Islamic Economic Studies
Vol. 22, No. 1, May, 2014 (159-184) DOI No.10.12816/0004134

An Empirical Study of Islamic Equity as a Better Alternative during Crisis Using Multivariate GARCH DCC

SYED AUN R RIZVI

SHAISTA ARSHAD

Abstract

Risk Sharing is the core of the Islamic finance, the closest modern equivalent being equity investments. Through the decades of Islamic Finance development scholars have stressed on equity as the most beneficial financial mechanism while most accept modern joint-stock companies as quasi Mushārakah and Muḍārabah forms, but this segment is still small in Islamic finance. Multitude of reasons contributes to it, primarily, the risk averseness and myth of equities as more risky alternate. This paper attempts to investigate this myth utilizing MGARCH DCC method, by studying the volatilities and correlations of Islamic indices over a period of twelve years. The findings are promising, suggesting a low moving correlation between the conventional and Islamic indices. The results substantiate the authors' argument, that during crisis, Islamic indices provide though not complete, but partial insulation, thus a safer haven. This bodes well for a hugely untapped Islamic alternate investment avenue for exploration.

Keywords: Islamic Equity Market, Global Crisis, Multivariate GARCH Dynamic Conditional Correlations, Equity Investments
JEL Classification: O16, C87
KAU-IEI Classification: K2, K3.

1. Introduction

Islamic banking and finance has mushroomed into an increasingly substantial segment of the global financial market leading to the crystallization of the Islamic stock market in particular, as a viable alternative to its conventional counterpart. It

is in the wake of the global economic meltdown that Islamic finance is in the limelight as a force to be reckoned with.

With Muslim societies becoming more sophisticated and their financing needs more complex, coupled with stagnating Islamic thought evolution, there comes a need to strengthen the current Islamic financial system, in particular the equity market. The wider acceptance of equity investments by Sharīʿah scholars in the early 1990s paved the way for the launch of equity markets complimented with the teachings of Islam.

Further, the establishment of credible equity benchmarks such as Dow Jones Islamic Market Index (DJMI) and FTSE Global Islamic Index Series has been a turning point for the industry, providing a comparative platform between indices. Looking into the performance of Islamic indices, no convincing performance differences can be found between them and conventional indices up until 2006. While Islamic indexes are growth and small-cap oriented, their conventional counterparts are relatively more value and mid-cap focused Girard and Hassan, (2008). Changes in performance of indices are attributed mainly to the global crisis of 2007, where preliminary evidence tends to support the stability of Islamic indices during the period.

This significant stability can be contributed by several factors such as the exclusion of conventional banking and insurance shares and stocks that failed to pass the screening criteria due to the nature of their business, from Islamic indices. Similarly, Islamic stock indices have included developing markets that were able to provide more leverage and thus Islamic indices were more positively skewed to the US market. Lastly, the Sharīʿah screening criteria had excluded financial organizations, the real instigator of the financial crisis, characterized by increasingly large and volatile cross-border capital flows amid an environment of profound international financial integration.

It is the last factor that forms the crux of the paper, where we attempt to analyze the dynamic correlations between the US conventional and financial indices (as a proxy for global benchmark) with fundamental Islamic indices. We employ the Dynamic Conditional Correlations approach to observe shifts in correlations between the indices during the crisis period. This approach allows us estimate correlations between standardized residuals with a small number of parameters.

Based on Multivariate General Autoregressive Conditional Hetroskedasticity Dynamic Conditional Correlation (MGARCH DCC) allows us to observe the

behavior of a time series that is similar in any epoch. This will permit us to comprehend the dynamic correlation of Islamic indices with global benchmark equity indices in comparison with their conventional counterparts. This will enable us to examine whether Islamic indices benchmarking have provided diversification or a dampening effect of the crisis. We hope to contribute to the growing reliance on Islamic equity investments by providing substantial empirical evidence on this matter.

This paper consists of six sections. Following the introduction, an assessment of the existing literature is conducted. We discuss the research objectives the motivation for the study in section 3, followed by the research methodology in section 4. The empirical results and their interpretations are then analyzed in section 5. Lastly, the conclusion, limitations and possible avenues for further research are explored in the final section.

2. Literature Review

The growing awareness of and demand for investing in accordance with Islamic principles on a global scale has created a flourishing world Islamic capital market. Despite the mounting interest in this global phenomenon, little research is available on Islamic stock markets. Leafing through the literature, studies can be found on the performance of capital market related investment products but at firm level only. Hence, it is the opinion of the authors that there is no prior research conducted on the dynamic correlations of global Islamic and conventional indices.

Globally, the existing research literature pertaining to Islamic indices in particular is inadequate. Nevertheless, authors such as Ahmad and Ibrahim (2002); Hakim and Rashidian (2002); Hussein (2005) and Albaity and Ahmad (2008) have analyzed the performance of Islamic indices vis-a-vis conventional stock market indices using stock market data. Similarly, Beik and Wardhana (2009) evaluate the volatility and forecasting ability of Islamic indices. However, these studies are mostly analyzed for developed countries and do not involve dynamic correlations and volatility concerns as addressed by this study.

In a study conducted by Hassan (2004) while investigating the market efficiency and relationship with risk return framework of DJIM, it was found that DJIM outperformed their conventional counterparts from 1996 to 2000 and underperformed them from 2001 to 2005. It was further revealed that the reward to risk and diversification benefits are similar for both indexes. Similarly, Girard and

Hassan (2008) found in their study that there was no difference between Islamic and non-Islamic indices in regards to performance.

Hussein (2004) indicates, in his study, that while Islamic and conventional indices (from a sample of FTSE indices) have similar performances, Islamic indices reach abnormal returns in bullish markets and underperforms in bearish markets. Correspondingly, Al-Zoubi and Maghyereh (2007) find Islamic indices to be less risky than the benchmark, attributing it to the profit and loss sharing principle in Islamic finance.

Similarly, Milly and Sultan (2009) revealed that Islamic funds perform much better during calm economic times and moderately better during times of crisis. It was then hypothesized that Islamic asset allocation methods may be safer during times of economic and financial distress. These results were concurred by Arshad and Rizvi (2013) who applied continuous wavelet to identify traces of comovement between regional Islamic and conventional stock Indies. Their results indicated that Islamic indices in the Asia Pacific and Emerging Market region were partially immune to speculative shocks to global financial services, thus regaling Islamic indices as a better alternative.

On the other hand, Mansor and Bhatti (2011) while analyzing performance of conventional and Islamic mutual funds in Malaysia discovered that Islamic portfolio provides slightly less returns as compared to conventional. Furthermore, it was revealed that Islamic and conventional portfolios rely on the market portfolio, which in turn mirrors the performance of conventional mutual funds mainly.

Moreover, a line of research investigating the efficiency and performance of stock markets revealed that gains from stock index diversifications is generally predicted on the belief that there exists low correlation among the return of different stock indices, Ben Zion (1996).

Interestingly, no correlation can be found between DJIM and Wilshire 5000 index and three-month treasury bills. In this study by Hakim and Raishidian (2004), the interdependence theory of financial markets was debased and it was concluded that the Islamic index has unique risk features that is independent from broad equity markets owing to the Sharīʿah screening criteria. This contradicts other studies Hassan, (2004), Girard and Hassan (2008); that provided empirical evidence of Islamic and non-Islamic indices being similar.

Looking at the approach taken for this paper, several empirical researches have undertaken MGARCH to study conventional financial volatility. Worthington and Higgs (2003) employed MGARCH to examine the transmission of equity returns and volatility among Asian markets. Similarly, Zhao (2010) used MGARCH to analyze the dynamic relationship between the Renminbi real effective exchange rate and stock prices. These studies and several more undertook MGARCH as it helps in understanding the volatilities and variations between the variables.

Keeping in mind the evident lack of literature on dynamic condition correlations in mind, this study aims to achieve the research objective by employing the technique of dynamic conditional correlations. It is to the best of the authors' knowledge that no previous studies have undertaken MGARCH model to estimate DCC and variances at equity indices level in Islamic finance.

3. Research Objective

In the main, this study attempts to investigate the claims that Islamic stock market are a safer alternative for investment during the financial crisis. The motivation of this study arises from the need to provide more empirical evidence to support Islamic finance as a viable substitute in the global arena. With the lack of research in this area, it becomes necessary to lay some groundwork for understanding the dynamic correlations of Islamic indices throughout the years. It is our objective to investigate the nature of Islamic indices during the period of crisis to understand whether there exists a diminishing effect on the correlations of Islamic indices against global benchmark. Furthermore, we attempt to empirically prove the decoupling effect of Islamic indices and the reduction in conditional correlations against global indices for the period of the financial crisis.

The objective of this study is to analyze the changing correlations between the global conventional and Islamic indices over the last decade and to pinpoint shifts in conditional correlations. The primary motivation of this study is to put to rest the argument on Islamic financial principles in equity markets as a safer if not an insulated alternative investment avenue during crisis. Benchmarking and imitation investment of the Islamic indices is not restricted by any means to only Muslims, and this gives rise to exploring this avenue.

With the above-mentioned motivation, we attempt to address the following research question: Do Islamic indices show lower dependence on conventional counterparts in times of crisis?

4. Methodology

The empirical study portion of our research is a multi-step process, where we attempt to sequentially analyze the data starting from simple descriptive statistical numeric. The crux of our model attempts to study the volatility of four conventional global indices and five Islamic indices. All the indices used for our empirical study have been taken from the Dow Jones Indices family. There are two main reasons for restricting our scope to Dow Jones Indices; firstly, to maintain uniformity amongst the underlying universe of stocks in conventional indices and the computational aspect of index pricing. Second reason is to maintain harmony in the Islamic indices because of Sharīʿah screening parameters. Every index screening process follows roughly the same criteria, but with slight variations in cutoffs for different ratios. Keeping all indices on the Dow Jones standard allows us to keep consistency. We have taken daily values of indices, transformed to daily returns for an extended period of 12 years from January 3, 2000 to December 30, 2011 a total observation points of 3130 day. The indices used are as follows:

Table-1
Details of Indices used in the Study

Conventional Indices		Islamic Indices	
CWFS	Dow Jones World Financial Services	IAP	Dow Jones Islamic Asia Pacific
CUSFS	Dow Jones US Financial Services	IWRLD	Dow Jones Islamic World
CJUS	Dow Jones US	IOIL	Dow Jones Islamic Oil Sector
CAP	Dow Jones Asia Pacific	IWEM	Dow Jones Islamic World Emerging Markets
		IFIN	Dow Jones Islamic Financial Services

In order to address the research question we have taken the conventional US Financial Services and Conventional World Financial Services indices as primary global benchmark. The intuition behind this are two fold; firstly US as the most liquid and largest equity market is the largest constituent of Dow Jones universe. Secondly, our study focuses on analyzing the Islamic indices in periods of world crisis, the most recent and most sever of them being the financial crisis originating from US and then the ensuing global economic slowdown.

To address our research questions, we have used the MGARCH model. Initially we test our variables on both Normal and T distribution to determine which distribution is a better fit to our set of variables. To have a cursory glance at the founding basis for our research questions, regarding Islamic financial indices as a safer alternative as compared to conventional indices, the empirical results of unconditional correlations coefficients will suffice.

However to address our research objective in specific, we utilize MGARCH DCC. The DCC model allows us to observe and analyze the precise timings of shifts in conditional correlation. Estimation of DCC is a two-step process to simplify estimation of time varying correlations. In the first stage, using GARCH model for each variable, univariate volatility parameters are estimated. In stage two, for the time varying correlations matrix, residuals from first stage are used as inputs for estimation. For sake of brevity, we omit details of mathematical derivations and the equations, which can be found in Pesaran and Pesaran (2009).

5. Empirical Evidence

5.1. Descriptive Statistics

The descriptive statistics for the daily returns of the nine indices in our study provides interesting insights into absolute time independent volatility of the returns, as represented by the standard deviations. The standard deviations for the conventional indices are relatively higher than Islamic ones especially for the Conventional US Financial Services Index. This high volatility for the US Financial Services and World Financial Services Indices is in line with our expectation, since the ten-year study comprises of three years of extreme financial volatility and global meltdown of the financial industry owing to the crisis. An interesting insight is in the relatively higher standard deviation of the Islamic Financial and Takaful Index as well, owing to different nature of the Islamic financial system. The common myth is that they should not have had major volatility, but then from a practitioning point of view, Islamic financial institutions closely attempt at mimicking the conventional procedures and returns, and their exposure to real sector is similar to that of conventional financial companies. The spillover of the conventional financial crisis affected the real sector companies, which in turn affected the Islamic financial institutions since their exposure to the real sector was threatened. At this point, the results seem similar to the aforementioned Hasan (2002) of Islamic indices underperforming.

Table-2
Descriptive Statistics

	Mean	Std. Deviation	Kurtosis	Skewness
IAP	-0.00044%	0.01332	4.62369	-0.31531
IFIN	0.00589%	0.01698	16.28017	0.53073
IOIL	0.03414%	0.01592	8.5335	-0.32215
IWEM	0.01000%	0.01384	4.98219	-0.23733
IWRLD	0.00182%	0.01161	6.34459	-0.13098
CAP	0.00416%	0.01273	4.60745	-0.28753
CWFS	-0.00410%	0.01534	7.58491	0.15186
CUSFS	0.00538%	0.02173	9.12782	0.26868
CUS	0.00777%	0.01374	6.822	-0.02929

The graphical plots of the daily returns of both the conventional and Islamic indices provide a varying picture as compared to the earlier simple statistical results, as seen in Appendix A. It is noticeable that all indices show a period of high volatility in returns during 2007 and 2009. This is in line with expectations owing to the financial crisis of 2007 that blew out in an economic collapse in US and a recessionary phase in all major economies.

A cursory glance at the Graphs shows two interesting factors which we would address in the following empirical tests and analysis. Firstly, the volatility of returns spikes up at the same instance, but the width of the volatility period on the Graphs is smaller for the Islamic indices. This represents that the volatile periods amongst Islamic indices normalized quicker than their conventional counterparts.

The other phenomenon that stands out is the Conventional Asia Pacific and its Islamic counterpart index. The indices daily returns show relatively less volatility over the whole ten years under study. Surprisingly, even during the crisis period the volatility spikes up but dies very quickly for the Conventional Asia Pacific Index. The plausible reasons for this observation will be discussed later.

At this juncture, we cannot make any clear argument in favour of the Islamic indices as being a better or worse option for investment during crisis or in normal times.

5.2. Unconditional Volatility and Unconditional Correlation

For our research we have used a sample of daily returns from January 3, 2000 to December 30, 2011 a total observation points of 3130 days, excluding the weekends and holidays. As a first step towards estimating dynamic conditional correlations and volatilities, we first take a look at the summarized results of maximum likelihood estimates of λ_1 and λ_2 in Table 3 below. The table also summarizes the delta 1 and delta 2 estimates while comparing multivariate normal distribution with multivariate student t-distribution.

Table-3
Estimates of λ_1 and λ_2, Delta, for the Indices

		Normal Distribution		T - Distribution	
	Parameter	Estimate	T Ratio	Estimate	T Ratio
Lambda 1	IAP	0.919780	154.3839	0.941480	184.6708
	IFIN	0.910710	111.178	0.934430	120.8221
	IOIL	0.930490	151.0746	0.941380	170.0591
	IWEM	0.912260	116.3738	0.936300	139.8826
	IWRLD	0.931440	224.6667	0.942310	232.0374
	CAP	0.919300	143.5889	0.942420	167.0751
	CUS	0.930080	217.8694	0.942290	216.3368
	CUSFS	0.926840	190.1581	0.935630	185.4837
	CWFS	0.926570	193.1442	0.936160	192.4499
Lambda 2	IAP	0.064913	15.0065	0.047924	12.7946
	IFIN	0.080441	11.4612	0.058584	8.958
	IOIL	0.058723	12.2775	0.048746	11.3275
	IWEM	0.072389	12.1384	0.052114	10.3449
	IWRLD	0.059980	17.9089	0.050367	15.3636
	CAP	0.062454	14.0811	0.045832	11.553
	CUS	0.060890	17.6467	0.050417	14.2925
	CUSFS	0.063810	16.1299	0.056990	13.6195
	CWFS	0.064748	16.4913	0.056908	14.0182
Delta 1		0.966250	710.363	0.967000	693.6631
Delta 2		0.028307	30.5162	0.027286	28.3288
Max. Log Likelihood		96,086.60		96,643.10	
Degrees of Freedom				9.69680	20.7298

From our results, it is evident that all estimates are highly significant implying gradual volatility decay for all indices. Also if we analyze the sum of lambda 1 and lambda 2 values for different indices we observe that their summation is less than one, pointing that the indices are not following I-GARCH; which means that shocks to the volatility is not permanent. We observe from our results that the maximized log-likelihood value for t-distribution 96,643.10 is larger than the maximized log likelihood under normal distribution 96,608. This implies that the student t-distribution is a more appropriate representation of the fat tailed nature of indices' returns. These findings are in agreement with findings of Pesaran & Pesaran (2009). To further substantiate this we observe the degrees of freedom which is 9.6968, well below the critical level of 30. Henceforth our analysis of the study works with the t-distribution estimates.

The following table representing the unconditional correlation and volatility matrix for the nine indices within our study helps us to further delve into the correlations between the indices and their unconditional volatiles. The estimated unconditional volatilities are the diagonal elements highlight and in bold while off diagonal elements represent unconditional correlations.

Table-4
Estimated Unconditional Volatility & Correlation Matrix for the Indices

	IAP	IFIN	IOIL	IWEM	IWRLD	CAP	CUS	CUSFS	CWFS
IAP	0.013036	0.267320	0.302150	0.731650	0.396410	0.973020	0.222800	0.152840	0.322100
IFIN	0.267320	0.016860	0.502440	0.417890	0.612300	0.224330	0.686220	0.670980	0.661480
IOIL	0.302150	0.502440	0.016072	0.519270	0.838740	0.267910	0.731680	0.574580	0.655540
IWEM	0.731650	0.417890	0.519270	0.013257	0.594320	0.664250	0.429150	0.341460	0.488360
IWRLD	0.396410	0.612300	0.838740	0.594320	0.011341	0.357190	0.918620	0.743290	0.839240
CAP	0.973020	0.224330	0.267910	0.664250	0.357190	0.012775	0.188990	0.126130	0.302710
CUS	0.222800	0.686220	0.731680	0.429150	0.918620	0.188990	0.013566	0.888470	0.895780
CUSFS	0.152840	0.670980	0.574580	0.341460	0.743290	0.126130	0.888470	0.021488	0.952630
CWFS	0.322100	0.661480	0.655540	0.488360	0.839240	0.302710	0.895780	0.952630	0.015342

A perfunctory glance at the unconditional volatility numbers shows the highest volatility for the Conventional US Financial Services Index, as expected and is similar to our earlier observation.

An interesting observation from the volatilities is the Islamic Oil Sector index as having the second highest volatility just ahead of Conventional World Financial Services Index. Now this high volatility in the view of authors emancipates from the focus of oil and gas sector companies in Islamic markets to crude oil specifically. The crude oil prices during the past decades have shown a tremendous increase, translating into windfall gains for the oil companies, the movement of oil prices has been erratic. The main volatility in oil prices arises from the speculative trading as well as geo political issues. This erratic behavior and high volatility in oil prices, directly impacts the returns and stock values of the oil companies.

Owing to the financial meltdown in US, which resulted in spillover effect to other sectors of economy in US very rapidly, the Dow Jones US Index has a relatively higher unconditional volatility parameter of 0.013556 amongst conventional indices. Surprisingly enough the volatilities of Islamic indices is relatively high as well in the period from 2001 to 2011, with their volatilities ranging from 0.01 to 0.013. An interesting observation from the unconditional volatility and unconditional correlation matrix is the very low volatility of the Islamic World Index. The plausible reason for this observation, in the view of authors is the composition of Islamic index. Most of the Sharīʿah compliant stocks arise out of low volatility sectors of the economy and are mainly concentrated in BRIC and ASEAN countries.

A glimpse on the economic progress and their interdependence amongst the world economies professes that these countries have moved from heavily reliant on US economy for trade and financing activities to a more balanced global mix skewed towards China and India. At this point, our research question stays unanswered, and requires an intuitive interpretation of the unconditional correlations between conventional and Islamic indices. Reverting to our research question to analyze the correlation of Islamic indices we refer to table 5, which ranks them with respect to highest to lowest.

In the first panel of Table 5, we observe that Conventional Asia Pacific Index has a very high correlation with Islamic Asia Pacific and a relatively higher correlation of 0.664250. The first part of the earlier statement is self-explanatory, with both categories of the index arising out of the same base countries and some stocks, the correlation amongst them is natural as the herd mentality affect in a market tends to carry the whole market in similar directions. The reason for relatively higher correlations with the Islamic World emerging markets of Conventional Asia Pacific Index is similar to our earlier reason. When we consider the breakdown of Emerging Market Economies, we observe that it is positively skewed towards ASEAN nations,

and India and China. All these countries also form the crux of the CAP constituent list as well.

Table-5
Unconditional Correlations Ranked by Value.

CAP		CUS		CUSFS		CWFS	
IAP	0.973020	IWRLD	0.918620	CWFS	0.952630	CUSFS	0.952630
IWEM	0.664250	CWFS	0.895780	CUS	0.888470	CUS	0.895780
IWRLD	0.357190	CUSFS	0.888470	IWRLD	0.743290	IWRLD	0.839240
CWFS	0.302710	IOIL	0.731680	IFIN	0.670980	IFIN	0.661480
IOIL	0.267910	IFIN	0.686220	IOIL	0.574580	IOIL	0.655540
IFIN	0.224330	IWEM	0.429150	IWEM	0.341460	IWEM	0.488360
CUS	0.188990	IAP	0.222800	IAP	0.152840	IAP	0.322100
CUSFS	0.126130	CAP	0.188990	CAP	0.126130	CAP	0.302710
CAP	0.012775	CUS	0.013566	CUSFS	0.021488	CWFS	0.015342

Islamic World Index shows one of the highest correlations with the Conventional US index which implies that any crisis in US which affects the US market would bring down the Islamic World index as well. At this point this observation is countering our initial research question. In the opinion of authors after studying the composition of world indices, the main reason for such a remarkable high correlation can be attributed to positively skewed composition towards US market. This seems logical, since in the Dow Jones Universe, US is the largest and most liquid market, and any world level index would heavily be dependent on US listed equities.

Going further to analyze the third and fourth panel of the Table 5, it is evident that Islamic indices have a relatively medium-high correlation with Conventional US Financial Services index and the World Financial Services Index. These two panels are of utmost importance to our study, and analyzing them we see that Islamic investments would have suffered in the recent financial crisis. The point to remember, at this time, is that these numerical values we are exploring are unconditional correlations, with the underlying restriction that firstly indices follow a Brownian motion, and secondly these volatilities are not dependent on each other's lagged values.

The correlations of Islamic indices, ranging in 0.6 range, implies in our understanding that investing in stocks mimicking Islamic indices, would partially protect the investors from a financial sector crisis, as the world experienced starting of 2007. An interesting observation in all the panels of Table 5 is the very low correlation numbers, the Islamic Asia Pacific Index and Islamic World Emerging

Market Index returned. The plausible reasons for this low correlation number have been identified in detail earlier, as the breakdown of these indices and the component countries.

While exploring the economic development of the Asia pacific region and emerging markets over the past decade it is observed, that these economies have developed booming financial sectors and increased trade amongst themselves and to China and India considerably. This implies that the dependence of the economy and the firms in this region has decreased on United States, which is evident from the very low correlations these indices have in respect to Conventional United States and Conventional United States Financial Services Indices.

Sharīʿah Screening Criteria removes conventional financial institutions from the Islamic indices, these results in a misconception there would be zero correlation between Islamic indices and convention US Financial and World Financial services indices. But our results show a different picture, the reason being two fold. The first being, that Sharīʿah screening criteria removes the conventional financial institutions, not Islamic institutions. The World financial services indices have quite a number of Muslim economies in the coverage and thus encompass Islamic financial institutions form part of the constituent list as well. More important is the inter-linking of all sectors of economies, and heavy dependence of corporations on financial sector for financing.

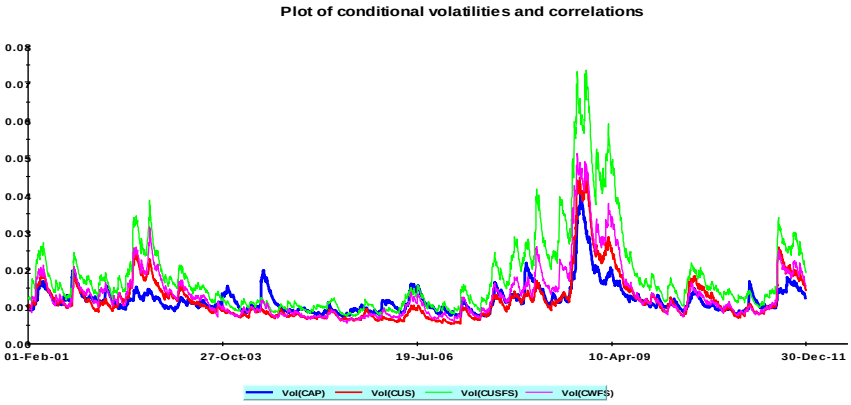
Any crisis in the financial sector spills over and impacts other sectors of economies in the form of high cost and unavailability of funds. This leads to vicious cycle of enhanced costs, low profitability's affecting the intrinsic value and the equity prices of the corporation. To understand this further we have also included the Islamic Financial Services Index (IFIN). Amongst the correlations we see a medium to high correlation of IFIN with all other conventional indices. This is owing to the heavy reliance of the Islamic financing sector on the real sector activities. A downward pressure on real sector in recessions or increased financial health of firms in boom, directly impacts the health of Islamic financial institutions.

5.3. Dynamic Conditional Correlations

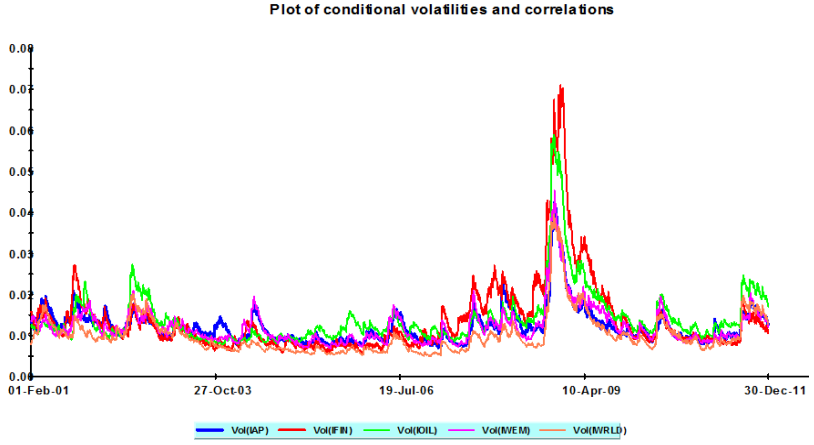
At this point in time, our empirical findings show contrasting and vague opinions regarding our research question. Until now, our analysis and interpretations have focused on unconditional volatilities and unconditional correlations. In simpler terms, our analysis has been constrained by the assumptions that volatilities and correlations stay constant over the period of study. On an intuitive note these

assumption restrict conditions of reality as ever evolving and changing dynamics of the capital markets and socio-political-economic landscape would mean variability of volatilities and correlations. It is closer to reality and logical to comprehend that the volatility and correlation are dynamic in nature, and owing to this aspect we utilize the Dynamic Correlation Coefficient (DCC) model in our study.

Graph-1
Conditional Volatilities of Conventional Indices



Graph-2
Conditional Volatilities of Islamic Indices



To build on and further investigate, we first delve into dynamic conditional volatilities of all indices. For comprehension and comparative purposes, the volatility Graphs are clubbed in sets of conventional indices and Islamic indices in Graph 1 and Graph 2.

The conditional volatilities plot for conventional indices reaffirm the earlier findings of US Financial services as being highly volatile followed by World Financial Services Index. The major spike in the volatility of returns is prominent starting from middle of 2007 to early 2009. This is the era of the worst financial turmoil to have hit the world since the great depression of 1930s. The highest peaks of the financial indices volatility is observed in late 2008 which was as expected by the authors, owing to the collapse of Lehman Brothers which led to an unprecedented credit crunch in the US financial system. The conditional volatilities of the other non-finance specific indices show a similar spike during that era as well. This in our opinion was caused through firstly the spillover effect and the freezing of credit availability to corporates, and secondly to the contagion amongst markets and sectors.

An earlier high volatility period is also observed from Graph 1 in 2001-2002. The reasons for this volatility in all the indices and specifically larger in the US market related indices are two fold; firstly the markets in US were shaken by the September 2001 terror attack on World Trade Centre. The markets were still reeling from that unusual and unprecedented situation when in 2002 the dot com bubble burst, sending internet giants like Webvan, Exodus Communications, and Pets.com to bankruptcy, while amazon, yahoo and EBay share prices took a pounding. The near collapse of the technology sector, in the US market's impact on the equity market exponentially increased in mid-2002 with the outbreak of Accounting scandals, at Arthur Andersen, Adelphia, Enron and WorldCom.

Turning towards the Islamic indices conditional volatilities, the key observation is the mimicking of Islamic indices volatility of conventional indices. A key difference is that the conditional volatilities are much closer to each other, with less absolute variation between different indices. We notice a high volatility of the Islamic financial services index during the global financial crisis. This is a unique observation since the underlying assumption is that owing to the prohibition of interest rates, the Islamic financial sector should not have been impacted in the crisis since it started from complex interest rate linked derivatives and credit default swaps. The high conditional volatility does not have any valid explanation in literature. Though authors believe that since most Islamic financial institutions operate in dual financial environment, the contagion effect and the close interaction of profit rates

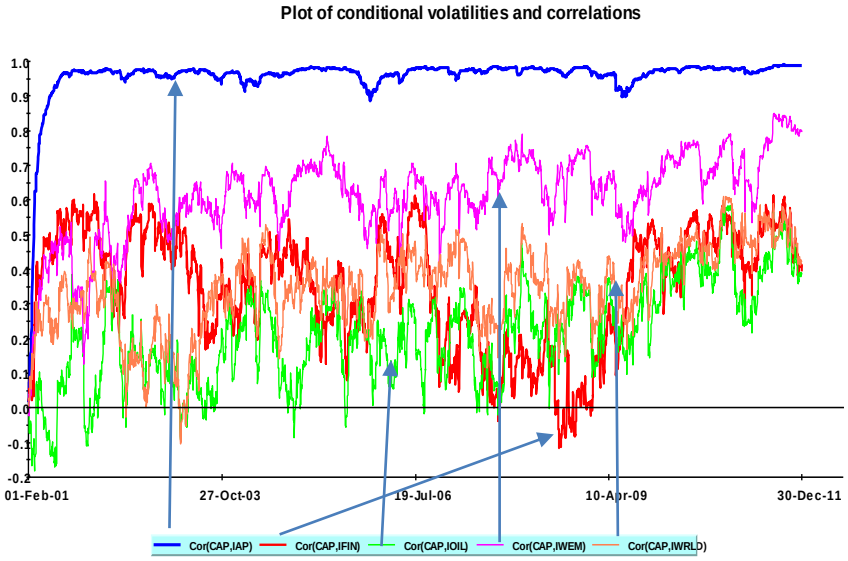
of Islamic financial institutions with conventional interest rates may be a plausible reason for this.

The conditional volatility plots suggest socio-political-economic events have a similar impact on conventional and Islamic indices. To further investigate for our research objective with a greater degree of certainty we use dynamic conditional correlations between Islamic indices and our proxies for global conventional benchmarks i.e. Conventional US Financial Services Index, Conventional World Financial Index and the Conventional Asia Pacific Index. The Conventional Asia Pacific Index has been used to further study and understand the interactions of Islamic indices, mainly since most of the Muslim economies are based in this region, and also Asia Pacific as a group has been the fore runner in driving economic growth over the past decade.

The authors have made a cautious attempt to investigate conditional correlation in three steps. Firstly we would dwell into dynamic conditional correlation plots of Islamic Indices and Conventional Asia Pacific Index (CAP). This would be followed on by investigation which is more relevant to our research objective, where we study the conditional correlation plots of Islamic indices with Conventional US Financial Index (CUFS), and Conventional World Financial Index (CWFS). The attempt is to understand if conditional correlations vary according to economic scenario or they remain constant throughout the decade of study.

In reference to Graph 3 of conditional correlation plot of CAP with Islamic indices, on the top part of the plot we see a steady near unity conditional correlations between the CAP and IAP. This observation is in line with author's expectation which was earlier discussed in Section 5.2, and is based on the concept of same markets and constituent list. It is observed in the plot a very erratic behavior of Islamic Oil Index and CAP correlations. In the view of authors and relevant literature, this is considered insignificant, since the IOIL index component companies, prices are strongly dependent on the world oil prices, which are dependent on exogenous, non-equity market related factors like geo-political situation, world consumption and energy needs.

Graph-3
Dynamic Conditional Correlations of Conventional Asia Pacific with Islamic Indices.



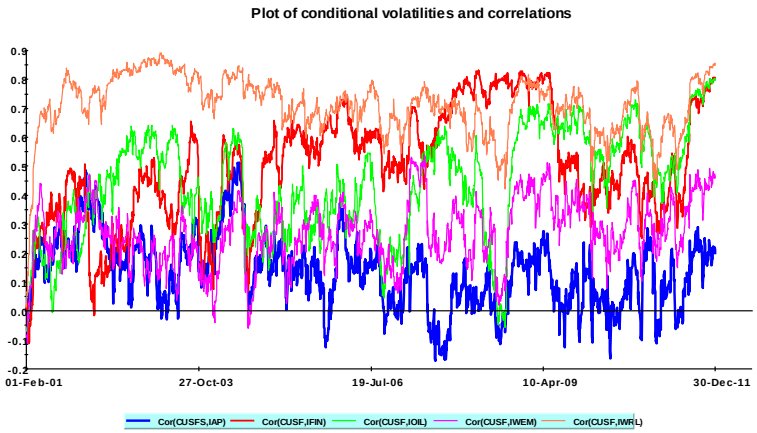
More interesting result is that of the conditional correlation plots of CAP with IFIN, CAP with IWEM and CAP with IWRLD. If we notice that there is no specific trend that can be deduced amongst all these conditional correlation, but one unique factor that is common in all is the dip in conditional correlation during the period of 2007 to 2009, the crisis period. Earlier we had observed that CAP is not very highly correlated with the CWFS or CUSFS index, so the impact of financial crisis should not have been severe on the Asia Pacific region. The plausible explanation for this dip in the view of authors is that though since all other Islamic indices except IAP are more global and encompass non Asia Pacific markets, the negative conditional correlations arise out of a more volatility for Islamic indices due to financial crisis as compared to the rather steady and low volatility of CAP.

The reasons for CAP staying partially insulated is the lower dependence of Asian economies in past decade on US as trading partner or financial sourcing alternative. Within the context of our research question our findings from unconditional correlation matrix and dynamic conditional correlations do not provide any solid evidence to either negate or to reaffirm our viewpoint, of Islamic indices as being a safer haven in crisis periods at global level. The only conclusion we could draw from

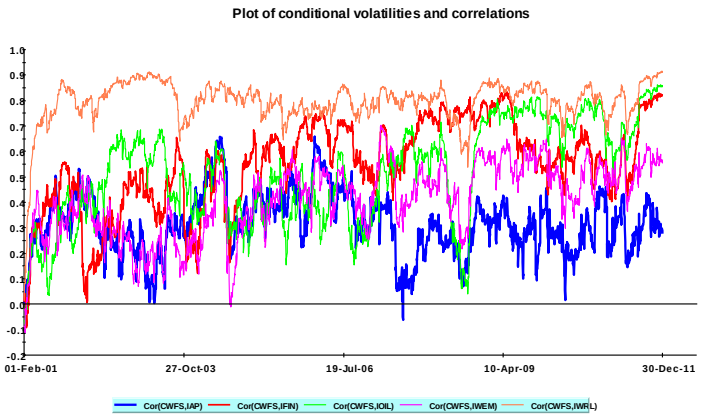
this plot is the fact that as a multi portfolio investor in the Asia Pacific region, we would be better off if we had invest in Islamic indices for diversification benefits.

After establishing the dynamic conditional correlation patterns for CAP and Islamic Indices, we delve into the DCC of Islamic Indices and CUSFS and CWFS.

Graph-4
Dynamic Conditional Correlations between Conventional US Financial Services and Islamic indices.



Graph-5
Dynamic Conditional Correlations between Conventional World Financial Services and Islamic indices.



In Graph 4 it is evident that conditional correlations between the US financial services indices and Islamic indices follow a very volatile path. Not surprisingly the observed behavior of conditional correlations of Conventional Financial Indices with IWRLD and IWEM is highly volatile. This was expected for authors owing to the earlier observations and elaborations of reasons. The conditional correlations plot for them does not follow any trends. A plausible reason is also that financial exclusion from Islamic indices, reduce any correlation between the financial sector and Islamic indices. The traces of an existence of a relationship in authors opinion is purely out of the dependence of all other business on health and performance of financial sector.

In context of our research question from both the plots we observe that there is a trend of conditional correlations between financial indices and Islamic indices, with near zero conditional correlation in middle of 2008, which was the peak of the crisis. The real life implications for these findings are unique and positive for Islamic financial development. It is observable that the Sharīʿah screening criteria creates a set of underlying stock selection which tends to have dampening conditional correlations with the global financial services indices, providing unique partial insulation to Islamic investors in financial turmoil. It implies that as an investor, who attempts to follow the Islamic indices would experiences low correlations with the financial indices and decreasing one during crisis period. In the context of economic crisis originating from financial sector, Islamic equity indices provides not complete insulation but dampened negative effect.

6. Conclusion

To summarize our analysis, recall our research question set forth at the onset of this paper: Do Islamic indices show lower dependence on conventional counterparts in times of crisis?

Firstly, our research shows strong evidence that conditional correlations between Islamic Indices and conventional financial indices show a negative trend during the times of recent crisis. This relationship helps us better understand the interaction of Islamic indices and their conventional counterparts by relaxing stiff assumptions of earlier statistical tools via employment of Multivariate GARCH, DCC methods. The initial belief of authors, about Islamic indices providing a better alternative if reaffirmed through the study of dynamic volatilities and conditional correlations, which point towards a changing correlating relationship between Islamic and conventional indices.

The focus of our study was the correlation dynamics of Islamic indices and conventional financial benchmarks. The evidence via plots of conditional correlation and volatilities suggest towards a dampening correlation between them especially through the financial crisis of 2007 to 2008. The authors view it as a positive omen and take a cautious stance that the exclusion of financial stocks due to Sharīʿah screening methodology has benefited the Islamic indices during the crisis periods. The implication of these findings though not groundbreaking, but are positive and beneficial in the favour of framing of Islamic finance as a solid and robust alternative investment channel. From an investors point of view the results of this study indicate that an investor following the Islamic indices, would be better protected in times of economic crisis originating from financial sector, as well as being in line with Sharīʿah standards and Halal investments.

The inherent philosophy of Islamic finance that promotes risk-sharing instruments and prohibits interest bearing business (modern day conventional banks) has its benefits in the modern capital markets. Our analysis suggests Islamic equity investments though they follow a similar return pattern as conventional in times of economic growth, but in downturns, are a safer alternative.

6.1. Limitations

The authors believe that it is of utmost importance that we are honest and understand the limitations of our study. In our understanding the following limitations exist in our study:

- The duration of the study spans 12 years, and an extended study encompassing previous decades would make the study more robust.
- Our research has taken a sample of 9 indices from the family of 42 available Islamic indices in Dow Jones Islamic indices universe. Addition of further indices can make the study more robust.
- This study focused on the financial indices from conventional side and was more aligned towards the Asian and Emerging market indices in Islamic side. This study can be expanded and findings be tested for validity for other regions and country specific indices using the same methodology.

It should be noted that the purpose of this study was exploratory and to provide a holistic empirical evidence of Islamic indices as being a safer investment option during crisis period. By analyzing this study in isolation, we cannot make judgments and decisions for the whole Islamic financial markets.

References

Ahmad, Z. and Ibrahim, H., (2002), "A Study of the KLSE Syariah Index", *Malaysian Management Journal*, Vol. 6, No.1&2, pp. 25-34

Albaity, M. & Ahmad, R. (2008), "Performance of Syariah & Composite Indices: Evidence from Bursa Malaysia", *Asian Academy of Management Journal of Accounting and Finance*, Vol 4, No.1, pp. 23-43

Al-Zoubi and Maghyereh (2007), "The Relative Risk Performance of Islamic Finance: A New Guide to Less Risky Investments," *International Journal of Theoretical and Applied Finance*, Vol. 10, No. 2, pp. 235-249

Arshad, S. and Rizvi, S.A.R., (2013), "The Impact of Global Financial Shocks to Islamic Indices: Speculative Influence or Fundamental Changes?" *Journal of Islamic Finance*, Vol. 2, No.1, pp. 13-22

Ayub, M. (2007), *Understanding Islamic Finance*, England: Wiley.

Beik, S. I., and Wardhana, W., (2009). "The Relationship between Jakarta Islamic Index and Other Selected Markets: Evidence from Impulse Response Function" Persatuan Pelajar Indonesia International Islamic University Malaysia. Retrieved from: ppi-iium.org/.../The%20Relationship%20between %20JII% 20&%20US.pdf.

Ben Zion, U. (1996), "The price linkages between country funds and national stock markets: evidence from cointegration and causality tests of Germany, Japan, and UK funds", *Journal of Banking & Finance*.

Engle, R.F. (2002), "Dynamic conditional correlation — a simple class of multivariate GARCH models" *Journal of Business Economics & Statistics* Vol.20, pp. 339–350.

Girard, E.C. and Hassan M.K. (2008). "Is There a Cost to Faith-Based Investing: Evidence from FTSE Islamic Indices" *The Journal of Investing*, Vol. 17, No. 4: pp. 112-121

Hakim, S., and Rashidian, M., (2002), "Risk & Return of Islamic Stock Market Indexes." Working paper. Available from: http://www.mafhoum.com/press4/136E15.pdf

Hassan, M.K. (2004), "Risk, Return and Volatility of Faith-Based Investing: The Case of Dow Jones Islamic Index", Paper in proceedings of the 5th Harvard University Forum on Islamic Finance, University of Harvard, USA.

Hoepner, A.G.F., Rammal, H.G. and Rezeca, M. (2010), "Islamic Mutual Funds' Financial Performance and International Investment Style: Evidence from 20 countries", *European Journal of Finance*. Forthcoming. Available at SSRN: http://ssrn.com/abstract=1475037

Hussein, K.A. (2004), "Ethical Investment: Empirical Evidence from FTSE Islamic Index", *Islamic Economic Studies*, Vol. 12, No. 1, pp. 21-40

Hussein, K.A. (2005), "Islamic Investment: Evidence from Dow Jones and FTSE Indices", *Advances in Islamic Economics and Finance*, Vol. 1, Proceedings of the 6th International Conference on Islamic Economics and Finance, Jakarta, Indonesia.

Iqbal, Z., and Mirakhor, A. (2007), *An Introduction to Islamic Finance – Theory and Practice*, Singapore: Wiley.

Lanza, A., Manera, M. and McAleer, M. (2006), "Modeling dynamic conditional correlations in WTI oil forward and futures returns", *Finance Research Letters*, forthcoming.

Mansor, F. and Bhatti, M.I., (2011), Risk and Return Analysis on Performance of the Islamic mutual funds: Evidence from Malaysia. Global Economy and Finance Journal Vol. 4, No.1, pp.: 19-31.

Milly, M. and J. Sultan, 2009, Portfolio diversification during financial crisis: An analysis of Islamic asset allocation strategy. Bentley University Working Paper.

Pesaran, B., and Pesaran, M.H. (2007), "Modelling Volatilities and Conditional Correlations in Futures Markets with a Multivariate t Distribution", CESIFO Working Paper No. 2056, Retrieved from: http://www.cesifo-group.de/portal/page/portal/DocBase_Content/WP/WP-CESifo_Working_Papers/wp-cesifo-2007/wp-cesifo-2007-07/cesifo1_wp2056.pdf

Pesaran, B., and Pesaran, M.H. (2009), *Time Series Econometrics using Microfit 5.0*, Oxford: Oxford University Press.

Rashid, A., Ahmad, S., (2008), "Predicting stock returns volatility: an evaluation of linear vs. nonlinear methods", *International Research. Journal of Finance and Economic*, Vol. 20, pp: 141-150.

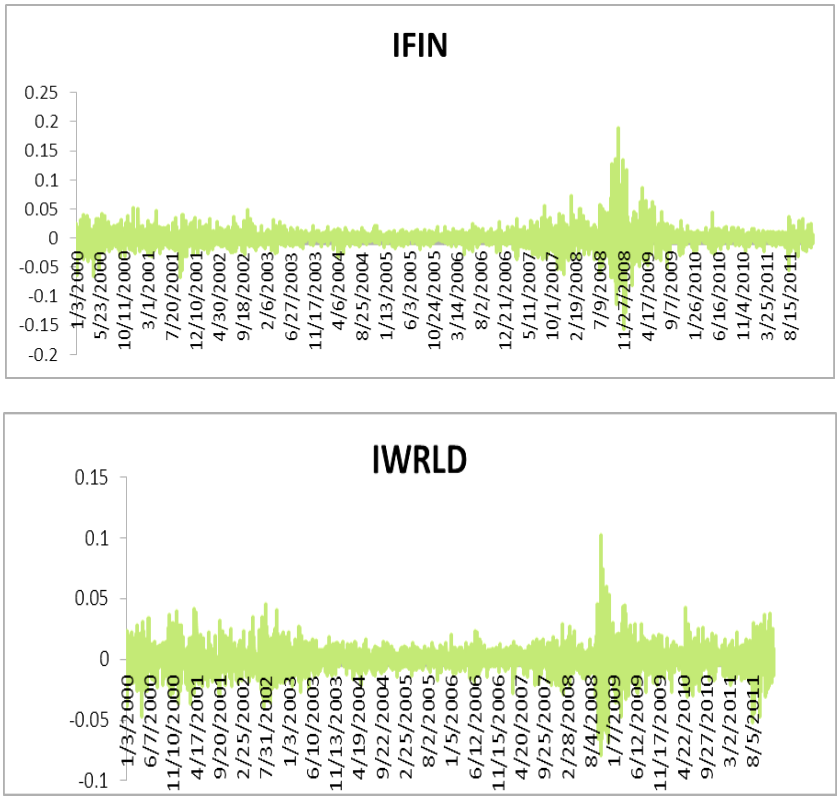
Usmani, M.T. (2002), *An Introduction to Islamic Finance*, Kluwer Law International: The Hague.

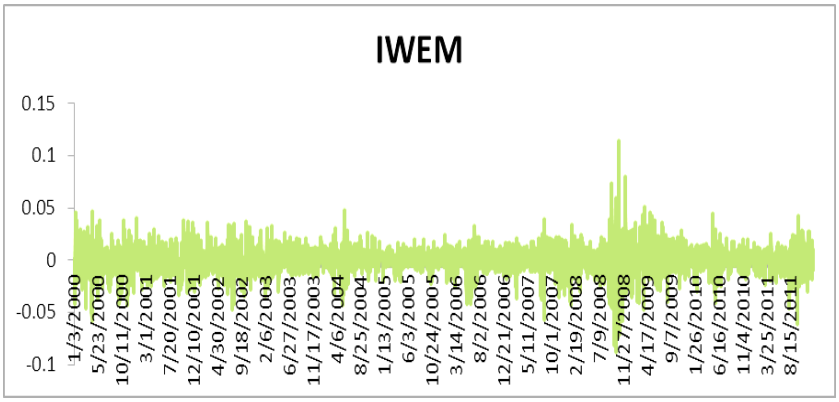
Worthington, A. and Higgs, H. (2004), Transmission of equity returns and volatility in Asian developed and emerging markets: a multivariate GARCH analysis. Int. J. Fin. Econ., 9: 71–80.

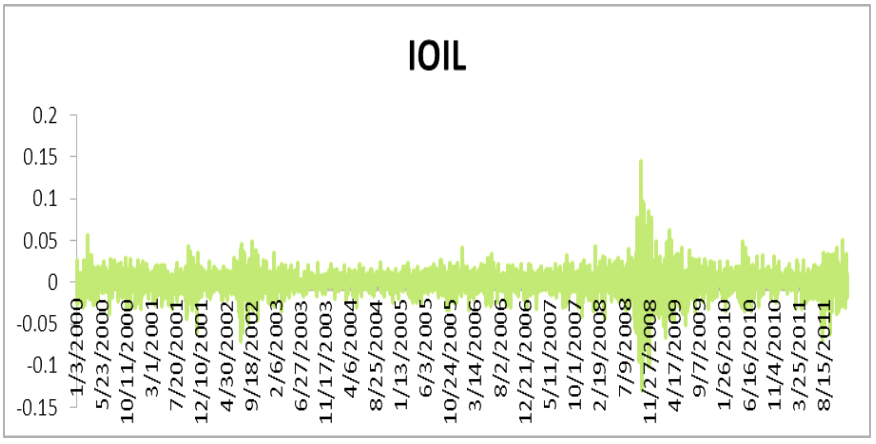
Zhao, H., (2010), Dynamic relationship between exchange rate and stock price: Evidence from China. Research in International Business and Finance, Vol. 24, No.2, pp. 103-112.

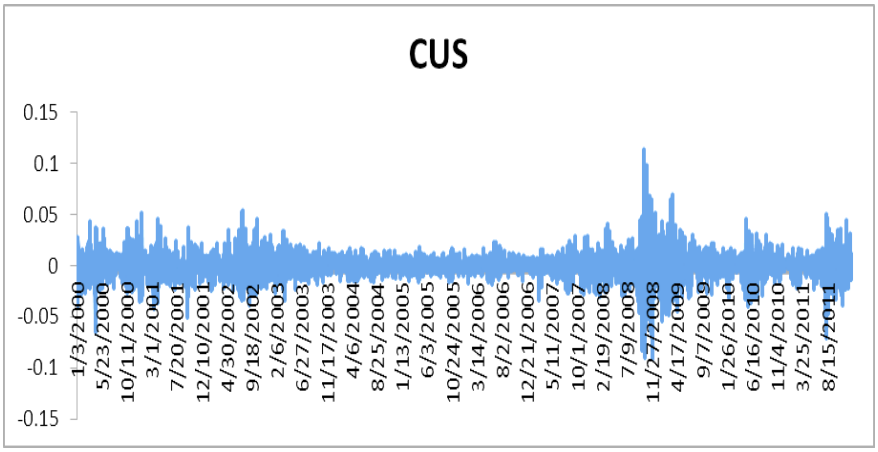
Appendix

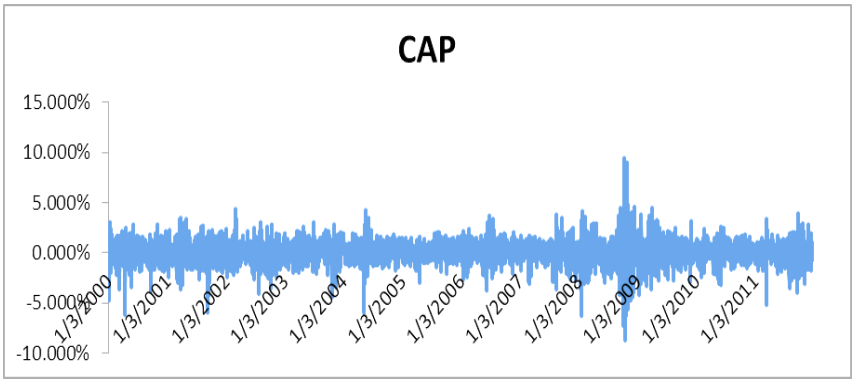
Appendix-A: Graphs of daily returns of conventional and Islamic indices (2001-2011)

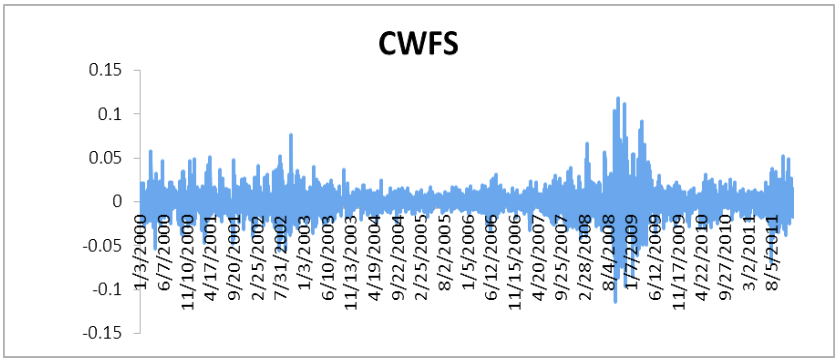


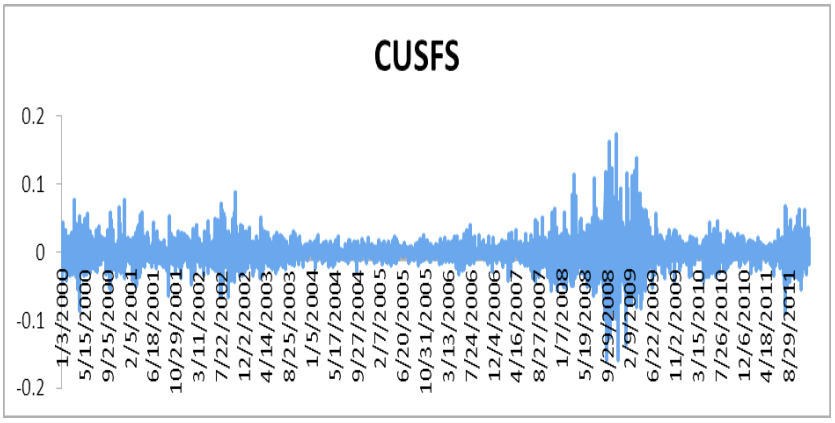

IWEM
0.15
0.1
0.05
0
-0.05
-0.1
1/3/2000
5/23/2000
10/11/2000
3/1/2001
7/20/2001
12/10/2001
4/30/2002
9/18/2002
2/6/2003
6/27/2003
11/17/2003
4/6/2004
8/25/2004
1/13/2005
6/3/2005
10/24/2005
3/14/2006
8/2/2006
12/21/2006
5/11/2007
10/1/2007
2/19/2008
7/9/2008
11/27/2008
4/17/2009
9/7/2009
1/26/2010
6/16/2010
11/4/2010
3/25/2011
8/15/2011


IOIL
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1/3/2000
5/23/2000
10/11/2000
3/1/2001
7/20/2001
12/10/2001
4/30/2002
9/18/2002
2/6/2003
6/27/2003
11/17/2003
4/6/2004
8/25/2004
1/13/2005
6/3/2005
10/24/2005
3/14/2006
8/2/2006
12/21/2006
5/11/2007
10/1/2007
2/19/2008
7/9/2008
11/27/2008
4/17/2009
9/7/2009
1/26/2010
6/16/2010
11/4/2010
3/25/2011
8/15/2011


CUS
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1/3/2000
5/23/2000
10/11/2000
3/1/2001
7/20/2001
12/10/2001
4/30/2002
9/18/2002
2/6/2003
6/27/2003
11/17/2003
4/6/2004
8/25/2004
1/13/2005
6/3/2005
10/24/2005
3/14/2006
8/2/2006
12/21/2006
5/11/2007
10/1/2007
2/19/2008
7/9/2008
11/27/2008
4/17/2009
9/7/2009
1/26/2010
6/16/2010
11/4/2010
3/25/2011
8/15/2011


CAP
15.000%
10.000%
5.000%
0.000%
-5.000%
-10.000%
1/3/2000
1/3/2001
1/3/2002
1/3/2003
1/3/2004
1/3/2005
1/3/2006
1/3/2007
1/3/2008
1/3/2009
1/3/2010
1/3/2011


CWFS
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1/3/2000
6/7/2000
11/10/2000
4/17/2001
9/20/2001
2/25/2002
7/31/2002
1/3/2003
6/10/2003
11/13/2003
4/19/2004
9/22/2004
2/25/2005
8/2/2005
1/5/2006
6/12/2006
11/15/2006
4/20/2007
9/25/2007
2/28/2008
8/4/2008
1/7/2009
6/12/2009
11/17/2009
4/22/2010
9/27/2010
3/2/2011
8/5/2011


CUSFS
0.2
0.1
0
-0.1
-0.2
1/3/2000
5/15/2000
9/25/2000
2/5/2001
6/18/2001
10/29/2001
3/11/2002
7/22/2002
12/2/2002
4/14/2003
8/25/2003
1/5/2004
5/17/2004
9/27/2004
2/7/2005
6/20/2005
10/31/2005
3/13/2006
7/24/2006
12/4/2006
4/16/2007
8/27/2007
1/7/2008
5/19/2008
9/29/2008
2/9/2009
6/22/2009
11/2/2009
3/15/2010
7/26/2010
12/6/2010
4/18/2011
8/29/2011