

SENSITIVITY OF USA ISLAMIC EQUITY MARKET INDEXES TO CHANGES IN INTEREST RATES: A COMPARATIVE ANALYSIS

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Abstract: Major stock market index providers differ in the stock selection criteria they use to select stocks for their Islamic indexes. Past research shows that this can cause the investment characteristics of their Islamic indexes to differ, which has implications for use of Islamic indexes such as for benchmarking. This study empirically examines if differences in the stocks selection criteria of Islamic indexes lead to variation in their levels of sensitivity to changes in interest rates. Monthly data of Islamic indexes of four major index providers i.e. MSCI, FTSE, Dow Jones and S&P, is analyzed for the period Jan 2008 to Dec 2016. Empirical durations of the Islamic indexes are estimated as a measure of their sensitivity to changes in interest rates. Overall results suggest that all of the examined Islamic indexes show different levels of sensitivity to interest rates. Which could largely be attributed to the differences in their stock selection criteria.

Keywords: Islamic Indexes, Stock Selection Criteria, Interest Rate Sensitivity.

Introduction

The Islamic finance industry has presence in 59 countries across 7 continents. Broadly, the industry is comprised of Islamic financial intermediaries (i.e. Islamic banks, Insurance companies), Islamic equity, investment funds, and lastly Islamic fixed-income Securities (i.e. Sukuks). As of 2015, the value of assets of global Islamic finance industry stood at 1.43 trillion USD (Alzahrani & Megginson, 2017). This study measure and compare the sensitivities of major USA Islamic equity market indexes, which are based on non-identical stock selection criteria, to changes in interest rates.

After investing in equities was ruled permissible by Islamic scholars in 1990's, U.S. based Dow Jones was the first index provider that began computing Islamic equity indexes for individual investors and fund managers to assess the performance of their Islamic equity investments. It launched Dow Jones Islamic Market World Index in May 1999 along with a series of regional indexes. Afterwards, MSCI another U.S. based index provider, launched its MSCI Global

Islamic Indexes in 2007, which was followed by FTSE with FTSE Shariah Global Equity Index Series in 2007. Finally, U.S. based S&P also launched its S&P Global BMI Shariah Index in 2008.

Fact sheets of global Islamic equity indexes of major providers (i.e. MSCI, FTSE, S&P and Dow Jones) indicate that on average 54% of their market capitalization belongs to U.S. firms. In other words, based on size, 54% of Islamic stocks exist in U.S. Furthermore, oil producing Islamic countries in the Middle East such as Saudi Arabia, Qatar, UAE and Oman invest a significant portion of their surplus earnings in U.S. debt and equities (Forbes, 2010). Thus, analyzing the investment characteristics of U.S. Islamic equity market portfolios will benefit both U.S. as well as foreign investors of U.S. Islamic equities and portfolios thereof. This article does a comparative analysis of the interest rate sensitivity of Islamic indexes for U.S. by four different providers i.e. MSCI, FTSE, S&P and Dow Jones which do not use identical stock selection criteria.

Stock Selection Criteria for Islamic indexes

Index providers considered in this study include stocks of only those firms in their Islamic indexes that are 1) not engaged in business activities that are forbidden in Islam such as dealing in alcohol, pork, weapons, interest (conventional banking) and insurance, and 2) do not have debt, cash and receivables ratios beyond a prescribed limit. Many studies, such as HO, C.S. (2015), indicated that while the index providers concur on the list business activities forbidden in Islam, they however differ on how to calculate the ratios involved and/or what should be the maximum allowable limit for each ratio. For each Islamic index provider analyzed in this study, table 1 shows the inputs used in calculating each ratio and the associated maximum permissible limit.

Table 1: Financial ratios used by MSCI, FTSE, Dow Jones and S&P for Islamic indexes

Index Family	Denominator used	Numerator used and maximum limits		
		Debt	Cash	Receivables
Dow Jones	24 months trailing average market capitalization	Total Debt < 33%	Total Cash + Interest Bearing Securities < 33%	Total Receivables < 33%
S&P	36 months trailing average market capitalization			< 49%
MSCI	Total Assets			Cash + Receivables < 70%
FTSE	Total Assets			< 50%

Empirical studies suggest that returns on stocks of conventional financial sector firms i.e. Banks and others, as well as those on stocks of non-financial firms with excessive debt on their balance sheets have relatively more sensitive to changes in interest rates (see for example Flannery and James, 1984; Choi et al., 1992; Moya-Martínez, Ferrer-Lapeña, & Escribano-Sotos 2015). As mentioned earlier, Islamic indexes do not include stocks of both conventional financial sector firms as well as those of non-financial firms with excessive debt ratios. And since, stock index returns are merely returns on portfolios of individual securities, the interest rate sensitivities of individual securities, therefore, aggregate up to the index level (Choi, Richardson, & Whitelaw, 2016). It, therefore, makes sense to expect Islamic indexes to be less sensitive to variations in interest rates compared to their conventional counterparts.

Islamic stock indexes are subsets of their conventional counterparts (Oranzo, 2013). Philips & Kinniry Jr (2012) reported that due to convergence of index construction methodology of major index providers (including those considered in this study), conventional indexes for U.S. by major providers are made up of more or less same stocks and hence exhibited similar investment characteristics over the past decade or so. As Islamic indexes are subsets of their conventional counterparts, therefore, Philips & Kinniry Jr findings suggest that the universes of stocks from which MSCI, FTSE, S&P and Dow Jones draw stocks for their respective Islamic indexes are nearly the same. Thus, if it is assumed that all index providers use identical criteria to select stocks for their Islamic indexes, then it would be safe to expect their Islamic indexes to exhibit similar investment characteristics- including interest rate sensitivity as each provider's Islamic index would have more or less the same stocks.

However, table 1 clearly suggest that this does not appear to be the case. It shows that to calculate the ratios for selecting stocks for their Islamic indexes, MSCI and FTSE use book value of assets while Dow Jones and S&P use market capitalization as denominator. Similarly, they prescribe different upper limits for accounts receivable ratio. Some previous studies have indicated that due to these differences the number of stocks that become part of Islamic indexes of the aforesaid providers vary significantly (D Ashraf, 2016) due to which investment characteristics of these indexes also differ (Derigs & Marzban, 2008).

Shariq & Sukor (2017) showed that due to differences in their stock selection criteria, Islamic indexes of the index providers considered in this study have different investment styles. They reported that unlike their conventional counterparts, Islamic indexes are mostly invested in various sizes of growth stocks and cash. The portion of their total investment allocated to each of these assets, however, varied from Islamic index of one provider to that of another.

Empirical literature has established that firms' growth prospects and cash holdings are negatively related to their debt levels and size (Bigelli & Sánchez-Vidal, 2012; D'Mello, Krishnaswami, & Larkin, 2008; Ferreira & Vilela, 2004; Opler, Pinkowitz, Stulz, & Williamson, 1999). It therefore, makes sense to expect that Islamic indexes of MSCI, FTSE, Dow Jones and S&P, by having different levels of investments in different sizes of growth stocks and cash (as reported by Shariq & Sukor 2017), would have different debt levels and by extension different levels of sensitivity to changes in interest rates. This article does a comparative analysis of the interest rate sensitivity of Islamic indexes for U.S. by four different providers i.e. MSCI, FTSE, S&P and Dow Jones which do not use identical stock selection criteria

Literature Review

It appears that only Shamsuddin (2014) investigated the interest rate sensitivity of Islamic indexes. The study observed that Islamic indexes of Dow Jones are immune to interest rates risk. It attributed this phenomenon to presence of low leverage stocks in these Islamic indexes. In total, 26 Dow Jones Islamic indexes and conventional counterparts were analyzed for interest sensitivity in the study. This included Dow Jones Islamic Market World and its conventional counterpart namely Dow Jones World Market, and their sub-indexes namely Dow Jones Islamic Emerging Market, Dow Jones World Emerging Markets, Dow Jones Islamic Excluding US and 20 Islamic and conventional sector indexes. The study observed that though Islamic market indexes were found immune to interest rate changes, their sector level indexes did show both positive as well as negative sensitivity to interest rates. It further suggests that the insensitivity of the aggregate Islamic market indexes could be due to the fact that the positive sensitivity to interest rates of some sectors was cancelled out by negative sensitivity of others, hence making aggregate Islamic market indexes immune to interest rates changes. However, it reported that overall Islamic sector indexes showed lower sensitivity to interest rates than their conventional counterparts.

Due to differences in their stock picking criteria, it is evident that the results of this study cannot be generalized to comparable Islamic indexes from other providers. Furthermore, evidence of some sector level indexes showing positive and some others showing negative sensitivity to interest rates implies that the immunity to interest rates exhibited by aggregate Islamic market indexes could be due to diversification. Hence, Islamic indexes of other providers, especially those that differ with Dow Jones stock selection criteria, need to be examined for interest rate sensitivity. In addition to the above, the study in question analyzed indexes that carry global stocks.

It is not clear if country level indexes show same kind of immunity to interest rates, particularly those that traditionally make larger portions of global Islamic indexes, specifically USA that make almost half of all major global Islamic equity indexes. Average corporate debt varies from country to country due to variation in tax laws that favor the use of debt. It is, therefore, expected that financial ratios used by Islamic index providers would be most effective in countries where tax laws are more favorable for debt. Hence, it is also expected that the impact of difference in the financial ratios used by different providers would be more pronounced in their Islamic indexes for such countries. It is therefore, expected that such a difference would reflect in varying levels aggregate debt and hence, of sensitivity to interest rates in the respective Islamic indexes of these providers. This expectation is in line with studies like Moya-Martínez, Ferrer-Lapeña, & Escribano-Sotos (2015) and Choi, Richardson, & Whitelaw (2016) to name a few, that interest rate sensitivity of market indexes is correlated with their aggregate debt.

Methodology

Empirical Duration (ED) is the method used to measure and compare the interest rate sensitivity of stock indexes considered in this study. ED is based on the historical relation between the variation in the prices of the examined indexes and changes in interest rates.

Reilly, Wright, & Johnson (2007) appears to be the most comprehensive study done on the interest rate sensitivity of a variety US stock market indexes. After surveying the relevant literature, the study suggested that ED should be used to measure the interest rate sensitivity of assets that are not fixed-income like bonds (e.g. stocks, real state among others). This is because methods like effective durations that are used for measuring interest rate sensitivity of fixed–

income securities require asset pricing models that can give estimate of prices for a change in interest rates. Since prices of assets like stocks and portfolios thereof are affected by many other factors alongside interest rates, an exact estimation of their prices in this regard is not possible (Leibowitz & Kogelman, 1993).

Leibowitz & Kogelman (1993), have shown that EDs are usually lower for growth stocks than value stocks. Furthermore, size is also reported to affect the interest rate sensitivity of stocks, such that stocks with larger market capitalizations are more often than not associated with higher EDs and vice versa. As size and growth prospects of firms vary overtime, EDs of their stocks varies in tandem (Reilly, Wright, & Johnson, 2007). Following Reilly, Wright, & Johnson (2007), a univariate regression model (also used in Hayre & Chang, 1997) will be used to observe the relationship between changes in each of the examined indexes and changes in interest rates.

$$\% \Delta A_{i,t} = \alpha_i + ED_i(\Delta Y_t) \quad (1)$$

Where,

$\% \Delta A_{i,t}$ = Percentage change in the price of examined index i during month t .

ED_i = Estimate of empirical duration for examined index i .

ΔY_t = Change in the Treasury yeild during month t .

Past studies, for example, Cornell (2000) reported that the effect of changes in interest rates on stock prices is generally passed on through the market element; nevertheless there is a significant effect of interest rate changes on stocks after allowing for the market effect. It is, therefore, recommended that EDs of indexes that represent segments of market i.e. industries and sectors should be measured using a proxy for the market in the model (Reilly, Wright, & Johnson, 2007). Since both Islamic and conventional indexes analyzed in this study are market portfolios (i.e. they cut through the various industries and sectors of the market), hence the aforesaid mode model suits the purpose of this study.

U.S. Islamic market indexes and their corresponding conventional indexes by four major index providers i.e. MSCI, FTSE, S&P and Dow Jones are used in the study. Previous studies such as Derigs & Marzban (2008), Walkshausl & Lobe (2012) and Ho, C.S. (2015) cited marked differences in the financial ratios used by these providers to select Islamic stocks for their respective Islamic indexes (see table 1). Differences between the financial ratios used by S&P and Dow Jones in this regard still exists, despite merger of their providers in 2012 (Oranzo, 2013). Therefore, for the purpose of this study, both indexes qualify to be considered as two Islamic indexes based on non-identical stock selection criteria. As is recommended in Reilly, Wright, & Johnson (2007), for interest rates, Bank of America (BoFA) Treasury Index's yield changes will be used. Monthly data and for the period of Jan, 2008 to Dec, 2016 is used for all indexes considered in this study.

Analysis of Results

ReferencesIn practice, signs of the estimates of the EDs are reversed (Reilly, Wright, & Johnson 2007, Choi, Richardson, & Whitelaw 2016). In this study, however, EDs are displayed with their original signs to avoid misunderstanding regarding the direction of sensitivity of an index to changes in interest rates (Fabozzi, 2012). Similarly, results of past studies referred to in this

analysis are also explained and compared with results of this study in light of their original ED signs.

Interest Rate Sensitivity of Islamic Indexes

Table 2 shows the entire period EDs of examined Islamic indices. The Islamic index of MSCI shows the lowest ED of +6.26 while that of S&P shows the highest ED of +7.38. Choi, Richardson, & Whitelaw (2016) reports that indexes having higher aggregate debt are relatively more sensitive to changes in interest rates. This can explain the rankings of Islamic indexes with respect to EDs in table 2, such that due to having the lowest aggregate debt, MSCI Islamic index has the lowest ED followed by Islamic indexes of FTSE, Dow Jones and S&P respectively. Shariq & Sukor (2017) findings reinforce the validity of this explanation. For the Islamic indexes considered in this study (and for the same time period), Shariq & Sukor observed that in terms of aggregate cash holdings MSCI Islamic index topped the rankings with the largest cash holdings followed FTSE, Dow Jones and S&P Islamic indexes. As stated earlier, firms' cash holdings (and therefore that of portfolios/indexes thereof) have negative relationship with their debt levels. Thus, Shariq and Sukor's rankings of the Islamic indexes with respect to their cash holdings indirectly convey their rankings in terms of their aggregate debt and by extension their ED or interest rate sensitivity. Overall analysis of results in table 2 indicates that Islamic indexes that are not based on identical stock selection criteria have different levels of sensitivity to changes in interest rates.

The question as to whether or not difference between the interest rate sensitivities of Islamic indexes be taken seriously by investors interested in Islamic stocks/indexes is considered next.

Table 2

Index	ED	t-stat	R-Square
MSCI	6.258	3.284	0.092
FTSE	6.362	3.277	0.092
Dow Jones	6.871	3.475	0.102
S&P	7.379	3.725	0.116

This table shows full period (i.e. Jan.2008 to Dec.2016) empirical durations (EDs) of Islamic indexes of MSCI, FTSE, Dow Jones and S&P. EDs are estimated using regression model 1 which does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

A few basis points difference in the EDs can translate into significant differences in the economic returns of portfolios as interest rates change. To emphasize this point, table 3 shows the percentage differences between the full period EDs of Islamic indexes. The smallest difference was noted between the EDs of FTSE and MSCI Islamic indexes, indicating that a 1% rise in interest rates could increase FTSE Islamic Index's value by 1.6% more than that of MSCI Islamic index. Likewise, the largest difference of 17.92% found between the EDs of S&P and MSCI Islamic indexes suggesting that in response to a 1% increase in interest rates, value of S&P Islamic index is expected to increase by 17.92%, more than that of MSCI Islamic index. Similarly, S&P Islamic index is likely to gain around 16% more in value compared to FTSE Islamic index. Dow Jones Islamic index on the other hand is expected to go up 9.80% and 8% higher but 7.40% lower than MSCI, FTSE and S&P Islamic indexes respectively as interest rates go up by 1%. It is clear from the above that the economic consequences of the seemingly

small absolute differences in EDs of the examined Islamic indexes can be significant, especially for large portfolios like Islamic ETFs and other index based fund.

Table 3

	MSCI	FTSE	Dow Jones	S&P
MSCI	0.00%	-	-	-
FTSE	1.67%	0.00%	-	-
Dow Jones	9.80%	8.00%	0.00%	-
S&P	17.92%	15.99%	7.40%	0.00%

This table shows percentage difference in full period (i.e. Jan.2008 to Dec.2016) empirical durations (EDs) of Islamic indexes of MSCI, FTSE, Dow Jones and S&P as given in table 2. In each case, the difference shows the extent by which ED of the Islamic index of provider heading the row exceeds ED of the Islamic index of provider heading the column.

The minimum and maximum of the rolling 36-month ED values taken on by the analyzed Islamic indexes are presented in table 4.

Table 4

Index	Average	Min	Max	Range (Min-Max)
MSCI	7.25	1.87	16.78	14.91
FTSE	6.72	0.25	16.44	16.19
Dow Jones	7.26	0.63	16.97	16.35
S&P	7.46	0.80	16.94	16.14

Note: This table shows average, minimum, maximum and range of the rolling 36-months empirical durations (EDs) of Islamic indexes of MSCI, FTSE, Dow Jones and S&P. For this purpose, empirical durations for all 36-months rolling periods that spanned the full period of analysis (i.e. Jan 2008 to Dec.2016) were estimated using regression model 1. The model does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

The gap between the minimum and the maximum ED values is high in each case and suggests that like the market index (i.e. Russell 3000), the rolling period EDs of Islamic indexes may also have remained positive but volatile over the period. figures 9,10,11 confirms this to be the case.

Figures 9,10,11 plots the percentage differences in the monthly rolling-36 months EDs of distinct pairs of the examined Islamic indexes.

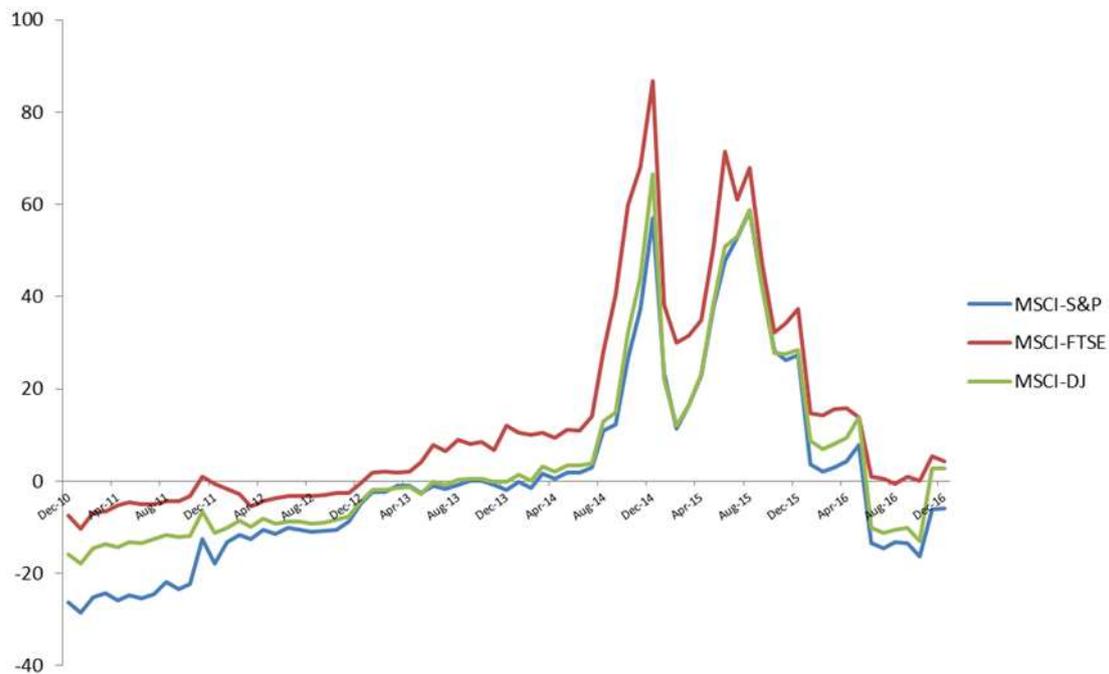


Figure 1

Figure 1 plots the percentage difference between the EDs of MSCI Islamic index and those of S&P, FTSE and Dow Jones Islamic indexes respectively for all rolling 36-months periods that encompasses the full period of analysis (i.e. Jan.2008 to Dec.2016). EDs for the rolling periods are based on regression model 1. The model does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

Figure 1 shows that initial ED of MSCI Islamic index was the lowest while that of S&P Islamic was the highest, which is why the difference between initial EDs of MSCI and S&P Islamic index was the largest at -26.20%. At the same time, the difference of -7.53% between the initial EDs of MSCI and FTSE Islamic index was the smallest which shows that initially FTSE Islamic index had the second lowest ED after MSCI Islamic index. Overall, the initial rank-order of the Islamic indexes in terms of their sensitivity to interest rates was exactly the same as it was for the full period i.e. MSCI Islamic index has the lowest positive sensitivity to interest rates followed FTSE, Dow Jones and S&P respectively.

This initial rank-order have changed many times over the rolling periods, as the rolling ED of MSCI Islamic index successively exceeded those of the other three Islamic indexes. From September 2013, when the MSCI Islamic index's ED went ahead of that of S&P Islamic index till June 2016, MSCI Islamic remained the most sensitive index followed by S&P, Dow Jones and FTSE Islamic indexes respectively. From June till November 2016 MSCI Islamic became the third most interest rate sensitive index as its rolling ED slipped below that of Dow Jones and S&P Islamic indexes. At the end of the period, the percentage difference between MSCI Islamic index's ED and that of S&P, Dow Jones and FTSE Islamic indexes became -5.98%, 2.74% and 4.32% respectively. This made MSCI Islamic the second most sensitive index to changes in interest rates after S&P Islamic index, and was followed by Dow Jones and FTSE Islamic indexes respectively. It may be noted that the relatively unstable EDs of MSCI Islamic

index compared to the other three Islamic indexes is consistent with changes in its style over the rolling periods reported in Shariq & Sukor (2017). The study observed that MSCI Islamic index drifted from its average style the most compared to other Islamic indexes.

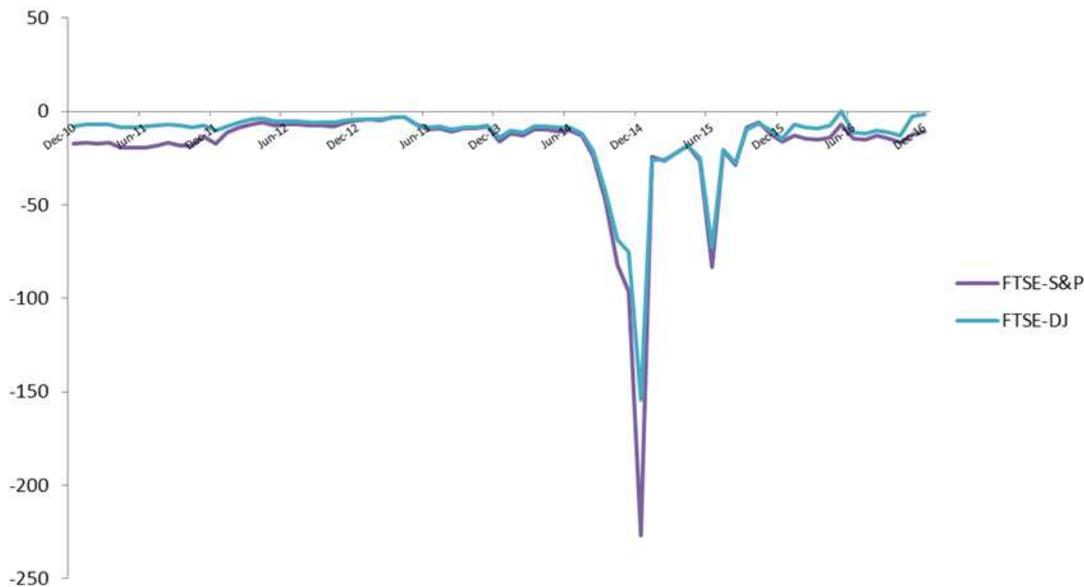


Figure 2

Figure 2 plots the percentage difference between the EDs of FTSE Islamic index and those of S&P and Dow Jones Islamic indexes respectively, for all rolling 36-months periods that comprised the full period of analysis (i.e. Jan.2008 to Dec.2016). EDs for the rolling periods are based on regression model 1. The model does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

Figure 2 shows that the monthly percentage difference with S&P Islamic index ranged from a low of -2.89% to an extremely high -226% while with Dow Jones Islamic index it remained between 0.07% to -154.34%. The negative percentage differences almost throughout the period indicates that overall FTSE Islamic index's EDs remained below those of S&P and Dow Jones Islamic indexes. On average, however, the percentage difference between FTSE and S&P Islamic indexes have been higher compared to that between FTSE and Dow Jones Islamic indexes. Furthermore, expansions and contractions in the percentage differences with S&P and Dow Jones Islamic index occurred almost simultaneously. All this shows that relative sensitivity of the three Islamic indices in question have remained almost the same as it was for the full period, such that S&P Islamic remained the most sensitive index to interest rates followed by Dow Jones and FTSE Islamic indexes respectively.

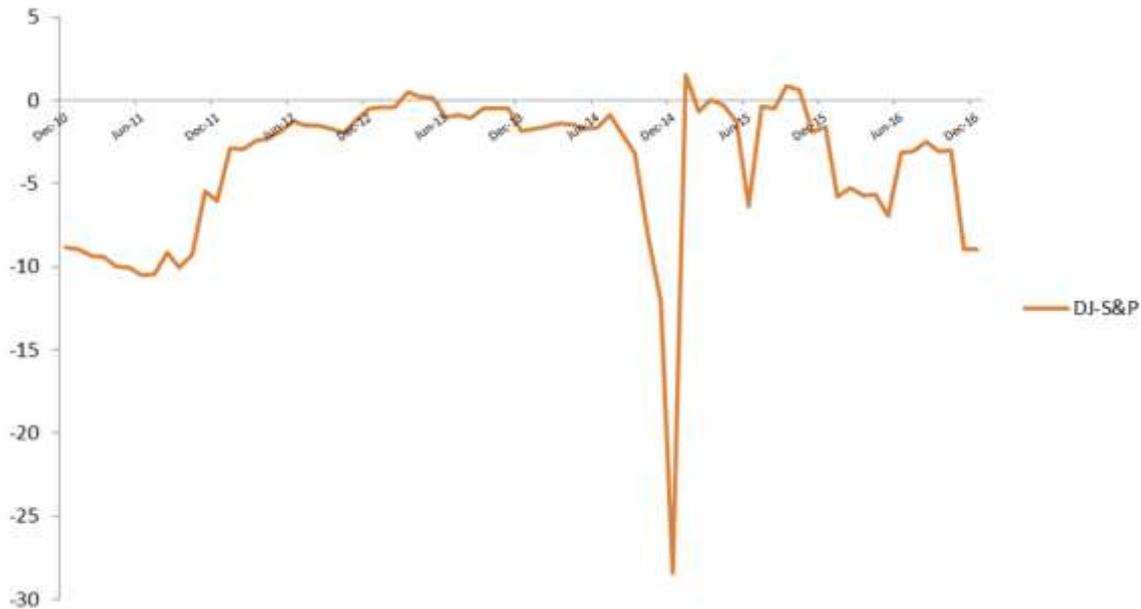


Figure 3

Figure 3 plots the percentage difference between the EDs of Dow Jones Islamic index and those of S&P Islamic index for all rolling 36-months periods that comprised the full period of analysis (i.e. Jan.2008 to Dec.2016). EDs for the rolling periods are based on regression model 1. The model does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

The initial percentage difference was -8.84%. It touched the maximum negative value of -28.41% around December 2014 before acquiring a positive value of 1.54% in the subsequent month. The end of period difference was -8.97%. The mostly negative percentage differences suggest that the rolling EDs of Dow Jones Islamic index have remained well below those of S&P Islamic for most of the months. Simply put, S&P Islamic index remained more sensitive to interest rate changes compared to Dow Jones Islamic index for most of the period. This indicates that over the period, the relative sensitivity to interest rates of S&P and Dow Jones Islamic indexes remained almost the same as it was for the full period. Again this is consistent with results in Shariq & Sukor (2017), wherein Islamic indexes of Dow Jones and S&P were found to have deviated the least from their full period styles over the rolling periods compared to those MSCI and FTSE.

Overall analysis of the results presented in Figures 9,10 and 11 suggest that the magnitude of difference between the rolling EDs of the four Islamic indexes varied over time. However, despite this variation, Islamic indexes of S&P, FTSE and Dow Jones maintained their full period ranking with respect to interest rate sensitivity even during the rolling periods. On the contrary, MSCI's was the only Islamic index that kept changing its ranking in terms of sensitivity to interest rates. Furthermore, changes in the interest rates sensitivity of all Islamic indexes almost matched changes in their styles as observed by Shariq & Sukor (2017) over the same rolling periods.

In summary, both full period and rolling periods analysis indicates that variations in their stock selection criteria kept Islamic indexes of all providers to invest differently and therefore, have

different aggregate debt levels and by extension different levels of sensitivity to changes in interest rates.

Interest rate Sensitivity: Islamic vs Conventional Indexes

Islamic indexes are subsets of conventional indexes (Oranzo, 2013). As stated earlier, Philips & Kinniry Jr (2012) empirically showed that due to convergence of their stock index construction methodologies of major providers (including those of MSCI, FTSE, Dow Jones and S&P), the investment attributes of their U.S. conventional indexes are almost similar. Thus, any variations in the investment attributes of U.S. Islamic indexes derived from the conventional indexes of these providers could largely be attributed to differences in the stock selection criteria on which these providers base their respective Islamic indexes. To know if this happens to be the case, this section compares the difference between EDs of the conventional indexes to that between the corresponding Islamic indexes in several ways.

Using regression model 1, the full period estimates of EDs for the four conventional indexes are presented in table 5. There is only one similarity in the full period results of conventional and Islamic indexes.

Table 5

Index	ED	T-stat	R Square
MSCI	6.933	3.359	0.096
S&P	7.069	3.382	0.097
FTSE	7.263	3.441	0.100
Dow Jones	7.390	3.499	0.104

This table presents full period (i.e. Jan.2008 to Dec.2016) empirical durations (EDs) of conventional indexes of MSCI, FTSE, Dow Jones and S&P. EDs are estimated using regression model 1, which does not include aggregate market term and hence estimates empirical duration without allowing for the market effect.

In both cases, MSCI's index has the lowest positive ED. However, the ranking of the conventional indexes of Dow Jones, S&P and FTSE in terms of interest rate sensitivity is not the same as was in the case of their Islamic indexes. Thus, while in the case of Islamic indexes MSCI's Islamic index had lowest positive ED followed by the Islamic index of FTSE, Dow Jones and S&P respectively. In the case of conventional indexes, however, MSCI is followed by S&P, FTSE and Dow Jones respectively.

Table 6

	MSCI	S&P	FTSE	Dow Jones
MSCI	0.00%	-	-	-
S&P	1.96%	0.00%	-	-
FTSE	4.76%	2.74%	0.00%	-
Dow Jones	6.59%	4.54%	1.75%	0.00%

This table displays percentage difference in full period (i.e. Jan.2008 to Dec.2016) empirical durations (EDs) of conventional indexes of MSCI, FTSE, Dow Jones and S&P as given in table 5. In each case, the difference shows the extent by which ED of the conventional index of provider heading the row exceeds ED of the conventional index of provider heading the column.

Table 6 shows the percentage differences between the full period EDs of conventional indexes. The smallest difference was noted between the EDs of FTSE and Dow Jones indexes, indicating that a 1% rise in interest rates could increase Dow Jones Index's value by 1.75% more than that of FTSE index. Likewise, the largest difference of 6.59% found between the EDs of MSCI and Dow Jones indexes suggest that in response to a 1% increase in interest rates, value of Dow Jones Islamic index is expected to increase by 6.59% more than that of MSCI index. The maximum percentage difference between the EDs of conventional indexes is much lower than that of 17.92% between EDs of Islamic indexes (table 3). This confirms Philips & Kinniry Jr (2012) findings that the index construction methodologies of these providers have mostly converged, and hence the investment attributes of their conventional indexes are less different. Thus, it makes sense to expect that the relatively larger differences between the interest rate sensitivity levels (EDs) of Islamic indexes can mostly be attributed to differences in the stock selection criteria on which they are based rather than the minor differences they may inherit from the conventional indexes from which they are derived.

Table 7

	MSCI	FTSE	Dow Jones	S&P
MSCI	-9.74%	-	-	-
FTSE	-	-12.41%	-	-
Dow Jones	-	-	-7.02%	-
S&P	-	-	-	4.39%

This table shows percentage difference between full period (i.e. Jan.2008 to Dec.2016) empirical durations (EDs) of Islamic and conventional indexes of MSCI, FTSE, Dow Jones and S&P as given in table 2 and table 5 respectively. Negative differences show cases where ED of the Islamic index of a provider was lower than the ED of the conventional index of that provider.

Table 7 presents percentage difference between the full period EDs of conventional and Islamic indexes of each provider. The negative signs represent instances where EDs of Islamic indexes were lower than those of conventional indexes. The highest negative difference was noticed in the case of FTSE followed by MSCI and Dow Jones respectively. Only in the case of S&P, the difference was positive. Simply put, Islamic indexes of FTSE, MSCI and Dow Jones showed lower positive sensitivity to interest rates than their conventional counterparts. Conversely, S&P Islamic index was more responsive to changes in interest rates compared to its conventional counterpart. It appears therefore, that the stock selection criteria of S&P allow firms with relatively more debt, thereby increasing the aggregate debt and hence the interest rate sensitivity of its Islamic index relative to the Islamic indexes of other providers. Hence, it can be said that of the four Islamic indexes examined here, S&P Islamic is the only index with even more interest rate risk compared to its conventional equivalent. The following can be concluded from the analysis of results in table 8 i.e. 1) Islamic indexes have generally low interest rate sensitivity compared to their conventional counterparts and 2) the scale of difference between the interest rate sensitivity of Islamic and conventional indexes is fairly significant, finally 3) The difference in variation of interest rate sensitivity between Islamic and conventional indexes of one index provider vary significantly from that of the others.

Table 8

	MSCI	FTSE	Dow Jones	S&P
MSCI	-	-	-	-
FTSE	-3.09%	-	-	-
Dow Jones	3.21%	6.25%	-	-
S&P	15.96%	13.25%	2.86%	-

This table is derived by subtracting values given in table 6 from those in table 3. It shows the extent by which the percentage difference between the full period EDs of conventional indexes of two providers vary from the percentage difference between the full period EDs of their Islamic indexes. Negative values show instances where difference between EDs of Islamic indexes of two providers was lower than that between their conventional indexes.

Table 8 shows the extent to which the percentage difference between the full period EDs of conventional indexes of two providers vary from the percentage difference between the full period EDs of their Islamic indexes. Difference in EDs of conventional indexes in each distinct pair is subtracted from difference in the EDs of Islamic indexes in the corresponding pair. The negative difference in case of MSCI and FTSE indicate that with respect to interest rate exposure, the gap between Islamic indexes of these two providers was 3.09% lower than it was between their conventional counterparts. The non-negative difference in all other cases shows that in terms of sensitivity to interest rates, variance within the Islamic indexes of the four index providers was generally larger than that between their conventional indexes. The largest such difference was in the case of MSCI and S&P suggesting that Islamic indexes of the two providers are 15.96% more different than their conventional counterparts with respect to interest rate sensitivity. Overall, the scale by which EDs of Islamic indexes in each pair vary is significantly larger from that witnessed in the corresponding pairs of conventional indexes. In summary, analysis of results in tables 7 and 8 confirms that the considerably larger differences in the interest rate sensitivities of Islamic indexes are in large part due to variations in the stock selection criteria on which they are based rather than the relatively minor differences in the interest rate sensitivities of conventional indexes from which they are derived.

As full period EDs are averages of sub periods' EDs. It is valuable to observe the path taken by EDs of Islamic indexes relative to that of their conventional counterparts over the sub-periods. To serve this purpose, Figures 4-7 plots the percentage differences in the monthly rolling-36 months EDs of each index provider's Islamic and conventional indexes. In calculating the percentage difference, monthly rolling EDs of conventional index were subtracted from those of the Islamic index of each provider. Hence, negative percentage differences reflect points in time where the rolling EDs of Islamic indexes were lower than those of their conventional counterparts.

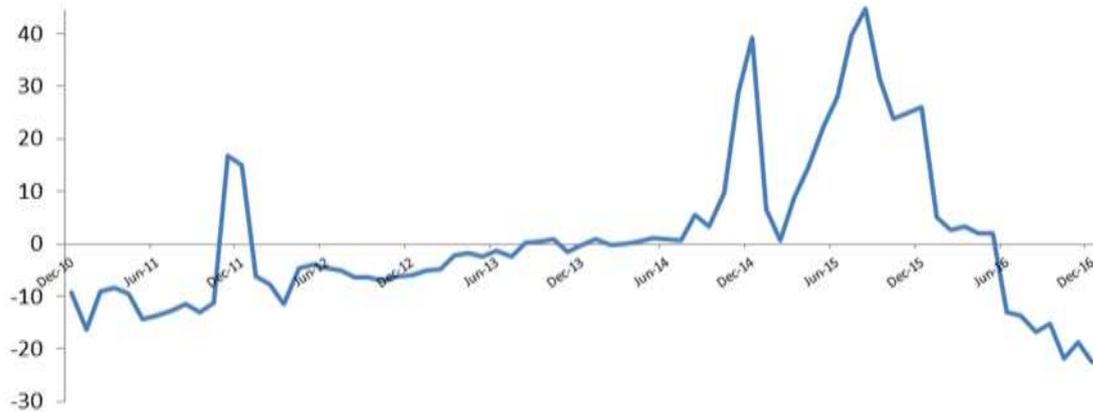


Figure 4

Figure 4 plots the percentage difference in the EDs of MSCI's Islamic and conventional indexes for all rolling 36-months periods that encompassed the full period of analysis (i.e. Jan.2008 to Dec.2016). Negative percentage differences reflect points in time where EDs of Islamic index were lower than that of its conventional counterpart.

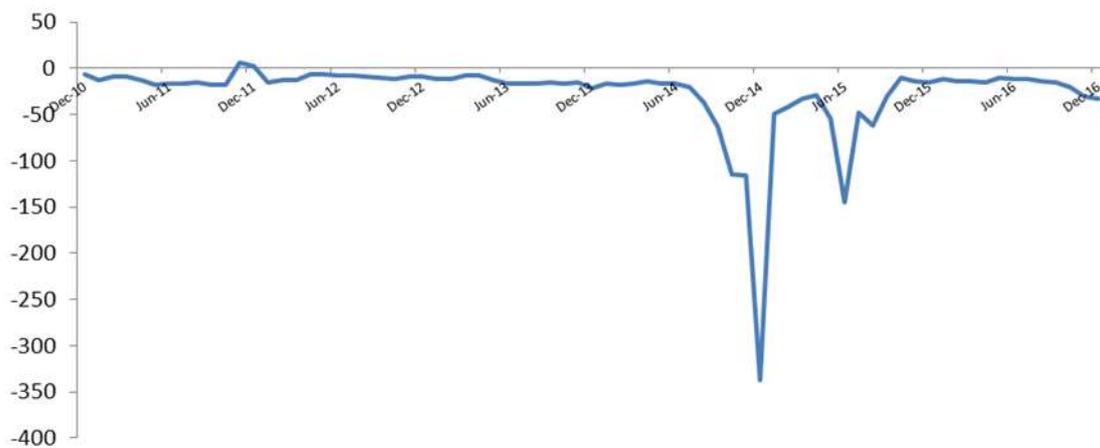


Figure 5

Figure 5 plots the percentage difference in the EDs of FTSE's Islamic and conventional indexes for all rolling 36-months periods that encompassed the full period of analysis (i.e. Jan.2008 to Dec.2016). Negative percentage differences reflect points in time where EDs of Islamic index were lower than that of its conventional counterpart.

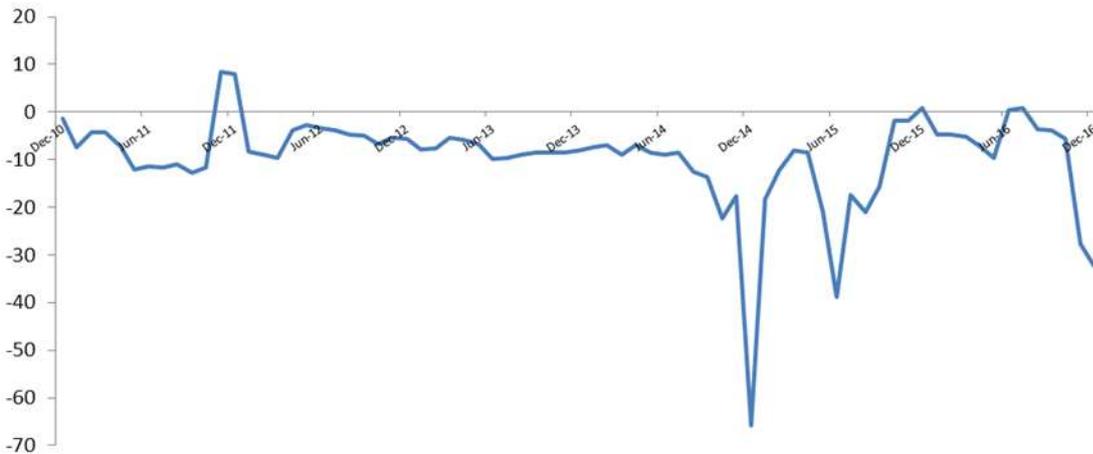


Figure 6

Figure 6 plots the percentage difference in the EDs of Dow Jones's Islamic and conventional indexes for all rolling 36-months periods that encompassed the full period of analysis (i.e. Jan.2008 to Dec.2016). Negative percentage differences reflect points in time where EDs of Islamic index were lower than that of its conventional counterpart.

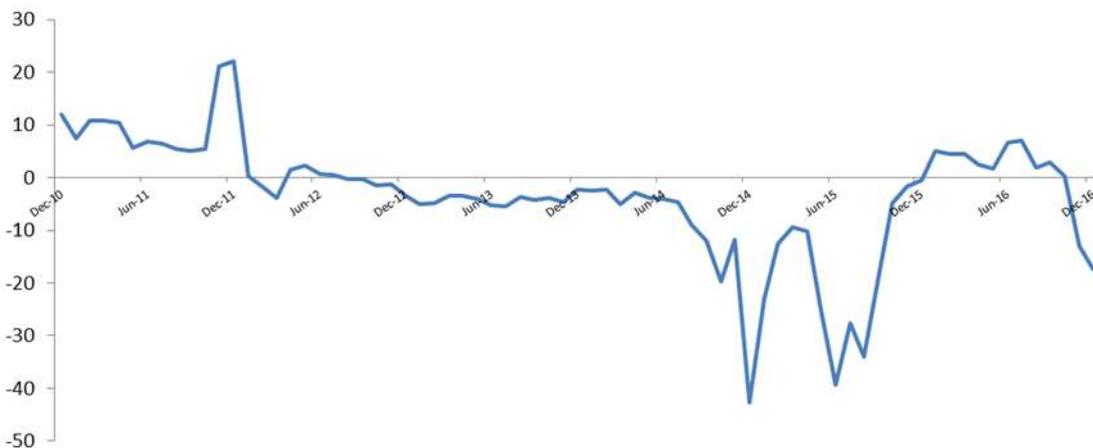


Figure 7

Figure 7 plots the percentage difference in the EDs of S&P's Islamic and conventional indexes for all rolling 36-months periods that encompassed the full period of analysis (i.e. Jan.2008 to Dec.2016). Negative percentage differences reflect points in time where EDs of Islamic index were lower than that of its conventional counterpart

The exhibits show that initially only S&P Islamic index's rolling-period ED was higher than its conventional equivalent (by 11.98%). However, the closing rolling EDs of Islamic indexes of all providers were lower than their conventional indexes. At the end of 2014, rolling ED of the FTSE's Islamic index reduced to a third of that of its conventional index, the biggest drop in the rolling ED of any of the analyzed Islamic indexes compared to that of their conventional counterparts during the period. Conversely, in 2015 ED of Islamic index of MSCI exceeded that of its conventional index's by 45%, the largest rise in the rolling ED of any of the Islamic indexes relative to that of their conventional equivalents.

Only MSCI Islamic index mean rolling periods ED was marginally above that of MSCI conventional i.e. by 0.85%. The mean rolling period EDs of all the other three providers' Islamic indexes remained below that of their conventional indexes, of which S&P Islamic index's average ED was relatively less low i.e. by 3.41% than its conventional equivalent. As mentioned earlier, the difference between the full period and the mean (average) of the rolling periods' EDs is due to the fact that 36-months rolling regressions involve non-overlapping months such that some months may appear in one of the 36-months rolling windows while others may appear in up to 36 windows.

However, the median of the rolling percentage differences was negative for all Islamic indexes indicating that all Islamic indexes had lower rolling EDs than those of their conventional equivalents for most of the period. The median percentage difference was lowest i.e. 1.7% for MSCI and highest at 5.22% in the case of FTSE. As in previous analysis, here too the period of steep rise/fall in the interest rate sensitivity of indexes is between 2014 and 2015. The largest period for which an Islamic index showed more sensitivity to interest rates than conventional was in the case MSCI and followed somewhat distantly by S&P. The time frames during which S&P and MSCI Islamic became and stayed more sensitive than their conventional counterparts were different. The Islamic indexes of Dow Jones and FTSE exceeded the sensitivity to interest rates of their conventional counterparts but only briefly and by very narrow margins.

Overall, figures 4-7 indicates that though at times EDs of some Islamic indexes exceeded or became equal to those of their conventional counterparts, however for most of the rolling periods all Islamic indexes' EDs remained below those of their conventional counterparts. Furthermore, the scale and at times the direction of difference between the EDs Islamic and conventional indexes of each index provider differed from that of the others over the rolling periods. Both of the aforesaid observations are consistent with the full period results. Furthermore, the lower EDs of S&P's Islamic index compared to that of its conventional index for most of the rolling periods indicate that the higher full period ED of S&P's Islamic index versus that of its conventional one could well be an exception rather than the norm.

Both full period and rolling periods results suggest that irrespective of the time frame, Islamic indexes of all providers generally have lower sensitivity to changes in interest rates relative to their conventional counterparts. However, the degree by which Islamic index's ED of each provider differed from that of its conventional equivalent was different in each case. This is further evidence showing though the stock selection criteria significantly lower interest rate sensitivity of Islamic relative to their conventional counterparts, however, variation in the degree by which interest rate sensitivity of Islamic index each provider differed from that of its conventional index could largely be attributed to inconsistencies in the stock selection criteria on which Islamic index of each provider is based.

Conclusion

In summary, Islamic indexes of major providers, i.e. MSCI, FTSE, Dow Jones and S&P, generally show low levels of sensitivity to changes in interest rates relative to their conventional counterparts. This phenomenon is best explained by the fact that stocks of firms with relatively high sensitivity to interest rates i.e. those of conventional financial firms (such as banks) and of firms with excessive debt on their balance sheets are absent in Islamic indexes.

Interest rates sensitivity of all Islamic indexes examined varied from one another. Furthermore, the scale of difference between the interest rate sensitivity of Islamic indexes of all the four providers was found to be significantly large compared to that observed between their conventional indexes. Since, earlier studies indicate that due to convergence in the general index construction methodology of MSCI, FTSE, S&P and Dow Jones, their conventional indexes exhibit almost similar investment characteristics (Philips & Kinniry Jr (2012). And since, Islamic indexes of these providers are subsets of their conventional indexes. It, therefore, makes sense to say that the relatively larger differences in the interest rate sensitivity of their Islamic indexes can mostly be attributed to differences in the stock selection criteria on which these providers base their respective Islamic indexes.

Overall, the rankings of Islamic indexes with respect to interest rate sensitivity matched their rankings in terms of expected aggregate debt as reflected by their styles in Shariq and Sukor (2017). As such, MSCI Islamic index showed the lowest sensitivity to interest rates followed by the Islamic indexes of FTSE, Dow Jones and S&P respectively. This shows that styles of Islamic indexes can work as proxy indicator of their aggregate debt, and by extension their interest rate sensitivity.

Due to variation in their interest rate sensitivity, the examined Islamic indexes offer four distinct investment strategies with respect to interest rate exposure. Hence, investors can invest in either of these strategies or a combination thereof to achieve their investment goals while keeping their exposure to interest rates at a desirable level. However, the magnitude of difference between the interest sensitivity of the four Islamic indexes varied over rolling periods. Similarly, the magnitude of difference between the interest rate sensitivity of Islamic indexes and their conventional counterparts varied over sub periods. Therefore, investors of Islamic indexes, particularly those having shorter investment horizons, should remain vigilant of the changes in the interest sensitivity of the Islamic index or indexes they wish invest in.

The difference in the levels of interest rates sensitivity also suggest that investors need to be cautious when benchmarking performance of their portfolios against that of Islamic indexes. As due to differences in their interest rates risk, overall risk of Islamic indexes can be different. Thus, while comparing the performance of two or more portfolios, they need to be benchmarked against Islamic index of same provider or at least of providers which based their Islamic indexes on same stock selection criteria.

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