DE GRUYTER OPEN

DOI 10.1515/sbe-2017-0004

ARE THERE CAUSAL RELATIONSHIPS BETWEEN ISLAMIC VERSUS CONVENTIONAL EQUITY INDICES? INTERNATIONAL EVIDENCE

EL AMRI Henda
ISG - University of Sousse, Tunisia

HAMZA Taher
IHEC - University of Carthage, Tunisia

Abstract:
This paper investigates Islamic Versus Conventional market indexes' performance. It analyzes also their short and long term relationship by testing cointegration, causality and impulse response functions. The sample period is from 2003 to 2011 and splited into 3 sub-periods: pre, during and post subprime crisis. Our findings provide evidence that first, index performance are somewhat mixed over the different period and through the different indices under consideration, and support the hypothesis that the impact of faith-based screens on investment performance is insignificant. Second, over the three sub-periods, there is no long run relationship between the Islamic indices and their conventional counterparts' performance, except for the Islamic emerging markets indices. Third, in the short-run, we find different causal links between Islamic Versus non-Islamic indices over the three sub-periods. This finding is robust even after testing an impulse responses functions. Our findings have important implications for international portfolio diversification.

Key words: *Islamic indices, Conventional indices, Sharpe ratio, cointegration, impulse response functions, Sharia screening process*

1. Introduction

One of the major innovations in the financial community is the rapid expand of Islamic financial services worldwide. Despite its former theoretical underpinning, Islamic finance emerged in the early 1960s, and has continued to grow by 15 to 20% per year over the past decade and is expected to sustain this growth rate.[1] Globally, the assets under management (AUM) in Islamic financial institutions have increased

[1] Source: Faisal Private Bank

five-fold to reach US $ 1trillion between 2003 and 2010. Moody's Investors Service estimates that the full potential of the industry is at least US $ 5 trillion[1]. Based on the principles of *Shariah* that impose justice, fairness and transparency, Islamic finance differs from conventional financial practices by a different conception of the value of capital and labor. Indeed, Islamic financial system emphasizes the ethics and morals and draws its source primarily from the Holy *Quran* and the *Sunnah (*"a path, a way, a manner of life"). The expansion of Islamic finance is primarily driven by the fact that it meets the needs of a large number of investors who seek financial services compliant with Sharia norms.

The World of finance has put forward the launch of Islamic indices filtered according to the *Shariah* on several stock exchange markets around the world. Consequently, to be in accordance with their beliefs, investors are looking into whether a portfolio of equities selected by an Islamic screening process presents a divergent performance than conventional one. Despite the increasing attention to Islamic investment, there are few empirical studies focusing on Islamic indices or funds behavior relative to their conventional counterparts. Most research examined the performance of these indices with respect to the performance of the conventional peers. Indeed, to our knowledge few papers investigated the short and long term relationships between Islamic and conventional indices. Our study addresses this research question: does the *Sharia* screening process influences, the performance of the Islamic indices, and its link with the performance of their conventional counterparts?

Our paper investigates Islamic Versus Conventional market index performance by using Sharpe ratio (Sharpe, 1994). It analyzes also their short and long term relationship by testing cointegration, causality and impulse response functions. The sample period is from 2003 to 2011 and splited into 3 sub-periods: pre, during and post subprime crisis. Our main findings can be summarized as follows: *i)*Index performance are somewhat mixed over the different period and through the different indices under consideration, and support the hypothesis that the impact of faith-based screens on investment performance is insignificant. *ii)* Over the three sub-periods, there is no long run relationship between the Islamic indices and their conventional counterparts' performance, except for the Islamic emerging markets indices. *iii)* In the short-run, we find different causal links between Islamic Versus non-Islamic indices over the three sub-periods. Lastly, as robustness test, the impulse response functions show that for the three sub-periods, a shock on Islamic index prices affects their conventional counterparts during four days. Our findings have important implications for international portfolio diversification.

Our paper adds to the recent literature in at least three ways. First, it asserts that during the pre, during and post subprime crisis, the impact of faith-based screens on investment performance is insignificant. Second, it supplements the literature by showing the absence of a long run relationship between the Islamic and their

[1] Source: Faisal Private Bank

conventional counterparts' performance, except for the Islamic emerging markets indices. It therefore recommends to investors different portfolio diversification strategy (Markowitz, 1952). Third, this paper shows different short term causal links between the two types of indices over the three sub-periods. This finding is robust even after testing an impulse responses functions. As such, we consider our research to be an important and timely contribution to this field.

The remainder of this study is organized as follows. Section 2 briefly reviews the literature regarding *Shariah* Compliant Equity Investments and screening procedure and the relationship between the Islamic indices and their conventional counterparts' performance. Section 3 describes the methodology and reports the empirical results. Section 4 provides some concluding remarks and implications.

2. Literature review

We present hereafter the literature related the screening process of the Shariah Compliant Equity Investments in one hand and the short and long-run relationship between Islamic Versus Conventional equity indices' performance in the other hand.

2.1. Shariah Compliant Equity Investments and screening procedure

Islam has strictly prohibited Riba (interest - Siddiqi, 2004) and all forms of unearned income which has drawn attention of some economists about their financial consequences (Robertson, 1990). All forms of gambling[1] transactions and pure games of chance (*Maysir* and *Qimar)* are also prohibited by *Sariah* rules. Besides, *Sariah* has prohibited *Gharar* defined as transaction of probable objects whose existence or description is doubtful in terms of type, size, and amount (Fadeel, 2002). Consequently, stock's short-selling are not allowed by *Sariah* norms. Hashim (2008) and Chong and Liu (2009) indicate that «*The prohibition of gharar is designed to prevent the weak from being exploited and, thus, a zero-sum game in which one gains at the expense of another is not sanctioned. Gambling and derivatives such as futures and options, therefore, are considered un-Islamic because of the prohibition of gharar*». According to *Shariah* rules, a transaction must imply a sharing in losses and profits between different parties. Moreover, mutual risk-sharing could help absorbing the loss by sharing it equitably between all parties. In addition, the backing with a tangible asset fosters stability system and risk control (Nait-Daoud, 2008). Furthermore, Derigs and Marzban (2009) underline that *Shariah* prohibits investing in non compliant activities (alcohol producers, casinos, conventional banking, pork, tobacco, arms and defence companies and nuclear industry).

[1] *Qimar* signifies the game of chance in which one gains at the cost of others. *Maysir* is related to the easy acquisition of wealth by chance, whether or not it deprives the other's right. So, it is seen as obscured and dishonoured transactions and it is taken for immoral. (Hassan *& al*., 2010).

To be "*Sharia*-Compliant", equity investment has to meet a number of screening criteria (*Shariah* norms). To this end, the screening process uses a set of financial and social criteria (Nait-Daoud, 2008; Hassan *et al,* 2005). There are two types of filtering. The first one is a screening based on sectors. The second consists on some compliance measurements. After removing companies with non-compliant business activities, the rest of the companies are examined for compliance in financial ratios (debt, liquidity, currency exchange rate, etc) as certain ratios may violate compliance measurements. *Shariah* scholars fixed minimum compliance criteria to the extent that fully *Shariah*-compliance is difficult to reach.

2.2. Short and long-run relationship between Islamic Versus Conventional equity indices' performance

Despite the increasing attention to Islamic investment, the empirical studies on Islamic indices and/or funds are scarce. In this context, Hakim and Rashidian (2002) evaluated the performance of an Islamic index Versus the rest of the American stock market and examine the relationship between them during the period 1999-2002. The authors show that the Islamic index outperforms both the Wilshire 5000 and the T-bill rate. Moreover, the results supported that neither the Wilshire 500 nor the T-Bill have significant long term link with the Islamic index. However, the risk-free rate has a significant stochastic impact on the Wilshire 5000. Furthermore, the Vector Error-Correction Models (VECM) results confirmed the absence of steady link with the conventional index and the T-bill rate. Guyot (2008) provides evidence that the variance ratio test proves that the Islamic screening process exerted a positive influence given that the Islamic indices returns show a convergence in time towards efficiency.

Moreover, all performance measurements (Sharpe ratio, Jensen Alpha, Beta and residual variance- Jensen, 1968) support the absence of difference in performance between the Islamic and conventional indices. The work of Guyot (2008) based on Phillips and Ouliaris (1999) approach find that, except for the Canada Indexes, the Islamic and the conventional indexes are not cointegrated. Yet, the Islamic indexes and their counterparts can evolve in a joint way on the short run. Hussein (2005) tests the effect of the *Shariah* screening on the performance of Islamic indexes in the short and long term. He used the Dow Jones Islamic Index and the FTSE Global Islamic index and their counterparts over the period 1993-2004. The author indicated that the Islamic indices are riskier than their conventional counterparts and that they outperformed them in the entire period. Besides, the author looked into the long term performance of the indices by using the cumulative return and buy-and-hold method. The findings are similar to those of the short term test. They reject the assumption that Shariah investing underperforms unscreened portfolios.

Girard and Hassan (2008) assessed the performance of Islamic indices and their counterparts using monthly returns of five Islamic indexes from FTSE Islamic Indexes and their corresponding conventional FTSE indices over the period 1998-

2006. The Sharpe and Treynor ratios (Treynor, 1965) report that the Islamic indices slightly outperform their non-Islamic counterparts. Furthermore, the authors used CAPM and Carhart's four-factor model and document a non significant difference in return between the Islamic indices and their conventional peers. By using multivariate cointegration analysis, the authors find that the Islamic indices and their conventional counterpart's peers are cointegrated. They conclude that there is similar reward to risk and diversification benefits for both types of indexes. Using the risk-adjusted return measurements over the period 1999-2005, Albaity and Ahmad (2008) show higher returns and higher beta of the Kuala Lumpur Shariah Index (KLSI) compared to the Kuala Lumpur Composite Index (KLCI) and their long-term and short-term relationship. They argue that the motivation behind investing in Islamic stocks differs greatly from that of conventional investment. In addition, the authors detected the existence of long run relationship between the both types of indexes. In the short run, the authors provide evidence of bidirectional causality between the two indices. Lastly, they report that the Islamic index affects the conventional index but not vice versa. Hassan et *al* (2010) show no convincing performance differences between Islamic and non-Islamic Malaysian unit trust funds (NIMUTF Versus IMUTF). Besides, they underline that NIMUTF are value-focused while IMUTF are small caps' oriented. Lastly, by using a cointegration analysis, they show the existence of diversification benefits between NIMUTF Versus IMUTF.

3. Data and methodology

We present hereafter, the sample selection procedure and different model specifications (Cointegration analysis, Causality test and Impulse response function analysis).

3.1. Data and sample selection

Our sample includes the different Dow Jones Market Indexes and their Islamic counterparts. As mentioned above, the Islamic financial market indexes' composition is carried out via a sector screening and compliance measurements. Hereafter the screening criteria used to this end.

Variables	Measurement	Value
Debt ratio	$\frac{\text{Total Debts}}{\text{Market Value of Equity (12 Month average)}}$	<33%
Liquidity ratio	$\frac{\text{Accounts Receivable s (12 Month average)}}{\text{Market val ue of Equity (12 Month average)}}$	<49%
	$\frac{\text{(Cash + Interest Bearing Securities)}}{\text{Market val ue of Equity (12 Month average)}}$	<33%

Interest income ratio	$\frac{\text{Interest income}}{\text{Revenue}}$	<5%

Table 1: Islamic and conventional indices and their symbols

Islamic indexes		**Conventional indexes**	
Designation	**Symbol**	**Designation**	**Symbol**
DJ Islamic World Index	DJIW	DJ Global Index	DJW
DJ Islamic US Market Index	DJIUSM	DJ US Market index	DJUSM
DJ Islamic Developed Markets Index	DJIDM	DJ Developed Markets index	DJDM
DJ Islamic Emerging Markets Index	DJIEM	DJ Emerging Markets index	DJEM

The data consists of daily closing prices of the 4 Islamic indexes and their conventional counterparts. The study period covers July 2003 to may 2011. To capture the impact of "Subprime" financial crisis on the indices' performance, we divide the time period into three sub-periods: pre-crisis period (07/01/2003 - 09/30/2007); crisis period (10/01/2007 - 12/31/2008) and post-crisis period (01/01/2009 - 05/15/2011). We obtained historical stock prices from the Datastream database. Continuously compounded daily returns are calculated as the natural log differences in prices: LOG (P_t/P_{t-1}). In addition, the one-month U.S. treasury bills rates are gathered from the U.S. Federal Reserve website and used as risk-free rate.

3.2. Model specification

We present hereafter the Sharpe index as a performance measurement. We look than for the stationarity of the time series of indexes returns. The third step consists on a cointegration test to examine the long-run relationships among the indices' pairs. To test the significance and the direction of causality between the indices returns, we use Granger causality approach. Lastly, as a robustness check, we analyze the Impulse responses functions' results.

$$S_i = \frac{(E(R_i) - R_f)}{\sigma_i}$$

Where:

$E(R_i)$ is the expected return of the index *i*

R_f is the risk-free rate. We use the daily US Treasury Bill rate.

σ_i the standard deviation of the index *i.*

We begin the analysis by a stationarity test of the time series. By applying the unit root tests, we determine the order of integration of these series. We adopt Augmented Dickey Fuller (ADF) test (1984), Phillips-Perron (PP) test (1988) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (1992) to confirm the stationarity and to

avoid spurious regressions. The ADF test takes into account the nature of heteroscedasticity and autocorrelation of the error terms. The test is based on following model:

$$\Delta X_t = \alpha + \beta X_{t-1} + \delta t + \sum_{j=1}^{p} \gamma_j \Delta X_{t-j} + \varepsilon_t$$

Where Δ is the difference operator,

α is a constant,

δ is a determinist trend,

β represents drift and ε_t is a pure white noise error term.

Compared to the ADF-test, PP (1988) test adds nonparametric statistical methods to take into account the serial autocorrelation and heteroscedasticity in the error terms. PP (1988) test is performed as follow:

$$\Delta Y_t = \mu + \theta t + \varphi Y_{t-1} + \omega_t$$

The KPSS (1992) test puts forward the reverse hypothesis testing. The stationarity of the variable serves as the null hypothesis whereas in the alternative hypothesis, the variable is non stationary.

3.2.1. Cointegration analysis

The use of the cointegration approach is particularly interesting to test the presence of long term relations between time series. It defines long-term steady relations and simultaneously examines the short-term dynamics of these series (Lardic and Mignon, 2002). The presence of such equilibrium relationship is tested by using Engle and Granger (1987) procedure that involves two steps:

Step 1: Estimation of the long-term relation. A necessary condition for cointegration test is that the series are integrated at the same order. It is than required to determine the order of each series' integration. We estimate the long term relationship between the two variables:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

ε_t is the error term

$\hat{\varepsilon}_t = Y_t - \hat{\alpha} - \hat{\beta} X_t$: the vector of residues estimated from the long term relation.

Engle and Granger (1987) propose different tests in order to confirm the cointegration hypothesis and recommend in particular the use of DF and ADF tests. The body of hypotheses to be tested is as follows:

$\begin{cases} H_0: \hat{\varepsilon}_t \text{ is not stationary} & \rightarrow \text{ absence of cointegration} \\ H_1: \hat{\varepsilon}_t \text{ is stationary} & \rightarrow \text{ Existence of cointegration} \end{cases}$

If the series are cointegrated, we deal with the second step.

Step 2: Estimation of Error Correction Model (ECM): We estimate the Error Correction Model (ECM) by the Ordinary Least Squares (OLS) method:

$$\Delta Y_t = -\gamma \widehat{\varepsilon_{t-1}} + \sum_i a_i \Delta X_{t-i} + \sum_j b_j \Delta Y_{t-j} + \omega_t$$

Where

ω_t ~ White Noise

$$\widehat{\varepsilon_{t-1}} = Y_{t-1} - \hat{\alpha} - \hat{\beta} X_{t-1}$$

Fisher and Student tests examine the significance of parameters related to the short-run dynamic (Lardic and Mignon, 2002).

3.2.2. Causality analysis

The causality analysis is conducted to test the significance and the direction of causality between the indices returns. According to Granger (1969), a variable X is said to 'Granger cause' Y if the past values of X help in the prediction of Y after controlling for past values of Y, or equivalently if the coefficients on the lagged values of X are statistically significant. We used Granger causality model (1969) and tested the following hypotheses:

$$\begin{cases} H_0: Y_t \text{ does not cause } X_t \\ H_1: Y_t \text{ causes} X_t \end{cases}$$

And,

$$\begin{cases} H_0: X_t \text{ does not cause } Y_t \\ H_1: X_t \text{ causes } Y_t \end{cases}$$

To test the Granger causality between the variables, a bivaried Vector Autoregressive VAR(p) is specified as follow:

$$\begin{cases} X_t = \alpha_x + \sum_{i=1}^{p} \beta_{x,i} X_{t-i} + \sum_{i=1}^{p} \delta_{x,i} Y_{t-i} + \varepsilon_{x,t} \\ Y_t = \alpha_y + \sum_{i=1}^{p} \beta_{y,i} Y_{t-i} + \sum_{i=1}^{p} \delta_{y,i} X_{t-i} + \varepsilon_{y,t} \end{cases}$$

Where:

- p: number of lags of the model. It is determined by minimizing Akaike (AIC) and Schwartz (SBC) criterions and maximizing the Log Likelihood (LV) criterion;

- α_x and α_y : constants;

- $\varepsilon_{x,t}$ and $\varepsilon_{y,t}$ **:** error terms in the time ***t***;

- $\beta_{x,i}$: the parameter of the past value of ***X.*** It shows how the past value of ***X*** explains the current value of ***X*** ;

- $\delta_{x,t}$ **:** the parameter of the past value of ***Y*** showing how the past value of ***Y*** explains the current value of ***X*** ;
- $\beta_{y,t}$ **:** the parameter of the past value of ***Y.*** It shows how the past value of ***Y*** explains the current value of ***Y***;
- $\delta_{y,t}$ **: :** the parameter of the past value of ***X*** showing how the past value of ***X*** explains the current value of ***Y***.

A standard test of Fisher is used to analyze the causality:

- If we reject H_0 $(\delta_x = 0)$ => ***Y*** causes ***X***
- If we reject $H_0 (\delta_y = 0)$ => ***X*** causes ***Y***
- If we reject H_0 $(\delta_x = 0)$ and $H_0 (\delta_y = 0)$ ➔ ***Y*** causes ***X*** and ***X*** causes ***Y.*** There is bidirectional causality which is called a **feedback effect**.

3.2.3. Impulse response function analysis

In empirical investigations, one of the main uses of VAR process is the analysis of impulse response. The latter indicates, in a VAR model, the responsiveness to shocks of the dependent variable to each of the explanatory variables. The shock effect is transmitted to all the other variables through the dynamic structure of the VAR. Impulse-response functions are used to measure the impact of an unanticipated shock on time t on the future returns. If the effect of a shock is permanent, it shifts the system to new long term equilibrium. In case of short term shock, the system returns to its previous equilibrium, and the impact disappears. The graphic representation of the impulse response functions allows the observation of the series' behavior, reacting to several shocks.

4. Empirical results and analysis

In this section, we present our empirical findings. First, we provide an overview on the descriptive statistics and the results of performance measurement of the returns indices, during the three periods. Second, we propose the stationarity findings of the different series during the three periods. Lastly, we expose the cointegration results for the different periods, the causality and the impulse responses findings.

4.1. Descriptive statistics and performance measurement

4.1.1. Descriptive statistics

Table 2 hereafter presents the descriptive statistics of the daily returns of conventional versus Islamic indices during the pre, during and post-crisis period. These indices are those of Developed, World, US and Emerging Market.

Table 2: Descriptive statistics of the daily returns of indices during the pre, during and post-crisis period.

LDJW, LDJDM, LDJEM, LDJUSM the logarithmic series of the following indices: DJW, DJDM, DJEM, DJUSM. DLDJW, DLDJDM, DLDJEM and DLDJUSM are the first differences respectively of LDJW, LDJDM, LDJEM, and LDJUSM. LDJIW, LDJIDM, LDJIEM and LDJIUSM are the logarithmic series of the following indices: DJIW, DJIDM, DJIEM and DJIUSM. DLDJIW, DLDJIDM, DLDJIEM and DLDJIUSM are the returns series of the indices: DJIW, DJIDM, DJIEM and DJIUSM.

Indices	Mean	Std .dev	Skewness	Kurtosis	Jarque-Bera	Probability
Pre-crisis period						
Developed Market						
DLDJDM	0.0006	0.00634	-0.345	4.144	79.277	0.00
DLDJIDM	0.0005	0.00662	-0.245	3.835	41.643	0.00
US Market						
DLDJUSM	0.00042	0.00741	-0.253	4.139	67.084	0.00
DLDJIUSM	0.00043	0.00774	-0.178	3.964	45.582	0.00
World Market						
DLDJW	0.0006	0.00634	-0.309	4.220	81.205	0.00
DLDJIW	0.0005	0.00656	-0.198	3.902	42.139	0.00
Emerging Market						
DLDJEM	0.0010	0.00990	- 0.941	7.059	889.079	0.00
DLDJIEM	0.0008	0.01016	-0.748	5.968	490.949	0.00
Crisis period						
Developed Market						
DLDJDM	-0.0020	0.0185	-0.2166	7.813	310.4885	0.00
DLDJIDM	-0.0017	0.0189	-0.1507	9.0395	486.0361	0.00
US Market						
DLDJUSM	-0.0016	0.2409	-0.1168	7.2309	239.427	0.00
DLDJIUSM	-0.0012	0.0225	0.13987	8.4635	384.087	0.00
World Market						
DLDJW	-0.0018	0.0187	-0.1677	7.833	311.9629	0.00
DLDJIW	-0.0016	0.0190	-0.123	8.832	452.9225	0.00
Emerging Market						
DLDJEM	-0.0024	0.0226	-0.2253	7.0627	223.488	0.00
DLDJIEM	-0.0025	0.0218	-0.1774	7.5931	283.8581	0.00
Post-crisis period						
Developed Market						
DLDJDM	0.00055	0.01188	-0.2096	5.3924	148.968	0.00
DLDJIDM	0.00059	0.01128	-0.2442	4.9318	100.262	0.00
US Market						
DLDJUSM	0.00079	0.01367	0.01812	5.8382	195.047	0.00
DLDJIUSM	0.00072	0.01223	-0.0227	5.259	123.591	0.00
World Market						
DLDJW	0.00069	0.01192	-0.2242	5.4708	154.771	0.00
DLDJIW	0.00073	0.01161	-0.2635	4.8387	89.7891	0.00
Emerging Market						
DLDJEM	0.00107	0.01330	-0.1278	4.9199	91.5973	0.00
DLDJIEM	0.00100	0.01297	-0.0656	4.6316	65.4248	0.00

Table 3 shows that, over the pre-crisis period, all return series have positive means. In addition, the conventional returns are higher than those of Islamic indices. During the crisis period, all return series have negative means. With the exception of the emerging markets index, the conventional indices realize on average higher losses than the Islamic indices. For the last period and as for the first period, all return series have positive means. Moreover, the returns of DJIDM and DJIW (developed and world

market indices) are higher than those of their conventional counterparts. However, DJEM and DJUSM (Emergent and US market indexes) exhibit higher returns than their Islamic counterpart indices. During the pre-crisis period, the Islamic indices exhibit higher risk than their conventional counterparts. The standard deviations for all returns series have increased and the DJEM and DJUSM (Emergent and US market indexes) became more risky than their Islamic counterparts. Over the post-crisis period, the standard deviations decreased compared to the crisis period but still higher than the one of the pre-crisis period. Except for the developed markets indexes, the conventional indices exhibit higher risk than the Islamic indices.

With respect to the skewness coefficient, table 3 reports that during the three periods, most return series are non-symmetric and skewed to the left (skewness < 0). This can be economically interpreted by the fact that the negative shocks have more effect on the returns than the positive ones. Over the three periods, the Kurtosis coefficient exceeds the reference value (>3) showing that all return series are leptokurtic. In other words, the tails of the distributions are thicker than those of the normal distribution. This excess of Kurtosis indicates a probability of extreme events occurrence. The test of normality of Jarque-Bera indicates that over the three periods, all probabilities of Jarque-Bera statistics are null (<5%). Thus, we can assert that the return distribution deviates significantly from the normal distribution which makes impossible the modelling of the extreme events from this distribution.

Table 3: Correlation tests during the pre, during and post-crisis period.

DJIW: DJ Islamic Market World Index; DJW: DJ Global Index; DJIUSM: DJ Islamic Market US index; DJUSM: DJ US Market index; DJIDM: DJ Islamic Market developed Markets index; DJDM: DJ Developed Markets index; DJIEM: DJ Islamic Market Emerging Markets index; DJEM: DJ Emerging Markets index.

	Correlation Tests		
Indices	**Pre-Crisis period**	**Crisis period**	**Post-Crisis period**
World Market			
DJW/DJIW	0,99	0,99	0,997
US Market			
DJUSM/DJIUSM	0,99	0,99	0,997
Developed Market			
DJDM/DJIDM	0,99	0,99	0,996
Emerging Market			
DJEM/DJIEM	0,99	1,00	0,998

We note for the three periods and for all pairs of indices, a high level of positive correlation coefficients. Therefore, the Islamic indices are strongly and significantly correlated with their conventional counterparts.

4.1.2. Results of performance measurement

The results of the Sharpe ratio for the three study periods are given in the following table.

Table 4: Results of Sharpe ratios for the pre, during and post-crisis period.
DJIW: DJ Islamic Market World Index; DJW: DJ Global Index; DJIUSM: DJ Islamic Market US index; DJUSM: DJ US Market index; DJIDM: DJ Islamic Market developed Markets index; DJDM: DJ Developed Markets index; DJIEM: DJ Islamic Market Emerging Markets index; DJEM: DJ Emerging Markets index.

	Sharpe Index		
Indices	**Pre-Crisis period**	**Crisis period**	**Post-Crisis period**
US Market			
DJIUSM	-3,97	-0,80	-0,02
DJUSM	-4,00	-0,78	-0,01
Developed Market			
DJIDM	-4,44	-0,98	-0,03
DJDM	-4,64	-1,02	-0,04
World Market			
DJIW	-4,49	-0,97	-0,02
DJW	-4,64	-1,01	-0,03
Emerging Market			
DJIEM	-2,87	-0,87	0,00
DJEM	-2,92	-0,85	0,01

Table 4 indicates that, during the pre-crisis period, all Sharpe ratios are negative. Islamic indexes exhibit higher Sharpe ratio than conventional ones. These results are in line with those of Hussein (2005) who reports that Islamic indices (FTSE Global Islamic index and Dow Jones Islamic Market Index DJIW) outperform their counterparts during the pre-crisis period. Similarly, Hussein and Omran (2005) who examined the performance of the DJIW and its 13 sub-indexes *vis à vis* their non Islamic peers over the period 1996-2003, provide evidence of Islamic indexes outperformance during bull markets.

Over the subprime crisis period, both DJEM and DJUSM (Emerging and Us markets indexes) exhibit higher Sharpe ratio than that of their Islamic counterpart indices. Conversely, the Islamic indices of World and developed markets (DJIDM and DJIW) outperform their counterpart indices. Our results are consistent with those of Abdullah et *al*. (2007) during a recession period (Malaysian Islamic unit trust funds 1995-2001). Elfakahani et *al.* (2005) who investigated the Islamic mutual funds' performance over the period 1997-2002, find that Islamic mutual funds performance during bearish economic trends is higher than during bullish economic conditions. These findings are consistent with those of Hussein (2005) and Hussein and Omran (2005) who studied respectively the UK and the US context.

During the post-crisis period, we find that the DJIDM and DJIW indices (Developed and world markets) outperform their conventional counterparts while DJIEM and DJIUSM indices (US and Emerging markets) underperform the conventional indices. The results regarding the DJIDM and DJIW indices are in line with those of Hussein (2005) who asserted that Islamic indices underperform during the second bull period that follow market downturns. Moreover, the findings regarding DJIEM and DJIUSM indices are in accordance with those of Hassan and Girard (2011). The authors examined the performance of 7 sub-indexes of Dow Jones Islamic and 7 corresponding MSCI indexes from 1996 to 2005, and provide evidence of the outperformance of Islamic indexes in the post-crisis period. There are potential explanations for our empirical results. The arguments are related to the *Sharia* screening criteria that under/overweight certain sectors in the composition of Islamic indexes. Over the whole period, Islamic indexes outperform their conventional counterparts in the Developed and world markets while they underperform the non-Islamic peers in the US and Emerging markets.

Summing up, our findings are somewhat mixed over the different periods and through the different indices under consideration, and support the hypothesis of the absence of difference in performance between Islamic and conventional indices (Girard and Hassan, 2008; Hassan et *al*. 2010). It seems that the impact of faith-based screens on investment performance does not matter.

4. 2. Stationarity results

4.2.1. Unit root tests on logarithmic series

Table 5 presents the results of Unit root tests on logarithmic series for the three periods.

Table 5: Results of Unit root tests on logarithmic series during the three periods

DJIW: DJ Islamic Market World Index; DJW: DJ Global Index; DJIUSM: DJ Islamic Market US index; DJUSM: US Market index; DJIDM: DJ Islamic Market developed Markets index; DJDM: DJ Developed Markets index; DJIEM: DJ Islamic Market Emerging Markets index; DJEM: DJ Emerging Markets index. LDJW, LDJDM, LDJEM, LDJUSM the logarithmic series of the following indices: DJW, DJDM, DJEM, DJUSM. LDJIW, LDJIDM, LDJIEM and LDJIUSM are the logarithmic series of the following indices: DJIW, DJIDM, DJIEM and DJIUSM.

	World Market		**Developed Market**		**US Market**		**Emerging Markets**	
	LDJW	**LDJIW**	**LDJDM**	**LDJIDM**	**LDJUSM**	**LDJIUSM**	**LDJEM**	**LDJIEM**
				Pre-crisis period				
ADF-	-3,303	-3,38	-3,139	-3,045	-4,108	-3,508*	-2,994	-2,32

Test PP T-statistic	-3,571*	-3,84*	-3,504*	-3,358	-0,89	-3,292	-2,931	2,497
KPSS T-statistic	0,499	0,908	0,620	1,073	0,655	1,144	0,694	1,981
Result	Not stationary							
Crisis period								
ADF-Test statistic	-1,918	-1,485	-1,855	-1,813	-1,486	-1,193	-1,589	-1,557
PP T-statistic	-1,77	-1,546	-1,856	-1,595	-1,847	-1,735	-1,702	-1,661
KPSS T-statistic	1,217	1,248	0,966	1,216	1,107	1,147	1,34	1,379
Result	Not stationary							
Post-crisis period								
ADF-Test statistic	-2,298	1,54	0,994	-2,213	-3,038	-2,779	1,468	1,665
PPTest statistic	1,252	1,448	1,038	-2,39	-2,975	-2,74	1,695	1,809
KPSS T-statistic	1,236	1,149	1,163	1,05	1,05	0,955	1,589	1,552
Stationary	No	No	No	No	No	No	No	No

***, **, * denote two-tailed statistical significance levels at the 1%, 5% and 10%, respectively.

The results of ADF, PP and KPSS for the three periods indicate the non stationarity of all logarithmic series. It is therefore necessary to differentiate these series and perform the same tests on indices in the first difference.

4.2.2. Stationarity tests on returns series

Table 6 below exposes the findings of the Unit root tests applied on returns series for the three periods.

Table 6: Results of Unit root tests on returns series during three periods

DJIW: DJ Islamic Market World Index; DJW: DJ Global Index; DJIUSM: DJ Islamic Market US index; DJUSM: DJ US Market index; DJIDM: DJ Islamic Market developed Markets index; DJDM: DJ Developed Markets index; DJIEM: DJ Islamic Market Emerging Markets index; DJEM: DJ Emerging Markets index. DLDJW, DLDJDM, DLDJEM and DLDJUSM are the first differences respectively of LDJW, LDJDM, LDJEM, and LDJUSM. DLDJIW, DLDJIDM, DLDJIEM and DLDJIUSM are the returns series of the indices: DJIW, DJIDM, DJIEM and DJIUSM.

	World Market		Developed Market		US Market		Emerging Markets	
	DLDJW	DLDJIW	DLDJDM	DLDJIDM	DLDJUSM	DLDJIUSM	DLDJEM	DLDJIEM
Pre-cisis period								
ADF T-statistic	-27,004*	-41,665*	-27,233*	-28,514*	-33,664*	-33,827*	-26,318*	-27,246*
PP T-statistic	-26,785*	-42,697*	-27,013*	-28,371*	-33,792*	-33,983*	-26,191*	-27,103*
KPSS T- statistic	0,037*	0,035*	0,037*	0,036*	0,017*	0,051*	0,038*	0,075*
Result	**Stationary**							
Crisis period								
ADF T-statistic	-14,104*	-15,146*	-14,668*	-15,202*	-15,342*	-16,309*	-14,273*	-13,778*
PP T- statistic	-15,385*	-16,966*	-15,686*	-16,846*	-20,564*	-21,511*	-14,212*	-13,697*
KPSS T-statistic	0,142*	0,184*	0,143*	0,165*	0,128*	0,143*	0,221*	0,243*
Result	Stationary							
Post-crisis period								
ADF-Test	-21,246*	-23,127*	-21,605*	-22,553*	-25,542*	-25,002*	-20,338*	-20,954*
PP T- statistic	-21,251*	-23,145*	-21,568*	-22,559*	-25,549*	-25,017*	-20,267*	-20,997*
KPSS T- statistic	0,069*	0,053*	0,068*	0,058*	0,042*	0,046*	0,1823*	0,1821*
Stationary	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

***, **, * denote two-tailed statistical significance levels at the 1%, 5% and 10%, respectively.

The unit root test results show that all differencing series are stationary. Thus, the series in level are integrated of order 1 (I(1)). These results are in line with the literature works showing that stock prices are non-stationary in the level form while the returns series are stationary.

4.3. Cointegration results

The stationarity tests show that over the three periods, all series are integrated of order 1. Thus, the first condition of cointegration is confirmed. We present the results of the ADF test regarding the residues of the long term relations. To analyze these results we use the tables of MacKinnon (1991) critical values. Table 7 presents the results of the ADF test during the three periods.

Table 7: Results of ADF test on residual series of the static relations between Islamic and conventional indices

	Emerging Markets Indices	Developed Markets Indices	World Markets Indices	US Markets Indices
Pre-crisis period				
ADF test statistic	-1,498	-1,033	-0,664	-1,215
Crisis period				
ADF test statistic	-3,869	-2,13	-2,042	-2,8
Post-crisis period				
ADF test statistic	-3,603	-1,672	-2,148	-2,107

During the pre-crisis period and for all pairs of indices, the ADF test is higher than the MacKinnon critical value (-3,34) for a 5% risk threshold. Thus, the null hypothesis is rejected and the residues are non-stationary. Consequently, there is no cointegration between Islamic and conventional indices.

Over the crisis period and for the emerging indices (DJEM and DJIEM), we detect a cointegration relationship since the condition of residual stationarity is confirmed given that the ADF test (-3,869) is lower than the MacKinnon critical value (-3,34). However, the cointegration relation is unique in this period. As in the previous period, there is no cointegration between the other indices. Indeed, the ADF test of the other pairs of indices are higher than the MacKinnon critical value (-3,34). In what follow, we present the ECM estimation for the emerging markets indices:

$$\Delta(logW5000)_t = 1{,}01\Delta(logDJIEMG)_t - 0{,}231\Delta(logW5000)_{t-1} + 0{,}208\Delta(logDJIEMG)_{t-1} - 0{,}107\varepsilon_{t-1}$$

Where:

Δ: is the operator of the first difference.

ε_{t-1}: is an equilibrium error (or disequilibrium term) occurred in the previous period.

ε_{t-1} is the error correction coefficient. It must be statistically negative which means that the model is dynamically stable.

We underline that this coefficient is equal to -0,107, we accept than this representation of the ECM.

During the post-crisis period and as for the second period, a long-run linkage is found between the emerging indices (DJEM and DJIEM) due to the residual stationarity of the static relationship. For the other pairs of indices, no cointegration is detected.

The ECM estimation regarding the emerging markets indices is given as follow:

$$\Delta(\text{LogDJEM})_t = 0{,}984\Delta(\text{LogDJIEM})_t - 0{,}151\Delta(\text{LogDJEM})_{t-1} + 0{,}179\Delta(\text{LogDJIEM})_{t-1} - 0{,}029\varepsilon_{t-1}$$

The error correction coefficient is statistically significant; we thus accept the ECM representation. Overall, we find no cointegration between conventional and Islamic indices of emerging markets during the three periods. This result is in accordance with the ones of Guyot (2008). The absence of cointegration fosters investing through a diversification portfolio strategy. Moreover, we find that the screening mechanism of Islamic indices might have an effect on their temporal behaviors as compared with their conventional counterpart. In other words, the adjustment process of securities over time influences the Islamic indices to deviate from the conventional indices movement. Hakim and Rashidian (2004a) show the absence of cointegration between DJIW and the Wilshire 500 and support the influence of exogenous variables on the indices behavior such as the level of personal income investors. Investors with high income

integrating Islamic rules in their selection criteria are pressuring demand for *Shariah* compliant securities, while demand for securities in general is influenced by all investors. In addition, the absence of cointegration indicates that the markets are efficient to the extent that the error of one series could not be used to predict the movement of the other. Regarding the emerging markets' indices, we detected cointegration between the DJEM and DJIEM in the two last periods. In other words, both series will tend to trend together in the long term. This suggests that eliminating firms that are not complying with the selection process of DJIEM will not affect the trend with its conventional counterpart.

4.4. Causality results

Table 8 exposes the results of Granger causality test.

Table 8: **Results of Granger causality test**

DJIW: DJ Islamic Market World Index; DJW: DJ Global Index; DJIUSM: DJ Islamic Market US index; DJUSM: DJ US Market index; DJIDM: DJ Islamic Market developed Markets index; DJDM: DJ Developed Markets index; DJIEM: DJ Islamic Market Emerging Markets index; DJEM: DJ Emerging Markets index. DLDJW, DLDJDM, DLDJEM and DLDJUSM are the first differences respectively of LDJW, LDJDM, LDJEM, and LDJUSM. DLDJIW, DLDJIDM, DLDJIEM and DLDJIUSM are the returns series of the indices: DJIW, DJIDM, DJIEM and DJIUSM.

Null hypothesis	F-statistic	Probability
Pre-crisis period		
DLDJIEM does not Granger cause DLDJEM	2,458	0,117
DLDJEM does not Granger cause DLDJIEM	16,491	5,2 E-05
DLDJIDM does not Granger cause DLDJDM	7,140	0,007
DLDJDM does not Granger cause DLDJIDM	0,095	0,757
DLDJIW does not Granger cause DLDJW	12,734	0,0003
DLDJW does not Granger cause DLDJIW	0,372	0,541
DLDJUSM does not Granger cause DLDJIUSM	6,734	0,009
DLDJIUSM does not Granger cause DLDJUSM	4,276	0,0389
Crisis period		
DLDJIEM does not Granger cause DLDJEM	3,552	0,029
DLDJEM does not Granger cause DLDJIEM	2,538	0,080
DLDJIDM does not Granger cause DLDJDM	2,746	0,098
DLDJDM does not Granger cause DLDJIDM	2,267	0,133
DLDJIW does not Granger cause DLDJW	1,528	0,217
DLDJW does not Granger cause DLDJIW	1,681	0,195
DLDJUSM does not Granger cause DLDJIUSM	3,786	0,052
DLDJIUSM does not Granger cause DLDJUSM	3,224	0,073
Post-crisis period		
DLDJIEM does not Granger cause DLDJEM	0,164	0,848
DLDJEM does not Granger cause DLDJIEM	1,733	0,177
DLDJIDM does not Granger cause DLDJDM	0,082	0,774
DLDJDM does not Granger cause DLDJIDM	0,808	0,368
DLDJIW does not Granger cause DLDJW	10,458	0,001
DLDJW does not Granger cause DLDJIW	3,752	0,053
DLDJUSM does not Granger cause DLDJIUSM	3,526	0,060
DLDJIUSM does not Granger cause DLDJUSM	0,513	0,473

Over the pre-crisis period and for the emerging indices, the null hypothesis that DJEM does not cause DJIEM is rejected (probability = 5,2E-05 less than 5%). The Islamic DJEM is caused by its conventional counterpart in the short term. With respect to the developed markets indices, the null hypothesis that DJIDM Index does not cause DJDM is rejected. Therefore, Islamic DJDM Index causes its conventional peer in the short term. As for the World market index, the Islamic DJW Index causes its conventional counterpart Index. Lastly, we detected bidirectional causality between the US indices (DJUSM and DJIUSM). During the Crisis period and for the developed markets indices, we find unidirectional causality as for the pre-crisis period. The Islamic DJDM index causes its conventional counterpart. Moreover, once again, we document a short term relationship between the US indices (DJUSM and DJIUSM). Besides, bidirectional causality is observed for the emerging markets indices. Lastly, we underline the absence of causality for the World indices. Over the post-crisis period and for US market indexes, the Islamic index is caused by its conventional counterpart in the short term. Regarding the world markets indices we note the existence of bidirectional causality. Therefore, Islamic DJDM Index causes its conventional peer in the short term. However, for the developed and emerging markets indices, no causality is observed.

Summing up, in most cases, Islamic indices cause their conventional counterparts (Albaity and Ahmad, 2008). Such evidence is useful for market investors to predict the indexes (Islamic or conventional) reaction to the movement of their counterparts and *vice versa.*

4.5. Results of Impulse responses functions

The estimated impulse responses provide an additional insight in examining how an Islamic or conventional index responds to innovations on its counterpart index. We test the effects of shocks over 10 periods (10 days) by using the impulse response function between different pairs of indices respectively over the pre-during and post-crisis period. During the three periods, all Islamic indices react immediately (positively or negatively) to shocks on their conventional counterparts. The impact of the shock on the conventional indices causes an effect on Islamic indices during 4 days. Similarly and for all indices, a shock that affects Islamic indices causes an impact on conventional indices that ranges from 3 to 4 days. The findings of the impulse response function test provide support for a short term relationship between Islamic and conventional indices. The impulse response is higher during the crisis period. The contagion effect between the two types of indices during this period leads to a high stock market instability. Such evidence is useful for market investor to predict the indexes (Islamic or conventional) reaction to an exogenous shock that affect their counterparts and *vice versa.*

5. Conclusion

This paper investigates Islamic Versus Conventional market index performance by using Sharpe ratio. It analyzes also their short and long term relationships by testing cointegration, causality and impulse response functions. Our empirical investigation considers daily closing prices of four Dow Jones conventional indices (Word, Developed, US and Emerging market) and their Islamic counterparts. The sample period covers July 1, 2003 to May 15, 2011 and splited into 3 sub-periods: pre-subprime crisis period, subprime crisis period and post- subprime crisis period.

Our findings provide evidence that first, index performance are somewhat mixed over the different period and through the different indices, and support the hypothesis that the impact of faith-based screens on investment performance is insignificant. Second, over the three sub-periods, there is no long run relationship between the Islamic indices and their conventional counterparts' performance, except for the Islamic emerging markets indices. Third, in the short-run, we find different causal links between Islamic Versus non-Islamic indices over the three sub-periods. This finding is robust even after testing an impulse response function. As such, we consider our research to be an important and timely contribution to this field.

Our findings have important implications for international portfolio diversification. In addition, such evidence is useful for market investors to predict the market indexes (Islamic or conventional) short term reaction to the movement of their counterparts and *vice versa.* It is equally important to predict the indexes (Islamic or conventional) reaction to an exogenous shock that affect their counterparts and *vice versa.* Future researches could examine a dynamic volatility GARCH models and Markov switching regime non-linear models to estimate the volatility transmission mechanism. A second future direction could investigate the impact of macroeconomic variables, such as inflation and cyclical output, on the performance of the Islamic stock market indices. Lastly, studying short and long term causal links between Faith-Based and socially responsibility equity investing could lead to very useful conclusions and implications.

6. References

Abdullah, F., Hassan, T. and Mohamad, S., (2007) "Investigation of performance of Malaysian Islamic unit trust funds", *Journal of Managerial Finance,* Vol. 33, n° 2, pp. 142-153.

Albaity, M., and Ahmad, R., (2008) "Performance of Shariah and Composite Indices: Evidence from Bursa Malaysia", *Asian Academy of Management Journal of Accounting and Finance*, Vol. 4, n°1, pp. 23-43.

Chong, B.S. and Liu, M.H. (2009) "Islamic banking: Interest-free or interest-based?", *Pacific-Basin Finance Journal*, Vol. 17, n° 1, pp. 125-144.

Derigs, U., and Marzban, S., (2009) " New strategies and a new paradigm for Shariah-compliant portfolio optimization", *Journal of Banking & Finance,* Vol. 33, n°6, pp. 1166-1176.

Dickey, D.A., Hasza, D.P., Fuller, W. A. (1984) «Testing for Unit Roots in Seasonal Time Series», *Journal of American Statistical Association*, Vol. 79, pp. 355-367.

Elfakhani, S., Hassan, M.K. and Sidani, Y., (2005) "Comparative Performance of Islamic Versus Secular Mutual Funds", *Economic Research Forum: 12th Annual Conference,* Cairo.

Engle, R.F. and Granger, C.W.J. (1987) « Cointegration and error correction: representation, estimation, and testing », *Econometrica*, Vol. 55, pp. 251-276.

Fadeel, M., (2002) «Legal Aspects of Islamic Finance», *Euromoney Books and AAOIFI , London*.

Girard, E., and Hassan, M.K., (2008) "Is There a Cost to Faith-Based Investing: Evidence from FTSE Islamic Indices.", *The Journal of Investing*, Vol. 17, n° 4, pp. 112-121.

Granger, C. W. J. (1969) "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods", *Econometrica*, Vol. 37, pp. 424-438.

Guyot, A., (2008) " Les préceptes de la Shariah contribuent-ils à l'efficience et à la performance des marchés d'actions ? Une étude comparative des indices Dow Jones Islamic", *Colloque international: ouverture et émergence en Méditerranée*, Rabat, Maroc.

Hakim, S., and Rashidian, M., (2002) "Risk and Return of Islamic Stock Market Indexes", *9th Economic Research Forum Annual Conference,* Sharjah, U.A.E.

Hakim, S., and Rashidian, M., (2004) «How Costly is Investors' Compliance to Sharia?», *Proceedings of the 11th Economic Research Forum Annual Conference.* Sharjah, UAE.

Hashim, N., (2008) "The FTSE Global Islamic and the Risk Dilemma", *AIUB Business and Economics Working Paper Series*, n° 2008-08.

Hassan, M.K., Khan, A-N.F. and Ngow, T., (2010) " Is faith-based investing rewarding? The case for Malaysian Islamic unit trust funds ", *Journal of Islamic Accounting and Business Research*, Vol. 1 n° 2, pp. 148-171.

Hassan A., Antonios A., and Paudyal DK., (2005) "Impact of ethical screening on investment performance: the case of the Dow Jones Islamic Index", *Islamic Economic Studies,* Vol. 12/13, n 1/2.

Hassan, M. K., and Girard, E., (2011) « Faith-based ethical investing:the case of Dow Jones Islamic indexes », *Networks Financial Institute*.

Hussein, K. (2005) "Islamic investment: Evidence from Dow Jones and FTSE Indexes," *6th International Conference on Islamic Banking and Finance*, Jakarta, Indonesia.

Hussein, K., and Omran, M., (2005) "Ethical Investment Revisited: Evidence from Dow Jones Islamic Indices", *Journal of Investing*, Vol. 14, n° 3, pp. 105–126.

Jensen, M. C., (1968) "The performance of Mutual Funds in the period 1945-1964", *Journal of Finance*, Vol. 23, n°2, pp. 389-416.

Kwiatkowski D.,PCB., Phillips, P., Schmidt and Y., Shin, (1992) « Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? », *Journal of econometrics*, Vol. 54, n. 3, pp. 159-178.

Lardic, S., and V., Mignon, (2002) "Econométrie des séries temporelles macroéconomiques et financières », *Ed. Economica*.

MacKinnon, J. G., (1991), "Critical values for cointegration tests," Chapter 13 in Long-Run Economic Relationships: Readings in Cointegration*, ed. R. F. Engle and C. W. J. Granger. Oxford, Oxford University Press*.

Markowitz, H., (1952) "Portfolio Selection ", *Journal of Finance,* Vol. 7, n°1, pp. 77-91

Nait-Daoud, A.,(2008) " Finance islamique et Fonds Sharia Compliant", *Université d'Evry Val d'Essonne, Société Générale*.

Phillips, PCB, S., Ouliaris, (1990) « Asymptotic properties of residual based tests for cointegration » *Econometrica*, Vol. 58, n 1 pp. 165-193.

Philipps, P. C., and P., Perron, (1988) « Testing for a Unit Root in Time Series Regression » *Biometrica*, Vol. 75, pp. 335–346.

Robertson, J., (1990) « Future wealth: a new economics for the 21st century», *Cassell publications, London*.

Sharpe, W. F., (1994) "The Sharpe ratio", *Journal of Portfolio Management,* Vol.1, n°2, pp. 49–58.

Siddiqi, M. N., (2004) «Riba, Bank Interest and the Rationale of its Prohibition», *Islamic Research and Training Institute and Islamic Development Bank, Jeddah*.

Treynor, J.L., (1965) "How to rate Management of Investment Funds", *Harvard Business Review*, Vol. 43, n° 1, pp. 63-75.