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Socially responsible investment and Shariah-compliant investment compared: Can investors benefit from diversification? An ARDL approach

Mohammad Ashraful Ferdous Chowdhury¹ and Mansur Masih²

Abstract:

Islamic finance and Socially Responsible Investment (SRI) have been two of the most rapidly growing areas of finance over the last two decades. During this period, they have each grown at rates that far exceed that of the financial markets as a whole. The purpose of this paper is to take a comparative approach in comparing and contrasting the performance of both types of restricted investment portfolios by using ARDL bounds testing approach. The paper provides an innovative view to two different markets and suggests that there are commonalities which need to be exploited for the benefit of both markets. The study assesses the extent of correlation between social responsible investment funds and Sharia compliant investment funds in different economic situations to determine if the nature of relationship between funds changes in between the non-crisis period and the 2007 crisis period for four markets such as Dow Jones Islamic World, Dow Jones Islamic Europe; Dow Jones Sustainability World and Dow Jones Sustainability Europe. By estimating the short and long term dynamics between the socially responsible investment indexes and Islamic indexes, and the extent of cointegration between these two funds, the findings tend to indicate that the SRI and Islamic funds have significantly different behavior in both the short run and long run. Despite the differences in the screening criteria and portfolio management of both types of funds, this study suggests that the potential diversification benefits between Sharia compliant funds and the SRI funds are possible both in the crisis period and non-crisis period.

Keywords: Sharia-compliant, socially responsible investments, diversification, ARDL

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1. Introduction

Over the past few years, the growth of some kinds of funds has been remarkable. In particular among these, one may highlight socially responsible (SRI) funds and another is Shariah compliant funds. The last decade witnessed a tremendous growth in socially responsible investment(SRI), where investors combine their financial objectives with their concerns about social, environmental, ethical and/or corporate governance issues in their investment selection. The total SRI counts for €7,594 billion globally, led mainly by the European and US markets with €4,986 billion and \$3,069 billion, respectively,(EUROSIF, 2010). In fact, the current practice of SRI is largely dominated by mainstream institutional investors, controlling around 92 and 75 percent of the total SRI in Europe and USA, respectively, including investment institutions such as pension funds and insurance companies (USSIF, 2010; EUROSIF, 2010). This implies that SRI is no longer considered as a niche market for religious groups only. Consequently, internationally recognized indices' providers such as FTSE and Dow Jones introduced SRI indices to meet the growing demand of such type of investments.

In addition, Islamic investment is considered under the broad umbrella of the SRI since they apply ethical screening criteria in order to exclude certain industries. Swift growth in financial markets can often be accompanied by growing pains. Total Islamic finance assets grew to an estimated USD1.8 trillion by the end of 2013. Islamic banking remains the dominant sector within the Islamic financial services industry (IFSI) with approximately 80% of the total Islamic financial assets. The industry is estimated to chart a compound annual growth rate (CAGR) of 17.04% between 2009 and 2013. The pace of growth of the Islamic banking industry has been moderating recently, but the average growth rate of 20% after 2009 is still impressive. The Islamic finance industry has been no exception to this rule, as it struggles to overcome various challenges relating to regulatory harmonization, the

development of professional standards, liquidity management and a human capital shortfall. It also points out that despite the positive developments in the industry, actually less than 20% of Muslims in the world have access to or are willing to use Islamic banks and that the success has so far been driven mainly by corporate actors and wealthy individuals (DiVanna and Howards, 2013).

On comparison, figures for SRI in Europe and the US alone add up to over 12 trillion USD for the same year (based on the Eurosif, 2012 and USSIF, 2012 market studies). Thus, even considering that Islamic Banking encompasses many more financial products than SRI, Its market volume is less than a tenth of SRI (considering that not all SRI invested assets are included in the figures above). Also in terms of growth rates, SRI is compatible with Islamic finance, with SRI in Europe having seen a growth of 35% between 2009 and 2011 (Eurosif, 2012). Also in terms of market share, SRI is well positioned as a measuring rod for Islamic finance. For instance, the latest Eurosif study (2012: 17) states that over a quarter of all invested assets in Europe are already screened against the exclusion of at least one nonfinancial criterion (e.g. weapons, tobacco, child labour, human rights violations etc.).

It can be seen therefore that SRI is a highly successful financial industry niche just as Islamic finance. At the same time, it has come up with a number of solutions to problems that both these niches have in common, e.g. regarding the issue of transparency of investment decision making processes and the outreach to poorer members of society. There are two opposing views regarding the economic viability of restricted socially responsible and Islamic investments. Opponents argue that from a portfolio theory point of view, imposing additional non financial screening criteria for the investment selection are likely to have an adverse impact on the performance and risk of the investment portfolios. This is because restricting the menu of assets available is more likely to lead to less diversified, and hence, less optimal investment portfolios which lower the returns and increase the volatility (Sauer, 1997). In other words, as a result of excluding certain industries/companies for their violation of Sharia[3]/social responsibility criteria, such a screening process might lead to less diversified investment portfolios compared to their unrestricted counterparts. Also, excluding certain sectors/companies for their non-compliance with Sharia/socially responsible principles might

eliminate attractive opportunities. Furthermore, the additional cost associated with implementing Sharia/social responsibility screening such as searching, monitoring and management costs would adversely affect performance (Sauer, 1997).

However, advocates argue that Sharia/social responsibility screening process is more likely to have a positive impact on the investment portfolio by selecting financially stronger, more stable and profitable companies. Also, the conservative nature of the management of Islamic/SRI portfolios might lead to less risky and more profitable investment portfolios. In addition, Sharia screening criteria exclude highly leveraged companies and also prohibit gharar (uncertainty elements) and gambling activities, which also seems to minimize the overall risk and lead to more solid investment opportunities (Hussein and Omran, 2005; Abdullah et al., 2007;).

Based on this background, the study aims to determine the difference between the performance of the SRI and Shariah Compliant funds investment in the non-crisis and crisis period in major financial markets such as the Dow Jones Islamic market Index world, Dow Jones Islamic market Index world, Dow Jones Islamic market Index Europe, Dow Jones Sustainability Index world, Dow Jones Sustainability Index Europe. By employing a battery of time series investigation techniques, the study seeks to examine the extent of correlation between the performance of Shariah-compliant investment and SRI in these markets and to determine whether investors can benefit from investing in both funds both in short run and long run. This study aims to also contribute towards enriching the literature by providing recent evidence on the performance of these special types of funds. While, a conventional investor is only restricted in his/her choice of funds, The Islamic investor is restricted to investing in Islamic funds. This is probably the first known humble attempt to examines whether Islamic investor would like to go to beyond Islamic funds and invest also in SRI will benefit from diversifications.

The following section provides more information on the development of SRI and the methods used to illustrate these points and lay the ground for the analysis and discussion following in later parts.

2. Theoretical Underpinning:

Islamic finance and SRI share several commonalities including that they are focused principally on individuals using their money in a manner that conforms to their morals and beliefs. Whereas finance traditionally has been driven solely by the effort to maximize risk adjusted returns, Islamic and SRI investors have added an additional objective for financial market activity – compatibility with the investor’s ethics and promotion of social-welfare activities. Although both types of investors seek to achieve a strong return on their investments, they take into account not only the pure economic return, but also the social returns the society receives from their money being used in compliance with their beliefs. In addition, the growth of both Islamic finance and SRI has been largely demand-driven, with financial institution devoting more resources to these two areas in response to the increasing demand from individual investor clients for these products.

Islamic finance and SRI share another similarity as well. To date, they both have been focused, within the capital markets sphere, more on equity than on fixed income investments. The fundamental principles behind Islamic finance, such as an emphasis on equitable sharing of risks and the prohibition of interest based financing, are most easily compatible with investing in equities. Likewise, SRI traditionally has been a strategy applied mainly to equity investing through the application of various types of portfolio screening techniques.

As a result, financial intermediaries have found it easier and more straight forward to create Shariah compliant and SRI equity products than fixed income ones. The summary of two types of restricted funds are given below:

	Criteria	Islamic investment	Socially responsible investment
Similarities	Broad Objectives	Both types of funds have ethical, social and financial objectives	

	Negative screening	Both types of fund has the negative screening(filtering) criteria in the selection of stocks to include in their portfolios	
	Shareholder advocacy	Shareholders in both type of funds are encouraged to formally express any negative opinion regarding certain practices	
Differences	Sources of guidance	Shariah , however, owing to the lack of a global shariahsupervisory body. Differencing interpretations between funds are currently used	Historically, SRI originated with religious groups avoiding investing in Sin stock. There are o universally recognized definition of SRI investment
	Restriction on investment activities and instruments	Yes, This type of investment excludes investment in the fixed income instruments such as corporate bonds, certificates of deposits(CDs), preferred stocks, warranty, and some derivatives	No, SRI funds can freely choose between debt bearing investments and equity bearing investments, as long as the stocks chosen adhere to SRI and Environment, Social, and Government principles (ESG)
	Financial ratios screening	Yes, financial filters, determined by the SSB, are applied during the stock selection process. The core principle to which the filters are related to: leverage, presence of interest-bearing assets and	There is no financial parameter in SRI investment.

		liabilities, high level of debt and credit	
	Purification process	Yes, purification is the process of eliminating or cleaning the portfolio of income or gain resulting from interest or any other impermissible revenue sources. Impermissible portfolio income is donated to charities and non-profit organizations	No
	Positive screening	No	No
	Sector exclusion	Yes, sectors considers not compliant with shariah are excluded for instance: alcoholic beverages, tobacco, weapons production or distribution, gambling, pornography, etc	Yes, sectors are not compliant with SRI criteria are excluded such as alcoholic beverages, tobacco, weapons production or distribution, gambling and pornography.
	Best-in class	No, there is a general distinction between admissible or prohibited assets. The strategy is in-out.	Yes, some funds include firms operating in sectors generally forbidden, if they exhibit a commitment to SRI principles
	Screens based on environment filters	No	Yes
	Screens based on human	No	Yes

	rights		
	Screens associated with transparent corporate practices	No,	Yes, but not in all cases

Table 1: similarities and dissimilarities of SRI and Islamic Funds

3. Literature Review:

Since the beginning of the financial crisis, a small number of investment strategies have emerged, boasting growth between the current financial storm and resilience to the near collapse of other investment categories. Two of these strategies include Socially Responsible Investment (SRI) and Islamic finance. Wilson (1995) explains the significance of Islamic banking as it is not just considered as a business entity which only fulfills the religious obligations of the Muslim community but more significantly it is viewed as a business which focuses on attracting more and more customers whilst retaining the old ones. Islamic finance is often related to social responsible investment or ethical investment by many authors and researchers in different time frame. The similarity between the two is mainly because of the few principles that the investment involved is not just for the profit motive instead involve an investment which is considered best for the whole community in terms of social, religious and ethical perspectives and also investment which involve the production of unethical goods for example alcohol, tobacco, armaments is considered immoral.(Wilson, 1997; Benson et al;2006) Socially Responsible Investing (SRI) is a well-designed economic discipline which offers investors with strict moral standards to invest their money without having to compromise their core beliefs and principles.Further he concluded that Socially Responsible Investing enables individual to invest without compromising his/her moral standards, and provides an effective management of corporate behavior and free-market forces thus becoming an important sector of capital markets today.

Previous studies found evidence that Sharia screening criteria do not seem to provide inferior performance. Wilson (2001) and Ahmad (2001) find that Islamic mutual funds are financially viable and Sharia compliant investments can compete on a commercial risk/return basis. Elfakhani and Hassan (2005), Kraussl and Hayat (2008) and Abderrezak (2008) show that, on average, there is no statistically significant difference between the risk adjusted performance of Islamic equity mutual funds and their Islamic and conventional market benchmarks. This is irrespective to the geographical focus of the investment portfolio examined.

Confirming previous studies' results, Hoepner et al. (2009) show that, in general, Islamic equity mutual funds do not significantly trail their international benchmarks if a home economy of the Islamic equity mutual funds has a high density of Muslim consumers, coupled with being a relatively well developed market for Islamic financial services such as GCC and Malaysia. However, they find that in non-Muslim countries, Islamic mutual funds tend to underperform compared to their market benchmarks.

By using a matched sample approach, Abdullah et al. (2007), Hassan et al. (2010) and Mansor and Bhatti (2011) indicate that the performance differences between Malaysian Islamic mutual funds and their conventional peers' funds are marginally significant. Likewise, Hussein (2004), Hakim and Rashidian (2004), Girard and Hassan (2005, 2008) and Hashim (2008) show that the performance of Islamic market indices, such as FTSE and Dow Jones Islamic indices family does not differ significantly from their conventional counterpart indices. This is consistent with Ahmad and Ibrahim (2002) and Albaity and Ahmad (2008) who find that the performance difference between the Kuala Lumpur Syariah Index (KLSI) and the Kuala Lumpur Composite Index (KLCI) is not statistically significant. Also, Dharani and Natarajan (2011) show that based on the Indian market the Nifty Shariah index and its Nifty conventional counterpart index provide similar performance. Merdad et al. (2010) indicate that Islamic mutual funds managed by HSBC in Saudi Arabia tend to underperform against their conventional counterparts during full and bullish periods, but they outperform conventional funds during bearish and financial crisis periods.

Similarly, there is empirical evidence to prove that SRI screening criteria do not seem to lead to underperformance. Luther et al. (1992), Luther and Matatko (1994) and Gregory and Whittaker (2007) show that the performance of the UK SRI fund does not differ significantly from their conventional counterpart mutual funds and their conventional market benchmarks. Likewise, Bello (2005) and Benson et al. (2006) find evidence that US SRI mutual funds do not underperform against their conventional counterpart mutual funds, and compared to their conventional market benchmarks.

Empirical studies find that Islamic investment portfolios tend to be less volatile and less vulnerable to the systematic risk than conventional investment portfolios. Abdullah et al. (2007) and Muhammad and Mokhtar (2008) show that Malaysian Islamic funds are less sensitive to the market volatility compared to their conventional counterpart funds and their market benchmark, indicating less exposure to the systematic risk. In addition, based on a larger sample of Islamic mutual funds that invest in different geographical focuses around the world, KrausslandHayat (2008), Abderrezak (2008) and Hoepner et al. (2009) indicate that Islamic equity mutual funds seem to have lower systematic risk compared to their broad market indices' benchmarks. Merdad et al. (2010) find that regardless of the benchmark used, whether Islamic or conventional, the systematic risk of Islamic funds is always lower than their conventional counterparts during a financial crisis period. Likewise, Hakim and Rashidian (2004) and Girard and Hassan (2005) show that the US Dow Jones Islamic Index seems to be less sensitive to the volatility in systematic risk than their conventional counterpart indices. Al-Zoubi and Maghyereh (2007) find less risk associated with the Dow Jones Islamic Market Index (DJIM) compared to the Dow Jones World Index (DJW) broad market basket of stocks. Consistent with previous studies, Ahmad and Ibrahim (2002) and Albaity and Ahmad (2008) indicate that the Kuala Lumpur Syariah Index (KLSI) is less risky than the Kuala Lumpur Composite Index (KLCI).

With regards to the risk associated with SRI portfolios, the result is not conclusive. Luther et al. (1992) and Gregory and Whittaker (2007) show that, on average, UK SRI mutual funds tend to be less sensitive to the market movements compared to conventional mutual funds. Kreander et al. (2005) find that European SRI funds seem to be less exposed to the systematic

risk, compared to their conventional counterparts. Confirming previous studies Bauer et al. (2005), find that SRI funds in the USA, the UK and Germany seem to be less exposed to the systematic risk compared to their conventional counterparts.

Most of previous studies find that Sharia and SRI screening processes tend to influence the investment style of the investment portfolios compared to their unrestricted conventional counterparts. Girard and Hassan (2005, 2008) and Abderrezak (2008) show that Islamic investment portfolios seem to be more exposed to small and growth companies. Studies by Forte and Miglietta (2007) and Kraussl and Hayat (2008) indicate a growth cap bias associated with Islamic indices. Hoepner et al. (2009) find small cap bias associated with Islamic mutual funds but not growth. Hassan et al. (2010) show that Malaysian Islamic mutual funds tend to be small cap oriented compared to their conventional counterparts.

This section briefly reviews the literature on the investment characteristics of the two groups of restricted investment portfolios, SRI and Islamic, as compared to unrestricted conventional investment portfolios. This gives a broad picture about the impact of applying non financial SRI and Sharia screening processes, on the performance, risk and investment style. This is since there is no literature that investigates the impact of incorporating sustainability criteria into the Sharia screening process or that investigates difference in investment characteristics between Islamic and conventional SRI portfolios. This indicates a gap in the literature of Islamic investment portfolios which needs to be filled and hence, the importance of the contribution of the present study. The current lack of research in this area serves as the first motivation for this paper. Also, the Islamic Finance industry has been growing at a steady pace but in order to sustain this growth the industry needs to develop and expand asset classes, which serves as the second motivating factor for this dissertation.

4. Data and methodology:

4.1 Data:

In line with the objective of understanding the relationship between the ethical investment and Islamic Investment, the stock market indices being selected for the types. First, purpose of analysis in this study are categorized into two the ethical investment indices include the Dow Jones Sustainability index and Dow Jones Islamic index. Dow Jones Sustainability index Global and Dow Jones Sustainability index Europe reflects the behavior of the ethical indices. For Islamic indices, Dow Jones Islamic index Global and Dow Jones Islamic Europe are then measured in this study. Daily data from 8-Mar-05 to 16-Sep-14 has been collected from Data Stream. The data set has been divided into two parts: one is entire period and another is from July 2007 to August 2008 for crisis period.

4.2 Autoregressive Distributed Lag Approach (Long run Analysis):

ARDL model was introduced by Pesaran et al. (2001) in order to incorporate $I(0)$ and $I(1)$ variables in same estimation so if your variables are stationary $I(0)$ then OLS is appropriate and if all are non-stationary $I(1)$ then it is advisable to do VECM (Johanson Approach) as it is much simple model. In this study, An Autoregressive Distributed Lag (ARDL) approach as introduced as introduced by Pesaran (et.al 1996) is adopted to explore the long run relationship between the ethical investment and Shraiah compliant investment.

A dynamic error correction model (ECM) can be derived from the ARDL through simple linear transactions (Benarjee et al. 1993). The ECM integrates the short run dynamics with long run equilibrium, without losing the long run information. Once the long run relationship has been demonstrated, the second stages of the analysis involves the estimation of the long run coefficients (after selecting the optimum order of the variables through AIC or SBC criteria) and then estimate the associated error correction model in order to estimate the adjustment coefficients of the error-correction term. Since the data are daily, we choose five for the maximum order of the lags in ARDL model. The error correction version of the ARDL (5, 5, 5, 5, 5,) that we have estimated is as follows:

$$dDJIW_t = a_0 \sum_{i=1}^5 b_i dDJIW_{t-i} + \sum_{i=1}^5 c_i dLDJIEU_{t-i} + \sum_{i=1}^5 d_i dDJSW_{t-i} + \sum_{i=1}^5 d_i dDJSEU_{t-i} \sum_{i=1}^5 d_i dGOLD_{t-i} + \delta_{1t} LDJIW_{t-1} + \delta_2 LDJIEU_{t-1} + \delta_3 LDJSW_{t-1} + \delta_4 LDJSEU_{t-1} + \delta_5 LGOLD_{t-1} + u_t \dots\dots\dots(i)$$

$$dDJIEU_t = a_0 \sum_{i=1}^5 b_i dDJIW_{t-i} + \sum_{i=1}^5 c_i dLDJIEU_{t-i} + \sum_{i=1}^5 d_i dDJSW_{t-i} + \sum_{i=1}^5 d_i dDJSEU_{t-i} \sum_{i=1}^5 d_i dGOLD_{t-i} + \delta_{1t} LDJIW_{t-1} + \delta_2 LDJIEU_{t-1} + \delta_3 LDJSW_{t-1} + \delta_4 LDJSEU_{t-1} + \delta_5 LGOLD_{t-1} + u_t \dots\dots\dots(ii)$$

$$dDJSW_t = a_0 \sum_{i=1}^5 b_i dDJIW_{t-i} + \sum_{i=1}^5 c_i dLDJIEU_{t-i} + \sum_{i=1}^5 d_i dDJSW_{t-i} + \sum_{i=1}^5 d_i dDJSEU_{t-i} \sum_{i=1}^5 d_i dGOLD_{t-i} + \delta_{1t} DJIW_{t-1} + \delta_2 DJIEU_{t-1} + \delta_3 DJSW_{t-1} + \delta_4 DJSEU_{t-1} + \delta_5 GOLD_{t-1} + u_t \dots\dots\dots(iii)$$

$$dDJSEU_t = a_0 \sum_{i=1}^5 b_i dDJIW_{t-i} + \sum_{i=1}^5 c_i dLDJIEU_{t-i} + \sum_{i=1}^5 d_i dDJSW_{t-i} + \sum_{i=1}^5 d_i dDJSEU_{t-i} \sum_{i=1}^5 d_i dGOLD_{t-i} + \delta_{1t} LDJIW_{t-1} + \delta_2 LDJIEU_{t-1} + \delta_3 LDJSW_{t-1} + \delta_4 LDJSEU_{t-1} + \delta_5 LGOLD_{t-1} + u_t \dots\dots\dots(iv)$$

$$dGOLD_t = a_0 \sum_{i=1}^5 b_i dDJIW_{t-i} + \sum_{i=1}^5 c_i dLDJIEU_{t-i} + \sum_{i=1}^5 d_i dDJSW_{t-i} + \sum_{i=1}^5 d_i dDJSEU_{t-i} \sum_{i=1}^5 d_i dGOLD_{t-i} + \delta_{1t} LDJIW_{t-1} + \delta_2 LDJIEU_{t-1} + \delta_3 LDJSW_{t-1} + \delta_4 LDJSEU_{t-1} + \delta_5 LGOLD_{t-1} + u_t \dots\dots\dots(v)$$

$H_0 : \delta_1 = \delta_2 = \delta_3 = 0$ Non existence of the longrun relationship

$H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq 0$ Existence of a longrun relationship

Here indexes are as follows:

DJIW= Dow Jones Islamic Index world

DJIEU= Dow Jones Islamic Europe

DSW= Dow Jones Sustainability index world

DJSEU= Dow Jones Sustainability index Europe

GOLD= Gold price per ounce

5. Empirical result and discussions:

5.1 Descriptive statistics:

To analyze the result of the study, first it is useful to comment on some preliminary features of our data. Table 1 shows descriptive statistics for the SRI indexes, socially responsible invest indexes and GOLD profitability. The mean of all other independent variables are also positive. Form the volatility perspective from the Table-2, it can be said that both of the Shariah compliant funds are least risky in comparing the SRI funds.

Descriptive statistics:

Variable(s):	LGOLD	LISEU	LISW	LSIEU	LSIW
Maximum:	7.5478	8.1699	7.988	5.3549	7.2901
Minimum:	6.0309	7.3083	7.0877	4.2718	6.3399
Mean:	6.9272	7.8792	7.6428	4.9566	6.9757
Std. Deviation:	0.39879	0.14789	0.1126	0.19916	0.16732
Skewness:	-0.50804	-0.5471	-0.43659	-0.2473	-0.64819
Kurtosis - 3:	-0.80959	0.028825	0.093306	-0.03581	0.64792
Coef of Variation	0.057569	0.021308	0.022583	0.040181	0.023987

Table 2: Descriptive studies

Correlation matrix:

	LGOLD	LISEU	LISW	LSIEU	LSIW
LGOLD	1	0.1599	0.42687	-0.319	-0.13094
LISEU	0.1599	1	0.92598	0.86102	0.94659
LISW	0.42687	0.12598	1	0.63469	0.80044
LSIEU	-0.319	0.86102	0.13469	1	0.96863
LSIW	-0.13094	0.94659	0.80044	0.96863	1

Table 3: correlation matrix

In Table-3, it can be seen that the correlation between the SRI fund and the Shraih complaint funds are not significantly positive. It can also be seen that there are negative between Gold

and the SRI funds and the he Shariah complaint funds. So, it could be said that there is a possibility to diversify portfolio investment.

5.2 Unit Root Test:

5.2.1 ADF test:

Most financial time series are non-stationary which implies they do not have a constant mean, variance and covariance. Performing ordinary regression on non-stationary variables will give misleading results as the statistical test such as t-ratios and F statistics are statistically not valid. The differenced form will make the variables stationary but performing ordinary regression on the differenced variable will not capture the long term trend or the theoretical part in the estimation. In order for the co-integration test to be valid, the variables have to be unit root. The unit root test is performed by using Augmented Dickey Fuller test, Phillips-Perron (PP) test, and KPSS test. The following tables are the results in log and 1st differenced form by using ADF test:

	Variable	ADF	Value	T-Stat	C.V	Result
Log Form	LSIEU	ADF(1)=AIC	7219.5	-1.9251	-3.4894	Non-stationary
		ADF(1)=SBC	7207.7	-1.9251	-3.4894	Non-stationary
	LSIW	ADF(1)=AIC	7855.1	-1.9715	-3.4894	Non-stationary
		ADF(1)=SBC	7843.4	-1.9715	-3.4894	Non-stationary
	LISEU	ADF(1)=AIC	7351.5	-2.3118	-3.4894	Non-stationary
		ADF(1)=SBC	7339.8	-2.3118	-3.4894	Non-stationary
	LISW	ADF(1)=AIC	8165.1	-2.1478	-3.4894	Non-stationary
		ADF(1)=SBC	8153.3	-2.1478	-3.4894	Non-stationary
	LGOLD	ADF(1)=AIC	7263.3	-1.1273	-3.4894	Non-stationary
		ADF(1)=SBC	7251.6	-1.1273	-3.4894	Non-stationary

Table 4: ADF test at level form

	Variable	ADF	Value	T-Stat	C.V	Result
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1 ST diff. Form	DSIEU	ADF(1)=AIC	7220.0	-37.6680	-2.8718	Stationary
		ADF(1)=SBC	7211.2	-37.6680	-2.8718	Stationary
	DSIW	ADF(1)=AIC	7859.4	-36.4293	-2.8718	Stationary
		ADF(1)=SBC	7850.6	-36.4293	-2.8718	Stationary
	DISEU	ADF(1)=AIC	7351.3	-37.6487	-2.8718	Stationary
		ADF(1)=SBC	7342.5	-37.6487	-2.8718	Stationary
	DISW	ADF(1)=AIC	8170.3	-36.4538	-2.8718	Stationary
		ADF(1)=SBC	8161.5	-36.4538	-2.8718	Stationary
	DGOLD	ADF(1)=AIC	7262.1	-36.4244	-2.8718	Stationary
		ADF(1)=SBC	7253.4	-36.4244	-2.8718	Stationary

Table 5: ADF test at 1st Difference form

Based on the AIC and SBC criteria, the variables used are non-stationary at their level form but stationary at their first difference form. Hence the variables are type I(1) and co integration test is possible for these type of variables.

5.1.2 Phillips-Perron(PP) test and KPSS Test:

We also perform the unit root test using another alternative which is called the Phillips-Peron test and KPSS Test. Phillip-Peron adjusts for both autocorrelation and heteroscedasticity while ADF adjusts for only autocorrelation. The following table summarises the results of Phillip-Peron test and KPSS:

PP				KPSS			
Variables	T-statistics	C.V	Result	Variables	T-statistics	C.V	Result
LSIEU	-2.1623	-3.4529	Non stationary	LSIEU	.24887	.15025	Non stationary
DSIEU	-52.125	-2.8551	stationary	DSIEU	.066396	.38185	stationary
LSIW	-2.1028	-3.4529	Non stationary	LSIW	.26494	.15025	Non stationary
DSIW	-46.1587	-3.4529	stationary	DSIW	.067206	.38185	stationary
LISEU	-2.5109	-3.4529	Non stationary	LISEU	.19788	.15025	Non stationary

DISEU	-52.0683	-3.4529	stationary	DISEU	.051656	.38185	stationary
LISW	-2.2648	-3.4529	Non stationary	LISW	.24787	.15025	Non stationary
DISW	-45.5037	-3.4529	stationary	DISW	.061432	.38185	stationary
LGOLD	-.73820	-3.4529	Non stationary	LGOLD	.48511	.15025	Non stationary
DGOLD	-53.266	-3.4529	stationary	DGOLD	.52987	.38185	Non stationary

Table 6: PP and KPSS test for Unit root

As it can be seen that all the variables becomes stationary after taking 1st differenced except the GOLD variable. KPSS shows the GOLD variable still remain non stationary even after taking 1st differenced. This is why, this study continues with the ARDL model where it estimate model irrespective of whether the regressors are I(0) or I(1).

5.2 VAR order:

Since the selection of the lag length is important in estimating the ARDL regression, the test runs over 6 lag length of 1, 2, 3, 4, 5 and 6 to determine the optimal lag length. However, lag length determined by SBC and AIC produced contradictory results. SBC suggests lag length of 1, while 5 lag lengths are suggested by AIC. Based on an Adjusted LR Test in Table 7, lag length of 5 has been determined. The log likelihood value is 47303.8170.99, (Probability = 0.06), thus we can proceed to the next step with lag 5 in this study.

Order	LL	AIC	SBC	LR test	Adj. LR test
6	47324.1	47169.1	46718.2	-----	-----
5	47303.8	47173.8	46795.7	CHSQ(25)= 40.5191[.026]	40.0136[.069]
4	47264.9	47159.9	46854.4	CHSQ(50)=118.4124[.000]	116.9353[.000]
3	47236.3	47156.3	46923.5	CHSQ(75)=175.6576[.000]	173.4663[.000]
2	47205.7	47150.7	46990.7	CHSQ(100)=236.8747[.000]	233.9197[.000]
1	47141.9	47111.9	47024.7	CHSQ(125)=364.3003[.000]	359.7557[.000]
0	46564.6	46559.6	46545	CHSQ(150)= 1519.1[.000]	1500.1[.000]

Table 7: VAR order

AIC = Akaike Information Criterion SBC = Schwarz Bayesian Criterion

5.3: F-Test for long-run relation:

In the ARDL procedure involves two stages. At the 1st stage the existence of the long-run relation between the variables under investigation is tested by computing the F-statistic for testing the significance of the lagged levels of the variables in the error correction form of the underlying ARDL model. However, the (asymptotic) distribution of this F-statistic is nonstandard, irrespective of whether the regressors are I(0) or I(1).

Pesaran, Shin, and Smith (1996) have tabulated the appropriate critical values for different numbers of regressors (k), and determined whether the ARDL model contains an intercept and/or trend. They give two sets of critical values: one set assuming that all the variables in the ARDL model are I(1), and another computed assuming all the variables are I(0). For each application, this provides a band covering all the possible classifications of the variables into I(0) and I(1), or even fractionally integrated ones. If the computed F-statistic falls outside this band a conclusive decision can be made without needing to know whether the underlying variables are I(0) or I(1), or fractionally integrated. If the computed statistic falls within the critical value band the result of the inference is inconclusive and depends on whether the underlying variables are I(0) or I(1). It is at this stage in the analysis that the investigator may have to carry out unit roots tests on the variables.

	Computed F-Statistics	Decision
F(DISW/DSIW,DISEU.DSIEU,DGOLD)	4.0071**	Cointegration
F(DSIW/ DISW,DISEU.DSIEU,DGOLD)	5.0799***	Cointegration
F(DISEU/ DISW,DSIW,DSIEU,DGOLD)	5.9348***	Cointegration
F(DSIEU/ DSIW,DISEU.DISW,DGOLD)	5.1299***	Cointegration
F(DGOLD/DISW, DSIW,DISEU.DSIEU)	1.1733	No-Cointegration
F-Critical value	Upper bounds : 2.649 Lower bounds: 3.805	
5% level of significance		

Table 8: F-Statistics for Testing the Existence of Long-Run Relationship

Table 6 shows the calculated F-statistics are higher than the upper bound critical value 3.805 at the 5% significance level. This implies that the null hypothesis of no cointegrating long-run relationship can be rejected. These results reveal that a long-run relationship exists between the socially responsible investment, Islamic investment indices and Gold. The evidence of long run relationship rules out the possibility of any spurious relationship

existing between the variables. In other words, there is a theoretical relationship existing between the variables

5.4 Results of Estimated Long-Run Coefficients using the ARDL Approach:

After finding the F-test significant, the next step involves estimating (1) to (4) using appropriate lag-length selection criteria based on the Akaike Information Criterion (AIC) and SBC. Both of the estimations are summarized in Table-2. The sample period is divided into entire period and crisis period. Both the result AIC and SBC suggest that there is significant long run relationship between the sharia compliant indices and socially responsible indices.

Long-run ARDL Model Estimation using AIC:

Entire Period					
	Model 1 Gold	Model 2 LSIEU	Model 3 LISEU	Model 4 LISW	Model 5 LSIW
C	3.9481	-2.2201***	2.9026**	-3.2138***	1.4204***
LSIEU	-2.0058	-	1.2566	-1.4267***	.62812***
LISEU	1.4824	.27028*	-	0.32954	-.079367
LISW	-.23100	-.58599***	.65819**	-	.42520***
LSIW	.45661	1.3621***	-.98793**	2.1460***	-
Gold	-	.0037803	.087846**	.053732	-.026722**
Crisis Period					
	Model 1 Gold	Model 2 LSIEU	Model 3 LISEU	Model 4 LISW	Model 5 LSIW
C	-37.8220	-2.0227***	1.6548**	-1.2747**	1.3568***
LSIEU	-20.2321		.99195***	-.71343***	.64259***
LISEU	1.4429	.60413		.58481***	-.31511**
LISW	-9.9769	-1.0675***	1.3776***		.67513***
LSIW	30.0933	1.4584***	-1.3221***	1.0915***	-
Gold	-	.025526***	.0084827	.028654	-.033266*

Table 9: Long-run ARDL Model Estimation using AIC

Long-run ARDL Model Estimation using SBC

Entire Period					
	Model 1 Gold	Model 2 LSIEU	Model 3 LISEU	Model 4 LISW	Model 5 LSIW
C	-1.1194	-2.2363***	2.9873**	-3.2307***	1.4657***

LSIEU	-4.2565		1.2812**	-1.3996***	.63930***
LISEU	.99191	.25694*		.38854*	-.10391
LISW	-1.0144	-.60394***	.71561**		.43622***
LSIW	4.1965	1.3934***	-1.0702*	2.0662***	
Gold		.0095242	.077613**	.049681	-.025485**
Crisis Period					
	Model 1 Gold	Model 2 LSIEU	Model 3 LISEU	Model 4 LISW	Model 5 LSIW
C	-37.8220	-2.0014	1.8323***	-1.4115	1.3480*
LSIEU	-20.2321	-----	1.0686***	-.78104***	.64881
LISEU	1.4429	.62304***	-----	.59521***	-.35087
LISW	-9.9769	-1.0635***	1.3877***	-----	.70654
LSIW	30.0933	1.4366***	-1.4162***	1.1566***	-.029990*
Gold		.018269	.011282	.019563	-----

Table 10: Long-run ARDL Model Estimation using SBC

In this study, the whole sample has been divided in to the Entire period and during the Crisis periods to find the portfolio diversification benefit between the Islamic funds and ethical funds. There are five models have been estimated for both the entire period and the crisis period.

Firstly, it has been found in model-1 that there is no long run relationship between Gold and the socially responsible investment indices and Islamic indices. It means that for gold investors, there is no suitable portfolio investment exists for diversifications. The trend remain same at the crisis period as well meaning that there is no portfolio diversification benefit exists among Gold, ethical investment and Islamic funds.

In model-2, it has been found that The Dow Jones sustainability index for European market is negatively and statistically significant Dow Islamic world index with the correlation coefficient -0.58. It is very important to highlight that a negative correlation between two funds meaning possibility of substantial diversification benefits for an investor who holds both the socially responsible investment and Shariah complaint investment. It has been also found that both Dow Jones Islamic Europe and Dow Jones Sustainability world index is positive and statistically significant relationship Dow Jones sustainablity index European market. Although the correlation between Dow Jone sustainability index Europe has zero correlation with Gold investment but it has no statistical significance. It means that the investors in European market can diversify their risk only by investing in the Dow Jones

world market. Although, the overall trend remains same however, when sample is divided into crisis period, some interesting observations can be made. In crisis period, it has been found that the Dow Jones sustainability index for European market is negatively and statistically significant Dow Islamic world index with the correlation coefficient -1.0675 which is statistically significant at 1% level of significance meaning that a substantial diversification benefits exists for an investor who holds both the socially responsible investment and Shariah complaint investment during Crisis period.

In model-3, Dow Jones Islamic European market is negative and significantly correlated with Dow Jones sustainability world index with 0.98 . From the context of the portfolio, model-3 confirms that consistently, the Dow Jones Islamic European market are less correlated with Dow Jones sustainability world index and suggests investors are better off by investing in these markets to gain portfolio diversification benefits. During the crisis period, it has been found more interestingly that Dow Jones Islamic European market has higher negative correlation (-1.3221) with Dow Jones sustainability world index which is also statistically significant at 1% level. It means the associations between these funds are more useful during the crisis period.

In addition, our results in Model-4, further indicates that even the performance of Dow Jones Islamic Global market is found to be negatively correlated with that of Dow Jones Sustainability European market for the entire sample period. This suggests that a passive investor can get benefit from diversifying between the Dow Jones Islamic Global market and Dow Jones sustainable European markets. The trend remained same both funds at the crisis period as well. It is therefore interesting to note that even though the screening criteria for both shariah compliant and ethical funds differ, they exhibit the same behavior in the long run.

Although, in Model-5, Dow Jones sustainable Global markets, it has interestingly found that none of the alternative assets are negatively and statistically correlated with Dow Jones Sustainable Global markets except Gold. It is important to highlight that a positive correlation between two types of funds means there is no possibility of substantial

diversification benefits for an investors who holds both ethical funds and the Islamic funds. During the crisis period, the model finds an interesting result where it has been found that Dow Jones sustainable Global markets is negatively and statistically correlated with Dow Jones Islamic Global markets during the crisis period.

5.4 Results of error correction models:

As stated earlier, cointegration tells us that there is a long run relationship between the variables. However, there could be a short-run deviation from the long-run equilibrium. Cointegration does not unfold the process of short-run adjustment to bring about the long-run equilibrium. For understanding that adjustment process we need to go to the error-correction model (Table 8).The error correction coefficient estimated is highly significant all the variables except dGOLD. Since maximum variables have the correct sign and implies a

Variable	(1) dLGOLD	(2) dLSIEU	(3) dISEU	(4) dLISW	(5) dLSIW
dLISW1	-0.1294	-0.204	0.4066	-0.20858	0.021005***
dLISW2	0.039188	-0.04921	0.10037	-0.052642	0.021303**
dLISW3	0.38014**	-0.03213	0.10515	-0.02248	0.015315***
dLISW4		-0.03186	0.050002	-0.02392	0.0094034
dLISEU	0.12199**	0.40637		0.22483	0.014256
dLISEU1	0.0062389	0.052319***	-0.079625	0.12183	0.015136
dLISEU2	-0.02056	0.058173	-0.13916	0.040832	0.015376
dLISEU3	-0.0315	-0.0289	-0.0289	-0.008317	0.011832
dLISEU4	-0.27262***	-0.02478**	-0.02478	0.012775	0.0068084**
dLSIEU	-0.42946		-0.079625	-0.84601***	0.016269**
dLSIEU1	-0.10425	-0.15219	0.11086	-0.10778**	0.023725
dLSIEU2			0.099636	-0.044583**	0.023522
dLGOLD		0.0066*	0.006741	-0.0073	0.0037061
dLSIW	0.51795	-0.613***	-0.454**	1.6292	0.015896
dLSIW1			0.4066	0.11257**	0.036935
dLSIW2	0.2427	-0.20459***			
dLSIW3	-0.089078	-0.04921***	0.10037	0.051574*	0.036607
dLSIW4	-0.50359	-0.03213***	0.10515	0.040861	0.020393
ecm(-1)	-0.0022	-0.012***	-0.011065*	-0.009**	0.0034201***
χ^2 Serial Correlation	1.8778[.171]	.13390[.714]	4.1006 [.043]	.020811[.885]	.040876[.840]
χ^2 Functionality Form	.33532[.563]	2.7953[.095]	3.5303 [.060]	19.8145[.000]	16.8264[.000]
χ^2 (Norm)	2873.7[.000]	6110.0[.000]	6438.7 [.000]	3584.7[.000]	2855.1[.000]
χ^2 (Het)	3.1480[.076]	43.1632[.00]	45.8900[.00]	91.6315[.000]	56.1574[.000]

Table 11: Error correction models

Slow speed of adjustment to equilibrium after a shock.As it can be seen in model1, there is no short run relation with Gold and other variables except the Dow Jones Islamic Europe. In

model 3 and Model 4, it can be seen that that the Shariah compliant funds has the has portfolio diversification advantages with the SRI. For example, DOW Jones Islamic has a negative correlation with Dow Jones Sustainability Europe index by -0.84601 which is also statistically significant. It means that the short run investors like hedge funds could also get benefit if they make portfolio investment in both Shariah complaint funds and the SRI.

5.6 Variance Decomposition (VDC) :

Now that we have known the attributes of the variables; whether they are exogenous or endogenous, useful information is to establish the pecking order of the erogeneity or endogeneity of the variables. This can be achieved by running the VDC. VDC decomposes the variance of forecast error of each variable into proportions attributable to shocks from each variable in system including its own. By using generalized VDC, it be seen that the GOLD is the exogenous variable wih 98% in all horizon which is also consistent with the error correction result as well.

Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	22	98.976%	0.235%	0.232%	0.341%	0.217%	1
DISEU	22	0.129%	27.537%	21.542%	25.804%	24.988%	3
DISW	22	0.088%	21.963%	30.156%	21.221%	26.572%	2
DSIEU	22	0.381%	81.103%	12.186%	5.952%	0.378%	5
DSIW	22	0.083%	23.776%	24.482%	24.730%	26.929%	4
Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	64	99.0%	0.2%	0.2%	0.3%	0.2%	1
DISEU	64	0.1%	27.5%	21.5%	25.8%	25.0%	3
DISW	64	0.1%	22.0%	30.2%	21.2%	26.6%	2
DSIEU	64	0.4%	81.1%	12.2%	6.0%	0.4%	5
DSIW	64	0.1%	23.8%	24.5%	24.7%	26.9%	4
Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	88	98.976%	0.235%	0.232%	0.341%	0.217%	1
DISEU	88	0.129%	27.537%	21.542%	25.804%	24.988%	3
DISW	88	0.088%	21.963%	30.156%	21.221%	26.572%	2
DSIEU	88	0.381%	81.103%	12.186%	5.952%	0.378%	5
DSIW	88	0.083%	23.776%	24.482%	24.730%	26.929%	4

Table 12: Ranking based on VDC(Generalized)

In Orthogonalised VDC, it is assumed that when a particular variable is shocked, all other variables are switched off unlike generalised VDC. Therefore we will not use orthogonalised VDC in this analysis because such condition is not relevant to an integrated stock markets. The assumption when apply to an integrated stock markets simply means when one market is shocked, the other markets remain stable. However, the results are available in table 10.

Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	22	98.68%	0.12%	0.30%	0.57%	0.33%	1
DISEU	22	0.39%	83.68%	14.62%	0.65%	0.66%	2
DISW	22	0.29%	71.31%	27.75%	0.29%	0.38%	3
DSIEU	22	0.38%	81.10%	12.19%	5.92%	0.38%	4
DSIW	22	0.29%	81.45%	13.82%	2.92%	1.52%	5
Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	64	98.68%	0.12%	0.30%	0.57%	0.33%	1
DISEU	64	0.39%	83.68%	14.62%	0.65%	0.66%	2
DISW	64	0.29%	71.31%	27.75%	0.29%	0.38%	3
DSIEU	64	0.38%	81.10%	12.19%	5.92%	0.38%	4
DSIW	64	0.29%	81.45%	13.82%	2.92%	1.52%	5
Variable name	Horizon	DGOLD	DISEU	DISW	DSIEU	DSIW	Ranking
DGOLD	88	98.68%	0.12%	0.30%	0.57%	0.33%	1
DISEU	88	0.39%	83.68%	14.62%	0.65%	0.66%	2
DISW	88	0.29%	71.31%	27.75%	0.29%	0.38%	3
DSIEU	88	0.38%	81.10%	12.19%	5.92%	0.38%	4
DSIW	88	0.29%	81.45%	13.82%	2.92%	1.52%	5

Table 13: Ranking based on VDC(orthogonalized)

5.7 Impulse Response:

This study also uses impulse response to find the impact of shock of one variable on others, their degree of response, and how long it would take to normalize. In this study, the objective is to find the reaction of other variables when Gold has been shocked. In normalized IRF, it can be seen that all variables come back in to equilibrium within 12 working days. For orthogonal VDC isalso almost same i,e12 working days. Here, IRFs produce the same interpretation as VDC except that they are presented in a graphical form.

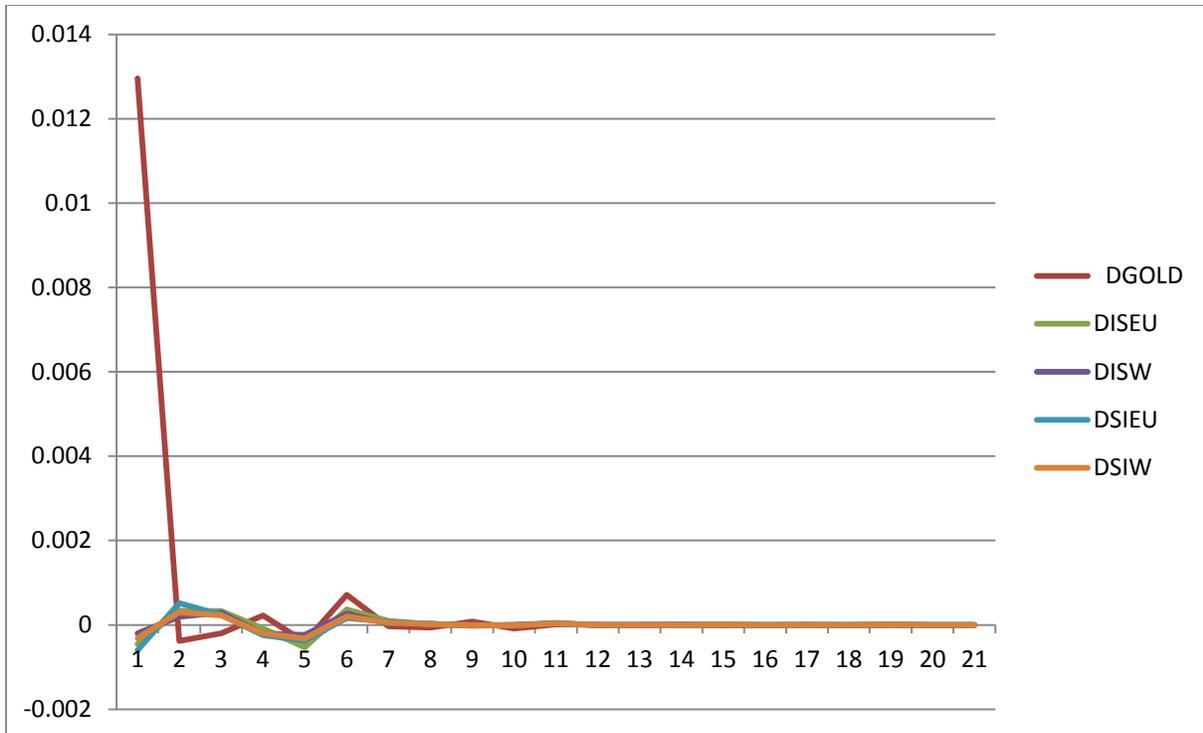


Fig 1: IRF (generalized) with shock to Gold price

Orthogonalized:

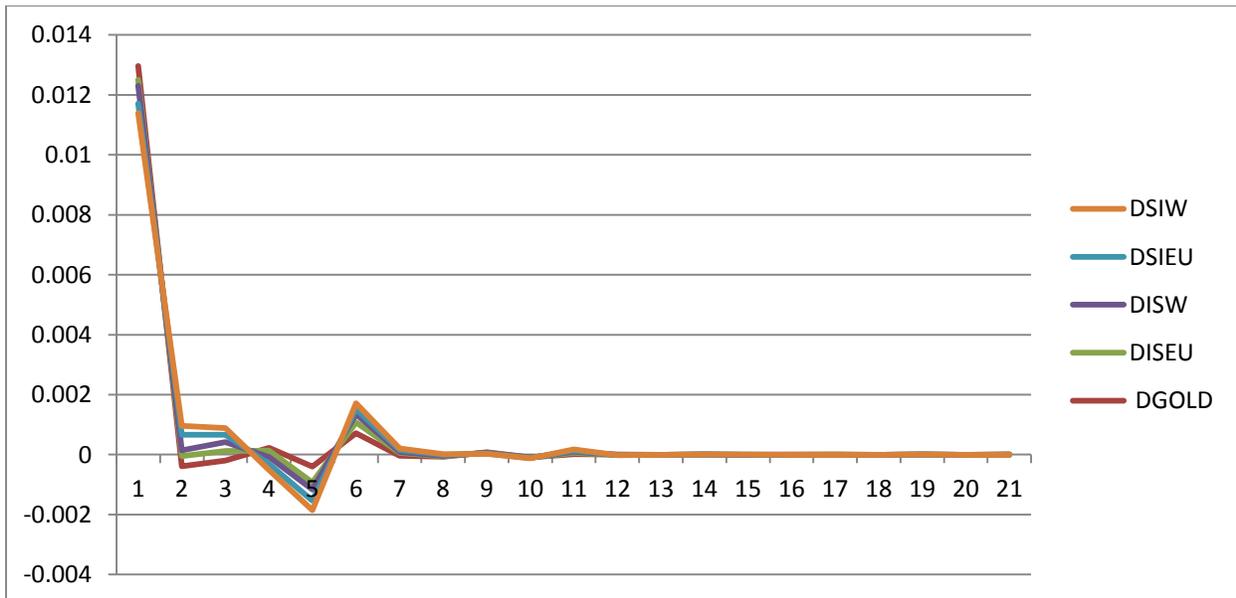


Fig 2: IRF (orthogonal) with shock to Gold price

5.8 Stability Test:

The diagnostics of all the equations of the error correction model (testing for the presence of autocorrelation, functional form, normality and heteroskedasticity) tend to indicate that the equations are well-specified although few models has the normality and heteroscedasticity problem. We also checked the stability of the coefficients by the CUSUM and CUSUM SQUARE tests (Fig. 1), which indicate that they are stable. We then tested the ‘stability’ of the coefficients of the final equations with the help of CUSUM and CUSUMSQ tests (Figures 3-4) and we find that the coefficients are all stable since they are all within the 5% critical bounds. It can be also seen that the CUSUMSQ crosses its critical bound when it was in 2007. This evidence shows us that the Crisis period has been properly identified in this study.

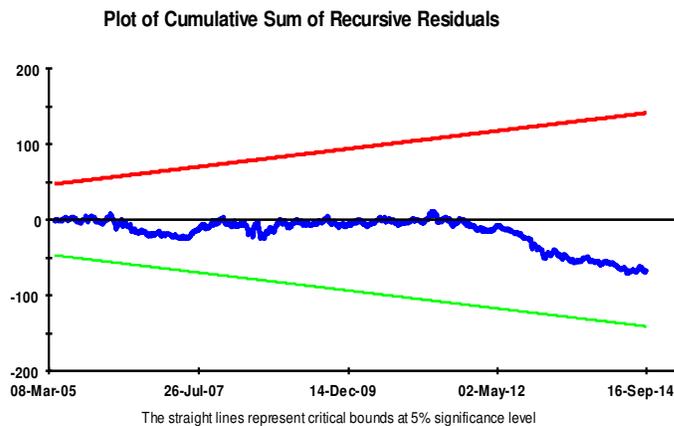


Fig 3 : CUSUM

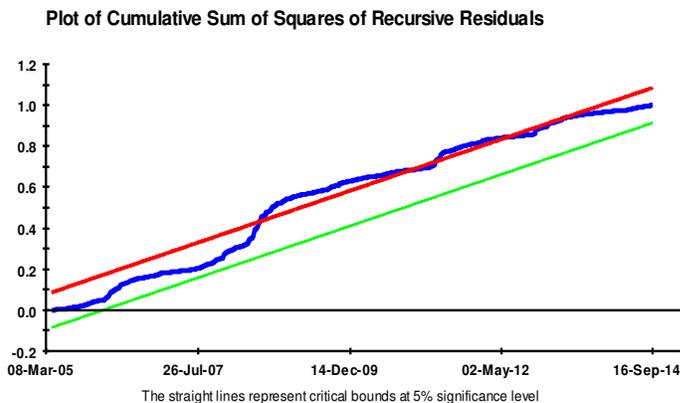


Fig 4 : CUSUM

6. Conclusion and Policy Implications:

With the objective of comparing the performance of the socially responsible investment funds and Shariah compliant investments in different economic situations, this study adopts several investigation tools to arrive at conclusive findings. It also aims to determine if nature of relationship between the funds changes non crisis period and during crisis period for both types of restricted investment portfolios. The study finds that the socially responsible funds and the Shariah compliant funds are negatively and significantly correlated in both the long run and short run during both the crisis period and non-crisis period. Islamic funds investors who are constrained (due to religious belief) to invest solely in Islamic funds should investigate other possibilities of diversification. This is also true for the ethical funds investors, who would be constrained to invest only in ethical funds.

Based on the result of this study, it can be suggested to the investors that there exists benefit of portfolio diversification by considering both the SRI stocks and Shariah compliant stock. The different criteria and screening procedures for both ethical funds and Islamic funds seem to have resulted in different stock returns behavior of these two types of restricted investment funds. This finding unlocks the door for Sharia scholars and Muslim investors to reconsider broader social and environmental aspects in the Sharia investment screening process. This is in order for Muslim investors to be in line with the embedded social and ethical concerns in the Sharia principles that have not been largely captured by the contemporary Sharia investment screening process. Therefore, this finding might lead to further development of Sharia investment screening process similar to SRI.

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