1. USMANI, M.T., 2008. Sukuk and their contemporary applications. 2. AL-MAGHLOUTH, A. K., 2009. Sukuk: An inside study of its background, structures, challenges & Cases
Characteristics:	The aim of issuing Sukuk is to let the Sukuk holders share the profits of large enterprises or in their revenues. However, it can be possible that there is a loss and no return on the investment made through	Conventional bond is an interest-bearing debt owed by the bonds issuer to the holders, and does not represent any ownership on the part of the bondholders in the company. Where the interest is determined as	Sukuk and conventional bonds characteristics are inimical at all in their main purposes and objectives, but the mechanisms used in Sukuk today, however, strike at the foundations of these objectives and render the Sukuk exactly the same as conventional	USMANI, M.T., 2008. Sukuk and their contemporary applications HAIDER, J. and AZHAR, M., 2010. Islamic Capital Market: Sukuk and its Risk Management in the Current

	Sukuk	Conventional Bonds	Comments	Author And Year
	Sukuk, so there is no guaranteed and fixed return on Sukuk. Otherwise, these characteristics are not to be found in Islamic Sukuk, at least not directly.	a percentage of the capital and not as a percentage of the actual profits. It guarantees the return of the money at maturity, regardless of whether the project is profitable or otherwise (the original debt and the agreed amount of interest) and have no right to share any profits achieved by the company.	bonds in terms of their economic results.	Scenario
Primary Market	Sukuk still remains active merely at the primary market (YEAN, 2009). Sukuk pricing are difficult in the primary market because of lacks of depth (AL-MAGHLOUTH, 2009).	It's a place where an investor can buys securities issued for the first time. Where bonds can be negotiated and traded freely in the market (YEAN, 2009).		
Maturity Value	Sukuk returns to investors are determined by the revenue generated or the profit elements in the lease or partnership. In other word, the value payable to the Sukuk-holder on maturity should be the current market value of the assets or enterprise and not the principal originally invested.3	Conventional bonds returns to investors are the interest that is determined on the basis of percentage of capital invested in addition to the face value of the bond.		AL-MAGHLOUTH, A. K., 2009. Sukuk: An inside study of its background, structures, challenges & Cases HAIDER, J. and AZHAR, M., 2010. Islamic Capital Market: Sukuk and its Risk Management in the Current Scenario 3 USMANI, M.T., 2008. Sukuk and their contemporary applications

	Sukuk	Conventional Bonds	Comments	Author And Year
Coupon Rate:	Sukuks on the other hand avoid this type of computation.	Conventional bond issuers pay interest to investors in regular intervals normally once in six months. This interest is computed by applying CR on the face value of the bond regularly. Except this function the CR has no role to play in bond management. This interest is based on time.		RAMASAMY, R., MUNISAMY, S. and HELMI, M.H.M., 2011. Relative Risk Of Islamic Sukuk Over Government And Conventional Bonds.
Secondary Market:	Lack of trading at the secondary market owing to several reason: First most holders keep sukuk to maturity and many sukuk are held by large institutions so that the assets are unavailable for the average private investors. Also, limited number of issuances, and the lack of alternative instruments in this asset class. Moreover, sukuk are out of reach for the average investors and its holders are normally the wealthiest Muslim investors due its huge trading size. In addition to the issues revolving bay' al dayn, or sale of debt. YEAN,	Bonds generally can be traded anywhere in the world as long as a buyer and a dealer can strike a deal. There is no central place or exchange for bond trading, as there is for publicly traded stocks. The bond market is known as an "over-the-counter" market, rather than an exchange market. There are some exceptions to this however. For example, some corporate bonds in the United States are listed on the exchange. Also, bond futures and some type of bond options are traded on exchanges. But the majority of the bonds do not trade on exchanges. NO	However, both sukuk and conventional bond securities are traded in secondary markets with the same trading mechanism. Sukuk securities are priced in the market, presumably by experts in the market, similar to the conventional bills and bonds are priced.3	1. YEAN, T.W., 2009. Sukuk: Issues and the Way Forward 2. Vijay Rabindranath and Parthaprati m Gupta, 2010. An Overview – Sukuk Market in Saudi Arabia 3. SAFARI, M., 2011. Are Sukuk Securities the Same as Convention al Bonds?

	Sukuk	Conventional Bonds	Comments	Author And Year
	However, Sukuk trading remains low in the GCC while Malaysia has an active secondary market for sukuk. So, Saudi Arabia aims to establish the first sukuk market by introducing sukuk trading on the Tadawul exchange. Such moves will help in the development of an active secondary market. 2 For example, in the Malaysian secondary market, bay' al-Dain is used in order to legalize reselling of the bonds. While its prohibited in the Middle-Eastern countries.			
Default	Islamic finance charges a markup (profit) over the principal and when default or delay occurs in repayment a penalty is charged (Al-Omar and Abdel- Haq 1996). In addition the delayed amount is not added to the principal and no extra amount is charged (Rose, 2010).	In conventional finance interest rates are charged and if the borrower fails to repay in time the interest accrued is added to the principal and thus interest earns interest based on the length of the time the funds are utilized by the borrower (Saeed 1995).		Ravindran Ramasamy, Shanmugam Munisamy and Mohd Hanif Mohd Helmi , 2011 , Relative Risk Of Islamic Sukuk Over Government And Conventional Bonds

	Sukuk	Conventional Bonds	Comments	Author And Year
Calculating Cash Flows	The profit rate charged by the Islamic finance is not based on length of time period.	When delay or default occurs due to some unforeseen reasons the amount due will not be added to the principal as in conventional finance to compute compound interest.		Ravindran Ramasamy, Shanmugam Munisamy and Mohd Hanif Mohd Helmi , 2011 , Relative Risk Of Islamic Sukuk Over Government And Conventional Bonds
Wealth Effect On Bond Issues Announcement	There is a wealth effect on the Islamic bond issues announcement.	However, no wealth effect on the conventional bond announcement.	This study has investigated the effect of Islamic and conventional bond announcements on stock return in Malaysia. In addition, we examine abnormal stock return determinant on bonds announcement. The bond offering size demonstrates as significant factor of stock return on Islamic and conventional bond announcement, but the sign for Islamic bond announcement is negative that contrary to conventional bond which follow the expected sign.	Conventional vs. Islamic Bond Announcements: The Effects on Shareholders' Wealth Zariyawati Mohd Ashhari, Loo Sin Chun and Annuar Md Nassir, 2009
Yield To Maturities	Results of pair-wise Granger causality tests do not show a general and definite relation between yield of Islamic sukuk securities and conventional bonds. In other words, changes in yield of Islamic sukuk or conventional bonds do not generally change the other one. It implies that not only yields of Islamic sukuk differ from yields of conventional bonds, but also these yields do not have causal (in terms of Granger causality) with each other		This paper investigates this matter empirically by first examining if the yield to maturities of sukuk securities and conventional bonds of same quality rating gives same returns to investors.	Are Sukuk Securities the Same as Conventional Bonds? Mohamed Ariff & Meysam Safari, 2012

	Sukuk	Conventional Bonds	Comments	Author And Year
This Paper Investigates Empirically By First Examining If The Yield To Maturities Of Sukuk Securities And Conventional Bonds Of Same Quality Rating Gives Same Returns To Investors. We Also Conduct A Test To See If There Is A Causal Relationship Between The Two. Results Observes And Documents An Anomalous Behavior To This Belief In The Market Place Because We Observe Significant Differences Between Yields To Maturities Of Sukuk Securities And Conventional Bonds, Controlling For The Issuer, Risk, Market Practices And Issue Tenure. The Magnitude And The Sign Of This Difference Are Fairly Apart For Various Issuers Or Maturities. **Results Of Pair-Wise Granger Causality Tests Do Not Show A General And Definite Relation Between Yield Of Islamic Sukuk Securities And Conventional Bonds. In Other Words, Changes In Yield Of Islamic Sukuk Or Conventional Bonds Do Not Generally Cause A Change In The Other. It Implies That Not Only Yields Of Islamic Sukuk Differ From Yields Of Conventional Bonds, But Also These Yields Do Not Have Causal (In Terms Of Granger Causality) Effect On With Each Other. Yield Changes In Conventional Bonds Of Different Classes Affect Each Other, Not So With Sukuk**				
Safety	All sukuk securities have to have this safety so that, from the start of the contract, the lenders have asset- backing for their funding. Which mean the creation of assets in a separate entity, these assets being owned by the lenders, the fund providers, in proportion to the amount of funds provided? This is a fundamental principle of sukuk contracting.	This makes sukuk security safer than the conventional bonds because the lender in a conventional debt contract would need the permission of the court of law to obtain right of ownership, and even that permission is only given if it is contested at the time of actual default of promised pay-off.		Sukuk securities, their definitions, classification and pricing issues Mohamed Ariff , Meysam Safari and Shamsher Mohamad, 2012
Musharaka Sukuk	Unlike in sukuk, in share- type musharaka sukuk securities issued to investors with right of control of the firm, the fund providers only get back agreed rewards in the form of a portion of profits based on a pre agreed profit ratio. Also, if the ownership is assigned to all the assets of the borrower, whether the ownership entails control or absence of control of the enterprise, then this is called musharaka sukuk, meaning a share- like funding arrangement for a finite period of time. This type does not exist at present and may be thought of as a common share in a specific project with a finite period of life to produce an item and the fund to be paid back with profits.	In conventional share funding, if another restriction is imposed to limit the use of such funds to produce permitted products/services , the result would be a common share, musharaka contract. If such issues were also issued for a finite period, this would be a new type of share, which is not found in conventional finance. All contracts with an infinite period and share-ownership- and-control of assets of the total enterprise are pure musharaka contracts.		Sukuk securities, their definitions, classification and pricing issues: Mohamed Ariff , Meysam Safari and Shamsher Mohamad, 2012

	Sukuk	Conventional Bonds	Comments	Author And Year
Collateralization	All sukuk issuance requires collateralization		Not all conventional bonds are collateralized	Sukuk securities, their definitions, classification and pricing issues: Mohamed Ariff , Meysam Safari and Shamsher Mohamad, 2012
Taxation	Taxation could also become an issue for certain investors where the legal basis for taxation of Islamic securities is not legislated in the home country (Thuronyi, 2007).		Taxation could also become an issue for certain investors	Are Sukuk Securities the Same as Conventional Bonds? Mohamed Ariff & Meysam Safari, 2012
The Structure Of The Securitization (I Think They Try To Show It Is Not Halal)	There are some differences, however, including a very transparent and elaborate discussion of the investment risks, which makes reference to the risks linked to investing in emerging markets. However, when we skate over these superficial differences and dig deeper into the actual contractual structures supporting the issuance, it becomes obvious that sukuk are essentially very similar to 'conventional' debt-based structures such as bonds, but also vary significantly from structured finance products based on the securitization of income flows known from their role in the recent crisis. This is because the structure of the securitization itself is much simpler than in conventional products such as RMBS. For instance, there is no mention of waterfall or tranching that provides investors with different classes of bonds (equity, mezzanine, senior and super senior tranches) with different credit risk ratings and different interest rates. This overt simplicity strongly suggests that the technique of securitizing assets is used here as a mere stratagem to circumvent Shari'a rules, as they are 'Islamic' in form, but not in substance (Agha, 2009). This can be deduced from three observations. First, in common asset-based structures certificate holders do not receive periodic payments on a variable PLS basis, but instead receive a fixed interest rate that is often benchmarked to LIBOR (London Interbank Offered Rate). As for the Emaar sukuk, the trust certificates indeed return a fixed yield of 8.5%, which makes the revenue for investors completely detached from the performance of the underlying assets. As with conventional debt-based products, then, it is the rating of the seller and not the assets that determines the sukuk rating. This explains why, contrary to a prospectus of 'conventional' securitizations where the emphasis is on the underlying assets, sukuk prospectuses extensively detail the credit status and the background of the obligor. In this case, the obligor Emaar Properties is partially government-owned, which makes that its rating is linked to the overall creditworthiness of the Emirate of Dubai, which is precarious at the moment. Second, the agreement of purchase undertaking (PU) included in the contract, which binds the seller to repurchase the assets at maturity, guarantees			Securitization across borders: organizational mimicry in Islamic finance, David Bassens; y, Ewald Engelen; Ben Derudder and Frank Witlox, 2012

	Sukuk	Conventional Bonds	Comments	Author And Year
	the investments of the sukuk holders disregarding the actual performance or value of the underlying assets and thus violates the PLS principle. Third, in asset-based structures such as the above no 'true' sale occurs, but rather a transfer to the issuer of a collection of 'rights akin to ownership' that allows the issuer to issue sukuk and enables the investor to participate in the revenues generated by the underlying assets. This means that investors have no recourse to assets, making the Emaar sukuk in fact unsecured obligations, which also explains the fixed interest rate paid on the notes. This limited recourse to underlying assets reflects the fact that non-residents are more than often not allowed to own or lease these Gulf assets (Thomas et al., 2005, 158), which explains why until recently the ijarah approach was usually sufficient to satisfy Shari'a scholars. In November 2007 Taqi Usmani, the president of AAOIFI's Shari'a Board has voiced the critique that sukuk are, in fact, nothing more than conventional debt. As the recent Emaar issuance, however, illustrates this critique has fallen on deaf ears with Islamic finance professionals and their Western handmaidens.			

Appendix 3: Summary of Literature Survey Sukuk Vs Conventional Bonds (2007-2012)

Studies ↓	Features	Riba	Gharar	Ownership Asset	Pricing By Profit Share	Face Value	Maturity	Coupon And Zero Coupon Bonds	Profits after risk sharing	Security And Safety	Default Or Delay In Repayment	Primary Market	Secondary Market	Cash Flows	Interest Rate	Risks	Securitization	Location ↓
Relative Risk Of Islamic Sukuk Over Government And Conventional Bonds, By: Ravindran Ramasamy, Shanmugam Munisamy And Mohd Hanif Mohd Helmi (2011)		x			x		x	x			x			x	x	x		USA
Capital And Money Markets Of Muslims: The Emerging Experience In Theory And Practice, By: Seif I. Tag El-Din (2007)		x	x	x		x	x	x									x	UK

Studies ↓ / Features	Riba	Gharar	Ownership Asset	Pricing By Profit Share	Face Value	Maturity	Coupon And Zero Coupon Bonds	Profits after risk sharing	Security And Safety	Default Or Delay In Repayment	Primary Market	Secondary Market	Cash Flows	Interest Rate	Risks	Securitization	Location ↓
The Implementation of Sukuk in Islamic Finance, By: Mohamad Zaid Mohd Zin, Nadiyah Hashim, Nurul Khairiah Khalid, Hajar Opir and Rohaya Sulaiman (2011).			x	x		x		x		x							Conference in Singapore
In What Ways Does Islamic Banking Differ From Conventional Finance? By: Mervin K. Lewis, (N.D).	x			x	x	x	x	x						x			Australia
Sukuk: Issues And The Way Forward, By: Tan Wan YEAN (2009)	x		x	x	x						x	x					Malaysia
Sukuk And Their Contemporary Applications, By: USMANI, M.T., (2008)			x	x	x	x		x				x		x			-
Ahmed Khalid Al-Maghlouth (2009).	x	x	x	x		x	x	x			x			x	x	x	Bahrain

Studies ↓ / Features	Riba	Gharar	Ownership Asset	Pricing By Profit Share	Face Value	Maturity	Coupon And Zero Coupon Bonds	Profits after risk sharing	Security And Safety	Default Or Delay In Repayment	Primary Market	Secondary Market	Cash Flows	Interest Rate	Risks	Securitization	Location ↓
Islamic Capital Market (Sukuk and Its Risk Management in the Current Scenario), By: HAIDER, J. and AZHAR, M. (2010).			x	x		x								x			Master Thesis, Sweden
Are Sukuk Securities The Same As Conventional Bonds?, By: Mohamed Ariff & Meysam Safari (2012)			X	X	X	X	X	X				x					Australia
Sukuk Securities, Their Defi Nitions, Classifi Cation And Pricing Issues, By: Mohamed Ariff ,Meysam Safari And Shamsher Mohamad (2012)	x	x	x	x	x	x	x	x	x				x				Book, UK

Studies ↓ / Features	Riba	Gharar	Ownership Asset	Pricing By Profit Share	Face Value	Maturity	Coupon And Zero Coupon Bonds	Profits after risk sharing	Security And Safety	Default Or Delay In Repayment	Primary Market	Secondary Market	Cash Flows	Interest Rate	Risks	Securitization	Location ↓
Sukuk: Its Definition, Types, Important Role In The Development, The Size Of Their Issues And Sukuk Challenges, By: Alzatari (2010)	x		x	x			x	x	x	x	x			x		x	Jordan In Arabic
Islamic Sukuk Securities As Financing Instruments: An Examination Of Bond Pricing In The Conventional And Islamic Setting And A Survey Of Literature On Alternative Benchmarks To The Interest-Based System, By: Hamza, Qais (2006)	x		x	x			x	x		x	x	x		x	x	x	Master Thesis, UK

Appendix 4: Literature Review

Others / year	Topic / title	Theoretical foundation/ aim/ theory	Type of research	sample size	Key finding	location
Ravindran Ramasamy, Shanmugam Munisamy and Mohd Hanif Mohd Helmi (2011)	Relative Risk Of Islamic Sukuk Over Government And Conventional Bonds	To compute and compare the duration and convexity of Islamic sukuk against Government bond and conventional bond.	Empirically analysed for sukuk' riskiness.	The sample consisted of 93 bonds data comprising 31 sukuk, 35 CBs and 27 GBs.	When empirically analysed for sukuk' riskiness, the results reveal that they are moderately riskier than government bonds and less risky than conventional bonds. As risk and return are positively correlated the sukuks provide a lower return. These results support the popularity of the sukuks though yield is lower due to their less risky nature. All these results imply that sukuks are the most apt investment for risk averters, whether they follow Islam or any other religion. Investors who choose bond market for investment will be normally risk averse else they will go to the stock market, which is more risky and with better YRs.	Malaysia
Fadilah Mansor and M. Ishaq Bhatti (2011)	Risk and Return Analysis on Performance of the Islamic mutual funds: Evidence from Malaysia	The aim of this paper is to examine the performance of the Islamic mutual funds in Malaysia based on aggregate return performance and compare with the Conventional peers and the market benchmark.	Empirically	The study used monthly aggregate returns to evaluate performance of the mutual funds for the Islamic and Conventional portfolios in Malaysia, from 1996 to 2009. The evidence from aggregate	The result has shown on average the Islamic portfolio provides slightly less returns relative to the Conventional counterparts. The result revealed a statistically significant difference	Malaysia

				returns of the 128 Islamic mutual funds and 350 Conventional mutual funds, consists of 160 observations denoted that both portfolios have performed better than the market portfolio within the period.	between the standard deviation of the portfolios, indicating that the Islamic portfolio is riskier than the Conventional portfolio. The results also revealed that both Islamic and Conventional portfolios were depended on the market portfolio of which the former portfolio was closely mirrored to the market movement in relation to the latter portfolio.	
Mohamed Ariff and Meysam Safari (2012)	Are Sukuk Securities the Same as Conventional Bonds?	This study aims to investigate empirically if the yield to maturities of sukuk securities and conventional bonds of same quality rating gives same returns to investors	Empirically	YTM data for first working day of each month for the period of August 2005 to January 2011. Data on daily prices and market index (Kuala Lumpur Composite Index, KLCI)	Results show a significant difference in yield of sukuk against yield of conventional bonds. Moreover, results of Granger causality test do not show causal relation between yields of these two types of securities. Some differences between yield curves of Islamic Securities and conventional bonds of different types of issuers are identified. Finally, the effect of issuance of ijarah sukuk on issuing firm's beta is studied. Our main conclusions are: sukuk securities should not be priced the same way as conventional	Malaysia

					bonds; the market for equity of issuing companies appear to suggest that the risk of the firm changes significantly because of the issue of ijara sukuk certificates.	
Selim Cakir and Faezeh Raei (2007)	Sukuk vs. Eurobonds: Is There a Difference in Value-at-Risk?	The paper aims to contribute to the debate on the issuance of Sukuk as alternative investment/financing instruments.	Empirically	The data originate from two different sources: weekly and daily prices are Downloaded from DataStream for Malaysian, Pakistani, and Qatari bonds from the issue date Through end-June 2007. The data for Bahrain is downloaded from Bloomberg; however, the Data are available only from August 2006 rather than the original issue date.	They take an opposing view, suggesting that Sukuk are truly different from conventional bonds. The authors examine the risk-reduction advantages of issuing sovereign sukuk as alternative financing instruments compared to conventional sovereign bonds. Using a sample of sovereign sukuk and Eurobonds from the same issuer, the authors estimate and compare value-at-risk (VaR) for a portfolio that includes both instruments to a pure Eurobond portfolio. They find that the VaR is reduced when sukuk are added to the portfolio of fixed-income securities, demonstrating that these investment certificates create diversification benefits for investors.	.
Wahida Ahmad and Rafisah Mat Radzi (2011)	Sustainability of Sukuk and Conventional Bond during Financial	This study aims to investigate the impact of economic and market conditions on the	Empirically	The sample consists of 20 annual observations on each sukuk	Found it interesting that the trends reveal that for most of the	Malaysia, 2011

	Crisis: Malaysia's Capital Market	issuance of Islamic and conventional bonds in Malaysia's capital market.		and conventional bond issuance in Malaysia from 1990 to 2009.	period, growth in sukuk and conventional bonds issuance is not parallel, particularly during the Asian financial crisis and subprime crisis. The results reveal evidence that differently measured factors and determined the value of sukuk and conventional bonds issuance in Malaysia. Sukuk issuers place a premium on current economic factors such as GDP, forex and international liquidity (reserves less gold) in sukuk issuance while conventional bonds issuers only consider forex as an important factor in its issuance. It implies the concern of sukuk issuers in economic conditions and stability in ensuring a sustainable Islamic capital market. As evidenced by the recent subprime financial crisis of 2007/08, sukuk are susceptible to deterioration. However, it is important to note that the effect is considered to be less severe compared to the conventional bond market. Considering the provisions inherent in the	

					sukuk structure, its fundamental value is more stable and hence less affected during financial crises.	
Muhammad al-Bashir Muhammad al-Amine,	THE ISLAMIC BONDS MARKET: POSSIBILITIES AND CHALLENGES	Try to investigate the possibilities and challenges of developing an Islamic bonds market free From usury and interest and capable of making use of the existing financial resources.	Conceptual		It is clear that the Islamic alternatives of resource mobilization through Islamic bonds is not only possible but also has proven to be practical through the implementation of several successful projects using Islamic bonds or as tools of monetary management. However, what is more important is that Muslim jurists and economists must intensify their efforts to explore the different forms of Islamic bonds based on the acceptable types of contract in Islamic law for that purpose, such as musharakah, muqaradah and ijarah. Similarly the possibility of having negotiable certificates based on salam should not be excluded totally and a systematic analysis of the possibility of reselling salam before taking possession needs to be explored by Muslim jurists especially at the Islamic Fiqh Academy level. Especially when the whole issue	

					of prohibiting resale before taking possession is based on the argument that such a sale may lead to gharar or even riba and to what extent this possibility is present nowadays.	
Christophe J. Godlewski, Rima Turk-Ariss and Laurent Weill (2011)	Do markets perceive sukuk and conventional bonds as different financing instruments?	Analyzed stock market reactions to announcements of sukuk and conventional bond issues	Empirically	Our sample period (2002–2009) contains 93 events for conven-tional bonds and 77 events for sukuk. The date of announcement is treated as day 0.	Our findings suggest the stock market is neutral to announcements of conventional bond issues, but reacts negatively to announcements of sukuk issues. We attribute this finding to the excess demand for Islamic investment certificates and explain the difference in stock market reactions as an adverse selection mechanism that favors sukuk issuance by lower-quality debtor companies. Unlike previous studies, our findings indicate markets readily distinguish between sukuk and conventional bonds.	Bank of Finland
Ghazali Syamni and Husaini (2010)	Interest rates and currencies effects on Islamic and conventional bonds	The paper measured and analyzed the relationship between interest rates, currencies conventional bonds, and Islamic bonds.	Empirically	It used quarterly, data of Interest rates and currencies, which are provided by Bank Negara Malaysia, ranged from 2001 to 2008.	The analysis on Islamic bonds showed that interest rates and currencies had no significant results. This provided additional support to the prohibition of interest in Islamic bonds. The analysis on	Malaysia

					conventional bond suggested that currency and interest rate had significant effects on conventional bonds value.	

Appendix 5: Explaining the Different Methodological Theories/Methods Relevant To The Current Study

Theories	Definition	Characteristics	Application	Methods of analysis	Used in previous studies (author/year)	Comments/criticisms
The Theory Of Efficient Market Hypothesis (EMH)	An efficient market is a market that adjusts rapidly to new information.	▪ Current day financial theory is based in one form or another on the efficient market hypothesis. ▪ The information is freely available to all market participations, such as: lenders, investors, management, government, agencies, auditors and do on, without any charge.	▪ General behaviour of the market. ▪ Test weak-form efficiency. ▪ Test semi-strong form efficiency. ▪ Test strong-form efficiency.	▪ The tests of the weak form of the EMH can be categorized as: **1**. Statistical tests such as: The autocorrelation tests, variance and runs tests **2**. Trading tests would be the filter rule, which shows that after transaction costs, an investor cannot earn an abnormal return. ▪ The tests of the semi-strong form of the EMH are as follows:	▪ Testing the semi-strong form efficiency of Islamic capital market with response to information content of dividend announcement- a study in Jakarta Islamic index, by: Dr. Misnen Ardiansyah, M.Si and Abdul Qoyum (2011). ▪ Effect of regulation, Islamic law and noise traders on the Saudi stock market, a thesis	▪ Information asymmetry. ▪ Investors are not rational. ▪ Stock market crashes happen far too often. ▪ An efficient market hypothesis was in large part, responsible for the crises.

		▪ Under this theory no investor can achieve a higher return than the others, because the yield is enough to make up each investor about their risks on investing. ▪ Keen competition among the market participants more or less ensures that the market will reflect intrinsic values.		**1.** Event test analyzes the security both before and after an event, such as earnings. **2.** Regression/time series tests. As a result, an investor should not be able to achieve an abnormal return using this method. ▪ Strong-form tests as follows: 1. Insiders to a company, such as senior managers, have access to inside information. 2. Exchange specialists: an exchange specialist	submitted for the degree of doctor of philosophy. By Abdullah K. Ibnrubbian (2012).	

				recalls runs on the orders for a specific equity. 3. Analysts: the equity analyst has been an interesting test. 4. Institutional money managers.		
Value at Risk (VaR) methodolgy	Value at Risk (VAR) calculates the maximum loss expected (or worst-case scenario) on an investment, over a given time period and given a specified degree of confidence.	▪ It is a nice summary of risk, as only a single number is presented. ▪ It is relatively easy to calculate. ▪ It is easy to understand by non-technical managers and executives.	In 1952, Markowitz provided a quantitative framework for measuring risk and return. VAR is used to evaluate portfolio risk, but also it can be used to evaluate the risk of a single index that trades like a stock and bonds.	There are three methods of calculating VAR: the historical method, the variance-covariance method and the Monte Carlo simulation.		▪ It has no indication of risk beyond specified confidence level. ▪ It does not capture all relevant information about risks in the market. ▪ Assumes fixed portfolio positions over horizon. ▪ It only captures the risk at a specific future time point.

The theory of term structure of interest rates	The term structure of interest rates is defined as the relationship between The yield-to-maturity on a zero coupon bond and the bond's maturity.	▪ If a yield curve is upward sloped, short-term interest rates are below long-term interest rates. In other words, long-term interest rates are usually higher than short-term interest rates, which is why we are saying normal yield curve. ▪ If a yield curve is downward sloped, long run interest rates are below short-term interest rates. This shape is often seen when the market expects interest rates to fall ▪ If a yield curve is flat, short-	▪ Forecasting future interest rates. ▪ Estimating the cost of capital for discounting future cash flows. ▪ Building predictive models of general economic growth (e.g., to project gross domestic product). ▪ Formulating monetary policy. ▪ Estimating future inflation. ▪ Understanding dynamics in financial markets. ▪ Constructing a portfolio or hedging strategy.	The common tool for this analysis is The yield curves. In their comprehensive book on interest rate modelling James and Webber note that by the following techniques: 1.Approximation using Lagrange polynomials 2. Fitting using parameterised curves. 3. Local regression. 4. Linear programming. In the money market practitioners might use different		In other words, there are 3 characteristics of the term structure of interest rates: ▪ The change in yields of different term bonds tends to move in the same direction. ▪ The yields on short-term bonds are more volatile than long-term bonds. ▪ The yields on long-term bonds tend to be higher than short-term bonds.

		term interest rates are equal to long-term interest rates. ▪ The relationship between an interest rate and the term to maturity of a bond is usually not linear, so that yield curves can often be classified as humped.		techniques to solve for different areas of the curve.		
There are three main economic theories of term structure of interest rates attempting to explain how yields vary with maturity. As follows :						
The pure expectations	Investors' expectation in the market is the major determinant to the yield curve shape for interest rates in the future,	The key assumption behind this theory is that buyers of bonds do not prefer bonds of one maturity over another, so they will not hold any quantity of a bond if its expected return is	▪ Explains why short-term interest rates are moving along with long term interest rates. ▪ Explain the observation that			It could not explain the stability in the shape of the yield curve.

	assuming that different maturities are perfect substitutes.	less than that of another bond with a different maturity.	yields rates usually move together.			
The liquidity premium	Assume that investors are interested in returns and an expected maturity date by having higher liquidity in a short-term debt (upward sloping yield curve).	• Key Assumption: Bonds of different maturities are substitutes, but are not perfect substitutes • Implication: Modifies Pure Expectations Theory with features of Market Segmentation Theory	• Modifies the expectations theory • Forward rates will be lower than calculated by the expectations theory • Helps to explain the recurring upward slope			There is no easy way to observe the level of liquidity premium(s). In other word this theory really has no opinion as to where the yield curve is headed.

The market segmentation theory	The bond markets are separated and divided according to different maturity dates.	▪ The interest rate of each maturity sector determines the shape on the basis of supply and demand of the bonds at this date only. ▪ That the borrowers and the lenders have specific dates selected when they want to deal. ▪ If an investor wants to go out of his sector, he'll want to be compensated for taking on that additional risk	It can be used to explain just about every type of yield curve an investor can came across in the market.			This theory cannot explain why interest rates of the different bonds maturities are move together. (Flat or humped yield curve).

Appendix 6: Sukuk and Conventional Bonds Listed Companies

SUKUK	Type	Sector	Issues	Maturity	S&P	Moody`s	Contrary	Conventional Bonds	Type	Sector	Issues	Maturity	S&P	Moody`s	Contrary
DAR AI ArkanSukuk 2013 5 3/4% 24/05/18 Regulation S	Ijarah	Real Estate	2013	24/05/18	B+	WR	KSA	Asset Repackaging Five 2010 Complex Coupon 05/11	Corporate	Financial Institution	2010	05/11	NA	NA	KSA
Saudi Electricity 2013 3.473% 08/04/23 144A	Ijarah	Electricity	2013	08/04/23	AA-	A1	KSA	IDB Trust Services 2010 2.55% 20/09/20 Semi-Annual	Corporate	Financial Institution	2010	20/09/20	NA	NA	KSA
Saudi Electricity 2013 5.06% 08/04/43 144A	Ijarah	Electricity	2013	08/04/43	AA-	A1	KSA	SAUDI BRITISH BANK 2005 F/R 03/10 Q	Corporate	Financial Institution	2005	03/10	NA	NA	KSA
Saudi Electricity 2012 2.665% 03/04/17 Regulation S	Ijarah	Electricity	2012	03/04/17	AA-	A1	KSA	Export Import Bank Korea 2011 Floating Rate Note 12/16 Regulation S	Corporate	Financial Institutions	2011	12/16	NA	NA	KSA
Saudi Electricity 2012 4.211% 03/04/22 Regulation S	Ijarah	Electricity	2012	03/04/22	AA-	A1	KSA	IDB TRUST SERVICES 2010 2.55% 20/09/20 S	Corporate	Financial Institution	2011	20/09/20	NA	NA	KSA
DAR Al-Arkan International 2010 10	Ijarah	Real Estate	2010	18/02/15	B+	WR	KSA	Inblk for Reconstruction 2009 2.45% 29/12/14	Corporate	NA	2009	29/12/14	NA	NA	KSA

3/4% 18/02/15 Regulation S								10371							
BSF Sukuk Limited 2012 2.947% 22/05/17 Regulation S	Wakala	Financial Services	2012	22/05/17	A	NA	KSA	Banque Saudi Fransi 2010 4 1/4% 30/03/15 Regulation S	Corporate	Financial Institution	2010	30/03/15	A	Aa3	KSA
DAAR INTL. SUKUK 2007 F/R 07/03/10 Q	Ijarah	Real Estate	2007	07/03/10	B+	WR	KSA	ICICI BANK BAHRAIN 20076 5/8% 03/10/12S	Corporate	Financial Institution	2007	03/10/12	BBB	NA	BAHRAIN
GFH Sukuk 2007 Floating Rate Note 07/18 S-1	Ijarah	Financial Services	2007	07/18	NR	NA	BAHRAIN	HDFC BANK LTD (BAHR 2013 3% 06/03/18 REG.S	Corporate	Financial Services	2013	06/03/18	BBB-	Baa2	BAHRAIN
CBB International Sukuk Company 2011 6.273% 22/11/18 Regulation S	Ijarah	Financial Services	2011	22/11/18	BBB	NA	BAHRAIN	ICICI BANK BAHRAIN 2009 5 1/2% 25/03/15 144A	Corporate	Financial Institution	2009	25/03/15	BBB-	Baa2	BAHRAIN
CBB International 2009 6.247% 17/06/14 Regulation S	Ijarah	Financial Services	2009	17/06/14	BBB	NA	BAHRAIN	BAHRAIN KINGDOM OF 2012 6 1/8% 05/07/22 REG.S	Sovereign	Government	2012	05/07/22	BBB	NR	BAHRAIN
BMA International Sukuk 2004 Floating	Al Ijarah	Financial Services	2004	06/09	NA	NA	BAHRAIN	FINANS BANK BAHRAIN 2006 6 1/4% 24/03/11 S	Corporate	Financial Institution	2006	24/03/11	NA	NA	BAHRAIN

Rate Note 06/09 S															
Adcb Islamic Finance 2011 4.071% 22/11/16 Regulation S	Wakala - Modarabah	Financial Institution	2011	22/11/16	A	A1	UAE	BAHRAIN KINGDOM OF 2010 5 1/2% 31/03/20 REG.S	Sovereign	Government	2010	31/03/20	BBB	NR	BAHRAIN
DP World Sukuk Limited 2007 6 1/4% 02/07/17 Regulation S	Modarabah	Industrials	2007	02/07/17	NR	Baa3	UAE	ICICI BANK BAHRAIN 2009 5 1/2% 25/03/15 REG.S	Corporate	Financial Institution	2009	25/03/15	BBB-	Baa2	BAHRAIN
Dubai DOF Sukuk 2009 6.396% 03/11/14 S-1	Sukuk Al Ijara	Government	2009	03/11/14	NA	NA	UAE	BAHRAIN MUMTALAKAT 2010 5% 30/06/15 REG.S	Government	Financial Institution	2010	30/06/15	BBB	NA	BAHRAIN
Dubai DOF Sukuk 2012 4.9% 02/05/17 Regulation S	Sukuk Al Ijara	Government	2012	02/05/17	NA	NA	UAE	BAHRAIN KINGDOM OF 2012 6 1/8% 05/07/22 144A	Sovereign	Government	2012	05/07/22	BBB	NR	BAHRAIN
Dubai DOF Sukuk 2012 6.45% 02/05/22 S-4	Sukuk Al Ijara	Government	2012	02/05/22	NA	NA	UAE	ABU DHABI COML.BK. 2006 6% 21/11/13 S	Corporate	Financial Services	2006	21/11/13	A -	A1	UAE
TdicSukuk Limited 2009 4.949% 21/10/14 S-1	Ijarah	Government	2009	21/10/14	AA	A1	UAE	DP WORLD LTD. 2007 6.85% 02/07/37 144A	Corporate	Industrials	2007	02/07/37	NR	Baa3	UAE
Anka A Sukuk	Ijarah	Real Estat	2012	25/08/16	NA	NA	UAE	Emblem Finance	Corporate	Financial Institution	2/11/2010	07/2014	NA	NA	UAE

Limited 2012 10% 25/08/16 Regulation S		e						Company Number 2 2010 Complex Coupon 07/14 Semi-Annual							
MAF Sukuk Limited 2012 5.85% 07/02/17 S-1	Wakala	Financial Institution	2012	07/02/17	BBB	NA	UAE	National Bank Abu Dhabi Convertible Floating Rate Note 02/18 Early	Corporate	Financial Services	NA	02/18	NA	NA	UAE
Jafz SUK 2019 Limited 2012 7% 19/06/19 Regulation S	Sukuk Al Musharakah	REAL ESTATE	2012	19/06/19	NA	Ba3	UAE	BARCLAYS BANK 2010 CMX.CPN. 03/20 Q	Corporate	Financial Institution	2010	03/20	NA	NA	UAE
EIB Sukuk Company 2012 4.718% 18/01/17 S-2	Musharaka	Financial Services	2012	18/01/17	NA	Baa1	UAE	STD.CHARTERED BANK 2008 ZERO 07/10/13	Corporate	Financial Services	2008	07/10/13	NA	NA	UAE
ABU DHABI ISLAMIC B 2006 F/R 12/11 Q	Musharaka	Financial Institution	2006	12/2011	NA	NA	UAE	XSTRATA FIN.DUBAI 2012 G/R 19/05/16 REG.S	Corporate	Financial Services	2012	19/05/2016	BBB	NA	UAE
EIB SUKUK CO. 2012 4.147% 11/01/18 REG.S	Musharaka	Financial Services	2012	11/01/2018	NA	Baa1	UAE	ADCB FINANCE CAYMAN 2009 F/R 01/11 Q	Corporate	Financial Services	2009	01/2011	NA	NA	UAE
DUBAI GLOBAL SUKUK 2004 F/R 04/11/09	Ijarah	Government	2004	04/11/2009	NA	NA	UAE	DUBAI 2010 6.7% 05/10/15 REG.S	Sovereign	Government	2010	05/10/2015	NA	NA	UAE
EIB SUKUK	Mushar	Finan	2012	11/01/2	NA	Baa1	UAE	ABU DHABI	Corpor	Electricity	2012	12/01/2	A-	A3	UAE

CTD. 2012 4.147% 11/01/18 REG.S	aka	cial Services		018				NAT. 2012 2 1/2% 12/01/18 144A	ate	and energy		018			
HBME SUKUK CO. 2011 3.575% 02/06/16 REG.S	Wakala - Modarabah	Financial Institution	2011	02/06/16	NA	A2	UAE	DUBAI 2010 7 3/4% 05/10/20 REG.S	Sovereign	Government	2010	05/10/2020	NA	NA	UAE
EIB SUKUK CTD. 2007 F/R 06/12 Q	Musharaka	Financial Services	2007	06/2012	NA	Baa1	UAE	EXOVA LTD.ABU DHABI 2010 10 1/2% 15/10/18 REG.S	Corporate	Industry	2010	15/10/2018	B-	Caa1	UAE
DIB SUKUK CTD. 2007 F/R 03/12 Q	Ijarah	Financial Institution	2007	03/2012	NR	NA	UAE	NAT.BK.ABU DHABI 2011 2.6% 15/07/26 S-1	Corporate	Banks and financial institutions	2011	15/07/2026	AA-	Aa3	UAE
HILAL SUKUK CO. 2009 3.037% 03/11/14 REG.S	Wakala -	Financial Institution	2009	03/11/2014	NA	Aaa	UAE	AXIS BANK LTD.DUBAI 2010 5 1/4% 30/09/15 REG.S	Corporate	Banks and financial institutions	2010	30/09/2015	BBB-	Baa2	UAE
SIB SUKUK CO. 2006 F/R 10/11 Q	Wakala	Financial Services	2006	10/2011	BBB+	NA	UAE	DUI.ELTY.&.WT.AUTH. 2010 8 1/2% 22/04/15 REG.S	Corporate	Electricity	2010	22/04/2015	NA	Baa3	UAE
RAKIA SUKUK CO. 2007 F/R 12/12 EARLY	Ijarah	Financial Service	2007	12/2012	NA	NA	UAE	AXIS BANK LTD.DUBAI 2010 4 3/4% 02/05/16 144A	Corporate	Banks and financial institutions	2010	02/05/2016	BBB-	Baa2	UAE
ADIB SUKUK CO. 2012 6.375%(F/R) PERP. S	Musharaka	Financial Institution	2012	NA	NA	NA	UAE	DUBAI.HLDG.COML.OPS 2007 6% 01/02/17	Corporate	Construction and development	2007	01/02/2017	NR	B2	UAE
FGB Sukuk Company Limited	Wakala - Modara	Financial Insti	2011	02/08/16	NA	A2	UAE	Nakheel Development Limited 2008	Corporate	Real Estate	2008	13/05/2010	NA	NA	UAE

2011 3.797% 02/08/16 Regulation S	bah	tutio n						Floating Rate Note 13/05/10 Semi-Annual							
FGB Sukuk Company Limited 2012 4.046% 18/01/17 S	Wakala - Modara bah	Finan cial Insti tutio n	2012	18/01/2 017	NA	A2	UAE	EMBLEM FIN.CO.NO.2 2008 F/R 08/18 S-4	Corpor ate	Financial Institution	2008	0/2018	NA	NA	UAE
Hbme Sukuk Company 2011 3.575% 02/06/16 Regulation S	Wakala - Modara bah	Finan cial Insti tutio n	2011	02/06/1 6	NA	A2	UAE	BANK OF IRELAND 2008 8%(V/R) 07/18 587	Corpor ate	Financial Services	2008	07/2018	NA	NA	UAE
SIB Sukuk CO II 2011 4.715% 25/05/16 Regulation S	Wakala	Finan cial Servi ces	2011	25/05/2 016	BBB +	NA	UAE	ABU DHABI COML.BK. 2007 6% 22/01/17 S	Corpor ate	Financial Services	2007	22/01/2 017	A -	A1	UAE
YaasSukuk I Limited 2013 6% 28/10/15 Regulation S	Al- Istith mar	Finan cial servi ces	2013	28/10/1 5	NA	NA	KUWAIT	NAT.BK.ABU DHABI 2009 3.8% 15/09/14	Corpor ate	Banks and financial institution s	2009	15/09/2 014	AA-	Aa3	UAE
YaasSukuk I Limited 2013 8% 28/10/15 Regulation S	Al- Istith mar	Finan cial servi ces	2013	28/10/1 5	NA	NA	KUWAIT	ABU DHABI NAT. 2009 6 1/4% 16/09/19 144A	Corpor ate	Electricity and energy	2009	09/2019	A-	A3	UAE
URC SUKUK 2007 F/R 06/12 REG.S	Mushar aka	NA	2007	06/2012	NA	NA	KUWAIT	ABU DHABI NAT. 2007 6.165% 25/10/17 REG.S	Corpor ate	Electricity and energy	2007	25/10/1 7	NA	NA	UAE
KT Turkey	Ijarah	Finan	2010	24/08/1	NA	NA	TURKEY	ABU DHABI	Corpor	Electricity	2006	27/10/2	NR	A3	UAE

Sukuk Limited 2010 5 1/4% 24/08/13 Regulation S	- Wakala	cial Servi ces		3				NAT. 2006 6 1/2% 27/10/36 144A	ate	and energy		036			
KT SukukVarlik 2011 5 7/8% 31/10/16 Regulation S	Ijarah - Wakala	Finan cial Servi ces	2011	31/10/2 016	NA	NA	TURKEY	ABU DHABI COML.BK. 2006 F/R 05/16 Q	Corpor ate	Financial Services	2006	05/2016	A-	NA	UAE
1MALAYSIA Sukuk Global 2010 3.928% 04/06/15 Regulation S	Ijarah	Gover nment	2010	04/06/2 015	A-	A3	MALAYS IA	Dubai Electricity and Water Authority. 2010 6 3/8% 21/10/16 REG.S	Corpor ate	Electricity	2010	21/10/2 016	NA	Baa3	UAE
Petronas Global Sukuk 2009 4 1/4% 12/08/14 Regulation S	Ijarah	Energ y, Oil & Gas - Integ rated	2009	12/08/2 014	NA	NA	MALAYS IA	DEWA FUNDING 2008 F/R 06/13 REG.S	Corpor ate	Financial Institution	2008	06/2013	NA	NA	UAE
1MALAYSIA Sukuk Global 2010 3.928% 04/06/15 144A	Ijarah	Gover nment	2010	04/06/2 015	A-	A3	MALAYS IA	BANK OF IRELAND 2008 V/R 27/08/18 REG.S	Corpor ate	Financial Institution	2008	27/08/1 8	NA	NA	UAE
Wakala Global Sukuk 2011 2.991% 06/07/16 Regulation S	Wakala	Gover nment	2011	06/07/2 016	A-	A3	MALAYS IA	Dubai 2008 Floating Rate Note 04/13 Regulation S	Sovere ign	Government	2008	04/2013	NA	NA	UAE

Wakala Global Sukuk 2011 4.646% 06/07/21 Regulation S	Wakala	Government	2011	06/07/2021	A-	A3	MALAYSIA	National Bank Abu Dhabi Convertible Floating Rate Note 03/16 Quarterly	Corporate	Financial Services	NA	03/2016	NA	NA	UAE
MBB Sukuk 2007 Floating Rate Note 04/17 Early	Ijarah	Financial Services	2007	04/2017	NA	NR	MALAYSIA	Kuwait Projects Cayman Islands 2009 8 7/8% 17/10/16 Regulation S	Corporate	Portfolio Management	2009	17/10/16	BBB-	Baa3	KUWAIT
BNM Sukuk BHD 2011 Zero 25/08/11 S-Preference Share	Ijarah	Government	2011	08/2011	NA	NA	MALAYSIA	Kuwait Projects Cayman Islands 2010 9 3/8% 15/07/20 Regulation S	Corporate	Portfolio Management	2010	15/07/20	BBB-	Baa3	KUWAIT
AlmanaSukuk 2008 Floating Rate Note 05/13 Early	Wakala	Specialty Retail	2008	05/2013	NA	NA	QATAR	KUWAIT PRJS.CYMN. 2006 F/R 04/11 Q	Corporate	Portfolio Management	2006	04/11	BBB-	Baa3	KUWAIT
QIB Sukuk Funding 2010 3.856% 07/10/15 S	Sukuk Al Ijara	Financial Services	2010	07/10/2015	NA	NA	QATAR	KUWAIT FINL.CTR. 2007 F/R 07/12 Q	Corporate	Financial Services	2010	15/07/20	NA	NA	KUWAIT
QIB Sukuk Limited 2012 2 1/2% 10/10/17 Regulation S	Sukuk Al Ijara	Financial Services	2012	10/10/2017	NA	NA	QATAR	TURKEY 2009 11% 06/08/14	Sovereign	Government	2009	06/08/14	NR	NR	TURKEY
QiibSukuk Funding Limited	Sukuk Al Ijara	Financial Servi	2012	18/10/2017	NA	A3	QATAR	TURKEY 2013 3 1/4% 23/03/23 S	Sovereign	Government	2013	23/03/2023	NA	Baa3	TURKEY

2012 2.688% 18/10/17 Regulation S		ces													
QREIC SUKUK LLC 2006 F/R 08/16 Q	Musharaka	Real Estate	2006	08/16	NA	NA	QATAR	Malaysia 2010 3.835% 12/08/15 Semi-Annual	Sovereign	Government	2010	12/08/2015	NA	A3	MALAYSIA
AlmanaSukuk 2011 Floating Rate Note 07/16 Regulation S	Wakala	Specialty Retail	2011	07/16	NA	NA	QATAR	HSBC BANK MALAYSIA 2007 G/R 02/11/27 TR - 1	Corporate	Financial Services	2007	02/11/2027	NA	NA	MALAYSIA
Pakistan 2006 7 7/8% 31/03/36 144A	NA	Sovereign	2006	31/03/36	B -	Caa1	PAKISTAN	OCBC BK.MALAYSIA 2009 6 3/4% 15/04/39 S-P	Corporate	Financial Services	2009	15/04/2039	NA	NA	MALAYSIA
Pakistan 2006 7 1/8% 31/03/16 Regulation S	NA	Sovereign	2006	31/03/16	B -	Caa1	PAKISTAN	BERJAYA INFR. 2004 9.4% 30/09/13 TRANCHE	Corporate	INFRASTRUCTURE AND UTILITIES	2004	30/09/2013	NA	NA	MALAYSIA
Pakistan 2006 7 1/8% 31/03/16 144A	NA	Sovereign	2006	31/03/16	B -	Caa1	PAKISTAN	PANGLIMA POWER SDN 2003 8.15% 19/03/15 TR - 2	Corporate	Electricity and energy	2003	19/03/2015	NA	NR	MALAYSIA
Pakistan 2007 6 7/8% 01/06/17 144A	NA	Sovereign	2007	01/06/17	B -	Caa1	PAKISTAN	MALAYSIA 2003 4.41% 29/01/18 S	Sovereign	Government	2003	29/01/2018	A	NR	MALAYSIA
PAK.INTL.SUKUK 2005 F/R 01/10 S	NA	Sovereign	2005	01/01/10	B -	Caa1	PAKISTAN	MALAYSIA 2005 4.837% 15/07/25 S-P	Sovereign	Government	2005	15/07/2025	NA	A3	MALAYSIA
								SABAH STATE 2009 4.58% 09/12/14 S	Sovereign	Government	2009	09/12/2014	NA	NA	MALAYSIA

	SYRKT PRSRNA NEGARA 2003 4.27% 30/11/16 S-P	Sovereign	Government	2003	30/11/2016	NA	NR	MALAYSIA
	MALAYSIA 2009 3.741% 27/02/15 S	Sovereign	Government	2009	27/02/15	NA	A3	MALAYSIA
	STD.CHT.BANK MAL. 2007 4.28%(F/R) 11/17 S-P	Corporate	Banks and financial institutions	2007	11/2017	NA	NA	MALAYSIA
	Digi Telecommunications 2009 4.85% 17/07/14 Medium-Term Note 2	Corporate	Telecommunication	2009	17/07/2014	NA	NA	MALAYSIA
	Malaysia 2009 3.741% 27/02/15 Semi-Annual	Sovereign	Government	2009	27/02/2015	NA	A3	MALAYSIA
	Orix Leasing Malaysia 2011 4.05% 28/01/16 S-Preference Share	Corporate	Leasing	2011	28/01/2016	NA	NA	MALAYSIA
	Malaysia 2011 4.16% 15/07/21 Semi-Annual	Sovereign	Government	2011	15/07/2021	NA	A3	MALAYSIA
	Standard Chartered Bank Malaysia 2007 4.28% (Floating Rate Note) 11/17 S-	Corporate	Financial Institution	2007	11/2017	NA	NA	MALAYSIA

	Preference Share							
	Bank Negara Malaysia 2011 T-Bill 24/08/11 S-Preference Share	Sub-Sovereign	Government	2011	08/2011	NA	NA	MALAYSIA
	Qatar 2009 5.15% 09/04/14 Regulation S	Sovereign	Government	2009	09/04/2014	AA	Aa2	QATAR
	Qatar 2009 4% 20/01/15 Semi-Annual	Sovereign	Government	2009	20/01/2015	AA	Aa2	QATAR
	QATAR PETROLEUM 2006 5.579% 30/05/11 144A	Government	Oil and Gas	2006	30/05/11	NA	NA	QATAR
	QATAR PETROLEUM 2006 5.579% 30/05/11 144A	Government	Oil and Gas	2006	30/05/11	NA	NA	QATAR
	QATAR 1999 9 1/2% 21/05/09 144A	Sovereign	Government	1999	21/05/09	AA	Aa2	QATAR
	QATAR 2000 9 3/4% 15/06/30 144A	Sovereign	Government	2000	15/06/30	AA	Aa2	QATAR
	QATAR 2009 5 1/4% 20/01/20 S	Sovereign	Government	2009	20/01/2020	AA	Aa2	QATAR
	QATAR 2009 6.55% 09/04/19 144A	Sovereign	Government	2009	09/04/2019	AA	Aa2	QATAR
	QATAR 2009 5.15% 09/04/14 144A	Sovereign	Government	2009	09/04/2014	AA	Aa2	QATAR
	QATAR 2009	Sovere	Government	2009	20/01/2	AA	Aa2	QATAR

	6.4% 20/01/40 S	ign			040			
	DOHA BANK 2006 F/R 12/16 S-1	Corporate	Financial Services	2006	12/2016	NA	NA	QATAR
	DOHA FINANCE LTD	Corporate	Financial Services	2012	2017	A-	A2	QATAR
	Qatar 2011 3 1/8% 20/01/17 Regulation S	Sovereign	Government	2011	20/01/2017	AA	Aa2	QATAR
	Qatar 2011 3 1/8% 20/01/17 144A	Sovereign	Government	2011	20/01/2017	AA	Aa2	QATAR
	PAKISTAN MOBL.COMMS 2006 8 5/8% 13/11/13 S	Corporate	NA	2006	13/11/13	B -	Caa1	PAKISTAN
	PAKISTAN MOBL.COMMS 2006 8 5/8% 13/11/13 REG.S	Corporate	NA	2006	13/11/13	B -	Caa1	PAKISTAN
	PAKISTAN 2004 6 3/4% 19/02/09 S	Sovereign	NA	2004	19/02/09	B -	Caa1	PAKISTAN
	PACE (PAKISTAN) LTD CV 1% 27/12/12 REG.S	Corporate	NA	NA	27/12/12	B -	Caa1	PAKISTAN

Appendix 7: Descriptive Statistic of Saudi Arabia Sukuk and Conventional Bonds

Sukuk	SAUDI ELTY. 2012	SAUDI ELTY. 2012	SAUDI ELTY. 2013	SAUDI ELTY. 2013	BSF SUKUK	DAR AI ARKAN SUKUK 2013	DAR AL-ARKAN INTL. 2010	DAAR INTL. 2007	Average
Mean	0.000157	6.61E-05	-0.00058	-0.00125	-7.5E-05	-0.00102	4.4E-05	0.000413	-0.00028
Standard Error	0.000123	6.47E-05	0.000588	0.001601	0.000394	0.000734	0.000276	0.000363	0.000518
Median	0	0	-9.8E-05	-0.00134	1.73E-05	0	0	0	-0.00018
Mode	0	0	0	0	0	0	0	0	0
Standard Deviation	0.002177	0.001145	0.004202	0.011434	0.004206	0.002434	0.007726	0.004496	0.004728
Sample Variance	4.74E-06	1.31E-06	1.77E-05	0.000131	1.77E-05	5.92E-06	5.97E-05	2.02E-05	3.22E-05
Kurtosis	3.374253	2.76452	1.957728	5.298326	14.44837	-1.33923	8.43635	3.920881	4.857649
Skewness	0.55855	-0.0622	-1.11518	0.417494	-0.62046	-0.6141	-0.16359	0.385257	-0.15178
Range	0.018073	0.010342	0.019807	0.078558	0.038631	0.006459	0.099037	0.032565	0.037934

Conventional bonds	SAUDI BRITISH BANK 2010	BANQUE SAUDI FRANSI	SAUDI BRITISH BANK 2005	INBLK	Average
Mean	6.32E-05	3.35E-05	0.00012	-2.6E-06	5.34389E-05
Standard Error	0.000156	0.00019	0.000425	0.00024	0.000252412
Median	0	0	0	0	0
Mode	0	0	0	0	0
Standard Deviation	0.004334	0.005698	0.005253	0.007204	0.005622355
Sample Variance	1.88E-05	3.25E-05	2.76E-05	5.19E-05	3.26867E-05
Kurtosis	6.766782	6.146327	11.49017	40.79209	16.29884201
Skewness	0.038907	0.023383	-0.22727	-0.06942	-0.05859935
Range	0.043677	0.06137	0.056367	0.098999	0.065103346

Minimum	-0.00743	-0.00508	-0.01243	-0.04018	-0.01998	-0.00476	-0.05103	-0.0155	-0.01955		Minimum	-0.02184	-0.03007	-0.02885	-0.04947	-0.03255634
Maximum	0.010638	0.005261	0.007375	0.038378	0.018647	0.001702	0.048009	0.017061	0.018384		Maximum	0.021839	0.031304	0.027513	0.049533	0.032547005
Sum	0.04901	0.02068	-0.02956	-0.06389	-0.0085	-0.01123	0.03449	0.063179	0.006772		Sum	0.049076	0.030259	0.018312	-0.00238	0.023815545
Count	313	313	51	51	114	11	784	153	223.75		Count	776	904	153	902	683.75

Appendix 8: Descriptive Statistic of Bahrain Sukuk and Conventional Bonds

Sukuk	CBB INTL. 2009	CBB INTL. 2011	Average		Conventional bonds	BAHRAIN KINGDOM OF 2012	BAHRAIN KINGDOM OF 2012	ICICI BANK BAHRAIN 2009	HDFC BANK LTD	FINANS BANK BAHRAIN	ICICI BANK BAHRAIN 2007	BAHRAIN KINGDOM OF 2010	ICICI BANK BAHRAIN 2009	BAHRAIN MUMTALAKAT 2010	Average
Mean	-8.1E-06	0.000289	0.00014		Mean	0.00022	0.000145	5.87E-05	-0.00015	-7.7E-05	-2.2E-06	4.54E-05	3.44E-05	4.44E-05	3.4997E-05
Standard Error	0.000143	0.000135	0.000139		Standard Error	0.000243	0.000221	8.79E-05	0.000346	6.66E-06	0.000291	0.000122	0.000269	0.000253	0.00020444
Median	0	0.000258	0.000129		Median	0	0	0	0	-0.00005	0	0	0	0	-5.556E-06

Mode	0	0	0		Mode	0	0	0	0	-0.00005	0	0	0	0	-5.556E-06
Standard Deviation	0.004676	0.0026 7	0.003673		Standard Deviation	0.003823	0.003468	0.002676	0.002939	6.14E-05	0.010516	0.0037 3	0.008633	0.007472	0.00481308
Sample Variance	2.19E-05	7.13E-06	1.45E-05		Sample Variance	1.46E-05	1.2E-05	7.16E-06	8.64E-06	3.77E-09	0.000111	1.39E-05	7.45E-05	5.58E-05	3.3033E-05
Kurtosis	7.58884	9.2406 5	8.414745		Kurtosis	16.79446	12.37722	20.66766	22.29473	0.980985	727.7879	9.181779	32.71399	21.37807	96.019649
Skewness	-0.51664	-0.0738 8	-0.2952 6		Skewness	-1.53564	-1.38465	1.239346	0.487906	-1.28726	-22.8385	-1.15168	-0.07295	-0.25828	-2.9779655
Range	0.056143	0.034899	0.045521		Range	0.04576	0.038559	0.0447	0.0314	0.00027	0.406436	0.045095	0.119343	0.11991	0.09460811
Minimum	-0.03363	-0.0181	-0.02587		Minimum	-0.02543	-0.02475	-0.01488	-0.01517	-0.00027	-0.3273 9	-0.0288	-0.05878	-0.06137	-0.0618711
Maximum	0.022513	0.016799	0.019656		Maximum	0.02033	0.013809	0.02982	0.01623	0	0.079046	0.016295	0.060563	0.05854	0.032737
Sum	-0.00873	0.1128 8	0.052073		Sum	0.054474	0.035734	0.054429	-0.01105	-0.00656	-0.00286	0.042641	0.035325	0.038803	0.0267711
Count	1076	391	733.5		Count	248	246	927	72	85	1302	939	1028	874	635.666667

Appendix 9: Descriptive Statistic of Kuwait Sukuk and Conventional Bonds

Sukuk	URC SUKUK 2007		Conventional bonds	KUWAIT PRJS.CYMN. 2009	KUWAIT PRJS.CYMN. 2010	KUWAIT PRJS.CYMN. 2006	KUWAIT FINL.CTR. 2007	Average
Mean	3.23E-05		Mean	0.000122	0.00019	0.000336	1.25E-05	0.00016512
Standard Error	0.000625		Standard Error	0.000114	0.000297	0.000143	5.09E-06	0.000139768
Median	0		Median	0	0	0	1E-05	2.50051E-06
Mode	0		Mode	0	0	0	0	0
Standard Deviation	0.012571		Standard Deviation	0.003371	0.008538	0.002994	4.49E-05	0.003736858
Sample Variance	0.000158		Sample Variance	1.14E-05	7.29E-05	8.96E-06	2.02E-09	2.33054E-05
Kurtosis	50.10184		Kurtosis	12.62873	8.801516	9.01739	35.98751	16.60878853
Skewness	-2.07785		Skewness	-1.42283	-0.04857	0.316572	0.567727	-0.1467761

Range	0.222348	Range	0.044496	0.095995	0.034188	0.000548	0.043806898
Minimum	-0.12172	Minimum	-0.02216	-0.04508	-0.01761	-0.00025	-0.0212759
Maximum	0.100631	Maximum	0.022336	0.050915	0.016578	0.000295	0.022531
Sum	0.013029	Sum	0.106086	0.156907	0.148131	0.000978	0.10302582
Count	404	Count	869	826	441	78	553.5

Appendix 10: Descriptive Statistic of Turkey Sukuk and Conventional Bonds

Sukuk	KT SUKUK 2010	KT SUKUK 2011	Average		Conventional bonds	TURKEY 2013	TURKEY 2009	Average
Mean	-9.5E-06	1.23E-05	1.43761E-06		Mean	-3.1E-05	-0.00081	-0.00042
Standard Error	6.74E-05	0.000394	0.000230915		Standard Error	0.00021	0.000754	0.000482
Median	0	0	0		Median	0	-0.00021	-0.00011

Mode	0	0	0		Mode	0	0	0
Standard Deviation	0.001541	0.004212	0.002876273		Standard Deviation	0.004794	0.009969	0.007382
Sample Variance	2.37E-06	1.77E-05	1.00558E-05		Sample Variance	2.3E-05	9.94E-05	6.12E-05
Kurtosis	195.7362	1.566689	98.65143924		Kurtosis	30.26244	5.601373	17.93191
Skewness	-1.3418	-0.19499	-0.76839356		Skewness	1.287459	-0.96701	0.160223
Range	0.04618	0.026948	0.036563949		Range	0.081191	0.080635	0.080913
Minimum	-0.02371	-0.01431	-0.01900869		Minimum	-0.03922	-0.04744	-0.04333
Maximum	0.022473	0.012638	0.01755526		Maximum	0.04197	0.033195	0.037582
Sum	-0.00495	0.001406	-0.00176984		Sum	-0.01621	-0.14258	-0.07939
Count	523	114	318.5		Count	523	175	349

Appendix 11: Descriptive Statistic of Qatar Sukuk

Sukuk	ALMANA SUKUK 2008	QIIB SUKUK 2012	QIB SUKUK 2012	ALMANA SUKUK 2011	QIB SUKUK 2010	QREIC SUKUK 2006	Average
Mean	-3.4E-05	-3.3E-05	-3.6E-05	6.55E-06	3.45E-05	9.75E-05	5.83799E-06
Standard Error	3.48E-05	0.000215	0.000142	6.11E-05	8.09E-05	0.000397	0.000155214
Median	0	0	0	1.71E-05	0	3.17E-05	8.13333E-06
Mode	0	0	0	0	0	0	0
Standard Deviation	0.000884	0.002781	0.001855	0.001135	0.002242	0.012566	0.003577162
Sample Variance	7.82E-07	7.73E-06	3.44E-06	1.29E-06	5.03E-06	0.000158	2.93617E-05
Kurtosis	322.9326	6.778358	21.30667	13.89543	4.573833	79.22482	74.78529355
Skewness	-15.8659	-0.303	-1.30565	0.887309	-0.27171	0.097746	-2.79353385
Range	0.021383	0.026434	0.023417	0.014338	0.02388	0.311971	0.070237167

Minimum	-0.01876	-0.01382	-0.01358	-0.00558	-0.01176	-0.15587	-0.03656167
Maximum	0.002623	0.012614	0.009837	0.008758	0.01212	0.156101	0.0336755
Sum	-0.02217	-0.0055	-0.00614	0.002259	0.026516	0.097673	0.015438145
Count	644	167	170	345	768	1002	516

Appendix 12: Descriptive Statistic of Qatar Conventional bonds

Conventional bonds	QATAR PETROLEUM 2006	QATAR 1999	QATAR PETROLEUM 2012	QATAR 2000	QATAR 2009	QATAR 2009	QATAR 2009	QATAR 2009	QATAR 2011	QATAR 2011	DOHA BANK 2006	QATAR 2011	QATAR 2009	Average
Mean	0.000119	-0.00017	-2.7E-05	0.000153	0.000133	0.000177	3.26E-05	4.15E-05	0.000179372	0.00011062	0.000204	0.000252	9.26668E-05	9.95771E-05
Standard Error	0.000102	8.26E-05	0.000154	0.000589	0.000112	0.00013	6.71E-05	6.69E-05	0.000195944	8.74973E-05	0.000161	0.002022	0.000138909	0.000300667
Median	-0.000099	0	0.0001	0	0	0	0	0	0	0	0	0	0	7.69231E-08
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0.002539	0.003248	0.002255	0.030069	0.003416	0.004294	0.002216	0.002042	0.005969068	0.001752132	0.003201	0.06637	0.002963024	0.010025802

Sample Variance	6.45E-06	1.06E-05	5.09E-06	0.000904	1.17E-05	1.84E-05	4.91E-06	4.17E-06	3.56298E-05	3.07E-06	1.02E-05	0.004405	8.78E-06	0.000417548
Kurtosis	215.482	23.90359	3.845656	95.47258	10.54365	11.24919	47.42424	14.8155	9.198047345	3.516513181	5.38167	395.8336	10.88957498	65.19660049
Skewness	12.40524	-0.09613	-1.21835	0.296762	-1.17064	-1.04495	2.694238	-1.25796	-0.42176789	-0.16374817	0.658786	0.54643	0.074539533	0.869420334
Range	0.059342	0.068866	0.015232	0.666667	0.043922	0.058715	0.045925	0.03	0.072792	0.016788	0.03068	2.835132	0.036978	0.306233769
Minimum	-0.0115	-0.03546	-0.00965	-0.33291	-0.02918	-0.04066	-0.01322	-0.01995	-0.03964	-0.00939	-0.01376	-1.40304	-0.01849	-0.15206538
Maximum	0.047842	0.033406	0.005582	0.333757	0.014742	0.018055	0.032705	0.01005	0.033152	0.007398	0.01692	1.432092	0.018488	0.154168385
Sum	0.073851	-0.26767	-0.00578	0.400043	0.123043	0.193753	0.035591	0.038615	0.1664572	0.0443587	0.080467	0.271741	0.0421634	0.092048858
Count	622	1545	215	2610	928	1093	1091	931	928	401	395	1077	455	945.4615385

Appendix 13: Descriptive Statistic of Pakistan Sukuk and Conventional Bonds

Sukuk	PAKISTAN SUKUK 2006	PAKISTAN SUKUK 2006	PAKISTAN SUKUK 2007	PAKISTAN SUKUK 2006	PAK.INTL.SUKUK 2005	Average
Mean	0.000523	0.000846	0.000837	0.000244	0.000246	0.000539
Standard Error	0.000337	0.000319	0.000319	0.000337	0.000182	0.000299
Median	0	0	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	0.011482	0.010869	0.010855	0.011059	0.002036	0.00926
Sample Variance	0.000132	0.000118	0.000118	0.000122	4.15E-06	9.89E-05
Kurtosis	23.99901	53.89439	40.08649	6.04981	22.25875	29.25769
Skewness	0.136381	2.366522	1.569316	-0.27885	2.772269	1.313128
Range	0.226835	0.255216	0.255168	0.136712	0.020515	0.178889

Conventional bonds	PAKISTAN MOBL 2006	PAKISTAN MOBL 2006	Average
Mean	-8.6E-06	0.000151	7.09569E-05
Standard Error	0.000397	0.000367	0.0003820775
Median	0	0	0
Mode	0	0	0
Standard Deviation	0.016461	0.011969	0.01421533
Sample Variance	0.000271	0.000143	0.00020712
Kurtosis	102.9336	39.36591	71.149729667
Skewness	-1.30982	1.038536	-0.13564099
Range	0.506207	0.266076	0.3861411183

Minimum	-0.12675	-0.12516	-0.12025	-0.06669	-0.01015	-0.0898		Minimum	-0.25131	-0.12361	-0.1874598
Maximum	0.100083	0.130053	0.134919	0.07002	0.010363	0.089088		Maximum	0.254892	0.142471	0.19868138 7
Sum	0.606136	0.980829	0.970358	0.262749	0.030772	0.570169		Sum	-0.01482	0.160016	0.07260035 7
Count	1160	1160	1160	1077	125	936.4		Count	1719	1063	1391

Appendix 14: Descriptive Statistic of Malaysia Sukuk

Sukuk	MBB SUKUK	1MALAYSIA SUKUK	1MALAYSIA SUKUK	WAKALA GLOBAL SUKUK	WAKALA GLOBAL SUKUK	BNM SUKUK	PETRONAS GLB.SUKUK	Average
Mean	0.000102	3.74E-05	-1.2E-05	8.49E-05	0.000131	0.000145	2.94E-05	7.38842E-05
Standard Error	9.21E-05	0.000177	0.000115	0.000103	0.000229	2.68E-05	0.000138	0.00012595
Median	0	0	0	0	0.000107	8.05E-05	0	2.68093E-05
Mode	0	0	0	0	0	0	0	0

Standard Deviation	0.003022	0.005152	0.003043	0.002297	0.005103	0.000251	0.004485	0.003336169
Sample Variance	9.13E-06	2.65E-05	9.26E-06	5.27E-06	2.6E-05	6.31E-08	2.01E-05	1.3776E-05
Kurtosis	95.05835	5.202956	9.545146	6.469751	3.819107	66.48503	145.096	47.38234055
Skewness	4.706161	0.380901	-0.1915	-0.09147	-0.1131	7.669871	1.486259	1.97816139
Range	0.074397	0.05206	0.041955	0.025691	0.045467	0.002404	0.139612	0.054512039
Minimum	-0.02671	-0.02307	-0.0231	-0.01301	-0.02328	-8.1E-05	-0.06508	-0.02490492
Maximum	0.047686	0.028988	0.018856	0.012682	0.022183	0.002323	0.074531	0.029607115
Sum	0.109806	0.031615	-0.00825	0.041877	0.065037	0.012734	0.031055	0.040553118
Count	1077	845	696	493	498	88	1055	678.8571429

Appendix 15: Descriptive Statistic of Malaysia Conventional Bonds (1)

Conventional bonds	HSBC BANK MALAYSIA	OCBC BK.MALAYSIA	BERJAYA INFR	SELIA SLNGR SELATAN	PANGLIMA POWER SDN	MALAYSIA 2003	MALAYSIA 2005	RCE ADVANCE SDN BHD	SABAH STATE
Mean	0.000155	7.26E-05	1.6E-19	0.000258	-8.9E-05	2.37E-05	9.49E-05	2.17E-05	1.46E-05
Standard Error	0.000144	0.000213	0.000138	0.000174	3.72E-05	7.1E-05	7.61E-05	3.7E-05	9.41E-05
Median	0	0	0	0.000109	-8.6E-05	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0
Standard Deviation	0.0043	0.006379	0.00365	0.005204	0.001115	0.002263	0.002424	0.001108	0.002703
Sample Variance	1.85E-05	4.07E-05	1.33E-05	2.71E-05	1.24E-06	5.12E-06	5.87E-06	1.23E-06	7.31E-06
Kurtosis	23.50684	33.16631	358.0859	105.0746	31.58324	202.1224	11.96927	315.9913	106.067
Skewness	1.223395	1.852385	5.44117	0.514312	-1.03963	4.926957	0.247276	12.92022	3.855674
Range	0.077533	0.123814	0.135131	0.141819	0.020412	0.075545	0.033508	0.035845	0.070228

Minimum	-0.03086	-0.04321	-0.0609	-0.07082	-0.01192	-0.02976	-0.01604	-0.01053	-0.02694
Maximum	0.046672	0.080601	0.074231	0.071	0.008494	0.045789	0.017471	0.025313	0.043289
Sum	0.138932	0.065116	1.11E-16	0.231027	-0.07981	0.024015	0.09634	0.019456	0.012045
Count	897	897	695	897	897	1015	1015	897	825

Appendix 16: Descriptive Statistic of Malaysia Conventional Bonds (2)

Conventional bonds	SYRKT PRSRNA NEGARA	MALAYSIA 2010	DIGI TELECOM	MALAYSIA 2009	ORIX LSG.MALAYSIA	MALAYSIA 2011	STD.CHT.BANK MAL	BK.NEGARA MALAYSIA	Average
Mean	2.74E-05	1.07E-05	8.34E-06	6.21E-06	-2.4E-05	2.1E-05	6.21E-06	-0.04273	-0.00248
Standard Error	5.58E-05	2.51E-05	3.3E-05	2E-05	6.57E-05	6.03E-05	2.18E-05	0.042838	0.002594
Median	0	0	0	0	0	0	0	8.54E-05	6.35E-06
Mode	0	0	0	0	0	0	0	0	0

Standard Deviation	0.001671	0.000766	0.001023	0.000648	0.001714	0.00159	0.000674	0.387911	0.025008
Sample Variance	2.79E-06	5.86E-07	1.05E-06	4.2E-07	2.94E-06	2.53E-06	4.54E-07	0.150475	0.008859
Kurtosis	43.10698	7.155136	54.15676	7.184576	226.6267	7.961607	60.30589	81.99999	98.59202
Skewness	0.446745	0.038978	-2.04232	0.129186	-11.3273	-0.99653	2.864898	-9.05538	0.588238
Range	0.035472	0.009601	0.021868	0.007833	0.042746	0.016734	0.014773	3.512879	0.257397
Minimum	-0.01795	-0.00424	-0.01132	-0.00379	-0.03386	-0.00899	-0.00495	-3.51258	-0.22933
Maximum	0.017527	0.005361	0.010552	0.004041	0.00889	0.007744	0.009821	0.000303	0.028065
Sum	0.024547	0.009978	0.008002	0.006534	-0.01633	0.014581	0.005959	-3.50372	-0.17314
Count	897	933	959	1052	680	695	959	82	840.7059

Appendix 17: Descriptive Statistic of UAE Sukuk (1)

	DP SUKUK	EIB SUKUK	EIB SUKUK	FGB SUKUK	FGB SUKUK	SIB SUKUK	HILAL SUKUK	ADIB SUKUK	MAF SUKUK	DUBAI DOF SUKUK	DUBAI DOF SUKUK	JAFZ SUKUK	ADCB ISLAMIC FIN
Mean	4.73E-05	0.000116	0.000165	6.94E-05	0.000149	0.000107	-3.4E-05	-0.00017	0.000205	0.000167	0.000404	-0.00022	-3.7E-05
Standard Error	0.000359	0.000111	8.89E-05	0.000294	0.000429	0.000273	4.26E-05	0.000348	0.000572	0.000118	0.00016	0.000171	0.000239
Median	8.93E-05	0	0	0	0	0	-4.1E-05	0	0	9.31E-05	0.000263	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0.014131	0.001702	0.001693	0.006467	0.008133	0.006298	0.001097	0.004187	0.010683	0.002006	0.002707	0.001828	0.002613
Sample Variance	0.0002	2.9E-06	2.87E-06	4.18E-05	6.61E-05	3.97E-05	1.2E-06	1.75E-05	0.000114	4.02E-06	7.33E-06	3.34E-06	6.83E-06
Kurtosis	158.4502	3.350314	1.598501	15.34898	22.38626	5.616981	9.565112	13.36039	36.94658	1.539886	1.552207	1.80721	7.691246
Skewness	-4.71839	0.364405	0.175777	-0.0354	0.477933	-0.07339	-0.47581	-0.80154	-0.20144	0.125437	0.142949	-0.51812	0.164011
Range	0.478459	0.014117	0.012727	0.067394	0.097122	0.060211	0.014631	0.045271	0.161724	0.014258	0.018138	0.012237	0.0244

Minimum	-0.27553	-0.00603	-0.00601	-0.03477	-0.04384	-0.02958	-0.00784	-0.02533	-0.08242	-0.0075	-0.00916	-0.00647	-0.0114
Maximum	0.202928	0.00809	0.006721	0.032622	0.053281	0.030629	0.006787	0.019936	0.079308	0.006762	0.008979	0.005771	0.012996
Sum	0.073225	0.027399	0.059859	0.033595	0.05355	0.056981	-0.02251	-0.02428	0.071702	0.04809	0.116481	-0.02463	-0.00443
Count	1547	237	363	484	360	533	663	145	349	288	288	114	119

Appendix 18: Descriptive Statistic of UAE Sukuk (2)

Mean	HBME SUKUK	ABU DHABI ISLAMIC	DUBAI GLOBAL SUKUK	RAKIA SUKUK	SIB SUKUK	DIB SUKUK	DUBAI SUKUK	EIB SUKUK	TDIC SUKUK	DUBAI DOF SUKUK	EIB SUKUK	HBME SUKUK	Average
Standard Error	-3.4E-06	6.83E-05	0.000155	0.000191	0.00015	0.00016 8	0.000776	0.00017 8	1.7E-05	3.75E-05	2.2E-05	3.87E-05	0.000107
Median	2.89E-06	0.000338	8.63E-05	0.000471	0.00028 1	0.00055 2	0.000677	0.00089 5	0.00017 2	0.000177	0.00011 3	0.000144	0.000274
Mode	0	0	0	0	0	0	0	0	0	0	0	0	1.56E-05

Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample Variance	6.56E-05	0.008293	0.000696	0.0139	0.006533	0.014478	0.017188	0.024455	0.005471	0.005585	0.00198	0.003516	0.006373
Kurtosis	4.31E-09	6.88E-05	4.84E-07	0.000193	4.27E-05	0.00021	0.000295	0.000598	2.99E-05	3.12E-05	3.92E-06	1.24E-05	7.67E-05
Skewness	105.7222	32.04449	34.54384	67.08822	14.23538	112.5217	52.32597	99.15098	53.11792	88.71312	2.426897	12.30948	36.66977
Mean	-8.77509	0.435481	5.641084	-0.07474	-0.2354	-5.58769	0.539076	0.282955	0.155226	-4.08867	0.112912	-0.4522	-0.67002
Standard Error	0.001252	0.135975	0.005038	0.311067	0.080497	0.345282	0.377981	0.576403	0.110829	0.141861	0.015309	0.048509	0.12195
Median	-0.00083	-0.06798	-0.0002	-0.15553	-0.04349	-0.23451	-0.18899	-0.28824	-0.05493	-0.0908	-0.00722	-0.02449	-0.0655
Mode	0.000422	0.067997	0.004837	0.155533	0.037011	0.110774	0.18899	0.288165	0.055897	0.05106	0.00809	0.024016	0.056446
Standard Deviation	-0.00176	0.041031	0.010101	0.166636	0.080878	0.115673	0.499562	0.132634	0.017204	0.03756	0.006772	0.023044	0.061322
Sample Variance	517	601	65	872	539	688	644	746	1012	1001	308	596	503.0385

Appendix 19: Descriptive Statistic of UAE Conventional Bonds (1)

	DP WORLD	ABU DHABI COML	ABU DHABI COML	XSTRATA FIN.	ADCB FINANCE	DUBAI 2010	ABU DHABI NAT	DUBAI 2010	AXIS BANK	DUI.ELTY.&.WT.AUTH
Mean	3.28E-05	-3.3E-05	0.00025	2.63E-05	0.00011	9.47E-05	-0.00015	0.000221	4.37E-05	6.61E-05
Standard Error	0.000405	4.82E-05	0.000204	7.11E-05	0.000152	0.0001	0.00028	0.000159	0.000144	9.94E-05
Median	0.000318	0	0	0.0001	0	0	-0.0002	9.45E-05	0	0
Mode	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0.015918	0.001216	0.005929	0.00104	0.002197	0.002779	0.00396	0.004523	0.004036	0.003019
Sample Variance	0.000253	1.48E-06	3.52E-05	1.08E-06	4.82E-06	7.72E-06	1.57E-05	2.05E-05	1.63E-05	9.11E-06
Kurtosis	77.56825	244.2628	180.0964	7.675085	175.4149	8.945252	4.691427	18.07523	251.331	12.07959
Skewness	-1.97808	-12.0524	8.100064	-1.67255	12.42964	-0.36124	-0.87576	-0.73952	9.575018	-0.20222
Range	0.465473	0.031168	0.165599	0.008803	0.038065	0.035549	0.031244	0.072046	0.127421	0.040148

Minimum	-0.24813	-0.0241	-0.07476	-0.00579	-0.00768	-0.0163	-0.01862	-0.04196	-0.04385	-0.01989
Maximum	0.217341	0.007072	0.090839	0.003009	0.030382	0.019251	0.012619	0.030081	0.083567	0.02026
Sum	0.050784	-0.02085	0.210787	0.00562	0.023123	0.072891	-0.02909	0.178303	0.034359	0.061037
Count	1547	636	842	214	210	770	200	806	787	923

Appendix 20: Descriptive Statistic of UAE Conventional Bonds (2)

	AXIS BANK	NAT.BK.ABU DHABI	EXOVA LTD.ABU DHABI	NAT.BK.ABU DHABI	ABU DHABI NAT	ABU DHABI NAT	ABU DHABI NAT	ABU DHABI COML	DUI.ELTY.&.WT. AUTH	Average
Mean	4.93E-05	0.000114	7.91E-05	-4.1E-05	0.000121	9.78E-05	7.99E-05	0.000232	0.00016	8.20207E-05
Standard Error	8.83E-05	0.000104	0.001316	4.04E-05	0.000145	0.000104	0.000276	0.000363	0.000115	0.000221803
Median	0	9.72E-05	0	-5.2E-05	8.3E-05	0	0	0	0	2.32961E-05
Mode	0	0	0	0	0	0	0	0	0	0

Standard Deviation	0.002707	0.002564	0.037029	0.00112	0.00477	0.00288	0.011796	0.012112	0.003238	0.00646493
Sample Variance	7.33E-06	6.58E-06	0.001371	1.25E-06	2.28E-05	8.29E-06	0.000139	0.000147	1.05E-05	0.000109414
Kurtosis	11.05678	2.793704	26.80301	91.02107	6.371438	8.56323	35.98692	23.72774	13.92565	63.17838953
Skewness	-0.96489	-0.66032	0.079814	3.125214	-0.43094	-0.05229	0.270686	-0.12961	0.270759	0.722706461
Range	0.037059	0.021409	0.543492	0.026846	0.060731	0.040021	0.300962	0.204558	0.0486	0.121010086
Minimum	-0.02239	-0.01274	-0.27175	-0.0094	-0.03904	-0.01955	-0.14309	-0.10228	-0.0231	-0.06023281
Maximum	0.014672	0.008667	0.271746	0.017443	0.021695	0.02047	0.157873	0.102279	0.025503	0.060777273
Sum	0.046288	0.068474	0.062671	-0.03172	0.130744	0.0752	0.146517	0.258511	0.126509	0.077377036
Count	939	603	792	769	1081	769	1833	1112	793	822.421052

Appendix 21: Autocorrelation Coefficients and Ljung-Box Q-Statistics in Daily Sukuk Returns

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
Turkey	KT SUKUK	1	0.001	0.001	0.001	1	0.978
		2	0	0	0.001	2	1
		3	-0.429	-0.429	97.379	3	0
		4	-0.043	-0.052	98.359	4	0
		5	0.02	0.024	98.577	5	0
		6	-0.025	-0.257	98.915	6	0
		7	0.043	-0.002	99.878	7	0
		8	-0.039	-0.029	100.695	8	0
		9	0.025	-0.129	101.031	9	0
		10	-0.02	-0.017	101.248	10	0
		11	0.015	-0.016	101.374	11	0
		12	0.038	-0.02	102.131	12	0
		13	-0.047	-0.075	103.335	13	0
		14	0.013	0.001	103.429	14	0
		15	-0.04	-0.029	104.291	15	0
		16	-0.003	-0.086	104.296	16	0
		17	0.052	0.074	105.784	17	0
		18	0.018	-0.001	105.959	18	0
		19	0.052	-0.007	107.44	19	0
		20	-0.109	-0.056	113.947	20	0
	KT SUKUK 2						
		1	-0.416	-0.416	20.259	1	0
		2	-0.072	-0.296	20.866	2	0
		3	0.214	0.069	26.319	3	0
		4	-0.186	-0.086	30.481	4	0
		5	0.046	-0.031	30.742	5	0
		6	0.008	-0.06	30.748	6	0
		7	0.043	0.08	30.979	7	0
		8	-0.028	0.017	31.079	8	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		9	-0.017	-0.007	31.116	9	0
		10	0.015	-0.031	31.146	10	0.001
		11	-0.083	-0.097	32.021	11	0.001
		12	0.089	0.017	33.051	12	0.001
		13	-0.02	0.009	33.105	13	0.002
		14	0.031	0.078	33.234	14	0.003
		15	-0.046	-0.044	33.515	15	0.004
		16	-0.079	-0.126	34.349	16	0.005
		17	0.104	-0.01	35.817	17	0.005
		18	-0.115	-0.079	37.629	18	0.004
		19	0.132	0.095	40.053	19	0.003
		20	-0.009	0.037	40.065	20	0.005
	PAKISTAN SUKUK	1	-0.003	-0.003	0.011	1	0.918
		2	-0.112	-0.112	14.614	2	0.001
		3	0.056	0.056	18.264	3	0
		4	-0.022	-0.035	18.831	4	0.001
		5	0.054	0.068	22.268	5	0
		6	0.055	0.045	25.764	6	0
		7	0.031	0.05	26.921	7	0
		8	0.029	0.033	27.902	8	0
		9	0.005	0.013	27.936	9	0.001
		10	0.039	0.041	29.698	10	0.001
		11	0.041	0.037	31.718	11	0.001
		12	-0.026	-0.024	32.499	12	0.001
		13	0.053	0.051	35.765	13	0.001
		14	0.016	0.002	36.067	14	0.001
		15	-0.051	-0.043	39.121	15	0.001
		16	0.008	-0.008	39.193	16	0.001
		17	0.061	0.049	43.642	17	0
Pakist		18	0.059	0.057	47.7	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
an						8	
		19	0.02	0.024	48.167	19	0
		20	-0.027	-0.02	49.027	20	0
	PAKISTAN SUKUK 2						
		1	0.046	0.046	2.502	1	0.114
		2	0.041	0.039	4.485	2	0.106
		3	-0.094	-0.098	14.69	3	0.002
		4	-0.051	-0.045	17.77	4	0.001
		5	0.01	0.023	17.883	5	0.003
		6	0.02	0.014	18.363	6	0.005
		7	0.094	0.083	28.668	7	0
		8	-0.081	-0.091	36.266	8	0
		9	-0.038	-0.035	37.996	9	0
		10	0.022	0.053	38.564	10	0
		11	0.056	0.05	42.211	11	0
		12	0.038	0.012	43.871	12	0
		13	0.142	0.14	67.414	13	0
		14	0.015	0.008	67.686	14	0
		15	0.047	0.061	70.314	15	0
		16	-0.03	-0.011	71.387	16	0
		17	-0.036	-0.042	72.893	17	0
		18	-0.036	-0.029	74.425	18	0
		19	-0.003	0.009	74.435	19	0
		20	0.062	0.036	78.926	20	0
	PAKISTAN SUKUK 3						
		1	0.002	0.002	0.003	1	0.956
		2	0.049	0.049	2.784	2	0.249
		3	-0.067	-0.067	7.937	3	0.047
		4	0.013	0.011	8.145	4	0.086
		5	0.009	0.016	8.248	5	0.143
		6	-0.06	-0.066	12.42	6	0.053
		7	0.092	0.095	22.37	7	0.00

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					4		2
		8	-0.046	-0.041	24.866	8	0.002
		9	-0.035	-0.053	26.284	9	0.002
		10	0.038	0.06	27.972	10	0.002
		11	0.05	0.046	30.884	11	0.001
		12	0.076	0.061	37.736	12	0
		13	0.005	0.021	37.769	13	0
		14	0.083	0.069	45.867	14	0
		15	-0.003	0.004	45.879	15	0
		16	0.001	0.004	45.88	16	0
		17	-0.022	-0.019	46.435	17	0
		18	-0.072	-0.076	52.495	18	0
		19	0.042	0.043	54.588	19	0
		20	0.009	0.028	54.692	20	0
	PAKISTAN INTIL SUKUK						
		1	-0.215	-0.215	5.934	1	0.015
		2	-0.015	-0.064	5.963	2	0.051
		3	-0.015	-0.034	5.992	3	0.112
		4	-0.015	-0.029	6.023	4	0.197
		5	-0.015	-0.028	6.054	5	0.301
		6	-0.015	-0.029	6.086	6	0.414
		7	-0.016	-0.03	6.118	7	0.526
		8	-0.016	-0.031	6.151	8	0.63
		9	-0.016	-0.032	6.186	9	0.721
		10	-0.011	-0.028	6.202	10	0.798
		11	-0.011	-0.027	6.22	11	0.858
		12	-0.011	-0.028	6.238	12	0.904
		13	0.195	0.191	11.643	13	0.557
		14	-0.012	0.078	11.662	14	0.633
		15	-0.012	0.019	11.682	15	0.703
		16	-0.012	-0.002	11.702	16	0.764

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		17	-0.012	-0.008	11.723	17	0.817
		18	-0.012	-0.011	11.744	18	0.86
		19	-0.012	-0.011	11.766	19	0.895
		20	-0.012	-0.012	11.789	20	0.923
	PAKISTAN SUKUK 4						
		1	-0.336	-0.336	121.779	1	0
		2	0.057	-0.063	125.234	2	0
		3	-0.034	-0.04	126.513	3	0
		4	-0.07	-0.104	131.875	4	0
		5	0.224	0.189	186.484	5	0
		6	-0.113	0.026	200.461	6	0
		7	0.025	-0.008	201.124	7	0
		8	0.021	0.043	201.609	8	0
		9	-0.095	-0.068	211.382	9	0
		10	0.155	0.068	237.715	10	0
		11	-0.044	0.056	239.872	11	0
		12	0.065	0.077	244.446	12	0
		13	-0.036	0.002	245.848	13	0
		14	-0.098	-0.086	256.326	14	0
		15	0.182	0.097	292.538	15	0
		16	-0.103	-0.017	304.221	16	0
		17	0.04	-0.024	306.009	17	0
		18	-0.038	-0.025	307.622	18	0
		19	-0.051	-0.036	310.532	19	0
		20	0.189	0.117	349.937	20	0
	URCSUKUK	1	-0.044	-0.044	0.775	1	0.379
		2	0.019	0.017	0.926	2	0.629
		3	-0.01	-0.008	0.963	3	0.81
		4	0.074	0.073	3.224	4	0.521
		5	-0.082	-0.076	5.971	5	0.309

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
Kuwait		6	-0.01	-0.019	6.014	6	0.422
		7	-0.015	-0.013	6.109	7	0.527
		8	0.018	0.011	6.238	8	0.621
		9	-0.082	-0.071	9.059	9	0.432
		10	0.052	0.042	10.178	10	0.425
		11	0.004	0.01	10.186	11	0.514
		12	0.041	0.036	10.898	12	0.538
		13	0.037	0.053	11.47	13	0.572
		14	0.043	0.028	12.251	14	0.586
		15	0.014	0.02	12.34	15	0.653
		16	-0.001	-0.005	12.34	16	0.72
		17	0.002	0.005	12.342	17	0.779
		18	-0.232	-0.242	35.302	18	0.009
		19	-0.022	-0.03	35.5	19	0.012
		20	-0.017	-0.012	35.625	20	0.017
	CBB SUKUK	1	-0.363	-0.363	142.279	1	0
		2	0.033	-0.114	143.469	2	0
		3	-0.053	-0.095	146.551	3	0
		4	-0.063	-0.135	150.895	4	0
		5	0.155	0.089	176.782	5	0
		6	-0.071	0.014	182.256	6	0
		7	-0.026	-0.052	183.014	7	0
		8	0.046	0.03	185.289	8	0
		9	-0.095	-0.069	195.024	9	0
		10	0.136	0.064	215.161	10	0
		11	-0.047	0.033	217.545	11	0
		12	-0.021	-0.015	218.034	12	0
		13	0.02	0.002	218.487	13	0
		14	-0.121	-0.109	234.45	14	0
		15	0.167	0.067	265.0	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
Bahrain					7	5	
		16	-0.145	-0.088	287.92	16	0
		17	0.121	0.067	304.028	17	0
		18	-0.08	-0.037	311.113	18	0
		19	-0.039	-0.054	312.82	19	0
		20	0.112	0.05	326.601	20	0
	CBB SUKUK 2						
		1	-0.251	0.125	24.897	1	0
		2	-0.045	0.061	25.704	2	0
		3	0.134	0.1	32.809	3	0
		4	0.022	0.061	33.009	4	0
		5	0.013	0.126	33.073	5	0
		6	-0.021	-0.089	33.247	6	0
		7	0.134	0.068	40.406	7	0
		8	-0.088	0.042	43.487	8	0
		9	-0.007	0.108	43.507	9	0
		10	0.035	-0.038	43.991	10	0
		11	0.034	0.031	44.47	11	0
		12	0.023	-0.028	44.677	12	0
		13	0.03	-0.013	45.039	13	0
		14	0.019	-0.041	45.182	14	0
		15	-0.106	-0.085	49.755	15	0
		16	-0.004	-0.021	49.761	16	0
		17	0.029	-0.018	50.1	17	0
		18	-0.055	-0.03	51.327	18	0
		19	-0.122	-0.017	57.498	19	0
		20	0.101	0.006	61.718	20	0
	MMB SUKUK						
		1	-0.107	-0.107	12.444	1	0
		2	-0.067	-0.079	17.297	2	0
		3	0.025	0.009	17.955	3	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
Malaysia		4	-0.023	-0.025	18.53	4	0.001
		5	0.186	0.186	55.844	5	0
		6	-0.116	-0.082	70.367	6	0
		7	-0.121	-0.12	86.312	7	0
		8	0.016	-0.034	86.577	8	0
		9	-0.024	-0.034	87.222	9	0
		10	0.072	0.04	92.908	10	0
		11	-0.005	0.04	92.938	11	0
		12	0.005	0.052	92.96	12	0
		13	0.064	0.05	97.417	13	0
		14	-0.032	-0.028	98.504	14	0
		15	-0.054	-0.091	101.72	15	0
		16	0.057	0.036	105.247	16	0
		17	-0.01	0.003	105.363	17	0
		18	0.096	0.111	115.493	18	0
		19	-0.082	-0.035	122.866	19	0
		20	0.061	0.098	127.005	20	0
	FIRST MALAYSIA SUKUK						
		1	-0.253	-0.253	54.432	1	0
		2	-0.067	-0.14	58.261	2	0
		3	-0.041	-0.105	59.718	3	0
		4	-0.005	-0.061	59.739	4	0
		5	-0.049	-0.091	61.785	5	0
		6	0.028	-0.026	62.46	6	0
		7	-0.093	-0.124	69.848	7	0
		8	-0.004	-0.087	69.861	8	0
		9	0.076	0.02	74.87	9	0
		10	-0.02	-0.024	75.203	10	0
		11	0.025	0.015	75.735	11	0
		12	-0.037	-0.041	76.921	12	0
		13	-0.048	-0.078	78.881	13	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		14	0.01	-0.044	78.971	14	0
		15	-0.013	-0.059	79.121	15	0
		16	0.086	0.07	85.452	16	0
		17	-0.016	0.015	85.666	17	0
		18	-0.052	-0.053	88.051	18	0
		19	0.037	0.008	89.243	19	0
		20	-0.008	-0.027	89.304	20	0
	FISRT MALAYSIA SUKUK 2						
		1	-0.214	-0.214	31.915	1	0
		2	0.017	-0.03	32.119	2	0
		3	0.017	0.015	32.331	3	0
		4	0.018	0.026	32.547	4	0
		5	-0.024	-0.016	32.965	5	0
		6	0.013	0.004	33.082	6	0
		7	-0.069	-0.07	36.445	7	0
		8	-0.016	-0.047	36.622	8	0
		9	-0.009	-0.024	36.684	9	0
		10	0.018	0.014	36.904	10	0
		11	-0.065	-0.057	39.932	11	0
		12	0.025	-0.003	40.362	12	0
		13	-0.025	-0.023	40.803	13	0
		14	-0.024	-0.04	41.201	14	0
		15	-0.018	-0.037	41.438	15	0
		16	0.001	-0.017	41.438	16	0
		17	-0.019	-0.02	41.684	17	0.001
		18	0.003	-0.013	41.69	18	0.001
		19	-0.022	-0.029	42.033	19	0.002
		20	0.008	-0.009	42.08	20	0.003
	WAKALA GLOBAL SUKUK						
		1	-0.2	-0.2	19.798	1	0
		2	0.046	0.006	20.853	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		3	-0.083	-0.076	24.3	3	0
		4	0.047	0.016	25.385	4	0
		5	-0.03	-0.015	25.829	5	0
		6	0.037	0.023	26.517	6	0
		7	-0.043	-0.028	27.466	7	0
		8	0.066	0.051	29.685	8	0
		9	0.021	0.052	29.911	9	0
		10	-0.037	-0.033	30.616	10	0.001
		11	0.011	0.007	30.672	11	0.001
		12	0.031	0.038	31.165	12	0.002
		13	-0.056	-0.049	32.756	13	0.002
		14	-0.088	-0.115	36.698	14	0.001
		15	-0.062	-0.101	38.653	15	0.001
		16	-0.055	-0.1	40.176	16	0.001
		17	-0.042	-0.099	41.095	17	0.001
		18	0.066	0.035	43.35	18	0.001
		19	-0.011	0.009	43.411	19	0.001
		20	-0.097	-0.12	48.297	20	0
	WAKALA GLOBAL SUKUK 2	1	-0.33	-0.33	54.5	1	0
		2	0.104	-0.006	59.904	2	0
		3	0.012	0.05	59.972	3	0
		4	-0.02	-0.001	60.17	4	0
		5	-0.029	-0.047	60.607	5	0
		6	0.113	0.101	67.07	6	0
		7	-0.151	-0.089	78.706	7	0
		8	0.072	-0.015	81.364	8	0
		9	-0.019	0.005	81.551	9	0
		10	0.039	0.051	82.31	10	0
		11	0.007	0.034	82.332	11	0
		12	0.005	-0.001	82.343	12	0
		13	-0.096	-0.09	87.076	13	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		14	0.04	-0.037	87.917	14	0
		15	-0.085	-0.076	91.675	15	0
		16	-0.008	-0.064	91.708	16	0
		17	0.006	-0.005	91.724	17	0
		18	-0.02	-0.009	91.938	18	0
		19	0	0	91.938	19	0
		20	0.025	0.002	92.273	20	0
	BNM SUKUK 1						
		1	-0.012	-0.012	0.014	1	0.907
		2	-0.016	-0.016	0.037	2	0.982
		3	-0.017	-0.018	0.064	3	0.996
		4	0.011	0.01	0.076	4	0.999
		5	0.02	0.02	0.116	5	1
		6	0.003	0.004	0.116	6	1
		7	-0.055	-0.054	0.408	7	1
		8	-0.046	-0.046	0.614	8	1
		9	0.045	0.042	0.818	9	1
		10	0.085	0.083	1.552	10	0.999
		11	0.046	0.05	1.774	11	0.999
		12	-0.097	-0.091	2.762	12	0.997
		13	-0.047	-0.048	3	13	0.998
		14	0.031	0.024	3.105	14	0.999
		15	0.043	0.035	3.308	15	0.999
		16	-0.02	-0.017	3.351	16	1
		17	-0.033	-0.018	3.474	17	1
		18	-0.035	-0.025	3.611	18	1
		19	0.074	0.061	4.24	19	1
		20	0.043	0.022	4.455	20	1
	PETRONAS GLB SUKUK						
		1	-0.387	-0.387	158.427	1	0
		2	0.144	-0.007	180.327	2	0
		3	-0.236	-0.215	239.582	3	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		4	0.194	0.038	279.409	4	0
		5	-0.161	-0.079	306.93	5	0
		6	-0.021	-0.178	307.408	6	0
		7	0.006	-0.028	307.447	7	0
		8	-0.013	-0.087	307.617	8	0
		9	0.016	-0.046	307.876	9	0
		10	-0.012	-0.016	308.038	10	0
		11	0.013	-0.053	308.209	11	0
		12	0.007	-0.009	308.262	12	0
		13	-0.017	-0.039	308.589	13	0
		14	0.013	-0.024	308.781	14	0
		15	0.008	0.012	308.849	15	0
		16	0.016	0.006	309.117	16	0
		17	-0.01	0.007	309.215	17	0
		18	-0.004	-0.005	309.23	18	0
		19	0	-0.007	309.23	19	0
		20	0.003	0.007	309.239	20	0
	ALMANA SUKUK	1	-0.016	-0.016	0.171	1	0.68
		2	-0.035	-0.035	0.968	2	0.616
		3	-0.046	-0.047	2.349	3	0.503
		4	0.001	-0.002	2.35	4	0.672
		5	-0.022	-0.025	2.652	5	0.753
		6	-0.016	-0.019	2.811	6	0.832
		7	-0.053	-0.056	4.67	7	0.7
		8	-0.043	-0.049	5.901	8	0.658
		9	0.106	0.1	13.327	9	0.148
		10	0.038	0.034	14.295	10	0.16
		11	-0.029	-0.026	14.83	11	0.19
		12	-0.004	0.004	14.843	12	0.25
		13	-0.066	-0.07	17.75	13	0.167

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
Qatar		14	0.052	0.049	19.528	14	0.146
		15	0.052	0.052	21.347	15	0.126
		16	-0.078	-0.073	25.348	16	0.064
		17	0.034	0.054	26.135	17	0.072
		18	0.026	0.014	26.598	18	0.087
		19	-0.034	-0.05	27.378	19	0.096
		20	0.185	0.201	50.131	20	0
	QIIB SUKUK						
		1	-0.305	-0.305	15.801	1	0
		2	-0.176	-0.297	21.118	2	0
		3	0.055	-0.127	21.641	3	0
		4	-0.114	-0.233	23.878	4	0
		5	0.078	-0.08	24.949	5	0
		6	0.082	0.015	26.128	6	0
		7	-0.077	-0.035	27.184	7	0
		8	-0.029	-0.059	27.33	8	0.001
		9	0.071	0.037	28.23	9	0.001
		10	0.033	0.09	28.425	10	0.002
		11	-0.03	0.044	28.587	11	0.003
		12	-0.052	-0.025	29.078	12	0.004
		13	-0.013	-0.027	29.108	13	0.006
		14	-0.002	-0.048	29.108	14	0.01
		15	0.055	-0.005	29.67	15	0.013
		16	0.142	0.178	33.431	16	0.006
		17	-0.157	0.003	38.077	17	0.002
		18	-0.173	-0.202	43.739	18	0.001
		19	0.203	0.026	51.618	19	0
		20	0.012	0.047	51.645	20	0
	QIB SUKUK						
		1	-0.44	-0.44	33.457	1	0
		2	-0.017	-0.261	33.507	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		3	0.039	-0.113	33.776	3	0
		4	0.025	-0.01	33.882	4	0
		5	-0.073	-0.071	34.836	5	0
		6	0.063	0.002	35.539	6	0
		7	0.003	0.027	35.541	7	0
		8	-0.038	-0.013	35.802	8	0
		9	-0.008	-0.039	35.815	9	0
		10	0.038	0.001	36.075	10	0
		11	-0.059	-0.053	36.709	11	0
		12	0.037	-0.012	36.96	12	0
		13	0.074	0.098	37.992	13	0
		14	-0.043	0.069	38.332	14	0
		15	0.06	0.133	39.006	15	0.001
		16	-0.014	0.093	39.043	16	0.001
		17	-0.063	-0.019	39.8	17	0.001
		18	-0.064	-0.15	40.591	18	0.002
		19	0.049	-0.129	41.057	19	0.002
		20	-0.05	-0.151	41.549	20	0.003
	ALMANA SUKUK 2						
		1	-0.264	-0.264	24.218	1	0
		2	0.037	-0.035	24.699	2	0
		3	0.046	0.051	25.444	3	0
		4	0.025	0.056	25.669	4	0
		5	-0.129	-0.117	31.493	5	0
		6	0.058	-0.012	32.662	6	0
		7	-0.064	-0.056	34.102	7	0
		8	-0.001	-0.02	34.103	8	0
		9	-0.016	-0.018	34.19	9	0
		10	-0.028	-0.05	34.475	10	0
		11	0.07	0.064	36.209	11	0
		12	-0.07	-0.051	37.995	12	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		13	0.109	0.089	42.317	13	0
		14	-0.141	-0.116	49.491	14	0
		15	0.094	0.028	52.667	15	0
		16	-0.137	-0.114	59.451	16	0
		17	0.12	0.062	64.685	17	0
		18	-0.034	0.04	65.105	18	0
		19	-0.025	-0.056	65.331	19	0
		20	-0.061	-0.068	66.7	20	0
	QIB SUKUK 2						
		1	-0.23	-0.23	40.657	1	0
		2	-0.098	-0.159	48.021	2	0
		3	-0.025	-0.095	48.506	3	0
		4	-0.039	-0.094	49.678	4	0
		5	0.033	-0.018	50.533	5	0
		6	0.018	0.003	50.776	6	0
		7	-0.006	-0.003	50.809	7	0
		8	-0.047	-0.051	52.52	8	0
		9	0.041	0.019	53.859	9	0
		10	0.011	0.017	53.956	10	0
		11	-0.062	-0.057	56.949	11	0
		12	0.072	0.048	61.048	12	0
		13	-0.011	0.013	61.135	13	0
		14	-0.022	-0.011	61.53	14	0
		15	0.094	0.095	68.484	15	0
		16	-0.115	-0.07	78.867	16	0
		17	-0.042	-0.072	80.226	17	0
		18	0.025	-0.028	80.713	18	0
		19	-0.026	-0.058	81.237	19	0
		20	0.077	0.049	85.952	20	0
	QREIC SUKUK						
		1	-0.33	-0.33	109.637	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		2	-0.005	-0.128	109.658	2	0
		3	0.007	-0.042	109.705	3	0
		4	-0.171	-0.209	139.118	4	0
		5	0.021	-0.136	139.56	5	0
		6	-0.017	-0.104	139.849	6	0
		7	0.024	-0.049	140.429	7	0
		8	-0.004	-0.072	140.442	8	0
		9	-0.012	-0.078	140.597	9	0
		10	-0.033	-0.109	141.696	10	0
		11	0.036	-0.039	143.014	11	0
		12	-0.004	-0.039	143.031	12	0
		13	0.024	-0.016	143.603	13	0
		14	-0.038	-0.077	145.076	14	0
		15	0.048	0.004	147.467	15	0
		16	-0.013	-0.006	147.652	16	0
		17	-0.016	-0.02	147.902	17	0
		18	0.006	-0.029	147.944	18	0
		19	-0.046	-0.062	150.068	19	0
		20	0.008	-0.049	150.128	20	0
	DP SUKUK	1	-0.021	-0.021	0.669	1	0.413
		2	0.017	0.017	1.117	2	0.572
		3	-0.017	-0.016	1.561	3	0.668
		4	-0.028	-0.029	2.776	4	0.596
		5	-0.033	-0.034	4.519	5	0.477
		6	0.034	0.033	6.288	6	0.392
		7	0.082	0.083	16.641	7	0.02
		8	0.066	0.067	23.414	8	0.003
		9	-0.06	-0.062	29.071	9	0.001
		10	-0.014	-0.017	29.364	10	0.001
		11	-0.009	0.002	29.48	1	0.00

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					7	1	2
		12	0.002	0.009	29.491	12	0.003
		13	0.023	0.019	30.286	13	0.004
		14	0.006	-0.01	30.338	14	0.007
		15	-0.012	-0.022	30.582	15	0.01
		16	0.001	0.008	30.583	16	0.015
		17	-0.055	-0.043	35.349	17	0.006
		18	0.066	0.064	42.089	18	0.001
		19	0.001	0.002	42.09	19	0.002
		20	0.068	0.06	49.362	20	0
	EIB SUKUK						
		1	0.026	0.026	0.166	1	0.683
		2	0.161	0.16	6.411	2	0.041
		3	-0.043	-0.053	6.868	3	0.076
		4	0.203	0.185	16.88	4	0.002
		5	0.125	0.136	20.712	5	0.001
		6	0.004	-0.068	20.715	6	0.002
		7	-0.049	-0.07	21.309	7	0.003
		8	0.077	0.074	22.781	8	0.004
		9	-0.018	-0.063	22.86	9	0.007
		10	0.01	-0.026	22.885	10	0.011
		11	-0.066	-0.013	23.966	11	0.013
		12	0.096	0.092	26.288	12	0.01
		13	-0.051	-0.061	26.952	13	0.013
		14	-0.091	-0.12	29.069	14	0.01
		15	-0.105	-0.05	31.882	15	0.007
		16	-0.102	-0.116	34.529	16	0.005
		17	-0.045	-0.047	35.057	17	0.006
		18	-0.169	-0.105	42.416	18	0.001
		19	-0.044	0.034	42.923	19	0.001
		20	0.007	0.086	42.935	20	0.002

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
UAE	EIB SUKUK 2						
		1	-0.089	-0.089	2.896	1	0.089
		2	0.07	0.063	4.694	2	0.096
		3	-0.006	0.006	4.707	3	0.195
		4	-0.038	-0.043	5.244	4	0.263
		5	0.031	0.025	5.6	5	0.347
		6	-0.122	-0.114	11.138	6	0.084
		7	0.025	0.002	11.369	7	0.123
		8	-0.033	-0.017	11.773	8	0.162
		9	0.066	0.063	13.414	9	0.145
		10	-0.001	0.004	13.414	10	0.201
		11	-0.018	-0.02	13.538	11	0.26
		12	-0.041	-0.062	14.175	12	0.29
		13	0.028	0.032	14.474	13	0.341
		14	-0.069	-0.068	16.261	14	0.298
		15	-0.094	-0.098	19.652	15	0.186
		16	-0.018	-0.031	19.78	16	0.23
		17	-0.046	-0.037	20.584	17	0.245
		18	0.001	-0.026	20.585	18	0.301
		19	-0.106	-0.106	24.91	19	0.164
		20	0.062	0.032	26.385	20	0.153
	FGB SUKUK						
		1	-0.236	-0.236	27.112	1	0
		2	-0.12	-0.186	34.156	2	0
		3	-0.075	-0.168	36.943	3	0
		4	-0.03	-0.137	37.386	4	0
		5	0.007	-0.092	37.412	5	0
		6	-0.109	-0.203	43.305	6	0
		7	0.121	-0.011	50.561	7	0
		8	-0.033	-0.083	51.114	8	0
		9	0.049	-0.002	52.288	9	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		10	-0.079	-0.1	55.357	10	0
		11	0.046	-0.005	56.41	11	0
		12	0.04	0.017	57.22	12	0
		13	-0.052	-0.023	58.57	13	0
		14	0.001	-0.026	58.57	14	0
		15	-0.06	-0.073	60.356	15	0
		16	0.058	-0.017	62.054	16	0
		17	-0.023	-0.031	62.318	17	0
		18	0.005	-0.034	62.329	18	0
		19	0.059	0.034	64.065	19	0
		20	-0.04	-0.028	64.871	20	0
	FGB SUKUK 2	1	-0.303	-0.303	33.372	1	0
		2	-0.117	-0.23	38.32	2	0
		3	0.029	-0.098	38.631	3	0
		4	-0.104	-0.18	42.601	4	0
		5	0.013	-0.115	42.666	5	0
		6	-0.065	-0.184	44.241	6	0
		7	-0.033	-0.194	44.641	7	0
		8	0.037	-0.159	45.146	8	0
		9	0.058	-0.079	46.375	9	0
		10	0.087	0.033	49.176	10	0
		11	-0.018	0.021	49.301	11	0
		12	0.002	0.045	49.302	12	0
		13	-0.068	-0.034	51.03	13	0
		14	-0.007	-0.008	51.046	14	0
		15	-0.06	-0.08	52.39	15	0
		16	0.055	0.022	53.524	16	0
		17	0.018	0.026	53.651	17	0
		18	-0.019	-0.002	53.786	18	0
		19	0.084	0.062	56.458	19	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		20	-0.086	-0.064	59.295	20	0
	SIB SUKUK						
		1	-0.465	-0.465	115.917	1	0
		2	0.051	-0.211	117.326	2	0
		3	0.012	-0.076	117.402	3	0
		4	-0.147	-0.218	128.994	4	0
		5	0.266	0.128	167.073	5	0
		6	-0.153	0.036	179.706	6	0
		7	-0.025	-0.073	180.037	7	0
		8	0.027	-0.058	180.422	8	0
		9	-0.081	-0.087	183.959	9	0
		10	0.098	-0.049	189.173	10	0
		11	0.021	0.071	189.412	11	0
		12	-0.112	-0.051	196.266	12	0
		13	0.102	0.023	202.009	13	0
		14	-0.143	-0.108	213.309	14	0
		15	0.179	0.072	230.872	15	0
		16	-0.028	0.06	231.293	16	0
		17	-0.105	-0.037	237.443	17	0
		18	0.086	-0.019	241.495	18	0
		19	-0.074	-0.002	244.525	19	0
		20	0.068	-0.022	247.109	20	0
	HILAL SUKUK						
		1	-0.025	-0.025	0.429	1	0.513
		2	-0.036	-0.037	1.307	2	0.52
		3	0.049	0.048	2.939	3	0.401
		4	0.062	0.063	5.471	4	0.242
		5	0.054	0.061	7.418	5	0.191
		6	0.006	0.012	7.445	6	0.282
		7	-0.1	-0.103	14.226	7	0.047
		8	-0.1	-0.118	20.913	8	0.007

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		9	0.036	0.014	21.807	9	0.01
		10	0.091	0.097	27.378	10	0.002
		11	0.057	0.097	29.603	11	0.002
		12	-0.058	-0.024	31.85	12	0.001
		13	0.003	-0.001	31.858	13	0.003
		14	0.073	0.034	35.465	14	0.001
		15	0.023	-0.011	35.828	15	0.002
		16	0.05	0.048	37.54	16	0.002
		17	-0.096	-0.073	43.81	17	0
		18	-0.042	-0.024	45.01	18	0
		19	0.023	0.004	45.36	19	0.001
		20	0.011	-0.006	45.439	20	0.001
	ADIB SUKUK						
		1	-0.068	-0.068	0.687	1	0.407
		2	0.083	0.079	1.716	2	0.424
		3	0.01	0.021	1.731	3	0.63
		4	0.122	0.118	3.964	4	0.411
		5	0.06	0.076	4.521	5	0.477
		6	-0.033	-0.043	4.688	6	0.584
		7	-0.036	-0.058	4.891	7	0.673
		8	0.013	-0.005	4.919	8	0.766
		9	0.048	0.043	5.286	9	0.809
		10	0.003	0.017	5.287	10	0.871
		11	0.09	0.105	6.589	11	0.831
		12	-0.001	0.014	6.589	12	0.884
		13	0.004	-0.028	6.592	13	0.922
		14	-0.047	-0.069	6.955	14	0.936
		15	0.166	0.144	11.456	15	0.72
		16	-0.013	0.012	11.482	16	0.779
		17	0.122	0.122	13.979	17	0.669
		18	-0.061	-0.031	14.604	18	0.689

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		19	0.073	0.016	15.514	19	0.689
		20	-0.145	-0.195	19.11	20	0.515
	MAF SUKUK						
		1	0.326	0.326	30.889	1	0
		2	0.237	0.146	47.3	2	0
		3	0.089	-0.028	49.641	3	0
		4	0.082	0.034	51.629	4	0
		5	0.07	0.036	53.067	5	0
		6	0.033	-0.015	53.38	6	0
		7	0.04	0.019	53.853	7	0
		8	-0.014	-0.04	53.916	8	0
		9	0.096	0.112	56.684	9	0
		10	0.038	-0.011	57.116	10	0
		11	0.103	0.067	60.336	11	0
		12	0.052	0	61.155	12	0
		13	-0.007	-0.063	61.169	13	0
		14	-0.005	-0.005	61.178	14	0
		15	0.018	0.034	61.275	15	0
		16	-0.059	-0.095	62.33	16	0
		17	-0.006	0.042	62.342	17	0
		18	0.033	0.05	62.674	18	0
		19	0.004	-0.021	62.678	19	0
		20	-0.024	-0.051	62.862	20	0
	DUBAI DOF SUKUK						
		1	0.051	0.051	0.307	1	0.58
		2	0.213	0.211	5.672	2	0.059
		3	0.033	0.014	5.798	3	0.122
		4	0.1	0.056	6.994	4	0.136
		5	0.143	0.134	9.461	5	0.092
		6	0.046	0.006	9.723	6	0.137
		7	0.08	0.023	10.506	7	0.162
		8	-0.181	-0.216	14.61	8	0.067

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		9	0.121	0.104	16.444	9	0.058
		10	0.018	0.071	16.483	10	0.087
		11	-0.041	-0.113	16.7	11	0.117
		12	-0.086	-0.095	17.654	12	0.127
		13	-0.113	-0.05	19.341	13	0.113
		14	-0.031	-0.004	19.466	14	0.148
		15	-0.073	-0.034	20.18	15	0.165
		16	-0.1	-0.136	21.519	16	0.159
		17	-0.063	0.055	22.066	17	0.182
		18	-0.083	0.012	23.027	18	0.19
		19	-0.084	-0.109	24.006	19	0.196
		20	-0.073	-0.048	24.752	20	0.211
	DUBAI DOF SUKUK 2						
		1	-0.424	-0.424	21.936	1	0
		2	0.025	-0.189	22.011	2	0
		3	0.01	-0.073	22.023	3	0
		4	0.007	-0.017	22.028	4	0
		5	-0.013	-0.016	22.05	5	0.001
		6	-0.029	-0.05	22.156	6	0.001
		7	0.02	-0.022	22.208	7	0.002
		8	-0.038	-0.055	22.399	8	0.004
		9	0.009	-0.039	22.409	9	0.008
		10	0.098	0.103	23.686	10	0.008
		11	-0.074	0.024	24.412	11	0.011
		12	0.009	-0.003	24.422	12	0.018
		13	-0.05	-0.076	24.759	13	0.025
		14	0.012	-0.064	24.778	14	0.037
		15	0.049	0.032	25.11	15	0.048
		16	-0.161	-0.15	28.729	16	0.026
		17	0.196	0.082	34.146	17	0.008
		18	-0.139	-0.045	36.90	1	0.00

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					2	8	5
		19	0.096	0.038	38.221	19	0.006
		20	-0.049	-0.021	38.568	20	0.008
	JAFZ SUKUK						
		1	-0.005	-0.005	0.014	1	0.905
		2	0.004	0.004	0.023	2	0.988
		3	-0.092	-0.092	4.398	3	0.222
		4	-0.007	-0.008	4.423	4	0.352
		5	-0.006	-0.006	4.443	5	0.488
		6	0.002	-0.006	4.445	6	0.617
		7	0.007	0.006	4.471	7	0.724
		8	0.008	0.007	4.505	8	0.809
		9	0	0	4.505	9	0.875
		10	-0.006	-0.005	4.526	10	0.921
		11	-0.004	-0.002	4.534	11	0.952
		12	0.009	0.009	4.579	12	0.971
		13	-0.019	-0.02	4.779	13	0.98
		14	0.001	0	4.78	14	0.989
		15	0.003	0.005	4.786	15	0.994
		16	0.023	0.02	5.069	16	0.995
		17	0.017	0.017	5.221	17	0.997
		18	0.001	0.002	5.221	18	0.998
		19	-0.043	-0.04	6.239	19	0.997
		20	0.008	0.011	6.273	20	0.998
	ADCB ISLAMIC FIN						
		1	-0.06	-0.06	5.566	1	0.018
		2	0.033	0.029	7.224	2	0.027
		3	-0.015	-0.011	7.552	3	0.056
		4	-0.008	-0.01	7.642	4	0.106
		5	-0.032	-0.032	9.201	5	0.101
		6	0	-0.003	9.202	6	0.163

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		7	0.027	0.029	10.347	7	0.17
		8	-0.071	-0.069	18.275	8	0.019
		9	0.027	0.016	19.38	9	0.022
		10	0.013	0.019	19.638	10	0.033
		11	0.028	0.027	20.84	11	0.035
		12	0.005	0.008	20.883	12	0.052
		13	0.012	0.008	21.126	13	0.07
		14	-0.011	-0.008	21.302	14	0.094
		15	0.022	0.026	22.036	15	0.107
		16	0.014	0.013	22.33	16	0.133
		17	0.038	0.041	24.626	17	0.103
		18	0.029	0.035	25.963	18	0.101
		19	0.026	0.03	26.994	19	0.105
		20	-0.02	-0.017	27.628	20	0.118
	HBME SUKUK						
		1	-0.302	-0.302	55.193	1	0
		2	-0.137	-0.251	66.564	2	0
		3	0.234	0.124	99.63	3	0
		4	-0.157	-0.079	114.618	4	0
		5	0.065	0.064	117.202	5	0
		6	-0.023	-0.062	117.52	6	0
		7	-0.085	-0.066	121.889	7	0
		8	-0.009	-0.119	121.936	8	0
		9	-0.08	-0.14	125.866	9	0
		10	0.147	0.092	139.066	10	0
		11	-0.095	-0.047	144.574	11	0
		12	-0.108	-0.108	151.744	12	0
		13	0.142	-0.016	164.125	13	0
		14	0.03	0.095	164.693	14	0
		15	-0.081	-0.035	168.794	15	0
		16	0.04	-0.025	169.779	16	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		17	-0.008	-0.029	169.819	17	0
		18	-0.017	-0.017	170.001	18	0
		19	0.064	0.037	172.561	19	0
		20	-0.065	-0.061	175.192	20	0
	ABUDHABI ISLAMIC						
		1	0.397	0.397	10.702	1	0.001
		2	-0.036	-0.229	10.791	2	0.005
		3	-0.025	0.104	10.835	3	0.013
		4	-0.002	-0.052	10.835	4	0.028
		5	0.14	0.203	12.265	5	0.031
		6	0.17	0.018	14.387	6	0.026
		7	-0.047	-0.125	14.552	7	0.042
		8	-0.007	0.134	14.556	8	0.068
		9	0.037	-0.054	14.665	9	0.101
		10	-0.055	-0.066	14.9	10	0.136
		11	-0.058	-0.044	15.174	11	0.175
		12	-0.06	-0.031	15.47	12	0.217
		13	-0.061	-0.005	15.779	13	0.261
		14	-0.062	-0.108	16.103	14	0.307
		15	-0.062	0.023	16.442	15	0.353
		16	-0.063	-0.029	16.796	16	0.399
		17	-0.064	-0.044	17.167	17	0.443
		18	-0.065	-0.021	17.555	18	0.485
		19	-0.065	-0.032	17.961	19	0.525
		20	-0.063	-0.009	18.347	20	0.565
	DUBAI GLOBAL SUKUK						
		1	-0.465	-0.465	188.913	1	0
		2	-0.018	-0.298	189.187	2	0
		3	0.004	-0.203	189.205	3	0
		4	-0.041	-0.204	190.688	4	0
		5	0.1	-0.041	199.524	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		6	0.022	0.076	199.941	6	0
		7	-0.045	0.068	201.695	7	0
		8	-0.138	-0.155	218.535	8	0
		9	0.276	0.174	285.713	9	0
		10	-0.18	0.02	314.361	10	0
		11	0.094	0.086	322.176	11	0
		12	-0.027	0.067	322.831	12	0
		13	-0.002	0.115	322.833	13	0
		14	-0.133	-0.189	338.431	14	0
		15	0.238	0.097	388.89	15	0
		16	-0.093	0.049	396.604	16	0
		17	-0.065	-0.003	400.335	17	0
		18	0.085	-0.034	406.722	18	0
		19	-0.125	-0.045	420.687	19	0
		20	0.205	0.107	458.445	20	0
	RAKIA SUKUK						
		1	-0.297	-0.297	47.656	1	0
		2	-0.008	-0.105	47.693	2	0
		3	-0.016	-0.055	47.824	3	0
		4	-0.059	-0.091	49.718	4	0
		5	-0.026	-0.085	50.098	5	0
		6	-0.06	-0.119	52.079	6	0
		7	0.099	0.033	57.423	7	0
		8	-0.076	-0.062	60.578	8	0
		9	0.034	-0.017	61.203	9	0
		10	-0.003	-0.019	61.208	10	0
		11	0.017	0.01	61.364	11	0
		12	-0.051	-0.056	62.795	12	0
		13	0.045	0.019	63.911	13	0
		14	-0.075	-0.084	67.039	14	0
		15	-0.037	-0.089	67.79	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					1	5	
		16	0.106	0.051	74.058	16	0
		17	-0.046	-0.011	75.227	17	0
		18	-0.047	-0.09	76.459	18	0
		19	0.074	0.03	79.502	19	0
		20	-0.082	-0.086	83.245	20	0
	SIP SUKUK						
		1	-0.215	-0.215	31.816	1	0
		2	-0.073	-0.125	35.542	2	0
		3	0.055	0.011	37.607	3	0
		4	-0.004	0.002	37.62	4	0
		5	0.019	0.027	37.863	5	0
		6	-0.071	-0.065	41.33	6	0
		7	0.123	0.102	51.792	7	0
		8	-0.125	-0.095	62.656	8	0
		9	0.016	-0.007	62.829	9	0
		10	0.055	0.029	64.931	10	0
		11	-0.131	-0.11	76.978	11	0
		12	-0.05	-0.112	78.743	12	0
		13	0.177	0.149	100.738	13	0
		14	-0.026	0.015	101.222	14	0
		15	0.066	0.134	104.274	15	0
		16	-0.148	-0.14	119.706	16	0
		17	0.102	0.052	127.052	17	0
		18	-0.079	-0.086	131.452	18	0
		19	0.01	0.022	131.52	19	0
		20	0.111	0.048	140.298	20	0
	DIB SUKUK						
		1	-0.471	-0.471	143.484	1	0
		2	0.171	-0.065	162.424	2	0
		3	0.022	0.1	162.751	3	0
		4	-0.111	-0.066	170.778	4	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		5	0.062	-0.045	173.311	5	0
		6	0.083	0.137	177.771	6	0
		7	-0.081	0.038	182.059	7	0
		8	0.04	-0.029	183.13	8	0
		9	-0.021	-0.026	183.432	9	0
		10	-0.023	-0.015	183.79	10	0
		11	0.012	-0.024	183.888	11	0
		12	0.036	0.032	184.725	12	0
		13	-0.04	0.002	185.806	13	0
		14	0.025	-0.005	186.209	14	0
		15	0.005	0.022	186.225	15	0
		16	-0.027	-0.001	186.698	16	0
		17	0.014	-0.018	186.834	17	0
		18	-0.022	-0.037	187.143	18	0
		19	-0.016	-0.034	187.303	19	0
		20	0.016	-0.01	187.464	20	0
	DUBI SUKUK						
		1	-0.441	-0.441	145.638	1	0
		2	0.016	-0.221	145.834	2	0
		3	-0.059	-0.194	148.482	3	0
		4	0.004	-0.15	148.496	4	0
		5	-0.002	-0.116	148.5	5	0
		6	-0.174	-0.339	171.441	6	0
		7	0.297	0.026	238.169	7	0
		8	-0.107	0.008	246.777	8	0
		9	0.003	-0.026	246.786	9	0
		10	-0.015	-0.009	246.946	10	0
		11	-0.001	-0.018	246.947	11	0
		12	-0.013	-0.044	247.077	12	0
		13	-0.067	-0.054	250.514	13	0
		14	0.267	0.232	304.782	14	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		15	-0.179	0.079	329.125	15	0
		16	0.009	0.028	329.185	16	0
		17	-0.012	0.035	329.303	17	0
		18	0.008	0.022	329.352	18	0
		19	-0.013	0.02	329.476	19	0
		20	-0.168	-0.196	351.246	20	0
	EIB SUKUK 3						
		1	-0.313	-0.313	99.581	1	0
		2	-0.095	-0.214	108.68	2	0
		3	-0.001	-0.121	108.682	3	0
		4	-0.044	-0.126	110.675	4	0
		5	0.057	-0.021	114.035	5	0
		6	-0.03	-0.046	114.949	6	0
		7	0.016	-0.007	115.213	7	0
		8	-0.032	-0.045	116.272	8	0
		9	0.01	-0.017	116.371	9	0
		10	0.057	0.048	119.712	10	0
		11	-0.013	0.033	119.876	11	0
		12	-0.022	0.002	120.367	12	0
		13	-0.02	-0.019	120.784	13	0
		14	-0.046	-0.074	122.955	14	0
		15	0.091	0.039	131.406	15	0
		16	-0.164	-0.168	159.047	16	0
		17	0.256	0.184	226.747	17	0
		18	-0.13	-0.03	244.146	18	0
		19	-0.047	-0.033	246.405	19	0
		20	0.122	0.079	261.793	20	0
	TDIC SUKUK						
		1	-0.036	-0.036	1.331	1	0.249
		2	0.045	0.044	3.364	2	0.186
		3	-0.16	-0.157	29.156	3	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		4	-0.03	-0.043	30.072	4	0
		5	-0.022	-0.012	30.577	5	0
		6	-0.101	-0.129	40.927	6	0
		7	0.085	0.07	48.264	7	0
		8	-0.062	-0.058	52.099	8	0
		9	0.205	0.165	94.437	9	0
		10	0.127	0.171	110.742	10	0
		11	-0.013	-0.038	110.907	11	0
		12	-0.14	-0.111	130.894	12	0
		13	-0.082	-0.023	137.717	13	0
		14	-0.034	-0.048	138.895	14	0
		15	-0.023	-0.011	139.441	15	0
		16	0.006	-0.02	139.477	16	0
		17	0.001	-0.028	139.477	17	0
		18	0.009	-0.035	139.559	18	0
		19	0.018	-0.036	139.883	19	0
		20	0.033	0.005	141.011	20	0
	DUBAI DOF SUKUK 3						
		1	0.045	0.045	0.631	1	0.427
		2	0.183	0.181	11.035	2	0.004
		3	0.016	0.001	11.118	3	0.011
		4	0.058	0.025	12.175	4	0.016
		5	0.072	0.068	13.818	5	0.017
		6	-0.028	-0.05	14.067	6	0.029
		7	-0.025	-0.049	14.26	7	0.047
		8	0.095	0.115	17.125	8	0.029
		9	0.047	0.049	17.821	9	0.037
		10	0.059	0.017	18.942	10	0.041
		11	0.064	0.058	20.257	11	0.042
		12	0.071	0.052	21.896	12	0.039
		13	-0.011	-0.064	21.93	1	0.05

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					8	3	6
		14	-0.039	-0.064	22.443	14	0.07
		15	-0.076	-0.06	24.319	15	0.06
		16	-0.081	-0.082	26.489	16	0.048
		17	0.017	0.043	26.579	17	0.065
		18	-0.141	-0.109	33.081	18	0.016
		19	-0.027	-0.034	33.323	19	0.022
		20	-0.019	0.022	33.44	20	0.03
	EIB SUKUK 4						
		1	-0.446	-0.446	119.083	1	0
		2	-0.012	-0.263	119.166	2	0
		3	0.047	-0.103	120.502	3	0
		4	-0.031	-0.072	121.091	4	0
		5	-0.001	-0.05	121.091	5	0
		6	0.033	0.008	121.745	6	0
		7	-0.024	-0.002	122.083	7	0
		8	-0.039	-0.059	122.99	8	0
		9	0.079	0.035	126.803	9	0
		10	-0.051	-0.002	128.385	10	0
		11	0.015	0.007	128.513	11	0
		12	-0.019	-0.028	128.737	12	0
		13	0.008	-0.015	128.778	13	0
		14	-0.042	-0.066	129.835	14	0
		15	0.042	-0.021	130.895	15	0
		16	-0.085	-0.114	135.353	16	0
		17	0.143	0.076	147.923	17	0
		18	-0.063	0.034	150.36	18	0
		19	0.015	0.051	150.505	19	0
		20	-0.016	0.003	150.66	20	0
ksa	SAUDI ELTY	1	0.044	0.044	0.621	1	0.431

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		2	0.145	0.143	7.292	2	0.026
		3	0.211	0.204	21.45	3	0
		4	0.019	-0.013	21.562	4	0
		5	0.105	0.05	25.101	5	0
		6	0.073	0.03	26.816	6	0
		7	0.03	0.008	27.104	7	0
		8	-0.005	-0.053	27.112	8	0.001
		9	0.06	0.04	28.299	9	0.001
		10	0.009	0.004	28.328	10	0.002
		11	-0.022	-0.033	28.491	11	0.003
		12	0.022	-0.003	28.645	12	0.004
		13	0.021	0.033	28.796	13	0.007
		14	0.012	0.017	28.846	14	0.011
		15	-0.008	-0.025	28.867	15	0.017
		16	0.128	0.127	34.338	16	0.005
		17	0.02	0.023	34.473	17	0.007
		18	0.035	0.002	34.877	18	0.01
		19	0.004	-0.062	34.882	19	0.014
		20	0.061	0.063	36.114	20	0.015
	SAUDI ELTY 2	1	-0.267	-0.267	22.604	1	0
		2	0.152	0.087	29.963	2	0
		3	-0.025	0.038	30.164	3	0
		4	0.003	-0.008	30.167	4	0
		5	-0.033	-0.041	30.52	5	0
		6	0.026	0.011	30.733	6	0
		7	0.009	0.029	30.759	7	0
		8	-0.019	-0.015	30.877	8	0
		9	0.007	-0.009	30.89	9	0
		10	-0.058	-0.059	31.976	10	0
		11	-0.015	-0.044	32.049	11	0.001
		12	0.056	0.062	33.06	1	0.00

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
					2	2	1
		13	0.022	0.063	33.223	13	0.002
		14	-0.006	-0.003	33.234	14	0.003
		15	0.071	0.057	34.885	15	0.003
		16	0.022	0.062	35.042	16	0.004
		17	0.058	0.078	36.145	17	0.004
		18	-0.042	-0.026	36.732	18	0.006
		19	-0.008	-0.051	36.753	19	0.009
		20	0.06	0.062	37.98	20	0.009
	SAUDI ELTY 3						
		1	-0.026	-0.026	0.036	1	0.85
		2	-0.184	-0.184	1.897	2	0.387
		3	0.019	0.009	1.917	3	0.59
		4	0.019	-0.015	1.937	4	0.747
		5	0.053	0.061	2.104	5	0.835
		6	0.059	0.066	2.314	6	0.889
		7	0.173	0.207	4.16	7	0.761
		8	0.023	0.063	4.192	8	0.839
		9	-0.027	0.05	4.24	9	0.895
		10	-0.094	-0.098	4.818	10	0.903
		11	0.026	0.004	4.863	11	0.938
		12	0.073	0.001	5.233	12	0.95
		13	-0.158	-0.196	7.017	13	0.901
		14	0.087	0.049	7.575	14	0.91
		15	0.027	-0.041	7.63	15	0.938
		16	-0.065	-0.023	7.958	16	0.95
		17	-0.103	-0.089	8.796	17	0.946
		18	-0.014	-0.015	8.813	18	0.964
		19	0.017	-0.021	8.836	19	0.976
		20	0.048	0.103	9.035	20	0.982
	SAUDI ELTY 4						
		1	-0.339	-0.339	6.196	1	0.013

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		2	0.084	-0.035	6.583	2	0.037
		3	0.019	0.042	6.604	3	0.086
		4	0.178	0.227	8.418	4	0.077
		5	-0.012	0.141	8.427	5	0.134
		6	-0.057	-0.041	8.623	6	0.196
		7	0.05	-0.03	8.776	7	0.269
		8	0.034	-0.005	8.849	8	0.355
		9	-0.014	-0.011	8.862	9	0.45
		10	0.083	0.117	9.314	10	0.503
		11	0.023	0.107	9.351	11	0.59
		12	0.064	0.101	9.631	12	0.648
		13	-0.035	-0.008	9.716	13	0.717
		14	0.041	-0.043	9.84	14	0.774
		15	0.084	0.05	10.363	15	0.796
		16	-0.083	-0.056	10.898	16	0.816
		17	0.012	-0.04	10.909	17	0.861
		18	-0.125	-0.181	12.191	18	0.837
		19	0.123	-0.014	13.476	19	0.813
		20	-0.058	0.02	13.765	20	0.842
	BSF						
		1	-0.354	-0.354	14.672	1	0
		2	-0.109	-0.269	16.087	2	0
		3	-0.02	-0.203	16.136	3	0.001
		4	0.004	-0.151	16.138	4	0.003
		5	-0.043	-0.175	16.365	5	0.006
		6	0.04	-0.106	16.561	6	0.011
		7	0.016	-0.069	16.592	7	0.02
		8	-0.027	-0.082	16.682	8	0.034
		9	-0.15	-0.278	19.527	9	0.021
		10	0.347	0.177	34.823	10	0
		11	-0.17	-0.016	38.521	11	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
		12	-0.014	0.011	38.545	12	0
		13	0.006	0.014	38.55	13	0
		14	-0.016	-0.018	38.584	14	0
		15	0.011	0.033	38.599	15	0.001
		16	-0.018	-0.035	38.642	16	0.001
		17	0.039	0.013	38.849	17	0.002
		18	-0.036	-0.036	39.025	18	0.003
		19	0.028	0.101	39.138	19	0.004
		20	0.009	-0.065	39.15	20	0.006
	DAR AIARKAN						
		1	-0.271	-0.271	57.898	1	0
		2	0.031	-0.045	58.679	2	0
		3	0.015	0.012	58.847	3	0
		4	-0.138	-0.14	73.986	4	0
		5	0.054	-0.024	76.29	5	0
		6	0.068	0.083	79.96	6	0
		7	0.008	0.056	80.014	7	0
		8	0.018	0.019	80.281	8	0
		9	-0.011	0.006	80.374	9	0
		10	0.004	0.028	80.389	10	0
		11	0.023	0.039	80.799	11	0
		12	-0.051	-0.046	82.908	12	0
		13	0.036	0.003	83.972	13	0
		14	0.016	0.032	84.169	14	0
		15	-0.074	-0.064	88.59	15	0
		16	0.061	0.006	91.597	16	0
		17	-0.068	-0.05	95.332	17	0
		18	-0.023	-0.05	95.758	18	0
		19	0.079	0.044	100.76	19	0
		20	0.014	0.063	100.923	20	0
	DAAR INTL						
		1	-0.247	-0.247	9.546	1	0.00

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation	Box-Ljung Statistic		
					Value	df	Sig.a
							2
		2	0.023	-0.041	9.625	2	0.008
		3	0.084	0.085	10.736	3	0.013
		4	-0.288	-0.264	23.962	4	0
		5	0.188	0.066	29.601	5	0
		6	0.017	0.081	29.648	6	0
		7	-0.002	0.054	29.649	7	0
		8	0.092	0.022	31.043	8	0
		9	-0.148	-0.073	34.67	9	0
		10	0.012	-0.028	34.694	10	0
		11	0.02	0.013	34.762	11	0
		12	-0.1	-0.082	36.448	12	0
		13	-0.008	-0.13	36.458	13	0.001
		14	-0.088	-0.124	37.782	14	0.001
		15	-0.093	-0.133	39.266	15	0.001
		16	0.062	-0.027	39.929	16	0.001
		17	-0.006	0.003	39.937	17	0.001
		18	-0.058	-0.099	40.52	18	0.002
		19	0.109	0.067	42.615	19	0.001
		20	-0.061	0.052	43.279	20	0.002

a. Based on the asymptotic chi-square approximation.

Appendix 22: Autocorrelation Coefficients and Ljung-Box Q-Statistics in Daily Conventional Bonds Returns

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
Turkey	TURKEY	1	-0.255	-0.255		34.332	1	0
		2	-0.042	-0.115		35.279	2	0
		3	0.038	-0.004		36.039	3	0
		4	-0.019	-0.016		36.238	4	0
		5	-0.052	-0.062		37.648	5	0
		6	-0.046	-0.087		38.78	6	0
		7	0.083	0.042		42.438	7	0
		8	-0.043	-0.017		43.426	8	0
		9	0.105	0.107		49.269	9	0
		10	-0.028	0.018		49.686	10	0
		11	-0.022	-0.013		49.937	11	0
		12	0.037	0.028		50.653	12	0
		13	-0.018	0.008		50.835	13	0
		14	-0.028	-0.021		51.253	14	0
		15	0.008	0.004		51.292	15	0
		16	0.011	-0.006		51.36	16	0
		17	0.034	0.047		51.987	17	0
		18	-0.047	-0.035		53.172	18	0
		19	0.073	0.055		56.037	19	0
		20	-0.052	-0.025		57.487	20	0
	TURKEY 2	1	0.282	0.282		14.202	1	0
		2	0.136	0.061		17.52	2	0
		3	-0.071	-0.136		18.437	3	0
		4	-0.165	-0.133		23.349	4	0
		5	-0.143	-0.048		27.0	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						83		
		6	-0.314	-0.27		45.177	6	0
		7	-0.161	-0.036		49.952	7	0
		8	-0.064	0.012		50.705	8	0
		9	0.07	0.039		51.627	9	0
		10	0.191	0.097		58.478	10	0
		11	0.113	-0.02		60.89	11	0
		12	0.264	0.173		74.102	12	0
		13	0.081	-0.038		75.359	13	0
		14	0.048	0.025		75.794	14	0
		15	-0.003	0.067		75.796	15	0
		16	-0.163	-0.078		80.941	16	0
		17	-0.07	0.04		81.912	17	0
		18	-0.071	0.084		82.906	18	0
		19	-0.029	-0.023		83.072	19	0
		20	-0.093	-0.13		84.794	20	0
Pakistan	PAKISTAN	1	0.046	0.046		2.477	1	0.116
		2	0.041	0.039		4.451	2	0.108
		3	-0.094	-0.098		14.639	3	0.002
		4	-0.051	-0.045		17.728	4	0.001
		5	0.01	0.023		17.844	5	0.003
		6	0.02	0.014		18.32	6	0.005
		7	0.094	0.083		28.628	7	0
		8	-0.081	-0.091		36.249	8	0
		9	-0.039	-0.035		37.985	9	0
		10	0.022	0.053		38.555	10	0
		11	0.056	0.05		42.1	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						72	1	
		12	0.038	0.012		43.824	12	0
		13	0.141	0.14		67.322	13	0
		14	0.015	0.008		67.593	14	0
		15	0.047	0.061		70.203	15	0
		16	-0.03	-0.011		71.282	16	0
		17	-0.035	-0.041		72.766	17	0
		18	-0.036	-0.03		74.31	18	0
		19	-0.003	0.009		74.319	19	0
		20	0.062	0.036		78.822	20	0
	PAKISTAN MOBL	1	0.128	0.128		28.371	1	0
		2	0.138	0.123		60.954	2	0
		3	-0.061	-0.096		67.423	3	0
		4	0.042	0.045		70.454	4	0
		5	-0.042	-0.033		73.534	5	0
		6	0.02	0.013		74.247	6	0
		7	-0.079	-0.07		85.096	7	0
		8	-0.033	-0.027		86.945	8	0
		9	0.019	0.055		87.587	9	0
		10	-0.004	-0.021		87.612	10	0
		11	-0.012	-0.016		87.861	11	0
		12	-0.009	0		87.988	12	0
		13	0.133	0.141		118.476	13	0
		14	0.046	0.01		122.161	14	0
		15	0.045	-0.006		125.741	15	0
		16	0.03	0.047		127.34	16	0
		17	0.06	0.044		133.	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						53	7	
		18	-0.002	-0.019		133.534	18	0
		19	0.027	0.011		134.824	19	0
		20	-0.116	-0.098		158.085	20	0
	PAKISTAN MOBL 2	1	-0.341	-0.341		124.265	1	0
		2	-0.019	-0.153		124.64	2	0
		3	-0.027	-0.1		125.405	3	0
		4	0.004	-0.053		125.418	4	0
		5	-0.071	-0.112		130.779	5	0
		6	0.091	0.022		139.716	6	0
		7	-0.077	-0.06		146.104	7	0
		8	-0.014	-0.071		146.308	8	0
		9	-0.009	-0.061		146.389	9	0
		10	0.044	0.001		148.484	10	0
		11	-0.052	-0.047		151.409	11	0
		12	0.011	-0.045		151.535	12	0
		13	-0.009	-0.036		151.628	13	0
		14	-0.008	-0.04		151.69	14	0
		15	-0.023	-0.06		152.274	15	0
		16	-0.045	-0.119		154.478	16	0
		17	0.05	-0.027		157.23	17	0
		18	0.01	-0.01		157.331	18	0
		19	0.005	-0.01		157.362	19	0
		20	0.016	0.003		157.627	20	0
	KUWAIT PRJS	1	0.158	0.158		21.905	1	0
		2	0.163	0.142		45.205	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
Kuwait		3	0.085	0.042		51.489	3	0
		4	0.021	-0.02		51.859	4	0
		5	0.082	0.066		57.705	5	0
		6	-0.063	-0.09		61.149	6	0
		7	0.106	0.113		71.037	7	0
		8	0.026	0.01		71.636	8	0
		9	0.043	0.019		73.249	9	0
		10	0.099	0.072		81.801	10	0
		11	-0.029	-0.055		82.543	11	0
		12	-0.01	-0.049		82.623	12	0
		13	-0.107	-0.087		92.716	13	0
		14	-0.086	-0.063		99.208	14	0
		15	-0.031	0.011		100.066	15	0
		16	-0.009	0.043		100.133	16	0
		17	-0.058	-0.079		103.15	17	0
		18	-0.036	-0.008		104.299	18	0
		19	-0.065	-0.056		108.099	19	0
		20	-0.006	0.028		108.128	20	0
	KUWAIT PRJS 2	1	-0.412	-0.412		140.59	1	0
		2	0.059	-0.133		143.494	2	0
		3	0.053	0.032		145.847	3	0
		4	-0.087	-0.052		152.217	4	0
		5	0.194	0.17		183.649	5	0
		6	-0.066	0.099		187.279	6	0
		7	-0.046	-0.031		189.049	7	0
		8	0.061	0.002		192.205	8	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		9	0.025	0.075		192.733	9	0
		10	0.062	0.104		196.002	10	0
		11	-0.061	-0.001		199.076	11	0
		12	0.03	0.022		199.814	12	0
		13	-0.064	-0.085		203.281	13	0
		14	0.057	-0.032		205.977	14	0
		15	0.028	0.025		206.641	15	0
		16	-0.095	-0.056		214.231	16	0
		17	0.064	-0.008		217.713	17	0
		18	-0.007	0.026		217.751	18	0
		19	-0.015	-0.013		217.943	19	0
		20	-0.056	-0.121		220.606	20	0
	KUWAIT PRJS 3	1	-0.078	-0.078		2.712	1	0.1
		2	0.102	0.096		7.297	2	0.026
		3	0.132	0.149		15.031	3	0.002
		4	0.053	0.068		16.306	4	0.003
		5	0.132	0.119		24.147	5	0
		6	0.135	0.134		32.276	6	0
		7	0.059	0.05		33.823	7	0
		8	0.139	0.099		42.523	8	0
		9	0.054	0.027		43.833	9	0
		10	0.055	0.004		45.192	10	0
		11	0.137	0.079		53.708	11	0
		12	0.004	-0.028		53.716	12	0
		13	0.082	0.014		56.808	13	0
		14	0.044	-0.011		57.697	14	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		15	0.002	-0.041		57.7	15	0
		16	0.003	-0.068		57.704	16	0
		17	0.074	0.026		60.246	17	0
		18	0.063	0.058		62.095	18	0
		19	0.002	-0.024		62.097	19	0
		20	0.007	-0.023		62.121	20	0
	KUWAIT FINL	1	0.01	0.01		0.008	1	0.93
		2	-0.01	-0.01		0.015	2	0.992
		3	0.008	0.008		0.02	3	0.999
		4	-0.024	-0.024		0.07	4	0.999
		5	-0.035	-0.034		0.173	5	0.999
		6	-0.522	-0.523		23.82	6	0.001
		7	0.029	0.041		23.896	7	0.001
		8	0.024	0.01		23.948	8	0.002
		9	-0.025	-0.02		24.003	9	0.004
		10	0.021	-0.011		24.044	10	0.007
		11	-0.036	-0.095		24.166	11	0.012
		12	0.022	-0.343		24.213	12	0.019
		13	0.003	0.049		24.213	13	0.029
		14	-0.018	-0.01		24.246	14	0.043
		15	0.043	0.025		24.433	15	0.058
		16	-0.027	-0.05		24.504	16	0.079
		17	0.043	-0.06		24.696	17	0.102
		18	0.008	-0.24		24.704	18	0.133
		19	-0.004	0.054		24.706	19	0.17
		20	0.016	0.001		24.732	20	0.212

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
	KUWAIT PRJS 4	1	-0.078	-0.078		2.71	1	0.1
		2	0.102	0.096		7.297	2	0.026
		3	0.132	0.149		15.028	3	0.002
		4	0.053	0.068		16.303	4	0.003
		5	0.132	0.119		24.142	5	0
		6	0.134	0.134		32.265	6	0
		7	0.059	0.05		33.814	7	0
		8	0.139	0.099		42.512	8	0
		9	0.054	0.027		43.824	9	0
		10	0.055	0.004		45.184	10	0
		11	0.137	0.079		53.697	11	0
		12	0.004	-0.028		53.705	12	0
		13	0.082	0.014		56.797	13	0
		14	0.044	-0.011		57.686	14	0
		15	0.002	-0.041		57.689	15	0
		16	0.003	-0.068		57.693	16	0
		17	0.074	0.026		60.234	17	0
		18	0.063	0.058		62.081	18	0
		19	0.002	-0.024		62.082	19	0
		20	0.007	-0.023		62.107	20	0
Bahrain	BAHRAIN KINGDOM	1	0.275	0.275		18.968	1	0
		2	0.137	0.067		23.731	2	0
		3	0.058	0.005		24.596	3	0
		4	0.166	0.153		31.63	4	0
		5	0.113	0.033		34.89	5	0
		6	0.086	0.023		36.77	6	0
		7	0.038	-0.002		37.1	7	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						45		
		8	0.088	0.055		39.14	8	0
		9	0.076	0.023		40.636	9	0
		10	0.045	-0.009		41.155	10	0
		11	-0.018	-0.046		41.237	11	0
		12	-0.007	-0.015		41.249	12	0
		13	0.048	0.043		41.849	13	0
		14	0.038	0.003		42.223	14	0
		15	-0.027	-0.045		42.411	15	0
		16	-0.002	0.018		42.413	16	0
		17	0.047	0.044		42.998	17	0
		18	0.032	-0.004		43.277	18	0.001
		19	-0.081	-0.1		45.062	19	0.001
		20	-0.112	-0.073		48.502	20	0
	BAHRAIN KINGDOM 2	1	0.368	0.368		33.802	1	0
		2	0.341	0.238		62.955	2	0
		3	0.241	0.07		77.519	3	0
		4	0.207	0.053		88.296	4	0
		5	0.166	0.029		95.256	5	0
		6	0.215	0.114		107.054	6	0
		7	0.095	-0.062		109.337	7	0
		8	0.08	-0.032		110.968	8	0
		9	0.053	-0.008		111.691	9	0
		10	0.097	0.066		114.148	10	0
		11	-0.027	-0.111		114.338	11	0
		12	0.064	0.054		115.417	12	0
		13	0.041	0.04		115.	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						863	3	
		14	0.034	-0.003		116.161	14	0
		15	0.011	-0.024		116.192	15	0
		16	-0.002	-0.036		116.193	16	0
		17	0.035	0.077		116.519	17	0
		18	-0.014	-0.06		116.571	18	0
		19	-0.009	-0.024		116.593	19	0
		20	-0.025	-0.021		116.765	20	0
	ICICI BANK	1	-0.114	-0.114		12.094	1	0.001
		2	-0.011	-0.024		12.206	2	0.002
		3	0.034	0.03		13.26	3	0.004
		4	0.015	0.022		13.465	4	0.009
		5	-0.015	-0.009		13.662	5	0.018
		6	-0.048	-0.052		15.773	6	0.015
		7	-0.022	-0.035		16.213	7	0.023
		8	-0.013	-0.021		16.375	8	0.037
		9	-0.014	-0.015		16.547	9	0.056
		10	-0.022	-0.022		16.994	10	0.074
		11	0.017	0.012		17.257	11	0.1
		12	0.003	0.004		17.266	12	0.14
		13	0.064	0.065		21.154	13	0.07
		14	0.032	0.045		22.115	14	0.076
		15	0.022	0.03		22.578	15	0.094
		16	0.032	0.033		23.575	16	0.099
		17	0.002	0.006		23.58	17	0.131
		18	0.014	0.016		23.765	18	0.163
		19	-0.043	-0.035		25.5	1	0.144

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						1	9	
		20	-0.016	-0.019		25.747	20	0.174
	HDFC BANK	1	-0.406	-0.406		12.352	1	0
		2	-0.002	-0.199		12.352	2	0.002
		3	0.014	-0.085		12.366	3	0.006
		4	0.039	0.015		12.488	4	0.014
		5	0.019	0.06		12.518	5	0.028
		6	-0.067	-0.029		12.882	6	0.045
		7	-0.031	-0.088		12.962	7	0.073
		8	0.024	-0.055		13.01	8	0.112
		9	-0.008	-0.038		13.016	9	0.162
		10	0.065	0.071		13.376	10	0.203
		11	0	0.092		13.376	11	0.269
		12	0.018	0.088		13.406	12	0.34
		13	0.075	0.145		13.918	13	0.38
		14	0.004	0.12		13.919	14	0.456
		15	-0.006	0.073		13.922	15	0.531
		16	-0.069	-0.047		14.373	16	0.571
		17	0.042	-0.017		14.545	17	0.628
		18	-0.017	-0.02		14.573	18	0.691
		19	-0.016	-0.011		14.598	19	0.748
		20	0.006	0.013		14.602	20	0.799
	FINANS BANK	1	0.013	0.013		0.016	1	0.9
		2	-0.322	-0.322		9.255	2	0.01
		3	-0.37	-0.401		21.579	3	0
		4	-0.008	-0.193		21.584	4	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
		5	0.644	0.511		59.912	5	0
		6	-0.007	-0.137		59.917	6	0
		7	-0.322	-0.179		69.727	7	0
		8	-0.343	-0.093		81.044	8	0
		9	-0.029	-0.151		81.127	9	0
		10	0.655	0.31		123.378	10	0
		11	0	-0.096		123.378	11	0
		12	-0.284	-0.068		131.524	12	0
		13	-0.36	-0.087		144.819	13	0
		14	0.008	0.001		144.825	14	0
		15	0.588	0.076		181.346	15	0
		16	-0.033	-0.155		181.463	16	0
		17	-0.269	-0.04		189.336	17	0
		18	-0.336	-0.048		201.825	18	0
		19	-0.034	-0.147		201.952	19	0
		20	0.545	-0.018		235.753	20	0
	ICICI BANK 2	1	-0.023	-0.023		0.68	1	0.41
		2	-0.018	-0.018		1.085	2	0.581
		3	-0.16	-0.161		34.371	3	0
		4	0.003	-0.005		34.386	4	0
		5	0.011	0.004		34.534	5	0
		6	-0.006	-0.032		34.579	6	0
		7	0.016	0.016		34.928	7	0
		8	-0.016	-0.014		35.254	8	0
		9	0.009	0.003		35.367	9	0
		10	-0.025	-0.021		36.19	10	0
		11	-0.004	-0.01		36.2	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						14	1	
		12	-0.013	-0.013		36.428	12	0
		13	0.003	-0.005		36.437	13	0.001
		14	0.005	0.001		36.47	14	0.001
		15	0.005	0.002		36.498	15	0.001
		16	0.006	0.005		36.545	16	0.002
		17	-0.003	-0.001		36.559	17	0.004
		18	0.005	0.005		36.589	18	0.006
		19	0.023	0.026		37.274	19	0.007
		20	0.026	0.027		38.202	20	0.008
	ICICI BANK 3	1	-0.422	-0.422		184.029	1	0
		2	0.053	-0.153		186.901	2	0
		3	-0.067	-0.132		191.564	3	0
		4	0.046	-0.041		193.79	4	0
		5	-0.023	-0.03		194.348	5	0
		6	-0.032	-0.068		195.408	6	0
		7	-0.019	-0.08		195.768	7	0
		8	0.007	-0.057		195.825	8	0
		9	-0.01	-0.052		195.928	9	0
		10	-0.039	-0.092		197.492	10	0
		11	0.025	-0.052		198.137	11	0
		12	-0.037	-0.083		199.579	12	0
		13	0.054	-0.016		202.624	13	0
		14	0.01	0.023		202.733	14	0
		15	-0.04	-0.04		204.376	15	0
		16	0.065	0.035		208.839	16	0
		17	-0.03	0.008		209.	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						762	7	
		18	0.06	0.065		213.585	18	0
		19	-0.021	0.057		214.029	19	0
		20	-0.034	-0.011		215.235	20	0
	BAHRAIN MUMTALAKAT	1	-0.426	-0.426		158.787	1	0
		2	0.049	-0.161		160.882	2	0
		3	-0.019	-0.079		161.192	3	0
		4	0.003	-0.038		161.201	4	0
		5	0.022	0.01		161.617	5	0
		6	-0.056	-0.051		164.362	6	0
		7	0.057	0.015		167.22	7	0
		8	-0.066	-0.048		171.026	8	0
		9	0.079	0.04		176.514	9	0
		10	-0.027	0.027		177.171	10	0
		11	-0.01	-0.003		177.251	11	0
		12	-0.011	-0.025		177.359	12	0
		13	0.021	0.008		177.738	13	0
		14	-0.055	-0.063		180.44	14	0
		15	0.072	0.037		185.078	15	0
		16	-0.105	-0.084		194.857	16	0
		17	0.155	0.104		216.297	17	0
		18	-0.065	0.045		220.039	18	0
		19	-0.016	-0.011		220.259	19	0
		20	0.072	0.069		224.873	20	0
	HSBC BANK	1	-0.143	-0.143		18.488	1	0
		2	-0.057	-0.079		21.449	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
Malaysia		3	-0.034	-0.056		22.493	3	0
		4	-0.008	-0.028		22.558	4	0
		5	-0.053	-0.067		25.119	5	0
		6	-0.001	-0.025		25.119	6	0
		7	0.04	0.026		26.545	7	0
		8	-0.013	-0.01		26.687	8	0.001
		9	0.004	0.002		26.703	9	0.002
		10	-0.009	-0.01		26.772	10	0.003
		11	-0.053	-0.058		29.329	11	0.002
		12	0.051	0.037		31.73	12	0.002
		13	-0.014	-0.011		31.919	13	0.002
		14	0.075	0.074		37.002	14	0.001
		15	-0.018	0.006		37.291	15	0.001
		16	-0.034	-0.031		38.338	16	0.001
		17	-0.037	-0.038		39.562	17	0.001
		18	0.009	-0.003		39.637	18	0.002
		19	-0.078	-0.086		45.291	19	0.001
		20	0.046	0.019		47.269	20	0.001
	OCBCBK MALAYSIA	1	-0.166	-0.166		24.876	1	0
		2	-0.089	-0.12		32.092	2	0
		3	-0.044	-0.084		33.851	3	0
		4	-0.002	-0.039		33.854	4	0
		5	0.01	-0.012		33.941	5	0
		6	-0.016	-0.026		34.18	6	0
		7	0.016	0.006		34.401	7	0
		8	-0.005	-0.005		34.423	8	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		9	0.042	0.043		36.051	9	0
		10	-0.016	0		36.292	10	0
		11	-0.038	-0.032		37.575	11	0
		12	0.039	0.03		38.966	12	0
		13	-0.054	-0.051		41.641	13	0
		14	0.048	0.032		43.75	14	0
		15	-0.027	-0.021		44.428	15	0
		16	0.01	0.004		44.529	16	0
		17	0.008	0.009		44.59	17	0
		18	0.019	0.024		44.925	18	0
		19	-0.069	-0.064		49.333	19	0
		20	-0.051	-0.069		51.746	20	0
	BERJAYA	1	-0.005	-0.005		0.021	1	0.885
		2	0.001	0.001		0.021	2	0.989
		3	0	0		0.021	3	0.999
		4	0.026	0.026		0.485	4	0.975
		5	-0.004	-0.004		0.496	5	0.992
		6	0.007	0.007		0.53	6	0.997
		7	-0.005	-0.005		0.549	7	0.999
		8	0	-0.001		0.549	8	1
		9	-0.003	-0.003		0.556	9	1
		10	0.001	0		0.557	10	1
		11	-0.007	-0.007		0.59	11	1
		12	0	-0.001		0.59	12	1
		13	0.003	0.004		0.598	13	1
		14	0	0		0.598	14	1
		15	0.001	0.002		0.6	1	1

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
							5	
		16	-0.002	-0.002		0.602	16	1
		17	0.006	0.005		0.624	17	1
		18	-0.017	-0.017		0.841	18	1
		19	0.002	0.001		0.843	19	1
		20	0.001	0.001		0.843	20	1
	SELIASLNG SELATAN	1	-0.38	-0.38		130.299	1	0
		2	-0.214	-0.419		171.46	2	0
		3	0.153	-0.173		192.647	3	0
		4	-0.013	-0.138		192.794	4	0
		5	-0.003	-0.043		192.799	5	0
		6	0.012	-0.008		192.925	6	0
		7	0.011	0.039		193.042	7	0
		8	-0.034	0		194.075	8	0
		9	0.02	0.02		194.442	9	0
		10	0.027	0.042		195.119	10	0
		11	-0.042	0.002		196.718	11	0
		12	0.004	-0.005		196.735	12	0
		13	0.02	-0.001		197.103	13	0
		14	-0.013	-0.007		197.25	14	0
		15	0.002	-0.002		197.254	15	0
		16	0	-0.007		197.254	16	0
		17	-0.014	-0.024		197.445	17	0
		18	-0.039	-0.088		198.853	18	0
		19	0.07	-0.008		203.304	19	0
		20	0.038	0.068		204.64	20	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
	PANGLIMA POWER SDN	1	-0.176	-0.176		28.003	1	0
		2	0.034	0.003		29.037	2	0
		3	-0.035	-0.03		30.169	3	0
		4	0.034	0.023		31.201	4	0
		5	-0.049	-0.039		33.369	5	0
		6	0.058	0.042		36.365	6	0
		7	-0.096	-0.079		44.641	7	0
		8	0.058	0.026		47.705	8	0
		9	-0.058	-0.04		50.788	9	0
		10	-0.056	-0.084		53.604	10	0
		11	0.012	-0.001		53.733	11	0
		12	0.011	0.002		53.844	12	0
		13	-0.065	-0.058		57.74	13	0
		14	0.015	-0.017		57.941	14	0
		15	0.022	0.029		58.399	15	0
		16	-0.074	-0.077		63.424	16	0
		17	0.055	0.025		66.2	17	0
		18	-0.046	-0.033		68.161	18	0
		19	0.04	0.019		69.658	19	0
		20	0.021	0.025		70.067	20	0
	MALAYSIA	1	-0.148	-0.148		22.215	1	0
		2	-0.221	-0.248		71.905	2	0
		3	-0.023	-0.109		72.431	3	0
		4	0.014	-0.073		72.621	4	0
		5	-0.057	-0.109		75.934	5	0
		6	0.02	-0.033		76.354	6	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		7	-0.007	-0.057		76.401	7	0
		8	0.01	-0.017		76.506	8	0
		9	0.014	-0.005		76.697	9	0
		10	-0.011	-0.018		76.817	10	0
		11	0	-0.002		76.817	11	0
		12	0.016	0.009		77.07	12	0
		13	-0.005	0.001		77.091	13	0
		14	-0.011	-0.005		77.223	14	0
		15	-0.004	-0.007		77.238	15	0
		16	0.015	0.011		77.458	16	0
		17	-0.006	-0.004		77.491	17	0
		18	0.019	0.024		77.855	18	0
		19	-0.015	-0.007		78.08	19	0
		20	0.005	0.012		78.108	20	0
	MALAYSIA 2	1	-0.156	-0.156		24.766	1	0
		2	0.007	-0.018		24.817	2	0
		3	0.066	0.066		29.222	3	0
		4	-0.011	0.01		29.335	4	0
		5	0.021	0.021		29.778	5	0
		6	-0.03	-0.029		30.699	6	0
		7	0.009	0		30.787	7	0
		8	0.002	0.001		30.791	8	0
		9	-0.029	-0.026		31.674	9	0
		10	0.024	0.015		32.273	10	0
		11	0.005	0.013		32.301	11	0.001
		12	-0.034	-0.03		33.518	12	0.001

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
		13	0.054	0.042		36.467	13	0.001
		14	-0.012	0.002		36.621	14	0.001
		15	-0.003	-0.002		36.629	15	0.001
		16	0.029	0.024		37.513	16	0.002
		17	0.062	0.074		41.456	17	0.001
		18	-0.062	-0.047		45.487	18	0
		19	0.021	0.004		45.933	19	0.001
		20	0.015	0.009		46.153	20	0.001
	RCE ADVANCE SDN BHD	1	-0.038	-0.038		1.283	1	0.257
		2	-0.005	-0.006		1.304	2	0.521
		3	-0.003	-0.004		1.313	3	0.726
		4	-0.012	-0.012		1.434	4	0.838
		5	-0.037	-0.038		2.693	5	0.747
		6	0.038	0.035		4.003	6	0.676
		7	-0.006	-0.004		4.038	7	0.775
		8	-0.024	-0.024		4.542	8	0.805
		9	0.012	0.01		4.68	9	0.861
		10	0.028	0.028		5.395	10	0.863
		11	-0.005	-0.001		5.42	11	0.909
		12	0.001	-0.001		5.421	12	0.942
		13	-0.012	-0.013		5.55	13	0.961
		14	-0.009	-0.007		5.625	14	0.975
		15	0.022	0.023		6.086	15	0.978
		16	-0.058	-0.06		9.187	16	0.906
		17	0.016	0.013		9.424	17	0.926
		18	-0.005	-0.004		9.449	18	0.948
		19	0.006	0.005		9.47	1	0.965

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						8	9	
		20	0.012	0.012		9.6	20	0.975
	SABAH	1	-0.177	-0.177		25.989	1	0
		2	-0.029	-0.063		26.702	2	0
		3	-0.154	-0.177		46.4	3	0
		4	0.118	0.057		57.982	4	0
		5	0.028	0.044		58.626	5	0
		6	-0.03	-0.033		59.395	6	0
		7	0.033	0.059		60.314	7	0
		8	-0.015	0.001		60.502	8	0
		9	-0.001	-0.015		60.502	9	0
		10	0.008	0.024		60.55	10	0
		11	-0.059	-0.069		63.454	11	0
		12	0.085	0.064		69.5	12	0
		13	-0.011	0.018		69.609	13	0
		14	-0.016	-0.032		69.815	14	0
		15	0.009	0.04		69.885	15	0
		16	-0.023	-0.028		70.312	16	0
		17	0.027	0.003		70.908	17	0
		18	0	0.027		70.908	18	0
		19	-0.017	-0.035		71.146	19	0
		20	0.025	0.03		71.656	20	0
	SYR KT PRS RNA	1	-0.347	-0.347		108.396	1	0
		2	-0.002	-0.139		108.399	2	0
		3	0.007	-0.049		108.44	3	0
		4	-0.017	-0.037		108.697	4	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		5	0.027	0.009		109.334	5	0
		6	-0.045	-0.039		111.198	6	0
		7	-0.037	-0.077		112.454	7	0
		8	0.034	-0.017		113.477	8	0
		9	-0.004	-0.005		113.493	9	0
		10	0.012	0.011		113.63	10	0
		11	-0.024	-0.018		114.164	11	0
		12	0.02	0.005		114.515	12	0
		13	-0.021	-0.023		114.911	13	0
		14	0.05	0.041		117.226	14	0
		15	-0.138	-0.124		134.736	15	0
		16	0.161	0.086		158.585	16	0
		17	-0.134	-0.076		175.041	17	0
		18	0.055	-0.002		177.771	18	0
		19	-0.031	-0.039		178.634	19	0
		20	-0.004	-0.02		178.652	20	0
	MALAYSIA 3	1	0.058	0.058		3.101	1	0.078
		2	0.029	0.025		3.868	2	0.145
		3	-0.038	-0.041		5.22	3	0.156
		4	-0.015	-0.011		5.433	4	0.246
		5	-0.011	-0.007		5.542	5	0.353
		6	-0.066	-0.066		9.605	6	0.142
		7	0.016	0.023		9.85	7	0.197
		8	-0.081	-0.081		16.068	8	0.041
		9	0.056	0.06		19.073	9	0.025
		10	-0.023	-0.027		19.578	10	0.034
		11	-0.005	-0.012		19.599	11	0.051

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		12	0.019	0.021		19.955	12	0.068
		13	0.019	0.018		20.303	13	0.088
		14	-0.025	-0.04		20.886	14	0.105
		15	-0.112	-0.099		32.876	15	0.005
		16	-0.015	-0.011		33.084	16	0.007
		17	0.017	0.032		33.352	17	0.01
		18	0.056	0.042		36.366	18	0.006
		19	0.012	0.004		36.507	19	0.009
		20	0.012	0.007		36.641	20	0.013
	DIGI TELE COM	1	-0.098	-0.098		9.148	1	0.002
		2	0.021	0.012		9.57	2	0.008
		3	0.02	0.023		9.954	3	0.019
		4	-0.063	-0.06		13.79	4	0.008
		5	-0.054	-0.068		16.644	5	0.005
		6	-0.067	-0.079		21.018	6	0.002
		7	-0.065	-0.077		25.144	7	0.001
		8	-0.022	-0.037		25.594	8	0.001
		9	0.015	0.005		25.814	9	0.002
		10	0.017	0.008		26.083	10	0.004
		11	-0.083	-0.102		32.765	11	0.001
		12	-0.041	-0.084		34.388	12	0.001
		13	0.003	-0.024		34.398	13	0.001
		14	-0.057	-0.066		37.605	14	0.001
		15	0.073	0.049		42.86	15	0
		16	-0.093	-0.102		51.253	16	0
		17	0.015	-0.033		51.472	17	0
		18	-0.031	-0.073		52.4	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						1	8	
		19	0.044	0.017		54.332	19	0
		20	0.056	0.047		57.36	20	0
	MALAYSIA 4	1	-0.019	-0.019		0.39	1	0.532
		2	0.033	0.032		1.517	2	0.468
		3	-0.074	-0.073		7.36	3	0.061
		4	-0.001	-0.004		7.36	4	0.118
		5	0.029	0.034		8.253	5	0.143
		6	-0.055	-0.06		11.478	6	0.075
		7	0.009	0.005		11.563	7	0.116
		8	-0.018	-0.009		11.91	8	0.155
		9	0.025	0.016		12.583	9	0.182
		10	0.002	0.003		12.586	10	0.248
		11	0.008	0.008		12.653	11	0.317
		12	-0.025	-0.026		13.306	12	0.347
		13	-0.011	-0.011		13.446	13	0.414
		14	-0.021	-0.022		13.93	14	0.455
		15	-0.019	-0.021		14.322	15	0.501
		16	-0.099	-0.102		24.861	16	0.072
		17	-0.003	-0.005		24.869	17	0.098
		18	0.018	0.019		25.217	18	0.119
		19	0.04	0.026		26.93	19	0.106
		20	0.04	0.038		28.66	20	0.095
	ORIX LSG	1	-0.065	-0.065		2.873	1	0.09
		2	-0.006	-0.01		2.898	2	0.235
		3	-0.022	-0.023		3.236	3	0.357
		4	-0.035	-0.038		4.072	4	0.396

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		5	-0.043	-0.048		5.326	5	0.377
		6	-0.006	-0.014		5.355	6	0.499
		7	-0.01	-0.014		5.426	7	0.608
		8	0.034	0.029		6.224	8	0.622
		9	0.016	0.016		6.404	9	0.699
		10	0.071	0.071		9.847	10	0.454
		11	0.03	0.04		10.467	11	0.489
		12	-0.018	-0.009		10.693	12	0.555
		13	-0.055	-0.049		12.763	13	0.466
		14	-0.05	-0.05		14.535	14	0.411
		15	-0.017	-0.017		14.73	15	0.471
		16	-0.015	-0.019		14.89	16	0.533
		17	0.004	-0.005		14.903	17	0.602
		18	0.009	-0.005		14.955	18	0.665
		19	-0.123	-0.137		25.531	19	0.144
		20	0.043	0.014		26.816	20	0.141
	MALAYSIA 5	1	0.109	0.109		8.287	1	0.004
		2	0.134	0.123		20.789	2	0
		3	-0.007	-0.034		20.82	3	0
		4	0.011	-0.002		20.906	4	0
		5	-0.082	-0.08		25.629	5	0
		6	0.047	0.064		27.215	6	0
		7	0.038	0.05		28.229	7	0
		8	0.043	0.018		29.51	8	0
		9	-0.01	-0.027		29.587	9	0.001
		10	-0.001	-0.013		29.588	10	0.001

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		11	-0.107	-0.095		37.65	11	0
		12	-0.01	0.017		37.726	12	0
		13	-0.047	-0.021		39.279	13	0
		14	-0.005	-0.009		39.299	14	0
		15	0.016	0.026		39.478	15	0.001
		16	0.091	0.075		45.421	16	0
		17	0.009	-0.001		45.481	17	0
		18	0.016	-0.003		45.664	18	0
		19	0.021	0.028		45.972	19	0.001
		20	-0.032	-0.038		46.704	20	0.001
	STD.CHT.BANK	1	-0.202	-0.202		39.385	1	0
		2	-0.02	-0.064		39.789	2	0
		3	-0.003	-0.022		39.801	3	0
		4	-0.028	-0.036		40.555	4	0
		5	-0.111	-0.131		52.406	5	0
		6	0.024	-0.033		52.962	6	0
		7	0.002	-0.013		52.966	7	0
		8	-0.011	-0.02		53.073	8	0
		9	-0.032	-0.052		54.06	9	0
		10	0.083	0.052		60.697	10	0
		11	-0.065	-0.044		64.807	11	0
		12	-0.018	-0.041		65.121	12	0
		13	-0.007	-0.032		65.168	13	0
		14	0.033	0.019		66.236	14	0
		15	-0.049	-0.033		68.54	15	0
		16	0.104	0.078		79.116	16	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		17	0.008	0.037		79.173	17	0
		18	-0.066	-0.054		83.463	18	0
		19	0.009	-0.006		83.549	19	0
		20	-0.009	-0.022		83.635	20	0
	BK.NEGARA	1	-0.012	-0.012		0.013	1	0.909
		2	0	0		0.013	2	0.993
		3	0	0		0.013	3	1
		4	-0.001	-0.001		0.013	4	1
		5	-0.001	-0.001		0.013	5	1
		6	-0.001	-0.001		0.013	6	1
		7	-0.001	-0.001		0.013	7	1
		8	-0.001	-0.001		0.014	8	1
		9	-0.001	-0.001		0.014	9	1
		10	-0.001	-0.002		0.014	10	1
		11	-0.002	-0.002		0.014	11	1
		12	-0.002	-0.002		0.015	12	1
		13	-0.002	-0.002		0.015	13	1
		14	-0.002	-0.002		0.015	14	1
		15	-0.002	-0.002		0.016	15	1
		16	-0.002	-0.002		0.017	16	1
		17	-0.003	-0.003		0.017	17	1
		18	-0.003	-0.003		0.018	18	1
		19	-0.003	-0.003		0.019	19	1
		20	-0.003	-0.003		0.02	20	1
	QATAR PETROLEUM	1	0.015	0.015		0.131	1	0.717
		2	-0.057	-0.058		2.19	2	0.334

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
Qatar						3		
		3	-0.02	-0.019		2.451	3	0.484
		4	0.02	0.017		2.696	4	0.61
		5	-0.007	-0.009		2.723	5	0.743
		6	0	0.002		2.724	6	0.843
		7	-0.018	-0.018		2.923	7	0.892
		8	0.014	0.014		3.054	8	0.931
		9	0.036	0.034		3.864	9	0.92
		10	-0.066	-0.067		6.664	10	0.757
		11	-0.026	-0.019		7.09	11	0.792
		12	0.014	0.008		7.21	12	0.843
		13	0.028	0.022		7.713	13	0.862
		14	0.008	0.01		7.751	14	0.902
		15	-0.044	-0.042		8.983	15	0.878
		16	-0.026	-0.023		9.429	16	0.895
		17	0.017	0.01		9.617	17	0.919
		18	0.074	0.07		13.09	18	0.786
		19	-0.067	-0.063		15.965	19	0.66
		20	-0.053	-0.046		17.761	20	0.603
	QATAR	1	-0.248	-0.248		95.081	1	0
		2	-0.036	-0.104		97.129	2	0
		3	-0.064	-0.107		103.425	3	0
		4	0.016	-0.036		103.833	4	0
		5	0.012	-0.006		104.068	5	0
		6	-0.062	-0.072		109.978	6	0
		7	0.083	0.051		120.663	7	0
		8	-0.005	0.024		120.	8	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						705		
		9	0.026	0.037		121.756	9	0
		10	-0.034	-0.005		123.567	10	0
		11	-0.045	-0.052		126.71	11	0
		12	0.069	0.044		134.178	12	0
		13	-0.073	-0.053		142.574	13	0
		14	-0.005	-0.045		142.615	14	0
		15	-0.013	-0.032		142.884	15	0
		16	-0.021	-0.06		143.605	16	0
		17	0.047	0.017		147.017	17	0
		18	0.005	0.028		147.06	18	0
		19	0.017	0.019		147.531	19	0
		20	-0.036	-0.01		149.565	20	0
	QATAR PETROLEUM 2	1	0	0		0	1	0.995
		2	0.049	0.049		0.536	2	0.765
		3	0.019	0.019		0.619	3	0.892
		4	-0.141	-0.144		4.999	4	0.287
		5	0.227	0.231		16.445	5	0.006
		6	0.016	0.024		16.504	6	0.011
		7	-0.146	-0.18		21.272	7	0.003
		8	-0.063	-0.091		22.162	8	0.005
		9	-0.129	-0.041		25.937	9	0.002
		10	0.135	0.12		30.084	10	0.001
		11	0.117	0.081		33.223	11	0
		12	-0.031	-0.006		33.444	12	0.001
		13	-0.123	-0.146		36.918	13	0
		14	-0.189	-0.158		45.173	14	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		15	-0.008	-0.029		45.186	15	0
		16	-0.021	-0.075		45.287	16	0
		17	0.012	0.024		45.318	17	0
		18	-0.157	-0.111		51.142	18	0
		19	-0.124	-0.036		54.825	19	0
		20	0.086	0.084		56.584	20	0
	QATAR 2	1	-0.03	-0.03		2.393	1	0.122
		2	-0.042	-0.043		7.113	2	0.029
		3	-0.032	-0.034		9.71	3	0.021
		4	-0.177	-0.181		91.444	4	0
		5	-0.137	-0.159		140.537	5	0
		6	-0.033	-0.071		143.324	6	0
		7	-0.197	-0.25		244.571	7	0
		8	0.087	-0.004		264.267	8	0
		9	0.021	-0.08		265.463	9	0
		10	-0.078	-0.17		281.375	10	0
		11	-0.023	-0.175		282.793	11	0
		12	0.121	0.008		321.52	12	0
		13	-0.036	-0.114		324.845	13	0
		14	0.116	-0.01		360.233	14	0
		15	-0.038	-0.111		363.937	15	0
		16	0.118	0.092		400.596	16	0
		17	-0.067	-0.134		412.547	17	0
		18	-0.082	-0.111		430.325	18	0
		19	-0.078	-0.092		446.497	19	0
		20	0.041	-0.024		450.858	20	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
	QATAR 3	1	-0.037	-0.037		1.299	1	0.254
		2	-0.002	-0.003		1.302	2	0.522
		3	0.047	0.047		3.404	3	0.333
		4	0.055	0.059		6.24	4	0.182
		5	0.044	0.049		8.025	5	0.155
		6	0.008	0.01		8.09	6	0.232
		7	0.04	0.035		9.561	7	0.215
		8	-0.047	-0.052		11.629	8	0.169
		9	0.02	0.01		11.999	9	0.213
		10	-0.028	-0.034		12.713	10	0.24
		11	0.022	0.02		13.186	11	0.281
		12	0.038	0.041		14.575	12	0.265
		13	0.028	0.038		15.323	13	0.288
		14	-0.038	-0.036		16.687	14	0.273
		15	0.038	0.036		18.046	15	0.26
		16	-0.048	-0.059		20.182	16	0.212
		17	-0.005	-0.01		20.205	17	0.264
		18	-0.009	-0.018		20.275	18	0.318
		19	-0.028	-0.025		21.006	19	0.336
		20	0.04	0.043		22.548	20	0.312
	QATAR 4	1	-0.158	-0.158		27.36	1	0
		2	-0.078	-0.105		33.964	2	0
		3	0.011	-0.02		34.106	3	0
		4	0.059	0.051		37.913	4	0
		5	-0.019	0		38.291	5	0
		6	-0.016	-0.009		38.568	6	0
		7	0.017	0.012		38.904	7	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		8	0.028	0.028		39.744	8	0
		9	0.042	0.057		41.658	9	0
		10	0.049	0.075		44.32	10	0
		11	0.012	0.042		44.47	11	0
		12	-0.004	0.013		44.488	12	0
		13	-0.033	-0.034		45.705	13	0
		14	0.044	0.028		47.816	14	0
		15	-0.034	-0.031		49.129	15	0
		16	-0.05	-0.06		51.95	16	0
		17	0.06	0.035		55.998	17	0
		18	0.02	0.016		56.461	18	0
		19	-0.055	-0.048		59.875	19	0
		20	0.033	0.02		61.124	20	0
	QATAR 5	1	-0.134	-0.134		19.578	1	0
		2	-0.02	-0.039		20.031	2	0
		3	0.019	0.011		20.425	3	0
		4	-0.021	-0.018		20.898	4	0
		5	0.05	0.046		23.608	5	0
		6	-0.023	-0.012		24.202	6	0
		7	-0.003	-0.005		24.212	7	0.001
		8	0.044	0.042		26.381	8	0.001
		9	0.012	0.026		26.53	9	0.002
		10	-0.044	-0.04		28.66	10	0.001
		11	0.077	0.069		35.224	11	0
		12	0.001	0.02		35.226	12	0
		13	0.061	0.068		39.351	13	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		14	-0.042	-0.028		41.297	14	0
		15	0.002	0.003		41.301	15	0
		16	-0.011	-0.025		41.445	16	0
		17	-0.071	-0.076		47.064	17	0
		18	0.003	-0.022		47.077	18	0
		19	-0.019	-0.025		47.46	19	0
		20	0.004	-0.008		47.478	20	0.001
	QATAR 6	1	-0.179	-0.179		30.033	1	0
		2	-0.003	-0.036		30.039	2	0
		3	-0.048	-0.057		32.222	3	0
		4	0.064	0.046		36.03	4	0
		5	-0.053	-0.037		38.654	5	0
		6	0.024	0.008		39.176	6	0
		7	0.013	0.022		39.335	7	0
		8	0.026	0.027		39.959	8	0
		9	-0.009	0.008		40.032	9	0
		10	-0.016	-0.018		40.289	10	0
		11	-0.001	-0.006		40.289	11	0
		12	0.027	0.024		40.961	12	0
		13	-0.009	0		41.041	13	0
		14	-0.056	-0.059		44.024	14	0
		15	0.035	0.015		45.214	15	0
		16	-0.022	-0.019		45.656	16	0
		17	-0.046	-0.056		47.698	17	0
		18	0.012	-0.001		47.825	18	0
		19	-0.022	-0.034		48.281	19	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		20	0.049	0.042		50.556	20	0
	QATAR 7	1	0.031	0.031		0.899	1	0.343
		2	0.076	0.075		6.274	2	0.043
		3	0.011	0.007		6.395	3	0.094
		4	0.01	0.004		6.487	4	0.166
		5	0.094	0.093		14.801	5	0.011
		6	0.069	0.063		19.236	6	0.004
		7	0.051	0.034		21.674	7	0.003
		8	-0.015	-0.028		21.886	8	0.005
		9	0.024	0.018		22.446	9	0.008
		10	0.079	0.074		28.299	10	0.002
		11	-0.008	-0.026		28.354	11	0.003
		12	0.05	0.028		30.695	12	0.002
		13	0.053	0.053		33.344	13	0.002
		14	-0.002	-0.012		33.349	14	0.003
		15	-0.042	-0.065		34.977	15	0.002
		16	-0.031	-0.037		35.861	16	0.003
		17	0.023	0.024		36.362	17	0.004
		18	0.032	0.028		37.331	18	0.005
		19	0.03	0.012		38.169	19	0.006
		20	-0.005	-0.008		38.195	20	0.008
	QATAR 8	1	-0.15	-0.15		9.038	1	0.003
		2	-0.094	-0.119		12.638	2	0.002
		3	0.097	0.066		16.449	3	0.001
		4	0.021	0.038		16.629	4	0.002
		5	0.138	0.171		24.4	5	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						32		
		6	-0.093	-0.048		27.991	6	0
		7	-0.045	-0.047		28.811	7	0
		8	0.036	-0.025		29.343	8	0
		9	-0.021	-0.028		29.517	9	0.001
		10	0.052	0.044		30.638	10	0.001
		11	-0.062	-0.027		32.232	11	0.001
		12	-0.02	-0.014		32.394	12	0.001
		13	-0.042	-0.08		33.133	13	0.002
		14	0.051	0.04		34.219	14	0.002
		15	-0.038	-0.045		34.822	15	0.003
		16	-0.144	-0.124		43.517	16	0
		17	0.073	0.025		45.732	17	0
		18	-0.019	-0.019		45.886	18	0
		19	0.025	0.046		46.159	19	0
		20	0.007	0.028		46.18	20	0.001
	QATAR 9	1	-0.176	-0.176		12.339	1	0
		2	0.052	0.022		13.418	2	0.001
		3	0.086	0.102		16.355	3	0.001
		4	-0.036	-0.005		16.871	4	0.002
		5	0.158	0.148		26.912	5	0
		6	0.031	0.082		27.309	6	0
		7	-0.061	-0.055		28.826	7	0
		8	0.024	-0.031		29.065	8	0
		9	-0.046	-0.052		29.915	9	0
		10	0.149	0.129		38.955	10	0
		11	-0.064	-0.031		40.6	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						32	1	
		12	-0.002	-0.008		40.634	12	0
		13	-0.015	-0.032		40.732	13	0
		14	-0.108	-0.109		45.557	14	0
		15	0.175	0.116		58.133	15	0
		16	-0.129	-0.081		65.049	16	0
		17	-0.023	-0.027		65.259	17	0
		18	-0.016	-0.041		65.359	18	0
		19	-0.086	-0.043		68.444	19	0
		20	0.126	0.074		75.099	20	0
	QATAR 10	1	0.163	0.163		28.66	1	0
		2	-0.077	-0.106		35.058	2	0
		3	-0.171	-0.146		66.809	3	0
		4	0.003	0.052		66.818	4	0
		5	0.006	-0.03		66.853	5	0
		6	0	-0.019		66.853	6	0
		7	-0.002	0.01		66.859	7	0
		8	0.003	-0.004		66.868	8	0
		9	-0.002	-0.005		66.872	9	0
		10	0.001	0.003		66.872	10	0
		11	0	-0.001		66.872	11	0
		12	0.168	0.178		97.582	12	0
		13	-0.004	-0.067		97.595	13	0
		14	-0.151	-0.131		122.671	14	0
		15	-0.437	-0.376		331.646	15	0
		16	0.001	0.111		331.648	16	0
		17	0.009	-0.117		331.	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						747	7	
		18	-0.001	-0.104		331.748	18	0
		19	-0.002	0.046		331.754	19	0
		20	0.002	-0.039		331.758	20	0
	QATAR 11	1	-0.35	-0.35		56.181	1	0
		2	-0.065	-0.214		58.144	2	0
		3	0.023	-0.096		58.379	3	0
		4	-0.152	-0.232		69.048	4	0
		5	0.301	0.182		110.952	5	0
		6	-0.097	0.062		115.273	6	0
		7	-0.03	0.035		115.704	7	0
		8	-0.076	-0.111		118.372	8	0
		9	-0.099	-0.158		122.908	9	0
		10	0.261	0.092		154.736	10	0
		11	-0.053	0.071		156.055	11	0
		12	-0.02	0.05		156.248	12	0
		13	-0.12	-0.104		163.007	13	0
		14	-0.088	-0.148		166.645	14	0
		15	0.303	0.131		209.91	15	0
		16	-0.181	-0.087		225.361	16	0
		17	0.013	-0.06		225.435	17	0
		18	-0.012	0.011		225.502	18	0
		19	-0.073	0.034		228.051	19	0
		20	0.21	0.071		249.197	20	0
	QATAR 12	1	-0.129	-0.129		18.027	1	0
		2	0.029	0.012		18.913	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		3	-0.043	-0.038		20.881	3	0
		4	0.024	0.014		21.511	4	0
		5	0.005	0.011		21.538	5	0.001
		6	-0.007	-0.007		21.593	6	0.001
		7	0.013	0.012		21.766	7	0.003
		8	-0.006	-0.003		21.811	8	0.005
		9	0.032	0.03		22.899	9	0.006
		10	0.073	0.084		28.715	10	0.001
		11	0.034	0.054		29.984	11	0.002
		12	0.004	0.016		30	12	0.003
		13	-0.061	-0.057		34.108	13	0.001
		14	-0.03	-0.048		35.088	14	0.001
		15	0.003	-0.008		35.096	15	0.002
		16	-0.031	-0.037		36.164	16	0.003
		17	0.04	0.031		37.916	17	0.003
		18	-0.038	-0.028		39.519	18	0.002
		19	0.013	-0.005		39.717	19	0.004
		20	0.053	0.052		42.775	20	0.002
UAE	ABUDHABI COML	1	-0.06	-0.06		5.566	1	0.018
		2	0.033	0.029		7.224	2	0.027
		3	-0.015	-0.011		7.552	3	0.056
		4	-0.008	-0.01		7.642	4	0.106
		5	-0.032	-0.032		9.201	5	0.101
		6	0	-0.003		9.202	6	0.163
		7	0.027	0.029		10.347	7	0.17
		8	-0.071	-0.069		18.275	8	0.019

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		9	0.027	0.016		19.38	9	0.022
		10	0.013	0.019		19.638	10	0.033
		11	0.028	0.027		20.84	11	0.035
		12	0.005	0.008		20.883	12	0.052
		13	0.012	0.008		21.126	13	0.07
		14	-0.011	-0.008		21.302	14	0.094
		15	0.022	0.026		22.036	15	0.107
		16	0.014	0.013		22.33	16	0.133
		17	0.038	0.041		24.626	17	0.103
		18	0.029	0.035		25.963	18	0.101
		19	0.026	0.03		26.994	19	0.105
		20	-0.02	-0.017		27.628	20	0.118
	ABUDHABI COML 2	1	-0.024	-0.024		0.383	1	0.536
		2	0.037	0.037		1.274	2	0.529
		3	0.025	0.027		1.678	3	0.642
		4	0.009	0.009		1.736	4	0.784
		5	0.025	0.024		2.137	5	0.83
		6	-0.026	-0.026		2.577	6	0.86
		7	0.02	0.017		2.836	7	0.9
		8	0.012	0.014		2.934	8	0.938
		9	0.002	0.002		2.937	9	0.967
		10	0.032	0.03		3.603	10	0.963
		11	-0.007	-0.006		3.638	11	0.979
		12	-0.023	-0.027		3.969	12	0.984
		13	0.029	0.028		4.534	13	0.984
		14	-0.025	-0.022		4.929	14	0.987

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		15	-0.014	-0.017		5.05	15	0.992
		16	0.018	0.02		5.272	16	0.994
		17	0.015	0.017		5.418	17	0.996
		18	0.019	0.017		5.656	18	0.997
		19	-0.025	-0.023		6.078	19	0.998
		20	0.02	0.014		6.331	20	0.998
	X STRATA	1	-0.005	-0.005		0.017	1	0.896
		2	0.214	0.214		38.788	2	0
		3	0.007	0.009		38.829	3	0
		4	-0.012	-0.06		38.942	4	0
		5	0.005	0.001		38.964	5	0
		6	0.008	0.025		39.021	6	0
		7	-0.006	-0.007		39.05	7	0
		8	0.003	-0.006		39.056	8	0
		9	0.001	0.005		39.058	9	0
		10	-0.004	-0.002		39.071	10	0
		11	-0.016	-0.019		39.284	11	0
		12	-0.01	-0.009		39.37	12	0
		13	-0.01	-0.002		39.456	13	0
		14	-0.008	-0.005		39.517	14	0
		15	-0.002	-0.001		39.522	15	0.001
		16	0.001	0.003		39.522	16	0.001
		17	0.001	0.002		39.523	17	0.002
		18	-0.016	-0.018		39.743	18	0.002
		19	-0.007	-0.008		39.781	19	0.003
		20	-0.021	-0.013		40.147	20	0.005

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
	ADCB	1	0.064	0.064		0.897	1	0.344
		2	0.257	0.253		15.251	2	0
		3	0.015	-0.015		15.299	3	0.002
		4	0.025	-0.043		15.44	4	0.004
		5	0.092	0.099		17.298	5	0.004
		6	0.084	0.086		18.871	6	0.004
		7	0.218	0.177		29.478	7	0
		8	0.002	-0.061		29.48	8	0
		9	0.181	0.1		36.9	9	0
		10	0.077	0.092		38.232	10	0
		11	0.073	-0.003		39.462	11	0
		12	-0.023	-0.107		39.579	12	0
		13	0.033	0.008		39.823	13	0
		14	-0.06	-0.08		40.647	14	0
		15	-0.047	-0.079		41.154	15	0
		16	-0.075	-0.129		42.482	16	0
		17	0.005	0.025		42.488	17	0.001
		18	-0.063	-0.05		43.413	18	0.001
		19	-0.071	-0.092		44.6	19	0.001
		20	-0.113	-0.12		47.652	20	0
	DUBI	1	-0.003	-0.003		0.002	1	0.963
		2	-0.003	-0.003		0.004	2	0.998
		3	-0.011	-0.011		0.032	3	0.999
		4	-0.234	-0.234		11.858	4	0.018
		5	0	-0.002		11.858	5	0.037
		6	0	-0.002		11.858	6	0.065

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
		7	0	-0.006		11.858	7	0.105
		8	0	-0.058		11.858	8	0.158
		9	0	-0.001		11.858	9	0.221
		10	0	-0.001		11.858	10	0.295
		11	-0.001	-0.003		11.858	11	0.374
		12	0	-0.015		11.858	12	0.457
		13	0	0		11.858	13	0.539
		14	-0.004	-0.005		11.862	14	0.617
		15	-0.002	-0.003		11.862	15	0.689
		16	-0.004	-0.008		11.867	16	0.753
		17	0	0		11.867	17	0.808
		18	0	-0.002		11.867	18	0.854
		19	0.004	0.003		11.87	19	0.891
		20	0	-0.003		11.87	20	0.92
	ABUDHABI NAT	1	0.07	0.07		3.743	1	0.053
		2	0.043	0.039		5.189	2	0.075
		3	0.06	0.055		7.963	3	0.047
		4	0.015	0.006		8.144	4	0.086
		5	-0.043	-0.049		9.591	5	0.088
		6	0.021	0.024		9.945	6	0.127
		7	0.018	0.018		10.203	7	0.177
		8	0.031	0.033		10.964	8	0.204
		9	-0.048	-0.055		12.745	9	0.175
		10	-0.02	-0.021		13.045	10	0.221
		11	0.018	0.023		13.288	11	0.275
		12	-0.016	-0.011		13.49	12	0.334

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		13	-0.063	-0.058		16.591	13	0.219
		14	-0.019	-0.019		16.878	14	0.263
		15	-0.014	-0.006		17.035	15	0.317
		16	-0.032	-0.018		17.821	16	0.334
		17	-0.096	-0.089		25.165	17	0.091
		18	-0.017	-0.01		25.394	18	0.114
		19	0.026	0.038		25.948	19	0.132
		20	0.002	0.015		25.951	20	0.167
	DUBI 2	1	-0.276	-0.276		15.518	1	0
		2	0.097	0.022		17.445	2	0
		3	-0.006	0.028		17.453	3	0.001
		4	-0.01	-0.007		17.473	4	0.002
		5	-0.077	-0.091		18.713	5	0.002
		6	-0.004	-0.052		18.717	6	0.005
		7	-0.07	-0.08		19.756	7	0.006
		8	0.083	0.055		21.22	8	0.007
		9	-0.1	-0.063		23.347	9	0.005
		10	0.077	0.021		24.601	10	0.006
		11	0.006	0.032		24.608	11	0.01
		12	0.057	0.062		25.309	12	0.013
		13	0.023	0.057		25.419	13	0.02
		14	-0.115	-0.125		28.273	14	0.013
		15	0.047	-0.013		28.75	15	0.017
		16	-0.051	-0.033		29.317	16	0.022
		17	-0.033	-0.025		29.559	17	0.03
		18	0.027	0.012		29.717	18	0.04

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
		19	-0.112	-0.119		32.528	19	0.027
		20	0.055	-0.014		33.201	20	0.032
	DUBAI.HLDG.COML	1	0.221	0.221		39.594	1	0
		2	0.081	0.034		44.905	2	0
		3	0.051	0.028		47.046	3	0
		4	0.001	-0.019		47.048	4	0
		5	0.062	0.065		50.203	5	0
		6	0.069	0.045		54.114	6	0
		7	0.057	0.03		56.797	7	0
		8	0.079	0.054		61.88	8	0
		9	0.002	-0.033		61.883	9	0
		10	0.023	0.021		62.326	10	0
		11	0.03	0.015		63.057	11	0
		12	-0.004	-0.019		63.07	12	0
		13	0.037	0.029		64.184	13	0
		14	-0.002	-0.022		64.187	14	0
		15	-0.052	-0.057		66.451	15	0
		16	-0.035	-0.022		67.463	16	0
		17	-0.114	-0.101		78.132	17	0
		18	-0.093	-0.054		85.216	18	0
		19	-0.007	0.03		85.253	19	0
		20	0.011	0.026		85.358	20	0
	AXIS BANK	1	-0.035	-0.035		0.987	1	0.321
		2	0.013	0.012		1.125	2	0.57
		3	0.009	0.01		1.193	3	0.755
		4	0.01	0.01		1.26	4	0.867

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						5		
		5	-0.005	-0.005		1.286	5	0.936
		6	-0.001	-0.001		1.286	6	0.972
		7	-0.003	-0.003		1.295	7	0.989
		8	-0.019	-0.019		1.589	8	0.991
		9	-0.003	-0.004		1.596	9	0.996
		10	-0.023	-0.023		2.026	10	0.996
		11	-0.005	-0.007		2.05	11	0.998
		12	-0.014	-0.014		2.217	12	0.999
		13	0.005	0.004		2.234	13	1
		14	0.013	0.014		2.374	14	1
		15	0.017	0.018		2.618	15	1
		16	0.014	0.015		2.781	16	1
		17	0.023	0.023		3.222	17	1
		18	0.021	0.021		3.595	18	1
		19	-0.006	-0.006		3.625	19	1
		20	-0.001	-0.004		3.626	20	1
	DUI.ELTY.WT.AUTH	1	-0.031	-0.031		0.884	1	0.347
		2	0.024	0.023		1.431	2	0.489
		3	0.036	0.037		2.61	3	0.456
		4	-0.024	-0.022		3.138	4	0.535
		5	0.027	0.024		3.833	5	0.574
		6	0.01	0.012		3.935	6	0.685
		7	-0.061	-0.06		7.425	7	0.386
		8	0.003	-0.004		7.433	8	0.491
		9	-0.032	-0.029		8.376	9	0.497
		10	0.118	0.121		21.333	10	0.019

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig. a
		11	0.042	0.048		22.984	11	0.018
		12	-0.021	-0.019		23.381	12	0.025
		13	-0.012	-0.025		23.521	13	0.036
		14	-0.072	-0.075		28.394	14	0.013
		15	-0.072	-0.08		33.277	15	0.004
		16	0.01	0.001		33.377	16	0.007
		17	-0.031	-0.006		34.283	17	0.008
		18	-0.02	-0.01		34.659	18	0.01
		19	-0.067	-0.063		38.915	19	0.005
		20	0.019	0.008		39.252	20	0.006
	AXIS BANK 2	1	-0.05	-0.05		2.377	1	0.123
		2	-0.061	-0.064		5.905	2	0.052
		3	-0.041	-0.048		7.484	3	0.058
		4	0.102	0.094		17.341	4	0.002
		5	-0.015	-0.01		17.553	5	0.004
		6	0.078	0.088		23.244	6	0.001
		7	0.032	0.048		24.224	7	0.001
		8	-0.043	-0.04		25.984	8	0.001
		9	-0.015	-0.005		26.188	9	0.002
		10	0.133	0.116		42.991	10	0
		11	-0.004	-0.003		43.01	11	0
		12	-0.026	-0.01		43.679	12	0
		13	0.037	0.042		45.009	13	0
		14	0.063	0.046		48.818	14	0
		15	0.012	0.029		48.958	15	0
		16	-0.091	-0.099		56.806	16	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		17	-0.016	-0.038		57.039	17	0
		18	0.001	-0.009		57.04	18	0
		19	0.022	0.005		57.524	19	0
		20	-0.005	-0.018		57.552	20	0
	NAT.BK.ABUDHAB	1	0.083	0.083		4.205	1	0.04
		2	0.036	0.03		5.006	2	0.082
		3	-0.082	-0.088		9.05	3	0.029
		4	-0.088	-0.076		13.735	4	0.008
		5	0.049	0.069		15.177	5	0.01
		6	0.007	-0.003		15.203	6	0.019
		7	-0.038	-0.058		16.078	7	0.024
		8	-0.021	-0.011		16.351	8	0.038
		9	-0.051	-0.034		17.96	9	0.036
		10	0.046	0.045		19.253	10	0.037
		11	0.104	0.093		25.977	11	0.007
		12	-0.016	-0.043		26.143	12	0.01
		13	-0.01	-0.014		26.21	13	0.016
		14	-0.105	-0.076		33.082	14	0.003
		15	0.004	0.028		33.094	15	0.005
		16	-0.03	-0.047		33.639	16	0.006
		17	-0.007	-0.014		33.668	17	0.009
		18	-0.125	-0.131		43.4	18	0.001
		19	-0.048	-0.016		44.842	19	0.001
		20	0.041	0.059		45.917	20	0.001
	EXOVALTD.ABUDHABI	1	-0.256	-0.256		52.227	1	0
		2	-0.04	-0.113		53.488	2	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		3	-0.012	-0.056		53.594	3	0
		4	-0.065	-0.096		56.968	4	0
		5	-0.082	-0.144		62.348	5	0
		6	-0.022	-0.113		62.734	6	0
		7	0.018	-0.056		62.98	7	0
		8	0.021	-0.022		63.348	8	0
		9	-0.024	-0.06		63.823	9	0
		10	-0.147	-0.224		81.161	10	0
		11	0.232	0.11		124.376	11	0
		12	-0.053	0.007		126.61	12	0
		13	0.053	0.06		128.909	13	0
		14	-0.031	-0.03		129.703	14	0
		15	-0.098	-0.133		137.474	15	0
		16	0.085	0.058		143.377	16	0
		17	0.001	0.061		143.379	17	0
		18	-0.01	0.019		143.46	18	0
		19	0.029	0.002		144.141	19	0
		20	-0.013	-0.027		144.276	20	0
	NAT.BK.ABUDHAB2	1	-0.011	-0.011		0.098	1	0.755
		2	-0.035	-0.035		1.052	2	0.591
		3	0.03	0.029		1.757	3	0.624
		4	0.101	0.101		9.657	4	0.047
		5	0.029	0.034		10.292	5	0.067
		6	0.086	0.094		16.08	6	0.013
		7	-0.024	-0.025		16.515	7	0.021
		8	-0.004	-0.011		16.528	8	0.035

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		9	0.015	0.001		16.708	9	0.053
		10	0.092	0.075		23.316	10	0.01
		11	0.035	0.04		24.271	11	0.012
		12	0.035	0.039		25.239	12	0.014
		13	-0.064	-0.064		28.478	13	0.008
		14	-0.035	-0.056		29.425	14	0.009
		15	0.019	-0.005		29.723	15	0.013
		16	-0.008	-0.031		29.777	16	0.019
		17	-0.039	-0.027		30.962	17	0.02
		18	0.012	0.019		31.079	18	0.028
		19	0.024	0.037		31.531	19	0.035
		20	-0.089	-0.089		37.864	20	0.009
	ABUDHABI NAT 2	1	-0.132	-0.132		18.78	1	0
		2	-0.073	-0.092		24.55	2	0
		3	-0.017	-0.041		24.871	3	0
		4	0.079	0.066		31.649	4	0
		5	-0.01	0.007		31.751	5	0
		6	-0.009	0.002		31.848	6	0
		7	0.006	0.008		31.889	7	0
		8	0.051	0.048		34.719	8	0
		9	-0.018	-0.003		35.087	9	0
		10	0.032	0.039		36.202	10	0
		11	0.035	0.046		37.564	11	0
		12	-0.062	-0.055		41.822	12	0
		13	0.019	0.012		42.23	13	0
		14	0.012	0.004		42.396	14	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		15	0.004	0		42.417	15	0
		16	-0.04	-0.033		44.204	16	0
		17	0.029	0.018		45.1	17	0
		18	-0.044	-0.051		47.221	18	0
		19	-0.012	-0.027		47.371	19	0
		20	0.015	0.014		47.603	20	0
	ABUDHABI NAT 3	1	-0.178	-0.178		24.472	1	0
		2	0.058	0.027		27.032	2	0
		3	0.024	0.04		27.47	3	0
		4	-0.009	0		27.536	4	0
		5	0.016	0.012		27.733	5	0
		6	0.056	0.062		30.163	6	0
		7	-0.038	-0.019		31.294	7	0
		8	-0.001	-0.018		31.294	8	0
		9	0.089	0.089		37.528	9	0
		10	0.017	0.053		37.744	10	0
		11	0.038	0.041		38.891	11	0
		12	-0.008	-0.005		38.943	12	0
		13	-0.032	-0.037		39.741	13	0
		14	0.062	0.047		42.744	14	0
		15	-0.062	-0.054		45.778	15	0
		16	0.017	-0.006		46.004	16	0
		17	-0.002	0.002		46.006	17	0
		18	-0.046	-0.049		47.687	18	0
		19	0.013	-0.011		47.816	19	0
		20	0.057	0.051		50.358	20	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
	ABUDHABI NAT 4	1	-0.058	-0.058		5.215	1	0.022
		2	0.016	0.012		5.591	2	0.061
		3	-0.076	-0.075		14.597	3	0.002
		4	0.028	0.019		15.799	4	0.003
		5	-0.16	-0.157		55.414	5	0
		6	0.057	0.036		60.54	6	0
		7	0.003	0.013		60.553	7	0
		8	0.028	0.006		61.811	8	0
		9	-0.021	-0.007		62.506	9	0
		10	0.068	0.043		69.731	10	0
		11	0.009	0.032		69.864	11	0
		12	0.024	0.025		70.76	12	0
		13	-0.019	-0.005		71.334	13	0
		14	-0.024	-0.03		72.228	14	0
		15	0.026	0.045		73.268	15	0
		16	-0.016	-0.014		73.674	16	0
		17	0.033	0.034		75.4	17	0
		18	0.011	0.012		75.588	18	0
		19	0.031	0.023		77.122	19	0
		20	-0.062	-0.046		83.078	20	0
	ABUDHABICOML. BK	1	-0.275	-0.275		84.458	1	0
		2	-0.034	-0.119		85.782	2	0
		3	-0.071	-0.126		91.407	3	0
		4	-0.015	-0.087		91.674	4	0
		5	0.059	0.014		95.627	5	0
		6	-0.123	-0.129		112.	6	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						441		
		7	0.082	0.006		119.992	7	0
		8	0.022	0.035		120.532	8	0
		9	-0.071	-0.072		126.252	9	0
		10	0.036	-0.001		127.716	10	0
		11	0.124	0.159		145.069	11	0
		12	-0.072	-0.011		150.852	12	0
		13	-0.031	-0.021		151.903	13	0
		14	-0.133	-0.136		171.93	14	0
		15	0.165	0.07		202.791	15	0
		16	-0.067	-0.035		207.805	16	0
		17	0.076	0.086		214.269	17	0
		18	-0.119	-0.118		230.258	18	0
		19	0.064	0.02		234.887	19	0
		20	0.018	0.018		235.253	20	0
	DUI.ELTY.WT.AUTH2	1	-0.126	-0.126		12.594	1	0
		2	0.045	0.03		14.233	2	0.001
		3	0.021	0.031		14.582	3	0.002
		4	0.036	0.041		15.594	4	0.004
		5	-0.005	0.002		15.617	5	0.008
		6	0.049	0.046		17.535	6	0.008
		7	-0.045	-0.036		19.155	7	0.008
		8	-0.036	-0.053		20.224	8	0.01
		9	0.035	0.025		21.195	9	0.012
		10	0.011	0.021		21.29	10	0.019
		11	0.056	0.065		23.831	11	0.013
		12	-0.041	-0.029		25.1	1	0.014

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						84	2	
		13	-0.022	-0.036		25.573	13	0.019
		14	-0.017	-0.025		25.795	14	0.027
		15	-0.036	-0.049		26.823	15	0.03
		16	-0.026	-0.032		27.353	16	0.038
		17	-0.081	-0.085		32.748	17	0.012
		18	-0.007	-0.013		32.79	18	0.018
		19	-0.036	-0.025		33.855	19	0.019
		20	0.033	0.027		34.765	20	0.021
KSA	SAUDI BRITISH BANK2	1	-0.329	-0.329		84.33	1	0
		2	0	-0.122		84.33	2	0
		3	-0.071	-0.126		88.233	3	0
		4	-0.033	-0.117		89.071	4	0
		5	0.034	-0.036		90.002	5	0
		6	0.012	-0.006		90.107	6	0
		7	-0.062	-0.079		93.097	7	0
		8	-0.015	-0.077		93.266	8	0
		9	-0.004	-0.055		93.28	9	0
		10	0.042	0.001		94.681	10	0
		11	0.052	0.057		96.8	11	0
		12	-0.048	-0.009		98.592	12	0
		13	-0.001	-0.007		98.592	13	0
		14	0.005	0.009		98.608	14	0
		15	0.021	0.025		98.952	15	0
		16	0.035	0.053		99.906	16	0
		17	-0.069	-0.031		103.699	17	0
		18	-0.006	-0.024		103.	1	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
						73	8	
		19	0.04	0.037		104.992	19	0
		20	-0.039	-0.027		106.212	20	0
	BANQUE SAUDI FRANSI	1	-0.435	-0.435		171.568	1	0
		2	0.042	-0.181		173.208	2	0
		3	-0.04	-0.123		174.63	3	0
		4	0.006	-0.076		174.658	4	0
		5	-0.013	-0.061		174.818	5	0
		6	-0.043	-0.102		176.529	6	0
		7	0.005	-0.088		176.555	7	0
		8	0.074	0.033		181.563	8	0
		9	-0.099	-0.072		190.56	9	0
		10	0.062	-0.018		194.052	10	0
		11	-0.013	-0.005		194.208	11	0
		12	-0.009	-0.027		194.291	12	0
		13	0.001	-0.019		194.293	13	0
		14	-0.035	-0.055		195.392	14	0
		15	0.081	0.041		201.499	15	0
		16	-0.089	-0.052		208.758	16	0
		17	0.04	-0.016		210.239	17	0
		18	0.028	0.03		210.974	18	0
		19	-0.051	-0.031		213.355	19	0
		20	0.074	0.056		218.45	20	0
	SAUDI BRITISH BANK	1	-0.137	-0.137		2.911	1	0.088
		2	-0.269	-0.293		14.284	2	0.001
		3	0.034	-0.06		14.466	3	0.002

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		4	-0.066	-0.167		15.163	4	0.004
		5	-0.178	-0.261		20.231	5	0.001
		6	0.093	-0.08		21.64	6	0.001
		7	0.066	-0.088		22.35	7	0.002
		8	0.04	0.014		22.606	8	0.004
		9	-0.086	-0.141		23.822	9	0.005
		10	0.03	-0.031		23.968	10	0.008
		11	0.023	-0.026		24.053	11	0.013
		12	0.02	0.039		24.123	12	0.02
		13	0.005	0.031		24.128	13	0.03
		14	-0.065	-0.082		24.859	14	0.036
		15	-0.092	-0.118		26.322	15	0.035
		16	0.067	-0.018		27.108	16	0.04
		17	0.087	0.06		28.424	17	0.04
		18	-0.078	-0.088		29.504	18	0.043
		19	0.085	0.055		30.779	19	0.043
		20	-0.058	-0.116		31.378	20	0.05
	INBLK FOR RECON	1	-0.288	-0.288		75.203	1	0
		2	-0.001	-0.092		75.204	2	0
		3	-0.048	-0.082		77.307	3	0
		4	-0.104	-0.159		87.102	4	0
		5	-0.102	-0.215		96.553	5	0
		6	0.203	0.092		133.881	6	0
		7	-0.243	-0.224		187.87	7	0
		8	0.13	-0.042		203.343	8	0
		9	-0.002	-0.028		203.346	9	0

Country	Bonds name	Lag	Autocorrelation	Partial Autocorrelation		Box-Ljung Statistic		
						Value	df	Sig.a
		10	0.005	-0.013		203.367	10	0
		11	0.154	0.168		225.156	11	0
		12	-0.225	-0.236		271.545	12	0
		13	-0.092	-0.156		279.318	13	0
		14	0.107	-0.029		289.799	14	0
		15	0.002	0.027		289.801	15	0
		16	-0.053	-0.123		292.424	16	0
		17	0.15	-0.025		313.229	17	0
		18	-0.092	0.053		321.117	18	0
		19	0.052	-0.024		323.592	19	0
		20	0.1	0.101		332.758	20	0

a. Based on the asymptotic chi-square approximation.

Appendix 23: Value at Risk of Sukuk and Conventional Portfolio

Sukuk			Conventional bonds			Mixed bonds portfolio	
	St.d	VaR		St.d	VaR	St.d	VaR
SAUDI ELTY 7856KJ	0.001939	319.0047	BANQUE SAUDI FRANSI 5597QC	0.00522	858.6771		
SAUDI ELTY 7856KH	0.001078	177.284	INBLK 5518PT	1.80827E-05	2.974610714		
			SAUDI BRITISH BANK	0.004248	698.8558		
Saudi Sukuk portfolio	0.001206	198.3379	Saudi conventional bonds portfolio	0.00202	332.2445	0.001328	218.3905
HBME SUKUK CO 6469EN	0.004452	732.2906	ABU DHABI COML.BK 82102P	0.00151	248.4626		
DUBAI DOF SUKUK 3976K4	0.002537	417.2938	ABU DHABI COML.BK 5528M4	0.005002	822.8963		
TDIC SUKUK LTD 002258880	0.002119	348.5777	DUBAI 2010 5764DV	0.001246	204.897		
DUBAI DOF SUKUK 7897KF	0.002524	415.1977	DUBAI 2010 5764DX	0.002026	333.2477		
DUBAI DOF SUKUK 7897KE	0.001833	301.5181	DUBAI.HLDG.COML.OPS 84889X	0.00354	582.3523		
MAF SUKUK LTD 7511XQ	0.012216	2009.459	AXIS BANK LTD.DUBA 6114RJ	0.00526	865.2598		
HILAL SUKUK CO 6022JH	0.000314	51.69737	DUI.ELTY.&.WT.AUTH	0.001821	299.5091		

Sukuk			Conventional bonds			Mixed bonds portfolio	
	St.d	VaR		St.d	VaR	St.d	VaR
SIB SUKUK CO II 6457MC	0.007338	1207.069	AXIS BANK LTD.DUBA 6114RJ	0.00526	865.2598		
FGB SUKUK CO.LTD 7470C6	0.009476	1558.787	AXIS BANK LTD.DUBA 5602KT	0.001358	223.4399		
FGB SUKUK CO.LTD 6560F4	0.007337	1206.922	NAT.BK.ABU DHABI 6534XQ	0.00289	475.4785		
EIB SUKUK CO 7470JK	0.001561	256.8268	EXOVA LTD 6097NE	0.024669	4058.041		
DP WORLD SUKUK LTD 98583L	0.002196	361.2401	DP WORLD LTD 99037J	0.005524	908.7117		
			NAT.BK.ABU DHABI 3941CE	0.000249	41.00153		
			ABU DHABI NAT 3933LP	0.002484	408.6405		
			ABU DHABI NAT 1768N1	0.002044	336.3109		
			ABU DHABI NAT 81558M	0.004976	818.4943		
			ABU DHABI COML.BK 65922T	0.005232	860.7315		
			DUI.ELTY.&.WT.AUTH 6095P8	0.001762	289.865		
UAE Sukuk portfolio	0.002641	434.4987	UAE conventional bonds portfolio	0.002207	363.1194	0.001777	292.3528

Sukuk			Conventional bonds			Mixed bonds portfolio	
	St.d	VaR		St.d	VaR	St.d	VaR
QREIC SUKUK LLC 2319HL	9.4293E-05	15.5112604	DOHA BANK 2006 83004Q	0.00711283	1170.05988		
QIB SUKUK FDG 5766F2	0.001523	250.6039	QATAR 2011 7262TK	0.003270292	537.9630799		
ALMANA SUKUK 6547VJ	0.00100966	166.089143	QATAR 3779UR	0.001284	211.2874		
			QATAR 2011 7262TJ	0.00330966	544.439435		
			QATAR 2011 7262TE	0.001504	247.4246		
Qatar Sukuk portfolio	0.000622	102.2401	Qatar conventional bonds portfolio	0.001784	293.5185	0.001129998	185.8846574
			ICICI BANK BAHRAIN 3999VW	0.001169	192.3176		
CBB INTL.SUKUK 7231XX	0.001956	321.8268	ICICI BANK 3999N9	0.009202	1513.707		
CBB INTERNATIONAL 3856VC	0.003316	545.5577	BAHRAIN MUMTALAKAT	0.006676	1098.244		
			BAHRAIN KINGDOM OF 2010 5601LW	0.002479	407.8428		
Bahrain Sukuk portfolio	0.001939429	319.0361004	Bahrain conventional bonds portfolio	0.003494	574.8178	0.002483473	408.531234

Sukuk			Conventional bonds			Mixed bonds portfolio	
	St.d	VaR		St.d	VaR	St.d	VaR
PAKISTAN 2006 5905V2	0.009216	1516.03	PAKISTAN MOBL.COMMS 81867X	0.0078451	1290.5109		
PAKISTAN 2006 5905V3	0.006087	1001.365	PAKISTAN MOBL.COMMS 81977V	0.005353	880.5596		
PAKISTAN 2007 5934WQ	0.0084281	1386.4208					
PAKISTAN 2006 64754Q	0.0076492	1258.2866					
Pakistan Sukuk portfolio	0.005183	852.5892	Pakistan conventional bonds portfolio	0.004934	811.6892	0.003862	635.3767
1MALAYSIA SUKUK 6093RM	0.002408067	396.1270556	STD.CHT.BANK MAL 5946ET	0.000610035	100.3507252		
WAKALA GLOBAL SUKUK 6519RW	0.001584555	260.6593457	MALAYSIA 2011 6219UD	0.001479439	243.3677196		
WAKALA GLOBAL SUKUK 6521KJ	0.004022669	661.7289993	MALAYSIA 2009 5573KC	0.00040213	66.1496003		
1MALAYSIA SUKUK 5655KP	0.006081	1000.267	DIGI TELECOM 6011U6	0.000271	44.54573		
PETRONAS GLB.SUKUK 3905W5	0.002054	337.885	MALAYSIA 2010 5699P6	0.0003257	53.572453		
MBB SUKUK 93509V	0	0	SYRKT PRSRNA NEGARA 5919QW	0.00079645	131.01652		
Malaysia Sukuk portfolio	0.001538	253.0234	Malaysia conventional bonds portfolio	0.000383249	63.04440077	0.000785	129.1101

Sukuk			Conventional bonds			Mixed bonds portfolio	
	St.d	VaR		St.d	VaR	St.d	VaR
Mixed Sukuk portfolio	0.001197496	196.9881149	Mixed Conventional bonds	0.001192	196.0154	0.000892224	146.770911

Appendix 24: Duration and Convexity for Sukuk and Conventional Bonds

Maturity	Sukuk							Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
						S&P	Moody`s						S&P	Moody`s
2013	KT (6146PV)	0.1833	0.1834	0.1787	0.1959	NA	NA	RCE ADVANCE SDN BHD (5900CW)	0.4822	0.4827	0.4694	0.6411	NA	NA
								PAKISTAN MOBL (81867X)	0.1528	0.153	0.1454	0.1447	B -	Caa1
								PAKISTAN MOBL (81977V)	0.4	0.4028	0.3887	0.491	B -	Caa1
2014	DUBAI DOF (3976K4)	1.1278	1.0833	1.0704	2.1524	NA	NA	ABU DHABI COM BK (82102P)	0.4278	0.428	0.4145	0.5389	A	A1
	HILAL (6022JH)	1.3556	1.3335	1.3236	3.0205	NA	Aaa	NAT.BK.ABU DHABI (3941CE)	0.8575	0.8575	0.8436	1.5416	AA-	Aa3
	TDIC (3962L8)	1.0944	1.0595	1.0518	2.1194	AA	A1	QATAR (3779UR)	0.5583	0.5461	0.5445	0.8343	AA	Aa2
	CBB (3856VC)	0.75	0.7352	0.7276	1.2243	BBB	NA	QATAR (6000ET)	0.8028	0.7905	0.7851	1.3771	AA	Aa2
	DIGI TELECOM (6011U6)	0.9	0.8898	0.8843	1.6406	A -	A1	TURKEY (5602DU)	1.137	1.0645	1.0289	1.9224	NR	NR
								SELIA SLNGER SELATAN (5882UK	0.7616	0.768	7414	1.2653	NA	NA
								SABAH STATE (6028XC)	1.4548	1.4219	1.3953	3.1956	NA	NA
								DIGI TELECOM (6011U6)	0.8219	0.8103	0.805	1.4293	NA	NA

Maturity	Sukuk							Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
2015	DAR AL- ARKAN (5568C4)	1.4194	1.3469	1.298	2.7335	B +	WR	BANQUE SAUDI FRANSI (5597QC)	1.5361	1.476	1.459	3.4944	A	Aa3
	INBLK (5518PT)	1.5329	1.5008	1.4909	3.5615	NA	Aaa	SAUDI BRITISH BANK (6135XP)	2.0167	1.9456	1.9326	5.5803	A	NA
	QIB (5766F2)	2.0528	1.9624	1.9423	5.5803	NA	NA	ICIC BANK (3999VW)	1.7667	1.6905	1.6721	4.3541	BBB-	Baa2
	1 MALAYSIA (5655KP)	1.7111	1.6557	1.6444	4.2784	A -	A3	ICIC BANK (3999N9)	1.3861	1.3473	1.3293	2.9976	BBB-	Baa2
	1 MALAYSIA (6093RM)	1.9361	1.8805	1.8659	5.2514	A -	A3	BAHRAIN MUMTALAKAT (5676MK)	1.65	1.5796	1.5548	3.8251	BBB	NA
								DUBAI(5764DV)	2.05	1.9005	1.8727	5.1987	NA	NA
								DUI.ELTY.&.WT.AUTH (5617RU)	1.4677	1.4038	1.391	3.2532	NA	Baa3
								AXIS BANK LTD.DUBA (5602KT)	1.9	1.8267	1.8008	4.8786	BBB-	Baa2
								QATAR (3996PX)	1.5833	1.527	1.5173	3.7618	AA	Aa2
								MALAYSIA (5573KC)	1.4384	1.4113	1.3888	3.1932	NA	A3
								MALAYSIA (5699P6)	1.8932	1.838	1.8087	4.8935	NA	A3
								PANGLIMA POWER SDN(5919RF)	1.7288	1.6198	1.5903	3.4167	NA	NR
2016	HBME (6469EN)	2.7083	2.5827	2.5541	8.8515	NA	A2	DUI.ELTY.&.WT.AUTH (6095P8)	2.9583	2.7501	2.7183	9.8464	NA	Baa3
	FGB (6560F4)	3.1444	2.9604	2.9265	11.1985	NA	A2	AXIS BANK LTD.DUBAI (6114RJ)	2.4833	2.3721	2.3323	6.406	BBB-	Baa2

Maturity	Sukuk						Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
	SIB (6457MC)	2.9167	2.7546	2.7159	9.7777	BBB+	NA	KUWAIT PRJS (5642XL)	3.0833	2.7035	2.6531	9.2934	BBB-	Baa3
	ADCB ISLAMIC (7430ED)	3.4083	3.2125	3.1742	12.9022	A	A1	SYRKT PRSRNA NEGARA (5919QW)	3.4301	3.2218	3.1661	12.6928	NA	NR
	KT (7066M4)	3.35	3.0749	3.0165	11.613	NA	NA	ORIX LSG (6253HU)	2.3562	2.2587	2.2075	6.7219	NA	NA
	PAKISTAN (5905V3)	2.7833	2.5304	2.4253	7.5657	B-	Caa1							
	PAKISTAN (64754Q)	2.5361	2.2847	2.1863	6.3167	B-	Caa1							
	WAKALA (6519RW)	3.0306	2.8836	2.8597	10.8334	A-	A3							
2017	SAUDI ELTY (7856KH)	3.7944	3.6183	3.5831	16.0738	AA-	A1	DOHA FINANCE (7824TT)	3.7	3.4714	3.4235	14.689	A-	A2
	BSF (8248GH)	3.9083	3.7106	3.6538	16.4405	A	NA	QATAR (7262TE)	3.5833	3.3804	3.3494	14.2732	AA	Aa2
	QIIB (8049Z2)	4.3139	4.08	4.0155	19.4562	NA	A3	QATAR (7262TK)	3.3389	3.1859	3.1584	12.8838	AA	Aa2
	EIB (7470JK)	3.6056	3.3078	3.2554	13.374	NA	Baa1	ABU DHABI COM BK (5528M4)	3.5972	3.2108	3.11	11.9233	A	A1
	FGB (7470C6)	3.6056	3.3487	3.3092	13.8917	NA	A2	DUBAI.HLDG (84889X)	3.2384	2.9178	2.7798	15.3757	NR	B2
	DP WORLD (98583L)	4.0556	3.5765	3.5119	15.2271	NR	Baa3	ABU DHABI NAT (1768N1)	3.9694	3.605	3.5613	15.8159	NA	NA
	DUBI DOF (7897KE)	3.8528	3.5427	3.4788	14.9731	NA	NA							
	MAF (7511XQ)	3.6167	3.2581	3.1989	12.9007	BBB	NA							

Maturity	Sukuk							Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
	PAKISTAN (5934WQ)	3.95	3.4994	3.3561	13.3645	B -	Caa1							
2018	DAR AL- ARKAN (781T0A)	4.9139	4.3236	4.1897	20.3336	B +	WR	HDFC BANK(84504Z)	4.7194	4.3973	4.3247	22.2159	BBB -	Baa2
	CBB (7231XX)	5.4083	4.6965	4.6096	24.844	BBB	NA	ABU DHABI NAT(8180WG)	4.3139	4.0945	4.0319	19.6221	A-	A3
	EIB (8007FP)	4.3167	3.9703	3.8926	18.2477	NA	Baa1	EXOVA LTD (6097NE)	4.9417	3.9979	3.8273	16.844	B-	Caa1
								MALAYSIA (2120M9)	4.5945	4.1484	4.0776	19.9477	A	NR
2019	JAFZ (8248GJ)	5.9833	5.0436	4.9209	27.6539	NA	Ba3	ABU DHABI NAT (3933LP)	5.8556	5.0203	4.9331	28.1942	A-	A3
								QATAR (3780PE)	5.8028	4.9651	4.903	28.1715	AA	Aa2
2020								QATAR (3995VJ)	6.58533	56142	5.534	35.0713	AA	Aa2
								KUWAIT PRJS(6061EW)	6.8278	5.2552	5.0872	28.9258	BBB -	Baa3
								BAHRAIN KINGDOM (5601LW)	6.4025	5.4734	5.3403	32.1469	BBB	NA
								DUBAI (5764DX)	6.9139	5.5898	5.4659	33.7089	NA	NA

Maturity	Sukuk							Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
2021	WAKALA GLOBAL (6521KJ)	8.0305	6.6964	6.5692	47.767	A-	A3	MALAYSIA (6219UD)	7.8164	6.7148	6.5842	47.9259	NA	A3
2022	SAUDI ELTY (7856KJ)	8.7944	7.4169	7.4169	58.113	AA-	A1	BAHRAIN KINGDOM(7996DH)	9.0444	6.9599	6.7808	49.9813	BBB	NA
	DUBAI DOF(7897KF)	8.8528	6.9052	6.7502	49.6049	NA	NA	BAHRAIN KINGDOM(7998WX)	9.05	6.9423	6.7515	49.3965	BBB	NA
								QATAR PETROLEUM (8277P2)	9.1589	8.6352	8.581	81.1389	NA	NA
								QATAR (7262TJ)	8.5889	7.1755	7.063	55.0968	AA	Aa2
2023	SAUDI ELTY (85384G)	9.8028	8.3174	8.1656	72.0393	AA-	A1	TURKEY (8271AR)	9.5139	7.9245	7.7176	63.7058	NA	Baa3
2025								MALAYSIA (64089F)	12.052	9.2669	9.0998	88.5193	NA	A3
2026								NAT.BK.ABU DHABI (6534XQ)	12.6822	10.7862	10.6823	122.3228	AA-	Aa3
2030								QATAR (668925)	16.9861	10.2763	10.0359	105.5257	AA	Aa2

Maturity	Sukuk							Conventional bonds						
	Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating		Bond name	Life	Duration	Mod. Duration	Convexity	Credit rating	
2036	PAKISTAN (5905V2)	22.7833	9.4724	9.0155	81.7783	B -	Caa1	ABU DHABI NAT (81558M)	22.9694	13.0339	12.7038	165.2889	NR	A3
2037								DP WORLD(99037J)	24.0555	12.3339	11.9736	146.3155	NR	Baa3
2039								OCBC BK.MALAYSIA(6001CX)	25.8027	13.0533	12.6733	163.2723	NA	NA
2040								QATAR (6025FW)	26.5833	14.0429	13.7074	191.9919	AA	Aa2
2043	SAUDI ELTY (85383Z)	29.8028	15.1787	14.7799	221.0685	AA -	A1							

Appendix 25: The Result for the Optimal Weight of the Mixed Portfolio

	Weight	Expected Return	St.d	Percentage
DUBAI DOF	0	0.001432	0.010109	0%
TDIC	0.032486949	-0.00044	0.016182	3%
HILAL	0.038404054	-0.00068	0.004612	4%
MBB	0	5.32E-05	0.002539	0%
PETRONAS	0	-0.00078	0.005204	0%
1MALAYSIA	0	-0.0002	0.010885	0%
1MALAYSIA	0.002520459	-0.00018	0.009304	0%
QREIC	0.097998351	0.000528	0.011386	10%
QIB	0.116187077	0.001072	0.006217	12%
CBB	0	-0.00214	0.009617	0%
GFH	0.000428418	-0.01931	0.573028	0%
DUI.ELTY.&.WT.AUTH	0	0.00405	0.014784	0%
ABU DHABI COML.BK	0.003415515	0.003665	0.014063	0%
ABU DHABI NAT	0	0.004225	0.036379	0%
ABU DHABI NAT	6.38212E-05	0.002169	0.013895	0%
ABU DHABI NAT	0	0.002522	0.016887	0%
NAT.BK.ABU DHABI	0	-0.00077	0.005524	0%
EXOVA LTD	0.002608533	0.001589	0.068259	0%
AXIS BANK LTD	0	0.000605	0.012767	0%
DUI.ELTY.&.WT.AUTH	0	0.000804	0.01312	0%
AXIS BANK LTD	0	0.001252	0.018424	0%
DUBAI.HLDG.COML	0	0.010404	0.042576	0%
DUBAI	0	0.002871	0.013888	0%
ABU DHABI COML.BK	0.004351947	0.002275	0.022944	0%
STD	0.025634553	1.1E-05	0.002176	3%
MALAYSIA	0	-8.7E-05	0.00213	0%
DIGI TELECOM	0.23838347	-6.6E-05	0.002089	24%
MALAYSIA	0	-0.00025	0.003154	0%
SYRKT PRSRNA NEGARA	0	-9.5E-05	0.003747	0%
SABAH STATE	0	-0.00031	0.004466	0%
RCE	0	-0.0009	0.002555	0%
MALAYSIA	0	-0.00101	0.013635	0%
MALAYSIA	0	-0.00019	0.005055	0%
PANGLIMA POWER	0	-0.00243	0.003621	0%
SELIA SLNGR SELATAN	0.429872906	0.003478	0.003367	43%
OCBC	0	0.000547	0.017102	0%
HSBC	0	0.000926	0.012013	0%
DOHA BANK	0.005505983	0.000878	0.017162	1%
QATAR	0	-0.0018	0.004857	0%
QATAR	0	0.000489	0.035214	0%
QATAR	0	-0.00043	0.005353	0%
QATAR	0	-0.00183	0.005374	0%
QATAR	0	0.000245	0.014908	0%

	Weight	Expected Return	St.d	Percentage
QATAR	0	0.000905	0.016998	0%
QATAR	0	0.000319	0.027397	0%
BAHRAIN MUMTALAKAT	0.002137963	0.000577	0.023572	0%
ICICI	0	-2.9E-05	0.013872	0%
BAHRAIN	0	7.3E-06	0.027456	0%
ICICI	0	-7.2E-05	0.010629	0%
SUM	1			

IN THE END, ALL PRAISE IS DUE TO ALLAH, LORD OF ALL THE WORLDS!