ESSAYS ON ISLAMIC EQUITY INVESTING

Hampus Adamsson

A Thesis Submitted for the Degree of PhD
at the
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at the
University of St Andrews

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ABSTRACT

Islamic finance is rapidly gaining momentum around the world. Interpretations of *Shari'ah,* or Islamic law, state that investments must be free from elements of *riba* (interest), *gharar* (uncertainty), *maysir* (speculation) and *haram* (unethical) business activities. Islamic equity investing, therefore, utilizes a set of business activity screens and accounting-based screens to exclude firms considered non-permissible under *Shari'ah*. Despite increased academic interest, there is still much uncertainty surrounding the financial implications of these investment principles. This Ph.D. thesis, comprised of three empirical essays, aims to contribute to this debate. The first essay offers a comprehensive examination of Islamic equity index performance. The findings show that Islamic equity indices have exhibited abnormal returns on a global and developed market level, primarily due to their exclusion of stocks in the financial services sector. The second essay attempts to study the determinants of Islamic investments' financial performance, with a particular focus on the role of country-level factors. The third essay studies performance related issues associated with the accounting-based screening process. A significant proportion of these screens are documented to contribute positively to risk-adjusted performance, most notably in periods of financial market turmoil.

Chapter 1

INTRODUCTION

1.1 Research background

Although historically centred in the Middle East, Islamic finance is currently gaining momentum globally. Motivated by the strong liquidity within the sector, Western economies have started to make significant efforts to accommodate the need for financial products and services that adhere to Islamic principles. For instance, during the 2013 World Economic Islamic Finance Forum, the UK Prime Minster David Cameron expressed his ambition for "London to stand alongside Dubai and Kuala Lumpur as one of the great capitals of Islamic finance anywhere in the world" (Hutton, 2013).[1] One can currently witness similar trends in other important market contexts, such as Australia, Canada, France and the United States. Islamic financial institutions are currently present in over 70 countries (Warde, 2010) and the industry is estimated to be worth over $1.8 trillion (EY, 2013). With an annual growth rate of more than 10% (Maslakovic, 2013) Islamic finance is widely considered one of the fastest growing sectors of the financial industry.

Islamic finance is about financial activities that are performed in accordance with *Shari'ah* or Islamic law. Interpretations of *Shari'ah* state that economic and commercial transactions must be free from elements of *riba* (interest), *gharar* (uncertainty) and *maysir* (speculation). Conventional financial instruments, such as fixed-income bonds, derivatives and futures, are therefore considered non-permissible from an Islamic perspective (Ayub, 2009; El-Gamal, 2006; Iqbal & Mirakhor, 2011).

[1] In 2014, the UK government issued the first ever sovereign *Sukuk* (a form of Islamic bond) outside the Islamic world.

In the light of these constraints, equity has emerged as a particularly important asset class for investors seeking *Shari'ah*-compliant returns (Khatkhatay & Nisar, 2007). Consequently, there are now thousands of Islamic mutual funds and equity indices available to investors around the world. These investment vehicles undertake so-called *Shari'ah*-based stock screening to rule out firms that do not comply with Islamic principles. This process comprises both *business activity screening* and *accounting based screening.*[2] The business activity screening aims to exclude firms that generate income from activities considered unethical, such as alcohol, conventional financial services, pork production and tobacco. The accounting-based screening, on the other hand, is concerned with firms' financial structure, which discourages excessive use of leverage and interest-bearing income (Derigs & Marzban, 2008; El-Gamal, 2006).

Academic interest in the performance attributes of Islamic equity investing has, not surprisingly, gradually increased in line with the industry. The central empirical question in this body of literature relates to the financial impact of employing *Shari'ah*-based stock screening. In addressing this issue, previous studies have examined the performance of Islamic equity indices relative to unconstrained market benchmarks. However, the empirical evidence in this literature stream is mixed.[3] Arguably, the uncertainty surrounding the performance of these indices is likely to harm investor confidence, hence threatening the future growth of the industry. One of

[2] In the literature these screens are also referred to as sector/qualitative screening and financial/quantitative screening.

[3] For instance, Islamic indices have been reported to exhibit both underperformance (Habib & Islam, 2014; Hussein, 2004) and outperformance (Jawadi, Jawadi, & Louhichi, 2014; Lean & Parsva, 2012; Walkshäusl & Lobe, 2012a, 2012b).

the major challenges faced by Islamic finance researchers, at least historically, has been the limited availability of comprehensive data. In fact, equity investing was not approved by Islamic authorities until the 1990s (Naughton & Naughton, 2000) and the first major index tracking the performance of *Shari'ah*-compliant firms was launched as late as 1999.[4] Hence, long-horizon studies have not been feasible until recently. Another limitation in this literature stream is the common use of rather simplistic performance measures, such as ratio analysis and single index asset pricing models (Albaity & Ahmad, 2008; Habib & Islam, 2014; Ho, Rahman, Yusuf, & Zamzamin, 2014; Hussein, 2004; Jouaber-Snoussi, 2012). The first essay of this thesis, entitled *An Islamic Equity Performance Puzzle*, aims to address these gaps in an attempt to deepen the understanding of Islamic index return and risk characteristics.

Shari'ah-compliant assets have not only grown immensely in size, but also in geographical distribution. By the end of 2012, it has been estimated that approximately 60% of the total asset base were distributed outside the Middle East (EY, 2013). Behind this trend lies an increased openness among Western governments to facilitate Islamic banking and finance, together with Muslim investors seeking to diversify their oil wealth (Mansoor & Ishaq, 2008). It could be argued that, with these assets becoming increasingly integrated into the global economy, it is critical to understand whether country-level characteristics impact the performance of Islamic equity portfolios. While previous studies have been interested in measuring

[4]The introduction of the global *Dow Jones Islamic Market Index* in 1999 is widely considered the first major launch of an Islamic index. However, it was not until half a decade later that other providers launched Islamic indices on a broad scale, such as MSCI and S&P.

the performance of Islamic indices relative market benchmarks, almost no attention has been given to the role of the country environment. The second essay of this thesis, entitled *Determinants of Islamic Index Performance*, aims to consider this issue.

One important limitation of analysing Islamic mutual funds and indices is that the financial impact of the *Shari'ah* screening can only be measured collectively. That is, the performance of these investment vehicles is essentially the collective outcome of a large number of business activity screens and accounting screens. Hence, it is highly improbable to separate, for instance, the merits of the different accounting screens that are used to define the asset universe. The importance of this issue is strengthening by the fact that *Shari'ah* screening norms adopted by financial institutions are not universal (Derigs & Marzban, 2008). For instance, while some institutions use accounting ratios based on market capitalization to define firm value, other use total assets. Similarly, there are disparities concerning the classification of unethical industries. Effectively, these inconsistencies result in *Shari'ah*-compliant asset universes that are likely to differ in terms of sector allocation, size and firm-level characteristics. Consequently, this raises the question whether individual *Shari'ah* screens are more efficient than others in terms of return and risk. The third essay of this thesis, entitled *The Financial Impact of Shari'ah-based Accounting Screens*, aims to address this issue.

1.2 Summary of contributions and main findings

1.2.1 Essay I: *An Islamic Equity Performance Puzzle*

This essay makes several contributions to the literature. First, it studies the return and risk characteristics of a comprehensive dataset of 32 global and regional *Shari'ah*-compliant indices from five major index providers (i.e., Dow Jones, FTSE, MSCI, Russell, S&P) over the period 1996 to 2012. The large number of indices (relative previous studies) is advantageous, as it increases the robustness of the results and permits performance comparison across geographical markets. Furthermore, using data from different index providers allows to study the potential financial impact of the unique *Shari'ah* screening criteria adopted by each provider, respectively. Second, the analysis addresses a number of methodologies shortcomings typically present in the literature. The performance evaluation is carried out in both a single and a multifactor regression setting, and is robust to matched index pairs (Kreander, Gray, Power, & Sinclair, 2005) and tailored investment style risk factors. The matched pair approach means that each Islamic index is benchmarked against its unconstrained index counterpart. Any difference in performance can hence be directly traced to the impact of the *Shari'ah* screening, avoiding potential biases such as differences in asset universe and index construction methodology.

The main analysis shows that several Islamic indices have yielded significant and positive risk-adjusted returns. This outperformance is particularly visible in a global and developed market context. For instance, four out of the five global Islamic indices report a significant four-factor alpha of between 26 and 41 basis points per month. In

explaining this performance puzzle, a number of potential behavioural, fundamental and research design related explanations are investigated. When the effect of the financial services sector is eliminated from the conventional benchmarks, the recorded outperformance is heavily reduced or disappears entirely. Hence, the study concludes that the relatively good performance of Islamic indices in recent years has been due to their low exposure to financial stocks.

1.2.2 Essay II: *Determinants of Islamic Index Performance*

Moving beyond traditional measures of relative performance, the second essay contributes to the literature by investigating potential determinants of Islamic index risk-adjusted returns. This area has not previously been explored in the literature. Based on a large sample of Islamic indices across 46 developed and emerging market countries, it is examined whether their risk-adjusted returns can be explained by country-level factors, such as cultural, economic, governance and religious variables. Furthermore, it is also examined whether variables related to the screening intensity of Islamic indices are significant determinants of performance.

The cross-sectional analysis shows that the country environment can be important to consider when constructing *Shari'ah*-compliant investment portfolios. The stock market environment appears to have a negative impact, suggesting that Islamic indices perform relatively worse (better) in bull (bear) market periods. The findings further suggest a positive relationship between risk-adjusted performance and the money supply environment (M2) and the level of the Muslim population. Furthermore, the analysis indicates a positive correlation between performance and accounting screens

based on market capitalization. However, the cultural and governance environment appears to be irrelevant in explaining the performance.

This essay is subject to a number of limitations. First, the analysis is limited to the period 2008 to 2012. This is because historical return data for country level Islamic indices is barely available prior to 2008 and it is not until recently that relevant macroeconomic data has become available for 2013. Second, the analysis includes an estimated dependent variable (i.e., alpha coefficient) which introduces some statistical uncertainty. Two alternative variables are considered to minimize this uncertainty. Finally, some relevant country factors have not been considered due to limited data coverage across the countries included in the sample.

1.2.3 Essay III: *The Financial Impact of Shari'ah-based Accounting Screens*

This chapter offers new evidence on the role of *Shari'ah*-based accounting screens. By analysing the performance of 25 hypothetical portfolios constructed in accordance with the specific rules of individual screens, we can measure the financial impact of these screens in isolation from each other. The results of this analysis can hence be viewed as a significant contribution, as existing evidence concerns only the collective impact of these screens. The findings of this chapter contribute extensively to Islamic equity performance literature. The debt screens seem to generate significant abnormal returns, although this is only true for screens based on a market capitalization based rulebook.

Analysing the time-varying difference, however, revealed that this outperformance is not persistent over time but stems entirely from the period covering the global financial crisis. Furthermore, the liquidity screens using a market capitalization based rulebook also contribute positively to performance, although significantly less than the debt screens. In contrast, interest screens appear to have little or no impact on financial performance. Taken together, the findings presented in this chapter suggest that the accounting based screening process does not harm investors' financial performance. Rather, it appears to serve as a risk management function in periods of market turmoil, excluding firms subject to risky characteristics. This appears to be true, however, only when market capitalization is used as a divisor.

1.3 Implications of research findings for different agents

The findings of the research conducted in this thesis is likely to appeal to several groups of agents, including academic researchers, policymakers & regulators, investors and professional fund managers. In Chapter 4 for instance, it is documented that several Islamic equity indices have outperformed their conventional benchmarks on a risk-adjusted basis. Although Chapter 4 is designed to evaluate the performance of Islamic investment principles, the implication of this finding is, arguably, more relevant for conventional investors. It is apparent that the recorded outperformance implies that the Shari'ah-compliant screening process could have the potential of adding economic value. From the perspective of an Islamic investor, however, the Shari'ah compliant universe (represented by an Islamic index) is per definition the true universe, and its return is therefore the true benchmark return. An unconstrained

conventional investor, on the other hand, could incorporate Islamic investment principles to (possibly) achieve better than benchmark returns. The second group of agents likely to benefit from the findings is fund managers, both Islamic and conventional. Islamic fund managers could benefit particularly from the findings in Chapter 6, which reveal that certain screening methodologies are more efficient than others in terms of return and risk. Following the logic in the previous paragraph, this presents an opportunity similar to the conventional investor. That is, to incorporate certain screens to achieve better than (Islamic) benchmark returns. As for conventional fund managers, the results of all empirical chapters suggest that incorporating Islamic investment principles into investment decision making could improve their risk management, particularity in periods of financial turmoil.

Chapter 2 and Chapter 6 illustrate how the variety in existing screening methodologies can influence an asset universe both in terms of characterises (e.g., sector allocation, size) and returns. These findings could be considered relevant for policy-makers and regulatory bodies of the Islamic finance industry, as imposing different guidelines and rules may have a diverse impact on investors' ability to generate returns. MSCI, a leading Islamic index provider, announced in a recent press release the launch of a new Islamic index series based on a market capitalization-based rather than total assets-based screening rulebook that "[…] addresses client demand for financial screening criteria based on market capitalization" (MSCI press release, September 2015). Arguably, this could be viewed as a market response to this issue. Finally, the findings of this thesis could have implications for the academic community when

conducting research on Islamic investments. It has been illustrated that carefully acknowledging the nature of the Islamic screening process, such as the impact of individual screens, could be beneficial when examining performance related aspects.

1.4 Thesis structure

This Ph.D. thesis proceeds as follows. Chapter 2 provides a background to Islamic equity investing and a critical examination of the *Shari'ah* screening process. Chapter 3 covers the theoretical background underpinning this thesis, starting with a review on the literature on expected return models followed by a discussion of performance measures. Chapter 4 presents the first empirical essay, entitled *An Islamic Equity Index Performance Puzzle*. Chapter 5 presents the second empirical essay, entitled *Determinants of Islamic Index Performance*. Chapter 6 presents the third empirical essay, entitled *Financial Impact of Shari'ah Accounting Screens*. Finally, Chapter 7 presents the conclusions and directions for future research.

Chapter 2

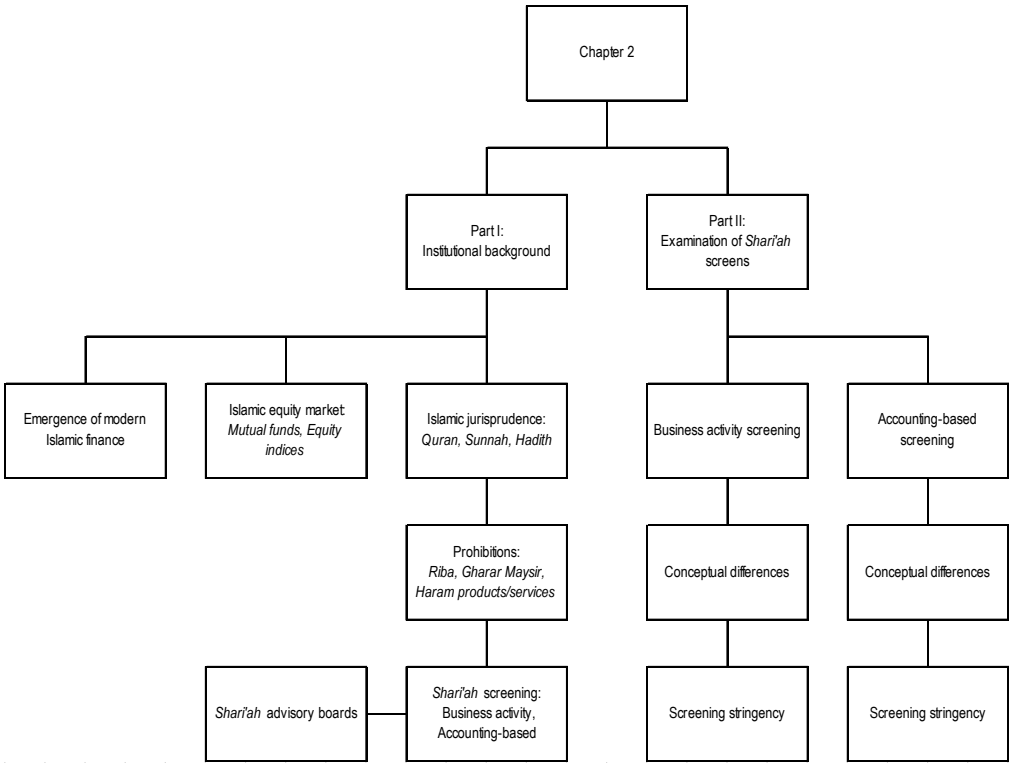
BACKGROUND

2.1 Introduction

This chapter comprises two parts. Part one, entitled *Institutional background*, introduces the fundamental principles of Islamic finance. The purpose here is not to provide a comprehensive discussion about Islamic Finance, but rather to contextualize aspects relevant for the research that is to be carried out in this thesis. The discussion departs from the historical development, followed by the sources of Islamic jurisprudence and the main prohibitions which make up the foundations of the Islamic finance model. This section also introduces the basic principles Islamic equity investing followed by an overview of the Islamic finance market and its main investment vehicles.

Part two of this chapter, entitled *a critical examination of Shari'ah-based stock screening*, provides a critical examination of the cornerstone of Islamic equity investing, namely the *Shari'ah* based stock screening process. The objective of this examination is twofold. First, it will introduce and emphasize the different elements involved in constructing *Shari'ah*-compliant investment portfolios, and further consider a number of conceptual issues currently present in the industry. The second objective is to shed light on a critical issue not extensively examined in the literature, namely the extent to which *Shari'ah* based screening reduces impact the size and characteristics of the stock market universe.

Figure 2.1 Elements covered in the chapter



The following figure provides an overview of the chapter. Part one covers the institutional background, including the emerging of the industry, an overview of the Islamic equity market and its investment vehicles. Part one also provides a by brief introduction to Islamic jurisprudence and how it shapes the practise of Islamic equity investing. Part two providers a critical examination of the *Shari'ah*-based screening process, including both conceptual differences and the stringency (i.e., impact) of the different screens.

2.2 Part I: Institutional background

2.2.1 Emergence of modern Islamic finance

The economic principles embedded in Islamic values have been practised for many centuries. During the early medieval period, riba-free transactions were common between European and Arab traders along the silk road (Abdul-Rahman, 2009). Modern roots of Islamic finance can be traced back to the mid-1960s. The

establishment of the Egypt bank *Mit Ghamr* in 1963 is widely considered to mark the birth of modern Islamic finance (Iqbal & Mirakhor, 2011; Venardos, 2011). The bank offered interest-free loans to promote the productivity of rural farmers. Other important establishments in this early era of the Islamic finance industry include the *Pilgrim's Management and Fund Board* (Malaysia) in 1969, The Nasir Social Bank (Egypt) in 1971 and the *Dubai Islamic Bank* (United Arab Emirates) in 1975 (Iqbal & Mirakhor, 2011). The great success that then followed was largely due to booming oil prices starting in 1973. This resulted in a large inflow of so-called *petrodollars* from oil-producing Gulf countries into interest-free banking systems, which resulted in "[a]rmies of commercial bankers and investment bankers landed in these oil-producing countries to expand the existing small riba-based banking operations and to link them efficiently with the international banking system" (Abdul-Rahman, 2009, p. 62). With the rapid increase in demand for *Shari'ah*-based financial products and services came a need to formalize *Shari'ah* principles within the context of banking and finance. It was during this period that many of todays' Islamic investment practises were developed by *Shari'ah* scholars (Abdul-Rahman, 2009).

2.2.2 Foundations of Islamic Jurisprudence

Shari'ah is a divine law that regulates the lifestyle for Muslims. Its two primary sources are the *Quran* and the *Sunnah*. Muslims consider the Quran to be the last revealed book (and hence the direct sayings) of the Prophet Muhammad. Hence, the Quran provides guidelines for all aspects of human life, including economic matters. The Sunnah (Arabic for path or way) makes up the words and acts of the Prophet Muhammad. The Holy Quran and the Sunnah are considered equally important (Ayub,

2009). The *Hadith* (tradition) are written work parts of the Sunnah. Naturally, the Holy Quran and the Sunnah cannot provide guidelines for all situations and aspects of life. In such situations, Islamic jurisprudence relies on a set of secondary sources. These include *Qiyas*; a form analogy in which the Hadith and the Quran are put in relation to each other, *Ijma*; a form agreement or consensus among Islamic scholars, and *Ijtihad*; a form of independent reasoning of how to interpret the Holy Quran. Furthermore, an important element of Islamic finance is *Fiqh*, which can be described as the science of understanding these sources (El-Gamal, 2006; Iqbal & Mirakhor, 2011; Warde, 2010).

2.2.3 The main prohibitions in Islamic finance

To ensure compliance with the principles and objectives of *Shari'ah*, Islamic finance rests on a number of prohibitions. Together these prohibitions shape the structure and asset allocation of Islamic investment vehicles (Iqbal & Mirakhor, 2011). The *prohibition of riba* (often translated to usury or interest) states that any form of gain must be justified by an effort or risk-taking. Hence, transactions that yield capital gains derived from interest or risk-free investments is not permissible. This means that Islamic investors cannot make use of fixed income products such as government bonds. The ban of riba also have implications for borrowers as these cannot finance projects based on interest-based loans. Although Islam currently is the only religion that recognizes interest as sinful, historically this has also been the case in several major religions such as Hinduism, Judaism and Christianity. For instance, Lewis (2007, p. 64) notes that "[t]o medieval Christians, the taking of what we would now call interest was usury, and usury was a sin, condemned in the strongest terms". From

an Islamic perspective, the prohibition of riba also serves an important role in enhancing the justice between partners in business transactions. For instance, Zaher and Kabir Hassan (2001, p. 157) point out that "the removal of riba results in the sharing of the risk of a project between the borrower and the lender". Further, Ayub (2009, p. 44) notes that "there is no difference of opinion among Muslims about the prohibition of riba and all Muslim sects consider indulgence in riba-based transactions a severe sin". Advocates of Islamic finance principles stresses that the ban of riba has positive economic implications, such as returns dependent on productivity (Zaher & Kabir Hassan, 2001).

The prohibition of gharar (uncertainty) stipulates that transactions subject to uncertainty or hazard caused by lack of clarity regarding the subject matter or the price in a contract or exchange must be avoided. One such example would the structure of a conventional insurance contract, or conventional derivatives, where the financial outcome lies with the future. According to El-Gamal (2006, p. 60), "gharar incorporates uncertainty regarding future events and qualities of goods, and it may be the result of one-sided or two-sided and intentional or unintentional incompleteness of information". *The prohibition of maysir* (gambling) implies that one cannot increase wealth by the games of chance. Maysir is often considered closely related to gharar as both of them relates to uncertainty about future events. Financial markets not considered gambling as it requires knowledge and analytical efforts, although excessive speculation is, as risk involved with that can be associated with high

uncertainty. Finally, the *prohibition of haram products and* services states that investors should not invest in products that do not comply with *Shari'ah*.

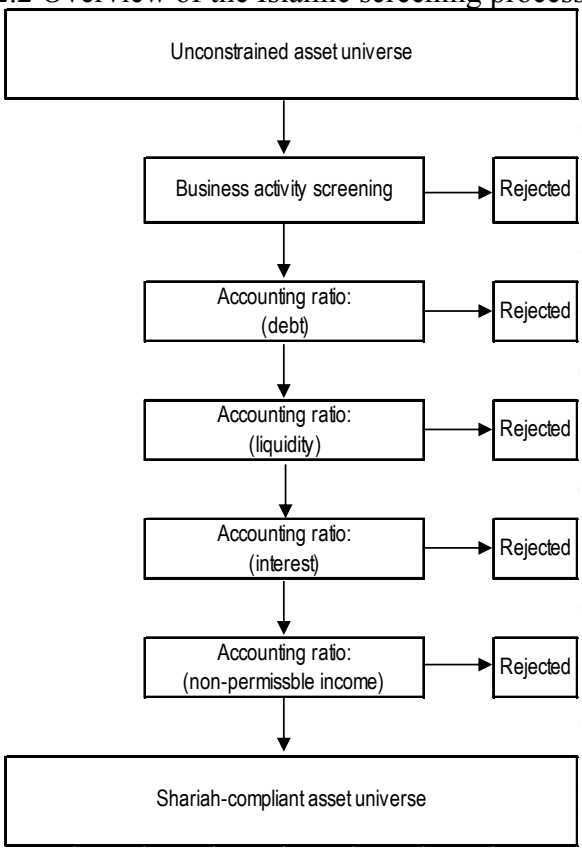
2.2.4 Fundamentals of Islamic equity investing

From an Islamic perspective, equities are a suitable asset class to invest in since *musharakah*, a form of partnership structure deeply rooted in Islamic finance, suggests that potential profits or losses should be shared among all parties involved in a given investment (Iqbal & Mirakhor, 2011; Jaffer, 2004). Nevertheless, the prohibitions discussed in Section 2.2.3 (i.e., *riba*, *gharar*, *maysir*, *non-permissible income*) imply that many stocks available to the public do not qualify as *Shari'ah*-compliant. The exclusion of such firms is a critical element for Islamic fund managers and index providers when constructing *Shari'ah*-compliant asset universes, whereby they engage with so-called *Shari'ah screening*. In its essence, this screening process can be described as a two-level analysis concerned with (i) the degree of involvement in unethical business activities and (ii) level of engagement in non-permissible financial activities.

The motivation behind the *business activity screening* is to make sure that firms that generate profit from sectors perceived unethical from a *Shari'ah* perspective are excluded from the investable universe. Examples of such sectors include alcohol, gambling and tobacco. Although business activity screening is rather similar to the one used in socially responsible investing, a number of additional sectors are considered. Such examples include the production of pork and conventional financial institutions offering interest-based products and services.

Beyond considering the ethical dimension of firms' business activities, *Shari'ah* stock screening also considers the financial structure of firms. The accounting ratios used in this part of the screening process address issues related financial leverage, liquidity and interest income, all of which are associated with riba. Since almost all publicly traded firms are exposed to riba simply by being part of the interest-based global economy, these accounting ratios include so-called threshold levels. Figure 2.2 Overview of the Islamic screening process illustrates a generalized version of the *Shari'ah* based screening process, where an unconstrained asset universe is reduced throughout each level of screening. The *Shari'ah*-compliant universe in the bottom represents the investable universe available to Islamic investors.

Figure 2.2 Overview of the Islamic screening process



The following figure illustrates the process of constructing a *Shari'ah*-compliant asset universe. Stocks that are rejected in the business activity screening are not considered in the accounting based screening process. Stocks constituting the *Shari'ah*-compliant asset universe have passed all screening levels.

2.2.5 The function of *Shari'ah* Advisory Boards

Shari'ah Advisory Boards form a key function in all Islamic finance institutions. Comprised of *Shari'ah* scholars, their principal role is to ensure that all activities are performed in line with Islamic principles. This includes overseeing financial activities and issuing *fatwas* (i.e., religious rulings) regarding the *Shari'ah*-compliance of products or services offered by the institution. One such example would be defining the screening methodology of Islamic funds and indices (further discussed in Section 2.3).

2.2.6 Current state of the Islamic equity market

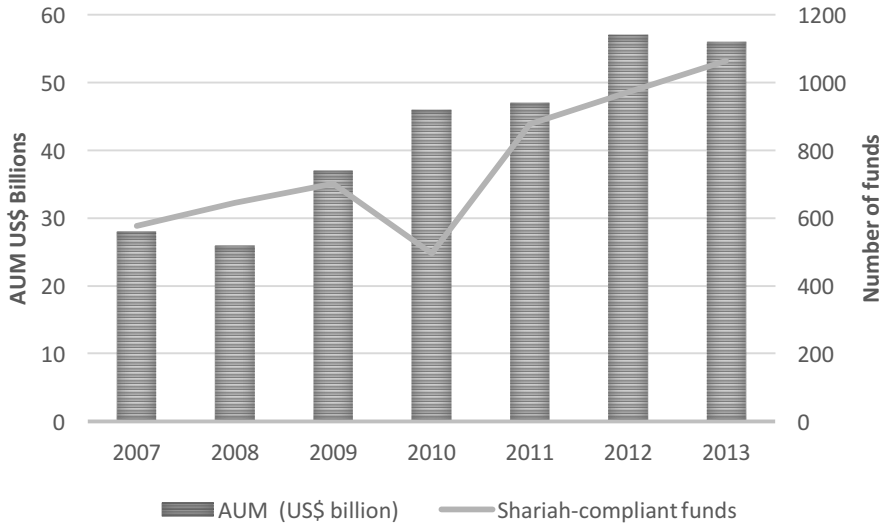
The first major milestone of Islamic equity investing took place in 1992 when the Council of the Islamic Fiqh Academia (CIFA)[5] issued a *fatwa* (a form of legal opinion) and hence approved equity investing as an investment mode compliant with Islamic principles (Naughton & Naughton, 2000). Theoretically, the Islamic equity market is represented by all public stocks that are permissible with *Shari'ah* (Shanmugam & Zahari, 2009). However, most Islamic investors gain access the equity market by investing in mutual funds offering *Shari'ah*-compliant investment strategies. These funds originate from the concept of *musharakah*, which is a form of partnership structure common in Islamic finance that emphasizes the sharing of profits and losses between all parties (Khatkhatay & Nisar, 2007). In this context, investors in the fund are the partners and where the fund managers act as investment agents on behalf of the investors. Apart from ensuring compliance with *Shari'ah*, Islamic mutual funds have the same investment goals as conventional funds in the context of maximizing risk-adjusted returns.

Islamic mutual funds have for long been the fastest growing segment of the Islamic finance industry (Elfakhani, Hassan, & Sidani, 2005). As displayed in Figure 2.3, between 2007 and 2013 the total asset under management (AUM) of *Shari'ah*-compliant funds doubled from US$28 billion to US$56 billion. During the same period, the number of *Shari'ah*-compliant funds has increased from 576 to 1065. Despite a temporary decline in number of funds, the total AUM increased steadily in

[5] The CIFA is considered "the leading authority on Islamic belongings" (Hayat & Kraeussl, 2011, p. 191)

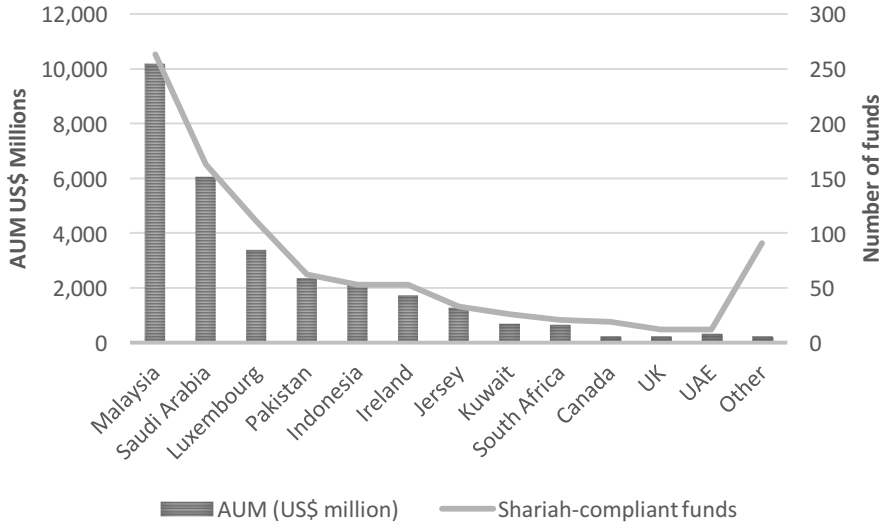
the wake of the global finance crisis. Anecdotal evidence suggests that this could be because the conservative principles of Islamic investing are perceived more appealing among investors (Ahmed, 2010). As revealed in Figure 2.4 these funds are typically centred in major Muslim economies such as Malaysia and Iran, together with Western fund management hubs, such as Luxembourg, Ireland and Jersey.

Figure 2.3. AUM of global *Shari'ah*-compliant funds



The following figure reports the number of Islamic mutual funds and their assets under management (AUM) in US$ billions between from the end of 2007 to the end of 2013. During this period that the AUM has doubled in value from US$ billion 28 in 2007 to US$ billions in 2013. During the same period, the number of funds has increased by 85% from 576 in 2007 to 1065 in 2013. *Source: Thomson Reuters*

Figure 2.4 Domicile of *Shari'ah*-compliant funds



The following figure reports the number of Islamic mutual funds per country and their assets under management (AUM) in US$ Millions as of 2013. The data illustrates that Malaysia and Saudi Arabia are the biggest hubs of Islamic mutual funds, with approximately 30% (Malaysia) and 18% (Saudi Arabia) of the funds/AUM. With 91 funds but only US$ Millions 248 AUM, the average fund in the rest of the world is significantly relative the countries presented in the figure. *Source: Thomson Reuters*

Stock market indices make up several important functions in capital markets around the world. First, by comparing the performance of portfolios relative stock market indices, investors can obtain important information regarding the return and characteristics of their investment strategies. Second, stock market indices also signal that its universe is accessible to institutional and international investors. It is common practise among institutional investors to invest only in stocks that are listed on stock market indices. Third, indices also serve as the underlying factor for many investment instruments, such as index funds and exchange-traded funds.

A major concern when Islamic mutual funds started to appear was the lack of proper market benchmark. Initially, the investment community often relied on conventional market benchmarks which were not ideal. As a response to this, in 1999 Dow Jones launched the first index which explicitly tracked the performance of *Shari'ah*-compliant stocks. This marked an important step in the development of the industry as there now was a reliable market benchmark. The launch by Dow Jones was followed by FTSE in 2000, S&P in 2006, MSCI in 2007 and Russell-Jadwa in 2009. Today, these providers offer hundreds of indices which track tens of thousands of *Shari'ah* -compliant stocks all over the world.

Most Islamic indices are based on the universe of broader unconstrained indices. For instance, The Dow Jones Islamic Market World Index is represented by the *Shari'ah*-compliant sub-universe of the Dow Jones Global Index. Similar to Islamic mutual funds, the creditability of Islamic indices is represented by *Shari'ah* advisory board. In

contrast to many Islamic mutual fund managers, however, Islamic index providers are fully transparent concerning their screening methodology and *Shari'ah* board members. Islamic indices are becoming increasingly important given recent trends of passive index-based products.

2.3 Part II: A critical examination of *Shari'ah*-based stock screening

Section 2.2.4 introduced the rationale for the *Shari'ah*-based stock screening, the process which forms the very basis of Islamic equity investing.[6] However, screening firms for *Shari'ah*-compliance has proven to be a controversial issue in the industry. For instance, comparing the screening norms of nine Islamic index providers and mutual fund managers, Derigs and Marzban (2008) found disparities concerning both the business activity screening and the accounting based screening. Ultimately, this led them to conclude that "different guidelines generally results in different companies into halal [allowed] and haram [forbidden]" (p. 299). Hence, the purpose of this part of Chapter 2 is to critically examine the conceptual and empirical implications of employing different *Shari'ah* screening methodologies.

There are several potential factors driving inconsistencies in *Shari'ah* screening practises among Islamic financial institutions. Parallel to the growth of Islamic finance

[6] "The difference between conventional and current *Shari'ah* portfolio management is the application of sector screens and financial screens by which the asset universe is reduced" (Derigs & Marzban, 2009, p. 1166).

there has been an increased presence of regulatory organizations[7] with the objective to "prepare and promulgate […] governance standards based on the Shari'a[h] precepts for Islamic financial institutions" (Karim, 2001, p. 173). However, these organizations rarely offer homogenous interpretations of Islamic sources, which has resulted in "various approaches taken by supervisory authorities to regulate Islamic banking" (Karim, 2001, p. 182). Consequently, how Islamic financial institutions choose to define their screening methodologies largely depend on which guidelines they adhere to. Furthermore, with limited enforcement power, it is likely that these regulatory standards serve more as guidelines rather than rules to follow, while the ultimate responsibility lies in the hands of the *Shari'ah* board of each institution, respectively.

The remaining sections proceed as follows. Section 2.3.1 discusses the collection of *Shari'ah* screening data. Section 2.3.2 and 2.3.3 discusses conceptual differences between different business activity screens and financial screens currently used in the industry. Finally, Section 2.3.4 examines the stringency of the screens.

2.3.1 Collection of screening data

Classification theory stresses the importance of complete information when structuring and analysing information within a given problem complex (Bailey, 1994; Doty & Glick, 1994). When collecting screening data currently used in the industry, we therefore carefully review all potential sources of screening information. First, we review all screens covered in the existing literature, using a range of keywords related

[7] Examples of such organizations include *The Accounting and Auditing Organization for Islamic Financial Institutions* (AAOIFI), *The Shari'ah Advisory Council of the Security Commission Malaysia* (SAC) and *The Islamic Financial Services Board* (IFSB).

to *Shari'ah* screening. Second, we scan through fact sheets, methodologies and websites of all known (i.e., several hundreds) index providers and mutual fund managers offering *Shari'ah*-compliant investment products. Third, we review the official guidelines set by Islamic finance regulatory bodies around world.

Inspired by the idea of morphological thinking, "a method for identifying and investigating the total set of possible relationships or "configurations" contained in a given problem complex" (Ritchey, 1998, p. 3), all unique screens are listed following the structure of a 'morphological box' (Table 2.1).[8] That is, each screening type (e.g., debt ratio, liquidity ratio) is treated as a unique dimension within the morphological box, and each dimension is assigned so-called parameters, represented by the total number of variation of that screen. Structuring the screening data in this way comes with two advantages. First, it provides a clear overview of all screens currently used in the industry, and all dimensions and parameters can easily be conceptually compared to each other. Second, reading the table from left to right, it represents a detailed overview of each step of the screening process and the different dimensions it contains.

[8] For further reading regarding morphological analysis, see, for instance, Ritchey (1998) and Zwicky (1948).

Table 2.1 Morphological box of the *Shari'ah*-based stock screening process

Business activity screening																	Accounting-based screening			
Adult Entertainment	Advertising & Media	Alcohol	Biotechnology	Casino	Cinema	Conl Finance	Entertainment	Gambling	Hotels	Leisure	Music	Pork related products	Resturants	Tobacco	Trading of Gold/Silver	Weapons	Debt	Liqudiity	Interest	Non-permissble income
Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	Core business	FD / OE < 33,33%	AC / MC$^{12m\ avg}$ < 30%	CSI / TA < 30%	II + NCI / < 5%
																	IBD / MC$^{12m\ avg}$ < 30%	AC / MC$^{12m\ avg}$ < 33%		
																	IBD / MC$^{12m\ avg}$ < 33%	AC / MC$^{12m\ avg}$ < 45%	CSI / TA < 33%	
																	IBD / TA < 25%	AC / MC$^{12m\ avg}$ < 49%		
																	IBD / TA < 33%	AC / MC$^{24m\ avg}$ < 33%	CSI / MC < 30%	
			Any involement						Any involement						Any involement	Any involement	IBD / TA < 37%	C + D + AC / MC$^{12m\ avg}$ < 70%		
																	TD / MC$^{12m\ avg}$ < 30%	ID / MC < 30%	CSI / MC < 33%	II + NCI / < 10%
																	TD / MC$^{12m\ avg}$ < 33%	IBI / MC < 30%		
																	TD / MC$^{24m\ avg}$ < 33%	IBI + C / MC < 33%	II / TR < 3%	
Any involement	Any involement	Any involement		Any involement	Any involement	Any involement	Any involement	Any involement		Any involement	Any involement	Any involement	Any involement	Any involement			TD / MC$^{36m\ avg}$ < 33%	AC / TA < 33%		
																	TD / MC & TA < 33%	AC / TA < 45%		
																	TD / TA < 30%	AC + C / TA < 50%	II / TR < 5%	NCI / < 5%
			Include						Include						Include	Include	TD / TA < 33%	AC + C / TA < 70%		
																		AC + CSI / TA < 50%		
																	TD / TA < 33,33%	AC + CSI / TA < 67%		
																		AC + CSI / TA < 80%	II / TR < 10%	
																	TD / TA < 37%	AC + CSI / TA < 90%		
																		C / TA < 33%		
																		AC / MC&TA < 45%		
																		C + D + AC / TA < 70%		
																		NCI / TA < 33%		

Please note: the following figure displays the morphological box. 'Any involvement' is a screen that tolerates no involvement in the corresponding industry. 'Core business' tolerates involvement in the corresponding industry as long as it is not the core business. 'Include' includes the corresponding industry. AC= Account receivables, C= Cash, CSI= Cash plus short-term investments, D= Deposits, FD= Financial debt, IBD= Interest bearing debt, IBI= Interest bearing investments, ID= Interest bearing deposits, II= Interest income, MC= Market capitalization, NCI= Non-compliant investments, OE= Owners Equity, TA= Total assets, TD= Total debt. $^{12m\ avg}$= 12 months average, $^{24m\ avg}$= 24 months average, $^{36m\ avg}$= 36 months average.

2.3.2 Business activity screening

Table 2.1 shows that a total of 18 sectors is considered non-permissible with *Shari'ah* by various institutions in the industry. For clarification, it should be noted that some institutions are more detailed in their disclosure than others. For instance, Dow Jones states that their Islamic indices exclude the *entertainment* sector while MSCI list *gambling*, *music*, *hotels*, *cinema* and *adult entertainment* as prohibited sectors.[9] It can be observed that the business activity screening used in Islamic equity investing in many ways reflect the one of socially responsible investing. Both branches exclude sectors such as *adult entertainment*, *alcohol*, *gambling*, *tobacco* and *weapons*.

Some sectors excluded by Islamic investors do not seem unethical at a first sight, such as *advertising & media*, *cinema* and *music*. The rationale for excluding such firms is that they are subject to forbidden content. There are some inconsistencies concerning the tolerance level of the business activity screening. Specifically, one approach is to exclude firms that have any involvement prohibited activities while a less stringent approach allows such activities as long as it is not the core business activity. One example of the latter would be an airline company which core business is transportation while profit also is generated from alcohol sales. Finally, Table 2.1 shows that there is a disagreement whether *biotechnology*, *hotels*, *trading of gold & silver* and *weapons* should be considered *Shari'ah*-compliant,

[9] For the sake of comparison, Table 2.1 includes all alternatives.

2.3.3 Accounting based screening

2.3.3.1 Debt screens

There are several approaches to screen firms for financial leverage. First, debt is being defined as either interest-bearing debt or total debt. The former appear somewhat more precise from a *Shari'ah* perspective, as it accounts only for debt associated with interest payments. In contrast, institutions using total debt assumes that all debt comes with the payment of interest. Second, in determining the value of a company, institutions employ either market capitalization or total assets. While market capitalization suggests that the market best determines the value, proponents of using total assets would argue that it is "a trusted accounting perspective and each measurement is independent from any external market influences or speculations" (Derigs & Marzban, 2008, p. 291). In what appears to be an attempt to smooth out possibly volatile outcomes of using market capitalization, some institutions use the 24 or 36 months trailing moving average, respectively. Third, there is a clear disagreement concerning the acceptance level of debt, with threshold levels varying from 25% to 37%. According to Table 2.1, the abovementioned differences result in 15 approaches to screening for debt currently used in the industry.

2.3.3.2 Liquidity screens

There are also many different approaches to screen firms for liquidity. Concerning the definition of liquid assets a number of accounting items are being used: *account receivables*, *cash*, *deposits*, *interest-bearing investments*, *short-term investments* and

non-compliant investments.[10] Clearly, there is a lack of consensus concerning which items that should be regarded as liquid assets. For instance, while some institutions use account receivables, others use account receivables plus cash and short-term investments. This lack of consensus is also reflected in the threshold levels, ranging from 30% to 90%. However, it appears that ratios that include more liquid assets have less stringent threshold levels. According to Table 2.1 there are currently 21 liquidity ratios used in the industry.

2.3.3.3 Interest and non-compliant income screens

There are fewer variations among industry participants concerning screening for interest and non-compliant income. The main difference concerns the use of either *cash & short-term investments* (in relation to market capitalization or total assets) or interest income (in relation to total revenue). The rationale for measuring the amount of cash & short-term investments is the assumption that firms holding such assets is likely to enjoy interest income (Derigs & Marzban, 2008).

2.3.4 Stringency of *Shari'ah* screens

To further increase the understanding of the impact of different screens, this part of the analysis will examine what impact business activity and accounting ratios have on a given asset universe. The analysis is based on firms included in FTSE All-World Index between January 2002 and December 2013. As noted in Section 2.3.3, many of

[10] Typically, index providers and fund managers do not provide detailed information of what the respective accounting item entail. Hence, it could be the case that some of the ratios displayed in Table 2.1differ only in terms of terminology.

the financial ratios currently used in the industry are based on market capitalization. Theoretically, this implies that the stringency of these screens should vary depending on the overall market environment. Here, the length of the sample period allows us to examine the stringency of screens in periods of both bull markets (post dot.com bubble) and bear markets (subprime crisis).

The dataset is constructed as follows. First we create a list of all FTSE All-World constituents between 2002 and 2013. To enable an examination of (i) the impact of the accounting screens in different sectors and (ii) the impact of the of the business activity screens, all constitutions must have a sector code allocated. Here, we rely on the Industry Classification Benchmark (ICB) which is a widely used taxonomy-type classification framework for stock market sectors. While the ICB have sector codes for most business screens, i.e., Advertising & Media, Alcohol (3533,3535), Financials (8000), Media (5500), Gambling (5752), Hotels (5753), Tobacco (3785) and Defence (2717), firms involved in adult entertainment and pork-related products has to be identified with an alternative method. To identify these firms use we S&P Capital IQ service to screen for firms for relevant keywords in the business description. In order to construct the accounting screens, we next download a large set of accounting data for all firms. From Thomson Reuters Datastream we obtain (i) account receivables (ii) cash (iii) interest income (iv) market capitalization (v) total revenue (vi) short-term investments (vii) total assets (viii) total debt.

The dataset is subject to three limitations. First, it is not possible to to analyse the difference between the two parameters of the business activity screens (i.e., *any involvement*, *core business*) as the ICB only assign sector codes for the main business activity. Second, it lacks accounting data needed to calculate the non-permissible income ratios. Hence, the analysis of the accounting screens is limited to the debt, liquidity and interest ratios. Third, we have taken the liberty to simplify some of the financial ratios. For instance, in the morphological box (Table 2.1) it can be observed that different of debt are being used, namely *interest-bearing debt* and *total debt*. Since we are unable to isolate interest-bearing debt, we use total debt in all cases. Table 2.2 reports the impact each screen has on the asset universe, as measured by the percentage decrease. While the majority of the screens have a marginal impact on the asset universe (0.01% to 1.9%), the financial sector screen reduces the asset universe with approximately almost 22%. The latter is noteworthy and suggests major differences in sector allocation between conventional and *Shari'ah*-compliant asset universes.

Table 2.2 Stringency of business activity screening

Sector	Stringency
Adult Entertainment	1.5%
Alcohol	0.9%
Biotech	0.4%
Defence	0.4%
Financials	21.8%
Gambling	0.7%
Hotels	0.6%
Media Agencies	0.4%
Pork	0.2%
Publishing	1.3%
Restaurants & Bars	0.7%
Tobacco	0.5%
Total reduction	**29.4%**

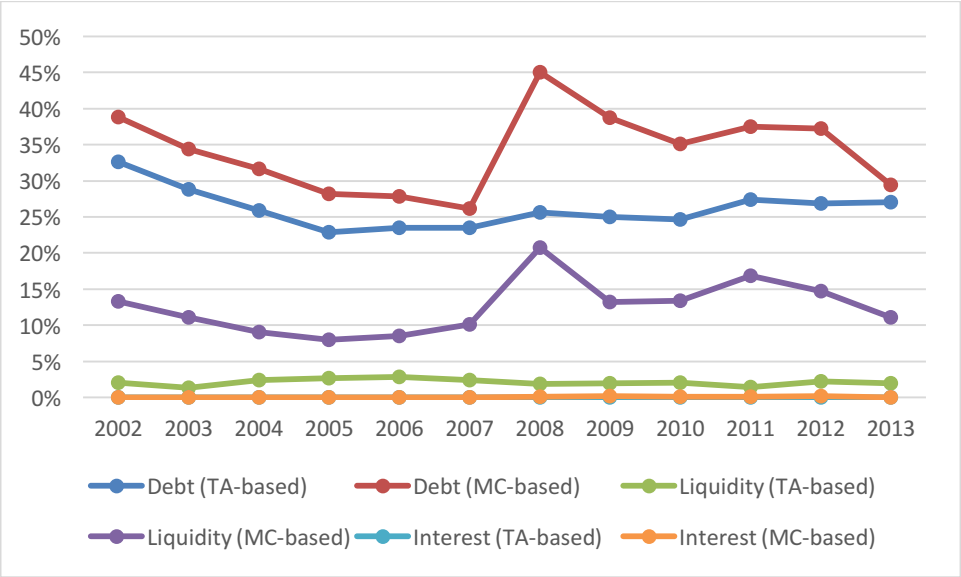
The following table reports the stringency of each business activity screen respectively. Collectively, these screens reduce almost 30% of the universe although the majority (21.8%) is due to the exclusion of financial stocks.

As illustrated in Table 2.1, excluding firms involved with prohibited business activities is the first step in constructing a Shari'ah-compliant asset universe. Hence, to capture the realistic impact of the accounting based screens, we construct a sub-universe that contains all constituents of the FTSE All-World Index, excluding all industries in Table 2.2. Table 2.3 reports several interesting variations in the stringency between different debt ratios. First, using total assets rather than market capitalization as a divisor results in a less constraint universe. For instance, at a 33% threshold level, the total assets (market capitalization) based ratio results in a reduction of between 22.8% (26.1%) and 32.6% (45%) throughout the sample period. Second, focusing on the period 2007 to 2009, there is a sharp increase in the stringency of the market capitalization based screens. This implies that fluctuations in the overall market environments significantly impact the stringency of financial ratios based on

market capitalization. Third, for the total assets based ratios, the threshold level appear to be an important determinant of the screening stringency. The difference between the 30% and 37% threshold level varies between 9.9% (2011) and 16% (2002). Finally, the most stringent ratio is the one where both market capitalization and total assets are used a divisor. This indicates that the two types of divisor exclude different types of stocks.

Overall, the liquidity screens are much less stringent than the debt screens. In fact, when *account receivables* (both with and without *cash* and *short-term investments*) are put in relation to total assets, there is almost no reduction in the asset universe at all. Typically, the total assets based screens do not reduce the asset universe with more than 3%. Fundamentally, this is not too surprising though. For instance, the laxest liquidity screen (i.e., AC+C+SI/TA<90%) suggests that all firms with less than 90% liquid assets will pass then screen. This minimal reduction in asset universe is also true for the interest income ratios that measures the cash and short-term investments in relation to total firm value, while the interest income to revenue ratios are somewhat more stringent (especially with a threshold level of 3%).

Figure 2.5 Time-varying difference in stringency between MC-based and TA-based screens at 33% threshold level



The following figure illustrates the difference in screening impact between financial ratios based on market capitalization (MC) and total assets (TA) at a 33% threshold level. Three interesting observations can be made from this figure. First, the sharp increase of the MC-based screens in 2008-2009 clearly illustrates how their stringency correlates with the valuation of the stock market. Second, with a stringency between 8% and 20%, the MC-based liquidity is significantly more stringent than its TA-based counterpart. Finally, it can be observed that neither of the interest screens has any impact at all on the asset universe.

Figure 2.5 illustrates how the impact of debt, interest and liquidity screens based on market capitalization and total assets, respectively, can fluctuate over time. Several interesting observations emerge from this figure. First, despite a fixed threshold level (i.e., 33%) there is a significant gap in stringency between market capitalization and total assets. For debt and liquidity, a market capitalization based screening rulebook result in a smaller universe throughout the entire sample period. Second, while the stringency of the total assets based screens remain relatively constant throughout the sample period, the market capitalization based screens are much more volatile. The

sharp increase in 2008 suggest that the stringency of market capitalization based screens is largely determined by the overall market environment, where a lower valuation result in more stringent screening. At the two spikes in the global stock market valuation during that sample period cover in Figure 2.5, that is, in 2007 just before the financial crisis breakout and the end of the recovery period in 2013, the stringency of the two types of debt screens is almost identical. Although the sample period is too short to draw any definite conclusions, this observation suggests that the stringency between market capitalization and and total assets based debt screens is very similar when the valuation of the market is high. Finally, it is evident from Figure 2.5 that the interest based screening, independent from using market capitalization or total assets, has next to no impact during the duration of the sample period.

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Table 2.3 Stringency of accounting based screens

Portfolios	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Debt screens												
TD / TA < 30%	0.39	0.35	0.30	0.29	0.27	0.29	0.31	0.30	0.30	0.31	0.32	0.34
TD / TA < 33%	0.33	0.29	0.26	0.23	0.23	0.23	0.26	0.25	0.25	0.27	0.27	0.27
TD / TA <33,33	0.32	0.28	0.26	0.22	0.23	0.23	0.25	0.25	0.24	0.27	0.27	0.27
TD / TA <37%	0.23	0.21	0.19	0.17	0.17	0.17	0.20	0.20	0.18	0.21	0.21	0.20
TD / MC < 30%	0.41	0.36	0.34	0.31	0.30	0.28	0.48	0.41	0.39	0.41	0.40	0.33
TD / MC < 33%	0.39	0.34	0.32	0.28	0.28	0.26	0.45	0.39	0.35	0.37	0.37	0.29
TD / TA&MC <33%	0.45	0.40	0.36	0.33	0.33	0.32	0.50	0.44	0.42	0.46	0.46	0.39
Liquidity screens												
AR / TA <33%	0.02	0.01	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.02
AR / TA <45%	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
AR+C/TA<50%	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.18	0.20
AR+C/TA<70%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.15
AR+C+SI/TA<67%	0.01	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01
AR+C+SI/TA<90%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR/MC<30%	0.16	0.12	0.12	0.09	0.10	0.12	0.23	0.16	0.15	0.20	0.16	0.12
AR/MC<33%	0.13	0.11	0.09	0.08	0.09	0.10	0.21	0.13	0.13	0.17	0.15	0.11
AR/MC<45%	0.09	0.07	0.06	0.05	0.05	0.06	0.15	0.08	0.09	0.13	0.11	0.07
AR/MC<49%	0.09	0.06	0.05	0.05	0.05	0.05	0.14	0.07	0.08	0.12	0.09	0.06
AR+C+SI/MC<70%	0.09	0.07	0.06	0.05	0.05	0.06	0.16	0.09	0.11	0.14	0.12	0.08
Interest screens												
CSI/TA<30%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSI/TA<33%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSI/MC<30%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSI/MC<33%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest income/Rev<3%	0.04	0.03	0.01	0.02	0.04	0.06	0.03	0.03	0.02	0.02	0.02	0.01
Interest income/Rev<5%	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Interest income/Rev<10%	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00

The following table displays the impact of each financial ratio (in percentage) between 2002 and 2013. Column one reports the ratio specification and subsequent threshold level, respectively. AR= Account receivables, C= Cash, CSI= Cash plus short-term investments, D= Deposits, FD= Financial debt, IBD= Interest bearing debt, IBI= Interest bearing investments, ID= Interest bearing deposits, II= Interest income, MC= Market capitalization, NCI= Non-compliant investments, OE= Owners Equity, TA= Total assets, TD= Total debt.

2.3.4.1 Screening impact in different sectors

Fundamentally, firms with more (less) intangible assets (e.g., intellectual property, patents) are likely to have relatively higher (lower) market capitalization to total assets ratios. This section, therefore, aims to investigate whether there are any cross-sector differences in the stringency of the financial ratios. Following the Industry Classification Benchmark (ICB), the original dataset is divided into the following nine

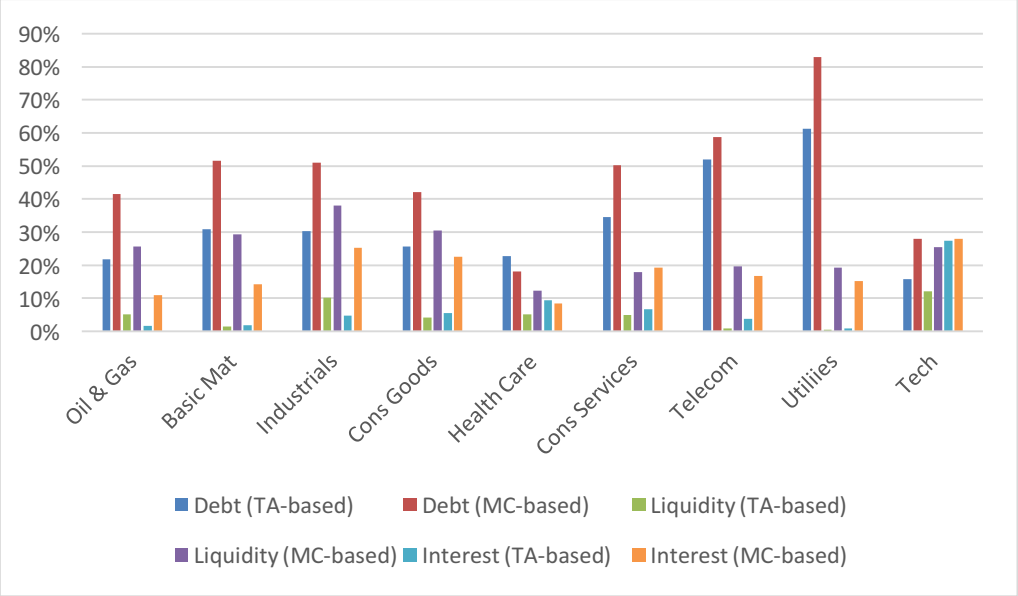
sectors: *Oil & Gas*, *Basic Materials*, *Industrials*, *Consumer Goods*, *Health Care*, *Consumer Services*, *Telecommunications*, *Utilities* and *Technology*.

The results, displayed in Table 2.4, provides a number of interesting observations. First, the stringency of most financial ratios appear to be sector sensitive. For instance, at a 30% threshold level, the debt screen based on total assets excludes 19% of the technology universe and 69% of the utilities universe (i.e., a 50% difference in screening impact), and using market capitalization as divisor results in a 65% difference between healthcare (20%) and utilities (85%). Second, the results suggest that the threshold level for a given ratio is a significant determinant of stringency. For example, for the utilities sector there is a 21% difference in impact between the 30% and 37% threshold level of the total asset based debt screen. Third, in some sectors total asset based debt ratios appear to be more stringent than market capitalization based screening, such as the health care sector.

To visualize the issue of screening impact, Figure 2.6 provides an overview of the screening stringency across nine common sectors (Oil & Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications, Utilities and Technology). Following the structure of Figure 2.5, a sample of debt, interest and liquidity screens based on market capitalization and total assets, respectively, are compared at the common 33% threshold level, showing the mean difference in screening stringency over the period 2002 to 2013. Based on this

comparison it is evident that the screening stringency is determined largely by the characteristics of a given industry. For instance, while the debt screen based on market capitalization exclude less than 20% of healthcare companies, more than 80% of firms of the firms in the utilities sector would fail to pass this screen.

Figure 2.6 An illustration of screening stringency across sectors



The following figure illustrates the mean difference in screening impact between financial ratios based on market capitalization (MC) and total assets (TA) at a 33% threshold level across different sectors. For many screens, the difference in stringency across sectors is significant. For instance, the MC-based debt screen excludes 83% of the utilities sector, but only 18% of the health care sector. Furthermore, it can be observed that the difference in stringency between the screens is significant in sectors such as utilities and telecom while being much more even in technology and healthcare sector

.

Table 2.4 Stringency of accounting based screens across sectors

		Sectors								
		Oil & Gas	Basic Materials	Industrials	Consumer Goods	Health Care	Consumer Services	Telecommunications	Utilities	Technology
Debt	TD / TA < 30%	0.27	0.38	0.37	0.32	0.29	0.41	0.59	0.69	0.19
	TD / TA < 33%	0.22	0.31	0.30	0.26	0.23	0.34	0.52	0.61	0.16
	TD / TA <33,33	0.21	0.30	0.30	0.25	0.22	0.34	0.51	0.60	0.15
	TD / TA <37%	0.17	0.23	0.22	0.19	0.17	0.28	0.43	0.48	0.12
	TD / MC < 30%	0.45	0.55	0.54	0.45	0.20	0.52	0.63	0.85	0.30
	TD / MC < 33%	0.41	0.52	0.51	0.42	0.18	0.50	0.59	0.83	0.28
	TD / TA&MC <33%	0.44	0.54	0.54	0.47	0.28	0.54	0.66	0.85	0.30
Liquidity	AC / TA <33%	0.05	0.01	0.10	0.04	0.05	0.05	0.01	0.01	0.12
	AC / TA <45%	0.02	0.00	0.02	0.00	0.03	0.02	0.00	0.00	0.04
	AC+C/TA<50%	0.06	0.02	0.05	0.04	0.06	0.04	0.04	0.03	0.10
	AC+C/TA<70%	0.04	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.04
	AC+C+SI/TA<67%	0.00	0.00	0.02	0.01	0.03	0.02	0.00	0.00	0.09
	AC+C+SI/TA<90%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AC/MC<30%	0.28	0.33	0.41	0.34	0.13	0.20	0.21	0.22	0.28
	AC/MC<33%	0.26	0.29	0.38	0.31	0.12	0.18	0.20	0.19	0.25
	AC/MC<45%	0.18	0.20	0.29	0.20	0.09	0.11	0.14	0.13	0.18
	AC/MC<49%	0.17	0.17	0.27	0.18	0.08	0.09	0.12	0.12	0.17
	AC+C+SI/MC<70%	0.17	0.19	0.32	0.25	0.09	0.15	0.18	0.17	0.24
Interest	CSI/TA<30%	0.03	0.03	0.07	0.08	0.14	0.09	0.05	0.01	0.32
	CSI/TA<33%	0.02	0.02	0.05	0.05	0.09	0.07	0.04	0.01	0.27
	CSI/MC<30%	0.13	0.16	0.28	0.26	0.10	0.21	0.19	0.17	0.31
	CSI/MC<33%	0.11	0.14	0.25	0.23	0.08	0.19	0.17	0.15	0.28
	Interest income/Rev<3%	0.03	0.03	0.04	0.02	0.03	0.02	0.08	0.12	0.05
	Interest income/Rev<5%	0.02	0.02	0.02	0.01	0.01	0.01	0.03	0.06	0.02
	Interest income/Rev<10%	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.02	0.00

The following table displays the mean impact of each financial ratio (in percentage) between 2002 and 2013. Column one reports the screening category and column two each ratio specification and subsequent threshold level, respectively. AC= Account receivables, C= Cash, CSI= Cash plus short-term investments, D= Deposits, FD= Financial debt, IBD= Interest bearing debt, IBI= Interest bearing investments, ID= Interest bearing deposits, II= Interest income, MC= Market capitalization, NCI= Non-compliant investments, OE= Owners Equity, TA= Total assets, TD= Total debt. Column three to eleven report the screening impact in each industry, respectively.

2.4 Chapter summary

Part one of this chapter was concerned with the institutional background of Islamic finance. Economic activities based on Islamic values have been performed for several centuries, although the modern form of Islamic finance started to develop as late as four decades ago. Based on the principles of *Shari'ah*, Islamic finance prohibits involvement in interest, speculation, uncertainty and unethical business activities. Islamic equity investing started to grow significantly after its official approval in 1992, and is now a multi-billion dollar industry with thousands of funds and indices available all over the world.

Part two offered a critical examination of the *Shari'ah*-based stock screening process, which can be considered the cornerstone of Islamic equity investing. Due to the absence of universal standards, there are currently major inconsistencies in how this screening process is performed. The results presented in this chapter illustrated the diverse impact this could have in terms of size and asset allocation. This suggests that the choice of *Shari'ah* screening norms could be an important determinant of return and risk.

Chapter 3

THEORETICAL BACKGROUND

3.1 Introduction

With its roots in the mean-variance efficiency paradigm of Markowitz (1952) modern asset pricing theory is concerned with describing the relationship between returns and risk of financial assets in market equilibrium. From both a chronological and fundamental perspective, it makes sense to start any such discussion with the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966). Ever since its inception, the CAPM has had a tremendous influence on how academic researchers and industry participants understand financial markets. Not only has been argued that the model "[…] marks the birth of asset pricing theory" (Fama & French 2004, p. 25) but it is also one of the most frequently used models to measure financial performance and estimating cost of capital (Bodie, Kane and Marcus, 2005). The CAPM specifics an algebraic relationship between the expected return and risk of assets in market equilibrium. Specifically, it postulates that the risk of an asset is defined by the extent to which it co-varies with the overall market. If investors are risk averse, as implied by the mean-variance efficiency logic, then investors would require higher returns for taking on risk.

The precise predictions made by the CAPM regarding the pricing of financial assets have from start been subject to scepticism, and many empirical tests have been performed to validate its conjecture regarding the relationship between risk and the cross-section of asset returns. Despite its widespread popularity, empirical tests have

largely come to disprove CAPMs predictions. For instance, early work such as Friend & Blume (1970) and Black, Johnson and Scholes (1972) presented empirical evidence that the slope of the security market line is flatter than predicted by the model. That is, less (more) risky assets earn higher (lower) returns than what is predicted by the model. More recent work such as Basu (1977), Banz (1981) and Jageedesh & Titman (1993) reveal the existence of market anomalies, which in the world of the CAPM should not exist. The overreaching conclusion drawn from this body of literature is that beta, the systematic risk factor within the CAPM framework, fails to explain all variations in the cross-section of asset returns. This insight led to the emergence of models that incorporate additional factors in an attempt to add explanatory power to cross-sectional differences in asset returns.

The first objective of this chapter is to review the asset pricing literature and the most significant developments of expected return models. This discussion departs from the theoretical foundation of the CAPM, followed by review of its empirical tests and the subsequent emergence of multifactor asset pricing models. In light of these expected return models, the second objective is to review a series performance measures that can be employed to meet the research objectives of the present thesis.

3.2 The Capital Asset Pricing Model

3.2.1 Theoretical foundation

The theoretical foundation of the CAPM departs from the mean-variance efficiency model introduced by Markowitz (1952) and the so-called separation theorem proposed by Tobin (1958). Markowitz's model, which is concerned with portfolio selection under uncertainty, spans over a single period horizon where investors form a portfolio in the beginning of the period (t-1) which delivers a randomly distributed return at the end of the period (t). In this context, the model states that under the assumption that investors are risk averse, the only parameters that are ought to be of interest are the expected mean and variance (risk) of asset returns. This implies that investors choose portfolios that maximize the expected return for a given level of risk, and minimize risk for a given level of expected return (i.e., portfolios that is mean-variance efficient). Incorporating the notion of risk-free lending and borrowing risk- into the mean-variance framework, Tobin (1958) showed that there is in-fact a single efficient portfolio, the market portfolio, and that investors adjust their risk by different weights in risky and risk-free assets.

In addition to the mean-variance logic, which imply a positive linear relationship between expected return and risk, the predications of the CAPM is underpinned by several assumptions. First, investors are believed to have homogenous expectations regarding the distribution of asset returns over a single period horizon. Second, in light

of Tobin's separation theorem, investors are believed to have access to unlimited borrowing and lending at the risk-free rate (Fama & French, 2004). Third, financial markets are believed to lack imperfections, meaning that elements such as transaction costs and taxes are not present and finally, these markets are subject to perfect competition, meaning that no single investors can influence stock prices. Based on these assumptions, the CAPM specifics the following prediction regarding the expected return of risky assets:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \tag{3.1}$$

where $E(R_i)$ denotes the expected return of asset i, R_f is the risk free rate and R_m is the return of the market portfolio m. β_i represents the systematic risk and is defined as the covariance of the return of asset i to the return of market portfolio m divided by variance the of the market portfolio m. Hence, β_i is a measure of the extent to which asset i tend to co-vary with the market portfolio. One of the key implications of this specification is that investors will be rewarded only by taking on higher systematic risk, while idiosyncratic (unsystematic) risk, as proven by the mean-variance model, can be eliminated through portfolio diversification.

3.2.2 CAPM critique and empirical validation

The CAPM has since its inception been subject to much criticism, and has been widely debated in the empirical asset pricing literature. The amount of attention received in

this literature stream is largely an outlet of the specific predictions made regarding the relationship between expected return and risk. Specifically, the model predicts that (i) asset returns and their respective market betas is positively and linearly related, (ii) cross-sectional differences in excess returns can be explained only by proportional differences in asset betas and (iii) the market premium (i.e., market return minus the risk-free rate) is positive, implying that its expected market return should be greater than assets uncorrelated with the market.

Initial tests of the CAPM aimed to examine whether the intercept equal the risk-free rate, and whether slope of the security market line reflects the market premium. The latter refer to the theoretical linear relationship between expected return and risk, as predicted by the model. The main approach to examine these predictions was to regress individual stock returns on their respective betas in a cross-sectional setting. As discussed by Fama & French (2004), this approach turned out to be problematic for two particular reasons. First, the residuals of the regressions were driven by unique industry effects, where "[p]ositive correlation in the residuals produces downward bias in the usual ordinary least estimates" (p.31). Second, the standard errors of the estimated betas of individual stocks were too large to statistically explain asset returns. To overcome this issue, and improve the estimates of beta, it became standard procedure to use portfolios rather than individual stocks.

Analysing a set of US stock portfolios, Black, Jensen, and Scholes (1972) found stocks with low beta values to earn higher return, and stocks with high beta values earn less return, than predicted by the CAPM. Furthermore, the authors found that "high-beta securities had significantly negative intercepts and low-beta securities had significantly positive intercepts" (p.44). When analysing two subsamples of US stock returns between 1960 and 1968, Friend and Blume (1970) found a non-stationary relationship between asset returns and beta. Specifically, they documented a negative relationship between return and beta in the first sample period (January 1960 to March 1964) and the reverse for the second sample period (April 1964 to June 1968). These findings were hence interpreted as a clear violation of the CAPM, as it suggests a non-linear (and possibly non-stationary) relationship between asset return and beta.

More recent tests examine whether there are other variables that add to the explanation of cross-sectional return differences. If the prediction made by the CAPM is correct, then beta should be the only significant determinant of asset returns. Since these tests started in the mid 1970s, there has been an increasing amount of empirical evidence that contradict the CAPM. Specifically, there is substantial evidence that beta fails to explain returns associated with cross-sectional differences in firm characteristics. so-called market anomalies.

The first evidence of market anomalies stems from the work of Basu (1977). Using a sample of US stocks over the period 1957 to 1971, Basu found that stocks with high

earnings-to-price ratios (so-called value stocks) significantly outperform stocks with low earnings-to-price ratios (so-called growth stocks). Banz (1981) and Reinganum (1981) documented stocks with small market capitalization to exhibit higher risk-adjusted performance than stocks with large market capitalization. Furthermore, both Stattman (1980) and Rosenberg, Reid, and Lanstein (1985) find evidence that firms characterised by high book-to-market ratios have higher returns than stocks with firms with low book-to-market ratios.

Bhandari (1988) finds firms with high financial leverage to outperform firms with low financial leverage. There is also empirical evidence that predictable power can be found in historical returns. For instance, DeBondt and Thaler (1985) find that over longer time horizons, historical returns are inversely related to future returns (i.e., a contrarian effect), while Jegadeesh and Titman (1993) document previous winning stocks to outperform previous loosing stocks over a short-term horizon (i.e., a momentum effect). Together, these empirical observations contradict the CAPM prediction that beta is the only relevant variable to explain cross-sectional variation in asset returns. Rather, they suggest that there are additional variables capable of better explaining cross-sectional variation in stock returns.

Drawing on the aforementioned empirical observations, Fama and French (1992) examined the explanatory power of market beta, size, leverage, book-to-market equity and earning-to-price ratios on US stock returns in a cross-sectional regression setting

between 1963 and 1990. It was found that the cross-sectional variation in stock returns linked to these variables is well captured by risk factors related to size and book-to-market equity. The seminal work of Fama & French (1992) is widely considered to represent a landmark in the asset pricing literature. Specifically, by addressing the empirical failings of the CAPM, the study incentivised research efforts to find models superior the CAPM in explaining variations in asset returns.

3.3 The emergence of multifactor models

A frequently used argument for the empirical failings of the CAPM rests on its underlying assumptions, some of which appear unrealistic in a real world context. For instance, with regard to investor behaviour under uncertainty, the model assumes that investors make decisions over a single-period horizon. That is, they selection portfolios in the beginning of a period and care only about the expected return in the end of that period. Furthermore, the fact that the model predicts all cross-sectional variation in asset returns to captured by a single factor (beta) can appear too simplistic. In response to these (arguably) unrealistic assumptions, a number of alternative expected return models emerged. What most of these models have in common is that they make use of multiple factors to explain variations in asset returns.

Merton (1973) contributed to the asset pricing literature by introducing the Intertemporal Asset Pricing Model (ICAPM). In the world of the ICAPM, investors,

when selecting portfolios, also consider how future changes in state variables will affect their wealth. The logic here is that if an asset has the tendency to do relatively better during periods of economic downturns then the demand for this stock will increase, resulting in a higher equilibrium price and hence lower expected return. To capture this change in investment opportunity, Merton (1973) prospered an extension of the original CAPM which also include relevant state variables. Using a different approach, Ross (1976) introduced Arbitrage Pricing Theory (APT) which defines the expected return of assets as a function of macroeconomic variables. Perhaps the main limitation of both the ICAPM and the APT model is these variables are not defined.

Fama and French (1993) introduced a three-factor model that uses abnormal returns rather than state variables to capture the cross-section of asset returns. Building on their previous work in Fama and French (1992), and under the assumptions that markets rationally priced, the authors claim that the return differentials between stocks with small market capitalization and big market capitalization (the size effect) and stocks with high and low book-to-market ratios (the value effect) serve as good risk proxies associated with unknown state variables omitted by the market beta. The three-factor model describes expected return as:

$$E(R_{it}) - R_{ft} = \beta_{im}(E(R_{mt}) - R_{ft}) + \beta_{is}E(SMB_t) + \beta_{ih}E(HML_t) \qquad (3.2)$$

where SMB_t, small minus big, represents the return differentials between stocks with small market capitalization and stocks with big market capitalization, and HML_t, high minus low, represents the return differentials between stocks with high book-to-market equity and stocks with low book-to-market equity.

While there is strong empirical evidence that SMB_t and HML_t capture cross-sectional variation in asset returns associated with well-known market anomalies such as size, leverage, book-to-market equity and earning-to-price ratios (Fama & French 1992, 1993), the three-factor model has not proven to capture the short-term momentum effect discovered by Jegadeesh & Titman (1993). In response to this shortcoming, Carhart (1997) extended the three-factor model by adding a momentum factor which captures the return differentials between previous winnings stocks and previous loosing stocks. The four-factor model of expected return is hence given as:

$$E(R_{it}) - R_{ft} = \beta_{im}(E(R_{mt}) - R_{ft}) + \beta_{is}E(SMB_t) + \beta_{ih}E(HML_t) + \beta_{iw}E(MOM_t) \quad (3.3)$$

where MOM_t represents the return differentials between previous winning stocks and previous loosing stocks.

While the aforementioned expected return models are designed to capture the effects of the most common market anomalies, others are left unexplained. For instance, using a sample of US stocks between 1973 to 1997, Titman, Wei, and Xie (2004) document

a negative relationship between with high capital investments and future performance. Analysing this performance in a Carhart (1997) four-factor regression setting led them to conclude that "[…] the negative abnormal capital investment/return relation is independent of the previously documented long-term return reversal and secondary equity issue anomalies" (p.677). Novy-Marx (2013) expose another anomaly which previous models fail to capture. Specifically, the author finds a strong positive relationship between profitability (defined as gross profits-to-assets) and return. Motivated by these empirical observations, Fama and French (2015) suggest a five-factor model which they define as:

$$\begin{aligned} E(R_{it}) - R_{ft} = \beta_{im}(E(R_{mt}) - R_{ft}) + \beta_{is}E(SMB_t) + \beta_{ih}E(HML_t) \\ + \beta_{ir}E(RMW_t) + \beta_{ic}E(CMA_t) \end{aligned} \tag{3.4}$$

where RMW_t represents the return differentials between stocks with robust and weak profitability, and CMA_t, represents the return differentials between stocks with low and high capital investments. Based on evidence from US stocks between 1963 and 2013, the authors find that the five-factor model is explaining more of the variation in average stock returns.

3.4 Performance measurements

The principal objective of performance measurements employed in empirical finance research is straight-forward: to compare the returns of a given investment portfolio, such as a mutual fund or equity index, with the returns of a suitable market benchmark. For this comparison to be useful, it should, ideally, be based on a theoretical model that makes predictions regarding expected returns. It is, therefore, necessary for the investment portfolio and the corresponding benchmark to share all characterises that could influence expected returns. As pointed out by Aragon and Ferson (2006), this is also why expected return models and performance measurements have developed in tandem over the past four decades. The purpose of the section is to discuss and motivate a series of performance measurements that can be utilized to to meet the research objectives of this thesis. The common thread is that they are concerned with measuring the return of assets on a risk-adjusted basis. That is, returns are adjusted to account for risk differentials between the portfolio of interest and its corresponding benchmark.

3.4.1 The Sharpe ratio

The Sharpe ratio, developed by Sharpe (1966), measures a portfolio's risk premium (i.e., portfolio return net of the risk-free rate) divided by its standard deviation. In this context, the standard deviation of portfolio return serves a proxy for risk. Hence, the

ratio will indicate how much the return that is generate for a given level of risk. It is computed as follows:

$$SR = \frac{R_i - R_f}{\sigma^i} \tag{3.5}$$

where $R_i - R_f$ is the excess mean return of portfolio p over the risk free rate and σ_p is the standard deviation of portfolio p. In other words, the higher the ratio the more favourable is the risk-adjusted return. It should be noted that the Sharpe ratio does not incorporate any information regarding the portfolio's market benchmark. Standard procedure is therefore to compute the ratio for the benchmark as well and then compare the results.

3.4.2 The Treynor ratio

The Treynor ratio, introduced by Treynor (1965), differs from the Sharpe ratio in that it measures the excess portfolio return in relation to the systematic (market) risk rather than standard deviation. It is computed in the following way:

$$TR = \frac{R_i - R_f}{\beta^i} \tag{3.6}$$

where β_p is the portfolio beta (or systematic risk) of portfolio i.

3.4.3 The Jensen's alpha measure

Following the logic of the CAPM, Jensen (1968) recognized that the model's prediction regarding expected return and risk also can be used to evaluate portfolio performance. The measure, known as 'Jensen's alpha', compares an asset's realized returns with its theoretical expected returns as predicted by the CAPM. To obtain the Jensen's alpha, one estimates the following time-series regression:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad (3.7)$$

Where R_{it} is the return of portfolio i at time t, R_{ft} is the risk-free rate at time, α_i is the intercept of the regression, β_i is the beta value of portfolio i, R_{mt} the return of the market benchmark at time t and ε_{it} is the random error term. Following the discussion from earlier, it is clear that the CAPM predicts α_i to be zero. Hence, if α_i turns out to be positive and statistically significant, this means that asset i has earned an actual return above its expected return (i.e., outperformance), a negative and significant α_i implies actual return is below its expected return (i.e., underperformance), and a zero α_i implies a similar performance.

The Jensen's alpha is widely considered to be the most frequently employed performance measure in financial research. Originally, Jensen (1968) used the measure to evaluate the performance of 115 US mutual funds and it has ever since been synonymous with testing fund managers ability to generate above market returns.

However, the measure is also widely used to test the performance hypothetical stock portfolios and passive instruments, such as equity indices and exchange traded funds.

3.4.4 The Fama & French (1993) three factor model

As previously discussed, one of the main criticism of the CAPM is the assumption that cross-sectional variation in asset returns can be explained entirely by the single factor beta. This criticism gained momentum following the vast amount of empirical evidence of market anomalies in the 1980s and 1990s. The seminal work of Fama & French (1992, 1993), resulting in the now well-known three-factor model, therefore paid a significant contribution to the performance measurement practice. The model departs from the empirical observations of financial premiums associated with value stocks (Basu 1977) and small cap stocks (Banz 1981). By incorporating these factors, the authors argued, one would end up with a model that better explain the cross-section in asset returns. The rationale for this reasoning is that, assuming that there is a rational pricing mechanism of assets, then stock returns should correctly proxy for the sensitivity to risk factors in returns. In a similar fashion as the Jensen's alpha, the three-factor model of expected return can also be written as time-series regression performance measure:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \varepsilon_{it} \quad (3.8)$$

where SMB_t (small minus big) is the difference in return between a portfolio of small stocks and a portfolio of big stocks and HML_t (high minus low) is the difference in return between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Fama & French find that adding the size and value factors as explanatory variables results in model that captures about 90% of the return variation in a diversified stock portfolio.

3.4.5 The Carhart (1997) four factor model

One market anomaly not captured by the Fama & French (1993) three-factor model is the short-term momentum effect documented by Jegadeesh and Titman (1993). When evaluating a sample of mutual funds, Carhart (1997) therefore proposed an extension of the three-factor model that, in addition to risk factors associated with market beta, size and value, also control momentum. The specification of the time-series regression can hence be written as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \varepsilon_{it} \qquad (3.9)$$

Where MOM_t is differences in return between previous winning stocks and previous loosing stocks. Including the momentum effect was mainly a way for Carhart (1997) to capture specific skills of fund managers. From this perspective, the four-factor model is primarily suited for analysing the performance of actively managed portfolios. However, in light of the Fama & French (2004) argument that the four-

factor model is "[…] legitimate in applications where the goal is to abstract from known patterns in average returns to uncover information-specific or manager-specific effects" (p.40), the model also appears appropriate when analysing passive investment instruments, such as equity indices.

3.5 Concluding remarks

In its essence, conventional asset pricing theory is concerned with understanding the relationship between expected returns of financial assets and risk. In the spirit of Markowitz (1952), this current thinking subscribes to the notion of rational, risk averse investors that select portfolios according to a mean-variance efficient paradigm. This implies a positive relationship between return and risk. Departing from the well-known Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966), this chapter has considered the most significant developments in the asset pricing literature over the past four decades.

Despite its significant popularity, the CAPM has proven to perform poorly when empirically examined. For instance, early evidence by Friend and & Blume (1970) and Black et al. (1972) disproved the prediction that beta is the only relevant factor in explaining the cross-sectional variation in asset returns. Subsequent tests also revealed stock market patterns, so-called anomalies, which beta fail to capture. These include the financial premium of factors such as size (Basu 1977), value (Banz 1981),

leverage (Bhandari 1988) and short-term momentum (Jegadeesh and Titman 1993). These empirical shortcomings of the CAPM led to the emergence of multifactor models, such as the Intertemporal Asset Pricing Model by Merton (1973), the three-factor model by Fama & French (1993) and the four-factor model by Carhart (1997). Overall, these model were proven to explain more of the variation in asset returns.

Based on the literature on expected return models, this chapter has also considered a series of popular measurements that can be used to evaluate the risk-adjusted performance of equity investments. Starting with Jensen (1968), it was showed that the CAPM can be incorporated into a time-series regression framework to evaluate investment performance. The key variable of interest in these regression tests is the intercept, which later became known as the Jensen's alpha. The CAPM predicts the intercept to be zero, whereby a positive (negative) intercept indicate a return better (worse) than what is theoretically predicted. Following the development in expected return models, the sophistication of these performance measures has increased over time. When applied to a diversified portfolio of stocks, the most sophisticated performance measures have an explanatory power of over 90%. This allows to draw precise conclusions regarding the return and risk characteristics of investments.

When used in empirical research, it is however important to acknowledge the limitations and potential weaknesses of using these performance measures. All expected return models, starting with the CAPM, are based on restrictive assumptions

about market structures and investor behaviour under uncertainty. Indeed, this implies that any results derived from the models should be interpreted with caution.

Chapter 4

AN ISLAMIC EQUITY INDEX PERFORMANCE PUZZLE[11]

Abstract

Analysing the financial performance of global and regional Islamic equity indices, we document these indices to outperform benchmarks on a global and developed market level. These results appear for multiple providers and remain after controlling for investment styles, back-testing bias, and omitted variable bias. To explain this puzzle, we investigate fundamental, behavioural and research design related explanations. From a fundamental perspective, liquidity constraints might theoretically cause Islamic equities to carry higher risk however empirically we are finding Islamic indices to be less risky during the recent credit crisis. Behaviourally, the previously found Ramadan performance boost does not seem to explain the performance recorded in this study. When we eliminate the effect of the financial services industry from conventional benchmarks, however, the explanatory power of our model rises even further, and the performance for several Islamic indices is heavily reduced. In other words, many Islamic indices appear to have yielded a significant outperformance during the recent years of financial turmoil due to their critical position towards risk-free interest and the conventional financial services industry. This implies that they represent a viable alternative for risk-averse passive investors, especially during periods of high uncertainty around financial services.

[11] Content of this chapter is used in a working paper entitled *An Islamic Equity Premium Puzzle*, co-authored by Andreas Hoepner and Kais Bouslah.

4.1 Introduction

The objective of this chapter is to analyse the financial performance of equity markets that comply with Islamic principles. We argue that, conceptually, these markets are best characterized by Islamic equity indices, which represent the *Shari'ah*-compliant sub-universes of major international equity indices. Dow Jones launched the first Islamic index in 1999 and today most major index providers offer similar indices (e.g. FTSE, MSCI, Russell, S&P), resulting in a wide range of benchmarks for Islamic investors. Analysing the performance of these indices allows us to separate the merits of the Islamic equity investment approach from the specific skills of fund managers (Schröder, 2007). In other words, analysing the financial performance of indices instead of funds controls for interfering aspects such as fund manager (market timing) skills and management fees. As a result, we purely measure the extent to which Islamic screens impact performance. Academic interest has gradually increased in line with the growth of the Islamic finance industry. While earlier studies analyse only a few indices (e.g., Hakim & Rashidian, 2004; Hashim, 2008), a more recent strand of literature (e.g., Lobe, Rößle, & Walkshäusl, 2012) incorporate somewhat larger data sets and use more sophisticated performance measurements. However, there is no consensus in the literature regarding the performance of Islamic equity indices.

Our paper makes three contributions to the literature. First, we develop a research design for the analysis of the financial performance of Islamic equity investments, which addresses a number of methodological shortcomings commonly present in previous studies. First, we employ a strict matching approach where all Islamic indices have corresponding benchmarks from the same index family. When comparing screened, and unscreened financial portfolios, matching index pairs are considered crucial to ensure reliable results (Kreander et al., 2005). In contrast, existing multifamily index studies, such as Lobe et al. (2012) generally use benchmark indices from a single provider. Second, we control for possible back-testing biases. Many Islamic indices offer back-tested performance data for their screening methodologies as part of their historical return data, and we argue that the performance can be significantly higher during this period for marketing reasons. Third, our analysis includes two approaches to sampling length, as we analyse indices both over their individual full data history and during their longest possible common sample period. Fourth, we construct an alternative, ex-financials benchmark variable. This allows us to specifically investigate the implications of the exclusion of financial stocks by Islamic investors through a comparison of Islamic indices performance vis-à-vis an all stock and an ex-financials benchmark. Fifth, we employ measurements related to financial crises and periods of market downturns not previously used in the Islamic index literature.

Our second contribution rests on our empirical findings, which brings new perspectives on the performance of Islamic equity markets. An important issue in the current Islamic finance literature is the lack of consensus regarding financial performance of Islamic equity indices. Previous studies have reported that Islamic equity markets either perform similar to the overall market, or in some cases underperform or outperform depending on the overall market condition (Girard & Hassan, 2008; Hussein, 2004). In contrast, we provide evidence that Islamic indices in many cases outperform their conventional counterparts. We document this outperformance in important contexts such as on global and developed country level. It appears for multiple providers and is robust to advance econometric modelling.

Our third contribution results from our ability to statistically explain our results. First, we find and control for a back-testing bias embedded in several Islamic indices. That is, many Islamic indices tend to perform better in back-tested performance periods compared to the 'real' period. Nevertheless, the alpha of many Islamic indices remains fairly constant after controlling for back-testing bias. Similarly, our results can also not be explained by the previously found Ramadan premium (Białkowski, Etebari, & Wisniewski, 2012). By isolating and controlling for the effects of critical events, such as financial crises, we found that Islamic indices performed relatively better during the recent credit crisis. These results reiterate that the investment philosophy embedded in Islamic finance (e.g., the ban of interest and excessive risk-taking) result in improved downside risk features. Finally, and most importantly, when we exclude financial

stocks from the conventional benchmarks the performance of Islamic indices are heavily reduced. This finding implies that many Islamic indices have yielded superior return due to their exclusion of financial stocks (as a result of their philosophical disagreement with the concept of interest). It should, however, be noted that these results are robust only to the specific sample period covered in this study.

The remaining parts of this paper are structured as follows. Section two provides a brief background to the rationale of Islamic equity investing and a review of the existing literature on the performance of Islamic equity indices. Section three discusses the theoretical arguments that form the basis of our hypotheses. In section four, we present the characteristics of the data, the data collection process as well as the construction of benchmark factors. Section five presents the main performance analysis and discussion of the results. In section six, we seek to explain the Islamic index performance. In section seven, we provide our concluding remarks and potential future research avenues.

4.2 Background

4.2.1 Islamic equity investing fundamentals

Islamic finance is an investment philosophy that adheres to Islamic principles based on *Shari'ah* law.[12] These principles are manifested in four prohibitions that signify the

[12] *Shari'ah* law is based on two sources: the *Holy Quran* and the *Sunnah* which is the saying and action of Prophet Mohammad.

compliance with Islam whereby the first three refer to transactions and the fourth to products and services (Ayub, 2009): (i) the prohibition of riba states that any form of gain must be justified by an effort or risk-taking. Hence, all forms of effortless guaranteed interest common to the western financial system are strictly forbidden in business transactions. (ii) The prohibition of maysir implies that one cannot increase wealth by the games of chance which prevent speculation. (iii) The prohibition of gharar forbids investors to deal with financial transactions that involve uncertainty or hazard caused by lack of clarity regarding the subject matter or the price in a contract or exchange, such as conventional derivatives, short-selling and insurance. (iv) The prohibition of haram products and services states that investors should not invest in products that do not comply with *Shari'ah* law (Warde, 2010).

To adhere to the above prohibitions, Islamic equity investing applies a set of negative screens to ensure that the investable universe is halal, which is the Arabic translation of the word for "allowed". The screening process is a two-step procedure where firms first must pass the industry screening and then a set of financial screens. The screening criteria must be defined by a *Shari'ah* advisory board that normally is constituted by a group of experts in Islamic law. The purpose of the industry screening is to exclude firms that are involved in business activities that are considered sinful or harmful to societies. Although somewhat inconsistent, there seems to be a consensus among *Shari'ah* scholars of what industries should be considered sinful (Derigs & Marzban,

2008). Common prohibited sectors include alcohol, entertainment, pork-related products, pornography, tobacco and the weapons industry.

In contrast to other forms of social norm based investing, Islamic investors are also restricted from investing in firms with unsatisfying financial characteristics. The main motivation for looking into a firm's financial statements is that business transactions cannot involve interest in any form (due to the prohibition of riba). Most publicly traded firms, however, are substantially integrated into the conventional (interest-based) banking system. Hence, a zero tolerance on interest payments would virtually eliminate the investable universe. To overcome this issue, *Shari'ah* scholars have agreed to define threshold levels for the respective accounting ratios (El-Gamal, 2006). Typically, Islamic index providers examine firms based on four financial characteristics: (i) Liquidity – the sum of a firm's liquid assets[13] cannot represent too much of its total market value as the profit must be from non-liquid assets. (ii) Interest – since *Shari'ah* strictly bans interest as a source of income, the interest screen is concerned with identifying the proportion of the total profit that stem from such activities. (iii) Debt – interest is not only banned as a source of income but also as a payment form. Hence, to pass the debt screen a firm cannot be highly leveraged. (iv) Non-permissible income – as multinational public firms often have several business activities, it could be the case that some parts of their overall business entail haram

[13] Liquid assets normally refer to cash, cash equivalents and other assets that converted into cash in less than 12 months.

activities. *Shari'ah* boards allow a certain level for such income subject to haram purification rule (i.e., charitable giving on the part of the profit generated from such activities).

Despite being a cornerstone of Islamic equity investing, the screening process is not controlled by regulatory authorities, with a few exceptions such as of Malaysia. Instead, index providers are free to use their own advisory boards that define the screening criteria based on their interpretation of *Shari'ah*. The screening criteria have proven to be inconsistent among index providers (Derigs & Marzban, 2008). Table 4.1 displays an overview of the screening criteria used by the index providers included in our analysis. While the business screens are quite similar, the financial screens differ substantially. More specifically, there is a difference on whether market capitalization or total assets is used to determine a firm's value. For instance, Dow Jones, Russell and S&P use market capitalization while MSCI and FTSE use total assets.

Table 4.1 Index provider screening norms

	Dow Jones	MSCI	FTSE	Russell	S&P
Accounting based screening					
Debt ratio	Total debt / market capitalization: <33%	Total debt / total assets: <33.33%	Total debt / total assets: <33.333%	Debt / market capitalization: <33%	Total debt / market capitalization: <33%
Liquidity ratio	Accounts receivables / market capitalization: <33%	Accounts receivables + cash / total assets: <33.33%	Accounts receivable & cash / total assets: <50%	cash, deposits & receivables / market capitalization: <70%	Accounts receivables / market capitalization: <33%
Interest ratio	Cash + interest-bearing securities / market capitalization: <33%	Cash + interest-bearing securities / total assets: <33.33%	Cash + interest-bearing securities / total assets: <33.333%	cash, deposits & interest bearing securities/ market capitalization: <33%	Cash + interest-bearing securities / market capitalization: <33%
Non-permissible income ratio			(Non-Permissible Income other than Interest Income) / Revenue < 5%	(Non-Permissible Income other than Interest Income) / Revenue < 5%	(Non-Permissible Income other than Interest Income) / Revenue < 5%
Business activity screening					
Advertising & media		yes		yes	yes
Adult entertainment		yes	yes	yes	yes
Alcohol	yes	yes	yes	yes	yes
Cinema		yes	yes		
Cloning				yes	yes
Conventional finance	yes	yes	yes		yes
Entertainment	yes				
Gambling		yes	yes	yes	yes
Hotels		yes	yes	yes	
Music		yes	yes		
Pork-related products	yes	yes	yes	yes	yes
Tobacco	yes	yes	yes	yes	yes
Trading of gold & silver				yes	yes
Weapons and defence	yes	yes	yes	yes	

The following table reports the *Shari'ah* screening criteria used by each index provider, respectively. The upper half of the table reports the accounting based screening. Dow Jones, Russell and S&P use screens based on market capitalization, while MSCI and FTSE use total assets. The threshold levels for the debt and interest ratio are almost identical (i.e., 33% to 33.333%), while for the liquidity ratio the gap is substantial (i.e., 33% (Dow Jones, S&P), 33.33% (MSCI), 50% (FTSE), 70% (Russell)). Liquidity is defined as either account receivables (Dow Jones, S&P), account receivables plus cash (MSCI, FTSE) or cash, deposits and receivables (Russell). Dow Jones does not disclose detailed information regarding entertainment related activities. Instead, they bundle such activities under the 'entertainment' category. While all providers employ very similar business activity screens, only Russell and S&P screen out firms involved in cloning and trading of gold and silver.

4.2.2 Empirical evidence on Islamic index performance

Earlier studies on Islamic index performance are characterised by small data samples and use of rather simplistic performance measurements, such as Sharpe ratio and Jensen's alpha. Most of these studies do not find any difference between Islamic and conventional indices on a risk-adjusted basis (Albaity & Ahmad, 2008; Habib & Islam, 2014; Ho et al., 2014; Hussein, 2004; Jouaber-Snoussi, 2012). However, Hussein and Omran (2005) report evidence indicating that Islamic index performance depends on the overall market conditions, where Islamic indices tend to outperform in bull market periods while underperforming in bear markets. This is surprising from a theoretical perspective since the Islamic accounting screens have rather conservative characteristics and could hence be expected to lead to better risk properties (i.e., outperformance in bear markets).

More recent studies use larger datasets and standard performance measurements. For example, Walkshäusl and Lobe (2012b) analyse 35 MSCI Islamic country indices from June 2002 to June 2011 using the Carhart (1997) four-factor model with MSCI's conventional indices as market benchmarks. They conclude that their "results provide supportive evidence that religious stock screens in the context of index-based Sharia-compliant investments do not reduce financial performance" (Walkshäusl & Lobe, 2012b, p. 62). It is noteworthy that they found the US and developed market Islamic indices to significantly outperform but only during their financial crisis sample

(January 2008 to June 2011). These results are also confirmed by Arouri, Ben Ameur, Jawadi, Jawadi, and Louhichi (2013) who found Islamic indices tracking the European, US and World regions to offer superior risk and return trade-offs during the financial crisis in 2007-2008.

Using a ratio and style analysis, Walkshäusl and Lobe (2012a) analysed MSCI Islamic indices of eight regions over the sample period June 2002 to May 2012 and find Islamic indices to outperform in developed regions but underperform in emerging regions. Their findings also reveal that the investment style for Islamic indices in developed markets is oriented towards growth stocks and in emerging markets the performance is mostly driven by a large cap stock tilt. Since MSCI launched their Islamic index series in July 2007, both studies depend less on live (real-time) data collected since the index launch than on back-tested data that MSCI used to develop the index product. Hence, these results should be interpreted with care, as they might be affected by substantial back testing bias. Finally, Lobe et al. (2012) employed the Sharpe ratio and Jensen's Alpha measures to analyse the performance of aggregated portfolios based on 155 Islamic indices (72 of these indices were further analysed in a Carhart four-factor setting) between January 2001 and June 2012. Overall, it was concluded that no significant difference in performance exists between Islamic and conventional indices.

Outside the Islamic index literature, our study is related to two particular studies which examine important aspects that could improve the understanding of potential drivers of Islamic equity performance. First, Derigs and Marzban (2009) studied the performance implications of employing different *Shari'ah* screening strategies to a set of financial portfolios, which resulted in several interesting observations. First, building financial portfolios based on the screening practises of several providers, one could achieve improved risk and return attributes. Second, introducing a hypothetical screening approach where the *Shari'ah* compliance is measured on a portfolio level rather on a single asset level, the efficient frontier for an Islamic equity portfolio could be improved significantly, achieving a risk and return profile similar to a conventional portfolio. Finally, it was concluded that if Islamic investors were to use the current screening practises, they are better off using market capitalization than total assets as a divisor in the financial ratios.

Second, Białkowski et al. (2012) studied the effect Ramadan on stock prices in 14 Muslim countries. Drawing on theories from positive psychology, the authors hypothesized that Ramadan, one of the five pillars of Islam which is the religious practice of fasting from dawn to sunset during the ninth month of the Islamic calendar, could have a positive impact on stock prices. This Ramadan month could increase investor optimism because it increases social awareness and solidarity among Muslims. Consistent with this prediction, they found that stock markets in Muslim countries perform significantly better during the Ramadan month compared to the rest

of the year. An interesting observation was these markets became less volatile during Ramadan, despite sharp increases in stock returns.

4.3 Hypotheses

Opponents of Islamic equity investing would argue that its religious constraints are likely to harm the performance attributes of Islamic indices. The negative screening undertaken by index providers to meet compliance with Shari'ah imply significant reduction of the investable universe. This could result in a financial cost due to less favourable risk-return trade-offs (Renneboog, Ter Horst, & Zhang, 2008). Empirical observation made by Hong and Kacperczyk (2009) also implies that certain market segments excluded by Shari'ah-based screening generate superior risk-adjusted returns. This could mean that Islamic indices will face relatively worse performance when compared to unconstrained market benchmarks. Furthermore, since the accounting-based screening will exclude stocks that do not meet the criteria of certain financial ratios, notwithstanding financial performance, the returns of Islamic indices can be further reduced.

On the contrary, proponents of Islamic equity investing would argue that its ethical focus is likely to enhance performance characteristics due to risk reduction. For instance, Renneboog et al. (2008) postulate that firms that comply with ethical screens are less likely to be affected by costs related to unethical activities. Furthermore,

Shari'ah-based screens exclude firms that operate with high levels of financial leverage and firms that are involved in speculative financial activities (Ahmed, 2010). Avoiding such firms could eventually drive the average return above the overall benchmark, especially during periods of financial crises. For instance, Arouri et al. (2013, p. 3412) found that "the impact of the current crisis on the Islamic finance industry is less marked than on conventional finance". Following the arguments discussed above, we arrive at the following hypotheses:

H_0: The performance of Islamic equity indices, relative unconstrained counterparts, is *indifferent* from zero

H_1: The performance of Islamic equity indices, relative unconstrained counterparts, is *different* from zero

4.4 Data

4.4.1 Islamic index data

As previously discussed, one of the main shortcomings of analysing equity indices that they are purely hypothetical, hence making it difficult incorporating trade-related information. Two alternative research settings would allow to incorporate such information. The first approach would entail obtaining firm-level data and effectively construct Shari'ah-compliant portfolios, following the screening methodologies made available by index providers and mutual fund managers. The main disadvantage of this

approach, however, is that screening for Shari'ah compliance is not always a straight forward process, but involves careful consideration of Shari'ah expertise. Hence, following such a procedure could result in a portfolio that would not necessarily be compliant with Islamic principles in practise.

A second alternative approach that would allow to incorporate tradable information would be to analyse Exchange Traded Funds (ETFs). An ETF is a financial instrument aimed to track the movements of a broader stock market index, where the price is determined by the value of its underlying constituents. In other words, using ETF rather than index data would allow to include tradable data while maintaining the advantages of passive investment products. The main disadvantage, however, is that the number of Shari'ah-compliant ETFs are few which would have limited the scope of our analysis significantly. Nevertheless, given the similarity between ETFs and indices, we would expect the performance to be very similar.

Two main attributes differentiate our dataset from most previous Islamic index studies. First, we include Islamic indices from five providers: Dow Jones, MSCI, FTSE, Russell and S&P. This allows us to analyse the financial impact of different screening methodologies reported in Table 4.1. This is an important aspect as Derigs and Marzban (2008) found substantial differences concerning the divisor in the financial ratios used by index providers. In the case of our sample, FTSE and MSCI use total assets to define a firm's value while Dow Jones, Russell and S&P use market

capitalization. The first approach assumes that a firm's books should determine its value while the latter approach suggests a market-driven valuation approach. Practically, the financial screens used by FTSE and MSCI should, therefore, be more stringent than the others, as market values exceed book value of assets substantially in most industries. In total, our sample includes 32 indices that together cover ten regional and global markets. Collectively, our sample stretches from September 1996 to September 2012. Total return data (i.e., closing price which includes dividends) for all indices are obtained from Bloomberg, Thomson Reuters Datastream and in some cases from the index providers directly. All data is in USD and we compute monthly return as follows:

$$R_{it} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \tag{4.1}$$

where R_{it} is the monthly return of the index *i* at time *t*, *ln* stands for the natural logarithm, and $P_{i,t}$ is the total return index at time t. For statistical reasons, we exclude all indices with a sample period of less than 30 month.

4.4.2 Benchmark data

Throughout our analysis, we employ a matched pair approach. That is, each Islamic index has a conventional market benchmark from the same index family. This is crucial as index providers could have asset universes that differ considerably (e.g., in size, weighting scheme). From a research design perspective, using matched pairs in the analysis of screened portfolios enhances research quality (Kreander et al., 2005).

Intuitionally, this approach also acknowledges the potential critique of data mining that could arise from employing a single market benchmark index to multifamily index setting. If a single index is used, then it can be questioned whether the market benchmark has been chosen on the basis of a favourable outcome. To systematically use market benchmark from the corresponding index family would, in contrast, make the analysis robust to a potential data mining bias via arbitrary benchmark suggestions.

Tailored benchmark factors are constructed for all regions, following the methodologies of Fama and French (1993) and Carhart (1997) when constructing the size, value and momentum factors. The data for these factors are obtained from Style Research database which has been used in several previous studies (e.g., Derwall, Koedijk, & Ter Horst, 2011; Hoepner, Rammal, & Rezec, 2011). Following the aforementioned reasoning for using customized benchmark factors, we also utilize different risk-free rate proxies for each geographical market, respectively. This is done to enhance the practical relevance of the results as the choice of risk-free rate will reflect choice of the local investor. Exposure to a foreign rather than local risk-free asset will, for most investors, result in higher transactions cost and therefore being a less attractive option. The risk-free asset (either 3-month treasury bill or the 3-month interbank rate) of the largest economy in each region is used, resulting in the following choices: World, Developed, Emerging and North America: the US 3-month T-bill, Europe and Eastern Europe: the 3-month LIBOR rate, Asia-Pacific: the Japanese 3-

month T-bill, BRIC and Latin America: the Brazilian 3-month T-bill, and the Nordic Countries: the Swedish 3-month T-bill.

4.4.3 Islamic index descriptive statistics

The descriptive statistics are reported in Table 4.2. It can be observed that 17 out of the 32 Islamic indices have higher mean excess return than their conventional counterparts while 14 have higher standard deviations. Interestingly, all five Islamic indices with a global exposure have superior mean excess returns, and all but one (Dow Jones) have lower standard deviation. Table 4.2 also reports the Sharpe ratio (i.e., mean excess return divided by its standard deviation) and suggest that 18 of the indices exercise more favourable reward-to-risk characteristics. The many cases of negative Sharpe ratios is most likely a result of the sample period, which covers the global financial crisis in 2008-2009. Column four and five report the base date and launch date of each Islamic index, respectively. Any difference between the two indicates that the Islamic index is subject to back-tested performance history. That is, the index has been constructed with the advantaged of hindsight. Potential implications of back-tested performance history will be further investigated in Section 4.5.4.

As illustrated in Table 4.1, all index providers in our sample employ somewhat different methodologies when screening for Shari'ah compliance. As an indication of

the stringency of these screens, one would therefore want to consider how many firms that constituting the respective Islamic and conventional index. Focusing on the global market level, in end of 2013 the number constituents for the respective Islamic (conventional) index is as follows: Dow Jones 2177 (6882), MSCI 856 (2434), FTSE 1378 (2882), Russell 3200 (10042) and S&P 3486 (10537). Here, two observations can be made. First, it most cases, the screening process undertaken by index providers typically exclude two thirds of the firms. The one exception is FTSE where the number of firms is (only) reduced in half. Potentially, the less apparent reduction in could be due to FTSE's relatively lax liquidity ratio (see Table 4.1). Second, constituted by four-digit firms in all but one case (i.e., MSCI), it appears that Islamic indices, at least on a global level, are to be considered well-diversified.

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Table 4.2 Descriptive statistics of Islamic and benchmark indices

	Index name		Base	Launch	Mean		St dev.		Sharpe ratio	
	Islamic	BM	date	date	Islamic	BM	Islamic	BM	Islamic	BM
World										
Dow Jones	DJIM World Index	Dow Jones Global	Dec-95	May-99	0.0029	0.0009	0.0513	0.0498	0.0572	0.0179
MSCI	MSCI ACWI Islamic	MSCI ACWI	Aug-08	Aug-08	0.0010	-0.0010	0.0581	0.0617	-0.0571	-0.0627
FTSE	FTSE *Shari'ah* All-World	FTSE All-World	Sep-03	Oct-07	0.0044	0.0041	0.0491	0.0510	0.0887	0.0805
Russell	Russell-Jadwa *Shari'ah* Global	Russell Global	Jul-07	Jun-09	0.0024	0.0003	0.0533	0.0581	0.0456	0.0057
S&P	S&P Global BMI *Shari'ah*	S&P Global BMI	Apr-08	Apr-08	0.0005	-0.0016	0.0615	0.0633	0.0075	-0.0252
Developed										
Dow Jones	DJIM Developed Markets Index	Dow Jones Developed Markets	Dec-95	May-99	0.0024	0.0008	0.0506	0.0490	0.0470	0.0170
FTSE	FTSE *Shari'ah* Developed Index	FTSE Developed Index	Oct-07	Oct-07	-0.0026	-0.0016	0.0589	0.0624	-0.0439	-0.0258
Russell	Russell-Jadwa *Shari'ah* Developed	Russell Developed	Jul-07	Jun-09	0.0036	0.0069	0.0785	0.0855	0.0459	0.0809
Emerging										
Dow Jones	DJIM Emerging Markets Index	Dow Jones Emerging Markets	Dec-95	May-99	0.0029	0.0007	0.0797	0.0795	0.0358	0.0094
MSCI	MSCI Emerging Markets Islamic	MSCI Emerging Markets	Aug-08	Aug-08	-0.0005	0.0003	0.0890	0.0880	-0.0894	-0.0876
FTSE	FTSE *Shari'ah* Emerging Index	FTSE Emerging Index	Oct-07	Oct-07	-0.0060	-0.0010	0.0877	0.0874	-0.0683	-0.0111
Russell	Russell-Jadwa *Shari'ah* Emerging	Russell Emerging Markets	Jul-07	Jun-09	0.0025	0.0006	0.0558	0.0600	0.0448	0.0099
S&P	S&P Emerging BMI *Shari'ah*	S&P Emerging BMI	Jan-08	Jan-08	-0.0037	-0.0007	0.0841	0.0872	-0.0441	-0.0079
Asia Pacific										
Dow Jones	DJIM Asia/Pacific Index	Dow Jones Asia/Pacific	Dec-95	May-99	0.0030	0.0003	0.0606	0.0557	0.0495	0.0058
MSCI	MSCI AC Asia Pacific IMI Islamic	MSCI AC Asia Pacific IMI	Aug-08	Aug-08	-0.0014	-0.0016	0.0692	0.0661	-0.0705	-0.0678
FTSE	FTSE *Shari'ah* Asia Pacific Index	FTSE Asia Pacific Index	Oct-07	Oct-07	-0.0051	-0.0022	0.0631	0.0670	-0.0804	-0.0331
S&P	S&P Asia Pacific BMI *Shari'ah*	S&P Asia Pacific BMI	Jun-07	Jun-07	0.0034	0.0045	0.0624	0.0633	0.0541	0.0705
BRIC										
MSCI	MSCI BRIC Islamic Index	MSCI BRIC Index	Aug-08	Aug-08	-0.0042	-0.0109	0.1008	0.0995	-0.1051	-0.1105
FTSE	FTSE *Shari'ah* All-World BRIC Index	FTSE All-World BRIC Index	Oct-07	Oct-07	0.0025	-0.0104	0.0744	0.0702	0.0330	-0.1480
S&P	S&P BRIC *Shari'ah*	S&P BRIC 40	May-07	May-07	0.0026	0.0005	0.0920	0.0932	0.0283	0.0058
Eastern Europe										
MSCI	MSCI EM Eastern Europe Islamic Index	MSCI EM Eastern Europe Index	Aug-08	Aug-08	-0.0123	-0.0120	0.1172	0.1192	-0.1294	-0.1311
FTSE	FTSE *Shari'ah* Eastern Europe Index	FTSE Eastern Europe Index	Oct-07	Oct-07	-0.0060	-0.0028	0.0876	0.0859	-0.0685	-0.0327
Europe										
Dow Jones	DJIM Europe Index	Dow Jones Europe Index	Dec-95	May-99	0.0008	0.0006	0.0537	0.0421	0.0141	0.0132
MSCI	MSCI Europe Islamic Index	MSCI Europe Islamic	Aug-08	Aug-08	-0.0013	-0.0048	0.0782	0.0759	-0.0794	-0.0807
FTSE	FTSE *Shari'ah* Europe Index	FTSE European Index	Oct-07	Oct-07	-0.0069	-0.0056	0.0728	0.0787	-0.0943	-0.0718
Latin America										
MSCI	MSCI EM Latin America Islamic	MSCI EM Latin America	Aug-08	Aug-08	-0.0072	-0.0063	0.1039	0.0962	-0.1111	-0.1026
FTSE	FTSE *Shari'ah* Latin America Index	The FTSE Latin America Index	Oct-07	Oct-07	-0.0150	-0.0084	0.0765	0.0725	-0.1958	-0.1161
Nordic										
MSCI	MSCI Nordic Countries Islamic Index	MSCI Nordic Countries Index	Aug-08	Aug-08	-0.0073	-0.0035	0.0849	0.0912	-0.0922	-0.0947
FTSE	FTSE *Shari'ah* Nordic Index	FTSE Nordic 30 Index	Oct-07	Oct-07	0.0003	0.0058	0.0778	0.0794	0.0035	0.0727
North America										
MSCI	MSCI North America Islamic Index	MSCI North America Index	Aug-08	Aug-08	0.0026	0.0011	0.0530	0.0573	-0.0504	-0.0562
FTSE	FTSE *Shari'ah* North America Index	FTSE North America Index	Oct-07	Oct-07	0.0069	0.0093	0.0449	0.0456	0.1546	0.2035
S&P	S&P North America BMI *Shari'ah*	S&P North America BMI	Apr-08	Apr-08	0.0051	0.0047	0.0563	0.0623	0.0912	0.0750

The following table reports the descriptive statistics for the sample of Islamic indices and their corresponding conventional benchmarks. Column one displays the geographical region and respective index provider. Column two and three reports the name of the each Islamic index and corresponding conventional benchmark index (BM), respectively. Column four and five reports the base date and launch date for each Islamic index, respectively. The potential difference between the base date and the launch date represent the period of back-tested performance. Column six to seven, eight to nine and ten to eleven report the monthly mean excess return, standard deviation and Sharpe ratio for the Islamic and corresponding benchmark index, respectively.

4.5 Main analysis

The following section offers a detailed outline of each step of the analysis and the results. All regressions have been estimated using the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors that correct for both autocorrelation and heteroscedasticity that may be present in the data. To examine the implications of investing according to Islamic principles, we analyse the performance of Islamic indices compared to their conventional counterparts using two risk-adjusted performance measures, namely the Jensen's Alpha obtained from the standard CAPM model, and the alpha obtained from the Carhart (1997) four-factor model, which controls for size, value and momentum risk factors. We also estimate the tracking error for all indices to investigate the impact of the Islamic screening process.

4.5.1 Jensen's Alpha

We estimate the widely used Jensen's Alpha (Jensen, 1968) which is defined as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \qquad (4.2)$$

where $R_{it}$is the continuous return of the Islamic index, R_{ft} represents the risk free rate, α_i is the abnormal risk-adjusted return of the Islamic index, β_i represent the exposure to the systematic (market) risk and ε_{it} is the random error term. Following the results of the Jensen's alpha regressions displayed in Panel A of Table 4.3, it can first be

observed that the performance of Islamic indices appears to vary across different geographical markets. On a global level, two Islamic indices exhibit a positive and statistically significant alpha of 20 and 29 basis points per month, respectively, while the remaining three indices do not perform statistically different from zero. Whereas the latter holds in a developed market context, it can be observed that two out five Islamic indices significantly underperform (up to 30 basis points) in an emerging market context.

The results of the smaller geographical regions, displayed in Panel B of Table 4.3, tell a similar story. While most Islamic indices in these regions exhibit a performance statistically indistinguishable from market benchmark, there is some evidence of geographical differences. Specifically, two out of three indices in the BRIC region outperform while there is some evidence of significant underperformance in Latin America, the Nordic countries and North America.

The mixed results documented across geographical markets is puzzling. An interesting observation is that Islamic indices provided by FTSE appear to perform relatively worse compared to other providers. For instance, the indices underperforming in Latin America, the Nordics countries and North America all belong to the FTSE index family. This could, instinctively, be associated with FTSE's unique screening methodology. The figures discussed in Section 4.5.3 imply that their screening is significantly less stringent than the other providers.

4.5.2 Carhart four-factor model

Next, we estimate the Carhart (1997) four-factor model, which extends the standard CAPM (which only accounts for the market risk factor i.e., excess market return) by including additional risk factors associated with size, value and momentum. We denote this model as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \varepsilon_{it} \qquad (4.3)$$

To construct the size (SMB_t) and value (HML_t) factors we first divide the asset universe into two groups, firms with small market capitalization (S) (0%-50%) and firms with large market capitalization (B) (50%-100%). We then create portfolios based on book-to-price (book value of equity per share divided by price per share), resulting in the following three portfolios: High book value (HV) (top 30%), Medium book value (MV) (40%) and low book value (LV) (bottom 30%). We then define SMB_t as the average return of (S/HV, S/MV, S/LV) minus the average return of (B/HV, B/MV, B/LV) and the HML_t is defined as the average return of (S/HV, B/HV) minus the average return of (S/LV, B/LV). In the construction of the momentum (MOM_t) factor we follow Carhart (1997) and define it as the return difference between previous winning firms (70%-100%) and previous loosing firms (0%-30%).

After controlling for size, value and momentum risk factors, the overall performance trend of the Islamic indices approximately the same as in the the Jensen's alpha regression setting. However, some differences can be observed, most notably at the global, developed and emerging market level. First, with four out of five indices exhibiting a positive and significant alpha coefficient, the previously recorded outperformance on a global level is strengthen in four-factor regression setting. This outperformance, which is up to 41 basis points per month, appears to be driven by tilt towards short-term momentum stocks. That is, three of the outperforming indices have positive and significant momentum coefficients.

Second, it can be observed that the performance on the developed market level moves from statistically insignificant to positive for two of the three indices (i.e., Dow Jones, Russell). In contrast to the global indices, this outperformance cannot be explained the tilt towards momentum stocks. For one if the indices, however, there is a tilt towards growth stocks. Third, as for the emerging market indices, the results are somewhat puzzling. Although the underperformance of the FTSE and S&P indices remain, and the Russell index also exhibit a significant underperformance, the emerging market index from Dow Jones seem to outperform with 31 basis points per month. This difference in performance could, potentially, stem from the more than 12 years longer return history of the Dow Jones index (see Table 4.2).

Directing the attention back to Panel B of Table 4.3 and the remaining geographical regions, we document mixed results for the Asia Pacific region. Here, the Dow Jones index significantly outperform with 44 basis points per month while the FTSE index underperform with 28 basis points. While the Dow Jones index has a tilt towards growth stocks and a beta value close to one (0.99), the FTSE index has a somewhat lower beta value (0.94) and is more oriented towards value stocks. As for the remaining regions the results of the four-factor regressions remain almost identical to the ones discussed on the previous section.

In both a single and multifactor regression setting, the beta values vary between 0.89 and 1.11. This implies that Islamic indices exhibit a risk approximately similar to the respective market benchmark. With exception of the momentum factor in global level multifactor regressions, most additional risk factors are statistically insignificant. This limits the possibility to explain performance in terms of factor loadings.

When observing both panels of Table 4.3, it is evident that the Islamic indices provided by Dow Jones perform relatively better, overall, than the indices of the other four providers. For instance, not a single Dow Jones index is recorded to underperform and as mentioned above, in both an emerging and Asia Pacific market context, Dow Jones indices outperform while other indices underperform. With a significantly longer return history of the Dow Jones indices, it can therefore be question whether the results are influenced by sample specific factors.

Table 4.3 Islamic index CAPM and Carhart regression results

Panel A										
Provider	CAPM		Carhart					CAPM adj r^2	Carhart adj r^2	Tracking error
	α_i	β_i	α_i	β_i	SMB_i	HML_i	MOM_i			
World										
Dow Jones	0.0020*	0.9990***	0.0026***	0.9905***	-0.0940*	-0.1785***	-0.0017	0.94	0.96	1.27%
MSCI	0.0019	0.9250***	0.0030*	0.9526***	0.0563	-0.0069	0.0590*	0.96	0.97	1.09%
FTSE	0.0005	0.9479***	0.0006	0.9613***	0.0326	-0.0092	0.0358**	0.97	0.97	0.82%
Russell	0.0020	0.9145***	0.0026**	0.9428***	0.0270	-0.0383	0.0580**	0.97	0.97	1.16%
S&P	0.0029**	0.9149***	0.0041***	0.9431***	0.0646	-0.0094	0.0557**	0.98	0.98	0.94%
Developed										
Dow Jones	0.0015	1.0007***	0.0019*	0.9925***	-0.0759	-0.1505***	0.0054	0.94	0.95	1.28%
FTSE	-0.0006	0.9235***	0.0012	0.9427***	0.0654	0.0280	0.0521	0.97	0.97	1.03%
Russell	0.0021	0.8996***	0.0035***	0.9232***	0.0701	0.0120	0.0602	0.96	0.96	1.25%
Emerging										
Dow Jones	0.0021	0.9694***	0.0031**	0.9702***	-0.0906**	-0.1099***	-0.0225	0.93	0.94	2.03%
MSCI	-0.0008	1.0042***	-0.0009	1.0121***	0.0496	-0.0029	0.0171	0.99	0.99	1.06%
FTSE	-0.0033*	0.9983***	-0.0037**	1.0052***	0.1115**	0.0348	0.0273	0.98	0.98	1.11%
Russell	-0.0027	0.9075***	-0.0029*	0.9338***	0.0328	0.0035	0.1206***	0.98	0.98	1.10%
S&P	-0.0030**	0.9588***	-0.0031**	0.9573***	0.0621	0.0537**	0.0197	0.99	0.99	0.91%

The following table displays the results of the Carhart (1997) and Jensen's alpha (1968) and tracking error estimations, as outlined in our main analysis section. Column one shows the respective region and index provider. Column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven shows the adjusted r-squared value. Column eight shows the Jensen's alpha, column nine the beta and column ten the adjusted r-squared value for the same model. Finally, column eleven displays the tracking error. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Panel B										
Region / Provider	CAPM		Carhart					CAPM	Carhart	Tracking
	α_i	β_i	α_i	β_i	SMB_i	HML_i	MOM_i	adj r^2	adj r^2	error
Asia Pacific										
Dow Jones	0.0027	1.0269***	0.0044***	0.9933***	-0.0271	-0.2550***	0.0114	0.89	0.91	2.02%
MSCI	0.0003	1.0379***	0.0007	1.0305***	0.0315	-0.0532	0.0087	0.99	0.99	0.83%
FTSE	-0.0022	0.9190***	-0.0028*	0.9412***	-0.0055	0.1031**	0.0215	0.96	0.96	1.30%
S&P	-0.0010	0.9715***	-0.0005	0.9886***	0.0776	-0.0853*	0.0445	0.97	0.97	1.08%
BRIC										
MSCI	0.0068***	1.0036***	0.0064***	1.0065***	0.0334	-0.0048	-0.0034	0.98	0.98	1.38%
FTSE	0.0133***	1.0472***	0.0135***	1.0515***	-0.0436	-0.0322	-0.0084	0.97	0.97	1.21%
S&P	0.0019	0.9673***	0.0008	0.9752***	0.1055**	0.0039	-0.0173	0.96	0.96	1.84%
Eastern Europe										
MSCI	-0.0006	0.9724***	-0.0011	0.9958***	0.0191	-0.0121	0.0318	0.98	0.98	1.76%
FTSE	-0.0032	1.0060***	-0.0040	1.0182***	-0.1264	-0.1690	0.0126	0.97	0.97	1.45%
Europe										
Dow Jones	0.0010	0.9040***	0.0004	0.9238***	-0.1318***	-0.1977***	0.0430**	0.93	0.95	2.19%
MSCI	0.0035	0.9955***	0.0025	1.0419***	-0.1422	-0.1345	0.1023**	0.93	0.94	2.01%
FTSE	-0.0010	0.9034***	-0.0020	0.9499***	-0.1023	-0.1373**	0.0702*	0.96	0.97	1.39%
Latin America										
MSCI	-0.0005	1.0578***	0.0009	1.1115***	0.2907***	0.2058***	0.0283	0.96	0.96	2.08%
FTSE	-0.0062***	1.0380***	-0.0054***	1.0870***	0.2586***	0.1869*	0.0135	0.97	0.97	1.40%
Nordic Countries										
MSCI	-0.0042	0.9049***	-0.0033	0.9575***	0.1575	0.0387	0.1260***	0.94	0.95	1.99%
FTSE	-0.0053***	0.9684***	-0.0040**	0.9951***	0.1599**	-0.0046	0.0211	0.98	0.98	1.18%
North America										
MSCI	0.0015	0.8998***	0.0025	0.9259***	0.0720	-0.0048	0.0532	0.95	0.95	1.20%
FTSE	-0.0021**	0.9789***	-0.0021**	0.9686***	-0.0949	-0.0381	0.0005	0.97	0.99	0.51%
S&P	0.0010	0.8954***	0.0006	0.8905***	-0.0333	-0.0128	-0.0046	0.98	0.98	0.79%

The following table displays the results of the Carhart (1997) and Jensen's alpha (1968) and tracking error estimations, as outlined in our main analysis section. Column one shows the respective region and index provider. Column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven shows the adjusted r-squared value. Column eight shows the Jensen's alpha, column nine the beta and column ten the adjusted r-squared value for the same model. Finally, column eleven displays the tracking error. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.5.3 Tracking error

We also compute the tracking error in order to analyse the impact of the screening methodology used by the respective provider. Following Statman (2006) we compute the tracking error by calculating the standard deviation of the residuals (i.e., the excess return over the risk-free rate of the Islamic index minus the excess return over the risk-free rate of the market benchmark). The tracking errors in our sample (see Table 4.3) ranges from 0.5% to just over 2%, which implies that Islamic indices follow their benchmarks relatively closely. Interestingly, the tracking errors for the FTSE indices do not stand out from the rest of the sample. This implies that the relatively poor performance of some of its indices is unlikely due to the FTSE's screening criteria.

Our analysis has so far yielded consistent and significant results about the performance of Islamic indices in various regions. These results suggest that Islamic indices perform differently in various geographical contexts. While we witness an outperformance on a global level, developed markets and the BRIC region, Islamic indices typically underperform in emerging markets with the exception of the Dow Jones index. A number of indices provided by FTSE also underperform in smaller regions, such as Latin America, the Nordic region and North America. We consider our results highly reliable, as they are stretching over multiple providers and the regressions carry high explanatory power, making omitted variable biases unlikely. However, we cannot provide much evidence when it comes to explaining the results

(i.e., why Islamic indices underperform or outperform). The remaining sections are therefore devoted to finding explanations to the performance drivers embedded in Islamic indices.

4.5.4 Is there a back-testing bias?

Many available Islamic indices have a base date that starts prior to the actual launch date. In such cases, parts of an index performance are hence based on back tested data instead of data generated by a live performing index. For this reason, we, therefore, want to examine whether Islamic indices could be subject to what the literature sometimes refer to as a 'look-ahead bias': "forecasting the future by seeing the future" (Mahfoud & Mani, 1996, p. 558). Intuitively, a potential reason why Islamic indices could have a positive back-tested performance bias is that it, from a marketing perspective, looks better to have good past performance. Index providers have in fact acknowledged some aspects of this issue: "Another limitation of back-tested hypothetical information is that generally the back-tested calculation is prepared with the benefit of hindsight. Back-tested data reflect the application of the index methodology and selection of index constituents in hindsight" (S&P Dow Jones Indices, 2014, p. 10)

In the case of SRI indices, Schröder (2007, p. 11) noted that back-tested performance resulted in better performance: "[t]here is clear evidence of a backward-looking bias. In fact, in every case when the available index time series has been calculated

backwards the estimated alpha is higher compared to the estimated performance when the data from the official inception date on are used". In the next step of the analysis, we, therefore, choose to test whether Islamic indices experience a relatively higher return in their back-tested performance periods. To control for this, we add a back-testing dummy variable to the Carhart model as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \lambda_i BACKTEST_{it} + \varepsilon_{it} \quad (4.4)$$

where $BACKTEST_{it}$ is defined as 1 in case an observation t is based on back-tested data and as zero otherwise. Table 4.4 displays the results of the Carhart regressions after controlling for a back-testing effect. Only indices that offer back-tested performance data are included in this regression specification, which results in a sample of nine indices. In line with our predictions, all significant back-testing coefficients have positive factors loadings. This implies that Islamic indices perform relatively better during periods of back-tested performance. The results are very strong for the Dow Jones indices, the index family that have by far the longest back-tested period (launched in 1999 with historical performance from December 1996). Given the strong significant back-testing coefficient in several regressions, we choose the model in equation 4.4 as our default model for the remaining parts of the analysis.

Table 4.4 Results of Carhart (1997) estimations after controlling for back-testing bias

Region/ Provider	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	Adj R2
World							
Dow Jones	0.0018*	0.9883***	-0.0863*	-0.1719***	-0.0037	0.0045**	0.96
FTSE	0.0014	0.9650***	0.0419	-0.0034	0.0437**	-0.0017	0.97
Russell	0.0028**	0.9424***	0.0274	-0.0386	0.0580**	-0.0004	0.97
Developed							
Dow Jones	0.0010	0.9889***	-0.0699	-0.1453***	0.0013	0.0049**	0.95
Russell	0.0032**	0.9242***	0.0703	0.0125	0.0603	0.0007	0.96
Emerging							
Dow Jones	0.0013	0.9764***	-0.0916**	-0.1111***	-0.0170	0.0108***	0.94
Russell	-0.0009	0.9317***	0.0274	-0.0041	0.1120***	-0.0043	0.98
Asia Pacific							
Dow Jones	0.0026	1.0033***	-0.0242	-0.2409***	0.0212	0.0098***	0.92
Europe							
Dow Jones	0.0001	0.9226***	-0.1313***	-0.1973***	0.0419*	0.0020	0.95

The following table displays the results of the Carhart (1997) plus back-testing dummy regressions, as outlined in our main analysis section. Column one shows the respective region and index provider. Column two to six shows the Carhart alpha, beta, smb, hml and mom factors. Column seven displays the back-testing coefficient and column eight the adjusted r-squared value. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987), *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.6 Potential explanation of the results

As previously mentioned, we have so far not been able to explain where the documented outperformance and underperformance of Islamic indices stem from. In this section, we, therefore, control for a number of possible explanations associated with crises and market downturn risk. Similarly, we also investigate possible behavioural and research design related explanations.

4.6.1 Is there a risk management effect?

It has been argued that many attributes of the Islamic financial system serve as a risk management function. For Islamic equity investors, one important attribute that affects their investment decisions is the prohibition of gharar, as it forbids investors to get involved in speculation and excessive risk taking. Companies involved in such activities (e.g., conventional financial institutions) are therefore not considered in the investment process. Similarly, Islamic investors must avoid investing in highly leveraged stocks. This conservative investment approach is therefore believed to limit the risk of Islamic indices in times of market turmoil (Ahmed, 2010). Recent empirical evidence confirms this view. For instance, Hoepner et al. (2011) argued that the investment style of Islamic mutual funds, with low risk characteristics (such as low debt to equity ratios), may result in a hedging effect against stock price volatility. Furthermore, Arouri et al. (2013) found that the Islamic equity market was less affected than the conventional equity market during the financial crisis.

To assess the downside risk management effect of Islamic indices we first utilize a dummy varible, a past Performance dummy (PP), whuch is set to minus one when the market return falls short of risk-free rate and to zero otherwise. Incorporating it into our regression framework allows us to control for performance of Islamic indices during market downturns. Furthermore, to test the performance in times of continuing market drawdowns we also include a variable developed by Hoepner and Zeume (2013). Much like the past performance dummy, the Hoepner & Zeume variable (HZ) is set to zero when the market return exceeds the risk-free rate. When the market excess return over the risk-free rate is negative for a given observation, however, it represents a measure of drawdown, which Hoepner and Zeume define as the absolute value of the sum of the negative excess return of the given observation plus all negative excess returns directly preceding the given observation (i.e., any uninterrupted series of directly preceding observations with negative excess returns). Hence, the HZ variable differs from the PP dummy as it captures the ability of fund managers or investment strategies to prepare for longer-term consecutive market losses, the so-called drawdowns. Including both variables into equation (4.4), we arrive at the following regression specification:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \delta_i BACKTEST_t + \theta_i PP_t + \chi_i HZ_t + \varepsilon_{it} \quad (4.5)$$

The results of the regressions are displayed in Table 4.5. We can observe only a few significant PP coefficients and those are both positive and negative. Hence, these results are rather mixed but suggest that Islamic and conventional indices perform very similar during occasional market downturns. Similarly, there are not many significant HZ coefficients, there are, however, more positive than negative factors loadings, which implies that some Islamic indices seem to be superior their conventional counterparts during periods of consecutive market downturns. Potentially, this could be explained by the fact that the Islamic debt ratio screen excludes firms that rely too much on debt where excess leverage having been shown to be risky in long-term market downturns (Opler & Titman, 1994). The alphas, however, remain reasonably consistent, suggesting that market downturns do not explain the results.

Table 4.5 Results of Carhart (1997) estimations after controlling for back-testing bias and downside risk

Region/ Provider	Panel A								
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	PP_i	HZ_i	Adj R2
World									
Dow Jones	0.0039**	0.9540***	-0.0848*	-0.1701***	-0.0053	0.0041**	0.0019	0.0046	0.96
MSCI	0.0014	0.9931***	0.0903	0.0121	0.0703**		0.0260	-0.0009	0.97
FTSE	0.0031	0.9366***	0.0382	-0.0072	0.0403**	-0.0020	-0.0046	0.0033	0.97
Russell	0.0041*	0.9106***	0.0108	-0.0488	0.0511**	-0.0002	0.0018	-0.0158	0.97
S&P	0.0066**	0.8979***	0.0392	-0.0274	0.0467*		0.0041	0.0156	0.98
Developed									
Dow Jones	0.0031*	0.9507***	-0.0715	-0.1451***	0.0000	0.0045**	-0.0061	0.0043	0.95
FTSE	0.0018	0.9421***	0.0774	0.0330	0.0554		0.0091	0.0020	0.97
Russell	0.0023	0.9364***	0.0684	0.0129	0.0610	0.0008	-0.0020	-0.0010	0.96
Emerging									
Dow Jones	0.0011	0.9824***	-0.0888**	-0.1104***	-0.0162	0.0107***	0.0113	0.0005	0.94
MSCI	0.0022	0.9621***	0.0136	-0.0196	-0.0110		-0.0273***	0.0025	0.99
FTSE	0.0005	0.9386***	0.0640	0.0122	-0.0087		-0.0330***	0.0043	0.99
Russell	0.0034	0.8673***	-0.0136	-0.0227	0.0771***	-0.0038	0.0050	-0.0317***	0.98
S&P	0.0008	0.8922***	0.0186	0.0350	-0.0202	0.0034	-0.0013	0.0320***	0.99

The following table displays the results of the Carhart (1997) estimations including the Past Performance and Hoepner & Zeume (2009) dummies. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factors loading for the back testing coefficient and column eight and nine display the HM and HZ dummy coefficients, respectively. Finally, column ten shows the adjusted r-squared values for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987), *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Region/ Provider	Panel B								
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	PP_i	HZ_i	Adj R2
Asia Pacific									
Dow Jones	0.0041	0.9751***	-0.0314	-0.2429***	0.0202	0.0102***	-0.0229	0.0017	0.92
MSCI	-0.0002	1.0429***	0.0330	-0.0505	0.0103		-0.0002	-0.0020	0.99
FTSE	-0.0031	0.9610***	0.0321	0.1065***	0.0309		0.0273	0.0023	0.96
S&P	0.0007	0.9666***	0.0611	-0.0822*	0.0386		0.0016	0.0093	0.97
BRIC									
MSCI	0.0105***	0.9508***	0.0214	-0.0134	-0.0203		-0.0241**	0.0053	0.98
FTSE	0.0151***	0.9996***	-0.0540	-0.0352	-0.0371		-0.0624	-0.0026	0.97
S&P	0.0091***	0.8545***	0.0806*	-0.0102	-0.0518**		0.0061	0.0726***	0.97
Eastern Europe									
MSCI	-0.0030	1.0219***	0.0427	0.0082	0.0409		0.0090	-0.0030	0.98
FTSE	-0.0020	0.9608***	-0.1304	-0.1299	-0.0105		-0.0921*	-0.0068	0.97
Europe									
Dow Jones	0.0005	0.9137***	-0.1354***	-0.1993***	0.0409*	0.0017	-0.0001	0.0077	0.95
MSCI	0.0046	1.0664***	-0.0768	-0.1020	0.1350***		0.0495	0.0096	0.94
FTSE	0.0017	0.9196***	-0.0830	-0.1246**	0.0786**		0.0063	0.0081*	0.97
Latin America									
MSCI	0.0049	1.0727***	0.2989***	0.2142***	0.0171		-0.0065	0.0074	0.96
FTSE	-0.0066	1.1175***	0.2810***	0.1952*	0.0204		0.0274	0.0001	0.97
Nordic Countries									
MSCI	-0.0039	0.9853***	0.1847	0.0436	0.1298***		0.0249*	0.0024	0.95
FTSE	-0.0065**	1.0228***	0.1780**	0.0340	0.0217		-0.0022	-0.0058	0.98
North America									
MSCI	-0.0014	1.0248***	0.1457	0.0289	0.0794**		0.0668**	-0.0032	0.95
FTSE	-0.0016	0.9508***	-0.1057	-0.0425	-0.0056		-0.0264	-0.0005	0.99
S&P	-0.0005	0.9092***	-0.0302	-0.0107	-0.0052	-0.0016	0.0334	-0.0084	0.98

The following table displays the results of the Carhart (1997) estimations including the Past Performance and Hoepner & Zeume (2009) dummies. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factors loading for the back testing coefficient and column eight and nine display the HM and HZ dummy coefficients, respectively. Finally, column ten shows the adjusted r-squared values for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987), *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.6.2 How do Islamic indices perform during financial crises?

A growing body of literature suggest that the principles underpinning Islamic financial products have a positive impact on the financial risk profile. Some studies even argue that several of the factors causing the recent credit crisis are prohibited in Islamic finance. For instance, one of the main factors trigging the Asian crisis was a growing presence of interest-based debt (Radelet & Sachs, 2000). Similarly, it has been argued that the most recent financial crisis was caused by excess risk-taking and the vast use of complex debt-based financial instruments, both of which are prohibited according to Islamic principles (Chapra, 2011). One could, therefore, argue that Islamic indices would outperform the market in times of lending crisis and general market turmoil. To test the performance of Islamic indices after controlling for financial crises, we include dummy variables for three major crises; (i) The Asian Crisis in 1997-1998 (ii) the dot-com bubble in 2001 and (iii) the credit crisis in 2008-2009. Each dummy variable is equal to 1 in the period of financial crisis, 0 otherwise.

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \delta_i BACKTEST_t + \pi 1_i ACRIS_t + \pi 2_i ICRIS_t + \pi 3_i CCRIS_t + \varepsilon_{it} \quad (4.6)$$

As shown in Table 4.6, only a few indices included in the analysis are old enough to cover the Asian financial crisis and the Internet crisis. Several FTSE indices had to be excluded as the credit crisis occurred prior to their start date in 2009. The results suggest that Islamic indices still outperform on a global level and in developed

markets. The underperformance in emerging markets also remains, which suggest that the effects of financial crises cannot explain the results entirely. While Islamic indices seem to have underperformed during the Internet crisis, the large number of positive and significant CCRIS coefficients suggests a relatively better performance during the recent credit crisis. This is in line with Radelet and Sachs (2000) who pointed out excessive leverage as one of the main aggravating factors of financial crises. A possible explanation for this outperformance could, therefore, be a result of the financial screening (where firms relying on excessive debt are excluded).

Table 4.6 Results of Carhart (1997) estimations after controlling for back-testing bias and financial crises

Region/ Provider	Panel A									
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	$ACRIS_i$	$ICRIS_i$	$CCRIS_i$	Adj R2
World										
Dow Jones	0.0028***	0.9807***	-0.0816*	-0.1585***	0.0005	0.0055**	-0.0044	-0.0065***	0.0015	0.96
MSCI	0.0013	0.9702***	0.0803	0.0172	0.0640**				0.0063**	0.97
FTSE	0.0006	0.9723	0.0503	0.0066	0.0445	-0.0013			0.0031	0.97
Russell	0.0026**	0.9575***	0.0568	-0.0155	0.0632***	-0.0039*			0.0067*	0.97
S&P	0.0034***	0.9530***	0.0741	0.0009	0.0598**				0.0033	0.98
Developed										
Dow Jones	0.0017	0.9869***	-0.0590	-0.1289***	0.0083	0.0064***	-0.0048*	-0.0058**	0.0034	0.95
FTSE	-0.0021	0.9512***	-0.1003	-0.1349*	0.0708*				0.0006	0.97
Russell	0.0032**	0.9476***	0.1155	0.0432	0.0694*	-0.0042*			0.0095**	0.96
Emerging										
Dow Jones	0.0037	0.9658***	-0.0959**	-0.1119***	-0.0242	0.0073	0.0020	-0.0083*	-0.0060*	0.94
MSCI	-0.0018	1.0176***	0.0567	0.0047	0.0233				0.0030	0.99
FTSE	-0.0049**	1.0161***	0.1160**	0.0432	0.0375*				0.0046	0.98
Russell	-0.0012	0.9460***	0.0440	0.0101	0.1200***	-0.0088**			0.0085*	0.98
S&P	-0.0030**	0.9559***	0.0614	0.0526*	0.0183				-0.0006	0.99

The following table displays the results of the Carhart (1997) estimations including the Asian crisis (ACRIS), dot com crisis (ICRIS) and the credit crisis (CCRIS) dummies. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factor loading for the back testing coefficient and column eight to ten display the factors loadings for the ACRIS, ICRIS and CCRIS coefficients, respectively. Finally, column eleven shows the adjusted r-squared value for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Region/ Provider	Panel B									
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	$ACRIS_i$	$ICRIS_i$	$CCRIS_i$	Adj R2
Asia Pacific										
Dow Jones	0.0039*	0.9918***	-0.0337	-0.2371***	0.0173	0.0095*	-0.0025	-0.0048	-0.0026	0.92
MSCI	0.0004	1.0340***	0.0406	-0.0507	0.0107				0.0013	0.99
FTSE	-0.0047**	0.9654***	0.0312	0.1118***	0.0357				0.0073**	0.96
S&P	-0.0010	1.0011***	0.0774	-0.0758**	0.0510**				0.0048	0.97
BRIC										
MSCI	0.0044	1.0159***	0.0342	0.0043	0.0041				0.0077*	0.98
S&P	0.0026	0.9694***	0.1093**	-0.0003	-0.0191				-0.0060	0.96
Eastern Europe										
MSCI	-0.0018	0.9994***	0.0223	-0.0091	0.0327				0.0030	0.98
Europe										
Dow Jones	0.0017	0.9099***	-0.1341***	-0.1980***	0.0445**	0.0025	-0.0045**	-0.0053	-0.0047	0.95
MSCI	-0.0014	1.0711***	-0.0856	-0.0677	0.1098**				0.0164**	0.95
Latin America										
MSCI	-0.0035	1.1267***	0.2930***	0.1924***	0.0186				0.0152**	0.97
Nordic Countries										
MSCI	-0.0073***	0.9828***	0.1534	0.0299	0.1285**				0.0138*	0.95
North America										
MSCI	0.0003	0.9524***	0.1064	0.0281	0.0605*				0.0078**	0.95
S&P	-0.0016	0.9259***	-0.0230	-0.0096	-0.0107				0.0131***	0.98

The following table displays the results of the Carhart (1997) estimations including the Asian crisis (ACRIS), dot com crisis (ICRIS) and the credit crisis (CCRIS) dummies. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factor loading for the back testing coefficient and column eight to ten display the factors loadings for the ACRIS, ICRIS and CCRIS coefficients, respectively. Finally, column eleven shows the adjusted r-squared value for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.6.3 Ramadan effect

Behavioural economists argue that stock prices can be substantially influenced by the mood of investors. For instance, researchers have found stocks prices to be positively affected by positive events such as sunshine (Hirshleifer & Shumway, 2003) and upcoming holidays (Kim & Park, 1994). Ramadan is one of the five pillars of Islam, which is the religious practice of fasting from dawn to sunset during the ninth month of the Islamic calendar. Both Białkowski et al. (2012) and Al-Hajieh, Redhead, and Rodgers (2011) found stocks in Muslim countries to yield higher returns during Ramadan compared to the rest of the year. Their results were explained by the fact that Ramadan encourages Muslims optimism which has a positive effect on stock prices. We, therefore, expect Islamic indices to yield higher return during periods of Ramadan, and we test this by estimating the following regression:

$$R_{it} - R_{ft}\alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \lambda_i BACKTEST_t + \nu_i RAMADAN_t + \varepsilon_{it} \quad (4.7)$$

where $RAMADAN_t$ is defined as the 'amount' of Ramadan days for a respective month. For instance, if Ramadan takes place from August 20 to September 20 for a given year, then the amount of Ramadan for August would be: 31-20=11 days divided by 31days=0.3548. Similarly, the amount of Ramadan for September would be 20 divided by 30=0.6666 and all other months of the given year would have the value of 0. In contrast to what we predicted, we do not find any consistent results supporting a

Ramadan effect as displayed in Table 4.7. The results could be explained by the fact that strong Muslim populations do not represent the countries and regions included in our data sample. Hence, a potential Ramadan effect might have disappeared due to the overwhelming influence of non-Muslim investors.

Table 4.7 Results of Carhart (1997) regressions after controlling for back-testing bias and Ramadan effect

Region/ Provider	Panel A							
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	$Ramadan_i$	Adj R2
World								
Dow Jones	0.0017*	0.9882***	-0.0859*	-0.1716***	-0.0036	0.0045**	0.0010	0.96
MSCI	0.0040**	0.9488***	0.0545	-0.0057	0.0619*		-0.0095*	0.97
FTSE	0.0015*	0.9588***	0.0256	-0.0122	0.0367		-0.0089	0.97
Russell	0.0033**	0.9404***	0.0234	-0.0401	0.0584**	-0.0005	-0.0055	0.97
S&P	0.0047***	0.9386***	0.0670	-0.0054	0.0565**		-0.0071	0.98
Developed								
Dow Jones	0.0009	0.9889***	-0.0698	-0.1451***	0.0014	0.0049**	0.0006	0.95
FTSE	-0.0034*	1.0037***	0.1106**	0.0351	0.0283		-0.0040	0.98
Russell	0.0038**	0.9220***	0.0683	0.0121	0.0610	0.0005	-0.0058	0.96
Emerging								
Dow Jones	0.0015	0.9766***	-0.0930**	-0.1116***	-0.0169	0.0108***	-0.0033	0.94
MSCI	-0.0010	1.0123***	0.0505	-0.0026	0.0168		0.0010	0.99
FTSE	-0.0011	0.9436***	-0.0980	-0.1301	0.0687		-0.0100	0.97
Russell	-0.0008	0.9315***	0.0270	-0.0043	0.1120***	-0.0043	-0.0005	0.98
S&P	-0.0029*	0.9561***	0.0616	0.0541**	0.0201		-0.0024	0.99

The following table displays the results of the Carhart (1997) estimations including the ramadan dummy. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factor loading for the back testing coefficient and column eight to ten display the factors loadings for the ramadan coefficient, respectively, Finally, column eleven shows the adjusted r-squared value for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Region/ Provider	Panel B							
	α_i	β_i	SMB_i	HML_i	MOM_i	BT_i	$Ramadan_i$	Adj R2
Asia Pacific								
Dow Jones	0.0026*	1.0036***	-0.0242	-0.2409***	0.0213	0.0098***	0.0010	0.92
MSCI	0.0014	1.0275***	0.0328	-0.0575*	0.0113		-0.0068	0.99
FTSE	-0.0009	0.9242***	0.0258	0.0988**	0.0264		-0.0235***	0.97
S&P	0.0000	0.9874***	0.0892	-0.0880**	0.0477**		-0.0064	0.97
BRIC								
MSCI	0.0064**	1.0065***	0.0334	-0.0048	-0.0034		0.0001	0.98
FTSE	0.0137***	1.0519***	-0.0410	-0.0335**	-0.0060*		-0.0019	0.97
S&P	0.0017	0.9723***	0.1033**	0.0035	-0.0192		-0.0098	0.96
Eastern Europe								
MSCI	-0.0011	0.9959***	0.0190	-0.0123	0.0319		0.0003	0.98
FTSE	-0.0038	1.0173***	-0.1272	-0.1729	0.0118		-0.0021	0.97
Europe								
Dow Jones	0.0005	0.9236***	-0.1304***	-0.1968***	0.0427*	0.0020	-0.0040	0.95
MSCI	0.0035	1.0377***	-0.1389	-0.1286	0.1034**		-0.0094	0.94
FTSE	-0.0011	0.9436***	-0.0980	-0.1301	0.0687		-0.0100	0.97
Latin America								
MSCI	0.0008	1.1116***	0.2912***	0.2060***	0.0281		0.0003	0.96
FTSE	-0.0047**	1.0824***	0.2426***	0.1717*	0.0119		-0.0086	0.97
Nordic Countries								
MSCI	-0.0027	0.9550***	0.1587	0.0473	0.1279***		-0.0063	0.95
FTSE	-0.0053***	1.0042***	0.1701**	-0.0106	0.0214		0.0156**	0.98
North America								
MSCI	0.0032	0.9232***	0.0706	-0.0041	0.0557		-0.0073	0.95
FTSE	-0.0025**	0.9733***	-0.0860	-0.0337	0.0011		0.0039	0.99
S&P	0.0006	0.8902***	-0.0331	-0.0126	-0.0050		-0.0008	0.98

The following table displays the results of the Carhart (1997) estimations including the ramadan dummy. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors, respectively. Column seven displays the factor loading for the back testing coefficient and column eight to ten display the factors loadings for the ramadan coefficient, respectively, Finally, column eleven shows the adjusted r-squared value for each regression. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.6.4 Full data history vs. common sample period

The rapid growth of the Islamic finance industry has resulted in an increased number of providers offering Islamic indices. In a multifamily index study, there are, however, two issues which are relevant from a research design perspective. First, the fact that screening practises differ widely among index providers raises a question of how different screens impact index performance. Second, all index families included in our analysis have different base dates, which makes it difficult to compare the results. In order to compare the relative performance across the providers, we, therefore, construct a common period sample. This sub-sample includes all indices that have a history of at least four years (September 2008 to September 2012), where all indices with short performance history are excluded.

We perform the Jensen's Alpha and Carhart regressions without a back-testing variable, as no back-tested data during this period exist. The results of the common sample analysis are displayed in Table 4.8 and can be summarized as follows. First, the results are very consistent with our estimations for the full data sample. Looking at the Carhart regressions, the outperformance remains at a global level, developed market level, and the BRIC region while Islamic indices underperform in emerging markets. Second, the financial performance seems to vary some across the providers. For instance, the outperformance at a global level range from 3.6% per annum (MSCI) to 5.5% p.a. (Dow Jones). Despite being a very simple form of comparison, it suggests

that different screening methodologies could lead to difference in financial performance.

Table 4.8 Results of Carhart (1997) estimations for the common sample period

Panel A									
Region/ Provider	CAPM model		Carhart model					CAPM Adj R2	Carhart Adj R2
	α_i	β_i	α_i	β_i	SMB_i	HML_i	MOM_i		
Dow Jones	0.0040***	0.9333***	0.0046***	0.9541***	0.0139	-0.0376	0.0308	0.98	0.98
MSCI	0.0019	0.9250***	0.0030*	0.9526***	0.0563	-0.0069	0.0590	0.96	0.97
FTSE	-0.0001	0.9409***	0.0010	0.9693***	-0.0302	-0.0761*	0.0308	0.98	0.99
Russell	0.0018	0.9146***	0.0033**	0.9498***	0.0756	-0.0114	0.0760	0.97	0.97
S&P	0.0024**	0.9096***	0.0035***	0.9414***	-0.0065	-0.0799*	0.0329	0.98	0.99
Developed									
Dow Jones	0.0024*	0.9269***	0.0038**	0.9473***	0.0310	-0.0077	0.0429	0.97	0.97
FTSE	-0.0015	0.9271***	-0.0012	0.9328***	-0.0659	-0.0421	0.0028	0.98	0.98
Russell	0.0020	0.9000***	0.0044**	0.9284***	0.1068	0.0332	0.0737	0.96	0.96
Emerging									
Dow Jones	0.0008	0.9400***	0.0001	0.9283***	0.0789*	0.0366	-0.0513	0.99	0.99
MSCI	-0.0008	1.0042***	-0.0009	1.0121***	0.0496	-0.0029	0.0171	0.99	0.99
FTSE	-0.0040**	1.0023***	-0.0043**	1.0112***	0.0661	0.0027	0.0225	0.99	0.99
Russell	-0.0034	0.9054***	-0.0027*	0.9411***	0.0725	0.0250	0.1509	0.98	0.98
S&P	-0.0032**	0.9594***	-0.0031**	0.9594***	0.0397	0.0353	0.0207	0.99	0.99

The following table displays the results of the Carhart (1997) and Jensen's alpha (1968) for the common sample period. Column one shows the respective region and index provider. Column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven shows the adjusted r-squared value. Column eight shows the Jensen's alpha, column nine the beta and column ten the adjusted r-squared value for the same model. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Panel B									
Region/ Provider	CAPM model		Carhart model					CAPM Adj R2	Carhart Adj R2
	α_i	β_i	α_i	β_i	SMB_i	HML_i	MOM_i		
Asia Pacific									
Dow Jones	0.0018	1.0593***	0.0022*	1.0330***	0.1417**	-0.0825*	-0.0069	0.97	0.97
MSCI	0.0003	1.0379***	0.0007	1.0305***	0.0315	-0.0532	0.0087	0.99	0.99
FTSE	-0.0034*	0.9354***	-0.0034*	0.9531***	0.0070	0.0583	0.0341	0.96	0.96
S&P	-0.0010	0.9715***	-0.0005	0.9886***	0.0776	-0.0853**	0.0445	0.97	0.97
BRIC									
MSCI	0.0068***	1.0036***	0.0064***	1.0065***	0.0334	-0.0048	-0.0034	0.98	0.98
S&P	0.0021	0.9757***	0.0017	0.9840***	0.1299**	0.0448	0.0303	0.96	0.97
Eastern Europe									
MSCI	-0.0006	0.9724***	-0.0011	0.9958***	0.0191	-0.0121	0.0318	0.98	0.98
Europe									
Dow Jones	0.0015	0.9069***	0.0008	0.9454***	-0.1433**	-0.1657***	0.0403	0.97	0.98
MSCI	0.0035	0.9955***	0.0025	1.0419***	-0.1422	-0.1345	0.1023	0.93	0.94
FTSE	-0.0016	0.9035***	-0.0023	0.9437***	-0.1249	-0.1388	0.0559	0.97	0.97
Latin America									
MSCI	-0.0005	1.0578***	0.0009	1.1115***	0.2907***	0.2058***	0.0283	0.96	0.96
Nordic Countries									
MSCI	-0.0042	0.9049***	-0.0033	0.9575***	0.1575	0.0387	0.1260	0.94	0.95
North America									
MSCI	0.0002	0.9071***	0.0010	0.9406***	-0.0235	-0.1032*	0.0212	0.97	0.97
S&P	0.0010	0.8954***	0.0015	0.9210***	-0.0310	-0.0842*	0.0138	0.98	0.98

The following table displays the results of the Carhart (1997) and Jensen's alpha (1968) for the common sample period. Column one shows the respective region and index provider. Column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven shows the adjusted r-squared value. Column eight shows the Jensen's alpha, column nine the beta and column ten the adjusted r-squared value for the same model. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.6.5 Conventional benchmarks vs. ex-financial benchmarks

In contrast to indices complying with Islamic principles, standard conventional indices tend to be heavily weighted towards financial services stocks. Typically, this sector constitutes 20% or more of broad market indices. As a final attempt to explain our results, we choose to analyse the performance of Islamic indices relative to market benchmarks including non-financials stocks only. Since not all providers offer ex-financials indices for all geographical markets in our sample, we construct an alternative, ex-financials benchmark return ($EXFIN_t$), which we define as follows:

$$EXFIN_t = R_{mkt,t} + \left(R_{mkt,t} - R_{fin,t}\right) * \left(MV_{fin,t} \div \left(MV_{mkt,t} - MV_{fin,t}\right)\right) \qquad (4.8)$$

where $R_{mkt,t}$ is the return of the overall market, $R_{mkt,t}$is the return of the financial services sector, $MV_{fin,t}$ is the market value of the financial services sector and $MV_{mkt,t}$ is the market value of the overall market. The results of the ex-financials regressions are displayed in Table 4.9. All Russell and S&P indices had to be excluded, as we could not obtain necessary market capitalization data. Two important findings are worth discussing. First, when we use the ex-financials variable as a market benchmark we witness a substantial increase in the adjusted R-squared values for nearly all estimations. For instance, the adjusted r-squared values for the global index regressions increased by 2,45% (Dow Jones), 2,17% (MSCI), 1,79% (FTSE) and we can observe a value as high as 99,45% (FTSE Emerging). This implies that our

model explains more of the return variation compared to the standard Carhart (1997) model. Here, it should also be noted that the adjusted r-squared values in the standard Carhart regressions are quite high and typically range from 93% to 97%. An interesting topic for future research would be to develop an Islamic asset pricing model where conventional financial services stocks are excluded from market benchmarks.

A second interesting observation is related to the performance implications of applying an alternative ex-financials benchmark. In several cases, Islamic indices seem to perform similarly or worse when applying the new benchmark. For instance, the outperformance of the Dow Jones World Index found using the standard benchmark disappears almost completely. Similarly, the insignificant results of the FTSE world index turn into a significant underperformance, and the positive alpha of the Dow Jones Asia Pacific index gets reduced. This implies that the good performance of several Islamic indices is largely due to the exclusion of financial stocks. However, as the outperformance is not due to a bias but an integral part embedded in the indices, the alphas should be considered genuine. Hence, some Islamic indices seem attractive for both Muslim and non-Muslim investors alike. It should, however, be noted that not all indices experience this change since some of the alphas remain fairly constant, such as the FTSE Emerging Index. However, we consider these results to support the notion that investing according to Islamic

principles could offer risk management advantages, which appears to be associated with the exclusion of financial stocks.

Table 4.9 Results of Carhart (1997) estimations with standard and ex-financials benchmarks

Panel A						
Region/ Provider	α_i	β_i	SMB_i	HML_i	MOM_i	Adj R2
World						
Dow Jones standard benchmark	0.0026***	0.9905***	-0.0940*	-0.1785***	-0.0017	0.96
Dow Jones ex-financials	0.0005*	1.0345***	-0.0873***	-0.1138***	-0.0030	0.98
MSCI standard benchmark	0.0030*	0.9526***	0.0563	-0.0069	0.0590*	0.97
MSCI ex-financials	0.0001	1.0154***	-0.0033	-0.0079	-0.0014	0.99
FTSE standard benchmark	0.0006	0.9613***	0.0326	-0.0092	0.0358**	0.97
FTSE ex-financials	-0.0014***	1.0134***	0.0169	0.0124	-0.0021	0.99
Developed						
Dow Jones standard benchmark	0.0019*	0.9925***	-0.0759	-0.1505***	0.0054	0.95
Dow Jones ex-financials	-0.0001	1.0447***	-0.0728**	-0.0945***	0.0064	0.98
FTSE standard benchmark	0.0012	0.9427***	0.0654	0.0280	0.0521	0.97
FTSE ex-financials	-0.0022*	1.0096***	-0.0064	0.0027	-0.0024	0.99
Emerging						
Dow Jones standard benchmark	0.0031**	0.9702***	-0.0906**	-0.1099***	-0.0225	0.94
Dow Jones ex-financials	0.0008	0.9814***	-0.1044***	-0.1039***	-0.0338**	0.96
MSCI standard benchmark	-0.0009	1.0121***	0.0496	-0.0029	0.0171	0.99
MSCI ex-financials	-0.0013	1.0306***	-0.0456*	-0.0357**	-0.0212	0.99
FTSE standard benchmark	-0.0037**	1.0052***	0.1115**	0.0348	0.0273	0.98
FTSE ex-financials	-0.0035***	1.0280***	0.0128	0.0030	0.0011	0.99

The following table displays the results of the Carhart (1997) regressions with standard and ex-financials benchmarks. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven displays the adjusted r-squared value. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987), *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

Panel B						
Region/ Provider	α_i	β_i	SMB_i	HML_i	MOM_i	Adj R2
Asia Pacific						
Dow Jones standard benchmark	0.0044***	0.9933***	-0.0271	-0.2550***	0.0114	0.91
Dow Jones ex-financials	0.0042***	1.0479***	-0.0393	-0.2006***	0.0030	0.94
MSCI standard benchmark	0.0007	1.0305***	0.0315	-0.0532	0.0087	0.99
MSCI ex-financials	0.0000	1.0648***	-0.0981**	-0.0813***	-0.0365***	0.99
FTSE standard benchmark	-0.0028*	0.9412***	-0.0055	0.1031**	0.0215	0.96
FTSE ex-financials	-0.0032**	0.9811***	-0.0704	0.1357***	0.0075	0.97
Europe						
MSCI standard benchmark	0.0025	1.0419***	-0.1422	-0.1345	0.1023**	0.94
MSCI ex-financials	0.0000	1.1285***	-0.0866	-0.0364	-0.0163	0.96
FTSE standard benchmark	-0.0020	0.9499***	-0.1023	-0.1373**	0.0702***	0.97
FTSE ex-financials	-0.0038***	1.0077***	-0.0626	-0.0538	-0.0267	0.98
Latin America						
MSCI standard benchmark	0.0009	1.1115***	0.2907***	0.2058***	0.0283	0.96
MSCI ex-financials	-0.0083***	1.1232***	0.2085***	0.1516***	0.0432	0.97
Nordic Countries						
MSCI standard benchmark	-0.0033	0.9575***	0.1575	0.0387	0.1260***	0.95
MSCI ex-financials	-0.0036*	0.9784***	0.1181	0.1562	0.0736	0.96
FTSE standard benchmark	-0.0040**	0.9951***	0.1599**	-0.0046	0.0211	0.98
FTSE ex-financials	-0.0038***	1.0243***	0.1082	0.0101	-0.0866**	0.99
North America						
MSCI standard benchmark	0.0025	0.9259***	0.0720	-0.0048	0.0532	0.95
MSCI ex-financials	0.0000	0.9732***	0.0226	0.0037	0.0063	0.98

The following table displays the results of the Carhart (1997) regressions with standard and ex-financials benchmarks. Column one shows the respective region and index provider, column two to six shows the Carhart alpha, beta, smb, hml and mom factors and column seven displays the adjusted r-squared value. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987), *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

4.7 Conclusion

This chapter analysed the financial performance of Islamic equity indices. The chapter distinguishes itself from most previous work by carefully addressing several methodological shortcomings that could explain the mixed results documented in the existing Islamic index literature. The steps towards a cleaner and more robust research approach can be summarized as follows. First, in contrast to many previous Islamic index papers, our data sample includes a large number of indices from multiple providers that together cover ten geographical markets. Second, throughout the analysis we maintain a strict matching approach which includes matched index pairs from the same provider and customized risk factors. Third, we account for possible back-testing biases that could be embedded in Islamic indices. Forth, we examine two sample periods length which allows us to (i) analyse potential performance implications of different screening practises currently used in the industry and (ii) better compare the performance of Islamic indices with different start dates. Fifth, we control for potential effects associated with market downturns and financial crises. Finally, we construct a refined market benchmark that excludes financials firms.

The first part of our analysis was concerned with analysing the risk-adjusted performance of Islamic indices. Our results suggest that this performance depends on the geographical context. We find that Islamic indices outperform their conventional

benchmarks on global and developed market level, as well as in the BRIC region. We consider these results very sound, as this equity premium appears for multiple providers and remain constant in our sub-sample analysis. In contrast, many Islamic indices seem to underperform in the emerging market region. Some evidence also suggests an underperformance in other regions, such as Latin America and the Nordic region.

The second part of the analysis was concerned with explaining the results, and can be summarized as follows. First, several Islamic indices in our sample seem to have a back-testing bias embedded in the performance history, resulting in relatively higher returns during periods of back-tested data. Controlling for this bias showed some evidence of a decrease in alpha, but this was marginal. Furthermore, many Islamic indices seem to have yielded a superior risk-adjusted return during the recent credit crisis, even though controlling for this only resulted in a marginal reduction of alpha. Finally, the single most important factor when explaining the results appears to be the exclusion of financial stocks. When excluding the financial sector from our market benchmark, the previously found alpha disappears while the explanatory power of the regression model increases.

The findings presented in this paper could be seen as step towards a deeper understanding of the pricing of Islamic equity markets. Future research on Islamic equity investing is encouraged to further investigate the implications of constructing

alternative market benchmarks. Similarly, it would be interesting to adopt a similar research approach on Islamic mutual funds, an industry that has grown with the rapid pace in recent years. The paper should also be considered highly relevant to investors and policymakers as it shows that the unique attributes embedded in Islamic equity investing could provide competitive investment strategies for both Muslim and non-Muslim investors alike.

Chapter 5

DETERMINANTS OF ISLAMIC INDEX PERFORMANCE

Abstract

This chapter is concerned with the determinants of Islamic index performance. Based on an extensive sample of Islamic country indices across 46 markets, we examine whether the risk-adjusted performance of these indices is explained by country level factors associated with the economic, cultural, governance and religious environment. Furthermore, we also consider whether different *Shari'ah* screens influence performance. We find that the risk-adjusted performance of Islamic indices is significantly determined by the stock market environment, the money supply environment and the level of the Muslim population. This implies that country-level factors are important to consider when investing in *Shari'ah*-compliant portfolio. The performance also appears to be related to the *Shari'ah* screening norms adopted by the index providers.

5.1 Introduction

Islamic finance is considered one of the fastest growing sectors of the financial industry. *Shari'ah*-compliant mutual funds have exhibited a particular strong growth and have doubled in numbers between 2007 and 2013 (see Figure 2.3). With background to this growing significance, there has been mounting academic interest in the performance attributes of Islamic equity investments. The most dominant research question in this literature stream is whether *Shari'ah*-based stock screening impact financial performance. In previous studies, this issue has been addressed by analysing the performance of Islamic equity portfolios relative to unconstrained market benchmarks. These have been reported to underperform (Hayat & Kraeussl, 2011; Nainggolan, How, & Verhoeven, 2013), outperform (Ashraf, 2013), or perform similar to the overall market (Albaity & Ahmad, 2008; Girard & Hassan, 2008; Hakim & Rashidian, 2004; Walkshäusl & Lobe, 2012b). Hence, the extent to which Islamic investment principles impact financial performance is still a question subject to debate.

Relative performance aside, one area that has been scarcely investigated is the determinants of Islamic index risk-adjusted performance. Although empirical observations have taught us that this performance could be determined by factors such as the stock market environment (e.g., Elfakhani et al., 2005; Girard & Hassan, 2008;

Hussein, 2004)[14] and the geographical context (e.g., Hoepner et al., 2011)[15], the evidence to date is limited. Outside the Islamic finance literature, this issue has received considerable more attention. For instance, Ferreira, Keswani, Miguel, and Ramos (2012) study the determinants of an international set of mutual funds from 27 countries by relating the funds' Carhart (1997) four-factor alpha to fund characteristics and country level economic variables. Renneboog et al. (2008) incorporate data on screening activity, fund characteristics and investment style to determine the risk-adjusted performance of socially responsible investment funds across 17 countries. In a related context, Ioannou and Serafeim (2012) examine whether the drivers of corporate social performance (CSP) are determined by country factors related to the economic, cultural and legal environment.[16]

This chapter seeks to contribute to the literature by studying the performance determinants of Islamic equity investment's financial performance. To do this, we first compute the risk-adjusted performance (i.e., *Jensen's alpha*) for a large sample of Islamic country indices across 46 markets.[17] In a cross-sectional regression

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[14] Specifically, sub sample analyses have revealed that Islamic indices have performed differently in bull and bear market periods.

[15] Hoepner et al. (2011) found Islamic mutual funds to exhibit relatively better risk-adjusted returns in countries with predominantly Muslim investors.

[16] There is no universal definition of corporate social performance. In the context of (Ioannou & Serafeim (2012) it is measured by the score of environmental, social and governance dimensions.

[17] An Islamic index can be thought of as the sub-universe of a conventional index, constituted only by stocks that comply with Islamic principles. These principles are based on interpretations of *Shari'ah* (Islamic law) and adherence to these principles is assured via the use of negative screens. Hence, for the purpose of analysing the direct implications of Islamic equity investing principles, such indices offer an ideal setting (Schröder, 2007).

framework, we subsequently investigate whether the performance of these indices is determined by a variety of country characteristics motivated by previous literature, such as economic, cultural, governance and religious factors. Furthermore, since the indices in our sample are constructed based on different *Shari'ah* screening norms, we complement the list of country characteristics with a set of proxy variables to capture the potential impact of different screens. The latter is similar to the approach by Renneboog et al. (2008) and Nainggolan, How, and Verhoeven (2015).

The findings suggest that country-level characteristics can be important determinants of Islamic index risk-adjusted performance. We document the overall stock market environment to have negative and significant impact on Islamic index performance. This relationship implies that Islamic indices will perform relatively worse when the market does well and *vice versa*. Furthermore, there is a positive relationship with the level of money supply although the economic relevance appears marginal. Interestingly, we also find Islamic indices to perform relatively better in markets subject to higher Muslim populations. In contrast, neither cultural nor governance environment appears to be relevant determinants of performance. Concerning the screening characteristics, we find that financial ratios based on market capitalization, rather than total assets, positively contributes to the performance

The remaining parts of this study are structured as follows. Section 5.2 covers the hypotheses development, Section 5.3 is concerned with data description, Section 5.4

outlines the research design, Section 5.5 discusses the results of the analysis and finally Section 5.6 provides a summary and concluding remarks.

5.2 Research questions

5.2.1 The interest rate environment

Perhaps the most distinguished and well-known feature of the Islamic finance system is the prohibition of riba, or interest. In the context of Islamic equity indices, the ban of interest has three significant implications. First, these indices cannot be constituted of firms that rely on interest a source of income (Iqbal & Mirakhor, 2011). To adhere to this principle, index providers employ negative screening that excludes firms subject to excess amounts of interest income. For instance, FTSE, one of the leading index providers, excludes from their Islamic indices all firms that have cash and other interest-bearing securities that exceed one third of the total assets, or where the interest income amounts for more than 5% of total revenue.

The prohibtion of riba implies that interest not only is banned as source of income but also as a source of payment. Hence, a second implication for Islamic equity indices is that they cannot be constitued of firms that operate with high financial leverage, as these firms in most cases would face interest payments on their loans. Following once more the example of FTSE, their Islamic indices therefore exclude firms that have a total debt that exceeds one third of the total assets. The final implication of the probibtion of riba for Islamic equity indices is that they cannot be constitued of firms

operating in the financial services industry. Put simply, the reason that this industry is considered non-compliant with the riba principle is that interest represent a fundamental part in the business model.

The exclusion of firms subject to the aforementioned characteristics implies that Islamic equity indices should be fundamentally different than their unconstrained index peers in terms of accounting fundamentals, size and sector allocation (Derigs & Marzban, 2008). With background to these differences in characteristics, it seems reasonable to question whether the interest rate environment could influence the return differentials between Islamic equity indices and their unconstrained counterparts. For instance, in a high interest rate environment, the less leveraged firms constituting an Islamic index will face less costs associated with financial debt than firms constituting the less restrictive conventional index. In the contrary, in a high interest rate environment, firms constituting the conventional index is likely to enjoy higher profits from interest income. To investigate this performance related issue of the interest rate environment, we formulate the first research question as follows:

1st research question: Is the interest rate environment a significant determinant of Islamic index risk-adjusted performance?

5.2.2 The level of money supply

Considerable empirical evidence suggest that money supply, defined as "[m]oney and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government" (The World Bank, 2014), could influence stock returns (Blume, Kraft, & Kraft, 1977; Brunie, Hamburger, & Kochin, 1972) but also bank profitability (Molyneux & Thornton, 1992). As discussed previously, Islamic equity indices differ substantially from the conventional counterparts, partly in that they are not being investable in conventional banks and other financial institutions. Under the assumption that the profitability of this segment of firms depend on the money supply environment, it implies that it could influence the differentia performance Islamic equity indices versus their conventional counterparts. Hence, we aim to examine the following research question:

2nd research question: Is the money supply environment a significant determinant of Islamic index risk-adjusted performance?

5.2.3 Impact of overall stock market behaviour

It is commonly accepted that stock markets move in cycles over time, being subject to so-called bull and bear market periods. Bull markets signify increased investor confidence, rising share prices and improved financial well-being, while bear markets imply the opposite: decrease in investor confidence, falling share prices and a

decreasing financial well-being (Gonzalez, Powell, Shi, & Wilson, 2005). As discussed in the formulation of the first research question, when screening for debt, Islamic equity indices are bound to take on less financial leverage than their conventional counterparts. Fundamentally, this implies that Islamic equity should carry relatively less risk during periods of market turmoil, while lagging behind conventional counterparts in optimistic market periods due to a smaller leverage effect (a result debt restrictions). To investigate the relationship between the overall stock market environment and the performance of Islamic equity indices relative conventional counterparts, the following research question is defined:

3rd research question: Is the stock market environment a significant determinant of Islamic index risk-adjusted performance?

5.2.4 The level of Muslim population

Empirical evidence suggests that religion could be an important determinant of investor behaviour. For instance, Kumar, Page, and Spalt (2011) find that investors in Catholic countries (relative Protestant countries) are more likely to hold lottery-type stocks, and first day returns of initial public offerings are generally higher. These findings suggest that Catholics are more willing to speculate and take higher risk. Białkowski et al. (2012) find in stock markets where the populations are of Muslim majority, markets have historically enjoyed increased risk-adjusted returns during Ramadan. Salaber (2013) find that Catholic investors are more likely than Protestant

investors to shun sin stocks, and Golombik, Kumar, and Parwada (2011) find religion to impact investment managers asset allocation / strategies, although financial performance is not sacrificed. With background to these empirical observations, this study seeks to examine whether Islam could influence the performance of Islamic equity indices relative their conventional counterparts. Hence, the final research question is defined as:

4th research question: Is the level of Muslim population a significant determinant of Islamic index risk-adjusted performance?

5.3 Data

This section is concerned with describing the data used in the analysis. First it outlines the various data sources that have been used to obtain necessary data, followed by a discussion of the method used to compute the dependent variable. Next, there is a detailed outline of key independent variables (which relate to the hypotheses) followed by a motivation of additional control variables.

5.3.1 Data sources

A number of data sources have been used to obtain necessary data for the analysis. Islamic index and market benchmark data are obtained from *Bloomberg*. Since the scope of the analysis spans over a wide range of countries, a critical issue the data coverage. For macroeconomic data we therefore rely on the *World Bank* database

(http://data.worldbank.org/), which merge data from the *International Monetary Fund* (IMF), *International Financial Statistics* (IFS) and the *Organization for Economic Co-operation and Development* (OECD). Another advantage of this database is that all data is available in an annual frequency, which fits well with the research design employed in this study. Furthermore, cultural data is obtained from the Geert Hofstede's website (http://geert-hofstede.com/), and governance data is from the *World Governance Indicators Project*. Finally, religious data comes from the *CIA World Factbook*.

5.3.2 Dependent variable: risk-adjusted performance (Jensen's alpha)

The main dependent variable in this study is the Islamic index risk-adjusted performance for a large international set of Islamic country indices. Focusing on the determinants of performance (relative to conventional benchmark) rather than returns is motivated by the lack of understanding of drivers of the risk-adjusted performance. The dependent variable is constructed as follows. First, we obtain weekly Islamic index total return data (dividends re-invested) covering 46 developed and emerging market countries.[18] It should be noted that we considered the inclusion of GCC country indices. This is an important Islamic finance region with large populations of Muslim investors. However, the data coverage for this region is poor which would

[18] Countries in alphabetical order: Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Luxembourg, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom and the United States

have had significant limiting effects on the analysis. Yet, it is to our knowledge the largest dataset used in an Islamic index study, as previous studies have incorporated a maximum of 35 countries (i.e., Abbes, 2012; Walkshäusl & Lobe, 2012b). Furthermore, the dataset includes indices from four providers, which allow us to control for the impact of screening characteristics (which will be discussed in detailed later). To ensure that all relevant Islamic indices are included, we review in detail the index supply of all major index providers.

As for conventional market benchmarks we adopt the methodological approach of Kreander et al. (2005) and use matched index pairs, where each Islamic index has a corresponding conventional benchmark from the same index provider, respectively. This procedure is believed to enhance the research quality as each index pair (Islamic and the benchmark index) stem from the same asset universe. In total, the dataset spans from January 2008 to December 2012, where the start date and end date is determined by the launch of Islamic indices and the availability of independent and control variables, respectively.[19] Indices with less than 23 weekly observations in a given year are excluded for statistical reasons. In preparing the data for the regression, we then transform all total return data into continuously compounded returns.[20] To improve the statistical accuracy further, we use country-specific risk-free rates, which

[19] While some Islamic country indices were launched earlier (e.g., in 1999 Dow Jones launched a handful of country level indices), it was not until 2007 that providers started to launch Islamic country indices on broad scale.

[20] The formula used to compute continuous compounded returns : $R_{it} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$ where ln is the natural logarithm, $P_{i,t}$ is the price of index i at time t, and , $P_{i,t-1}$ is the price of index i at time t-1.

is represented by the investment yield of the local three-month treasury bill.[21] In order to arrive at the risk-adjusted return of each Islamic index, we then estimate the Jensen's alpha which stem from the capital asset pricing model (CAPM). In its regression form the model is denoted as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad (5.1)$$

The left hand side of the equation represents the excess return where R_{it} is the logged return of the Islamic index and R_{ft} is the local risk-free. On the right hand side the α_i represent the abnormal return of the index, β_i is the exposure to the systematic risk, R_{mt} is the logged return of the market benchmark and ε_{it} stands for the random error term. The model is estimated annually between 2008 and 2012

The fact that the present research design involves a two-stage estimation process calls for caution when interpreting the results. That is, alpha coefficients of Islamic equity indices are estimated in a first-stage, and in the second-stage estimation these coefficients form the dependent variable. Since the dependent variable is estimated one must acknowledge the potential risk that it is subject to so-called measurement error. In this context, measurement error can be described as a situation where the exact true value of a variable cannot be observed directly but has to be estimated (Hausman, 2001). For instance, if y_i represents the true (unobserved) value of the

[21] For countries that do not offer T-bills, we use instruments with similar characteristics.

dependent variable and y_i^* represents the estimated value of the dependent variable, then the measurement error (ζ_i) can be defined as the difference between true and observed value, or:

$$\zeta_i = y_i - y_i^* \tag{5.2}$$

Suppose the model for describing the determinants of the true value of Islamic index risk-adjusted performance can be written as:

$$y_i = \beta_0 + \beta_1 x_i + \cdots + \beta_k x_k + \varepsilon_i \tag{5.3}$$

where y_i is the true value of Islamic index performance, x_k represent relevant explanatory variables and ε_i is the random error term, then, by incorporating the information in Equation 5.2, the model for describing the determinants of the estimated value of Islamic index risk-adjusted performance can be written as:

$$y_i^* = \beta_0 + \beta_1 x_i + \cdots + \beta_k x_k + \varepsilon_i + \zeta_i \tag{5.4}$$

In Equation 5.4, it can be observed that when the dependent variable is subject to measurement error, the error term of the regression is given by $\varepsilon_i + \zeta_i$. This implies that using an estimated dependent variable will lead to an increase in regression

disturbance, whereby the regression output will be subject to lower statistical accuracy (Hausman, 2001; Wooldridge, 2012). Because of the general assumption that ε_i and ζ_i have zero means and is uncorrelated with the independent variables, it is however anticipated that a measurement error in the dependent variable presents no problems for the ordinary least squares (OLS) estimators (Wooldridge, 2012). In other words, the principal price one has to pay for using an estimated dependent variable is larger standard errors and lower statistical accuracy. Hence, caution is recommended when interpreting the results of this two-stage estimation process.

Several observations emerge from the descriptive statistics displayed in Table 5.1. Although the focus of this study is on the determinants of Islamic index performance rather than the performance itself, we still find it worth discussing the risk and return characteristics. First, the aggregated mean excess return for the Islamic indices is higher (lower) than the market benchmark in 20 (26) countries. On average, the annual mean return for the Islamic indices is -0.026 and conventional indices -0.010 which implies that conventional indices, on average, have yielded better mean returns during between 2008 and 2012. With a mean standard deviation of 0.331 (Islamic) and 0.334 (conventional) it does not seem to be a significant difference in volatility. As an indication of the reward-to-risk profile, we calculate the Sharpe ratio.[22] Again, we can observe similar risk and return characteristics of Islamic and conventional indices. In

[22] The Sharpe ratio is calculated by taking the mean excess return of index *i* divided by the standard deviation of the excess return history.

Table 5.1 we also display the mean alpha coefficients for each country, respectively. Islamic indices had a positive mean economic significance across the sample period in 24 countries, while mean alpha for all indices is positive in 2008, 2009, 2010 and 2011 while being negative in 2012.

Table 5.1 Dependent variable summary statistics

Country	*N indices*	Islamic index			Benchmark index			Mean Alpha				
		mean	s.d.	sharpe	mean	s.d.	sharpe	2008	2009	2010	2011	2012
Australia	2	-0.004	0.398	-0.011	0.028	0.345	0.080	0.175	-0.005	0.034	-0.095	-0.113
Austria	3	-0.141	0.372	-0.380	-0.072	0.387	-0.186	-0.084	-0.054	-0.058	0.070	0.004
Belgium	3	-0.016	0.280	-0.058	-0.090	0.358	-0.251	0.117	-0.071	0.077	-0.070	-0.060
Brazil	3	-0.103	0.424	-0.244	-0.015	0.396	-0.039	-0.037	-0.009	-0.064	-0.080	-0.077
Canada	3	-0.053	0.381	-0.140	0.001	0.343	0.002	0.038	0.019	-0.003	-0.028	-0.093
Chile	3	0.037	0.315	0.116	0.061	0.311	0.196	-0.109	0.023	-0.133	-0.003	-0.022
China	3	-0.066	0.337	-0.195	0.047	0.325	0.144	-0.120	-0.054	0.026	0.032	-0.041
Colombia	2	0.178	0.280	0.635	0.076	0.301	0.252	-0.129	-0.020	-0.036	-0.006	0.020
Czech Rep	3	-0.120	0.342	-0.349	0.031	0.322	0.095	0.036	-0.073	-0.072	0.041	-0.082
Denmark	3	0.060	0.297	0.203	-0.005	0.322	-0.015	0.187	-0.063	0.076	0.034	0.052
Egypt	2	-0.018	0.338	-0.052	-0.062	0.332	-0.188	-0.133	0.158	0.052	0.257	-0.112
Finland	3	-0.176	0.368	-0.477	-0.098	0.352	-0.278	0.077	-0.106	-0.090	-0.066	-0.016
France	3	-0.035	0.303	-0.117	-0.085	0.339	-0.252	0.109	0.006	-0.027	0.060	0.015
Germany	2	-0.031	0.336	-0.093	-0.032	0.332	-0.098	0.019	0.032	0.023	0.020	0.029
Greece	3	-0.123	0.573	-0.214	-0.260	0.415	-0.627	-0.139	0.149	0.100	0.015	0.277
Hong Kong	3	-0.016	0.246	-0.063	-0.121	0.337	-0.360	-0.019	0.078	-0.051	-0.043	-0.014
Hungary	3	-0.111	0.410	-0.271	-0.075	0.425	-0.176	-0.066	-0.003	0.034	-0.038	-0.026
India	3	-0.077	0.298	-0.259	-0.022	0.329	-0.068	-0.052	0.021	-0.029	0.007	-0.020
Indonesia	3	0.002	0.342	0.006	0.050	0.355	0.140	-0.150	-0.045	-0.125	-0.108	0.065
Ireland	3	-0.007	0.519	-0.014	-0.096	0.376	-0.255	0.163	0.156	0.301	-0.114	-0.264
Israel	2	-0.074	0.208	-0.359	-0.072	0.291	-0.248	0.148	-0.033	-0.071	0.045	-0.079
Italy	3	-0.037	0.353	-0.105	-0.115	0.322	-0.357	0.223	0.027	0.118	0.091	0.113
Japan	4	-0.045	0.196	-0.232	-0.068	0.248	-0.275	-0.058	0.100	0.002	0.020	-0.064
Luxembourg	1	-0.121	0.495	-0.244	-0.111	0.357	-0.311	0.014	0.035	0.121	0.257	-0.011
Malaysia	3	0.063	0.182	0.345	0.121	0.190	0.639	0.021	0.035	-0.068	0.030	0.031
Mexico	3	0.085	0.358	0.237	0.058	0.313	0.185	-0.017	0.098	0.103	-0.064	0.064
Morocco	2	-0.075	0.205	-0.366	-0.013	0.264	-0.049	0.161	-0.089	-0.036	-0.020	-0.017
Netherlands	3	-0.007	0.280	-0.025	-0.043	0.286	-0.151	-0.046	0.134	-0.007	-0.011	0.023
New Zealand	2	0.028	0.277	0.099	-0.007	0.274	-0.024	0.075	-0.098	-0.047	-0.155	-0.013

Norway	3	-0.044	0.386	-0.114	-0.004	0.362	-0.010	0.142	-0.056	-0.053	0.008	-0.071
Peru	3	0.033	0.388	0.085	0.090	0.373	0.241	0.038	0.016	-0.021	-0.044	-0.129
Philippines	3	0.057	0.290	0.196	0.143	0.314	0.456	-0.039	-0.010	-0.120	0.062	-0.214
Poland	3	-0.094	0.356	-0.265	-0.001	0.359	-0.002	-0.145	0.010	-0.029	0.051	-0.093
Portugal	2	-0.248	0.336	-0.739	-0.111	0.333	-0.334	-0.115	-0.162	0.201	0.059	-0.224
Russia	3	-0.089	0.444	-0.200	-0.103	0.406	-0.253	0.072	-0.099	-0.008	0.045	-0.021
Singapore	3	0.020	0.260	0.078	-0.003	0.353	-0.010	-0.023	-0.012	0.030	0.050	-0.025
South Africa	3	-0.001	0.366	-0.004	0.057	0.325	0.174	0.003	-0.029	-0.060	-0.020	-0.130
South Korea	2	0.036	0.360	0.099	0.039	0.364	0.108	0.096	0.088	-0.026	-0.046	-0.028
Spain	3	-0.005	0.321	-0.015	-0.046	0.366	-0.126	-0.008	-0.178	0.131	0.055	0.295
Sweden	3	0.040	0.345	0.117	-0.019	0.373	-0.051	0.083	0.066	0.009	0.003	-0.033
Switzerland	3	0.054	0.217	0.248	0.023	0.295	0.077	0.080	0.065	0.036	0.011	0.003
Taiwan	3	0.039	0.245	0.161	0.241	0.375	0.642	-0.052	0.091	-0.020	0.056	0.022
Thailand	3	0.071	0.302	0.234	0.153	0.282	0.542	-0.177	-0.111	-0.074	0.032	-0.125
Turkey	3	-0.002	0.373	-0.004	0.071	0.385	0.186	-0.086	0.026	-0.013	0.048	0.049
UK	2	-0.066	0.323	-0.203	-0.013	0.324	-0.039	0.088	0.057	0.013	0.022	-0.099
US	4	0.021	0.213	0.101	0.008	0.246	0.031	0.017	0.032	-0.016	0.010	-0.040
	128	**-0.026**	**0.331**	**-0.062**	**-0.010**	**0.334**	**-0.018**	**0.008**	**0.003**	**0.003**	**0.010**	**-0.028**

The following table reports the summary statistics of the Islamic indices. Column one shows the respective country, column two displays the number (N) of indices included for each country, respectively. Column three to five and six to eight report the aggregated mean return, standard deviation and Sharpe ratio of the Islamic and benchmark indices, respectively. Finally, column nine to fourteen reports the aggregated mean alpha coefficients, obtained from the CAPM regressions. All figures have been annualized.

5.3.3 Key independent variables

These are the variables that we primarily expect to be significant determinants of Islamic index risk-adjusted performance. First, as a proxy for the interest rate environment we construct a variable (INTEREST) that contains the lagged official lending rate in each country, respectively. As it reflects the bank rate that "…meets the short- and medium-term financing needs of the private sector" (World Bank 2014), we consider it a suitable proxy for the interest rate environment.

Second, to examine the impact of the money supply we construct a variable (M2) that contains the lagged level of money supply (M2) relative to the GDP in each country, respectively. This variable is predicated to have a positive impact on the risk-adjusted performance. Third, to capture the impact of the overall stock market environment we utilize a variable (STOCKMARKET) that captures the mean return of each benchmark index, respectively. Finally, to test whether the degree of Muslim population determines Islamic index risk-adjusted performance we collect from the CIA World Factbook data on the degree of Muslims in relation to the total population (MUSLIMPOP).[23]

[23] CIA World Factbook has been used in a number of prominent studies on religion and finance (e.g., Stulz & Williamson 2003).

5.3.4 Additional control variables

Since the sample of Islamic indices stretches across 46 countries, there is an opportunity to explore the role of other country-level factors in explaining the risk-adjusted performance. Hence, in addition to the key independent variables we also include a set of country-level control variables motivated by the previous literature. These are bundled in five categories: (i) economic environment (ii) investment styles (iii) cultural environment (iv) governance environment (v) screening characteristics. We consider the inclusion of this cross-section of country variables an important contribution as they have not been examined in the previous Islamic index literature.

5.3.4.1 Economic environment

In addition to the key independent variables, we also include additional economic variables motivated by previous literature. To control for the impact of fluctuations in exchange rates, we obtain annualized monthly average data on local currency units relative to the USD (CURRENCY). Once downloaded, the data is then transformed, so it expresses the annual change in percentage. To test how the level of inflation, impact the performance we use the consumer price index data (INFLATION), which is expressed as the annual percentage difference in average consumer prices. Furthermore, to control for the impact of government's economic policies we also include government spending data (GOVSPEND). This variable is defined as the percentage of government spending relative the GDP. All three variables are lagged one period.

5.3.4.2 Investment styles

To control for how common investment styles impact Islamic index risk-adjusted performance, we follow the methodology of Fama and French (1993) and Carhart (1997) and construct investment style portfolios for each country and each year related to small versus big, value versus growth and momentum versus contrarian. We then note the mean annual return of these portfolios, resulting in three investment style variables: size (SMB), value (HML) and momentum (MOM).

5.3.4.3 Cultural environment

Previous research suggests that culture can be an important determinant of the stock market performance. Culture can be defined as "the collective programming of the human mind that distinguishes the members of one human group from those of another. Culture, in this sense, is a system of collectively held vales" (Hofstede, 1980, p. 24). Culture is believed to be important in a finance context since cultural preferences vary across the globe, and it is likely to affect investor behaviour differently (Stulz & Williamson, 2003). Or as Statman (2008, p. 38) puts it: "the collective set of common experiences that people of the same culture share will influence their cognitive and emotional approach to investing.".

Much empirical evidence supports the view of culture being an important determinant of investor behaviour. For instance, using religion and language as proxies for culture, Stulz and Williamson (2003) examine whether culture impacts investor rights. They

find that the culture is an important determinant, where, for instance, Catholic countries have weaker creditor rights than other countries. Beugelsdijk and Frijns (2010) find evidence that cultural distances can explain foreign bias in asset allocation. Specifically, investors in societies signified by high uncertainty avoidance invest relatively less foreign equity while the opposite apply for individualistic societies. Additional evidence that the individualistic dimension matters is provided by Chui, Titman, and Wei (2010) who find investors in less individualistic countries to put more emphasize on information considered as consensus, resulting in a stronger momentum effect compared to collectivistic countries. De Jong and Semenov (2002) find stock markets to be more developed in countries with low uncertainty avoidance and high masculinity.

Motivated by these empirical observations we also include a set of variables to control for the cultural orientation for the countries in our sample. We follow previous literature and use the cultural dimension indices proposed by Hofstede (1980): Power distance (PDI) is an index that measures the extent to which members with less power in a society accept power to be unequally distributed. Individualism versus collectivism (IDV) is an index that represents the degree of group belonging experienced by individuals. Long-term orientation (LTO) is an index that represents the degree to which societies focus on the future (long-term orientation) versus the present or the past (short-term orientation). Masculinity versus femininity (MAS) is an index that captures the distribution of roles between men and women.

5.3.4.4 Governance

In a country level context, governance can be defined as "the traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them " (Kaufmann, Kraay, & Mastruzzi, 2011, p. 222). The link between governance and finance is a widely researched topic. The general conclusion is that the governance related issues are relevant in finance context as they determine "countries' financial systems as the breadth and depth of their capital markets, the pace of new security issues, corporate ownership structures, dividend policies, and the efficiency of investment allocation" (La Porta, Lopez-de-SIlanes, Shleifer, & Vishny, 2000, p. 4). Empirical evidence supports this notion. For instance, Barro (1996) found better Rule of law and political freedom to have a positive impact on economic growth. When studying a large sample of firms in 27 countries, La Porta, Lopez-de-SIlanes, Shleifer, and Vishny (2002) found corporate valuation positively correlated with shareholder protection and higher cash flow ownership by controlling shareholders.

To control for the impact of country governance environment we include data on six governance indicators constructed by Kaufmann, Kraay, and Mastruzzi (2005): Voice and Accountability (ACCOUNTABILITY) captures the possibility for a population to

impact the choice of government and the freedom of association, expression and media. Political Stability (POLSTAB) captures the perception regarding the probability of instability and violence related to the political environment. Government Effectiveness (GOVEFF) captures quality of civil and public services and the extent to which these are independent of political pressure. Regulatory Quality (REGQ) captures the degree to which governments apply regulations that promote developments in the private sector. Rule of Law (RULEOFLAW) measures how the rule of law is perceived with regard to the following variables: (i) government powers (ii) absence of corruption (iii) open government (iv) fundamental rights (v) order and security (vi) regulatory enforcement (vii) civil justice and (viii) criminal justice. Control of Corruption (CORRUPTION) captures the extent to which public power is exercised for private gain. All variables are ranging from -2.5 (worse outcome) to 2.5 (best outcome).

It should be noted that since its inception the WGI dataset has been subject to much criticism. These criticisms are summarized and discussed by Kaufmann, Kraay, and Mastruzzi (2007), and include things like the problem with using different data sources in different countries (i.e., comparability), lack of precision in underlying variables, the fact that some indicators being biased as they stem from commercial sources, and that the values of the indicators are influenced by economic performance rather than its true value.

5.3.4.5 Islamic index screening characteristics

As previously discussed, in order to adhere to the investment principles as stipulated by *Shari'ah*, Islamic index providers utilize negative screening to exclude firms considered impermissible from an Islamic perspective. Paradoxically, previous literature has made observations that this screening process differs widely across the industry (Derigs & Marzban, 2008), which is also the case for the four providers included in our sample. For instance, while MSCI and FTSE use total assets as a divisor in the accounting ratios, Dow Jones an S&P use the 24 and 36 months trailing average market capitalization, respectively. Furthermore, S&P and FTSE are the only ones that employ a screen specifically for non-permissible income (5% of total revenue). To explore whether the use of different screens have an impact on the risk-adjusted performance we include three dummy variables: MC24, which equals 1 if the index is constructed using financial screens based on the 24-month average market capitalization, and 0 otherwise. MC36, which equals 1 if the index is constructed using financial screens based on the 36-month average market capitalization, and 0 otherwise. Finally, we include NC5%, which equals 1 if the index is constructed using 5% non-compliant income screen, and zero otherwise. The variable that captures indices constructed using total assets is left out to avoid a dummy variable trap due to perfect multicollinearity between the variables.

Table 5.2 Overview of variables, definitions and data sources

Category	Variable	Definition	Source
Dependent variables	*ALPHA*	Intercept of CAPM regression	Author
Key variables	*INTEREST*	The average annual official lending rate	World Bank
	M2	The average annual level of the money supply (outside banks and central government) relative the GDP of country	World Bank
	STOCKMARKET	The mean return of overall stock market	Author
	MUSLIMPOP	The Muslim population relative total population	CIA Factbook
Economic	*CURRENCY*	Annual percentage change in local currency relative the USD	World Bank
	INFLATION	Annual percentage change in the consumer price index	World Bank
	GOVSPEND	Annual government spending relative the GDP	World Bank
Style factors	*SMB*	Annual mean difference between the return of small stocks and big stocks	Author
	HML	Annual mean difference between the return of value stocks and growth stocks	Author
	MOM	Annual mean difference between the return of previous winning stocks and previous losing stocks	Author
Culture	*PDI*	The power distance dimension in country i of Hofstede's (1980) cultural framework	Hofstede website
	IDV	The individualism versus collectivism dimension country *i* of Hofstede's (1980) cultural framework	Hofstede website
	MAS	The masculinity versus femininity dimension country *i* of Hofstede's (1980) cultural framework	Hofstede website
	LTO	The long-term orientation dimension country *i* of Hofstede's (1980) cultural framework	Hofstede website
	UAI	The uncertainty avoidance dimension country *i* of Hofstede's (1980) cultural framework	Hofstede website
Governance	*ACCOUNTABILITY*	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	WGI
	POLSTAB	Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	WGI
	GOVEFF	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	WGI
	REGQ	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
	RULEOFLAW	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI
	CORRUPTION	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	WGI
Screening	*MC24*	Dummy variable that takes the value 1 if the index provider use financial ratios based on a 24 month moving average market capitalization, zero otherwise	Index fact sheet
	MC36	Dummy variable that takes the value 1 if the index provider use financial ratios based on a 36 month moving average market capitalization, zero otherwise	Index fact sheet
	5%NC	Dummy variable that takes the value 1 if the index provider employ a 5% non-compliant income screen, zero otherwise	Index fact sheet

The following tables provides and overview of all variables included in the analysis. Column displays the variable category, column the variable name, column three a detailed variable description and column five the source. WGI stands for World Governance Indicators.

5.3.5 Descriptive statistics

Table 5.3 displays the summary statistics for all explanatory variables used in the regression specifications, and Table 5.4 reports their mean values for each country, respectively. Focusing on the key independent variables (i.e., INTEREST, M2, STOCKMARKET, MUSLIMPOP) we can observe large variations for all over time and across the countries in the sample. For instance, INTEREST differs from 0.05% to 47.3%, which suggest major differences in the interest rate environment. The lowest mean interest levels can typically be found in developed market countries (e.g., Japan 2%, UK 2%, Germany 3%, US 5%) while many emerging market countries have significantly higher mean interest rate levels (e.g., Brazil 44%, Peru 21%, Indonesia 14%, Colombia 13%). As for the level of the money supply (M2) we can observe quite the opposite, with high levels typically for developed market countries and low levels in many emerging market countries.

The standard deviation for M2 is 77.8%, suggesting large variations. In this study, we predict the level of the Muslim population to be a significant determinant of Islamic index risk-adjusted performance. We can observe that the Muslim population (MUSLIMPOP) differ substantially across the sample, ranging from practically zero (i.e., Chile, Czech Republic, Hungary, Iceland, Luxembourg, Mexico, Peru, Poland, South Korea, Taiwan) to well over 90% in countries such as Egypt, Morocco and Turkey. Large variations are true also for additional variables capturing the country

level economic conditions. For instance, while INFLATION has a mean of approximately 3.5% across the sample, we can observe periods of deflation, -4.5%, to as high as 18.3%. It should be noted that these large variations are likely to be due to the critical events of the global financial crisis.

Table 5.3 Summary statistics of explanatory variables

Category	Variable	Mean	St dev	Min	Max
Key independent variables	*INTEREST*	0.072	0.069	0.005	0.473
	M2	1.201	0.778	0.262	6.550
	STOCKMARKET	-0.001	0.008	-0.026	0.016
	MUSLIMPOP	0.123	0.261	0.000	0.999
Economic	*CURRENCY*	0.990	0.078	0.841	1.295
	INFLATION	0.034	0.029	-0.045	0.183
	GOVSPEND	0.175	0.054	0.083	0.298
Investment style	*SMB*	-0.011	0.098	-0.414	0.394
	HML	-0.014	0.098	-0.540	0.252
	MOM	0.000	0.164	-0.889	0.649
Culture	*PDI*	0.559	0.216	0.110	1.040
	IDV	0.511	0.236	0.130	0.910
	MAS	0.518	0.202	0.050	0.950
	LTO	0.499	0.219	0.068	1.000
	UAI	0.631	0.244	0.080	1.120
Governance	*ACCOUNTABILITY*	0.674	0.834	-1.662	1.671
	POLSTAB	0.261	0.907	-1.842	1.514
	GOVEFF	1.013	0.816	-0.536	2.430
	REGQ	0.968	0.735	-0.395	1.996
	RULEOFLAW	0.862	0.910	-0.949	2.000
	CORRUPTION	0.856	1.075	-1.088	2.525
Screening	*MC24*	0.022	0.148	0.000	1.000
	MC36	0.356	0.479	0.000	1.000
	5%NC	0.599	0.491	0.000	1.000
	2009	0.164	0.371	0.000	1.000
	2010	0.224	0.417	0.000	1.000
	2011	0.224	0.417	0.000	1.000
	2012	0.218	0.413	0.000	1.000

The following table reports the summary statistics of all independent variables. Column one displays the category and column two the name of each variable, respectively. Column three to six report the mean, standard deviation, minimum and maximum for each variable, respectively.

Table 5.4 Summary statistics of country level independent variables

	Key variables				Economic			Investment styles			Culture					Governance					
	INTEREST	*M2*	*STOCKMARKET*	*MUSLIMPOP*	*CURRENCY*	*INFLATION*	*GOVSPEND*	*SMB*	*HML*	*MOM*	*PDI*	*IDV*	*MAS*	*LTO*	*UAI*	*ACCOUNTABILITY*	*POLSTAB*	*GOVEFF*	*REGQ*	*RULEOFLAW*	*CORRUPTION*
Australia	0.08	0.97	0.00	0.02	0.94	0.03	0.18	-0.03	0.05	0.13	0.36	0.9	0.61	0.21	0.51	1.19	0.75	1.46	1.47	1.45	1.72
Austria	0.04	1.92	0.00	0.05	1.01	0.02	0.19	0.05	0.00	0.08	0.11	0.55	0.79	0.60	0.70	1.19	1.01	1.46	1.27	1.55	1.48
Belgium	0.04	1.33	0.00	0.06	1.01	0.02	0.24	0.03	-0.06	-0.01	0.65	0.75	0.54	0.82	0.94	1.14	0.65	1.30	1.11	1.13	1.18
Brazil	0.44	0.67	0.00	0.00	0.95	0.05	0.21	-0.01	-0.01	0.02	0.69	0.38	0.49	0.44	0.76	0.42	-0.11	-0.09	0.08	-0.17	-0.02
Canada	0.04	1.20	0.00	0.02	0.97	0.02	0.21	-0.05	0.01	-0.11	0.39	0.80	0.52	0.36	0.48	1.17	0.84	1.47	1.39	1.49	1.69
Chile	0.09	0.74	0.00	0.00	0.98	0.04	0.12	0.00	-0.07	0.03	0.63	0.23	0.28	0.31	0.86	0.88	0.42	1.03	1.24	1.07	1.17
China	0.06	1.69	0.00	0.02	0.96	0.04	0.13	0.00	0.04	-0.04	0.80	0.20	0.66	0.87	0.30	-1.36	-0.44	0.11	-0.15	-0.30	-0.47
Colombia	0.13	0.37	0.00	0.00	0.96	0.04	0.16	-0.01	0.06	0.01	0.67	0.13	0.64	0.13	0.80	-0.13	-1.38	-0.05	0.21	-0.33	-0.24
Czech Republic	0.06	0.71	0.00	0.00	0.96	0.03	0.21	-0.04	-0.02	0.05	0.57	0.58	0.57	0.70	0.74	0.83	0.82	0.78	1.01	0.77	0.23
Denmark	0.04	0.81	0.00	0.04	0.98	0.02	0.28	-0.08	-0.01	0.03	0.18	0.74	0.16	0.35	0.23	1.31	0.88	1.84	1.58	1.62	2.06
Egypt	0.12	0.85	0.00	0.95	1.01	0.12	0.11	-0.01	-0.02	-0.05	0.70	0.25	0.45	0.07	0.80	-0.95	-0.68	-0.32	-0.19	-0.14	-0.50
Finland	0.03	1.05	0.00	0.01	1.01	0.02	0.24	0.02	-0.08	0.02	0.33	0.63	0.26	0.38	0.59	1.26	1.19	1.79	1.45	1.62	1.93
France	0.04	1.46	0.00	0.08	1.01	0.02	0.24	0.01	-0.04	-0.03	0.68	0.71	0.43	0.63	0.86	1.03	0.47	1.23	1.04	1.21	1.20
Germany	0.03	1.85	0.00	0.06	1.01	0.02	0.19	-0.03	0.01	-0.11	0.35	0.67	0.66	0.83	0.65	1.12	0.73	1.31	1.29	1.39	1.43
Greece	0.07	1.06	-0.01	0.05	1.01	0.03	0.18	-0.01	0.00	-0.09	0.60	0.35	0.57	0.45	1.12	0.73	0.06	0.47	0.62	0.57	0.00
Hong Kong	0.05	3.15	0.00	0.02	1.00	0.03	0.09	-0.04	0.05	0.02	0.68	0.25	0.57	0.61	0.29	0.41	0.81	1.47	1.59	1.26	1.59
Hungary	0.09	0.62	0.00	0.00	1.00	0.05	0.20	0.02	-0.12	-0.01	0.46	0.80	0.88	0.58	0.82	0.77	0.56	0.58	0.92	0.68	0.31
India	0.11	0.75	0.00	0.14	1.01	0.09	0.11	-0.02	-0.05	0.04	0.77	0.48	0.56	0.51	0.40	0.36	-1.02	0.01	-0.27	0.01	-0.39
Indonesia	0.14	0.39	0.00	0.87	0.99	0.06	0.09	0.12	-0.08	0.07	0.78	0.14	0.46	0.62	0.48	-0.05	-0.78	-0.21	-0.28	-0.53	-0.56
Ireland	0.03	2.07	0.00	0.01	1.01	0.01	0.19	-0.03	-0.05	0.01	0.28	0.70	0.68	0.24	0.35	1.15	0.87	1.20	1.45	1.45	1.42
Israel	0.06	0.92	0.00	0.25	0.96	0.03	0.23	-0.04	0.04	0.05	0.13	0.54	0.47	0.38	0.81	0.53	-1.12	1.09	0.99	0.73	0.63
Italy	0.05	1.37	0.00	0.04	1.01	0.02	0.20	-0.03	-0.03	0.04	0.50	0.76	0.70	0.61	0.75	0.83	0.38	0.29	0.74	0.33	0.13
Japan	0.02	2.21	0.00	0.00	0.93	0.00	0.19	0.05	0.01	-0.03	0.54	0.46	0.95	0.88	0.92	0.83	0.76	1.23	0.91	1.09	1.17
Luxembourg	0.04	5.78	0.00	0.00	1.01	0.02	0.16	0.00	-0.14	0.06	0.40	0.60	0.50	0.64	0.70	1.29	1.20	1.40	1.44	1.50	1.71
Malaysia	0.05	1.31	0.00	0.64	0.97	0.03	0.12	-0.02	0.03	-0.02	1.04	0.26	0.50	0.41	0.36	-0.41	0.06	0.93	0.40	0.41	0.08
Mexico	0.07	0.29	0.00	0.00	1.03	0.04	0.11	0.00	0.03	0.07	0.81	0.30	0.69	0.24	0.82	0.10	-0.61	0.16	0.25	-0.50	-0.26
Morocco	0.12	1.09	0.00	1.00	0.98	0.02	0.18	0.00	0.02	0.05	0.70	0.46	0.53	0.14	0.68	-0.63	-0.38	-0.11	-0.10	-0.19	-0.26
Netherlands	0.03	2.15	0.00	0.06	1.01	0.02	0.27	-0.03	-0.06	0.05	0.38	0.80	0.14	0.67	0.53	1.28	0.76	1.45	1.47	1.49	1.81
New Zealand	0.07	0.92	0.00	0.01	0.97	0.03	0.20	0.06	-0.04	0.04	0.22	0.79	0.58	0.33	0.49	1.28	0.99	1.48	1.52	1.56	1.98
Norway	0.05	0.56	0.00	0.04	0.98	0.02	0.21	-0.06	-0.04	0.02	0.31	0.69	0.08	0.35	0.50	1.34	1.04	1.57	1.22	1.60	1.68
Peru	0.21	0.34	0.00	0.00	0.97	0.03	0.09	0.02	0.01	-0.04	0.64	0.16	0.42	0.25	0.87	0.06	-0.76	-0.27	0.33	-0.56	-0.22
Philippines	0.08	0.61	0.00	0.06	0.97	0.05	0.09	0.06	0.02	-0.03	0.94	0.32	0.64	0.27	0.44	-0.06	-1.36	0.02	-0.12	-0.46	-0.62
Poland	0.06	0.53	0.00	0.00	1.00	0.04	0.18	-0.08	-0.01	0.01	0.68	0.60	0.64	0.38	0.93	0.80	0.74	0.44	0.74	0.48	0.30
Portugal	0.04	1.68	0.00	0.01	1.01	0.02	0.21	-0.04	-0.06	-0.06	0.63	0.27	0.31	0.28	1.04	0.96	0.66	0.85	0.75	0.85	0.85
Russia	0.11	0.47	0.00	0.10	1.02	0.10	0.19	0.01	-0.01	0.05	0.93	0.39	0.36	0.81	0.95	-0.73	-0.75	-0.34	-0.29	-0.69	-0.86

Singapore	0.05	1.26	0.00	0.14	0.96	0.03	0.10	0.01	-0.01	-0.05	0.74	0.2	0.48	0.72	0.08	-0.20	0.99	1.92	1.52	1.38	1.85
South Africa	0.12	0.81	0.00	0.02	1.02	0.07	0.20	-0.01	-0.01	-0.01	0.49	0.65	0.63	0.34	0.49	0.47	0.02	0.38	0.36	0.07	0.11
South Korea	0.06	1.40	0.00	0.00	1.04	0.03	0.15	-0.07	-0.01	0.02	0.6	0.18	0.39	1.00	0.85	0.57	0.33	0.98	0.74	0.81	0.37
Spain	0.04	2.01	0.00	0.02	1.01	0.02	0.20	-0.07	-0.01	0.07	0.57	0.51	0.42	0.48	0.86	0.94	-0.24	0.81	0.97	0.96	0.86
Sweden	0.04	0.91	0.00	0.05	0.98	0.02	0.26	-0.03	0.01	0.07	0.31	0.71	0.05	0.53	0.29	1.32	0.96	1.66	1.41	1.61	1.88
Switzerland	0.03	1.50	0.00	0.05	0.93	0.01	0.11	-0.05	0.00	0.04	0.34	0.68	0.7	0.74	0.58	1.33	1.04	1.63	1.35	1.48	1.77
Thailand	0.07	1.15	0.00	0.06	0.96	0.03	0.13	0.01	-0.03	0.02	0.64	0.2	0.34	0.32	0.64	-0.42	-1.07	0.22	0.17	-0.14	-0.28
Turkey	0.04	0.52	0.00	0.98	1.04	0.08	0.14	-0.04	0.02	-0.01	0.66	0.37	0.45	0.46	0.85	-0.09	-0.76	0.25	0.26	0.07	0.06
UK	0.02	1.68	0.00	0.04	1.03	0.03	0.22	-0.04	-0.02	0.02	0.35	0.89	0.66	0.51	0.35	1.10	0.31	1.32	1.43	1.41	1.35
US	0.05	0.85	0.00	0.01	1.00	0.02	0.16	-0.04	0.03	-0.40	0.4	0.91	0.62	0.26	0.46	0.92	0.40	1.30	1.22	1.33	1.09

The following table reports the mean country-level values for all independent variables. Column one displays the respective country, column two to five report the key independent variables (i.e., interest rate level, level of money supply (M2), stock market return, Muslim population). Column six to eight report the macroeconomic variables (i.e., local currency to USD, inflation, government spending) and column nine to eleven the investment style portfolios (i.e., size, value, momentum). Column twelve to sixteen displays Hofstede's cultural dimensions (i.e., power distance, individualism versus collectivism, masculinity versus femininity, long-term orientation versus short-term orientation, uncertainty avoidance). Finally, column seventeen to twenty two report the values of the governance indicators (i.e., accountability, political stability, governance effectiveness, regulatory quality, rule of law, corruption).

5.4 Research design

The main purpose of this study is to analyse the determinants of Islamic index performance. Hence, we create a research design that allows us to explore the cross-sectional differences between the annual risk-adjusted performance of Islamic indices and relevant country-level variables. Similar research designs have been applied in several contexts, most notably on mutual funds. For instance, Ferreira et al. (2012) study the determinants of an international set of mutual funds from 27 countries by regressing the Carhart (1997) alpha on a set of fund characteristics and country level economic variables. Renneboog et al. (2008) use variables related to screening activity, fund characteristics and investment style to determine the risk-adjusted performance of socially responsible investment funds in 17 countries. In a related context, Ioannou and Serafeim (2012) examine whether drivers of corporate social performance (CSP) is determined by country factors related to the economic, cultural and legal environment.[24]

As the focus is on Islamic index risk-adjusted performance and not excess returns (relative market benchmark), we adjusted the research design to an annual setting, where the Jensen's alpha of each Islamic index is estimated using weekly return data and then annualised, and further regressed on annualised (or fixed) explanatory

[24] There is no universal definition of corporate social performance. In the context of (Ioannou & Serafeim (2012) it is measured by the score of environmental, social and governance dimensions.

variables. In order to make the analysis robust to potentially time-varying effects, this process is repeated for each year in the sample.[25] To explore whether the explanatory variables significantly determine the risk-adjusted performance, we perform bivariate and multivariate regressions. The regressions are performed using the ordinary least squares (OLS) method with White (1980) heteroscedasticity-consistent standard errors.

5.5 Results

5.5.1 Bivariate regression results

The results of the bivariate regressions are displayed in Table 5.5 We can observe that the INTEREST coefficient is significant and negative, which implies that a high (low) interest rate environment harms (enhances) Islamic index risk-adjusted performance. Furthermore, the results imply that the level of the money supply is positively correlated with the performance. Money supply (M2) is positive and significant at the 1% level, although the economic significance is marginal (0.0004). The stock market environment (STOCKMARKET) has a significant negative impact on Islamic index performance. Furthermore, while we can observe a positive relationship between Islamic index performance and the level of Muslim population (MUSLIMPOP), the coefficient is statistically insignificant.

[25] An alternative approach to analyse the determinants of risk-adjusted performance in a time-varying setting would be to run rolling regressions. For instance, Ferreira et al. (2012) estimate a four factor alpha every quarter, based on the past 36 months return history.

Focusing on the economic control variables, the rate of the local currency relative the USD (CURRENCY) does not seem to impact performance, as the coefficient is insignificant across all estimations. The level of inflation (INFLATION) however is negative and statistically significant, and the government spending relative GDP (GOVSPEND) a positive impact on Islamic index performance. As for the investment style variables, the results suggest that the size factor (SMB) is negative and significant. In contrast, the value factor (HML) and the momentum factor (MOM) do not seem to influence Islamic index performance.

When controlling for the cultural environment, the power distance (PDI) and individualism (IDV) dimensions show a statistically significant relationship, where the PDI is negative and IDV positive. In contrast, all other cultural variables (i.e., masculinity versus femininity (MAS), long-term orientation versus short-term orientation (LTO), uncertainty avoidance (UAI)) do not seem to determine the risk-adjusted performance. Interestingly, we can observe that the coefficients for all governance indicator variables (i.e., voice and accountability (ACCOUNTABILITY), political stability and absence of violence (POLSTAB), government effectiveness (GOVEFF), regulatory quality (REGQ), rule of law (RULEOFLAW), control of corruption (CORRUPTION)) are statistically significant and have a positive impact on Islamic index performance across all three estimations. As for the screening characteristics, it seems that the 5% non-compliant screen has a negative impact on Islamic index performance.

Table 5.5 Bivariate regression results

CATEGORY	VARIABLE	Dependent variable: ALPHA		Dependent variable: TSTAT	
Key independent variables	*INTEREST*	-0.0038***	*-5.161*	-2.1284***	*-4.286*
	M2	0.0004***	*3.603*	0.1908***	*3.293*
	STOCKMARKET	-0.0307***	*-2.585*	-23.5781***	*-4.173*
	MUSLIMPOP	0.0000	*-0.105*	0.0477	*0.265*
Economic	*CURRENCY*	0.0006	*0.597*	0.2449	*0.396*
	INFLATION	-0.0063*	*-1.952*	-3.1883*	*-1.698*
	GOVSPEND	0.0040***	*2.934*	1.5917*	*1.766*
Investment style	*SMB*	-0.0023**	*-2.138*	-1.1669**	*-2.324*
	HML	0.0003	*0.280*	0.3435	*0.647*
	MOM	0.0002	*0.488*	0.3758	*1.054*
Culture	*PDI*	-0.0009**	*-2.420*	-0.3508	*-1.469*
	IDV	0.0011***	*3.440*	0.4316**	*1.997*
	MAS	0.0002	*0.538*	0.0664	*0.266*
	LTO	0.0004	*1.099*	0.5824	*2.493*
	UAI	0.0003	*0.947*	0.1711	*0.818*
Governance	*ACCOUNTABILITY*	0.0003***	*2.755*	0.1140*	*1.845*
	POLSTAB	0.0002**	*2.541*	0.1180**	*2.205*
	GOVEFF	0.0003***	*2.672*	0.1530**	*2.495*
	REGQ	0.0003***	*3.120*	0.1661**	*2.391*
	RULEOFLAW	0.0003***	*3.127*	0.1369**	*2.435*
	CORRUPTION	0.0002**	*2.572*	0.1080**	*2.266*
Screening characteristics	*MC24*	0.0001	*0.495*	0.0416	*0.130*
	MC36	0.0002	*1.330*	0.2709***	*2.616*
	5%NC	-0.0004**	*-2.468*	-0.2829***	*-2.810*
Yearly dummies	2009	0.0002	*0.897*	0.2823**	*2.211*
	2010	0.0000	*-0.131*	-0.1377	*-1.119*
	2011	0.0002	*1.280*	0.2261**	*2.020*
	2012	-0.0005**	*-2.129*	-0.5439***	*-4.103*

The following table reports the results of the bivariate regressions. The dependent variables are (1) the Jensen's Alpha *(ALPHA)* (2) the Jensen's alpha t-statistic *(TSTAT).* Key independent variables include the official lending rate *(INTEREST),* the level of money supply *(M2),* the return of the overall stock market *(STOCKMARKET)* and the level of Muslim population *(MUSLIMPOP).* Economic variables include the exchange rate of the local currency relative the USD *(CURRENCY),* the inflation rate proxied by the consumer price index *(INFLATION)* and the level of government spending relative the GDP *(GOVSPEND).* Investment style variables include size *(SMB),* Value *(HML)* and momentum *(MOM).* Cultural variables include the power distance *(PDI),* individualism versus collectivism *(IDV),* masculinity versus femininity *(MAS),* long-term orientation versus short-term orientation *(LTO)* and uncertainty avoidance (*UAI*). Governance indicators include accountability *(ACCOUNTABILITY),* political stability *(POLSTAB),* government effectiveness *(GOVEFF),* regulatory quality (*REGQ*), rule of law (*RULEOFLAW*) and the level of corruption (*CORRUPTION*). Screening characteristics include a dummy variable for 24 months market capitalization based financial screens (*MC24*), 36 months market capitalization based financial screens (*MC36*) and a dummy variable for the 5% non-compliant income screen *(5%NC*). Finally, annual dummies include dummy variables for each year of the sample (2008 left out to avoid the dummy trap). ***, ** and * represent the 1%, 5% and 10% significance level, respectively. T-statistics are reported in italics.

5.5.2 Multivariate regression results

The results of the multivariate regressions are reported in Panel A and Panel B of Table 5.6. The first estimation includes the key independent variables with no country fixed effects. The results indicate that the interest rate environment (INTEREST) is negatively and significantly related to Islamic index performance. Following the reasoning in the research question section, this relationship could stem from Islamic indices' exclusion of firms relying on interest as a source of income or firms in the financial services sector. Fundamentally, these two groups could, ceteris paribus, enjoy relatively better earnings in high interest rate environments. It can further be observed that the level of the money supply (M2) exhibits a positive relationship and the overall stock market environment (STOCKMARKET) a negative relationship. In contrast, there is no indication that the level of the Muslim population influences the performance. With a factor loading of 0.0291, changes in the stock market environment appear to influence performance significantly more than the interest rate environment (0.0026) and the level of money supply (0.0003). The coefficients of the INTEREST, M2 and STOCKMARKET, are statistically significant which suggest the results are robust. However, with an adjusted r-squared value of less than 0.05, it should be noted that the explanatory power of the model is marginal. Including additional explanatory variables and accounting for fixed effects should, however, result in a higher explanatory power.

When controls for country specific factors are included (i.e., estimation 2), three interesting observations can be made. First, the statistically significant relationship

between performance and the interest rate environment (INTEREST) disappears and the factor loading of the coefficient moves from negative to positive. Second, there is a decrease in statistical significance between Islamic index performance and the money supply (M2) and the overall stock market environment (STOCKMARKET), respectively. Both variables are now statistically significant at the 10% level compared to a 5% level in estimation 1. Third, with an adjusted r-squared of 0.0944, it can be observed that including controls for country factors lead to a substantial increase in explanatory power.

Following the results of the third estimation, it can be observed that when the group of economic variables (i.e., CURRENCY, INFLATION, GOVSPEND) is added to the model, the relationship between the degree of Muslim population and Islamic index performance turns statistically significant and positive. This relationship implies that a higher demand for Shari'ah-compliant stocks, given a larger pool of Muslim investors, could benefit Islamic indices. Neither the exchange rate nor the level of inflation seems to exhibit any association with Islamic index performance. These coefficients are statistically insignificant in both estimations. The level government spending, on the other hand, appears to be positively related to performance. The results stay fairly consistent when adding the set of investment style variables (i.e., estimation 4). The relationship between performance and the interest rate environment remains insignificant, while the statistically significant impact of the money supply environment, the stock market environment and government spending stay about the

same. The results of this estimation suggest that neither size, value not momentum investment styles influence the risk-adjusted performance of Islamic indices.

As can be seen in estimation 5, adding the influence of cultural dimensions (i.e., PDI, IDV, MAS, LTO, UAI) substantially impact the results recorded in the previous estimations. That is, the coefficients of M2, STOCKMARKET, MUSLIMPOP and GOVSPEND are no longer statistically significant. In contrast, there is now a statistically significant and positive relationship between Islamic index performance and the interest rate environment. This observation is in stark contrast to what was recorded earlier, where the INTEREST coefficient was negative. The results further suggest that the cultural context exhibits no association with Islamic index performance. Furthermore, there is no evidence that any governance dimensions (i.e., ACCOUNTABILITY, POLSTAB, GOVEFF, REGQ, RULEOFLAW, CORRUPTION) are significant determinants of Islamic index performance. When these variables are added to the regression (i.e., estimation 6), it can also be observed that IDV coefficient turns positive and statistically significant (at the 10% level). This implies that the performance of Islamic indices could perform better relative benchmarks in countries with individualistic values.

Following the results of estimation 7, it appears that Shari'ah screening can be a relevant determinant of performance. There is a positive and significant relationship (at the 1% level) between risk-adjusted performance and accounting based ratios that are using a 36 months trailing market capitalization as a divisor (MC36), while the

non-compliant income screen (5%NC) has a negative impact (significant at the 5% level). These results suggest that the choice of Shari'ah screening norms does influence performance, although the impact appears marginal. Next, it can also be seen that when the screening variables are added, the INTEREST and GOVEFF coefficients become statistically significant at the 5% and 10% level, respectively, while IDV turns insignificant. Finally, including variables related to country governance result in an increase in adjusted r-squared value to 0.1458.

In the final estimation, yearly dummy variables are added to the model in order to determine the impact over time. To avoid a dummy variable trap, the first year (i.e., 2008) is excluded. The coefficients of these variables are all positive, suggesting that Islamic indices enjoyed higher risk-adjusted returns during this period compared to the first year of the sample. Interestingly, the coefficient for 2009 is much larger than the other years. This could, arguably, be due to the financial turmoil in that year, resulting in relatively higher performance for Islamic indices. Adding the annual dummy variables cause the STOCKMARKET coefficient to increase considerably from 0.0142 to 0.0919. With other variables staying approximately the same, this is likely due to a high correlation between the STOCKMARKET and the annual dummies, as the financial crisis correlates highly with the annual dummies.

Table 5.6 Multivariate regression results

		PANEL A							
CATEGORY	VARIABLE	(1)		(2)		(3)		(4)	
Key independent variables	*INTEREST*	-0.0026***	*-3.381*	0.0044	*0.749*	0.0080	*1.279*	0.0092	*1.459*
	M2	0.0003**	*2.417*	0.0012*	*1.960*	0.0012*	*1.945*	0.0012*	*1.935*
	STOCKMARKET	-0.0291**	*-2.444*	-0.0224*	*-1.858*	-0.0208*	*-1.637*	-0.0222*	*-1.724*
	MUSLIMPOP	0.0002	*0.652*	0.0010	*1.471*	0.0015*	*1.904*	0.0016*	*1.894*
Economic variables	*CURRENCY*					-0.0002	*-0.248*	-0.0003	*-0.300*
	INFLATION					-0.0042	*-0.661*	-0.0046	*-0.725*
	GOVSPEND					0.0064*	*1.959*	0.0068*	*1.858*
Investment style variables	*SMB*							-0.0012	*-0.889*
	HML							-0.0005	*-0.388*
	MOM							-0.0004	*-0.698*
	Country effects	No		Yes		Yes		Yes	
	Constant	-0.0002		-0.0016	*-2.119*	-0.0026*	*-1.845*	-0.0028*	*-1.909*
	Adjusted r-squared	0.0372		0.0944		0.0962		0.0943	

The following table reports the results of the multivariate regressions, including the first, second and third category independent variables. Explanation of variables: the official lending rate (INTEREST), the level of money supply (M2), the return of the overall stock market (STOCKMARKET) and the level of Muslim population (MUSLIMPOP), local currency relative the USD (CURRENCY), the inflation rate proxied by the consumer price index (INFLATION) and the level of government spending relative the GDP (GOVSPEND), size (SMB), value (HML) and momentum (MOM),). ***, ** and * represent the 1%, 5% and 10% significance level, respectively. T-statistics are reported in italics

		PANEL B							
CATEGORY	VARIABLE	(5)		(6)		(7)		(8)	
Key independent variables	*INTEREST*	0.0156***	*2.592*	0.0169*	*2.689*	0.0142**	*2.221*	0.0215***	*3.193*
	M2	0.0009	*0.715*	0.0009	*0.692*	0.0010	*0.831*	0.0003	*0.204*
	STOCKMARKET	-0.0149	*-1.074*	-0.0124	*-0.912*	-0.0102	*-0.753*	-0.0919***	*-2.712*
	MUSLIMPOP	0.0012	*0.400*	-0.0009	*-0.249*	0.0000	*0.002*	-0.0024	*-0.597*
Economic variables	*CURRENCY*	-0.0004	*-0.396*	-0.0005	*-0.419*	-0.0002	*-0.140*	0.0003	*0.244*
	INFLATION	-0.0057	*-0.898*	-0.0063	*-0.989*	-0.0083	*-1.319*	-0.0125	*-1.569*
	GOVSPEND	-0.0014	*-0.192*	0.0014	*0.174*	0.0028	*0.361*	-0.0027	*-0.320*
Investment style variables	*SMB*	-0.0012	*-0.888*	-0.0015	*-1.096*	-0.0016	*-1.184*	-0.0020	*-1.433*
	HML	-0.0006	*-0.485*	-0.0004	*-0.337*	-0.0006	*-0.473*	-0.0001	*-0.094*
	MOM	0.0001	*0.190*	0.0001	*0.106*	0.0001	*0.185*	-0.0003	*-0.495*
Cultural variables	*PDI*	0.0032	*0.161*	0.0189	*0.667*	0.0112	*0.395*	0.0383	*1.317*
	IDV	0.0068	*0.918*	0.0169*	*1.659*	0.0134	*1.349*	0.0216*	*1.825*
	MAS	-0.0030	*-1.082*	-0.0056	*-1.546*	-0.0048	*-1.364*	-0.0067*	*-1.661*
	LTO	0.0033	*0.418*	0.0110	*1.119*	0.0075	*0.768*	0.0172	*1.547*
	UAI	0.0034	*0.864*	0.0033	*0.424*	0.0048	*0.619*	-0.0015	*-0.202*
Governance variables	*ACCOUNTABILITY*			-0.0012	*-0.485*	-0.0011	*-0.468*	-0.0007	*-0.276*
	POLSTAB			0.0008	*0.777*	0.0008	*0.729*	0.0012	*1.232*
	GOVEFF			0.0025	*1.548*	0.0027*	*1.694*	0.0028*	*1.750*
	REGQ			-0.0011	*-0.676*	-0.0012	*-0.706*	-0.0017	*-1.061*
	RULEOFLAW			-0.0016	*-0.949*	-0.0013	*-0.780*	-0.0017	*-1.045*
	CORRUPTION			-0.0006	*-0.524*	-0.0009	*-0.731*	-0.0009	*-0.750*
Screening variables	*MC24*					-0.0003	*-0.968*	-0.0003	*-1.180*
	MC36					0.0007***	*3.337*	0.0007***	*3.378*
	5%NC					-0.0009***	*-4.476*	-0.0009***	*-4.476*
Yearly variables	2009							0.0024***	*2.861*
	2010							0.0017***	*2.454*
	2011							0.0016***	*2.892*
	2012							0.0017***	*2.290*
	Country effects	Yes		Yes		Yes		Yes	
	Constant	-0.0087	*-0.657*	-0.0229	*-1.375*	-0.0177	*-1.072*	-0.0346*	*-1.913*
	Adjusted r-squared	0.1162		0.1176		0.1458		0.1654	

The following table reports the results of the multivariate regressions, including the fourth, fifth, sixth and seventh category independent variables. Explanation of variables: the official lending rate (INTEREST), the level of money supply (M2), the return of the overall stock market (STOCKMARKET) and the level of Muslim population (MUSLIMPOP), local currency relative the USD (CURRENCY), the inflation rate proxied by the consumer price index (INFLATION) and the level of government spending relative the GDP (GOVSPEND), size (SMB), value (HML) and momentum (MOM), power distance (PDI), individualism versus collectivism (IDV), masculinity versus femininity (MAS), long-term orientation versus short-term orientation (LTO) and uncertainty avoidance (UAI), power distance (PDI), individualism versus collectivism (IDV), masculinity versus femininity (MAS), long-term orientation versus short-term orientation (LTO) and uncertainty avoidance (UAI), dummy variable for 24 months market capitalization based financial screens (MC24), 36 months market capitalization based financial screens and a dummy variable for the 5% non-compliant income screen (5%NC). ***, ** and * represent the 1%, 5% and 10% significance level, respectively. T-statistics are reported in italics

5.6 Concluding remarks

This chapter has offered a modest attempt to explore the determinants of Islamic index performance. Specifically, it has been considered whether the risk-adjusted performance of national Islamic indices can be significantly related to country-level factors which proxies for the cultural, economic, governance and religious environment. Furthermore, the chapter has also considered whether the different *Shari'ah* screening norms adopted by index providers have a diverse impact on the risk-adjusted performance of these indices. The results of this analysis can be considered an important contribution, as past work has been concerned primarily with the relative performance.

The results of the cross-sectional regression analysis suggest that Islamic index performance is negatively related to the overall stock market environment. This implies that the risk-adjusted returns of these indices appear to increase when the overall stock market performs poorly, and vice versa. It was posited that this relationship is due to Islamic indices' underinvestment in high leveraged stocks. That is, Islamic indices to be more risk averse in market downturns while in market upswings these indices will lag behind the market due to a smaller leverage effect.

The results also suggest that other country factors level factors determine Islamic index performance, although these appears to be less economically relevant. Specifically, a high (low) money supply environment has a (negative) impact on risk-adjust returns, which also is the case for the degree of the Muslim population. The latter is in line with previous findings on the cross-country performance of Islamic mutual funds (Hoepner et al., 2011). In contrast, neither the cultural nor the governance environment seems to be relevant in explaining Islamic index performance. Concerning the *Shari'ah* screening norms, we find accounting screens following a market capitalization based rulebook to impact performance positively, while the opposite is true for screens using a total assets based rulebook.

It should be noted that the research presented in this chapter is subject to several limitations. First, while it can be argued that the scope of the data sample is comprehensive (i.e., 128 Islamic indices across 46 markets), it only covers the period 2008 to 2012. This is because historical return data for country level Islamic indices prior to 2008 is limited, and reliable macroeconomic data for the year 2013 was not released until recently. Given the short time horizon, it is, therefore, fair to assume that the results of the analysis have been heavily influenced by the events surrounding the major credit crisis in 2008-2009.

Second, as discussed earlier in the chapter, one issue of using an estimated dependent variable is the additional disturbance caused by a potential measurement error. Finally,

although this chapter has considered several explanatory variables typically discussed in the asset pricing and the cross-country performance literature, there are still many potentially relevant factors that have not been considered. The main reasons for this are the challenging task of obtaining country level data that is complete and consistent across such a diverse range of countries.

Chapter 6

THE FINANCIAL IMPACT OF *SHARI'AH*-BASED ACCOUNTING SCREENS

Abstract

One of the fundamental pillars of Islamic finance is the prohibition of *riba*, which implies that business transactions must be free from the collection or payment of interest. Islamic equity investing, therefore, utilizes accounting-based screening to identify firms subject to non-permissible financial characteristics, such as excessive use of financial leverage and income generated from interest. The extent to which these screens impact financial performance remains one of the central empirical questions in the Islamic finance literature. This chapter examines the return and risk characteristics of a large set of *Shari'ah*-based accounting screens in isolation from each other, hence contributing with new empirical evidence to the literature. The results suggest that several screens have generated significant risk-adjusted returns. However, this is true only for screens based on market capitalization, and primarily in periods of market turmoil.

6.1 Introduction

One of the fundamental pillars of Islamic finance is the prohibition of *riba*, which implies that business transactions must be free from the collection or payment of interest (El-Gamal, 2006). Islamic equity investing, therefore, utilizes accounting-based screening to identify firms subject to non-permissible financial characteristics. This process, typically comprised by four accounting ratios, investigates the characteristics of firms concerning *debt*, *liquidity*, *interest income* and *income from non-permissible business activities*. Firms that do not fulfil the predetermined acceptance levels are not considered eligible to invest in, and hence excluded from the asset universe. Financial institutions across the industry adopt different *Shari'ah* screening norms resulting in the use of different ratios to define *Shari'ah*-compliant asset universes. Here, the most dominant difference is the use of either market capitalization or total assets to define firm value, which is used in the denominator in the different ratios. Furthermore, threshold levels (i.e., maximum acceptance level) in these ratios differ significantly

Whether the accounting based screening process has an impact on performance is perhaps the central empirical questions in the Islamic equity investing literature. To address this issue, one literature stream has compared the performance of Islamic investment vehicles, such as mutual funds and equity indices, relative unconstrained

market benchmarks, where the difference in performance captures the potential screening impact. Although this research approach is useful to determine the effectiveness of Islamic investment principles, it is subject to some limitations. First, since the universe constituting these investment vehicles effectively is the results of multiple financial screens, it is only possible to measure the *collective* screening impact. Furthermore, the performance difference between Islamic portfolios and market benchmarks may also be driven by the business activity screening.[26] Recent attempts to overcome this issue include comparing performance of Islamic indices subject to different screening norms (Ashraf, 2014; Lobe et al., 2012) and to construct hypothetical portfolios of different screens (Derigs & Marzban, 2009; Marzban & Asutay, 2012). Nevertheless, there is still no evidence of individual screens.

This chapter seeks to address these limitations by studying the financial impact accounting-based screens in isolation from each other. Making use of a wide range of accounting data, we construct hypothetical equity portfolios that correspond to rules of each financial screen, respectively. Apart from analysing the performance of all screens, the research design setting also allow us to examine whether the recorded differences in screening methodology, such as the choice of divisor in the financial ratios and different threshold levels have an impact on financial performance.

[26] The business activity screening is the other half the *Shari'ah* screening process, and is concerned with excluding firms that are involved

The findings of this chapter contribute extensively to Islamic equity performance literature. First, we find that many of the accounting screens used by Islamic investors result in significant abnormal returns. This is the case for all three screening categories considered in this study (i.e., debt, liquidity, interest income). The economic significance for many of these appears substantial. Second, the performance impact of the screens is largely determined by the choice of divisor. In many cases, screens based on market capitalization result in abnormal returns while screens based on total assets do not perform statistically different from zero. Third, some evidence suggests that more stringent screen (i.e., lower threshold levels) result in a greater outperformance. This suggests that a positive relationship between the level of *Shari'ah* compliance and financial performance. Fourth, the findings also suggest that the performance impact of accounting screens depend highly on industry characteristics. For instance, we find total assets based debt screens to result in an outperformance in sectors characterized by high levels of tangible assets.

The remaining parts of this chapter are structured as follows. Section 6.2 provides a background to the study. Characterises of accounting screens are discussed as well theories that can be related to the accounting screens. Section 6.3 gives a detailed outline of the research objectives and academic and practical relevance. 6.4 is concerned with describing the data and portfolio construction while 6.5 shows the analysis and results. Finally, in 6.6 are the conclusions.

6.2 Capital structure theory

The accounting based screening employed in Islamic equity investing result in portfolios that hold firms of which capital structure are tilted towards equity rather than debt. The role of capital structure has been extensively discussed in the corporate finance literature, and traces back to Modigliani & Miller (1958) (MM) and their *irrelevance proposition*. MM argue that firm value is independent of its capital structure, whereby the level of debt is irrelevant. A key concept shaping their proposition is the one of arbitrage. Specifically, it is argued that since investors can leverage themselves in an identical way and without any additional cost, the capital structure of the firm should not impact firm value (Fama, 1978). An important aspect of the irrelevance proposition is the different assumptions it is based upon. For instance, it assumes there is a perfect substitution of financing types, no bankruptcy costs, transaction costs, corporate taxes and all firms carry an equal risk. Naturally, much criticism has been pointed towards these assumptions, as they are unlikely to be true in the real world. For instance, firms with high amounts of fixed assets are likely to receive better credit rating and hence lower borrowing rate.

In a subsequent paper, Modigliani & Miller (1963) presented a correction of their earlier paper with the motivation to "…increase somewhat the estimate of the tax advantages of debt financing under our model and consequently to reduce somewhat the quantitative difference between the estimates of the effects of leverage under out

model and under the naïve traditional view" (Modigliani & Miller 1963, p.442). Here, they argue that the optimal capital structure is achieved through the highest possible leverage as it will create a greater tax shield (i.e., reduction of corporate taxes from tax-deductible income). According to this view, total firm value would equal the value of the unleveraged firm value plus the benefits of the tax shield. This view was heavily critiqued by Miller (1977) who argued that in order to increase leverage additional bondholders will require higher interest rates, which will even any potential benefit of the tax shield.

A second influential theory related to capital structure is the agency problem theory. The theory is concerned with describing the conflicting interest between corporate managers and owners. The free cash flow agency problem (Jensen 1986) suggests that in firms with substantial amounts of free cash flow, managers are more likely to invest in projects with less favourable net present value (NPV) to increase their personal compensation. Such activities would generate less return for the shareholders. Jensen (1986) argues that by increasing the financial leverage and hence reducing the free cash flow, managers are more limited to invest in projects with less favourable NPV. This agency problem hence states that leveraged firms are more successful as a result of managers being more efficient.

From a *Shari'ah* perspective, assets should be in illiquid form whereby Islamic investors are prohibited from investing in stocks with excess liquidity. In this context,

liquidity can be defined as the ability to convert assets into cash or cash equivalents. This typically includes account receivables, cash and short-term investments. Fundamentally, liquidity is necessary to firms in order meet short-term financial obligations. Firms also maintain liquid assets for speculative purposes (i.e., profitable future investment opportunities) as well as a protection against future contingencies (Kim 1998). One could, therefore, argue that from this perspective, Islamic investors should be punished financially for holding low-liquidity stocks as a result of short-term risk. However, one of the main drawbacks of liquid assets is the low profitability. The low risk associated with holding liquid assets is likely to yield lower return compared to invest in illiquid assets with higher risk.

This relationship has been extensively studied in recent years and is subject to some contradicting views. Following Jensen (1986) and the free cash flow argument, firms should hold zero liquid assets to avoid managers investing in negative net present value projects instead of paying it out to shareholders. Similarly, the fact that liquid assets always are available at a fair price implies that the optimal strategy would be zero liquidity. However, market imperfections suggest that firms should hold excess liquidity. This is particularly true when external funding is costly. In contrast, pecking order theory (Myers & Majluf 1984) suggest that firms should hold liquid assets so that future investment opportunities could be financed with internal funds. (Kim 1998) argues that the optimal level of liquidity is positively correlated with the cost of

external financing. According to this argument, fewer liquid firms should perform relatively worse in times of costly external financing.

6.3 Data

6.3.1 Asset universe, financial returns and accounting data

The dataset used in this study is utilized as follows. First, we obtain the annual constituents list of the FTSE All-World Index between 2002 and 2013. This index has several attractive features. First, as one of the leading stock market indices, it represents a practically relevant universe of stocks across a large number of developed and emerging market countries.. In total this represents approximately 5400 firms. Second, we follow the procedure of most index providers and exclude all stocks involved with unethical business activities. The rationale here is that we want to capture the accurate performance of the different financial screens. Here, we use the list of unethical firms presented in Chapter 2 (Table 2.1). Specifically, we exclude from the constituents list firms with the following Industry Classification Benchmark (ICB) codes: Advertising & Media, Alcohol (3533, 3535), Financials (8000), Media (5500), Gambling (5752), Hotels (5753), Tobacco (3785) and Defence (2717). Firms involved with adult entertainment and pork-related products are identified using the S&P Capital IQ platform[27]. After this step is performed, we are left with approximately 3400 firms.

[27] Specifically, we search for relevant keywords in the business description

Third, from Thomson Reuters Datastream we obtain total return data (i.e., dividends re-invested) for all remaining constituents from January 2002 to December 2013. The data is then transformed into continuously compounded returns. To avoid a possible survivorship bias (Brown, Goetzmann, Ibbotson, & Ross, 1992), all stocks are included up until the point that they die. Fourth, for all remaining constituents we also obtain accounting data necessary to construct portfolios that correspond to the financial ratios. Specifically, this includes account receivables, cash, interest income, market capitalization, short-term investments, total assets, total debt and total revenue. Constituents with incomplete observations are excluded.

Based on the accounting data contained in the dataset outlined previously, we form value-weighted portfolios of constituents which corresponds to the inclusion criterion of each screen, respectively. The exact definitions of these criteria are reported in Table 6.1. From this table, it can be observed that the portfolios are not mutually exclusive. To ensure practical relevance, we follow major providers of Islamic indices and repeat this process annually at the beginning of each year throughout the period of the sample. In total, there are 25 equity portfolios, which proxies for the characteristics of 7 debt screens, 11 liquidity screens and 7 interest screens.

Table 6.1 Portfolio definition

Portfolio	Description of inclusion criteria
Debt screens	
TD / TA < 30%	total $debt_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 30%
TD / TA < 33%	total $debt_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 33%
TD / TA <33,33	total $debt_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 33,33%
TD / TA <37%	total $debt_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 37%
TD / MC < 30%	total $debt_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 30%
TD / MC < 33%	total $debt_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 33%
TD / TA&MC <33%	total $debt_{(i,t)}$ / total $assets_{(i,t)}$ & market $capitalization_{(i,t)}$ must be less than 33%
Liquidity screens	
AR / TA <33%	account $receivables_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 33%
AR / TA <45%	account $receivables_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 45%
AR+C/TA<50%	account $receivables_{(i,t)}$ plus $cash_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 50%
AR+C/TA<70%	account $receivables_{(i,t)}$ plus $cash_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 70%
AR+C+SI/TA<67%	account $receivables_{(i,t)}$ plus $cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 67%
AR+C+SI/TA<90%	account $receivables_{(i,t)}$ plus $cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 90%
AR/MC<30%	account $receivables_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 30%
AR/MC<33%	account $receivables_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 33%
AR/MC<45%	account $receivables_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 45%
AR/MC<49%	account $receivables_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 49%
AR+C+SI/MC<70%	account $receivables_{(i,t)}$ plus $cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 70%
Interest screens	
CSI/TA<30%	$cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 30%
CSI/TA<33%	$cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / total $assets_{(i,t)}$ must be less than 33%
CSI/MC<30%	$cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 30%
CSI/MC<33%	$cash_{(i,t)}$ plus short-term $investments_{(i,t)}$ / market $capitalization_{(i,t)}$ must be less than 33%
Int income/Rev<3%	total interest $income_{(i,t)}$ / total $revenue_{(i,t)}$ must be less than 3%
Int income/Rev<5%	total interest $income_{(i,t)}$ / total $revenue_{(i,t)}$ must be less than 5%
Int income/Rev<10%	total interest $income_{(i,t)}$ / total $revenue_{(i,t)}$ must be less than 10%

The following table reports the inclsuiion criteria of each screen, respectively. AC= Account receivables, C= Cash, CSI= Cash plus short-term investments, D= Deposits, FD= Financial debt, IBD= Interest bearing debt, IBI= Interest bearing investments, ID= Interest bearing deposits, II= Interest income, MC= Market capitalization, NCI= Non-compliant investments, OE= Owners Equity, TA= Total assets, TD= Total debt.

6.4 Analysis & Results

6.4.1 Descriptive statistics

The descriptive statistics of the 25 hypothetical portfolios are presented in Table 6.2 and present a number of interesting observations. First, the average number of firms differ substantially across the portfolios. For instance, the smallest debt portfolio contains 799 firms while the largest has an average of 1264 firms. This clearly illustrates the diverse stringency of the different screens, and it is likely to assume that it will impact return and risk. The debt screens are more stringent than both the liquidity and interest screens. In fact, some portfolios are almost identical to the market benchmark in terms of size. This implies that some accounting ratios used in the industry have little or no impact. Second, mean excess returns above the market can be observed for all screening types (i.e., debt, liquidity, interest income), although this is true only for the market capitalization based ratios. This suggests that market capitalization based ratios generate higher mean returns compared to their total assets based counterparts.[28] This is in direct contrast to Ashraf (2014, p. 7) who finds that "in terms of *Shari'ah* screening criteria based on return, it is evident that indices that use trailing market value of equity […] as a divisor for financial ratio calculation perform worse than that of [indices] using total assets as a divisor". This is puzzling, note least as Ashraf's study cover approximately the same period (i.e., 2000-2012). Arguably,

[28] For instance, the difference in monthly mean excess return between two debt screens is as large as 0.0027% (or 3.24% per annum).

this illustrates the point made earlier in the chapter, that is can be problematic to draw conclusions regarding specific *Shari'ah* screens based on existing Islamic indices.

Third, it seems that the threshold level only has a marginal impact on returns. For instance, the 7% difference in threshold levels between the laxest and most stringent total asset based ratios is only one basis point. The kurtosis and skewness estimate suggests that total assets based ratios deviate more from the normal distribution compared to the market capitalization based ratios, although this difference appears to be marginal. Finally, in addition to the descriptive statistics, Table 6.2 also presents the results of two common ratios commonly used to rank the reward-to-risk characterises of investment portfolios. These are the *Sharpe ratio* (defined as the portfolio excess return divided by the portfolio's standard deviation) and the *Treynor ratio* (defined as the portfolio excess return divided by the portfolio's systematic risk). Hence, the basic interpretation of these ratios is that the higher the ratio, the better risk-to-reward characteristic of the portfolio. It can be observed that all but two portfolios exhibit lower than benchmark Sharpe ratios. This implies that, when risk is defined by total volatility, *Shari'ah* screening result in somewhat better risk-adjusted performance. When the systematic risk is accounted for (i.e., the Treynor ratio), the number of portfolios with reward-to-risk characteristics below the market decreases from 25 to 15.

Table 6.2 Descriptive statistics

Portfolio	Descriptive Statistics									Ratio analysis	
	N firms	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Beta	Sharpe	Treynor
Debt screens											
TD / TA < 30%	1035	0.0100	0.0159	0.1405	-0.2460	0.0517	-1.0952	6.9750	1.0075	0.1927	0.0099
TD / TA < 33%	1141	0.0099	0.0152	0.1425	-0.2485	0.0522	-1.0983	7.0155	1.0133	0.1903	0.0098
TD / TA <33,33	1150	0.0099	0.0154	0.1434	-0.2487	0.0523	-1.0923	7.0084	1.0138	0.1896	0.0098
TD / TA <37%	1264	0.0099	0.0158	0.1468	-0.2487	0.0524	-1.0726	6.9651	1.0075	0.1883	0.0098
TD / MC < 30%	830	0.0126	0.0176	0.1300	-0.2118	0.0473	-0.9572	6.2734	0.9236	0.2670	0.0137
TD / MC < 33%	876	0.0126	0.0176	0.1311	-0.2144	0.0476	-0.9673	6.3292	0.9302	0.2637	0.0135
TD / TA&MC <33%	799	0.0113	0.0165	0.1534	-0.2322	0.0504	-0.9378	6.6394	0.9500	0.2247	0.0119
Liquidity screens											
AR / TA <33%	1586	0.0095	0.0153	0.1607	-0.2573	0.0532	-1.0734	7.2437	0.9931	0.1783	0.0096
AR / TA <45%	1652	0.0095	0.0151	0.1614	-0.2578	0.0535	-1.0640	7.1983	0.9983	0.1769	0.0095
AR+C/TA<50%	1599	0.0094	0.0151	0.1613	-0.2585	0.0533	-1.0842	7.3170	0.9967	0.1770	0.0095
AR+C/TA<70%	1634	0.0094	0.0148	0.1609	-0.2585	0.0533	-1.0859	7.2963	0.9979	0.1766	0.0094
AR+C+SI/TA<67%	1644	0.0094	0.0147	0.1609	-0.2590	0.0535	-1.0828	7.2732	0.9969	0.1763	0.0095
AR+C+SI/TA<90%	1678	0.0094	0.0148	0.1608	-0.2586	0.0535	-1.0714	7.2161	0.9996	0.1761	0.0094
AR/MC<30%	1216	0.0119	0.0155	0.1522	-0.2188	0.0494	-0.8366	6.2031	0.9497	0.2418	0.0126
AR/MC<33%	1259	0.0117	0.0152	0.1519	-0.2227	0.0499	-0.8684	6.2654	0.9582	0.2351	0.0123
AR/MC<45%	1384	0.0113	0.0152	0.1546	-0.2332	0.0508	-0.9437	6.6241	0.9715	0.2213	0.0116
AR/MC<49%	1413	0.0112	0.0155	0.1553	-0.2343	0.0509	-0.9480	6.6621	0.9750	0.2208	0.0115
AR+C+SI/MC<70%	1329	0.0113	0.0158	0.1540	-0.2310	0.0505	-0.9348	6.5780	0.9651	0.2247	0.0117
Interest screens											
CSI/TA<30%	1677	0.0107	0.0147	0.1591	-0.2428	0.0520	-0.9806	6.8148	1.0000	0.2050	0.0107
CSI/TA<33%	1677	0.0107	0.0146	0.1589	-0.2432	0.0520	-0.9845	6.8335	1.0000	0.2053	0.0107
CSI/MC<30%	1667	0.0113	0.0162	0.1553	-0.2342	0.0506	-0.9552	6.7125	0.9991	0.2231	0.0113
CSI/MC<33%	1669	0.0113	0.0162	0.1554	-0.2348	0.0507	-0.9578	6.7176	0.9993	0.2222	0.0113
Interest income/Rev<3%	1595	0.0107	0.0150	0.1585	-0.2425	0.0519	-0.9872	6.8116	0.9934	0.2068	0.0108
Interest income/Rev<5%	1639	0.0107	0.0150	0.1581	-0.2432	0.0520	-0.9909	6.8263	0.9972	0.2065	0.0108
Interest income/Rev<10%	1665	0.0107	0.0148	0.1581	-0.2433	0.0521	-0.9899	6.8196	0.9989	0.2062	0.0108
Benchmark	1680	0.0111	0.0141	0.1211	-0.1820	0.0459	-0.7689	4.9893	1.0000	0.2427	0.0111

Please note: the following table displays the descriptive statistics and ratio analysis. Column one shows the name of each portfolio and column two the corresponding formula, which the portfolio construction is based upon. Column three to nine displays relevant descriptive statistics and column ten to thirteen displays the results of the Sharpe, Treynor and Sortino ratios, respectively. AR: account receivables, C: cash, CSI: cash plus short-term investments, Int income: interest income, MC: total market capitalization, Rev: total revenue, SI: short-term investments, TA: total assets and TD: total debt

6.5 Regression analysis

To analyse the risk-adjusted performance of the portfolios we follow much of the previous literature and employ the single-factor model proposed by Jensen (1968) (i.e., *Jensen's alpha*) together with the extended four-factor model introduced by Carhart (1997). In addition to market risk, the four-factor model also controls for investment style factors associated with size, book-to-market and momentum. The two models are estimated with the following time-series regressions:

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + \varepsilon_{it} \tag{6.1}$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + \gamma_i SMB_t + \delta_i HML_t + \zeta_i MOM_t + \varepsilon_{it} \tag{6.2}$$

where R_{it} is the continuous return of the portfolio i in month t, R_{ft} represents the risk free rate at month t, α_i is the abnormal return of portfolio i, β_i represents the portfolio's exposure to the systematic risk. SMB_t represents the difference in return between stocks with small market capitalization and stocks with large market capitalization at time t, HML_t represents the difference in return between stocks with high and low book-to-market ratios, MOM_t represents the difference in return between previous winning stocks and previous loosing stocks. Finally, ε_{it} is the random error term.

The results of the Jensen's Alpha and Carhart regressions are displayed in Table 6.3. Before discussing the results, it should be noted that we acknowledge the abnormally high adjusted r-squared values, which in several cases equals to 100%, or one (i.e., perfect fit). This is because some screens exclude just a few number of constituents, resulting in portfolios with almost identical characteristics as the market benchmark. Nevertheless, we include these portfolios to illustrate this point, and conclude that these portfolios exhibit similar return and risk characteristics as the overall market.

It can be observed that several debt ratios generate positive risk-adjusted returns with up to 23 basis points per month. However, this is true only when market capitalization is used as a divisor, as all debt screens based on total assets do not perform statistically different from zero. With negative and significant smb factors loadings in almost all cases, it seems that excluding highly leveraged firms results in a tilt towards stocks with large market capitalization. This finding is in line with the established notion that small stocks tend to take on more financial debt (e.g., Titman & Wessels, 1988). It can further be observed that these portfolios have a tilt towards growth and momentum stocks. Interestingly, the choice of divisor in the accounting ratios appears to be an important determinant of risk. As illustrated in the regression results, in the four-factor setting all debt screens based on market capitalization results in beta values ranging from 0.94 to 0.96, while the total assets based counterparts results in beta values around 1.02. A final observation regarding the debt ratios is that a more stringent threshold level, that is, 30% rather than 33%, generates a marginally greater

outperformance, suggesting that more stringent debt screening results in better financial performance.

Market capitalization appears to be superior even when screening for liquidity. The results indicate that all screens based on market capitalization generate statistically significant abnormal returns, while the total assets based generate a performance indistinguishable from zero. These results appear in both a single and multifactor setting and can hence be considered statistically robust. It is noteworthy that the exclusion of high liquidity firms generates a beta value below one, which is the case for all liquidity screens. Arguably, one would expect that imposing liquidity constraints on a portfolio would lead to above market risk. Finally, the interest screens appear to have little or no impact on performance. This result is not surprising given the marginal size reduction associated with these screens (Table 6.2).

Table 6.3 Main regression results

Portfolio	Jensen's Alpha		Carhart (1997) four-factor model					CAPM	Carhart
	α	β	α	β	SMB	HML	MOM	Adj R2	Adj R2
Debt screens									
TD / TA < 30%	-0.0002	1.0075***	-0.0002	1.0166***	-0.0459***	-0.0360***	0.0193	99.21%	99.31%
TD / TA < 33%	-0.0003	1.0133***	-0.0003	1.0213***	-0.0370**	-0.0326**	0.0152	99.34%	99.40%
TD / TA <33,33	-0.0003	1.0138***	-0.0003	1.0212***	-0.0360**	-0.0314**	0.0137	99.36%	99.42%
TD / TA <37%	-0.0002	1.0075***	-0.0003	1.0149***	-0.0166	-0.0195**	0.0157*	99.61%	99.64%
TD / MC < 30%	0.0023***	0.9236***	0.0023***	0.9411***	-0.0873***	-0.0634***	0.0407***	98.53%	98.97%
TD / MC < 33%	0.0021***	0.9302***	0.0021***	0.9461***	-0.0774***	-0.0567***	0.0371***	98.73%	99.07%
TD / TA&MC <33%	0.0016***	0.9500***	0.0017***	0.9636***	-0.0858***	-0.0621***	0.0290**	98.56%	98.90%
Liquidity screens									
AR / TA <33%	0.0000	0.9931***	0.0000	0.9934***	-0.0028	-0.0003	0.0017	99.99%	99.99%
AR / TA <45%	0.0000	0.9983***	0.0000	0.9982***	-0.0005	-0.0001	-0.0003	100.00%	100.00%
AR+C/TA<50%	-0.0001	0.9967***	-0.0001	0.9976***	-0.0020	-0.0007	0.0031	99.95%	99.95%
AR+C/TA<70%	-0.0001	0.9979***	-0.0001	0.9987***	-0.0013	-0.0003	0.0027	99.97%	99.97%
AR+C+SI/TA<67%	0.0000	0.9969***	0.0000	0.9968***	0.0000	0.0014	0.0005	99.97%	99.97%
AR+C+SI/TA<90%	0.0000	0.9996***	0.0000	0.9996***	0.0000	-0.0002*	-0.0003	100.00%	100.00%
AR/MC<30%	0.0013***	0.9497***	0.0015***	0.9528***	-0.0600***	-0.0370***	0.0042	99.50%	99.62%
AR/MC<33%	0.0011***	0.9582***	0.0013***	0.9599***	-0.0536***	-0.0311***	0.0018	99.64%	99.73%
AR/MC<45%	0.0008***	0.9715***	0.0009***	0.9729***	-0.0340***	-0.0198***	0.0021	99.83%	99.87%
AR/MC<49%	0.0007***	0.9750***	0.0008***	0.9763***	-0.0313***	-0.0185***	0.0019	99.86%	99.89%
AR+C+SI/MC<70%	0.0009***	0.9651***	0.0010***	0.9682***	-0.0387***	-0.0247***	0.0057	99.78%	99.83%
Interest income									
CSI/TA<30%	0.0000**	1.0000***	0.0000*	1.0000***	0.0000	0.0000*	0.0000	100.00%	100.00%
CSI/TA<33%	0.0000**	1.0000***	0.0000*	1.0000***	0.0000	0.0000*	0.0000	100.00%	100.00%
CSI/MC<30%	0.0000***	0.9991***	0.0000***	0.9994***	-0.0005*	-0.0005***	0.0005***	100.00%	100.00%
CSI/MC<33%	0.0000***	0.9993***	0.0000***	0.9995***	-0.0003	-0.0005***	0.0004***	100.00%	100.00%
Interest income/Rev<3%	0.0000	0.9934***	0.0000	0.9955***	0.0010	0.0013	0.0073***	99.97%	99.97%
Interest income/Rev<5%	0.0000	0.9972***	0.0000	0.9974***	-0.0019*	-0.0008	0.0008	100.00%	100.00%
Interest income/Rev<10%	0.0000	0.9989***	0.0000	0.9991***	0.0000	0.0003	0.0008*	100.00%	100.00%

Please note: the following table displays the results of Jensen's Alpha and Carhart (1997) regressions. Column one shows the name of each portfolio and column two the corresponding formula, which the portfolio construction is based upon. Column three, four and five display the alpha coefficient, beta coefficient and adjusted r-squared value of the Jensen's alpha regressions, respectively. Column six to ten display the alpha, beta, value, size and momentum coefficients for the Carhart (1997) regressions. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

6.5.1 Time-varying impact of screens

In Chapter 2 it was illustrated how the stringency of the accounting screens is not constant, but vary over time. For instance, debt screens based on market capitalization were 10% to 15% more stringent after the global financial crisis compared to before. (e.g., Figure 2.5). The purpose of this section is, therefore, to examine how the risk and return characteristics of accounting screens evolve over time. To examine potential time-varying effects we divide the sample into two sub-samples, where the first half (2002-2007) represent the bull market, including the recovery after the dot.com bubble, and second half (2008-2013) represents the bear market, including the main events and the wake of the global financial crisis.

The results of the multifactor regressions, displayed in Table 6.4, yield several interesting observations. First, it appears that the previously recorded outperformance of the market capitalization based debt ratios stem entirely from the second sub-sample period, which implies that these ratios are very efficient in times of market turmoil (such as the global financial crisis). Arguably, the underlying reason for this outperformance is that the market capitalization based screens become more stringent when market value declines, hence serving as a form of risk management function. The fact that the beta values of these ratios are about 7% lower in the second sub-sample periods supports this argument.

Screening for liquidity, on the other hand, seems to have generated positive risk-adjusted returns in both sample periods (again, only true when market capitalization is used a divisor), although this outperformance seems to be twice as big in the second sub-sample.[29] The fact that screening for liquidity is more efficient during turbulent market times appears a bit puzzling, as it would be fair to assume that higher levels of liquidity should be rewarded in periods of investor uncertainty. The factor loadings remain fairly constant for both sample periods, although the tilt towards growth stocks is reduced in the second half.

[29] For instance, at a 30% threshold level, the market capitalization based debt ratio generated an outperformance of 11 basis points per month in the first sub sample period, while in the second sub sample period the outperformance was 20 basis points.

Table 6.4 Sub-sample analysis

Portfolio	2002-2007						2008-2013					
	α	β	SMB	HML	MOM	Adj R2	α	β	SMB	HML	MOM	Adj R2
Debt screens												
TD / TA < 30%	-0.0003	1.0287***	-0.0384*	-0.0620***	0.0027	98.59%	0.0000	1.014***	-0.031	-0.026*	0.0311**	99.59%
TD / TA < 33%	-0.0003	1.0316***	-0.0416*	-0.0521**	0.0017	98.81%	-0.0002	1.019***	-0.005	-0.016	0.0290*	99.64%
TD / TA <33,33	-0.0004	1.0329***	-0.0400*	-0.0508**	0.0011	98.84%	-0.0002	1.019***	-0.005	-0.015	0.0267*	99.65%
TD / TA <37%	-0.0004	1.0191***	-0.0220	-0.0157	0.0112	99.27%	-0.0002	1.014***	0.002	-0.011	0.0229**	99.77%
TD / MC < 30%	0.0007	0.9805***	-0.0667***	-0.1124***	0.0305***	98.67%	0.0036***	0.930***	-0.061**	-0.041***	0.0510***	99.31%
TD / MC < 33%	0.0006	0.9811***	-0.0605***	-0.0903***	0.0279**	98.78%	0.0033***	0.936***	-0.051*	-0.036***	0.0480***	99.36%
TD / TA&MC <33%	0.0004	1.0034***	-0.0695***	-0.1017***	0.0166	98.41%	0.0028***	0.952***	-0.056*	-0.040***	0.0415***	99.28%
Liquidity screens												
AR / TA <33%	0.0001	0.9902***	-0.0028	-0.0049	0.0005	99.98%	0.0000	0.995***	-0.002	0.000	0.0025**	100.00%
AR / TA <45%	0.0000	0.9972***	-0.0002	-0.0016*	-0.0010**	100.00%	0.0000*	0.999***	0.000	0.000	0.0003	100.00%
AR+C/TA<50%	0.0000	0.9982***	0.0000	-0.0019**	-0.0002	100.00%	-0.0002	0.998***	-0.005	-0.002	0.0042	99.93%
AR+C/TA<70%	0.0000*	0.9998***	0.0000	0.0002	-0.0002	100.00%	-0.0001	0.998***	-0.002	-0.001	0.0040	99.96%
AR+C+SI/TA<67%	-0.0001	0.9927***	-0.0047	0.0166***	0.0043	99.93%	0.0000	0.998***	0.002	0.001	0.0001	99.99%
AR+C+SI/TA<90%	0.0000	0.9996***	0.0000	0.0012*	-0.0004*	100.00%	0.0000*	1.000***	0.000	0.000	0.0000	100.00%
AR/MC<30%	0.0011***	0.9687***	-0.0493***	-0.0835***	-0.0039	99.63%	0.0020***	0.948***	-0.049**	-0.026***	0.0091	99.65%
AR/MC<33%	0.0009***	0.9716***	-0.0447***	-0.0702***	-0.0065	99.74%	0.0018***	0.957***	-0.043**	-0.021**	0.0076	99.76%
AR/MC<45%	0.0007***	0.9765***	-0.0293***	-0.0475***	-0.0009	99.85%	0.0012***	0.972***	-0.029**	-0.014**	0.0039	99.88%
AR/MC<49%	0.0007***	0.9786***	-0.0283***	-0.0445***	-0.0006	99.87%	0.0011***	0.976***	-0.025**	-0.013**	0.0037	99.90%
AR+C+SI/MC<70%	0.0007***	0.9738***	-0.0336***	-0.0412***	0.0021	99.86%	0.0014***	0.967***	-0.032	-0.019**	0.0091	99.82%
Interest screens												
CSI/TA<30%	0.0000	1.0000***	0.0000	0.0000	0.0000**	100.00%	0.0000	1.000***	0.000**	0.000**	0.0000*	100.00%
CSI/TA<33%	0.0000	1.0000***	0.0000	0.0000	0.0000**	100.00%	0.0000	1.000***	0.000**	0.000**	0.0000*	100.00%
CSI/MC<30%	0.0000**	0.9998***	-0.0004**	0.0002	0.0001	100.00%	0.0000***	0.999***	0.000	0.000	0.0009***	100.00%
CSI/MC<33%	0.0000*	0.9998***	-0.0003**	0.0001	0.0002	100.00%	0.0000***	0.999***	0.000	0.000	0.0007***	100.00%
Interest income/Rev<3%	-0.0001	0.9891***	0.0003	0.0171**	0.0116**	99.95%	0.0000	0.998***	-0.005	-0.003	0.0051**	99.99%
Interest income/Rev<5%	0.0000	0.9963***	-0.0007	0.0033	0.0004	99.99%	0.0000	0.998***	-0.0040*	-0.002*	0.0010	100.00%
Interest income/Rev<10%	0.0000	0.9983***	0.0012	-0.0002	0.0009	100.00%	0.0000	0.999***	-0.0020**	-0.001	0.0003	100.00%

The following table reports the Carhart (1997) regression results for the two subsample periods 2002-2007 and 2008-2013. Column one displays the financial ratio of the portfolio and column two to seven and eight to thirteen report the alpha, beta, smb, hml, mom and adjusted r-squared values for the first and second sub sample, respectively. Coefficient covariances and standard errors are made heteroscedasticity and autocorrelation are based on (Newey & West 1987). *, **, *** represent a 10%, 5%, and 1% significant level, respectively.

6.5.2 What is the performance in different sectors?

In Chapter 2 it was illustrated that existing Shari'ah screening methodologies result in different levels of stringency. It was further shown that this stringency not only is time-dependent, but also varies across sectors. In fact, the most extreme case suggested that it could be up to a 60% difference in stringency for a single screen between two sectors, as measured number of firms excluded. In order to make the empirical results robust to potential return differentials across sectors, we construct some sector-specific sub-portfolios. To arrive at these sector-specific portfolios, we adopt the ICB sector structure, resulting in to the following nine sectors: Oil & Gas (0001), Basic materials (1000), Industrials (2000), Consumer goods (3000), Healthcare (4000), Consumer services (5000), Telecommunications (6000), Utilities (7000) and Technology (9000). We purposely exclude financials (8000) as it is practically irrelevant to consider this sector. Specifically, all major Islamic mutual funds and indices do not invest in the financial sector due to the interest-driven business model. This is also true for firms in the insurance sector (8500) as this violates the prohibition of gharar (uncertainty). Next, we estimate the following four-factor regression:

$$R_{st} - R_{ft} = \alpha_s + \beta_s(R_{it} - R_{ft}) + \gamma_s SMB_t + \delta_s HML_t + \zeta_s MOM_t + \varepsilon_{it} \qquad (6.3)$$

where R_{st} is the return of the sub-portfolio at time t and R_{it} is the return of the corresponding sector-specific market benchmark at time t. Replacing the overall market benchmark with a sector specific benchmark is essential to make the results robust to a potential sector-related performance bias. Hence, we arrive at the following sector benchmarks: Oil & Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications, Utilities, and Technology.

Carhart (1997) four-factor regressions are performed for each sector respectively, and the results are presented in Table 6.5 However, the beta, smb, hml and mom coefficients of the regressions, together with the adjusted r-squared values, are excluded for the reason to save space. Starting with the first category of debt screens, it can be observed that next to all ratios based on market capitalization lead to a statistically significant outperformance in seven out of the nine sectors in the sample. Only in Consumer Goods and Telecommunication does the impact of this group of screens result in a performance similar to benchmark. Interestingly, it appears that the degree of economic significance generated by a single screen depends largely on the characterises of the sector. For instance, applying the TD/MC<30% screen to the Technology sector generates an outperformance of 8 basis points per month while for the Utilities sector the outperformance is 64 basis points, (both results statistically significant at the 1% level). For this group of screens, there is no evidence that the threshold level is a significant determinant of performance.

In contrast to the debt screens based on a market capitalization based rulebook, debt screens with a total assets based divisor do not typically generate a performance statistically different than benchmark. Some sign of abnormal returns can be found for the Industrials sector and more significantly in the Healthcare sector. However, the TD/TA<30% screen actually generates a negative risk-adjusted performance in the Utilities sector. This observation strengthens the notion of *Shari'ah*-screens being sensitive to unique sector characteristics, as all three market capitalization based debt screens generate a large and highly significant outperformance in the Utilities sector.

The group of liquidity screens tells a very similar story as the debt screens. That is, the majority of the screens based on market capitalization outperform in six sectors (Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Utilities, Technology) while in the remaining two (i.e., Oil & Gas, Telecommunications) the performance appears to be similar to the market. Generally, liquidity screens based on total assets appear to result in no difference in performance. While there is some evidence of outperformance in the Health Care sector, two screens lead to a marginally but statistically significant underperformance in the Industrials and Technology sector, respectively. Again, this underperformance occurs despite proof of market capitalization based screens outperform.

Moving on o the final group of interest screens, it can be observed that most alphas are statistically indistinguishable from zero. Outperforming in seven out of the nine

sectors, the two screens based on market capitalization are the only interest screens that result in favourable return characteristics. The pattern of conflicting results within certain sector is also true for this group of screens, as the total assets based screens lead to underperformance in the Consumer Services and Utilities sector, respectively.

Table 6.5 Summary of sector specific four-factor alpha

Portfolio	Oil & Gas	Basic Materials	Industrials	Consumer Goods	Health Care	Consumer Services	Telecom	Utilities	Technology
Debt screens									
TD / TA < 30%	-0.0002	-0.0002	0.0011	-0.0005	0.0001	0.0000	-0.0006	-0.0021*	0.0000
TD / TA < 33%	-0.0002	-0.0001	0.0011*	-0.0006	0.0015***	-0.0004	-0.0001	-0.0011	-0.0002
TD / TA <33,33	-0.0002	-0.0001	0.0012*	-0.0006	0.0014***	-0.0004	-0.0002	-0.0013	0.0001
TD / TA <37%	-0.0002	0.0002	0.0010	-0.0003	0.0013***	-0.0002	-0.0006	-0.0010	0.0001
TD / MC < 30%	0.0014**	0.0030**	0.0039***	0.0010	0.0033***	0.0024***	0.0020	0.0064***	0.0008***
TD / MC < 33%	0.0012**	0.0026*	0.0035***	0.0011	0.0030***	0.0027***	0.0020	0.0053**	0.0011***
TD / TA&MC <33%	0.0011*	0.0023*	0.0034***	0.0008	0.0034***	0.0021**	0.0006	0.0048**	0.0007**
Liquidity screens									
AR / TA <33%	0.0000	0.0000	-0.0002	0.0001	0.0001***	0.0001	0.0000	0.0000	-0.0003*
AR / TA <45%	0.0000	0.0000	-0.0001	0.0000**	0.0000	0.0000	0.0000**	0.0000	0.0000
AR+C/TA<50%	-0.0001	0.0001	0.0000	0.0001	0.0003*	-0.0002	-0.0002	0.0000	-0.0006
AR+C/TA<70%	0.0000	0.0000	0.0000	0.0000	0.0001*	0.0000	-0.0002	0.0001	-0.0005
AR+C+SI/TA<67%	0.0000	0.0000	-0.0002***	0.0001	0.0000	-0.0002	0.0000	0.0000	-0.0003
AR+C+SI/TA<90%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000***	0.0000**	0.0000	0.0000**
AR/MC<30%	0.0001	0.0013**	0.0026***	0.0015*	0.0011***	0.0013***	0.0002	0.0039***	0.0012***
AR/MC<33%	0.0000	0.0008	0.0022***	0.0012*	0.0010***	0.0010***	0.0002	0.0034***	0.0009***
AR/MC<45%	0.0002	0.0004	0.0015***	0.0010*	0.0006***	0.0005***	0.0004	0.0023***	0.0007***
AR/MC<49%	0.0002	0.0003	0.0014***	0.0009*	0.0005***	0.0005***	0.0003	0.0023***	0.0007***
AR+C+SI/MC<70%	0.0001	0.0007***	0.0018***	0.0013*	0.0007***	0.0010***	0.0003	0.0025***	0.0010***
Interest screens									
CSI/TA<30%	-0.0001	0.0000	0.0000	-0.0001	0.0000	-0.0009**	0.0002	-0.0002**	-0.0011
CSI/TA<33%	0.0000	0.0000	0.0000	0.0000	0.0001	-0.0006**	0.0007	-0.0001*	-0.0006
CSI/MC<30%	0.0003	0.0008***	0.0017***	0.0018***	0.0007***	0.0011***	0.0009	0.0014*	0.0016***
CSI/MC<33%	0.0002	0.0007***	0.0016***	0.0015***	0.0006***	0.0010***	0.0008	0.0014**	0.0014***
Interest income/Rev<3%	-0.0001	0.0002	0.0000	0.0000	0.0000	0.0001	0.0000	-0.0004	0.0001
Interest income/Rev<5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	-0.0004**	0.0001
Interest income/Rev<10%	0.0000	0.0000	0.0000	0.0000	0.0000*	0.0000	0.0000	-0.0002**	0.0000

The following table reports the Carhart (1997) alpha coefficients for each sector, respectively. The beta, smb, hml and mom coefficients together adjusted r-squared values are not displayed for the sake of saving space.

6.6 Concluding remarks

This chapter was concerned with investigating the financial impact of the accounting-based screening process used in Islamic equity investing. This process, typically comprised by four accounting screens, investigates the characteristics of firms concerning debt, liquidity, interest income and income from non-permissible business activities. By analysing the performance of hypothetical portfolios that satisfy the rules of a single rather than multiple screens, we addressed the empirically challenging issue of distinguishing their merits. The results of the empirical analysis can hence be viewed as a significant contribution, as existing evidence concerns only the collective impact of the *Shari'ah* screening process.

First, we find that several debt screens generate significant abnormal returns, although this is only true for screens based on a market capitalization based rulebook. In contrast, screens following a total assets based rulebook typically perform similarly to the market. The difference in performance appears to be due to lower systematic risk, arguably caused by the greater stringency of the market capitalization based screens. Analysing the time-varying difference, however, revealed that this outperformance is not persistent over time but stem entirely from the period covering the global financial crisis. Furthermore, the liquidity screens using a market capitalization based rulebook also contribute positively to performance, although significantly less than the debt

screens. In contrast, interest screens appear to have little or no impact on financial performance. Taken together, the findings presented in this chapter suggest that the accounting based screening process does not harm investors' financial performance. Rather, it appears to serve as a risk management function in periods of market turmoil, excluding firms subject to risky characteristics. This appears to be true, however, only when market capitalization is used a divisor.

The analysis conducted in this chapter is subject to a number of limitations. First, due to data availability we have not been able to consider all accounting screens currently used in the industry. Most notably, this concerns the category of non-permissible income screens, which has not been considered at all. Second, while the portfolios have been constructed to capture the actual impact of the screens, this has been done to the best of our knowledge. It could be the case that some investors use a somewhat different methodology when performing their screening. Finally, while we only consider the financial impact of individual screens, it could also be interesting to study the performance of different screening combinations. This could be an interesting area for future research.

Chapter 8

CONCLUSIONS

7.1 Summary of thesis

This Ph.D. thesis comprised four empirical essays on Islamic equity investing. Since its inception in the early 1990s, Islamic equity investing has developed into a multibillion dollar industry with thousands of Islamic mutual funds and equity indices available around the world. Although academic interest has followed the rapid growth of the industry, there is still much uncertainty surrounding the performance implications of integrating Islamic principles into investment strategies. The principal objective of the research presented in this Ph.D. thesis was to bring clarity to some of these issues.

Chapter 2 was devoted to the institutional background of Islamic finance, including the historical development, sources of Islamic jurisprudence and the main prohibitions which the Islamic finance model rests upon. The current state of the Islamic equity market was also discussed, together with the fundamentals of Islamic equity investing. The second part critically examined the *Shari'ah*-based stock screening process, which can be considered the cornerstone of Islamic equity investing. Specifically, it addressed issues relating to current inconsistencies in *Shari'ah* screening norms, and how different screens impact the characteristics of *Shari'ah*-compliant asset universe in terms of size and asset allocation. Chapter 3 outlined the core principles of efficient market theory and the implications it has for investors seeking abnormal returns.

Furthermore, Chapter 3 also outlined the rationale for some of the most frequently used performance measures used in financial research.

Chapter 4 investigated the return and risk characteristics of Islamic equity indices. It was argued that analysing passive indices, rather than actively managed mutual funds, provide a better opportunity to measure the direct impact of the *Shari'ah*-screening employed by these investment vehicles. This since it excludes disturbing elements such as fund manager fees and market timing skills. Based on the current state of the Islamic index literature, it is difficult to draw any certain conclusions regarding return and risk. It was argued that this uncertainty could stem from a number of limitations characterizing many previous studies, such as small data samples and simplistic performance measures. In addressing these issues, Chapter 4 analysed a large set of global and regional Islamic indices from five major index providers within a multifactor regression framework over the period 1996 to 2012. The results showed that Islamic indices typically do not lag behind their unconstrained market benchmarks. In fact, indices with a global and developed market exposure were proven to exhibit significant abnormal returns. These indices performed particularly well during the recent credit crisis, although the majority of the recorded outperformance stem from the exclusion of stocks in the financial industry. In sum, this chapter concluded that *Shari'ah*-based investment strategies could provide investors with a risk-averse investment option, especially during times of market turmoil around the financial services sector.

While existing research is concerned with the performance of *Shari'ah*-compliant equity indices relative conventional benchmarks, one area currently unexplored in the literature is what factors that determine this relative performance. Chapter 5 offered a modest attempt to address this issue. Specifically, it related the risk-adjusted performance of national Islamic indics across 46 markets to country level characterisics, such as the economic, cultural, governance and religious environment. Furthermore, since the providers of these indices use different *Shari'ah* screening norms when constructing their Islamic inidces, these screens where also considered as potential determinants of performance. Overall, the findings from this analysis suggested that the country envrioment can be a signficant determinant of Islamic index risk-adjusted performance. The overall stock market envrionment was found to have a signficant negative impact, suggesting that Islamic indices will do relatively better in market downturns, and vice versa. Other factors that seem to determine performance include the money supply enviorment, the level of Muslim population and the difference in return between small cap and large cap stocks. Cultural and governece factors were found to have no signficant impact.

Although the accounting-based screening is a central element in constructing Shari'ah-compliant investment portfolios, the manner in which these screens influence return and risk is currently poorly understood in the literature. Most previous studies have addressed this issue by analysing the performance of existing investment vehicles,

such as Islamic equity indices and mutual funds. However, since these indices and funds are constructed using multiple accounting screens, any findings will concern their collective impact on performance. Chapter 6 addressed this issue by utilizing a research design that allowed to isolate the merits of individual screens. This alternative approach contributed to the literature in two ways. First, it allowed to study the extent to which the different parts of the screening process (i.e., debt, liquidity interest-income) influence return and risk. Second, it enabled to investigate whether the different screening methods currently employed in the industry have a diverse impact on financial performance. It was found that both debt ant liquidity screens have generated positive risk-adjusted returns, although this is true only when market capitalization is used a divisor in the ratios.

7.2 Discussion

Much of the empirical evidence presented in this thesis suggest that Islamic equity investing offers competitive performance. Chapter 4 revealed that global and developed market Islamic indices have yielded a significant four-factor alpha of up to 41 basis points per month or 4.92% per annum. Interestingly, this finding contradicts many previous studies, which have reported Islamic indices to either underperformed or performed similar to market benchmarks (Abbes, 2012; Albaity & Ahmad, 2008; Ashraf, 2013; Walkshäusl & Lobe, 2012b). However, the results appear to be robust, as they are documented for multiple providers and across different time periods. It was

further shown that the principal explanation for this outperformance is as a result of the exclusion of the financial services sector. When the financial sector was excluded from the market benchmark, the recorded outperform was significantly reduced.

However, it appears that the financial success of Islamic investments is largely determined by the nature of the accounting-based screening. Already in Chapter 2 it was illustrated that screens based on market capitalization and total assets have a diverse impact in terms of size and asset allocation. On average, market capitalization based screens are more stringent, although this stringency vary across different sectors and over time. When combining the findings of Chapter 4 to 6, it is clear that market capitalization based screens have been superior total assets. For instance, in Chapter 4 it was shown that the FTSE indices, which are constructed using total assets based screens, performed relatively worse on a risk-adjusted basis compared to Islamic indices using market capitalization based screens, such as Dow Jones and Russell[30]. Similarly, Chapter 5 reported a positive and significant relationship between market capitalizations based screening and risk-adjusted performance.

Focusing on the return and risk characteristics of the accounting screens on an individual level, Chapter 6 then confirmed the relatively better performance generated

[30] For instance, in Table 4.3 (Panel A) it can be observed that FTSE is the only global index out of five that did not significantly outperform on a risk-adjusted basis. Furthermore, Panel B of the same table reports a significant underperformance for FTSE in Asia Pacific while the Dow Jones index significantly outperform. These results stay consistent in common sample period setting (i.e., Table 4.8) which imply that the results are not due to a sample time issue.

by market capitalization based screens. Specifically, debt and liquidity ratios based on market capitalization significantly outperformed during the duration of the sample, while the total assets based screens did not perform statistically different from zero. Interestingly though, the results of the sub-sample analysis revealed that the entire outperform came from the second half of the sample which included the turmoil around the global financial crisis. This implies that the dynamic stringency of market capitalization based screening (i.e., more (less) stringent when markets are down (up)) serves as risk management function. That is, in periods of market turmoil; these screens will exclude firms with more financial leverage, leading to a decrease in portfolio risk.

7.3 Research limitations and directions for future research

The research presented in this thesis is subject to a number of limitations. First, it should be acknowledged that the evidence stem from data that cover a relatively short time period. A longer time horizon is likely to have improved the statistical robustness. However, *Shari'ah*-compliant indices or funds were typically not launched until the early 2000s. On this note, the present thesis is believed to cover the longest time period in the literature. Second, in Chapter 4 and 5 it was argued that the impact of *Shari'ah* screening is best measured using passive indices rather than actively managed funds. Here, it should be noted that indices are hypothetical investment portfolios and hence non-investable. Perhaps the main disadvantage of analysing

indices is that trading-related aspects, such as liquidity risk, cannot be controlled for. Furthermore, indices allow us to analyse only the investment opportunities. Hence, whether Islamic fund managers have the ability to produce competitive returns is to consider a separate research question. Third, the asset universes in Chapter 6 and 7 are based on the constituents list of the FTSE All-World Index. While comprised of approximately 3000 firms globally, these are all firms with medium and large market capitalization. Hence, the evidence presented in these chapters is not robust to stocks with small market capitalization. Finally, it should be noted that the research presented in this thesis has been limited to the performance related aspects of Islamic equity investing. Hence, there were no aspirations made to consider other issues that might have emerged. One such example would be the issue of inconsistences in the *Shari'ah* screening norms highlighted in Chapter 2, which also fits into the standardization debate currently taking place in the Islamic finance literature.

Several potential paths for future research has emerged from this thesis. First, it would be interesting to continue to explore areas related to determinants of Islamic equity performance. The empirical evidence presented in this thesis is based on a limited set of variables, which could be extended much further. Furthermore, the analysis can be extended to include actively managed mutual funds. This area has started to be explored in a very recent study by Nainggolan et al. (2015). Second, it would be interesting to elaborate further with the *Shari'ah* screens presented in Table 2.1. Chapter 6 illustrated that these screens result in different return and risk

characteristics, which suggests opportunity for portfolio optimization. Work on this topic has in fact been carried out by Derigs and Marzban (2009). However, their analysis is limited to a handful screens, and covers what appears to be only one year of data.

Third, empirical observations made in this thesis suggest that an interesting future research could investigate further the economic factors common for Islamic equity investments. When examining how individual accounting-based screens impact return and risk (i.e., Chapter 6), the results indicate that screening for Shari'ah compliance seem to result in portfolios that tilted towards large cap stocks and stocks with growth firm characteristics. A final potential path for future research emerging from the present thesis is to explore the opportunities for conventional fund managers to incorporate Islamic principles into their investment decision-making. For instance, the findings presented in Chapter 6 suggest that the risk management function of these funds could benefit from considering debt and liquidity ratios.

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