MK7227 Postgraduate Dissertation

Student Number: 1154245

	Comments	Max Mark	Actual Mark
Introduction *Identification of a valid topic, research question and objectives framed to Masters Level standard with academic rationale developed, clear industry contextualisation of the research topic*	**Supervisor Comments:**	**10%**	
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<tr><td rowspan="2">Research Methodology

Evaluation of research philosophies and perspectives. Justification of methodological approach, sampling strategy, data analysis and reliability and validity measures as applicable</td><td>Supervisor Comments:</td><td rowspan="2">15%</td><td></td></tr>
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<tr><td rowspan="2">Conclusions and Recommendations

Research question and objectives addressed with implications to theoretical and managerial concepts considered. Recommendations provided for theory, practice and future research</td><td>Supervisor Comments:</td><td rowspan="2">10%</td><td></td></tr>
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Supervisor's Name: Dr Iqbal Asariya **Signature: ……**

2nd Marker's Name: Dr Shampa Roy-Mukherjee **Signature: ……**

Do screened indexes and their portfolios experience a performance penalty due to the application of screening criteria? Empirical evidence from a study of the performances of four FTSE indexes.

A dissertation submitted in partial fulfilment of the requirements of the School of Business and Law, University of East London for the degree of **MSc. Finance and Risk.**

May 2016

Word Count: 13, 921 Words

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Course Title *The title of the course e.g.*	Finance and Risk
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Title

Do screened indexes and their portfolios experience a performance penalty due to the application of screening criteria? Empirical evidence from a study of the performances of four FTSE indexes.

Abstract

With growing trends of Sustainable, Responsible and Impact (SRI) and Shariah investing, it is very important to understand the returns performance of these investment practices. It is also important to understand how these investment practices are different from the conventional investment practices. This paper contributes to the existing literature on the comparison of conventional indexes and screened indexes in terms of their returns performances and risk levels by taking the modern investment and portfolio theory into consideration. The study uses various empirical models to analyse data for a 10 year period from 2006 until 2016. A comparison of four indexes, FTSE 100 Index, FTSE All-Share Index, FTSE Shariah All-World Index and FTSE4GOOD Global index, and their portfolios for the 10 year period reveals that there are no significant differences between their performances.

Acknowledgments

Firstly, I would like to thank my supervisor, Dr. Iqbal Asariya, for his constant support, guidance and patience through the course of my dissertation, and for inspiring me to conduct research on this relatively unexplored topic.

Secondly, I would like to thank all my family and friends who supported me through my years at university and helped me achieve a master's degree.

Contents

1. Introduction

1.1. Background

Screened indexes vary from conventional indexes mainly due to the additional criteria applied for selecting qualifying constituents or members. This paper's aim is to investigate whether screened indexes (and their portfolios) perform differently from conventional indexes (and their portfolios).

The idea of ethical and religious-based investing first came about in 1928 when the Church of England needed ethically and religiously screened funds for investment purposes. Due to religious and moral principles the Church could not invest in 'sinful companies' that engaged in harmful and unethical practices such as companies that manufacture arms and ammunition and organisations that make profits through gambling institutions. Consequently, the Pioneer fund was created as the first mutual fund that was screened based on religious principles (Schepers, 2003 & Bauer et al., 2005, cited in Bank Negara Malaysia, 2015). It was followed by the creation of the PAX World Fund in 1971 which excluded all companies that were involved in dealing with arms and ammunitions especially during the Vietnam War (Fowler & Hope, 2007, cited in Bank Negara Malaysia, 2015).

An increased awareness of social, ethical and environmental issues has led to the creation of other ethical, sustainable and religious indexes such as FTSE4GOOD Global Index, FTSE Shariah All-World Index, Dow Jones Sustainability World Index, Dow Jones Islamic Market World Index, and Dow Jones Islamic Market Sustainability Index over the past few decades. A good example of this is the recent report published by the Cambridge Zero Carbon Society (2016) which is urging a university to divest from investments in fossil fuels in particular, which are very harmful for the environment as they increase the rate at which global warming takes place, and set a good example for other institutions to follow with a similar positive change in investment practices towards more ethical and sustainable investing. Additionally, Investors are constantly exploring ways to direct investments and capital towards companies that have a positive social and environmental impact or in some way give back to the community. Consequently, Sustainable, Responsible and Impactful (SRI) and Shariah investments (SI) are becoming increasingly popular as highlighted by Winshel (2016). Mr Al Jabri, chief executive of Saudi Arabia's Sedco, quoted by Johnson (2013), says that, 'he feels strongly about investing and that he deserves to make money only when he creates value for

the economy and the community by giving back through means such as the creation of jobs'. Also, screened Indexes performed particularly well during the global financial crisis in 2007 and 2008 due to which they gained popularity as more equitable and efficient alternatives to the conventional indexes (Ahmed (2010), Alasrag (2010).

According to the Global Sustainable Investment Alliance (2014) SRI assets have grown from $13.4 trillion in 2012 to $21.4 trillion in 2014. Table 1.1 below present geographical figures for SRI relative to total managed assets revealing that SRI assets grew by 8.7% globally:

	2012	2014
Europe	49.0%	58.8%
Canada	20.2%	31.3%
United States	11.2%	17.9%
Australia	12.5%	16.6%
Asia	0.6%	0.8%
Global	21.5%	30.2%

Table 1. 1: SRI Assets Growth, GISA (2014)

Figure 1.1 below gives a breakdown of global SRI assets by region in 2014 with Europe in the lead and United States as the runner up in second place. Global Sustainable Investment Alliance (2014) also highlights a notable growth in contribution by the United States from 28.2% in 2012 to 30.8% in 2014.

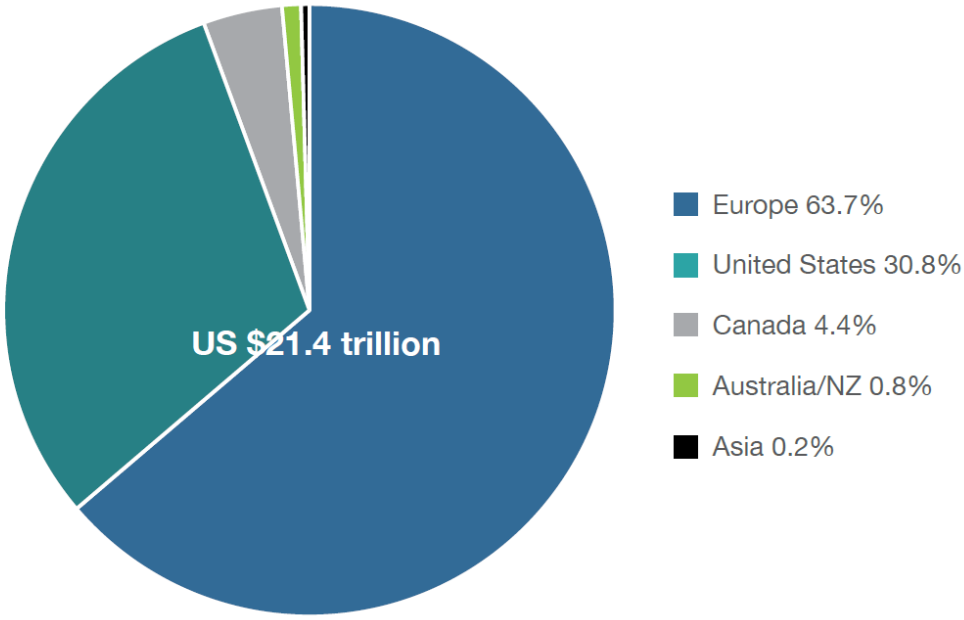

Figure 1. 1: SRI Assets by Region, Global Sustainable Investment Alliance (2014)

Shariah investments have also experienced growth. Figure 1.2 below gives an annual breakdown of country-wise growth of Shariah assets:

Figure 1. 2: Asset Growth, EY (2016)

	Conventional Asset Growth	Shariah Asset Growth
Saudi Arabia	7%	18%
Malaysia	1%	4%
UAE	19%	18%
Kuwait	4%	13%
Qatar	7%	20%
Turkey	5%	-1%
Indonesia	2%	3%
Bahrain	-1%	7%
Pakistan	8%	19%

Table 1. 2: Asset Growth, EY (2016)

Data in Figure 1.2 and Table 1.2 both reflect the growth of Shariah assets based on participation banks in 9 countries: participation banking growth figures are higher than conventional banking growth figures in the 7 out of 9 countries. Participation banks differ from Conventional banks mainly due to the fact that they invest only in interest-free finance pursuing the principles of interest-free Islamic investing.

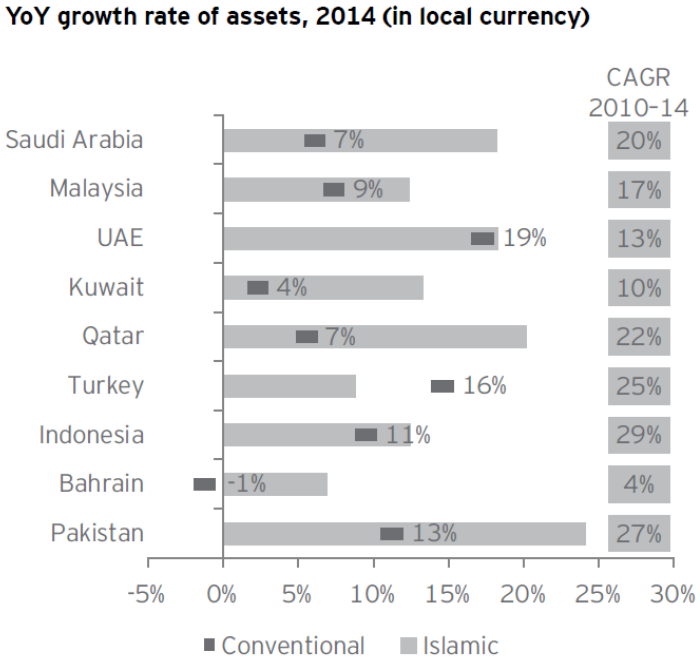

Figure 1. 3: Growth of Assets, EY (2016)

Figure 1.3 above gives a geographical comparison of growth in conventional assets with the growth in Islamic assets. These figures add further evidence to the data in Figure 1.2 and Table 1.2 that Shariah investments are growing and surpassing the growth of conventional investments in many cases: all countries except for UAE experienced greater growth in Islamic assets than in conventional assets in 2014.

1.2. Aims and Objectives

This paper aims to investigate if there is a performance penalty for screened indexes and investments. The paper examines the performance of portfolios constructed from screened ethical and religious indexes against the performance of portfolios constructed from conventional indexes. The analysis uses the four following FTSE indexes for the comparison of portfolio performance: FTSE100 Index, FTSE All-Share Index, FTSE4GOOD Global Index, and FTSE Shariah All-World Index. Selection of these indexes is mainly due to the fact that this

topic has been mostly explored in-depth with respect to the Dow Jones indexes but there is a lack of academic literature with regards to other indexes such as those within the FTSE group of indexes. One of the reasons for this has been identified as the lack of availability of data or easy access to it. Therefore, this paper aims to add empirical evidence to the current debate and encourage further academic research on other screened indexes by comparing portfolios created from conventional indexes to portfolios created from screened indexes.

1.3. Definitions and Criteria

The following definitions and criteria were adopted for the purpose of this paper.

1.3.1. Market Index (Conventional Index)

'A market index tracks the performance of a specific collection of stocks that represent a particular market or industry sector within a stock market and/or economy' (U.S. Securities and Exchange Commission, 2012). Each index has its own specific criteria for qualifying stocks that are listed in it. There are different types of FTSE indexes. Most of them are weighted based on market capitalisation.

1.3.2. Screened Index

A screened index is a type of market index that applies additional eligibility criteria for stocks to be listed on it such as the FTSE4GOOD Global Index Series which applies additional criteria on the FTSE Developed Index Series to screen out ineligible stocks that do not fit the inclusion criteria.

1.3.3. SRI Investments

According to US SIF (2015), 'sustainable, responsible and impact investing (SRI) is an investment discipline that considers environmental, social and corporate governance (ESG) criteria to generate long-term competitive financial returns and positive societal impact'. It also highlights that the main motivation behind this type of investment is the belief of investors that investments should make a positive contributions towards the development of social, environment and governance practices with betterment of the community as the core aim. The European Sustainable Investment Forum (2014) further adds to this by outlining that 'SRIs incorporate...Environmental, Social and Governance (ESG) issues as well as criteria linked to a values-based approach...Investors may choose to include or exclude specific equities and/or sectors based their impact on the environment and the community.' Due to the increased awareness of investors, SRI investments are becoming a popular choice.

1.3.4. Shariah Investments

As outlined by MICF (2015), 'Shariah investments...comply with the tenets of the Islamic law in the form of two missions of man:

i. As a servant of the Creator
ii. As a trustee of the Creator'

The second mission of man as a trustee of the Creator is applicable to the case of investments. It makes a person accountable for their actions implying that they must ensure their actions cause no harm to others and make a positive contribution to the society. Therefore, the investments they make must not have a negative impact on society and must be directed towards community building companies and causes. To summarise, Shariah investments would be made in Shariah-compliant equities, funds, etc. which would have positive contributions towards the general community and would abstain from any activities that would harm members of the community.

1.3.5. FTSE100 Index

'FTSE 100 Index is a capitalisation-weighted index of the 100 most highly capitalised companies on the London Stock Exchange. The equities use an investibility weighting in the index calculation.' (Bloomberg, 2016)

1.3.6. FTSE All-Share Index

'FTSE All-Share Index is a capitalisation weighted index comprising of the FTSE 350 and the FTSE Small Cap Indices. Currently, the Index has a total of 639 equities.' (Bloomberg, 2016)

1.3.7. FTSE4GOOD Global Index

FTSE4GOOD is a type of SRI index that is also capitalisation weighted. It is designed to measure the performance of companies utilising globally recognised Environmental, Social and Governance (ESG) standards. The index screens out constituents, also called 'ethical companies', using criteria based on the ESG standards. The criteria model consists of 300 indicators, 14 themes and 3 pillars as shown below in Figure 1.4. Based on these criteria, each company is 'given an ESG rating from 0 to 5, with 5 being the highest rating and 0 being the lowest. Companies with a rating of 3.2 and higher are compiled as a list of prospective eligible companies. Currently, the index has 782 equities.

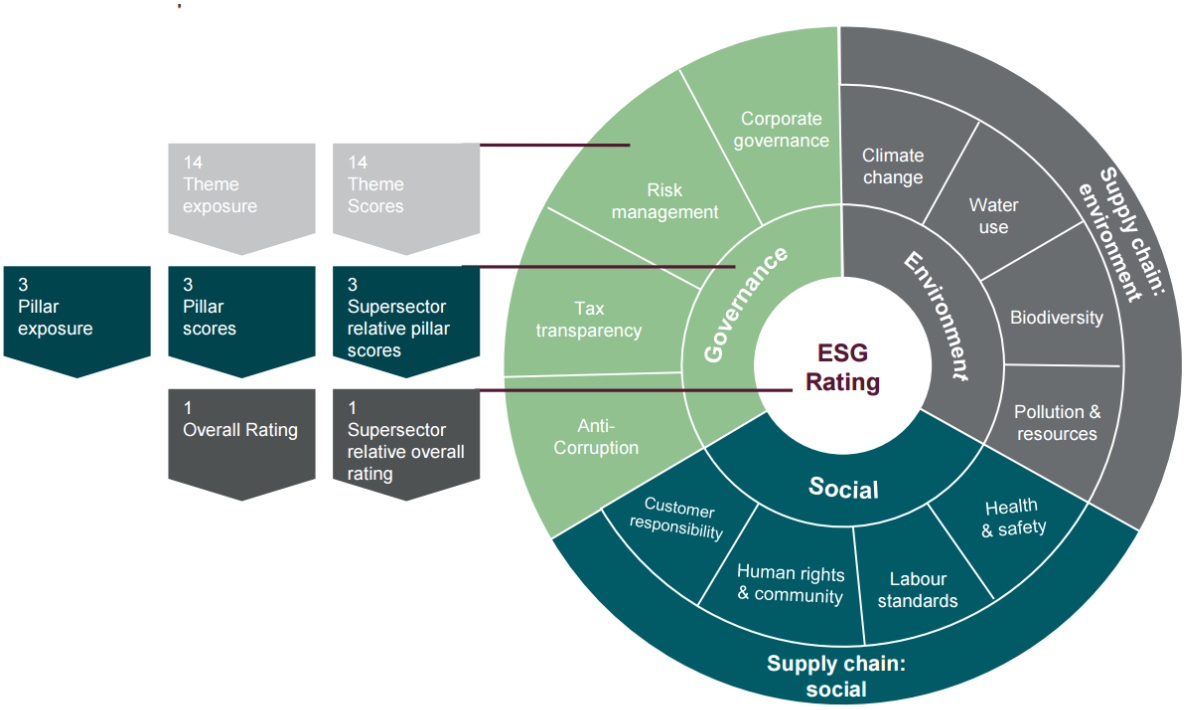

Figure 1. 4: FTSE4GOOD ESG Criteria, FTSE International Limited (2016)

However, there are additional criteria that are also applied during the screening process. Companies involved in the manufacturing and trade of the following products are excluded:

a) 'Tobacco
b) Weapon systems
c) Components for controversial weapons; cluster munitions, anti-personnel mines, depleted uranium, chemical/biological weapons and nuclear weapons.

Companies that at any point have a rating of 2.5 or lower are informed of this with a warning. If their rating continues to be 2.5 or lower following a 12 month period, they are excluded from the index unless decided otherwise by the FTSE ASG Advisory Committee'
(FTSE International Limited, 2016).

1.3.8. FTSE Shariah All-World Index

FTSE Shariah is a type of Shariah index that 'is designed to represent the performance of the largest and most liquid Shariah compliant companies based on the FTSE Global Equity Index Series large-cap and mid-cap companies. Constituents are weighted by their adjusted market capitalisation, applying the investibility factor' (Bloomberg, 2016). Currently, the index comprises of 1428 equities.

The screening process for this index involves two stages. In the first stage, companies are screened out on their business sector. According to FTSE International Limited (2016), companies involved in the following activities are classified as non-halal and screened out:

a) Conventional Finance (non-Islamic Banking, Finance and Insurance, etc.)
b) Alcohol
c) Pork related products and non-halal food production, packaging and processing or any other activity related to pork and non-halal food
d) Entertainment (Casinos, Gambling, Cinema, Music, Pornography and Hotels)
e) Tobacco
f) Weapons, arms and defence manufacturing

The second stage involves further screening out of companies based on financial criteria. Companies that meet the following criteria qualify as constituents:

a) Debt is less than 33.333% of total assets
b) Cash and Interest bearing items are less than 33.333% of total assets
c) Accounts receivable and cash are less than 50% of total assets
d) Total interest and non-compliant activities income should not exceed 5% of total revenue

The remaining companies after the two stages of the screening process are then listed in the index.

1.3.9. Portfolio

A portfolio is a collection of investment assets. The collection can consist of a vast array of assets that can include foreign stocks and bonds, real estate, precious metals, collectibles, futures, options, and other derivatives. (Bodie et al., 2010)

1.3.10. Portfolio Performance

Performance of a portfolio is based on the contribution of each component asset towards the returns and risk of the portfolio. There are various models used to measure the performance of a portfolio such as the Capital Asset Pricing Model (CAPM). Risk of a portfolio (and an index) is also referred to as volatility. This paper will use both terms interchangeably throughout this paper.

1.3.11. Constituent

Member of an index or an equity/asset listed in an index.

1.3.12. Investment Theory/Modern Portfolio Theory

Investment theory explains various methods that enable an investor to choose a suitably profitable investment path by employing appropriate strategies. These strategies include diversification through appropriate asset selection and risk allocation, choosing the feasible combinations of risk-returns through appropriate capital allocation strategies, and optimisation of portfolio (performance) through correct allocation of weightage to assets within the portfolio. (Bodie et al., 2010, p. 11)

1.3.13. Portfolio Diversification

Portfolio diversification is when the asset selection process is done in a way so that assets from different industries with varying risk thresholds are selected. Consequently, the portfolio risk is spread out across those assets and the risk of the portfolio at any one time irrespective of how the market is behaving is never too high. To put it simply, it means that many different assets are held in the portfolio with consideration of how they behave with respect to each other so that the exposure of risk to any one particular asset is limited. Greater the size of the asset pool, greater the ability to diversify the portfolio through asset selection. (Bodie et al., 2010, p. 11 & 149)

1.3.14. Risk Premium

Risk Premium represents the value of returns earned in excess of the risk-free rate.

2. Critical Literature Review

Shariah indexes and SRI indexes are similar in ideology and performance but vary with respect to their specific screening criteria. Therefore, this section will review existing literature on both Shariah and SRI indexes together for screened indexes with the understanding that both types of screened indexes behave similarly.

Through extensive research it was identified that most of the existing academic literature mainly investigates various aspects of the Dow Jones SRI and Shariah indexes plus a few others, thus, indicating a lack of (academic) literature on the performance of FTSE SRI and Shariah indexes. Therefore, some of the existing literature on the performance of other screened indexes will be critically reviewed with the assumption that they would behave similar to the FTSE4GOOD Global Index and FTSE Shariah All-World Index. Albaity and Ahmad (2011) found no significant difference between the performances of FTSE Global Islamic Index, FTSE4GOOD Global Index, Dow Jones Islamic Market Index and Dow Jones Sustainability Index for the period of 1999-2007.

The main difference between the Dow Jones indexes and the FTSE indexes lies in the way that they are weighted: Dow Jones is a group of price-weighted indexes whereas FTSE 100 for example, being the most popular FTSE index, is a capital-weighted index. FTSE indexes are market capital driven and their gearing is dependent upon the flow of market capital. Dow Jones indexes are asset driven and their gearing is dependent upon asset value (based on each asset's price). Performance of the FTSE indexes takes the changes in the market into account more than the Dow Jones indexes do so the evidence from this paper would be an important addition to the current literature as it would provide a different perspective of the performance of screened indexes.

Like most others, the debate around the performance of screened indexes (and their portfolios and funds) also has a divide. Most claim through extensive research that they perform better due to the elimination of high risk assets while others argue that they are likely to face performance penalties due to the elimination of disqualifying assets which reduces the size of the asset pool. Some also argue that due to the latter argument, screened indexes might have lower returns and higher risk but some researchers have found evidence that disproves that. This section will examine the ongoing debate around the performance of screened indexes.

A general trend identified by BinMahfouz and Hassan (2013) as well as Johnson (2013) for both types of investments, SRI and Shariah, was that they are skewed towards growth stocks or equities to be specific. Evidence for this in Shariah investment can be seen in Table 1.3 below which gives a breakdown of Shariah investment with respect to the type of assets:

Mandate	Percentage Contribution
Equity	46.9%
Money Markets	22.2%
Mixed Assets	11.8%
Real Estate	9.0%
Sukuk	5.8%
Commodities	3.4%
Others	0.9%
Trade Finance	0.1%
Structured Products / Hedge Funds	0.1%
Total	**100%**

Table 2. 1: Funds by Asset Class, Global Islamic Finance Forum Magazine (2012)

With an increased awareness of global warming and an increase in global conflicts, screened indexes have gained significant popularity in the past few years as investors are beginning to question the contribution their investments make towards such issues: companies that investors have been investing in might have a high level of carbon emissions which increase global warming or might deal with arms and ammunitions which make global conflicts worse through easy provision of weaponry.

2.1. Performance of screened and conventional indexes

FTSE International Limited (2013) noted in their research that the screening process can have a significant impact on the size of an index i.e. the number of constituents that qualify reduces such as the screening process of FTSE Developed World Index to achieve FTSE Shariah Developed Word Index reduced the number of constituents 'from around 2050 to just 960'. Based on investment theory, this would allow for an assumption of weaker performance and higher risk due to a restricted pool of assets for portfolio asset selection which would allow for less diversification. BinMahfouz and Hassan (2013) identified that previous studies of Shariah screening criteria do not indicate an inferior performance due to screening but the

screening criteria are actually more likely to have a positive impact on the investment portfolio by selection of the remaining companies with stronger and stables performances. They also identified that despite differences in screening criteria, there are no significant differences between the performances and principles of SRI and Shariah indexes so the two types of screened indexes can be presented as a joint viable option for all ethical and sustainable investors. PWC (2009) noted in their paper that there are various issues that exist in the Shariah investments industry as the market is still young but these issues should get resolved as the screened investment sector matures. However, despite the prevalent issues the sector offers attractively high rewards not unlike the conventional investment sector. PWC (2009) also conclude in their report that Shariah-compliant funds face similar challenges to those faced in conventional asset management implying that there is no difference between their investment styles. The Cambridge Zero Carbon Society (2016) highlight in their report encouraging divestment from fossil fuels that based on a 5 year analysis, the process of screening indexes does not reduce the index and portfolio performance but can actually enhance their performance in some cases especially in terms of Sharpe Ratios when compared with their conventional counterparts. Charles et al. (2015) discovered that the Shariah indexes exhibited either an equal or higher performance than their conventional counterparts when the Dow Jones Shariah indexes were compared to their conventional counterparts. Girard and Hassan (2008) conducted research on five FTSE Islamic indexes, including the FTSE Global Islamic Index, from 1998 until 2006 which revealed that there was no difference between the risk adjusted performances of screened indexes and conventional indexes. Euromoney Institutional Investor PLC (2009) noted that due to the better performance of screened indexes and funds during the global financial crisis in 2007-2008, investors have been attracted towards them for future investments. They also point out that Shariah indexes and funds are not inflation-proof so they would need to include criteria and measures that accommodate for inflation and other such variables to continue achieving positive performance in the future as well. Ashraf and Mohammad (2014) found evidence of better performance by Shariah indexes than conventional indexes from an analysis of 12 indexes with different geographical limitations for a 10 year period of 2002-2012. Ashraf (2012) found further evidence of better performance by Islamic funds than conventional funds in a separate research conducted on Islamic funds in Saudi Arabia. The findings also suggest that this is possible due to the fact that ‘Islamic funds can provide hedging against

adverse economic conditions'. Mansor and Bhatti's (2011) research on Malaysian indexes and their screened counterparts showed marginal significance of the difference between their respective performances. This strengthened the observations by Hassan et al. (2010) that also reflected similar results for the Malaysian indexes and their screened counterparts.

On the other side of the debate Rana and Akhter (2015) provided evidence from research conducted in Pakistan for the underperformance of KMI 30 (Shariah) index when compared with its conventional counterpart KSE 100. Marriage (2016) discusses concerns regarding the improving performance of the tobacco industry despite divestment from tobacco by so many investors for ethical investment objectives. The article quotes figures for lost returns (and profits) for companies that divested from tobacco to range from $1.9 billion to $3 billion. This implies that screening out companies that produce such products and offer high returns has a negative impact on the performance of investments. Additionally, Hussein (2004) noted in an earlier study that the reduced levels of diversification due to the screening process would cause screened investment vehicles to underperform the conventional investment vehicles.

2.2. Risk of screened indexes and conventional indexes

Research conducted by Charles et al. (2015) revealed that Dow Jones Shariah indexes were more risky than their conventional counterparts. However, they also noted, like PWC (2009), that the Shariah indexes were affected by the same extreme events such as the global financial crisis of 2007-2008 which might produce biased results. Al-Zoubi and Maghyereh (2007) conducted research on the risk performance comparison of the Dow Jones Islamic index with the Dow Jones World index. Their results based on the Value-at-Risk (VAR) model revealed that the level of risk exposure for the Shariah index was significantly less than the level of risk exposure for the conventional index. Abdullah et al. (2007), and Ghoul and Karam (2007) highlighted in their respective research that screening criteria provide better investment options with reduced risk levels by excluding highly leveraged companies and those involved in activities with high uncertainty such as gambling. Additionally, Dharani and Natarajan's (2011) comparison of screened indexes with conventional indexes in India also gave results of lower risk levels for screened indexes than conventional indexes. Analysis of the UK SRI mutual funds by Gregory and Whittaker (2007) shows that screened funds are less exposed to market volatility than conventional funds. Kreander et al. (2005) found similar results for European SRI Funds which were also found to be less exposed to market risk than

conventional funds. Johnson (2013) reiterates comments by Mr Al Jabri, chief executive of Saudi Arabia's Sedco, highlighting that due to the screening out of high leverage companies especially in Shariah investing, the performance of screened indexes is better as the lack of high leverage equities implies less exposure to market risk.

Charles et al (2015) find 'the same number of variance changes in the conventional and screened indexes within the same time period'. However, their analysis of risk and risk-adjusted performances for conventional and screened indexes reveal that the screened indexes had a higher level of risk than the conventional indexes. Further evidence for this side of the debate was found by Scholtens (2005) who found that Dutch SRI Funds had higher levels of risk than their conventional counterparts. Schroder (2007) supported these results with further evidence of SRI indexes being exposed to more systematic risk than conventional indexes. Furthermore, it was noted by Hussein and Omran (2005) that as the screening process eliminates larger firms, the remaining smaller firms exhibit more volatility.

2.3. Summary

Comparison of the performance of conventional indexes with the performance of screened indexes provides very important evidence to be added to the ongoing debate. However, it is worth noting that 'financial returns for Islamic and ethic investors is not always of primary importance' (Hassan et al., 2005). Most of the literature provides evidence that the performance of the screened indexes (portfolios and funds) is either greater than or equal to the performance of the conventional indexes (portfolios and funds). A substantial number of studies also indicate that the screened indexes outperformed the conventional indexes during the global financial crisis from 2007 until 2008. However, evidence from research on the levels of risk and risk-adjusted performances provides with mixed conclusions. Most studies lean more towards screened indexes having lower levels of risk than conventional indexes but a significant number of studies also provide evidence for screened indexes being more volatile than the conventional indexes. Analysis of the investment styles of the two types of indexes reveals that there is not a significant difference as both types are exposed to the same market factors and have to adjust in similar ways. These findings reflect the analysis by Mercer (2009) of 12 academic studies: '10 studies showed evidence of a positive relationship between ESG factors and financial performance, 2 studies found a negative relationship between the factors and performance, and 4 studies reported a neutral relationship'.

3. Research Methodology

The adopted research method was a combination of quantitative and qualitative research. Quantitative research refers to research concerned with quantities and measurements whereas qualitative research concerns in-depth exploratory studies (Biggam, 2015). Qualitative strategy was used to investigate and understand historical secondary data published by other researchers and quantitative strategy was adopted to manipulate and analyse historical and current data to add empirical evidence to the current literature. Data was obtained from the Bloomberg database, FTSE International Limited online database, various journals, and organisations that publish index-related data.

3.1. Hypothesis

Investors have different objectives for investing, however, maximising returns tends to be a common one. Investment theory suggests that in order to maximise returns, an investor must invest in a diversified portfolio with a mixture of financial assets from different industries and sectors. As commonly known 'in terms of investment, one must never put all their eggs in one basket' and distribute them amongst different divisions to diversify. This process of diversification also reduces volatility and minimises risk that the portfolio or fund is exposed to. As screened indexes eliminate a significant number of investment assets through the implementation of ethical, religious and sustainable criteria, theory implies that portfolios constructed from these indexes would experience a performance penalty due to the reduced size of asset pool available for asset selection which in turn would only allow for restricted diversification. MIFC (2015) also identifies that the main challenge faced in the acceptance of screened investments is the fear of sacrifice in performance due to the application of the screening criteria. Therefore, this paper will investigate the following hypothesis through a comparison of 5 portfolios created from 4 different indexes.

Hypothesis:

According to investment theories, SRI and Shariah investments should experience a performance penalty due to a restricted pool of assets available for asset selection and, therefore, greater exposure to risk due to less diversification.

3.2. Data Selection

As mentioned previously in section 2, research on screened indexes revealed a gap in research on screened FTSE indexes. Therefore, four FTSE indexes were selected for the data analysis:

FTSE 100 Index, FTSE All-Share Index, FTSE4GOOD Global Index, and FTSE Shariah All-World Index. An additional fifth index was created from equities that overlapped in the FTSE Shariah All-World Index and FTSE4GOOD Global Index. Characteristics for these indexes are given below:

	Index	Ticker	No. of Constituents
1.	FTSE 100 Index	UKX	100
2.	FTSE All-Share Index	ASX	639
3.	FTSE4GOOD Global Index	4GGL	782
4.	FTSE Shariah All-World Index	SWORLDS	1428
5.	FTSE4GOOD & FTSE Shariah Overlapping	N/A	354

Table 3. 1: Index Characteristics

From the four indexes, five portfolios were created for an analysis of performance and risk using the following criteria:

i. Top 100 equities from FTSE 100 index
ii. Top 100 equities from FTSE All-Share Index
iii. Top 100 equities from FTSE Shariah All-World Index
iv. Top 100 equities from FTSE4GOOD Global Index
v. Top 100 equities from FTSE Shariah All-World Index and FTSE4GOOD Global Index overlapping Index

The time period selected for the data analysis was a 10 year period from 2006 until 2016. Data for the additional year of 2006 is for the purpose of calculating asset and portfolio returns. Due to time limitation, the benchmark for each portfolio was set as the index that it was created from only. The following categories of data were used for the analysis of each portfolio:

i. Last Price
   Bloomberg Ticker: PX_LAST
ii. 12 Months Dividend Yield
   Bloomberg Ticker: EQY_DVD_YLD_12M

Weight for each equity within a portfolio was allocated based on its respective market capital.

3.3. Data Collection

Data was collected using the Bloomberg Database Software on campus. Data for UKX index and ASX Index was readily available, however, data for SWORLDS Index and 4GGL Index was

not available for academic purposes. Therefore, two different methods of data collection were adopted for conventional indexes and screened indexes respectively.

Data for the top 100 companies in UKX index and ASX index was downloaded directly from the Bloomberg Database. It was then analysed using Microsoft Excel. Results are discussed in section 4.

Data for SWORLDS Index and 4GGL Index was difficult to gather due to lack of availability. Therefore, a simulation of the indexes was created using a list of constituents of each index. The most recent lists of constituents available were from January 2015. The names of companies in the lists did not match the tickers used by Bloomberg, thus, the first stage of data collection for the SWORLDS Index and 4GGL Index involved downloading of tickers using the Bloomberg Symbol Lookup database and Bloomberg's online database in some cases. As a simulation of indexes needed to be created to identify the top 100 equities in each index, data for volume of shares and price was downloaded for each equity in order to calculate the index weights using the formula below:

$$Weight = \frac{Shares \times Price}{Total\ value\ of\ all\ shares\ in\ the\ Index}$$

Then the list of each index was ranked based on weight and data for the top 100 selected equities was downloaded from the Bloomberg Database.

Final data for the five portfolios consisted of constituents listed below. The weight represents the equities' weight in their respective indexes.

i. Top 100 equities from FTSE 100 index

#	Constituent	Weight
1.	HSBC Holdings PLC	5.45%
2.	British American Tobacco PLC	4.86%
3.	Royal Dutch Shell PLC	4.63%
4.	GlaxoSmithKline PLC	4.49%
5.	BP PLC	4.27%
6.	Royal Dutch Shell PLC	4.14%
7.	Vodafone Group PLC	3.68%
8.	AstraZeneca PLC	3.10%

9.	Diageo PLC	2.94%
10.	Lloyds Banking Group PLC	2.64%
11.	Reckitt Benckiser Group PLC	2.63%
12.	SABMiller PLC	2.52%
13.	Unilever PLC	2.35%
14.	National Grid PLC	2.34%
15.	BT Group PLC	2.33%
16.	Imperial Brands PLC	2.26%
17.	Prudential PLC	2.12%
18.	Barclays PLC	1.73%
19.	Rio Tinto PLC	1.63%
20.	Shire PLC	1.56%
21.	WPP PLC	1.29%
22.	Compass Group PLC	1.26%
23.	BHP Billiton PLC	1.16%
24.	Glencore PLC	1.10%
25.	Aviva PLC	1.10%
26.	CRH PLC	1.00%
27.	SSE PLC	0.95%
28.	Standard Chartered PLC	0.94%
29.	BAE Systems PLC	0.88%
30.	Tesco PLC	0.86%
31.	ARM Holdings PLC	0.85%
32.	RELX PLC	0.83%
33.	Legal & General Group PLC	0.82%
34.	Rolls-Royce Holdings PLC	0.76%
35.	Experian PLC	0.74%
36.	Centrica PLC	0.74%
37.	Associated British Foods PLC	0.68%
38.	Smith & Nephew PLC	0.66%
39.	International Consolidated Airlines Group	0.62%

40.	Wolseley PLC	0.62%
41.	Sky PLC	0.59%
42.	Anglo American PLC	0.56%
43.	Old Mutual PLC	0.55%
44.	Land Securities Group PLC	0.55%
45.	London Stock Exchange Group PLC	0.54%
46.	ITV PLC	0.53%
47.	Kingfisher PLC	0.52%
48.	Royal Bank of Scotland Group PLC	0.47%
49.	Next PLC	0.46%
50.	British Land Co PLC/The	0.45%
51.	Paddy Power Betfair PLC	0.45%
52.	Whitbread PLC	0.44%
53.	Marks & Spencer Group PLC	0.43%
54.	Bunzl PLC	0.43%
55.	Pearson PLC	0.41%
56.	Capita PLC	0.41%
57.	InterContinental Hotels Group PLC	0.41%
58.	Standard Life PLC	0.40%
59.	United Utilities Group PLC	0.40%
60.	Sage Group PLC/The	0.40%
61.	Carnival PLC	0.39%
62.	Persimmon PLC	0.38%
63.	Randgold Resources Ltd	0.38%
64.	Taylor Wimpey PLC	0.37%
65.	Johnson Matthey PLC	0.35%
66.	DCC PLC	0.34%
67.	Burberry Group PLC	0.33%
68.	Barratt Developments PLC	0.33%
69.	Intertek Group PLC	0.33%
70.	Severn Trent PLC	0.33%

71.	Direct Line Insurance Group PLC	0.32%
72.	GKN PLC	0.30%
73.	Mondi PLC	0.30%
74.	TUI AG	0.30%
75.	Babcock International Group PLC	0.30%
76.	RSA Insurance Group PLC	0.29%
77.	Travis Perkins PLC	0.29%
78.	Ashtead Group PLC	0.29%
79.	3i Group PLC	0.28%
80.	Hammerson PLC	0.28%
81.	St James's Place PLC	0.28%
82.	Royal Mail PLC	0.28%
83.	Rexam PLC	0.27%
84.	Dixons Carphone PLC	0.27%
85.	Provident Financial PLC	0.27%
86.	Informa PLC	0.26%
87.	Wm Morrison Supermarkets PLC	0.26%
88.	Inmarsat PLC	0.26%
89.	J Sainsbury PLC	0.25%
90.	Berkeley Group Holdings PLC	0.24%
91.	easyJet PLC	0.23%
92.	Admiral Group PLC	0.22%
93.	Worldpay Group PLC	0.22%
94.	Mediclinic International PLC	0.22%
95.	Merlin Entertainments PLC	0.19%
96.	Intu Properties PLC	0.18%
97.	Schroders PLC	0.18%
98.	Hargreaves Lansdown PLC	0.17%
99.	Coca-Cola HBC AG	0.17%
100.	Fresnillo PLC	0.11%

Table 3. 2: FTSE 100 Index Portfolio Equities

ii. Top 100 equities from FTSE All-Share Index

#	Constituent	Weight
1.	HSBC Holdings PLC	4.48%
2.	British American Tobacco PLC	3.84%
3.	Royal Dutch Shell PLC	3.75%
4.	GlaxoSmithKline PLC	3.56%
5.	BP PLC	3.47%
6.	Royal Dutch Shell PLC	3.35%
7.	Vodafone Group PLC	2.92%
8.	AstraZeneca PLC	2.46%
9.	Diageo PLC	2.32%
10.	Lloyds Banking Group PLC	2.14%
11.	Reckitt Benckiser Group PLC	2.09%
12.	SABMiller PLC	1.98%
13.	Unilever PLC	1.84%
14.	National Grid PLC	1.81%
15.	BT Group PLC	1.79%
16.	Imperial Brands PLC	1.75%
17.	Prudential PLC	1.73%
18.	Barclays PLC	1.44%
19.	Rio Tinto PLC	1.38%
20.	Shire PLC	1.21%
21.	WPP PLC	1.04%
22.	Compass Group PLC	1.00%
23.	BHP Billiton PLC	0.98%
24.	Glencore PLC	0.90%
25.	Aviva PLC	0.87%
26.	CRH PLC	0.81%
27.	SSE PLC	0.75%
28.	Standard Chartered PLC	0.75%

29.	BAE Systems PLC	0.75%
30.	Tesco PLC	0.69%
31.	ARM Holdings PLC	0.67%
32.	RELX PLC	0.67%
33.	Legal & General Group PLC	0.66%
34.	Rolls-Royce Holdings PLC	0.63%
35.	Experian PLC	0.60%
36.	Centrica PLC	0.59%
37.	Associated British Foods PLC	0.53%
38.	Smith & Nephew PLC	0.52%
39.	International Consolidated Airlines Group	0.50%
40.	Wolseley PLC	0.49%
41.	Sky PLC	0.49%
42.	Anglo American PLC	0.48%
43.	Old Mutual PLC	0.45%
44.	Land Securities Group PLC	0.44%
45.	London Stock Exchange Group PLC	0.42%
46.	ITV PLC	0.42%
47.	Kingfisher PLC	0.42%
48.	Royal Bank of Scotland Group PLC	0.39%
49.	Next PLC	0.37%
50.	British Land Co PLC/The	0.36%
51.	Paddy Power Betfair PLC	0.36%
52.	Whitbread PLC	0.36%
53.	Marks & Spencer Group PLC	0.34%
54.	Bunzl PLC	0.33%
55.	Pearson PLC	0.33%
56.	Capita PLC	0.33%
57.	InterContinental Hotels Group PLC	0.32%
58.	Standard Life PLC	0.32%
59.	United Utilities Group PLC	0.31%

60.	Sage Group PLC/The	0.31%
61.	Carnival PLC	0.31%
62.	Persimmon PLC	0.30%
63.	Randgold Resources Ltd	0.30%
64.	Taylor Wimpey PLC	0.30%
65.	Johnson Matthey PLC	0.28%
66.	DCC PLC	0.27%
67.	Burberry Group PLC	0.26%
68.	Barratt Developments PLC	0.26%
69.	Intertek Group PLC	0.26%
70.	Severn Trent PLC	0.26%
71.	Direct Line Insurance Group PLC	0.24%
72.	GKN PLC	0.24%
73.	Mondi PLC	0.24%
74.	TUI AG	0.24%
75.	Babcock International Group PLC	0.24%
76.	RSA Insurance Group PLC	0.23%
77.	Travis Perkins PLC	0.23%
78.	Ashtead Group PLC	0.23%
79.	3i Group PLC	0.23%
80.	Hammerson PLC	0.23%
81.	St James's Place PLC	0.22%
82.	Smith’s Group PLC	0.22%
83.	Royal Mail PLC	0.22%
84.	Rexam PLC	0.22%
85.	Dixons Carphone PLC	0.21%
86.	Provident Financial PLC	0.21%
87.	Informa PLC	0.21%
88.	Wm Morrison Supermarkets PLC	0.21%
89.	Inmarsat PLC	0.20%
90.	J Sainsbury PLC	0.20%

91.	Croda International PLC	0.20%
92.	Berkeley Group Holdings PLC	0.19%
93.	easyJet PLC	0.19%
94.	Admiral Group PLC	0.18%
95.	Auto Trader Group PLC	0.18%
96.	DS Smith PLC	0.18%
97.	Worldpay Group PLC	0.18%
98.	Mediclinic International PLC	0.17%
99.	Right move PLC	0.17%
100.	Scottish Mortgage Investment Trust PLC	0.17%

Table 3. 3: FTSE All-Share Index Portfolio Equities

iii. Top 100 equities from FTSE Shariah All-World Index

#	Constituent	Country	Weight
1.	Apple Inc.	USA	2.59%
2.	Exxon Mobil Corporation	USA	1.83%
3.	Johnson & Johnson	USA	1.56%
4.	Procter & Gamble	USA	1.09%
5.	Hospira	USA	1.05%
6.	Pfizer	USA	1.05%
7.	Novartis (REGD)	SWIT	1.02%
8.	Coca-Cola	USA	0.97%
9.	Chevron	USA	0.96%
10.	Roche Holdings (GENUS)	SWIT	0.89%
11.	Home Depot	USA	0.84%
12.	Samsung Electronics	KOR	0.79%
13.	Merck & Co	USA	0.77%
14.	Pepsi co	USA	0.75%
15.	Intel Corp	USA	0.71%
16.	International Bus Machns.	USA	0.69%
17.	Catamaran Corp	CAN	0.63%

18.	Total	FRA	0.61%
19.	Bristol Myers Squibb	USA	0.60%
20.	Taiwan Semiconductor Manufacturing	TWN	0.59%
21.	Gilead Sciences	USA	0.59%
22.	CVS Health Corporation	USA	0.57%
23.	Omnicare Inc	USA	0.57%
24.	Novo-Nordisk B	DEN	0.55%
25.	Royal Dutch Shell A	UK	0.55%
26.	Sanofi	FRA	0.54%
27.	Cameron International Corp.	USA	0.54%
28.	Schlumberger	USA	0.54%
29.	L'Oreal	FRA	0.51%
30.	3M Company	USA	0.51%
31.	NTT Docomo	JA	0.50%
32.	BP	UK	0.50%
33.	Inditex	SP	0.50%
34.	AbbVie Inc	USA	0.50%
35.	SAP	GER	0.48%
36.	Royal Dutch Shell B	UK	0.48%
37.	Nippo	JA	0.48%
38.	NTT	JA	0.48%
39.	Bayer AG	GER	0.47%
40.	Siemens AG	GER	0.44%
41.	Walgreens Boots Alliance	USA	0.44%
42.	Actavis	USA	0.43%
43.	Vodafone Group	UK	0.43%
44.	Lilly (Eli) & Co	USA	0.42%
45.	Nike Inc Cl B	USA	0.40%
46.	KDDI Corp	JA	0.40%
47.	Unilever NV CVA	NETH	0.38%
48.	Tata Consultancy Services	IDA	0.37%

49.	Union Pacific Corp	USA	0.36%
50.	BASF	GER	0.36%
51.	AstraZeneca	UK	0.36%
52.	United Parcel Service	USA	0.36%
53.	Accenture Cl A	USA	0.35%
54.	Reckitt Benckiser Group	UK	0.34%
55.	Lowes Cos Inc	USA	0.34%
56.	Mondelez International Inc.	USA	0.34%
57.	Danaher Corp	USA	0.33%
58.	OAO Gazprom	RUS	0.31%
59.	Toll Holdings	AU	0.30%
60.	Biogen Idec	USA	0.30%
61.	Unilever	UK	0.29%
62.	Dow Chemical	USA	0.29%
63.	Texas Instruments	USA	0.29%
64.	Rosneft Oil	RUS	0.29%
65.	Occidental Petroleum	USA	0.29%
66.	Eni	ITA	0.28%
67.	Du Pont De Nemours	USA	0.28%
68.	Abbott Laboratories	USA	0.28%
69.	Broadcom Corp	USA	0.28%
70.	ConocoPhillips	USA	0.28%
71.	CNOOC (Red Chip)	CHN	0.27%
72.	Statoil ASA	NOR	0.27%
73.	Telstra Corp	AU	0.26%
74.	EMC Corp	USA	0.26%
75.	Hennes & Mauritz B	SWED	0.26%
76.	TJX Companies	USA	0.25%
77.	Salesforce.com	USA	0.25%
78.	BHP Billiton Ltd	AU	0.25%
79.	General Motors	USA	0.24%

80.	Canadian National Railway	CAN	0.24%
81.	Reliance Industries	IDA	0.24%
82.	Adobe Systems Inc	USA	0.23%
83.	Express Scripts Holding	USA	0.23%
84.	Danone	FRA	0.23%
85.	Kimberly-Clark	USA	0.23%
86.	Enel	ITA	0.23%
87.	Iberdrola	SP	0.23%
88.	Singapore Telecommunications	SI	0.23%
89.	Vinci	FRA	0.22%
90.	EOG Resources	USA	0.22%
91.	Fedex Corporation	USA	0.22%
92.	Public Storage	USA	0.22%
93.	Canadian Oil Sands Trust	CAN	0.22%
94.	Suncor Energy	CAN	0.22%
95.	ABB	SWIT	0.22%
96.	Rio Tinto	UK	0.22%
97.	Continental	GER	0.22%
98.	CITIC Pacific (Red Chip)	CHN	0.21%
99.	Phillips 66	USA	0.21%
100.	Monsanto Company	USA	0.21%

Table 3. 4: FTSE Shariah All-World Index Portfolio Equities

iv. Top 100 equities from FTSE4GOOD Global Index

#	Constituent	Country	Weight
1.	Apple Inc.	USA	2.74%
2.	Microsoft Corp	USA	2.07%
3.	Johnson & Johnson	USA	1.64%
4.	Wells Fargo & Company	USA	1.33%
5.	Google Class C	USA	1.26%
6.	AT&T	USA	1.26%

7.	Nestle	SWIT	1.26%
8.	Procter & Gamble	USA	1.15%
9.	Google Class A	USA	1.10%
10.	Verizon Communications	USA	1.09%
11.	Novartis (REGD)	SWIT	1.08%
12.	Coca-Cola	USA	1.02%
13.	Roche Holdings (GENUS)	SWIT	0.94%
14.	Toyota Motor	JA	0.89%
15.	Disney (Walt) Company	USA	0.89%
16.	Merck & Co	USA	0.81%
17.	Comcast A	USA	0.78%
18.	Comcast Special A	USA	0.78%
19.	Bank of America	USA	0.78%
20.	Intel Corp	USA	0.75%
21.	Cisco Systems	USA	0.71%
22.	Citigroup	USA	0.71%
23.	HSBC Holdings	UK	0.68%
24.	United health Group	USA	0.66%
25.	Total	FRA	0.64%
26.	Bristol Myers Squibb	USA	0.63%
27.	CVS Health Corporation	USA	0.60%
28.	Covidien	USA	0.59%
29.	Medtronic	USA	0.59%
30.	Novo-Nordisk B	DEN	0.58%
31.	Royal Dutch Shell A	UK	0.58%
32.	Sanofi	FRA	0.57%
33.	GlaxoSmithKline	UK	0.55%
34.	L'Oreal	FRA	0.54%
35.	NTT Docomo	JA	0.53%
36.	Inditex	SP	0.53%
37.	SABMiller	UK	0.52%

38.	Commonwealth Bank of Australia	AU	0.51%
39.	SAP	GER	0.51%
40.	Royal Dutch Shell B	UK	0.51%
41.	Bayer AG	GER	0.50%
42.	Royal Bank Of Canada	CAN	0.47%
43.	Siemens AG	GER	0.47%
44.	Allergan	USA	0.45%
45.	Vodafone Group	UK	0.45%
46.	LVMH	FRA	0.45%
47.	Starbucks	USA	0.44%
48.	Toronto-Dominion Com	CAN	0.43%
49.	Deutsche Telekom	GER	0.43%
50.	Allianz SE	GER	0.42%
51.	Nike Inc Cl B	USA	0.42%
52.	Westpac Banking Corp	AU	0.41%
53.	Unilever NV CVA	NETH	0.40%
54.	Qualcomm	USA	0.39%
55.	US Bancorp	USA	0.39%
56.	Union Pacific Corp	USA	0.38%
57.	BASF	GER	0.38%
58.	AstraZeneca	UK	0.38%
59.	Accenture Cl A	USA	0.37%
60.	Banco Santander	SP	0.37%
61.	Reckitt Benckiser Group	UK	0.36%
62.	Goldman Sachs Group	USA	0.36%
63.	Diageo	UK	0.36%
64.	Lloyds Banking Group	UK	0.36%
65.	Pall Corp	USA	0.35%
66.	Mitsubishi UFJ Financial	JA	0.35%
67.	BNP Paribas	FRA	0.35%
68.	Softbank	JA	0.34%

69.	BT Group	UK	0.34%
70.	UBS Group AG	SWIT	0.33%
71.	AXA	FRA	0.33%
72.	American Express Com	USA	0.33%
73.	Time Warner Cable Inc.	USA	0.32%
74.	Biogen Idec	USA	0.32%
75.	Bank of Nova Scotia	CAN	0.32%
76.	Unilever	UK	0.31%
77.	Time Warner	USA	0.31%
78.	Blackrock Inc	USA	0.31%
79.	Eni	ITA	0.30%
80.	Chubb Corp	USA	0.29%
81.	Australia & New Zealand Banking Group	AU	0.29%
82.	National Australia Bank	AU	0.29%
83.	BMW	GER	0.29%
84.	Heineken NV	NETH	0.29%
85.	National Grid	UK	0.28%
86.	Statoil ASA	NOR	0.28%
87.	Telefonica	SP	0.28%
88.	Ford Motor Company	USA	0.28%
89.	Telstra Corp	AU	0.27%
90.	EMC Corp	USA	0.27%
91.	Hennes & Mauritz B	SWED	0.27%
92.	TJX Companies	USA	0.27%
93.	Salesforce.com	USA	0.27%
94.	BHP Billiton Ltd	AU	0.26%
95.	Prudential	UK	0.26%
96.	Canadian National Railway	CAN	0.25%
97.	Adobe Systems Inc	USA	0.25%
98.	ING Group CVA	NETH	0.24%
99.	Kimberly-Clark	USA	0.24%

100.	Enel	ITA	0.24%

Table 3. 5: FTSE4GOOD Global Index Portfolio Equities

v. Top 100 overlapping equities in FTSE Shariah All-World Index and FTSE4GOOD Global Index

	Constituents	Country	Weight
1.	Apple Inc.	USA	6.28%
2.	Johnson & Johnson	USA	3.77%
3.	Procter & Gamble	USA	2.63%
4.	Novartis (REGD)	SWIT	2.48%
5.	Coca-Cola	USA	2.35%
6.	Roche Holdings (GENUS)	SWIT	2.15%
7.	Merck & Co	USA	1.86%
8.	Intel Corp	USA	1.73%
9.	Total	FRA	1.48%
10.	Bristol Myers Squibb	USA	1.45%
11.	CVS Health Corporation	USA	1.38%
12.	Novo-Nordisk B	DEN	1.34%
13.	Royal Dutch Shell A	UK	1.33%
14.	Sanofi	FRA	1.31%
15.	L'Oreal	FRA	1.24%
16.	NTT Docomo	JA	1.22%
17.	Inditex	SP	1.21%
18.	SAP	GER	1.17%
19.	Royal Dutch Shell B	UK	1.17%
20.	Bayer AG	GER	1.14%
21.	Siemens AG	GER	1.07%
22.	Vodafone Group	UK	1.04%
23.	Nike Inc Cl B	USA	0.96%
24.	Unilever NV CVA	NETH	0.92%
25.	Union Pacific Corp	USA	0.88%

26.	BASF	GER	0.88%
27.	AstraZeneca	UK	0.87%
28.	Accenture Cl A	USA	0.85%
29.	Reckitt Benckiser Group	UK	0.83%
30.	Biogen Idec	USA	0.73%
31.	Unilever	UK	0.71%
32.	Eni	ITA	0.69%
33.	Statoil ASA	NOR	0.65%
34.	Telstra Corp	AU	0.63%
35.	EMC Corp	USA	0.62%
36.	Hennes & Mauritz B	SWED	0.62%
37.	TJX Companies	USA	0.62%
38.	Salesforce.com	USA	0.61%
39.	BHP Billiton Ltd	AU	0.61%
40.	Canadian National Railway	CAN	0.58%
41.	Adobe Systems Inc	USA	0.57%
42.	Kimberly-Clark	USA	0.55%
43.	Enel	ITA	0.55%
44.	Iberdrola	SP	0.55%
45.	Public Storage	USA	0.54%
46.	Suncor Energy	CAN	0.53%
47.	ABB	SWIT	0.53%
48.	Rio Tinto	UK	0.52%
49.	ASML Holding	NETH	0.50%
50.	Automatic Data Process	USA	0.49%
51.	McKesson	USA	0.47%
52.	Hermes International S.C.A.	FRA	0.46%
53.	Takeda Pharmaceutical	JA	0.46%
54.	Syngenta	SWIT	0.46%
55.	CSL	AU	0.46%
56.	Shire	UK	0.44%

57.	Deutsche Post	GER	0.43%
58.	Yahoo	USA	0.41%
59.	Becton Dickinson	USA	0.41%
60.	CareFusion Corporation	USA	0.41%
61.	Air Products And Chemcom	USA	0.38%
62.	WPP	UK	0.36%
63.	Astellas Pharmaceutical	JA	0.36%
64.	Boston Scientific Corp	USA	0.36%
65.	MTR Corp	HK	0.35%
66.	Holcim	SWIT	0.35%
67.	Lafarge	FRA	0.35%
68.	Essilor Intl	FRA	0.34%
69.	Kao	JA	0.34%
70.	Linde	GER	0.34%
71.	Ebay	USA	0.33%
72.	Hewlett-Packard	USA	0.33%
73.	Adidas	GER	0.33%
74.	Sysco Corp	USA	0.33%
75.	BHP Billiton	UK	0.33%
76.	Henkel KG Pref	GER	0.32%
77.	Henkel Kgaa ORD	GER	0.32%
78.	Sherwin-Williams	USA	0.32%
79.	Johnson Controls	USA	0.32%
80.	Electricite de France (EDF)	FRA	0.32%
81.	St Gobain (Cie De)	FRA	0.31%
82.	CSX Corp	USA	0.31%
83.	Koninklijke Philips NV	NETH	0.30%
84.	Baxter Intl	USA	0.30%
85.	Ericsson B	SWED	0.29%
86.	Weyerhaeuser	USA	0.29%
87.	CRH	UK	0.28%

88.	Zimmer Holdings	USA	0.28%
89.	SSE	UK	0.27%
90.	Mitsui & Co	JA	0.27%
91.	Canadian Pacific Railway	CAN	0.27%
92.	Kering	FRA	0.26%
93.	Assa Abloy B	SWED	0.26%
94.	St Jude Medical	USA	0.26%
95.	Atlas Copco A	SWED	0.26%
96.	Amorepacific Corp	KOR	0.26%
97.	Panasonic Corp	JA	0.26%
98.	Fuji Film Holdings	JA	0.25%
99.	Lauder (Estee)	USA	0.25%
100.	Gas Natural	SP	0.25%

Table 3. 6: FTSE Shariah All-World Index and FTSE4GOOD Global Index Overlapping Portfolio Equities

All data was downloaded on the 3rd of May, 2016 in British Pounds/GBP to ensure consistency and comparability.

3.4. Empirical Models

Models for the data analysis were selected based on the study of various other methodologies used in previous research on the performance of screened indexes, their funds and portfolios. The following models and formulae were used to analyse the indexes and their portfolios in section 4.

3.4.1. Returns performance analysis

Returns are a key indicator for how a portfolio has grown over a certain period of time. Portfolio returns also indicates the monetary returns that a portfolio holder would receive from their investment. Returns for each asset in the five portfolios were calculated using the formula below:

$$\text{Asset Returns} = \frac{\mathrm{P_t} - \mathrm{P_{t-1}} + D_t}{\mathrm{P_{t-1}}}$$

$$Where,$$

$$\mathrm{P_t} = \text{Price of Stock in Year t}$$

$$\mathrm{P_{t-1}} = \text{Price of Stock in Year t} - 1$$

$$D_t = \text{Dividend for Year t}$$

Based on the returns of each asset, the portfolio returns were calculated by taking a sum of all assets' average returns time their respective weights using the following formula:

$$\text{Portfolio Returns } = \sum_{\text{i=1}}^{\text{n}} \text{Weight}_\text{i}\text{Returns}_i$$

$$Where,$$

$$Weight_i = \text{Weight of Asset in Portfolio}$$

$$\text{Return}_\text{i} = \text{Average Historical Return of Asset}$$

$$\text{n} = \text{Total number of assets}$$

3.4.2. Risk (Standard deviation)

Risk is a very important factor to consider in investments as it represents the volatility of assets. Each investor has their own specific investment style and thus risk appetite. Risk for each equity was calculated using the standard deviation function in Microsoft Excel. However, the risk for each portfolio for calculated using the formula given below:

$$\text{Portfolio Risk } = \sum_{\text{i=1}}^{\text{n}} \text{Weight}_\text{i}\text{Risk}_\text{i}$$

$$Where,$$

$$Weight_i = \text{Weight of Asset in Portfolio}$$

$$\text{Risk}_\text{i} = \text{Average Historical Risk of Asset}$$

$$\text{n} = \text{Total number of assets}$$

The risk of an asset was multiplied by its assigned weight and this process was repeated for each asset within each portfolio. The obtained figures were then summed together to obtain the value of risk for each portfolio.

3.4.3. Sharpe Index

Also known as Sharpe Ratio, the Sharpe Index represents the reward-to-volatility ratio of the portfolio based on its risk premium. The ratio indicates the excess returns of the portfolio for each unit of risk that it is exposed to by dividing the portfolio's risk premium by its volatility (standard deviation) as shown below:

$$\text{Sharpe Ratio} = \frac{R_{pt} - R_{ft}}{\sigma_{pt}}$$

$$Where,$$

$$R_{pt} = Portfolio\ Return\ at\ Time\ t$$

$$R_{ft} = Risk\ Free\ Rate\ of\ Return\ at\ Time\ t$$

$$R_{pt} - R_{ft} = Portfolio\ Risk\ Premium$$

$$\sigma_{pt} = Portfolio\ Risk\ (Standard\ Deviation)\ at\ Time\ t$$

The higher the value of the Sharpe Ratio, the greater the reward or portfolio returns per unit of volatility and greater the efficiency of the portfolio. (Bodie et al., 2010, p. 124-125)

3.4.4. Capital Asset Pricing Model – CAPM (Jensen's Alpha & Beta)

The CAPM as shown below gives two measures, Jensen's Alpha and Beta, of a portfolio by using risk premiums for the portfolio and the market. A regression is run on the portfolio and market risk-premiums using the equation below to obtain results.

$$(R_{pt} - R_{ft}) = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \varepsilon_{pt}$$

$$Where,$$

$$R_{pt} = Portfolio\ Return\ at\ Time\ t$$

$$R_{ft} = Risk\ Free\ Rate\ of\ Return\ at\ Time\ t$$

$$R_{mt} = Market\ Return\ at\ Time\ t$$

$$\alpha_p = Jensen's\ Alpha$$

$$\beta_p = Portfolio\ Beta$$

$$\varepsilon_{pt} = Portfolio\ Error\ at\ Time\ t$$

$(R_p - R_f)$ represents the 'portfolio's excess returns over the risk free rate at time t' and $(R_m - R_f)$ represents the 'market risk premium over the risk free rate at time t'.

Jensen's Alpha

Jensen's Alpha indicates the returns in excess of the level of returns estimated by the CAPM. It also indicates whether a portfolio is achieving the appropriate level of returns with respect to its risk exposure. A positive value of Jensen's Alpha confirms that the portfolio is earning excess returns and a negative value indicates the opposite: greater the value of the Alpha, greater the portfolio's returns above the CAPM predicted level of returns.

Normally, the alpha value would also indicate the contribution of the asset manager as the additional excess returns is due to the management of the portfolio which includes asset selection and assigning of weights. However, as the top 100 equities were chosen from each index without the application of any additional selection criteria, this aspect of the Jensen's Alpha is not really applicable to this paper's data analysis.

Beta

Beta indicates the volatility, also referred to as the systematic risk, of the portfolio with respect to the market. It represents the units of volatility the portfolio would experience per each unit of volatility in the market. In other words, a beta value of 1 would mean that the portfolio is as volatile as the market i.e. the portfolio would earn returns similar to the market and would be exposed to similar level of risk as the market. A beta value less than 1 would mean the portfolio is less volatile than the market and would thus earn fewer returns than the market in a period of market growth but would also experience lower level of risk than the market during periods of high volatility. Consequently, a beta value greater than 1 would mean the portfolio is more volatile than the market with greater returns but also greater volatility.

R Square

The regression results also include the 'R Square' value which indicates how closely the portfolio's performance is linked with the market's performance. A value of 1, being the maximum possible value, indicates that the portfolio's performance is completely in line with the market's performance. Therefore, lower the value of the R Square measure, less in line the portfolio's performance is with the market's performance and vice versa. The value of R Square also represents the reliability of the Beta value; higher the R Square value, greater the reliability of the Beta value.

3.4.5. Treynor Index

Treynor Index, also known as Treynor Ratio, is another reward-to-volatility ratio. It differs from the Sharpe Index as it uses the Portfolio Beta as the measure of volatility (in the denominator) instead of the risk (standard deviation). The formula used for calculating the Treynor Index is given below:

$$\text{Treynor Ratio} = \frac{R_{pt} - R_{ft}}{\beta_p}$$

$$Where,$$

$$R_{pt} = Portfolio\ Return\ at\ Time\ t$$

$$R_{ft} = Risk\ Free\ Rate\ of\ Return\ at\ Time\ t$$

$$R_{pt} - R_{ft} = Portfolio\ Risk\ Premium$$

$$\beta_p = Portfolio\ Beta$$

It measures the risk-adjusted performance of the portfolio with respect to the systematic risk that it is exposed to. It indicates the portfolio returns earned in surplus of returns that could

be earned on a risk-free investment per each unit of systematic/market risk. Higher the value of Treynor Index, better the risk-adjusted performance of the portfolio.

3.5. Limitations

There were various limitations that were identified during the process of the literature review, data selection and data collection especially regarding the availability of data. Some limitations were also due to the fact that only the Bloomberg Database was available for data access. All identified limitations are listed below:

i. Most of the existing literature analyses Dow Jones screened indexes due to which there is limited literature available on FTSE screened indexes.
ii. Data for the FTSE screened indexes is controlled directly by FTSE Russel and is not available for academic purposes.
iii. For some equities data for a 10 year period is not available so data analysis for those equities had to be based on data for less than 10 years. This predominantly had an impact on the risk and variation calculations. Risk and variation figures could not be calculated for equities with data for only two years or less.
iv. Due to the unavailability of data, tickers needed to be downloaded for each equity in the screened indexes using a list from January 2015 which led to various other limitations:
    - Some companies had merged or had been acquired.
    - Some companies no longer existed.
    - Tickers for some companies couldn't be found.
    - Names of certain companies were recorded differently on the Bloomberg database.
    - Some names in the lists did not specify which class of stock to choose from which made the selection process difficult for those equities that had stocks of more than one class available.
    - Most Egyptian and Polish stocks could not be found.

A list of companies for which no tickers and other data could be found is given below in Table 3.7 and Table 3.8. Due to lack of data these equities could not be incorporated into the portfolio analysis.

3.5.1. FTSE Shariah All-World Index – Excluded equities

#	Constituent	Country
1.	CEZ	CZE
2.	Douja Promotion Groupe Addoha	MAR
3.	Egypt Kuwait Holding Co	EGY
4.	El Ezz Steel Rebars	EGY
5.	Elswedy Electric Co	EGY
6.	Enea S.A.	POL
7.	Energa SA	POL
8.	Fauji Fertilizer Co	PAK
9.	Federal'naya Setevaya Kompaniya Yedinoy Energeticheskoy Sist	RUS
10.	Galp Energia SGPS SA	PTL
11.	GDF SUEZ	FRA
12.	Goodman Fielder	AU
13.	Jastrzebska Spolka Weglowa Spolka Akcyjna	POL
14.	Juhayna Food Industries Co.	EGY
15.	Keurig Green Mountain	USA
16.	KGHM Polska	POL
17.	Lend Lease Group	AU
18.	LPP SA	POL
19.	MOL	HUN
20.	O2 Czech Republic	CZE
21.	Orange Polska SA	POL
22.	Pakistan Petroleum	PAK
23.	Petsmart	USA
24.	Pirelli & C	ITA
25.	PKN (Polski Koncern Naftowy)	POL
26.	Polska Grupa Energetyczna Sa	POL
27.	Polskie Gornictwo Naftowe I Gazownictwo	POL
28.	Polyus Gold International	UK
29.	Richter	HUN

30.	Sigma Aldrich	USA
31.	Synthos	POL
32.	Talisman Energy	CAN
33.	Tauron Polska Energia S.A.	POL
34.	Telecom Egypt	EGY
35.	TRW Automotive Holdings	USA

Table 3. 7: FTSE Shariah All-World Index Excluded Equities

3.5.2. FTSE4GOOD Global Index – Excluded Equities

#	Constituent	Country code
1.	Corio	NETH
2.	EDP	PTL
3.	Enel Green Power	ITA
4.	Federation Centres	AU
5.	Galp Energia SGPS SA	PTL
6.	Novion Property Group	AU
7.	Pirelli & C	ITA
8.	Polyus Gold International	UK
9.	Ace Ltd	USA
10.	McGraw Hill Financial	USA
11.	Scentre Group	AU

Table 3. 8: FTSE4GOOD Global Index Excluded Equities

All limitations mentioned above affect the confidence and reliability of the data results and analysis. This paper would recommend further research to overcome these limitations to obtain more accurate results.

4. Data Analysis

This section discusses results of the data analysis. For data analysis calculations, the 10 year Gilt rate recorded on the 3rd of May, 2016 was used as the risk-free rate.

Risk-free rate	1.53%

4.1. Comparison of Indexes

As discussed in previous sections, each of the four selected indexes has its own criteria for equity selection. Consequently, each index performs differently as well. Table 4.1 below provides a yearly breakdown of the historical returns of each index along with the average historical returns, risk (standard deviation), Sharpe Index, and Treynor Index. Treynor Index values for UKX and ASX were very low, therefore, figures needed to be presented in up to four decimal places. Results in Table 4.1 will be discussed below.

	UKX	ASX	SWORLDS	4GGL
2007	3.85%	2.13%	15.67%	3.23%
2008	-31.24%	-32.62%	-17.71%	-22.72%
2009	22.15%	25.11%	19.86%	16.61%
2010	9.06%	11.05%	14.57%	8.74%
2011	-5.49%	-6.56%	-7.63%	-9.09%
2012	5.91%	8.38%	5.51%	10.88%
2013	14.50%	16.80%	15.25%	21.04%
2014	-2.64%	-2.01%	7.94%	8.78%
2015	-4.87%	-2.39%	-0.97%	2.75%
2016	-0.84%	-1.34%	3.32%	-0.13%
Average Returns	1.04%	1.86%	5.58%	4.01%
Risk (S.D.)	14.37%	15.61%	11.79%	12.68%
Sharpe Index	-0.03	0.02	0.34	0.20
Treynor Index	-0.0049	0.0033	0.0405	0.0248

Table 4. 1: Comparison of Indexes' Returns

Key for Table 4.1:

UKX: FTSE 100 Index

ASX: FTSE All-Share Index

SWORLDS: FTSE Shariah All-World Index

4GGL: FTSE4GOOD Global Index

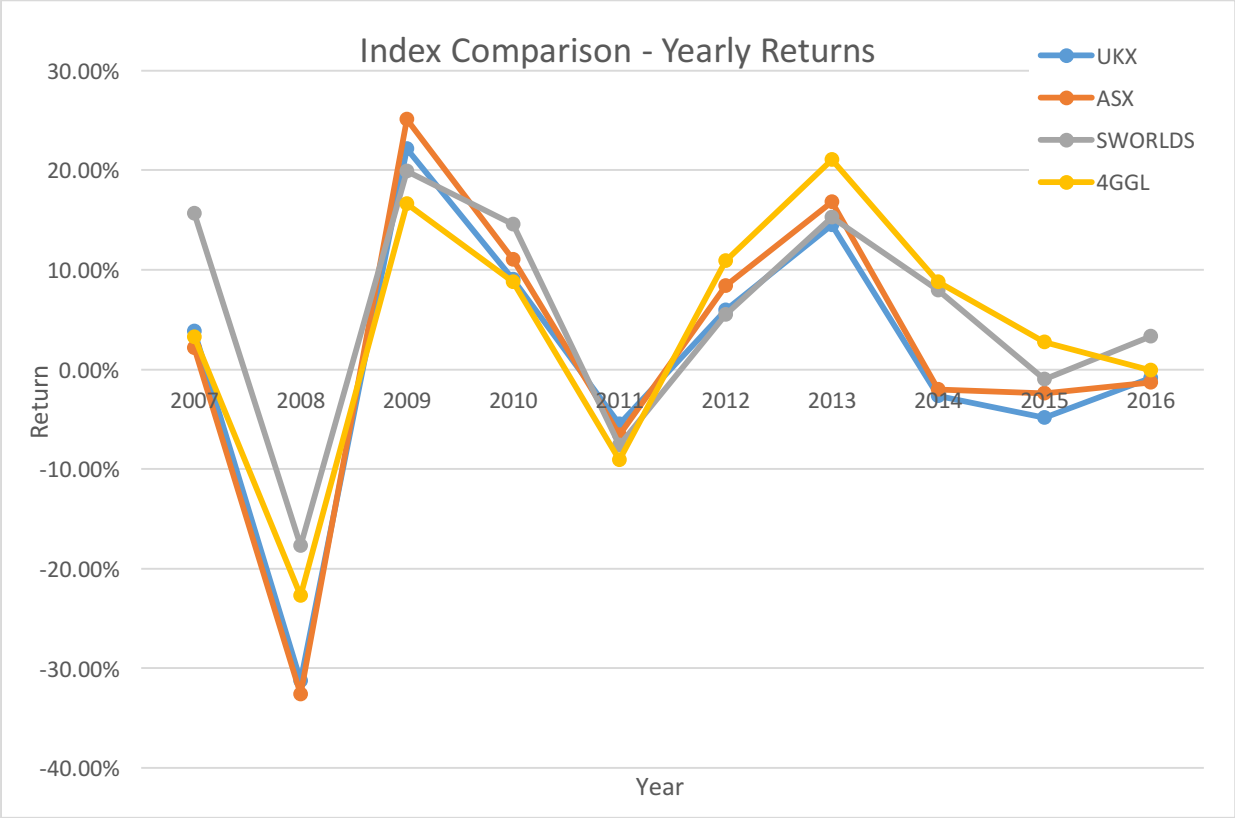

Figure 4. 1: Comparison of Indexes' Returns

Figure 4.1 above graphically represents the returns data in Table 4.1 indicating that returns of all four indexes have followed a similar growth pattern over the past ten years. This indicates that there has been no significant difference between the performances of the four indexes. Returns dropped significantly during the financial crisis from 2007 to 2008. However, SWORLDS and 4GGL maintained significantly higher returns than UKX and ASX during this period. Except for the period of 2009-2011, SWORLDS and 4GGL have continued to maintain higher returns than the conventional indexes until 2016, with notably higher returns in 2014. This indicates that the four indexes perform in a similar way but the SWORLDS and 4GGL indexes have outperformed the UKX and ASX indexes multiple times over the period of past ten years. The average returns figures also reflect this as the screened indexes are revealed to have overall outperformed the conventional indexes over the past decade

Risk figures calculated using the standard deviation model also indicate better performance by the screened indexes. The risk figures fall within a range of 11%-16% with the rates for SWORLDS and 4GGL being within a 1% range of each other and the UKX and ASX risk levels being 3-4% higher than them.

The Sharpe Index figures for the conventional indexes reveal a very low reward-to-volatility ratio and UKX's Sharpe Index actually reveals negative growth in returns for each unit of risk. Sharpe index figures for the screened indexes are also relatively low but significantly higher than the Sharpe Index figures for the conventional indexes. For each unit of risk, SWORLDS has earned 0.34 units of returns and 4GGL has earned 0.20 units of returns. Therefore, the screened indexes outperformed the conventional indexes with respect to the Sharpe Index as well.

Treynor Index figures were very low for all four indexes but were higher for the screened indexes. The positive Treynor Ratios for the ASX, SWORLDS and 4GGL indexes confirm that they had returns in excess of the returns that could be gained from a risk-free asset. SWORLDS had the highest excess returns, 4GGL had the second highest and ASX had the lowest excess returns. UKX had a negative Treynor Ratio indicating that it had returns less than the returns of a risk-free asset. Overall the screened indexes outperformed the conventional indexes with respect to the Treynor Index as they had the highest rewards-to-volatility ratios.

In summary, screened indexes outperformed conventional indexes as evidenced by the four empirical models above: Returns, Risk (standard deviation), Sharpe Index, and Treynor Index. Screened indexes achieved better performance than conventional indexes in each model thus indicating that screened indexes have not experience any performance penalties but have actually outperformed conventional indexes.

4.2. Portfolio statistics

A summary of the results of the empirical models for the five portfolios are presented in Table 4.2 below. The results are discussed in the sections below.

As mentioned previously, the benchmark for each portfolio was set as the index that it was created from. However, the fifth portfolio was constructed using equities that overlapped in both FTSE Shariah All-World Index and FTSE4GOOD Global Index so its analysis was conducted using both indexes as benchmarks individually. Portfolios were compared against their benchmarks in three empirical models: Sharpe Index, Capital Asset Pricing Model (Jensen's Alpha and Beta), and Treynor Ratio. Results for these models indicate that the portfolios in general outperformed their benchmark indexes.

Portfolio:	UKX	ASX	SWORLDS	4GGL	SWORLDS + 4GGL Overlap	
Market	UKX	ASX	SWORLDS	4GGL	SWORLDS	4GGL
Returns	101.28%	101.81%	42.09%	36.23%	51.67%	51.67%
Risk	93.27%	94.03%	31.72%	31.46%	27.77%	27.77%
Risk Free Rate	1.53%	1.53%	1.53%	1.53%	1.53%	1.53%
Sharpe Ratio	1.07	1.07	1.28	1.10	1.81	1.81
Jensen's Alpha	0.98	0.97	0.38	0.33	0.32	0.34
Beta	1.21	1.17	0.59	0.68	0.82	0.61
R Square	0.11	0.12	0.64	0.54	0.82	0.52
Treynor Ratio	0.83	0.86	0.69	0.53	0.61	0.83

Table 4. 2: Portfolio Statistics

Key for Table 4.2:

UKX: FTSE 100 Index Portfolio

ASX: FTSE All-Share Index Portfolio

SWORLDS: FTSE Shariah All-World Index Portfolio

4GGL: FTSE4GOOD Global Index Portfolio

SWORLDS + 4GGL Overlap: Overlapping SWORLDS and 4GGL equities Portfolio

4.2.1. Returns

	UKX	ASX	SWORLDS	4GGL	Overlapping
2007	65.92%	66.72%	51.22%	36.86%	47.39%
2008	119.72%	121.53%	34.27%	25.43%	19.04%
2009	242.03%	244.67%	55.92%	60.79%	51.88%
2010	75.21%	75.59%	46.46%	38.89%	43.81%
2011	70.85%	70.96%	36.78%	26.91%	32.58%
2012	95.94%	96.43%	38.24%	39.85%	36.11%
2013	79.64%	79.69%	47.33%	44.01%	42.42%
2014	81.97%	81.32%	43.57%	35.44%	41.10%
2015	68.42%	68.61%	30.93%	26.03%	20.96%
2016	85.69%	86.26%	30.93%	23.65%	36.92%

Table 4. 3: Yearly Returns for Portfolios

Yearly returns for portfolios, given in Table 4.3 above presented a slightly different picture than the yearly returns for the indexes presented in Table 4.1 and Figure 4.1. Conventional

portfolios had consistently higher historical returns than the screened portfolios for each year in the last decade.

Figure 4.2 gives a graphical representation of the yearly returns. The growth patterns for the portfolio returns are similar for the conventional portfolios and screened portfolios respectively. All portfolios had the highest returns in 2009 during the recovery period following the global financial crisis in 2007 and 2008. However, UKX and ASX had extraordinarily high growth in 2009. This could be due to very low returns during the crisis and then high positive growth

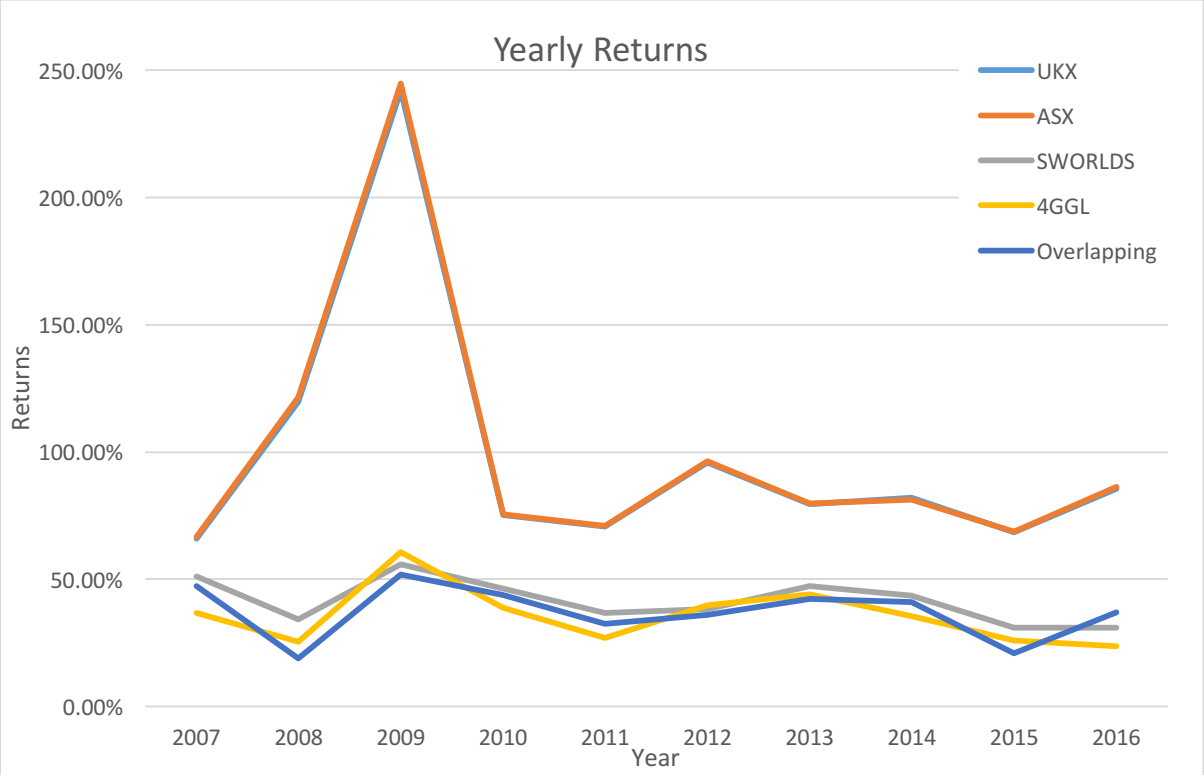

Figure 4. 2: Yearly Returns for Portfolios

As seen in Table 4.2, portfolios constructed from conventional indexes, UKX and ASX, outperformed the three screened indexes by a significant difference. Returns of the conventional portfolios were very similar with only a 0.53% difference. Following them was the overlapping index with 51.67% returns which is considerably greater than its parent indexes, SWORLDS and 4GGL. Therefore, conventional indexes outperformed the screened indexes with respect to returns. It is also noteworthy that all portfolios outperformed their benchmark indexes with respect to returns.

4.2.2. Risk (Standard deviation)

Risk results for the portfolios were similar to the risk results for the indexes. Screened portfolios were exposed to significantly less risk than the conventional portfolios with an approximate difference of 60% as shown in Figure 4.3. Risk exposure levels of all screened portfolios were very similar within the range of 27-32%. However, Portfolio of the SWORLDS and 4GGL overlapping index had the lowest risk and outperformed all the other portfolios with respect to risk. 4GGL and SWORLDS followed close behind with only a 3.69% and a 3.95% difference respectively. UKX and ASX portfolios came last with very similar high risk exposure within 1% range of each other. Their risk figures were just as high as their returns implying their Sharpe and Treynor Ratios might be very low. In conclusion, screened indexes clearly outperformed conventional indexes with respect to risk.

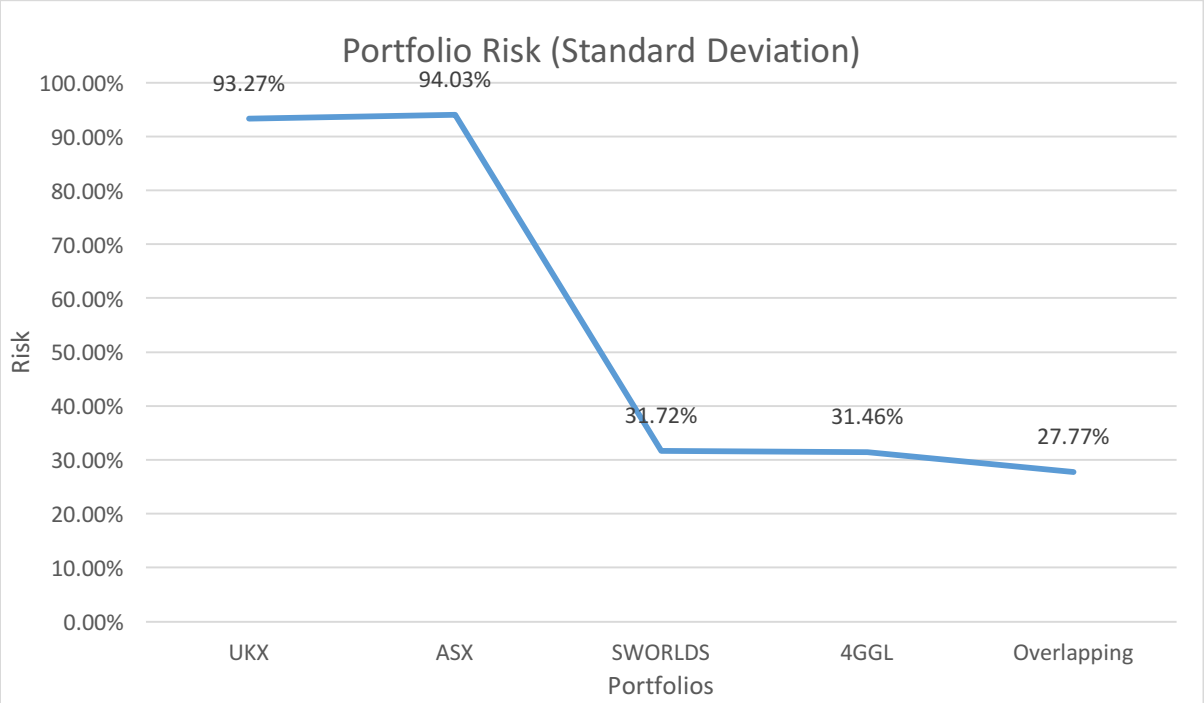

Figure 4. 3: Portfolio Risk

4.2.3. Sharpe Index

Higher returns of the conventional portfolios would have led to the assumption that their Sharpe Ratios would be higher as well. However, due to their high risk levels this was not the case. Both UKX and ASX portfolios had a Sharpe Index of 1.07 which indicates that for each unit of risk that they were exposed to they earned 1.07 units of returns. 4GGL portfolio had a slightly higher Sharpe Ratio at 1.10 indicating it earned 1.10 units of returns for each unit of risk it was exposed to. SWORLDS had the second best Sharpe Index as it earned 1.28 units of

returns for each unit of risk. SWORLDS and 4GGL overlapping index had the highest reward-to-volatility ratio at 1.81 indicating it earned almost twice as much units of returns as the risk it was exposed to.

Therefore, based on the evidence presented screened portfolios outperformed the conventional portfolios with respect to the Sharpe Index. Additionally, all portfolios also outperformed their benchmark indexes with significantly higher Sharpe Indexes, however, the overlapping index had the highest difference with both of its benchmarks' Sharpe Indexes. These results are also supported by the results published in a recent report by the Cambridge Zero Carbon Society's (2016).

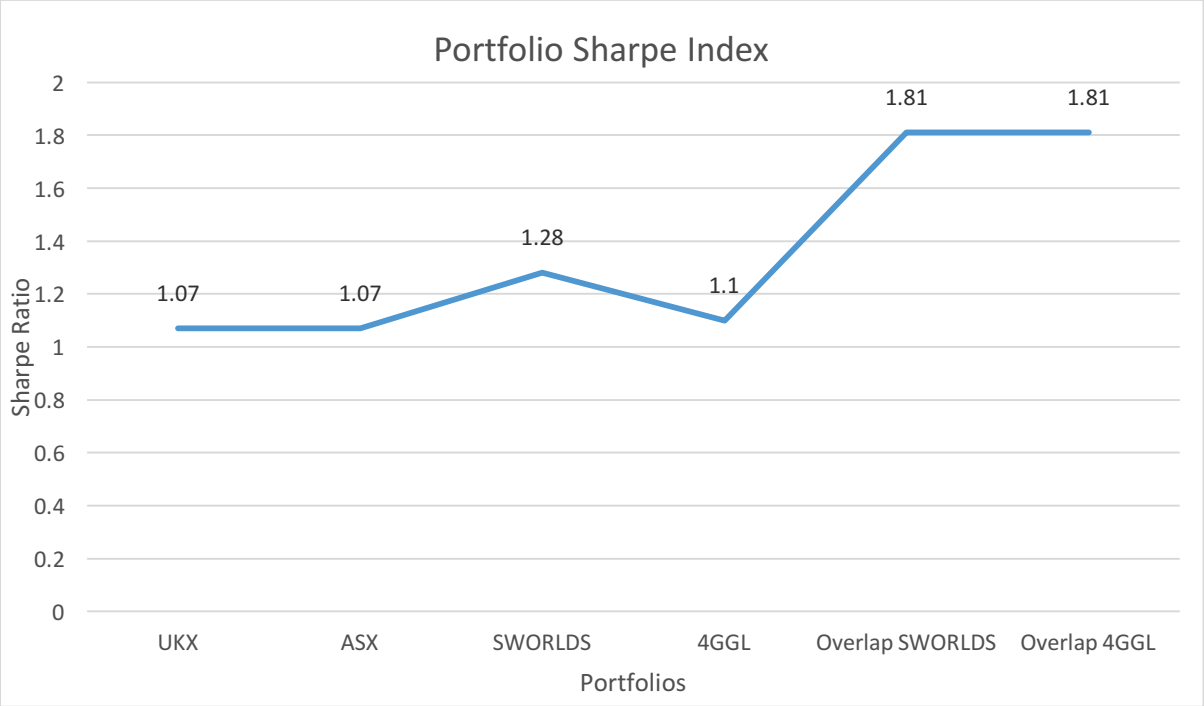

Figure 4. 4: Portfolio Sharpe Index

4.2.4. Capital Asset Pricing Model (CAPM)

The CAPM models for the conventional index portfolios, UKX and ASX, are very similar. The CAPM models for screened index portfolios, SWORLDS and 4GGL, portfolios are also very similar but the overlapping portfolio has slightly different results.

$$UKX: (R_{pt} - R_{ft}) = 0.98 + 1.\ 1(R_{mt} - R_{ft}) + 0.53$$

$$ASX: (R_{pt} - R_{ft}) = 0.97 + 1.17(R_{mt} - R_{ft}) + 0.54$$

$$SWORLDS: (R_{pt} - R_{ft}) = 0.38 + 0.59(R_{mt} - R_{ft}) + 0.06$$

$$4GGL: (R_{pt} - R_{ft}) = 0.33 + 0.68(R_{mt} - R_{ft}) + 0.08$$

$$Overlapping\ (SWORLDS\ Benchmark): (R_{pt} - R_{ft}) = 0.3\ \ + 0.8\ \ (R_{mt} - R_{ft}) + 0.05$$

$$Overlapping\ (4GGL\ Benchmark)\text{: } (R_{pt} - R_{ft}) = 0.34 + 0.61(R_{mt} - R_{ft}) + 0.08$$

The CAPM models reveal that the error figures for the conventional portfolios were significantly higher than those for the screened portfolios.

Jensen's Alpha

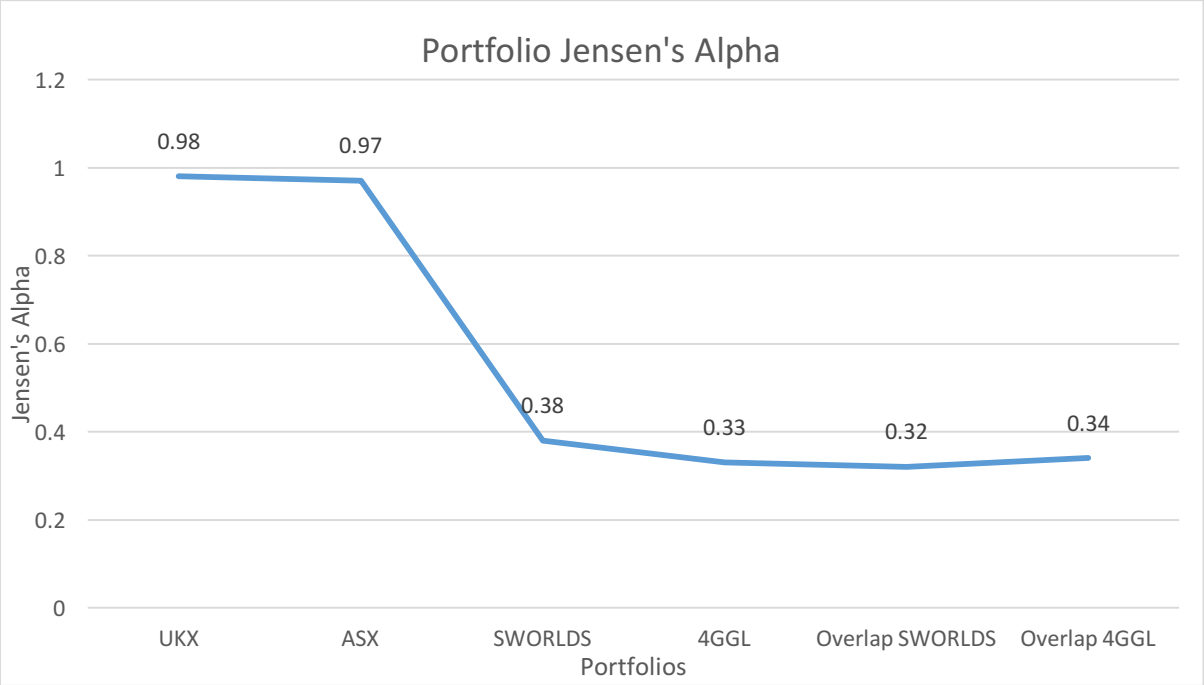

Figure 4. 5: Portfolio Jensen's Alpha

Jensen's Alpha figures for all portfolios were positive indicating that they all earned excess returns beyond the level of returns predicted by the CAPM. Jensen's Alpha figures for each type of portfolio were very consistent: figures for screened indexes varied between 0.32-0.38 and figures for conventional portfolios varied between 0.97-0.98. However, UKX and ASX had significantly higher Jensen's Alpha figures indicating they had greater excess returns than the level of returns predicted by the CAPM, thus, outperforming the screened portfolios with respect to the Jensen's Alpha measure.

Beta

As mentioned previously, Beta indicates the volatility of each portfolio with respect to the market. Volatility of the market is considered to be a benchmark with the value of 1 or 100% and the volatility of the portfolio is measured as a percentage against this market volatility spread. Beta figures for the portfolios are graphically represented in Figure 4.6 below.

Results revealed that both conventional portfolios were more volatile than the market: UKX was 21% more volatile and ASX was 17% more volatile. Higher volatility implies that the

portfolios would earn greater returns in a period of market growth and would experience greater risks and thus losses during any financial crisis that the market might face. This reflects back on the high risk figures for these portfolios linking them to their Beta values.

All three of the screened portfolios were less volatile than the market. SWORLDS portfolio was 41% less volatile than the market and 4GGL portfolio was 32% less volatile than the market. The SWORLDS and 4GGL overlapping portfolio had two significantly different Beta figures for comparison with each benchmark: with SWORLDS as the benchmark the portfolio was 18% less volatile and with 4GGL as the benchmark the portfolio was 39% less volatile than the market. Less volatility than the market implies that the portfolios would react less to changes in the market: they would experience less growth during market growth but would also experience less risk and volatility during periods of financial challenges such as the financial crisis in 2007 and 2008. This reflects back on the lower risk figures for these screened portfolios.

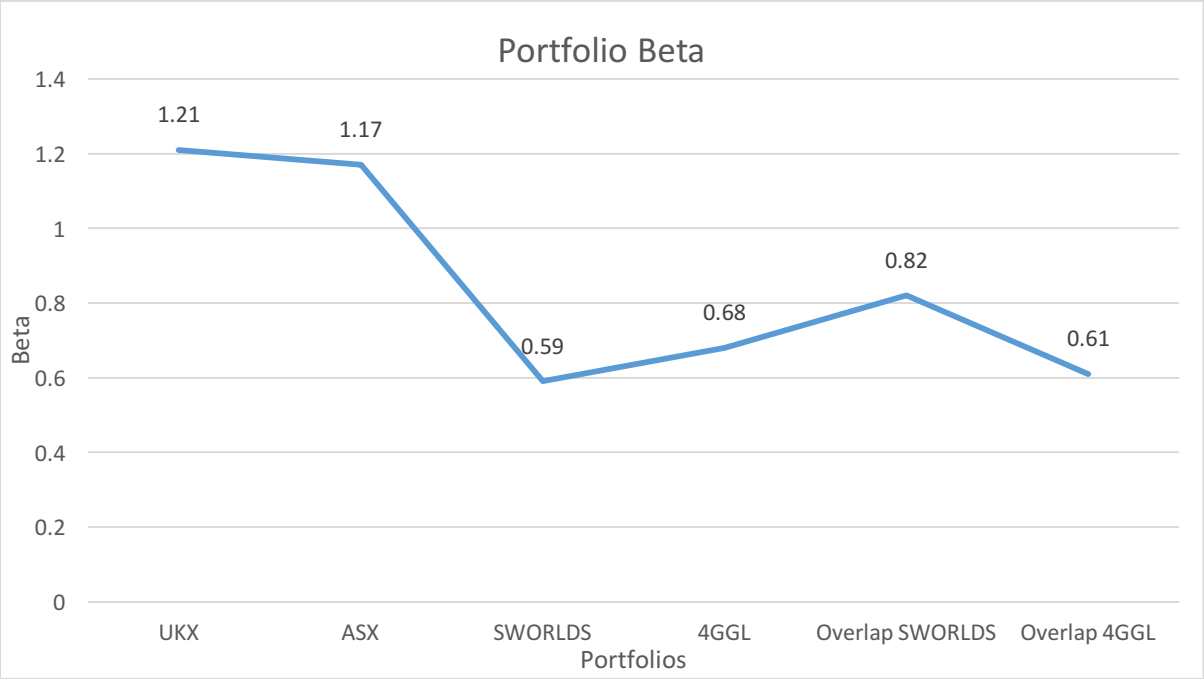

Figure 4. 6: Portfolio Beta

However, risk preference and volatility is purely dependent on the risk preference of the investor. As Beta figures for the five portfolios are significantly different, they do not clearly indicate whether one type of portfolios perform better than the other type but they do reinforce the risk results discussed in section 4.2.2. Higher volatility would be good in certain circumstances and lower volatility would be preferable in others making the interpretation of

Beta values circumstantial and open to interpretation. However, lower volatility does imply more certainty about future performance due to which it is considered as a positive characteristic by many investors. Lower risks and greater certainty in the future outcomes are usually preferred by investors thus it can be deduced that the screened portfolios have outperformed the conventional portfolios in this respect. However, to be specific it can be concluded that the overlapping portfolio with SWORLDS as the benchmark has outperformed the other portfolios with a Beta value close to 1: its volatility is less than the market but not too low so as to suggest significant loss of growth and also not too high to suggest significant exposure to risk if the market struggles.

R Square

R Square figures highlight how closely a portfolio follows the performance of a certain market or benchmark. It also indicates how reliable the figure for the Beta values are. High R Square figures imply that a portfolio follows the performance of a market very closely due to which the Beta value is reliable. Low figures indicate that a portfolio does not perform in line with the market and thus the Beta results are not very reliable. Figures 4.7, 4.8, 4.9, 4.10, 4.11 and 4.12 give a graphical representation of the CAPM for all portfolios.

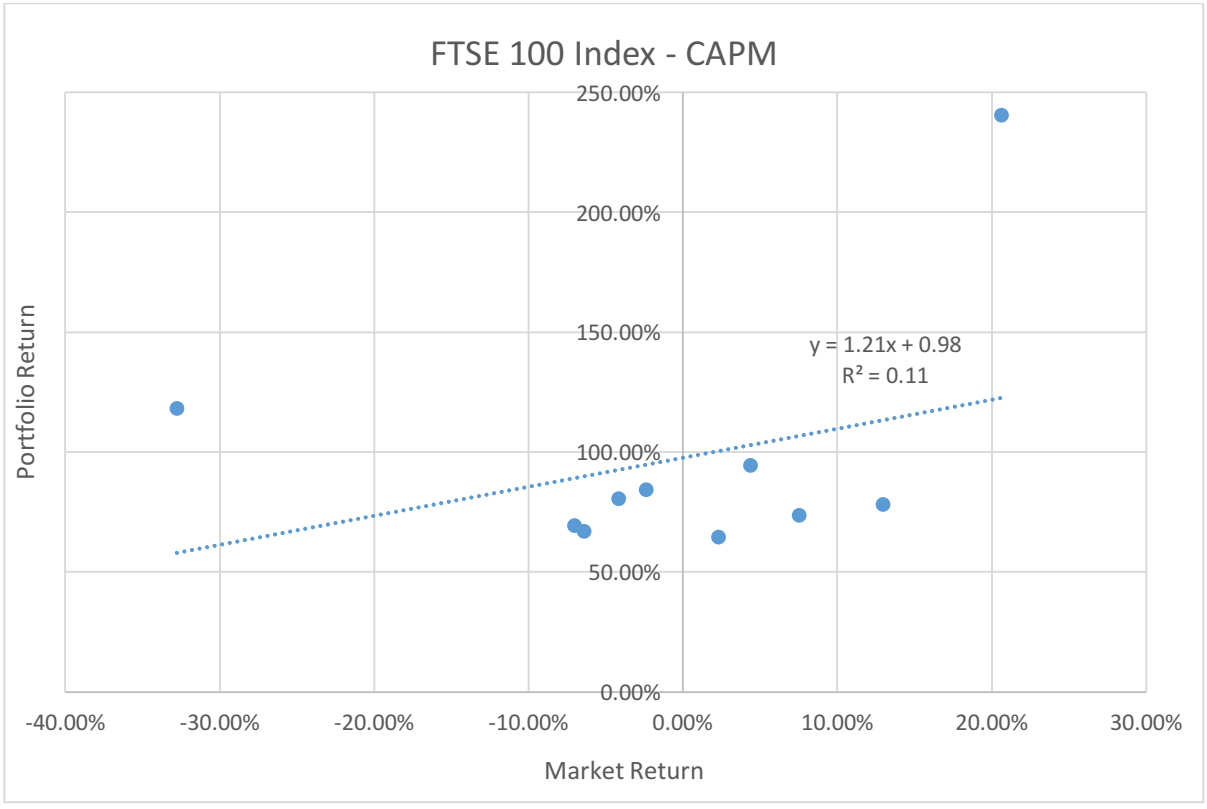

Figure 4. 7: FTSE 100 Index - CAPM

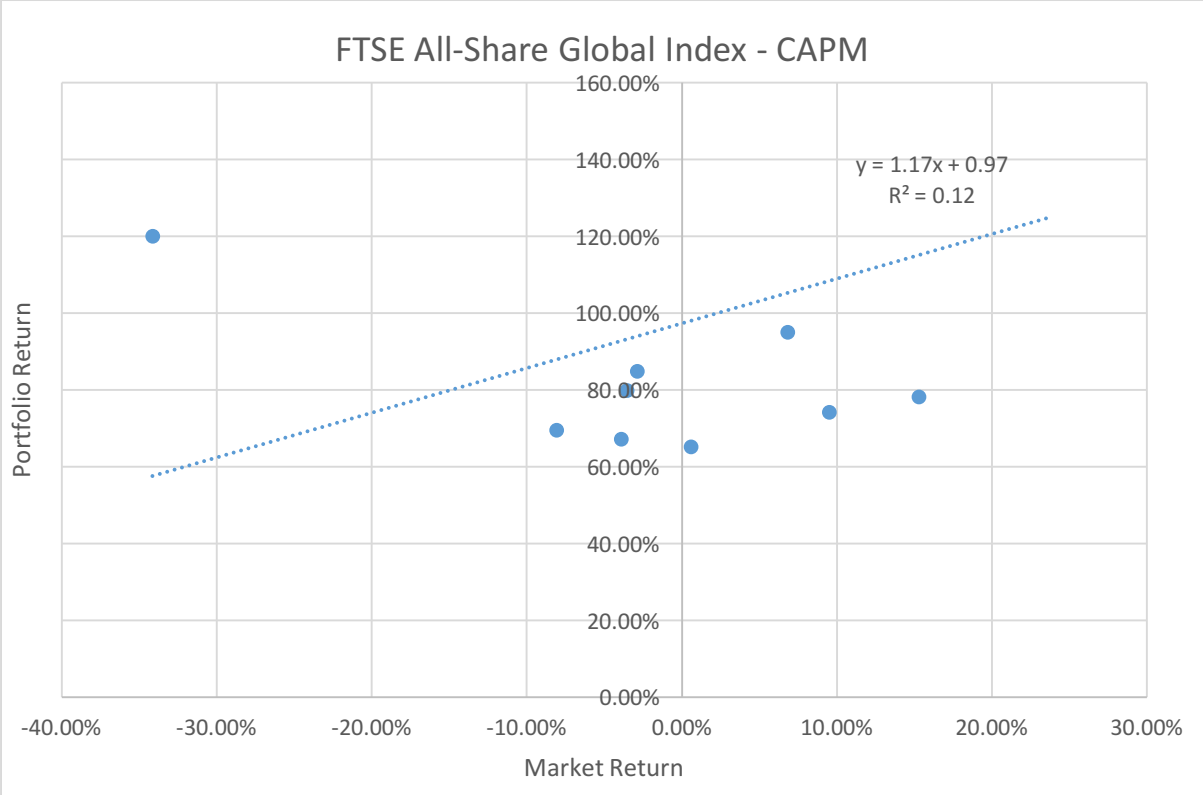

Figure 4. 8: FTSE All-Share Global Index - CAPM

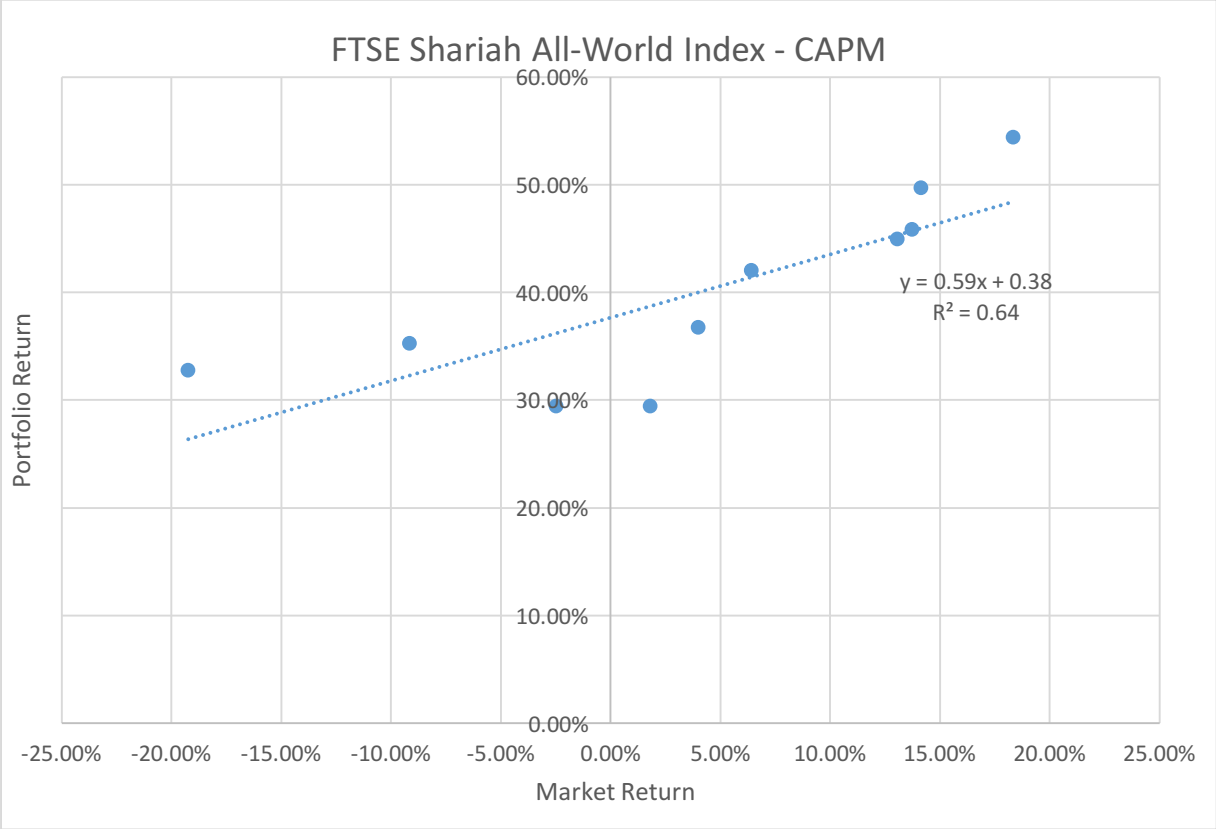

Figure 4. 9: FTSE Shariah All-World Index - CAPM

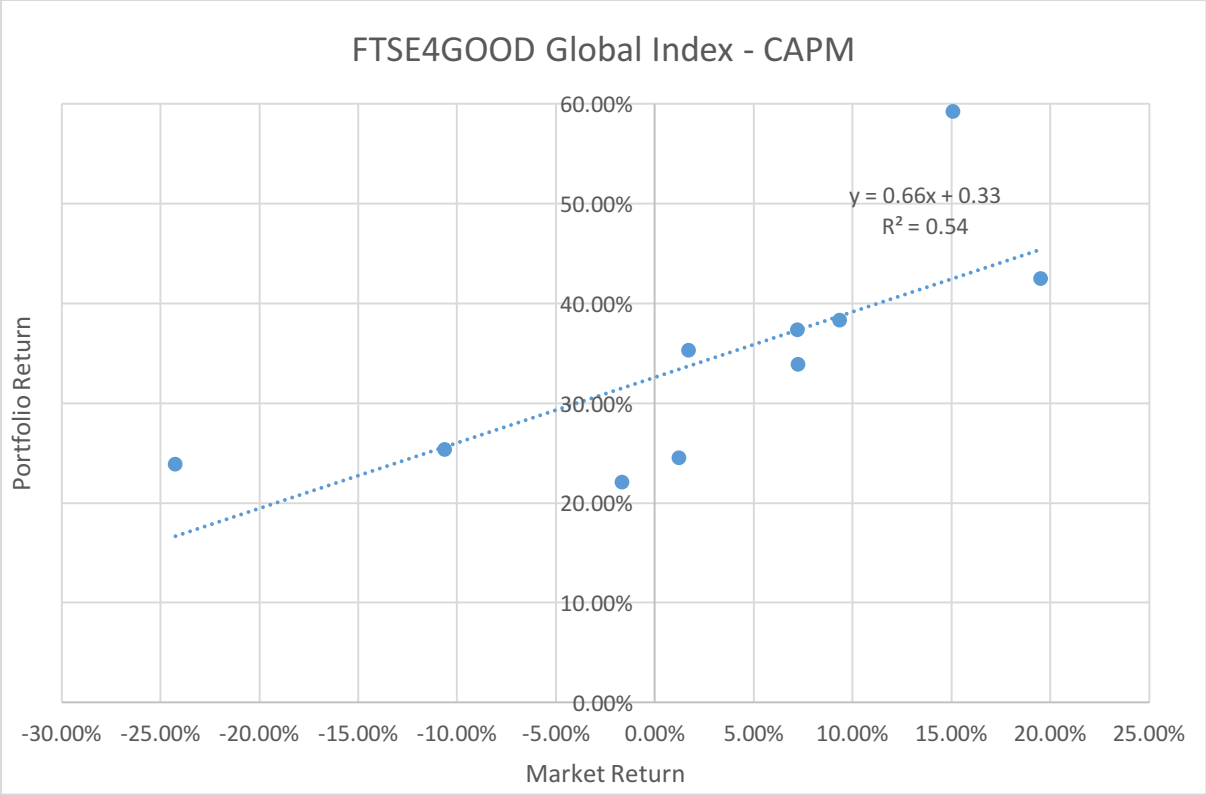

Figure 4. 10: FTSE4GOOD Global Index - CAPM

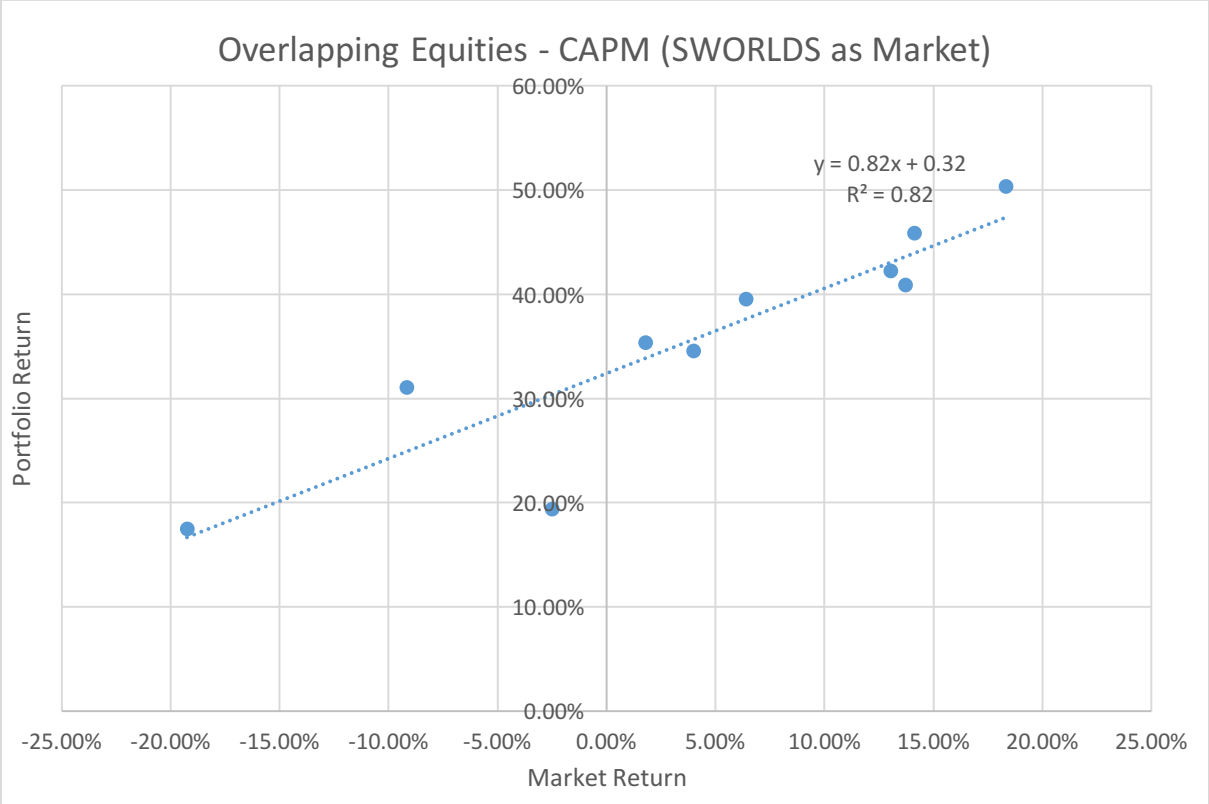

Figure 4. 11: Overlapping Equities with FTSE Shariah as Benchmark - CAPM

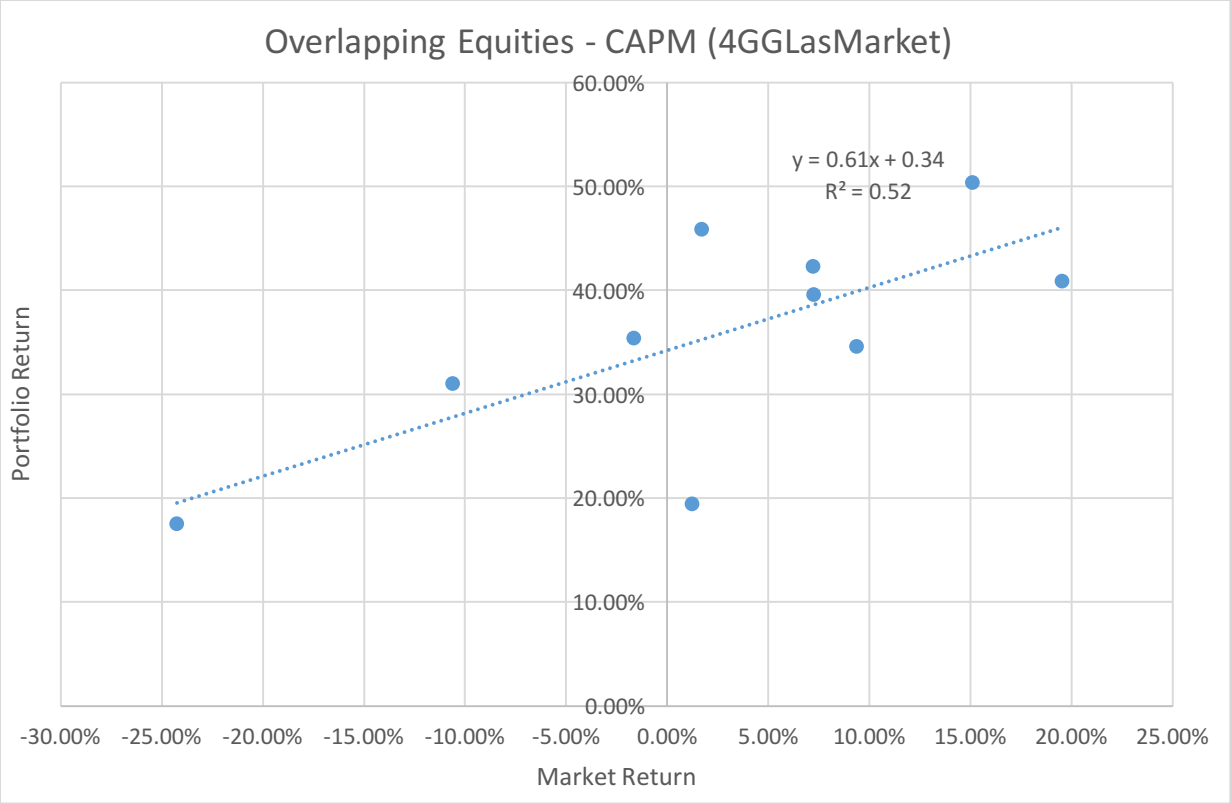

Figure 4. 12: Overlapping Equities with FTSE4GOOD as Benchmark - CAPM

The figures above highlight how close the trend line fit is to the actual data for the markets and portfolios. As seen in the figures, R square values for all portfolios except for the overlapping portfolio with SWORLDS index as the benchmark are very low. This suggests that the portfolios are not in line with the performance of their respective indexes or benchmarks. Therefore, further research would be required to confirm the results for the Beta values for these portfolios with low R Square figures as the low R square values indicate that the Beta figures are not very reliable. A high R Square value for the overlapping portfolio implies that it follows the performance of the SWORLDS index more than it follows the performance of the 4GGL index.

In conclusion, the R Square figures mostly highlight that the portfolios behave differently than their parent indexes or benchmarks. Due to the majority of R Square figures being very low, further research with a more appropriate portfolio selection method and more reliable data would be required to provide more conclusive result. However, this does not impact the reliability of figures for other models and analysis presented in this paper.

4.2.5. Treynor Index

As discussed previously in section 3, Treynor Index highlights the returns in excess of returns that could be earned on a risk-free asset. Figure 4.13 below gives a graphical comparison of Treynor Ratio figures for the five portfolios.

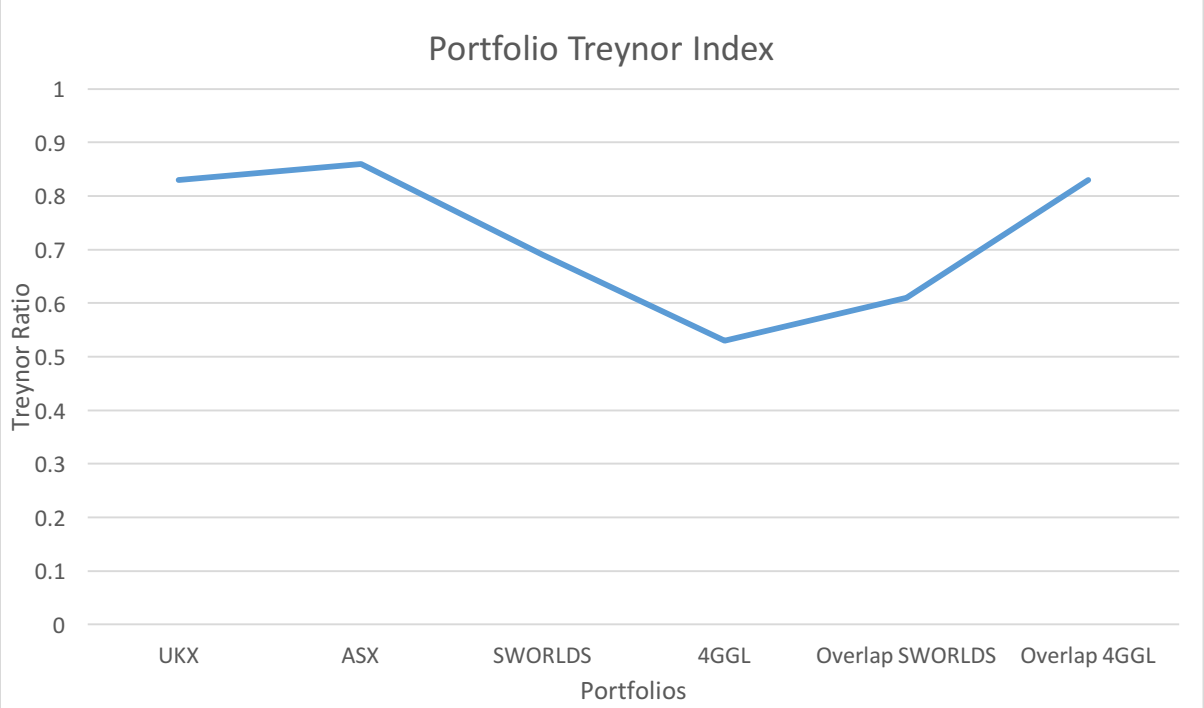

Figure 4. 13: Portfolio Treynor Index

Treynor ratio figures for all portfolios were positive indicating that they all earned returns in excess of returns from a risk-free asset. However, the ASX portfolio had the highest figure of 0.86 indicating 86% returns in excess of returns from a risk-free asset. The UKX portfolio and the overlapping portfolio with 4GGL as benchmark followed in second place with Treynor indexes of 0.83 indicating 83% excess returns. SWORLDS portfolio had 69% excess returns, the overlapping portfolio with SWORLDS as benchmark had 61 % excess returns and 4GGL portfolio had 53% excess returns. The Treynor Index results reveal that the conventional portfolios had an overall better performance than the screened portfolios.

4.3. Summary

The data results reveal that the two different types of portfolios, conventional and screened, outperform each other in different ways when their performance is measured using different models. Table 4.3 below summarises the best performance out of the 5 portfolios with respect to the five empirical models that were employed: Returns, Risk, Sharpe Index, Capital Asset Pricing Model (Jensen's Alpha and Beta), and Treynor Ratio.

Portfolio:	Best Performance
Returns	Conventional Portfolio
Risk	Screened Portfolio
Sharpe Index	Screened Portfolio
Jensen's Alpha	Conventional Portfolio
Beta	Screened Portfolio
Treynor Index	Conventional Portfolio

Table 4. 4: Consolidated Portfolio Results

The results reveal that conventional portfolios performed better in three measures: Returns, Jensen's Alpha, and Treynor Index. Screened portfolios performed better according to the other three measures: Risk (Standard Deviation), Sharpe Index and Beta. Therefore, neither type of portfolios can be classified as a better performer than the each other and thus it can be concluded that while the portfolios had varied results, they did not face any performance penalties as they outperformed each other in different aspects.

Table 4.4 below gives consolidated index analysis results which had significantly different results from that portfolio analysis.

Index:	Best Performance
Returns	Screened Index
Risk (S.D.)	Screened Index
Sharpe Index	Screened Index
Treynor Index	Screened Index

Table 4. 5: Consolidated Index Results

The index analysis, contrary to the portfolio analysis results, indicated screened indexes to have clearly outperformed the conventional indexes in four different measures. If the two sets of results were to be observed with a combined perspective, screened indexes and portfolios, with more positive aspects, would seem to have outperformed the conventional indexes and portfolios. However, due to the portfolio results for the portfolios being inconclusive, further evidence from future research would be required to strengthen the overall results of the data analysis. Further research on different portfolios constructed from similar indexes including covariance and variance models would provide additional substantial evidence.

However, the data analysis does provide evidence to disprove the hypothesis statement as the screened indexes and portfolios did not experience a performance penalty but actually performed better than the conventional indexes and portfolios in certain cases. One of the most important results of the analysis is also that the FTSE Shariah All-World Index and FTSE4GOOD Global Index overlapping portfolio had the overall best performance. This further indicates that the application of screening criteria does not have a penalty on the performance of indexes and their portfolios but in fact the combination of the two different sets of screening criteria resulted in overall best performance.

5. Conclusion

The aim of this paper was to investigate the following hypothesis:

According to investment theories, SRI and Shariah investments should experience a performance penalty due to a restricted pool of assets available for asset selection and, therefore, greater exposure to risk due to less diversification.

As mentioned previously, investment theory explains various strategies of appropriate asset selection, diversification, risk preference, and weightage allocation that enable an investor to optimise their gains. Based on studies of the existing investment theory, screened indexes and their portfolios were expected to face penalties due to application of the screened criteria which would reduce the size of the asset pool. The reduced size of the asset pool would allow for less diversification, minimisation of risk and optimisation of returns. However, the results disproved the hypothesis and highlighted that the screened indexes have a far better performance than the conventional indexes. Results for the portfolios revealed that where the conventional portfolios underperformed, the screened portfolios outperformed and vice versa. Therefore, the overall performances indicated that there were no significant differences in performance and thus no performance penalty was identified.

Some key points identified during the research were:

- Returns of the screened indexes were higher than returns of conventional indexes but the returns of the screened portfolios were lower than the returns of the conventional portfolios.
- Screened indexes and portfolios were exposed to significantly less (systematic) risk than the conventional indexes and portfolios.
- Sharpe Indexes figures for screened indexes and portfolios were significantly higher and thus better than those for conventional indexes and portfolios.
- Jensen's Alpha figures indicated that all portfolios earned returns in excess of the CAPM predicted levels but conventional portfolios had greater excess returns than the screened portfolios.
- Beta values indicated that conventional portfolios were more volatile than their benchmarks and screened indexes were less volatile than their benchmarks.

- Behaviour of the screened portfolios was more in line with their respective screened indexes than the behaviour of the conventional portfolios with their respective conventional indexes.
- Treynor Index figures for the indexes revealed that screened indexes earned excess returns that were considerably higher than the conventional indexes. Additionally, only one conventional index, ASX Index, earned excess returns. UKX Index had a negative Treynor Index which indicated that it earned fewer returns than a risk-free asset.
- Treynor Index figures for portfolios revealed that all portfolios earned excess returns that varied within a range of about 30% from 0.53-0.86.
- Screened Indexes performed better than the conventional indexes in the financial crisis during 2007 and 2008.
- Performance of screened indexes was significantly better than the conventional indexes but performances of the screened portfolios and conventional portfolios had mixed results as they surpassed each other's performance in different models.

Based on the evidence discussed above, it can be concluded that there were no performance penalties experienced by the screened indexes and their portfolios but in fact they were identified to outperform the conventional indexes and their portfolios in certain cases. Therefore, screened indexes, portfolios and investing practices do not have a weaker performance than their conventional counterparts. These results support the studies conducted by other researchers as discussed in the literature review section above. However, evidence from further research would be required to strengthen these results as the limitations experienced during the research process negatively impacted the confidence level.

6. Recommendations

Investing patterns have a significant impact on the flow of global finances and thus the impact of each community in the world respectively. Sometimes the gain of an investor can mean the downfall of a community somewhere else in the world. Global warming, caused mainly due to carbon emissions, is becoming an increasingly greater concern. Emissions from the use of fossil fuels in various manufacturing processes and every day machines contain high carbon content. The industry of arms and ammunition receives great investment each year which leads to the destruction of various communities in the world. The poorer communities in such cases suffer the most as they do not have the funds and resources to fight back the negative impacts. Therefore, sustainable and ethical investing is essential to bring about a positive change at a global level. Marriage (2016) quotes Phil Angelides, former state treasurer for California and Chairman of Riverview Capital, who gave his opinion regarding investments in the tobacco industry by saying that, 'investments should be made in industries that do no kill lots of people and cause massive public health costs. Companies such as those producing tobacco products do so much damage to the economy, health and society.'

This report provides evidence that there do not need to be any concerns regarding returns and profitability of ethical and sustainable investments practices as the screened indexes and their portfolios have been shown to perform better than conventional indexes in certain circumstances and offer higher reward-to-volatility ratios. Due to the importance of this research, this paper would encourage further research on screened investment as it is vitally important to change investing patterns for the greater global good. A significant amount of research has already been done or is ongoing but to prove that screened investing does not underperform, additional research and evidence for its performance with respect to different scenarios and simulations is very important. A recent report published by the Cambridge Zero Carbon Society (2016) is a good example of this. The Society urges the Cambridge University, and other institutions as well, to divest from fossil fuels and set a good example by highlighting the adverse impacts of the use of fossil fuels, how their investment in fossil fuels contributes towards those negative impacts on a global scale by encouraging use of fossil fuels, the positive impact of restricting and diminishing the use of fossil fuels, and the gains of divesting towards more sustainable investment practices.

Given the limitations that were experienced during the course of this research, this paper would make the following recommendations for further research in the future to obtain more conclusive results based on different scenarios:

- Data for the screened indexes was not available for access for academic purposes and, therefore, a simulation of the indexes at the time of data collection needed to be created in order to extract a list of top 100 equities in FTSE Shariah All-World Index and FTSE4GOOD Global Index. This was done based on research on how the index weights are calculated. However, this data can never be as reliable as the original data for the indexes so this paper would recommend making access to data for further research easily available. This would allow for an in-depth research and more conclusive results based on more reliably accurate data.
- Weights for the portfolios were assigned based on market capital only. Future research would be encouraged to also examine the correlation between the portfolio constituents and allocate weightage based on correlation values which can be used for further optimisation. This would provide additional evidence for a comparison between conventional indexes (and portfolio) and screened indexes (and portfolios).
- Research on the portfolios was conducted based on five empirical models: Returns, Risk, Sharpe Index, Capital Asset Pricing Model (Jensen's Alpha, Beta, R Square), and Treynor Index. This paper would recommend further research to include other empirical models that take various other factors into account as well to obtain more conclusive results especially for why indexes outperform each other in different circumstances.
- Due to the limitations of time and scope of this paper, only a restricted number of indexes and their constituents could be included in the research. Research in future with more time available should include other screened and conventional indexes including those outside of the FTSE group, and also include a larger pool of index constituents for portfolio analysis. It would also be worth analysing the performance of equities with the lowest weightage. This would provide for more accurate results based on a larger and diverse sample size.
- The results indicated that certain screened indexes have better performances than others. This paper would recommend future research on a comparison of different screened indexes to analyse which perform better and due to what factors.

- Issues with direct access to data for screened indexes negatively affects the confidence in the results of this research and their reliability As the R square values for most of the portfolios were low, further research should be conducted on similar data to achieve more conclusive and reliable results
- Due to limitations of time and aims of this paper, the portfolios' performances were only compared to their parent indexes as benchmarks. This paper would recommend a comparison of the portfolios' performances with the other involved indexes as benchmarks as well to obtain more well-rounded results.

The recommendations above would allow for more conclusive results to be achieved for a comparison of conventional indexes with screened indexes: whether one performs better and why.

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Appendix A

FTSE 100 Index

Regression Statistics	
Multiple R	0.328258529
R Square	0.107753662
Adjusted R Square	-0.00377713
Standard Error	0.529341883
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.270713408	0.270713408	0.966133743	0.354434587
Residual	8	2.241622634	0.280202829		
Total	9	2.512336043			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.976021777	0.167500202	5.826988653	0.000392906
X Variable 1	1.206620377	1.227586291	0.982921026	0.354434587
	Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.589765618	1.362277936	0.589765618	1.362277936
X Variable 1	-1.624198687	4.03743944	-1.624198687	4.03743944

FTSE All-Share Index

Regression Statistics	
Multiple R	0.339205571
R Square	0.115060419
Adjusted R Square	0.004442972
Standard Error	0.535051795
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*

Regression	1	0.297778933	0.297778933	1.040165199	0.337631461
Residual	8	2.290243386	0.286280423		
Total	9	2.58802232			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.97268822	0.169239487	5.747407047	0.000430274
X Variable 1	1.165015211	1.142300682	1.019884895	0.337631461
	Lower 95%	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	0.582421263	1.362955177	0.582421263	1.362955177
X Variable 1	-1.469134886	3.799165308	-1.46913489	3.799165308

FTSE Shariah All-World Index

Regression Statistics	
Multiple R	0.799411154
R Square	0.639058193
Adjusted R Square	0.593940467
Standard Error	0.05513352
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.043055105	0.043055105	14.16423766	0.005516334
Residual	8	0.02431764	0.003039705		
Total	9	0.067372745			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.376582182	0.018544735	20.30669007	3.61459E-08
X Variable 1	0.586832264	0.155925585	3.763540575	0.005516334
	Lower 95%	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	0.333817947	0.419346418	0.333817947	0.419346418
X Variable 1	0.227267221	0.946397307	0.227267221	0.946397307

FTSE4GOOD Global Index

Regression Statistics	
Multiple R	0.737642852
R Square	0.544116977
Adjusted R Square	0.487131599
Standard Error	0.080911643
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.062510199	0.062510199	9.548361298	0.014888599
Residual	8	0.052373552	0.006546694		
Total	9	0.114883751			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.326257141	0.026125611	12.48801977	1.58133E-06
X Variable 1	0.657319406	0.212721816	3.090042281	0.014888599
	Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.266011375	0.386502907	0.266011375	0.386502907
X Variable 1	0.166782018	1.147856793	0.166782018	1.147856793

FTSE Shariah All-World Index & FTSE4GOOD Global Index Overlapping Index

With FTSE Shariah All World Index as Market

Regression Statistics	
Multiple R	0.904674706
R Square	0.818436324
Adjusted R Square	0.795740865
Standard Error	0.048149133
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.083603193	0.083603193	36.06167684	0.000321548

Residual	8	0.018546712	0.002318339		
Total	9	0.102149905			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.323788287	0.016195463	19.99252992	4.0859E-08
X Variable 1	0.81773595	0.136172726	6.005137537	0.000321548
	Lower 95%	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	0.286441481	0.361135092	0.286441481	0.361135092
X Variable 1	0.50372108	1.13175082	0.50372108	1.13175082

FTSE Shariah All-World Index & FTSE4GOOD Global Index Overlapping Index With FTSE4GOOD Global Index as Market

Regression Statistics	
Multiple R	0.720438942
R Square	0.519032269
Adjusted R Square	0.458911303
Standard Error	0.078366772
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.053019097	0.053019097	8.633132515	0.018760683
Residual	8	0.049130808	0.006141351		
Total	9	0.102149905			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.341910258	0.025303516	13.51236159	8.63572E-07
X Variable 1	0.605411444	0.20604706	2.938219276	0.018760683
	Lower 95%	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	0.283560246	0.400260271	0.283560246	0.400260271
X Variable 1	0.130266071	1.080556816	0.130266071	1.080556816