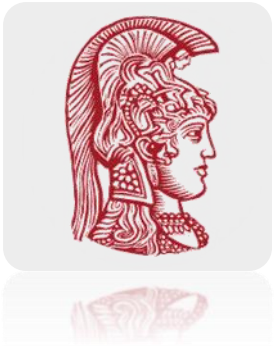

NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS

DEPARTMENT OF ECONOMICS

MASTER OF SCIENCE IN APPLIED ECONOMICS AND FINANCE

"THE IMPACT OF ECB's UNCONVENTIONAL MONETARY POLICY ON CONVENTIONAL AND ISLAMIC STOCK INDICES"

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ABSTRACT

This paper examines and explains, using econometric models, the possible heterogeneity of the ECB in the effects of the quantitative easing programs on Islamic and Conventional sectoral equity indices, covering worldwide the shares of companies participating in these indices. The source of our data is Reuters DataStream, and the indices to be analyzed are from S&P Dow Jones. Our aim is to highlight the effects of the quantitative easing programs implemented on Islamic equity indexes and to compare these effects between conventional and Islamic indexes. In the analysis, we utilize a generalized autoregressive conditional heteroscedasticity (GARCH) modeling framework to examine the effects on both the mean and volatility of these indices. The results show that the global sector can influence every sector and index for all time periods. Also, the dummy variables affect more the Conventional sectors and less the Islamic sector indices. Last but not least on Islamic sector indices, only for industrial and technology sectors, the results show that a positive and significant correlation suggesting a quantitative easing impact, on Conventional sector indices, basic materials, consumer goods, consumer services and industrial show that the positive and significant correlation has more affects.

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1. INTRODUCTION

Since the outbreak of the global financial crisis in 2008 many economies have been forced to adopt new policy methods in order to maintain price level and financial markets stability. The world's largest central banks, Federal Reserve (FED) and the European Central Bank (ECB), started to integrate unconventional measures to their operating monetary policy frameworks, and especially quantitative easing. Federal Reserve decided to set federal fund rate to zero lower bound and simultaneously used a range of quantitative easing monetary financing programs called unconventional monetary policy to simulate the US economy. By using unconventional policy, FED bought critical credit market assets such as bond backed securities that where frozen because of economic slowdown. By monetizing the debt in this way, the FED pumps money directly in the economy. The non-standard monetary policy measures of the ECB consisted of a Securities Market Program (SMP), an Outright Monetary Policy Transactions (OMT) Program, a Covered Bond Purchase Program (CBPP3) and a Public Sector Purchase Program (PSPP), with the last program has been characterized as quantitative easing.

These programs have been operated through various channels of transmission of spillover effects to financial assets, mainly via the signaling channel in order to become definite to the public the monetary policy stance of the central bank, and furthermore via confidence channel and portfolio-rebalancing channel under somewhat different economic conditions. Many researchers have concentrated to the investment effects of quantitative easing of Federal Reserve and as well how the portfolio-rebalancing channel works by reducing the supply of security types to private investors and lead to an increase in demand for all substitute assets, including assets from non-domestic developed and emerging markets (Bernanke, 2012). The large scale asset purchases (lASPs) were expected to raise asset prices, lower the yields of those securities, promote and stabilize a low inflation rate (Bernanke, 2010).

In the past 12 years, Islamic financial products have played an important role in financial markets and especially in Islamic countries. Also, the characteristics of Islamic indices such as less leverage and lower diversification make them less risky. Therefore, it seems that the negative influence of financial crisis on Islamic products should be less than conventional. Although relatively few studies have been done in this area, most have focused on interdependencies of conventional and Islamic indices or Islamic bonds and Islamic indices and comparison of Islamic and conventional banks.

The objective of this paper is to shed some insight into the effects of US unconventional monetary policy on low leverage financial assets. Above all, we will examine the impact of quantitative easing policy shocks on Islamic financial products from 2007 until 2015 by using GARCH models. It is hypothesized that during this period, specifically from November 2008, unconventional monetary policy and zero bound interest rates have been implemented in the

US economy. However, the strength of effects of this range of policies on Islamic products is unidentified.

The policy of large-scale asset purchases was performed in five phases. The first phase, is quantitative easing 1, began in November 2008 and lasted until August 2010. The second phase, quantitative easing II, began in August 2010 and lasted in June 2012. The third phase, quantitative easing III, began in August 2012 and ended in December 2012. The fourth phase, it's maturity, began in May 2013 and lasted October 2014. And last the fifth phase, in tapering, began in December 2015 and lasted in June 2017.

Nine years after this policy took hold in 2008 in USA, there is now a consensus that quantitative easing has had a significant effect on US economy and to some extent has served to stabilize prevent further collapse of financial markets. However, there are serious discussions about the spillover of the unconventional ECB policy effects on the financial markets of developed and emerging countries. Hausman and Wongswan (2011) argue that the effect US unconventional monetary policy has on stock markets is more pronounced in those countries with less flexible exchange rate regime. Fratzcher et al. (2013) pointed out that US quantitative policy has significant influence on global portfolio reallocation and can lead to an increase in asset prices and exchange rate fluctuation in emerging countries. Fic (2013) and Bowman et al. (2015) also emphasized the strong response of asset prices in emerging market to US quantitative easing (QE) announcements. Chen et al. (2015) determined that US monetary policy spillover contributed to inflation fluctuation in emerging economies in 2010 and 2011. Lo Duca et al. (2014) identified that US unconventional monetary policy has important effects on nonfinancial corporate bonds, particularly in emerging countries. Likewise, Rajan (2013) and Taylor (2013) argued that QE policies will lead to devaluation of currencies and capital inflows and increase the risk of competition in asset markets.

The primary contribution of this paper is to evaluate the effects of US unconventional monetary policy on Islamic Shariah indices. Second, while Islamic equities represent the limit of leverage, little attention has been directed toward the effect of quantitative easing policy on assets under qualitative and quantitative screening, a gap that this study attempts to cover. Third, most of the Middle Eastern countries have pegged their currency to the US dollar. According to Mundell-Fleming models, US monetary policy should shadow conventional monetary policy in these countries, however, the effects of US new unconventional policy on financial markets of these countries is unknown. Investigation in the Islamic economics and finance literature has shown that most of the papers have focused on the effects of US conventional monetary policy, stock market and financial crisis on financial markets of Islamic countries, however, there is no specific study which evaluates the effects of unconventional monetary policy on Islamic financial products.

2. QUANTITATIVE EASING

Since the advent of the financial crisis in 2008, some of the world's largest central banks have embarked on monetary easing in order to combat recessions by adopting different types of unconventional measures. The most high-profile form of unconventional monetary policy has been Quantitative Easing (QE), which have been characterized as an unorthodox way of pumping money into the economy. Japan in credited as the first country that started implementing QE in 2001, as it dealt with the bursting of a real estate bubble and the deflationary pressures that followed in the 1990s.

The usual conventional monetary acts by affecting short-term interest rates through open market operations, by either selling or buying securities from the banking sector and thus influence the level of reserves that banks hold in the system. Fluctuations in reserves are a means to perform desired changes in interest rates. With interest rates at their lower zero bound, quantitative easing was introduced to signal a shift in focus towards targeting quantity variables, where the bank of Japan aimed at purchasing government securities from the banking sector in order to boost the level of reserves the bank held. By targeting a high enough level of reserves, eventually this would spill over into lending into the broader economy, helping rise asset prices up and counter deflationary forces.

Quantitative easing and other asset purchase programs have therefore been adopted worldwide by major central banks under exceptional circumstances, but it was not until the 2008 financial crisis that central banks of developed countries started using QE regularly to stimulate their economies, increase bank lending, and encourage spending. There are significant differences of how each central bank have followed QE programs and policies, in line also with their financial structure.

Federal Reserve implemented various unconventional policy measures, to provide liquidity to the market that had dried up in the wake of financial crisis, helped lower mortgage interest rates directly and provided credit lines to the economy. Another type was the Operation Twist (OT), where Fed sold short-term government bonds, used the proceeds to buy long term bonds of equal amount and with these purchases aid to drive up their prices and lower lon-term interest rates. In 2008, the first QE program (QE1) was introduced by the Fed with Large-Scale Asset Purchases (LSAP) of agency debt, mortgage-backed securities (MBS) and Treasury securities, with the purpose to repair the functioning of financial markets accompanied by liquidity operations supporting banks. In the second half of 2010 another main push via a second QE program (QE2), concentrated on purchases of US Treasury securities in order to

stimulate the US economy by lowering yields and pushing up asset prices in riskier market-segments inducing therefore positive wealth effects. The third round of QE (QE3) came in 2012 with an injection of a monthly $85 billion through the purchase of mortgage-backed securities and longer-term Treasury securities.

The ECB's balance sheet expands mainly through repo operations, i.e. the provision of loans, for the most part long term in exchange for collateral, much of them bank loans rather despite government bonds. All strategies ECB had followed constitute as a response to the various economic situations the EU have been through since the global crisis in 2008. Stresses within the euro area led to a steady and vary substantial outflow of euro deposits from banks in peripheral countries and into banks in different euro nations. As a consequence the creation of imbalances in the internal banking system, essentially bank run on many institutions. Since the ECB's structure is largely-bank based, it was necessary to undertake effective measures in order to alleviate the acute funding difficulties that were generated.

The term "quantitative easing" (QE) is used to describe the Bank of England's program of expansionary monetary policy through asset purchases funded by electronic money creation. The recent financial crisis that, in the UK, first came into sharp focus with the run on Nothern Rock bank in September 2007, led ultimately to a lowering of the short-term interest rate- the instrument of (conventional) monetary policy – from 5% to 0.5% between October 2008 and March 2009. As early as January 2009, the Bank of England announced its attention to establish an asset purchase facility (APF), and the asset purchases began two days after the reduction in the base from 1% to 0.5% in March 2009. The first phase of QE, QE1, lasted until January 2010 and saw £200 billion spent to purchase assets, mostly government bonds. By the end of QE1 40% of the stock outstanding of 3-10 year maturity bonds were purchased, 50% of the 10-25 year maturity bonds, and 15% of the more than 25 years maturity bonds were purchased. Other asset such as commercial paper and corporate bonds were also purchased by the Bank but is significantly smaller quantities, and these were being sold back into the market by December 2009. At the meeting of the Monetary Policy Committee (MPC) held on the fourth of February 2010, the members decided not to increase the limit for asset purchases further. In October 2011, the second round of QE began (QE2) after the members of the MPC voted to increase the limit of asset purchases further by £75 billion. A further increase of £50 billion was announced in February 2012 and the purchases were accomplished by the second of May 2012. After only a two-month gap the QE APF was restarted again. On the fifth of July 2012, the MPC announced a further £50 billion of gilt purchases, to be completed by November 2012, this phases being identified as QE3.

Determining the effects of QE on the correlation between asset classes is not only important for investors, but is also fundamental to understanding whether QE is operating successfully. QE has three main channels through which it can affect the economy. The first is

a signaling channel. The use of QE demonstrates a commitment to low interest rates and monetary easing more generally, and this is likely to boost investment and consumption. The second is a liquidity channel. In this case, the purchases of gilts from the banks, by the Bank of England, enhance their reserve levels, that should then facilitate greater lending to commercial activity. The third channel is a portfolio balance channel, whereby the purchases of gilts may lead to an increase in asset prices, which leads to both wealth effects and lower costs of capital, that in turn boosts the economy through increased investment and consumption. As well as the direct upward pressure on gilt prices that may arise from the Bank's purchases, there can arise an additional 'ripple effect' to increase the prices of other assets if the sellers of the gilts do not regard the cash received as a perfect substitute for the gilts sold, and use the cash to purchase other assets. This process may continue until all asset prices have been bid upwards to rebalance asset portfolios to accommodate the increased cash balances. The success or otherwise of the ripple effect of QE must, therefore, depend on the correlation between the returns among different asset classes, which will reflect their degree of substitutability.

While there have a been a number of studies of the effects of QE on the prices and yields of various UK asset classes, for example, Meier (2009), Joyce et al. (2011), Meaning and Zhu (2011), Breedon, Chadha, and Waters (2012) , Glick and Leduc (2012), Joyce and Tong (2012) and Martin and Milas (2012), these in common with studies of the effects of US QE have focused mainly on the effects on prices and returns. An exception is Tan and Kohli (2011) who examine the volatility of the US stock market over the period 2008 to 2011, which encompasses the US QE1 and QE2 phases. They examine three models of volatility, an AR(1) process and a modified constant elasticity of variance model , both applied to the VIX measure of implied volatility for the S&P500 index, and the conditional volatility from a GARCH(1,1) model applied to the returns to the S&P500 index. They find that the onset of QE led to a significant drop in stock index volatility that then reverted to previous levels following the ending of a phase of QE. Joyce et al. (2011) examine the behavior of the option-implied volatility of the FTSE100 index between January 2009 and June 2010, a period encompassing the UK QE1 phase. They found that the twelve-month implied volatility fell by around 40% during 2009. They also constructed an option-implied probability distribution for the FTSE100 returns and found that it narrowed between February 2009 and February 2010, with the (lower) tail risk falling considerably.

Joyce et al. (2011) also consider the possibility of time-variation in the correlation structure between asset classes. They use a diagonal VECH form of the multivariate GARCH and offer some preliminary evidence, using monthly data until the end of 2009, of increases in the volatility of the correlation between UK equities and bonds around the commencement of QE. However, the estimated conditional covariance appear to display some instability with the onset of the crisis, and the lack of statistical significance of some of the coefficient estimates,

particularly in the unconditional variance-covariance matrix suggests that their model may be poorly specified.

3. ECB's UNCONVENTIONAL MONETARY POLICY

The unconventional policy action taken by central banks in a number of major economies have led to an emerging literature on their effectiveness on macroeconomic variables and financial markets (for a survey see Joyce et al.,2012; Kenourgios et al., 2015a,b). Recent studies examine the effects of the ECB's UMPs on macroeconomic variables, equity prices, exchange rates and domestic bond yields (see Varghese and Zhang, 2018, and the references there in). Another thread of the literature has also examined the effects of U.S. unconventional monetary policy measures and the spillovers to advanced and emerging markets around the world (e.g., Chen et al., 2015; MacDonald et al., 2019).Spillovers of ECB's UMPs to non-euro area EU countries are found to be transmitted mainly through the portfolio rebalancing channel, largely affecting sovereign yields and exchange rates, and have become more prominent in the new UMP phase that begun in the summer of 2014 (Falagiarda et al., 2015; Varghese and Zhang, 2018).

3.1 ISLAMIC EQUITY INDICES

The primary contribution of this paper is to evaluate the effects of unconventional monetary policy on Islamic Shariah indices. While Islamic equities represent the limit of leverage, little attention has been directed toward the effect of quantitative easing policy on assets under qualitative and quantitative screening. Also, most of the Middle Eastern countries have pegged their currency to the US dollar. According to Mundell - Felming models, US monetary policy should shadow conventional monetary policy in these countries; however, the effects of new unconventional policy on financial markets of these countries is unknown. Investigation in the Islamic economics and finance literature has shown that most of the papers have focused on the effects of conventional monetary policy, stock market and financial crisis on financial markets of Islamic countries; however there is no specific study which evaluates the effect of unconventional monetary policy on Islamic financial products.

The empirical results disclose the significant effects of US unconventional monetary policy on Shariah equity indices; this implies the spillover effects of US QE strategies on financial markets. However, Shariah equity prices in different markets have various responses in relation to unconventional monetary policy tools. Findings indicate that a decline in spread between 10 and 3 years' US sovereign yields is seen as a negative sign in Shariah equity markets, but a decline in corporate spread is seen as a positive signal in this market. Finally, digging deeper into the results revealed that Islamic equity price responses are relatively larger in relation to corporate spread than term spread.

3.2. THE EFFECT OF UNCONVENTIONAL MONETARY POLICY ON INTERNATIONAL ISLAMIC EQUITIES

One standard deviation increase in US term spread has significant and persistent positive effect on US Shariah equity prices, and the corporate spread shock has a negative effect on US Shariah stock. In EU, Islamic equity prices also showed a positive and significant response to term spread and negative response to corporate spread shocks. This finding suggests that shocks on term spread are recognized negatively, and shocks on corporate spread are perceived positively in US and EU Islamic equity markets. The result is consistent with Chen et al.'s (2015) findings that a cut in term spread has positive effects on conventional equity prices in developed countries.

In the case of Pan Asia and Pan Arab Shariah, term spread has less impact on equity prices than corporate spread. Pan Asia Shariah stock responded positively for only a few days after US monetary shock, and then the equity prices demonstrated persistent negative reaction to both term and corporate spread shocks. This might be attributed to positive recognition of the US unconventional policy effects on Islamic equity markets in Asian countries.

The effects of both term and corporate spread on equity prices have been evaluated during the first main phase of Federal Reserve asset purchasing from November 2008 to December 2010. In the case of Shariah US and EU equity prices, results indicate that one standard deviation shock to term spread decreases equity prices simultaneously, and persistent decline of equity prices to term spread occurred a few days after the shocks. In the case of Pan Asia and Pan Arab, equity price increases persistently, followed a corporate spread shock. Equity prices fell one month after term spread innovation in Pan Asia Shariah equity price, but the results demonstrate that in the first phase of LSAP program, the effects of term spread shocks on Pan Arab equity prices are not significant.

Shariah equity price in Islamic countries have a different response to unconventional monetary policy shocks in terms of size and direction. In the case of Oman, Qatar, Saudi Arabia,

UAE and Jordan, equity price displays persistent decline a few days after both term and corporate spread shocks. In Bahrain and Kuwait, the response of equity prices to unconventional monetary policy shocks (both term and corporate spread shock) is positive.

According to credit channel of monetary policy transmission mechanism, it is expected that any expansionary monetary policy has positive effects on equity prices. Moreover, as GCC countries have pegged their currency to US dollar, it is also anticipated that an expansionary monetary innovation has positive effects on equity markets, but the results indicated that unconventional monetary policy (term and corporate spread cut) had been recognized negatively by the markets (except Kuwait and Bahrain). Moreover, in Malaysia, Tunis and Lebanon, responses of equity price to corporate spread is negative, however, the effect of term spread shocks on equity price is not pronounced.

4. *LITERATURE REVIEW*

In the past few years, there has been a growing strand of literature investigating the effect of the US economy on markets of Islamic countries. In the case of Saudi Arabia, Ziaei (2012) and Gulf Cooperation Council (GCC) countries, Ziaei (2013) evaluated the effects of federal fund rate (as proxy of US monetary policy) on the economies of GCC countries. He found that as these countries had pegged their currency to US dollar, US conventional monetary policy innovation had important effects on monetary policy instruments and aggregate demand of these countries, especially in long horizon. Hammoudech et al. (2008) argued that most sudden shocks imposed on GCC financial markets are because of oil price shocks and US financial crisis. Alotaibi and Mishra (2015) determined that the spillover effects from US financial market to GCC stock market are highly significant and positive.

Yu and Hassan (2008); Naime (2012) and Maghyereh et al. (2014) concluded that US stock market has a significant effect on the volatility of the stock markets in most of the Middle East and Non-African countries. Maghyereh et al. (2014) emphasized that the degree of strength of transmission effects from US stock markets to stock markets in the Middle East and North African countries was much more pronounced during the financial crisis.

By comparing independencies of conventional and Islamic Morgan Stanley Capital International (MSCI) indices in some Islamic and emerging countries, Saiti et al. (2014) found that Shariah MSCI in Islamic countries provided better diversification compare to Shariah MSCI in emerging countries. However, it seems that Islamic stock indices do not provide additional diversification benefits compared to conventional stock indices. Bourkhis and Nabi (2013) investigated the effects of the recent financial crisis on bank soundness of 34

conventional and Islamic banks. The result shows that the type of bank, be it conventional or Islamic, does not play a significant role in terms of the effects of financial crisis on bank soundness.

Godlewski et al. (2013) in the case of Malaysia and Aloui et al. (2015) for GCC countries evaluated the volatility spillover from Shariah stock to sukuk market. A common finding is a time-varying negative relationship between these two indicators and robust evidence of persistence in Shariah stocks and sukuk volatilities.

The main concern of Shariah laws regarding monetary policy is the interest rate. Khan and Mirakhor (1993) believed that in Islamic states' monetary authorities can use all monetary policy tools, except those related to discount rate and interest rate. Although most of the Islamic state pegged their currency to the US dollar in an atmosphere of capital mobility, indirectly, their credit and asset markets (Islamic or conventional) are inevitably affected by US monetary policy and economic conditions.

There is a vast empirical work on the effects of conventional central bank interventions on exchange rate co-movements and volatility. Since the seminal paper of Engle et al. (1990), another strand of the literature also investigates volatility spillover linkages among exchange rates. In general, empirical evidence reveals intraday exchange rate volatility transmission, asymmetric exchange rate dependence structure, as well as time-varying linkages among currencies during a turmoil period.

Chen et al. (2015) study the effects of US quantitative easing in reductions in the US term and corporate spreads, on both the emerging and advanced economies. The estimations suggest that cross-border spillovers varied across economies, that by reducing the US corporate spread, and, to a lesser extent, the US term spread, had sizeable effects on financial conditions and economic activity both domestically and globally. US QE programs, especially the first LSAP, were important counter-cyclical measures, apparently preventing US abd other advanced economies from prolonged recession and deflation. The effects of US QE measures on the emerging economies are estimated to be generally larger and more diverse than those in the advanced economies. The strength of the effects depends partly on how each economy reacts to the US policy shocks, and partly on the distinct economic and financial structures, policy frameworks and exchange rate arrangements. US QE measures contributed to overheating in Brazil, China and some other emerging economies in 2010 and 2011, but supported recovery in these economies in 2009 and 2012. The diverse cross-border QE effects imply that the costs and benefits of US QE policies have been unevenly distributed between the advanced and emerging economies and have varied over time.

MacDonald et al. (2016) suggest that unconventional monetary policy announcements and operations can affect foreign asset prices through signaling, portfolio balance, and risk

channels. The signaling channel is activated as the Fed's LSAP operations provide a credible signal that future short-term interest rates will remain low, and therefore decreases the expectations component of long-term interest rates. Purchases also lead to portfolio rebalancing as the Fed reduces the supply of assets in the market and raises their price, thereby inducing investors to search for (imperfectly) substitutable assets with potentially higher returns, such as EMEs government debt. Finally, as the Fed makes credible commitments to continue LSAPs, the risk premium for holding long-term assets falls and global risk appetite rises, potentially propelling investors toward relatively riskier EMEs assets.

Falagiarda et al. (2015) investigate the presence and the magnitude of spillovers from the ECB's non-standard monetary policies on financial assets in selected non-euro area EU countries from Central and Eastern Europe (the Czech Republic, Hungary, Poland and Romania). They found evidence of strong spillovers from the ECB's monetary policy to all countries, in particular, on bond yields and the exchange rate. Among recent ECB monetary policy decisions, the spillovers from the Securities Markets Program announcements were the most pronounced, while spillovers from the Outright Monetary Transactions and the Public Sector Purchase Program announcements were rather limited. Turning to the channels of transmission of these spillovers, we argue that for the SMP announcements both the portfolio rebalancing and the signaling channels played a key role in the transmission to CEE countries. The OMT has impacted CEE countries indirectly, operated via the confidence channel, reducing the perceived redenomination risk within the euro area without resulting in cross-border spillovers to these economies. Regarding the PSPP they found that both the confidence and the signaling channels were important in its transmission across borders.

Kenourgios et al. (2013) found that the ECB's announcements cause a delayed devaluation of EUR and a positive impact on its volatility, implying an unclear signal of future monetary policy actions of investors. On the other hand, the BoE's and BoJ's QE announcements cause a more direct and significant reduction on their currencies without producing increased volatility. These findings highlight the increased credibility and effectiveness of the BoE's and BoJ's monetary easing policies and support the existence of a signaling channel in the foreign exchange markets. The conditional correlation between two competitive high correlated currencies, EUR and GBP is affected negatively around the QE announcement by the BoE. This result implies that, although EUR shares the higher correlation with GBP during the full sample period, the BoE announced QE actions lead the two currencies to follow a different path. This dynamic conditional correlation behavior may be considered as evidence of non-cooperative monetary policies and highlight the need for some form of policy coordination among the BoE and the ECB on reducing recent crisis effects. It also implies a high degree of competiveness between the two currencies in an international portfolio and a portfolio rebalancing. On the other hand, the dynamic correlation between GBP and JPY

remains unaffected around the QE announcements by both the BoE and BoJ, while EUR and JPY follow a weak diverse path over the period of the ECB's QE announcements.

Kryzanowsli et al. (2016) examines the correlations between bond markets, stock markets and currency forwards during the three QE programs launched by the US Federal Reserve and find that these correlations differ by QE period across developed and emerging countries. The investment effects of each QE worked primarily through the portfolio-rebalancing channel under somewhat different economic conditions. The portfolio- rebalancing effect channel argues that by reducing the supply of security type(s) to private investors, domestic-country large scaled asset purchases lead to an increase in demand for all substitute assets, including assets from non-domestic developed and emerging markets (Bernanke, 2012; Gagnon et al., 2011; Joyce et al., 2011; Neely, 2015). As a result, LSAPs are expected to raise asset prices, lower the yields of those securities, promote employment and stabilize a low inflation rate (Bernanke, 2010). If, as expected, domestic investors rebalance their portfolios towards more foreign assets, the resulting capital outflows from the domestic country to other developed and emerging markets are expected to result in the appreciation of their foreign currencies, increase their asset prices and change asset and currency cross-correlations. Thus, the correlations between bonds or stocks and currency forwards and between foreign currency forwards are different for and between the three QE periods.

Steeley et al. (2015), examine the effects of QE on the volatility of and correlation among stocks, short-term bonds and long-term bonds in the UK. They find that volatility in each of the markets experiences a significant increase during the financial crisis that is reversed during the first phase of QE. The find limited effects of the specific occurrence or intensity of QE activity on either the volatility or correlations for these asset classes, but evidence that volatility persistence experienced temporary shifts. Therefore the find short-term variability in the correlations between the markets during the crisis and QE periods, but cannot discard the hypothesis that correlations were constant throughout the sample period. They do not find such dramatic evidence that QE activity significantly altered the correlation structure between the three asset classes. Indeed, after controlling for the effects of QE on the conditional variances, the conditional correlations display a remarkable stability during the recent past. Therefore, they are unable to conclude that the variability in correlation that occurred during the crisis and QE phases was in excess of sampling variation around a constant long run correlation level between the asset classes. Therefore, the crisis and QE did not change the level of integration within UK capital markets.

According to Lo Duca et al. (2012), a first key result highlights the fundamental difference between QE1 and QE2 of Fed. QE1 measures have been highly effective in lowering long term yields in the US and elsewhere and in supporting equity prices (especially in the US). However, the also triggered a strong global rebalancing of investor portfolios out of EMEs and

into US equity and bond funds, thus also inducing overall appreciation of the US dollar. By contrast, QE2 measures appear to have been largely ineffective in lowering yields worldwide, have caused sizeable capital outflows, mainly into EME equities, and marked US dollar depreciation. This evidence thus suggests the presence of a portfolio balance channel. QE1 measures induced mainly a portfolio rebalancing across countries, while QE2 functioned both through a portfolio rebalancing across asset classes and across countries. In particular the US Treasury purchases under QE2 triggered a large portfolio rebalancing out of bond markets globally, primarily into EME equity markets. While most of the debate has focused on the effects of QE on the US economy, foreign policy makers have been criticizing the Fed's policies, arguing that these have created excessive global liquidity, and thus caused the massive acceleration pressures on EME currencies, a build-up of financial imbalances and asset price bubbles in EMEs, high credit growth and the threat of an over-heating of the domestic economies. As the above quote suggests, some see the unconventional monetary policy measures of advanced economies even as a form of protectionism.

5. *DATA METHODOLOGY AND EMPIRICAL TESTS*

5.1 DATA

Our sample consists Islamic sector equity indices and Conventional sector indices. At first, we have chosen from Islamic sectors basic materials, consumer goods, consumer services, financials, health care, industrial, oil & gas, technology, telecommunications, utilities and world Islamic. Also, we use the same sectors for conventional indices. In the charts, presented in Empirical Results, we can see how the sector returns move over the course of the year.

- **Basic Materials**: The basic materials sector is a category of stocks for companies involved in the discovery, development and processing of raw materials. The sector includes companies engaged in mining and metal refining, chemical products and forestry products. The basic materials sector is subject to the law of supply and demand, in the same way as consumer goods are. In fact, there are closely interrelated. If the demand for consumer goods drops, the demand for the raw materials involved in the production of those goods also drops.
- **Consumer Goods**: The consumer goods sector is a category of stocks and companies that relate to items purchased by individuals and households rather than by manufacturers and industries. These companies make and sell products that are intended for direct use by the buyers for their own use and enjoyment. This sector includes companies involved with food production, packaged goods, clothing, beverages, automobiles and electronics.

- **Consumer Services**: The range of services provided to consumers of a product by the company that produces markets, or supports the product. Consumer services may include technical support, warranty registration, problem notifications, account management, mediation with other vendors, or other service depending on the nature of the product purchased by the customer.
- **Financial sector:** The Financial sector is a section of the economy made up of firms and institutions that provide financial services to commercial and retail customers. This sector comprises a broad range of industries including banks, investment companies, insurance companies, and real estate firms. A large portion of this sector generates revenue from mortgages and loans, which gain value as interest rates drop. The health of the economy depends in large part to the strength of its financial sector. The stronger it is, the healthier the economy. A weak financial sector typically means the economy is weakening.
- **Health Care sector:** The healthcare sector consists of businesses that provide medical services, manufacture medical equipment or drugs provide medical insurance or otherwise facilitate the provision of healthcare to patients. This sector is one of the largest and most complex in the U.S. economy, accounting for close to a fifth of overall gross domestic product (GDP). The U.S. healthcare sector benefits from a strong system of a medical research and development in cooperation with the higher education system and the technology industry.
- **Industrial sector:** The industrial goods sector is a category of stocks of companies who produce capital goods used in construction and manufacturing. Businesses in the industrial goods sector make and sell machinery, equipment and supplies that are used to produce other goods rather than sold directly to consumers. The industrial goods sector includes companies involved with aerospace and defense, industrial machinery, tools, construction, waste management, manufactured housing and cement and metal fabrication. Performance in the industrial goods, sector is largely driven by supply and demand for building construction in the residential, commercial and industrial real estate segments, as well as the demand for manufactured products.
- **Oil & Gus sector**: The oil & gas sector includes the global processes of exploration, extraction, refining, transporting and marketing of petroleum products. The largest volume products of the industry are fuel oil and petrol.
- **Technology sector:** The technology sector is the category of stocks relating to the research, development and/or distribution of technologically based goods and services. This sector contains businesses revolving around the manufacturing of electronics, creation of software, computers or products and services relating to information technology. The technology sector offers a wide arrange of products and services for both customers and other businesses. Consumer goods like personal computers, mobile devices, wearable technology, home appliances, and televisions and so on are continually being improved and sold to consumers with new features.
- **Telecommunication Sector:** The telecom sector is made up of companies that make communication possible on a global scale, whether it is through the phone or the Internet through airwaves or cables, through wires or wirelessly. These companies, created the infrastructure that allows data in words, voice, audio, or video to be sent anywhere in the world. The largest companies in the sector are

telephone (both wired and wireless), operators, satellite companies, cable companies and internet service providers.

- **Utilities sector:** The utilities sector refers to a category of companies that provide basic amenities, such as water sewage services, electricity, dams and natural gas. Although utilities earn profits, they are part of the public service landscape and are therefore heavily regulated. Investors typically treat utilities as long term holdings and use them to inject steady income in their portfolios. Utilities typically offer investors stable and consistent dividends, coupled with less price volatility relative to the overall equity markets. Because of these facts, utilities tend to perform well during recessionary climates. Contrarily, utility stocks tend to fall out of favor with the market, during times of economic growth.

In this study we investigate the effects of the unconventional monetary policy measures implemented by the ECB on global Conventional and Islamic sectoral equity indices. We document a spillover impact of these measures of the Eurozone on international financial markets and we examine how these correlations differ across countries through the four different programs the ECB implement (i.e. SMP, OMT, CBPP3 and PSPP).

All of the data used are weekly and the time period of the sample that we examine starts in the first week of January 1996 and ends up to the first week of November 2017.

At first tables presents the estimated Garch for Islamic sector indices for 21 years returns, we estimated all of this using the five dummy variables. We estimated and R-squared which we can see if a sector is statistically significant. On the other hand we did the same and for conventional sector indices.

Also, by taking the values of the coefficient R squared, which measures the sum of the variances y, -y for all its observations of the squared sample interpreted on the basis of its independent linear variables in the open space (0,1), values that are valid $0<R<1$. When the value R is close to the 1, means that the predictive capacity of the model is very high. So, as we will see from our results, from the Islamic sector indices, only industrial sector is 87.7%, so this index has the highest correlation between the world Islamic index and industrial index. Furthermore, from the results of Conventional sector indices, we have many sectors with high R squared, we have again the industrial index with 91%, world consumer services with 84%, financial goods with 86%, consumer goods with 76% and basic materials index with 70.7%. For all of this sectors, as we can see from their probability, they are statistical significant because they are less than 1%.

Estimating the GARCH model and the conditional variance equation, we will test if there is impact between the two pairs of Conditional and Islamic sector indices. To conclude if such an event occurs, we will apply several different tests, regarding the five dummies and the control variables.

The generalized autoregressive conditional heteroskedasticity (GARCH) process is an econometric term developed in 1982 by Robert F. Engle. There are several forms of GARCH modeling. The GARCH process is offer preferred by financial modeling professionals because it provides a more real world context than other forms trying to predict the prices and rates of financial instruments.

Heteroskedasticity describes the irregular pattern of variation of an error term, or variable, in a statistical model. Essentially, where there is heteroskedasticity observation to not conform to a linear pattern. The result is that the conclusions and predictive value one can draw from the model will not be reliable. GARCH is a statistical model that can be used to analyze a number of different types of financial data.

GARCH (p, q) model specification:

The log length p of a GARCH (p, q) process is established in three steps:

1. Estimate the best fitting AR(q) model:

   $$y_t = a_0 + a_1 y_{t-1} + ... + a_q y_{t-q} + \varepsilon_t$$

2. Compute and plot the autocorrelations of $\hat{\varepsilon}^2$ by

   $$p = \frac{\sum_{t=i+1}^{T} (\hat{\varepsilon}_t^2 - \hat{\sigma}_t^2)(\hat{\varepsilon}_{t-1}^2 - \hat{\sigma}_{t-1}^2)}{\sum_{t=1}^{T} (\hat{\varepsilon}_t^2 - \hat{\sigma}_t^2)^2}$$

3. The asymptotic, that is for large samples, standard deviation of p(i) is $1/\sqrt{T}$. Individual values that are larger than this indicate GARCH errors. To estimate the total numbers of lags use the Ljung - Box test until the values of these are less than, say, 10% significant. The Ljung – Box Q-Statistic follows $\hat{X}^2$ distribution with n degrees of freedom if the squared residuals $\hat{\varepsilon}^2$ are uncorrelated. It is recommended to consider up to T/4 values of n. The null hypothesis states that there are no ARCH or GARCH errors. Rejecting the null thus means that such errors exist in the conditional variance.

In general, under the null hypothesis, the coefficients level of the variables is zero and negative across stable periods, indicating the absence of impact quantitative easing. Alternatively, a statistical significant coefficients level bigger than zero across the periods implies the spread of the crisis from a global financial Conditional to the examined Islamic. Specifically, the null hypothesis (H0) is tested against the one-sided alternative (H1) that the function conditional correlations are greater at the 10%, 5% and 1% significance levels.

5.2 METHODOLOGY GARCH

We examine the impact of each program, on the correlation between index stock and currency forward for each sector. We are using the GARCH (1,1) with the largest negative Likelihood Ratio (LR), with the parameters a and b subsequently are less than 1. Eagle and Sheppard (2001) and Eagle (2002) propose the use of the GARCH (1,1) for estimating dynamic correlations while directly considering heteroscedasticity. The GARCH model directly accounts for heteroscedasticity and has no volatility bias by estimating the correlation coefficients of the standardized residuals (Chiang et al. 2007).

The generalized autoregressive conditional heteroskedasticity (GARCH) process is an econometric term developed in 1982 by Robert F. Eagle, an economist and 2003 winner of the Nobel Memorial Prize for Economics, to describe an approach to estimate volatility in financial markets. These are several forms of GARCH modeling. The GARCH process is often preferred by financial modeling professionals because it provides a more real-world context than other forms when trying to predict the prices and rates of financial instruments.

Heteroskedasticity describes the irregular pattern of variation of an error term, or variable, in a statistical model. Essentially, where there is heteroskedasticity, observations do not conform to a linear pattern. Instead they tend to cluster. The result is that the conclusions and predictive value one can draw from the model will not be reliable. GARCH is a statistical model that can be used to analyze a number of different types of financial data, for instance, macroeconomic data. Financial institutions typically use this model to estimate the volatility of returns for stocks, bonds and market indices. They use the resulting information to help determine pricing and judge which assets will potentially provide higher returns, as well as to forecast the returns of current investments to help in their asset allocation, hedging, risk management and portfolio optimization decisions.

The general process for a GARCH model involves three steps. The first is to estimate a best-fitting autoregressive model. The second is to compute autocorrelations of the error term. The third step is to test for significance. Two other widely used approaches to estimating and predicting financial volatility are the classic historical volatility method and the exponentially weighted moving average volatility method.

Autoregressive terms comprising up to five lags of past returns in each market are included to control for coefficient bias or inefficiencies arising from any autocorrelation or cross autocorrelation in the returns. As first observed by Fisher (1996), index returns will be

characterized by autocorrelation where the component asset returns respond with different speed to new information. The regularity of both conventional and unconventional monetary policy activity suggests that including dummy variables to account for this is also desirable. Specifically, announcements of changes to UK monetary policy are made at the conclusion of the monthly meeting of the MPC, which is invariably on a Thursday. The reverse auctions that were used by the bank of England for the purpose of buying bonds during the phases of QE were also clustered on particular weekdays.

The variance Equation includes five dummy variables designed to capture the financial crisis in many economies, and each of the five phases of QE. While these dummy variables account for the effects of the broad phases of QE and the pre-QE crisis period, they do not directly measure the local impact on variability of QE activity.

Our methodology follows the Conventional and Islamic sector indices which are treated as a sample of pairs (i, j) in order to quantify the impact of QE announcements on the volatility of each equity sectors. We create five dummy variables, which are equal to unity for 1 to the QE announcements of each central bank (zero otherwise).

We regress each equity sector indices volatility, as represented by the following equation, in order to identify any direct or indirect effects of QE announcements on volatility dynamics:

$$h_{i,t} = \delta_0 + \delta_1 h_{i,t-1} + \delta_2 h_{j,t-1} + \delta_3 dummy_{i,t-1} h_{j,t-1} + ... + \delta_7 dummy_{i,t} + k_t$$

Where $\hat{h}_{i,t}$ is the estimated conditional variance of each sector derived from the APARCH (1,1) model. For each of the eleven sectors, dummy corresponds to QE announcements by the central bank of sector j. The dummy coefficients capture the (indirect) impact on volatility transmission from conventional sector j to Islamic sector i around the QE announcements by the central bank of sectors i and j, respectively. The dummy coefficients capture the direct effect of QE announcements by the central bank of sector i and j, respectively, on the volatility of sector i.

As indicator of Islamic equity price in US, S&P 500 Shariah index (IS), in EU, S&P Europe 350 Shariah (SPEUI), in the case of Asia, S&P Pan Asia Shariah (1) (SPPASI) and S&P Pan Arab Shariah (2) (SPARBI) indices for selected Arab countries have been used. Moreover, S&P Pan Arab Shariah index used as proxy of Islamic equity price of each Islamic country, such as Bahrain (BHSSI) Kuwait (KUSSI) Jordan (JORSSI), Lebanon (LEBSSI), Oman (OMSSI), Qatar (QASSI), Saudi Arabia (SASSI), Tunis (TUNSSI) and UAE (UAESSI), and for Malaysia, FTSE Bursa Malaysia Shariah price index has been applied as indicators of Islamic equity.

Our empirical analysis concentrates on whether the correlations between bonds and correlations of currency forwards among all of the sectors are affected during the implementation periods of the major four unconventional monetary policy programs of the FED after the financial crisis, and if there is a significant spillover to emerging markets.

6. EMPIRICAL RESULTS

According to the empirical results in tables, we will present the results as clearly as possible can be. It seems that there is an impact on correlations of the sector indices during the periods where ECB implemented under the framework of non-standard monetary policy measures. We estimate the GARCH model to derive the time-varying conditional correlations among Islamic and conditional sectors and dummy variables, particularly. Extracting the results, as a third stage we estimate an OLS regression using the five dummy variables and the results from the GARCH model.

In the next diagrams, we can see the returns of each sector, Islamic and Conventional respectively.

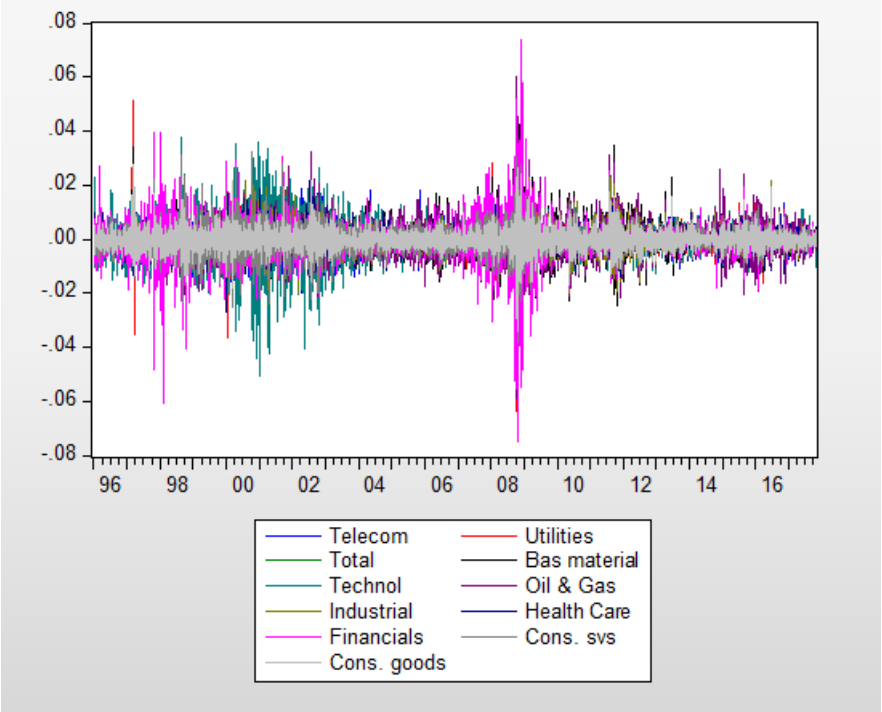

Figure 1. Islamic sector returns 1

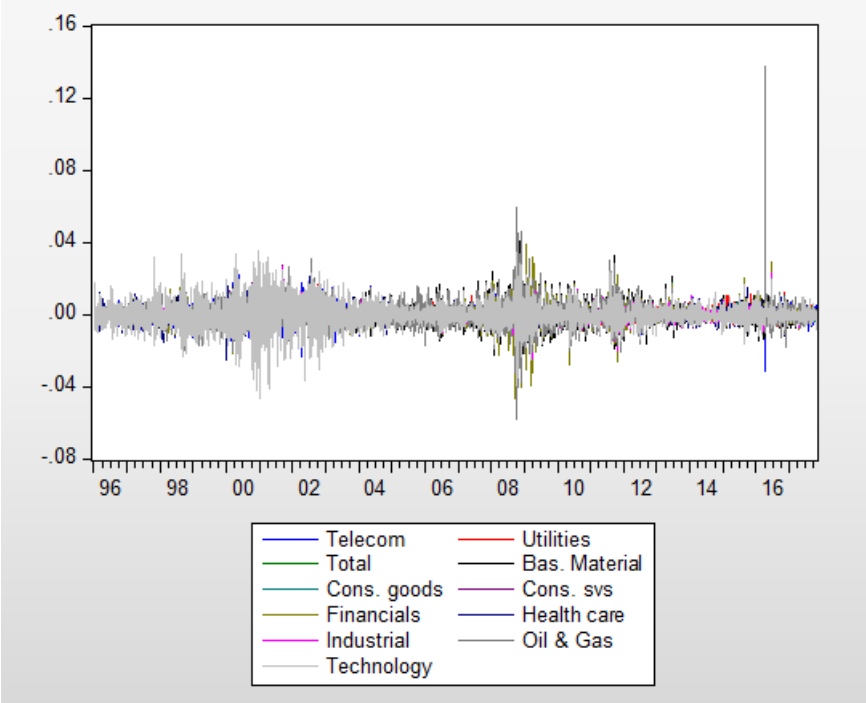

Figure 2. Conventional sector returns 1

We can observe from the graphs that as regard the Conventional sector have more effect across the periods as the correlation is up to zero. The conventional returns graphs depict that all of them, are influenced by the Federal Reserve, which is a sign of quantitative easing.

Convent.	Tchn	Oil	Ind	HCare	Fnc	CSvs	CGds	BMat	Utl	Tel
RESID(-1)^2	0.047	0.15	0.05	0.067	0.15	0.054	0.06	0.15	0.15	0.056
GARCH(-1)	0.949	0.6	0.937	0.927	0.6	0.942	0.929	0.6	0.6	0.94
R^2	0.621	0.483	0.916	0.582	0.861	0.847	0.763	0.7	0.595	0.64
Durbin-Watson	1.895	1.815	1.991	1.695	1.703	1.869	1.992	1.668	1.763	1.752
Akaike	-8.78	-7.96	-10.8	-9.41	-9.63	-10.3	-10.3	-8.76	-9.23	-9.33
Schwarz	-8.77	-7.95	-10.7	-9.40	-9.62	-10.3	-10.3	-8.75	-9.22	-9.31
Mean	0.0064	0.0058	0.004	0.003	0.005	0.004	0.003	0.005	0.003	0.004
Variance	0.003	0.031	0.003	0.003	0.018	0.004	0.004	0.002	0.023	0.003

Table 1. Estimation Results Conventional 1

Islamic	Tchn	Oil	Ind	HCare	Fnc	CSvs	CGds	BMat	Utl	Tel
RESID(-1)^2	0.047	0.055	0.08	0.076	0.073	0.054	0.15	0.085	0.068	0.045
GARCH(-1)	0.949	0.944	0.917	0.917	0.925	0.942	0.6	0.91	0.928	0.947
R^2	0.704	0.528	0.844	0.569	0.279	0.66	0.623	0.6	0.374	0.549
Durbin-Watson	1.939	1.778	2.021	1.654	2.209	1.909	1.883	1.745	1.993	1.969
Akaike	-8.88	-8.56	-10.1	-9.38	-8.28	-9.37	-9.33	-8.79	-8.73	-8.87
Schwarz	-8.87	-8.55	-10.1	-9.37	-8.27	-9.36	-9.31	-8.78	-8.72	-8.86
Mean	0.008	0.006	0.005	0.004	0.007	0.004	0.003	0.005	0.004	0.004
Variance	0.003	0.003	0.003	0.004	0.005	0.003	0.0176	0.003	0.004	0.0028

Table 2. Estimation Results Islamic 1

In the two tables we have the estimation results of Conventional and Islamic sector indices respectively. Where, **Tchn** is **Technology sector**, **Oil** is **Oil & Gas**, **Ind** is **Industrial**, **HCare** is **Health Care**, **Fnc** is **Financials**, **CSvs** is **Consumer Services**, **CGds** is **Consumer Goods**, **BMat** is **Basic Material**, **Utl** is **Utilities** and **Tel** is **Telecommunication**.

The Figures 1 and 2 shows the extracted results from the OLS equation, indicating the correlation among the Conventional and Islamic sector indices. The results show that the global sector can influence every sector and index for all time periods that we have our data. Also as we can see, the dummy variables affect more the Conventional sectors and less the Islamic sector indices.

The results extracted by the two figures, also there are similarities between Conventional and Islamic on Akaike Criteria and Schwarz Criteria, but if we will see the estimated R squared only conventional sectors are statistically significant, therefore there are more affected on quantitative easing.

Regarding the sectors, for Islamic sector indices, only for industrial sector and technology, the results show that a positive and significant correlation suggesting a quantitative easing impact. On the other hand, for conventional sectors, basic materials, consumer goods,

consumer services and industrial show that the positive and significant correlation has more affects.

Also, Technology and Industrial affects the correlation with the Global Finance with the dummy variables each time. As well, from the results of the estimated GARCH again we have better results on conventional sector indices.

The overall pattern of the impacts on quantitative easing based on the figures depicts that the most affected sectors from the control variables are Deals & Services Exchanges, Financial Services, and Financials. The least affected are Oil and Gas, Technology, Telecommunication and Utilities.

Also, in the next tables we can see the results of our estimation with dummy variables. At first we will see Conventional sector indices for each equity sector,

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y10_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:08
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 39 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.19E-06	2.63E-05	0.159371	0.8734
Y1_CONV_WORLD	0.827495	0.005903	140.1784	0.0000
D1_D1	-0.000201	0.001025	-0.195774	0.8448
D2_D2	0.000172	0.000659	0.260713	0.7943
D3_D3	-0.000732	0.001332	-0.549769	0.5825
D4_D4	0.000397	0.000781	0.508992	0.6108
D5_D5	-0.001326	0.000808	-1.641898	0.1006
Variance Equation				
C	3.26E-08	5.01E-09	6.517407	0.0000
RESID(-1)^2	0.056265	0.003635	15.47804	0.0000
GARCH(-1)	0.940352	0.003204	293.5192	0.0000

R-squared	0.640179	Mean dependent var	-9.60E-05
Adjusted R-squared	0.639800	S.D. dependent var	0.004480
S.E. of regression	0.002689	Akaike info criterion	-9.330496
Sum squared resid	0.041154	Schwarz criterion	-9.318830
Log likelihood	26597.25	Hannan-Quinn criter.	-9.326434
Durbin-Watson stat	1.752949		

Table 3 Conventional Telecommunication

Dependent Variable: Y3_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 21:58
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 49 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.70E-05	1.59E-05	-2.957664	0.0031
Y1_CONV_WORLD	0.786254	0.004197	187.3294	0.0000
D1_D1	-0.000350	0.000875	-0.400074	0.6891
D2_D2	-0.000205	0.000364	-0.565099	0.5720
D3_D3	-0.000386	0.001131	-0.341520	0.7327
D4_D4	0.001940	0.000471	4.117966	0.0000
D5_D5	-0.000857	0.001058	-0.810606	0.4176
Variance Equation				
C	1.91E-08	2.70E-09	7.066671	0.0000
RESID(-1)^2	0.063197	0.004432	14.25790	0.0000
GARCH(-1)	0.929096	0.004739	196.0545	0.0000

R-squared	0.763558	Mean dependent var	-0.000132
Adjusted R-squared	0.763309	S.D. dependent var	0.003365
S.E. of regression	0.001637	Akaike info criterion	-10.35740
Sum squared resid	0.015258	Schwarz criterion	-10.34573
Log likelihood	29523.41	Hannan-Quinn criter.	-10.35334
Durbin-Watson stat	1.992142		

Table 4 Conventional Consumer Goods

Dependent Variable: Y4_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:01
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 35 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.91E-05	1.60E-05	-1.193994	0.2325
Y1_CONV_WORLD	0.899810	0.004375	205.6525	0.0000
D1_D1	0.000223	0.001115	0.200322	0.8412
D2_D2	0.000571	0.000269	2.119758	0.0340
D3_D3	1.84E-05	0.001297	0.014216	0.9887
D4_D4	-9.57E-05	0.001439	-0.066507	0.9470
D5_D5	0.000330	0.000864	0.382283	0.7023
Variance Equation				
C	1.09E-08	2.55E-09	4.269003	0.0000
RESID(-1)^2	0.054113	0.003817	14.17813	0.0000
GARCH(-1)	0.941834	0.004355	216.2424	0.0000

R-squared	0.847011	Mean dependent var	-0.000127
Adjusted R-squared	0.846850	S.D. dependent var	0.004104
S.E. of regression	0.001606	Akaike info criterion	-10.37237
Sum squared resid	0.014683	Schwarz criterion	-10.36071
Log likelihood	29566.08	Hannan-Quinn criter.	-10.36831
Durbin-Watson stat	1.869232		

Table 5 Conventional Consumer Services

Dependent Variable: Y5_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:02
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Failure to improve likelihood (non-zero gradients) after 0 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.01E-05	5.99E-05	0.669758	0.5030
Y1_CONV_WORLD	1.149576	0.009331	123.2014	0.0000
D1_D1	0.001042	0.002017	0.516470	0.6055
D2_D2	-0.000216	0.001966	-0.110112	0.9123
D3_D3	-8.33E-05	0.005189	-0.016045	0.9872
D4_D4	-8.99E-05	0.002569	-0.034992	0.9721
D5_D5	-0.000376	0.002820	-0.133511	0.8938
Variance Equation				
C	2.38E-06	2.12E-07	11.21821	0.0000
RESID(-1)^2	0.150000	0.018806	7.976028	0.0000
GARCH(-1)	0.600000	0.031463	19.06994	0.0000

R-squared	0.860729	Mean dependent var	-9.13E-05
Adjusted R-squared	0.860582	S.D. dependent var	0.005126
S.E. of regression	0.001914	Akaike info criterion	-9.633994
Sum squared resid	0.020848	Schwarz criterion	-9.622329
Log likelihood	27462.07	Hannan-Quinn criter.	-9.629933
Durbin-Watson stat	1.703101		

Table 6 Convenional Financials

Dependent Variable: Y8_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:06
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Failure to improve likelihood (non-zero gradients) after 0 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.08E-05	0.000129	-0.084143	0.9329
Y1_CONV_WORLD	0.990190	0.022574	43.86453	0.0000
D1_D1	-0.001353	0.002992	-0.452112	0.6512
D2_D2	0.000586	0.003390	0.172859	0.8628
D3_D3	0.000379	0.010535	0.035962	0.9713
D4_D4	-0.000411	0.023729	-0.017299	0.9862
D5_D5	0.000494	0.010284	0.048075	0.9617
Variance Equation				
C	1.17E-05	2.16E-06	5.405536	0.0000
RESID(-1)^2	0.150000	0.030570	4.906755	0.0000
GARCH(-1)	0.600000	0.070873	8.465892	0.0000

R-squared	0.482676	Mean dependent var	-0.000126
Adjusted R-squared	0.482131	S.D. dependent var	0.005898
S.E. of regression	0.004244	Akaike info criterion	-7.963768
Sum squared resid	0.102529	Schwarz criterion	-7.952102
Log likelihood	22702.76	Hannan-Quinn criter.	-7.959706
Durbin-Watson stat	1.815610		

Table 7 Conventional oil & gas

Dependent Variable: Y6_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:03
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 33 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.37E-05	2.49E-05	-2.560965	0.0104
Y1_CONV_WORLD	0.760552	0.006248	121.7273	0.0000
D1_D1	0.000523	0.001127	0.464128	0.6426
D2_D2	-1.17E-05	0.000452	-0.025939	0.9793
D3_D3	0.000833	0.000846	0.984147	0.3250
D4_D4	-0.000434	0.000650	-0.666945	0.5048
D5_D5	0.001620	0.000646	2.508155	0.0121
Variance Equation				
C	4.25E-08	6.49E-09	6.545855	0.0000
RESID(-1)^2	0.067594	0.003873	17.45443	0.0000
GARCH(-1)	0.927392	0.003836	241.7772	0.0000

R-squared	0.582036	Mean dependent var	-0.000154
Adjusted R-squared	0.581595	S.D. dependent var	0.003980
S.E. of regression	0.002575	Akaike info criterion	-9.414015
Sum squared resid	0.037731	Schwarz criterion	-9.402350
Log likelihood	26835.24	Hannan-Quinn criter.	-9.409954
Durbin-Watson stat	1.695856		

Table 8 Conventional Health Care 1

Dependent Variable: Y7_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:04
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 37 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.85E-06	1.27E-05	-0.539074	0.5898
Y1_CONV_WORLD	1.021188	0.003429	297.8344	0.0000
D1_D1	-0.000190	0.000611	-0.310439	0.7562
D2_D2	0.000125	0.000508	0.245233	0.8063
D3_D3	1.65E-05	0.000447	0.036935	0.9705
D4_D4	-0.000378	0.000793	-0.476718	0.6336
D5_D5	-0.000420	0.000523	-0.803206	0.4219
Variance Equation				
C	7.85E-09	1.64E-09	4.775280	0.0000
RESID(-1)^2	0.058252	0.003285	17.73243	0.0000
GARCH(-1)	0.937803	0.003576	262.2537	0.0000

R-squared	0.916983	Mean dependent var	-0.000114
Adjusted R-squared	0.916895	S.D. dependent var	0.004386
S.E. of regression	0.001264	Akaike info criterion	-10.80692
Sum squared resid	0.009101	Schwarz criterion	-10.79526
Log likelihood	30804.32	Hannan-Quinn criter.	-10.80286
Durbin-Watson stat	1.991059		

Table 9 Conventional Industrial

Dependent Variable: Y9_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:07
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 50 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-5.31E-05	3.14E-05	-1.692106	0.0906
Y1_CONV_WORLD	1.054859	0.008627	122.2678	0.0000
D1_D1	-0.000226	0.001450	-0.155751	0.8762
D2_D2	-3.57E-05	0.000427	-0.083626	0.9334
D3_D3	0.000395	0.001954	0.202300	0.8397
D4_D4	-0.000481	0.000597	-0.805124	0.4207
D5_D5	4.41E-05	0.001736	0.025422	0.9797
Variance Equation				
C	3.45E-08	6.06E-09	5.703224	0.0000
RESID(-1)^2	0.047901	0.003555	13.47248	0.0000
GARCH(-1)	0.949078	0.003661	259.2528	0.0000

R-squared	0.621326	Mean dependent var	-0.000146
Adjusted R-squared	0.620927	S.D. dependent var	0.006427
S.E. of regression	0.003957	Akaike info criterion	-8.788808
Sum squared resid	0.089135	Schwarz criterion	-8.777142
Log likelihood	25053.71	Hannan-Quinn criter.	-8.784746
Durbin-Watson stat	1.894959		

Table 10 Conventional Technology

Dependent Variable: Y11_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 22:09
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Failure to improve likelihood (non-zero gradients) after 0 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.07E-05	6.45E-05	-0.476313	0.6339
Y1_CONV_WORLD	0.661890	0.011462	57.74564	0.0000
D1_D1	-0.000631	0.001009	-0.625784	0.5315
D2_D2	0.000251	0.001867	0.134569	0.8930
D3_D3	0.000424	0.003482	0.121713	0.9031
D4_D4	0.000872	0.001608	0.542176	0.5877
D5_D5	-0.001456	0.002911	-0.500281	0.6169
Variance Equation				
C	3.32E-06	6.17E-07	5.382293	0.0000
RESID(-1)^2	0.150000	0.023766	6.311426	0.0000
GARCH(-1)	0.600000	0.065646	9.139935	0.0000

R-squared	0.595043	Mean dependent var	-0.000108
Adjusted R-squared	0.594616	S.D. dependent var	0.003551
S.E. of regression	0.002261	Akaike info criterion	-9.236987
Sum squared resid	0.029100	Schwarz criterion	-9.225322
Log likelihood	26330.80	Hannan-Quinn criter.	-9.232926
Durbin-Watson stat	1.763967		

Table 11 Conventional Utilities

Dependent Variable: Y2_CONV
Method: ML - ARCH
Date: 09/09/19 Time: 21:57
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Failure to improve likelihood (non-zero gradients) after 0 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.26E-05	8.21E-05	0.275736	0.7828
Y1_CONV_WORLD	1.076737	0.014889	72.31575	0.0000
D1_D1	-0.002573	0.000944	-2.726995	0.0064
D2_D2	-0.000122	0.001854	-0.065643	0.9477
D3_D3	-0.000776	0.023868	-0.032503	0.9741
D4_D4	0.001183	0.002225	0.531633	0.5950
D5_D5	0.000655	0.002401	0.272641	0.7851
Variance Equation				
C	5.35E-06	7.92E-07	6.753106	0.0000
RESID(-1)^2	0.150000	0.029035	5.166231	0.0000
GARCH(-1)	0.600000	0.056661	10.58924	0.0000

R-squared	0.707239	Mean dependent var	-0.000105
Adjusted R-squared	0.706930	S.D. dependent var	0.005301
S.E. of regression	0.002869	Akaike info criterion	-8.766083
Sum squared resid	0.046867	Schwarz criterion	-8.754418
Log likelihood	24988.95	Hannan-Quinn criter.	-8.762021
Durbin-Watson stat	1.668988		

Table 12 Conventional Basic Materials

Now, we can see the estimation of Islamic equity indices for each sector respectively,

Dependent Variable: Y10_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:50
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 38 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.29E-05	3.41E-05	0.671475	0.5019
Y1_ISL_WORLD	0.754760	0.008417	89.67224	0.0000
D1_D1	-0.000666	0.002039	-0.326386	0.7441
D2_D2	-7.79E-06	0.001037	-0.007511	0.9940
D3_D3	-0.000185	0.000985	-0.187773	0.8511
D4_D4	0.001597	0.001843	0.866382	0.3863
D5_D5	-0.002340	0.000513	-4.557490	0.0000
Variance Equation				
C	6.98E-08	1.12E-08	6.243007	0.0000
RESID(-1)^2	0.045515	0.002822	16.12788	0.0000
GARCH(-1)	0.947790	0.003350	282.9281	0.0000

R-squared	0.549738	Mean dependent var	-0.000108
Adjusted R-squared	0.549264	S.D. dependent var	0.004767
S.E. of regression	0.003200	Akaike info criterion	-8.873212
Sum squared resid	0.058301	Schwarz criterion	-8.861547
Log likelihood	25294.22	Hannan-Quinn criter.	-8.869151
Durbin-Watson stat	1.969610		

Table 13 Islamic Telecommunication

Dependent Variable: Y11_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:51
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 49 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-5.07E-05	3.44E-05	-1.475034	0.1402
Y1_ISL_WORLD	0.636113	0.009302	68.38697	0.0000
D1_D1	-0.000908	0.001787	-0.507913	0.6115
D2_D2	-0.000164	0.000908	-0.180732	0.8566
D3_D3	0.001585	0.001065	1.488684	0.1366
D4_D4	0.002159	0.001310	1.648109	0.0993
D5_D5	-0.001856	0.000893	-2.077147	0.0378
Variance Equation				
C	9.18E-08	1.31E-08	6.992578	0.0000
RESID(-1)^2	0.068489	0.004040	16.95447	0.0000
GARCH(-1)	0.928604	0.004054	229.0593	0.0000

R-squared	0.374327	Mean dependent var	-8.74E-05
Adjusted R-squared	0.373667	S.D. dependent var	0.004596
S.E. of regression	0.003638	Akaike info criterion	-8.736909
Sum squared resid	0.075314	Schwarz criterion	-8.725244
Log likelihood	24905.82	Hannan-Quinn criter.	-8.732848
Durbin-Watson stat	1.993683		

Table 14 Islamic Utilities

Dependent Variable: Y4_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:34
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 31 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.66E-05	2.50E-05	-1.466697	0.1425
Y1_ISL_WORLD	0.872070	0.006843	127.4340	0.0000
D1_D1	0.001654	0.000763	2.167761	0.0302
D2_D2	0.000545	0.000510	1.068994	0.2851
D3_D3	-0.000284	0.003480	-0.081743	0.9349
D4_D4	-7.06E-05	0.001319	-0.053556	0.9573
D5_D5	0.000529	0.001538	0.343760	0.7310
Variance Equation				
C	2.81E-08	5.22E-09	5.377837	0.0000
RESID(-1)^2	0.054387	0.003480	15.62846	0.0000
GARCH(-1)	0.942292	0.003794	248.3377	0.0000

R-squared	0.666462	Mean dependent var	-0.000163
Adjusted R-squared	0.666110	S.D. dependent var	0.004613
S.E. of regression	0.002666	Akaike info criterion	-9.377832
Sum squared resid	0.040449	Schwarz criterion	-9.366167
Log likelihood	26732.13	Hannan-Quinn criter.	-9.373771
Durbin-Watson stat	1.909988		

Table 15 Islamic Consumer Services

Dependent Variable: Y3_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:32
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Failure to improve likelihood (non-zero gradients) after 0 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.44E-05	6.25E-05	-0.710602	0.4773
Y1_ISL_WORLD	0.644985	0.011131	57.94232	0.0000
D1_D1	0.000418	0.001175	0.355331	0.7223
D2_D2	0.000446	0.001914	0.233283	0.8155
D3_D3	0.000237	0.004061	0.058296	0.9535
D4_D4	0.002233	0.001738	1.285114	0.1988
D5_D5	-0.000869	0.003735	-0.232559	0.8161
Variance Equation				
C	3.08E-06	3.22E-07	9.575218	0.0000
RESID(-1)^2	0.150000	0.017632	8.507087	0.0000
GARCH(-1)	0.600000	0.038168	15.71986	0.0000

R-squared	0.623078	Mean dependent var	-0.000129
Adjusted R-squared	0.622681	S.D. dependent var	0.003547
S.E. of regression	0.002179	Akaike info criterion	-9.330642
Sum squared resid	0.027024	Schwarz criterion	-9.318977
Log likelihood	26597.66	Hannan-Quinn criter.	-9.326581
Durbin-Watson stat	1.883123		

Table 16 Islamic Consumer Goods

Dependent Variable: Y2_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:30
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 47 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	5.38E-05	3.27E-05	1.643971	0.1002
Y1_ISL_WORLD	1.045418	0.009054	115.4699	0.0000
D1_D1	-0.002101	0.000925	-2.272223	0.0231
D2_D2	-0.000464	0.000634	-0.732352	0.4640
D3_D3	-0.000959	0.004564	-0.210096	0.8336
D4_D4	0.001989	0.000793	2.508592	0.0121
D5_D5	-0.000518	0.000700	-0.739104	0.4598
Variance Equation				
C	1.01E-07	1.64E-08	6.173806	0.0000
RESID(-1)^2	0.085956	0.003963	21.69035	0.0000
GARCH(-1)	0.908709	0.004444	204.4732	0.0000

R-squared	0.600376	Mean dependent var	-0.000124
Adjusted R-squared	0.599955	S.D. dependent var	0.005556
S.E. of regression	0.003514	Akaike info criterion	-8.793599
Sum squared resid	0.070290	Schwarz criterion	-8.781934
Log likelihood	25067.36	Hannan-Quinn criter.	-8.789538
Durbin-Watson stat	1.745405		

Table 17 Islamic Basic Material

Dependent Variable: Y5_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:35
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 52 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.000110	3.79E-05	-2.895379	0.0038
Y1_ISL_WORLD	0.732837	0.007531	97.30409	0.0000
D1_D1	-0.001015	0.002692	-0.377019	0.7062
D2_D2	-0.000597	0.001168	-0.511130	0.6093
D3_D3	0.000105	0.002587	0.040435	0.9677
D4_D4	-0.006108	0.000213	-28.63510	0.0000
D5_D5	3.32E-05	0.002903	0.011443	0.9909
Variance Equation				
C	6.78E-08	8.43E-09	8.043065	0.0000
RESID(-1)^2	0.073474	0.004349	16.89282	0.0000
GARCH(-1)	0.925800	0.004054	228.3570	0.0000

R-squared	0.279981	Mean dependent var	-0.000104
Adjusted R-squared	0.279222	S.D. dependent var	0.006700
S.E. of regression	0.005688	Akaike info criterion	-8.281875
Sum squared resid	0.184176	Schwarz criterion	-8.270209
Log likelihood	23609.20	Hannan-Quinn criter.	-8.277813
Durbin-Watson stat	2.209982		

Table 18 Islamic Financial

Dependent Variable: Y7_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:43
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 57 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.11E-05	1.77E-05	-0.626045	0.5313
Y1_ISL_WORLD	1.006752	0.004310	233.5669	0.0000
D1_D1	-4.80E-05	0.000504	-0.095251	0.9241
D2_D2	-9.61E-05	0.000411	-0.234012	0.8150
D3_D3	-0.000158	0.000470	-0.336835	0.7362
D4_D4	-0.000444	0.000700	-0.634010	0.5261
D5_D5	-0.000492	0.002779	-0.177096	0.8594
Variance Equation				
C	2.10E-08	3.44E-09	6.096519	0.0000
RESID(-1)^2	0.080394	0.003963	20.28819	0.0000
GARCH(-1)	0.917868	0.004533	202.4796	0.0000

R-squared	0.844820	Mean dependent var	-0.000131
Adjusted R-squared	0.844656	S.D. dependent var	0.004640
S.E. of regression	0.001829	Akaike info criterion	-10.09495
Sum squared resid	0.019039	Schwarz criterion	-10.08328
Log likelihood	28775.55	Hannan-Quinn criter.	-10.09089
Durbin-Watson stat	2.021115		

Table 19 Islamic Industrial

Dependent Variable: Y6_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:41
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 38 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.19E-05	2.52E-05	-1.663276	0.0963
Y1_ISL_WORLD	0.765344	0.005576	137.2553	0.0000
D1_D1	0.000682	0.000967	0.705518	0.4805
D2_D2	-0.000192	0.000395	-0.486670	0.6265
D3_D3	0.000646	0.001107	0.583332	0.5597
D4_D4	-0.000185	0.000545	-0.339877	0.7339
D5_D5	0.001105	0.001202	0.919607	0.3578
Variance Equation				
C	5.22E-08	7.52E-09	6.942716	0.0000
RESID(-1)^2	0.076780	0.004639	16.55117	0.0000
GARCH(-1)	0.917965	0.004716	194.6491	0.0000

R-squared	0.569311	Mean dependent var	-0.000153
Adjusted R-squared	0.568857	S.D. dependent var	0.004094
S.E. of regression	0.002688	Akaike info criterion	-9.387025
Sum squared resid	0.041122	Schwarz criterion	-9.375360
Log likelihood	26758.33	Hannan-Quinn criter.	-9.382964
Durbin-Watson stat	1.654189		

Table 20 Islamic Health Care

Dependent Variable: Y9_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:46
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 38 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.41E-05	3.03E-05	-0.795402	0.4264
Y1_ISL_WORLD	1.136840	0.007887	144.1397	0.0000
D1_D1	-0.000284	0.001191	-0.238425	0.8116
D2_D2	-0.000215	0.000412	-0.520778	0.6025
D3_D3	0.000270	0.002142	0.126056	0.8997
D4_D4	-0.000112	0.000404	-0.276395	0.7822
D5_D5	-0.000226	0.002787	-0.081090	0.9354
Variance Equation				
C	2.80E-08	5.18E-09	5.396989	0.0000
RESID(-1)^2	0.047559	0.003345	14.21895	0.0000
GARCH(-1)	0.949938	0.003416	278.0908	0.0000

R-squared	0.704108	Mean dependent var	-0.000150
Adjusted R-squared	0.703796	S.D. dependent var	0.006798
S.E. of regression	0.003700	Akaike info criterion	-8.884152
Sum squared resid	0.077918	Schwarz criterion	-8.872486
Log likelihood	25325.39	Hannan-Quinn criter.	-8.880090
Durbin-Watson stat	1.939224		

Table 21 Islamic Technology

Dependent Variable: Y8_ISL
Method: ML - ARCH
Date: 09/09/19 Time: 21:45
Sample (adjusted): 1/01/1996 11/02/2017
Included observations: 5699 after adjustments
Convergence achieved after 36 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7.65E-05	3.61E-05	2.117068	0.0343
Y1_ISL_WORLD	1.163330	0.008965	129.7700	0.0000
D1_D1	0.000230	0.001054	0.218545	0.8270
D2_D2	-0.000329	0.000448	-0.734190	0.4628
D3_D3	0.000314	0.001499	0.209792	0.8338
D4_D4	-0.001236	0.000937	-1.319601	0.1870
D5_D5	0.002585	0.006841	0.377881	0.7055
Variance Equation				
C	2.53E-08	8.26E-09	3.062238	0.0022
RESID(-1)^2	0.055617	0.003968	14.01701	0.0000
GARCH(-1)	0.944491	0.003772	250.4008	0.0000

R-squared	0.528032	Mean dependent var	-0.000120
Adjusted R-squared	0.527535	S.D. dependent var	0.006036
S.E. of regression	0.004149	Akaike info criterion	-8.565904
Sum squared resid	0.097978	Schwarz criterion	-8.554239
Log likelihood	24418.54	Hannan-Quinn criter.	-8.561843
Durbin-Watson stat	1.778043		

Table 22 Islamic Oil & Gas

7. CONCLUSION

This study has investigated the effects of US unconventional monetary policy innovation on Islamic equity prices. Daily data from 1996 to 2017 have been used to identify quantitative easing shocks. Findings of this paper reinforce and significantly extend the view of other similar studies on spillover effects of US monetary policy shock on asset markets. The papers empirical findings suggest the following conclusions.

Through our investigation, we find out that correlations between Conventional and Islamic sector equity indices across the 11 sectors of our sample and their effects on quantitative easing on international financial assets returns different considerably in each period the ECB implemented specified programs of regime unconventional monetary policy.

The results suggest that among SMP, OMT, CBPP3 and PSPP programs, the program with the most powerful impacts on correlations in CBPP3. Specially, CBPP3 affected notably the correlations of bond and currency. It is proved that there are significant effects to developed and emerging market economies, but it is clear that the correlations of emerging markets have been influenced into a higher extent in total.

The differentiation of cross-country correlations indicates that not only CBPP3 but all the four programs prove that unconventional monetary policy announcements and operations of the European Central Bank can affect foreign asset prices through signaling, portfolio

balance and risk channels. The programs were designed to revive particular dysfunctional segments of the market, to facilitate credit provision, to boost the investment and eventually support the economic growth of the Euro system, and we find that the cost and benefits that the cost and benefits of these unconventional measures and quantitative easing have been unevenly distributed between the advanced and emerging economies and have varied over time. By examining the behavior of dynamic conditional correlations, the transmission mechanisms of the programs worked on changing the asset yields, altering the behavior of private agents, correct their expectations induce investors to search for imperfectly substitutable assets with potentially higher returns, and in turn encourage capital outflows to EMEs. As a result, this situation leads to the depreciation and appreciation of local currencies and thus affecting the conditions of competitiveness between countries around the world and international financial markets.

In global accounts, term spread has been recognized as a negative sign in stock markets, which implies that as this rate decreases, Islamic equity prices fall. However, response of most indices in this result confirms that corporate spread shock is considered a positive signal in Islamic equity markets. So, comparison of Chen et al.'s (2015) results with our findings indicated that corporate spread cut has an identical and positive effect on conventional and Islamic equity prices, especially in the case of USA and EU.

The result indicated that in all sample groups, corporate spread has larger effects on equity prices rather that term spread. Moreover, in some Islamic countries, an effect of term spread is not significant at all. According to Blinder (2012), the purchase of the US Government sovereign compared to the purchase of private assets is considered a weaker tool of monetary policy.

Likewise, results emphasized the imperative role of US monetary policy on Islamic equity prices, especially in those countries such as GCC states that pegged their currency to the US dollar.

It seems the degree effect, size and direction of US unconventional monetary policy shock on developing and developed countries equity prices are related mostly to their monetary and fiscal policy, exchange rate regime and structure of financial market, rather than type of equity such as Islamic or conventional.

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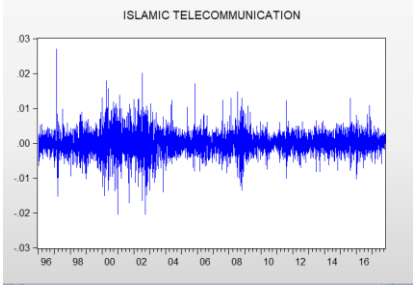
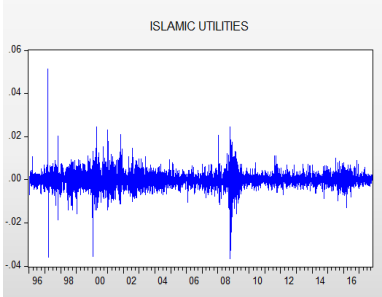
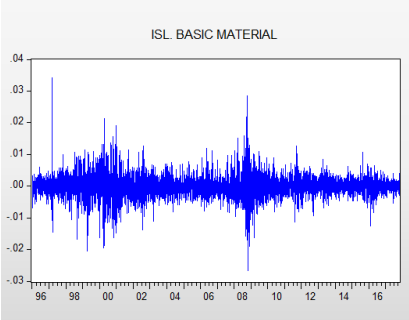
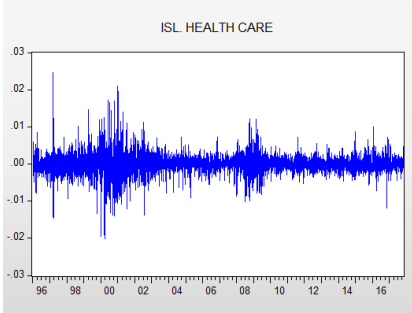
APPENDIX

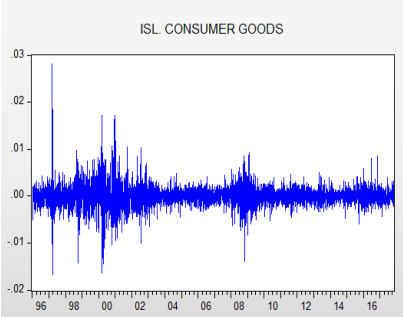
(Graphs for returns of each Islamic Sector Indices)

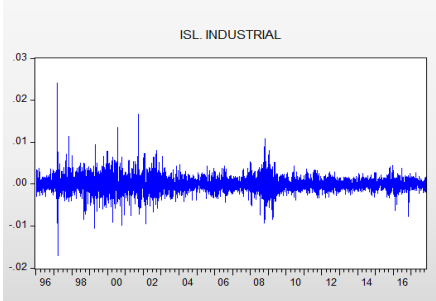


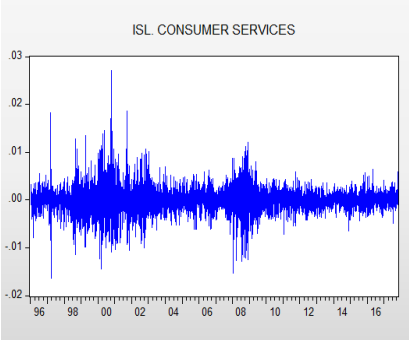


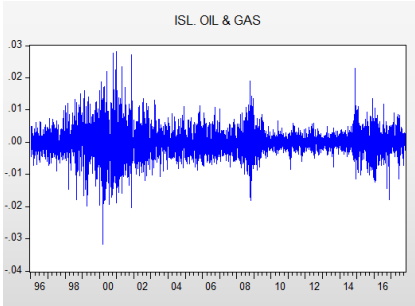


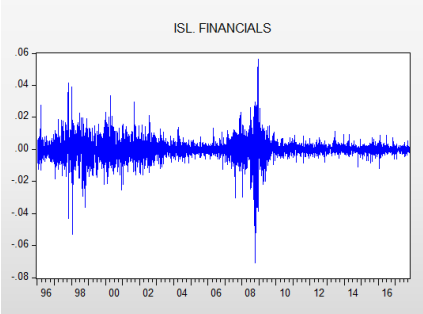


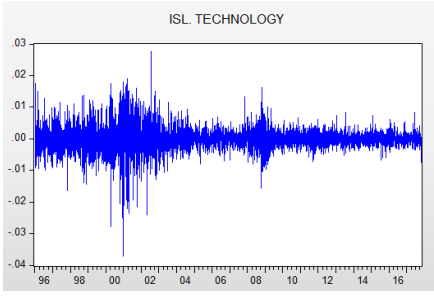




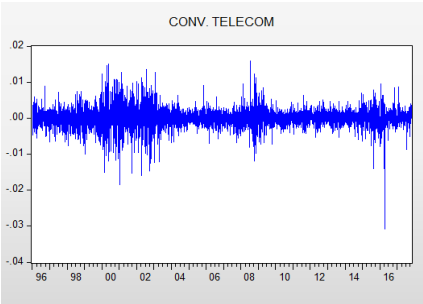


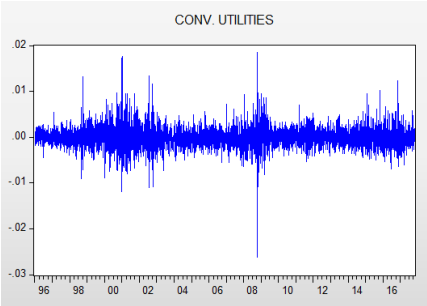


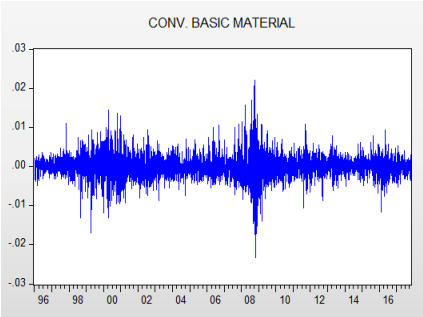


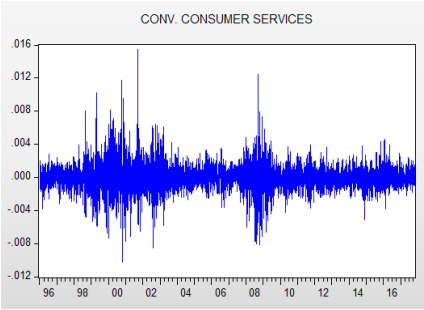


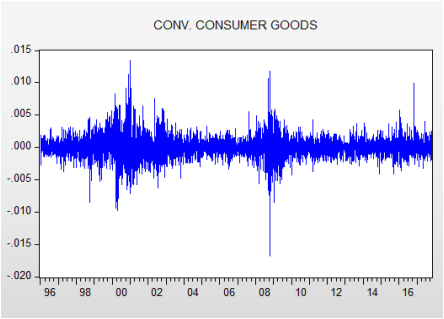
(Graphs for returns of each Conventional sector indices)

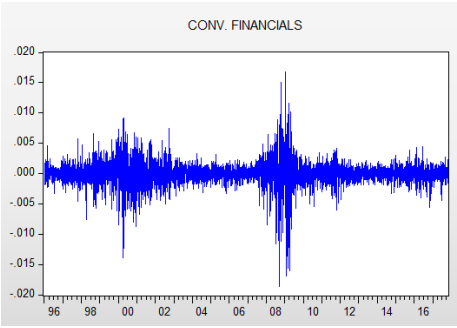


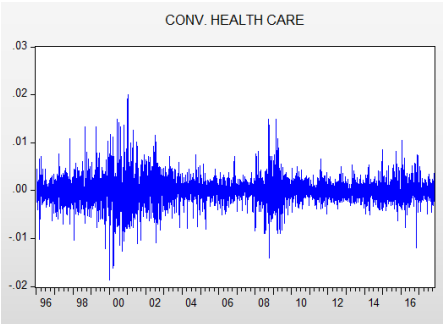


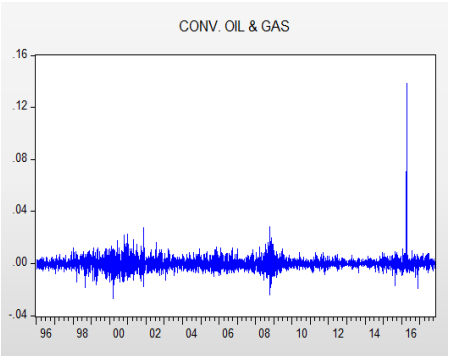


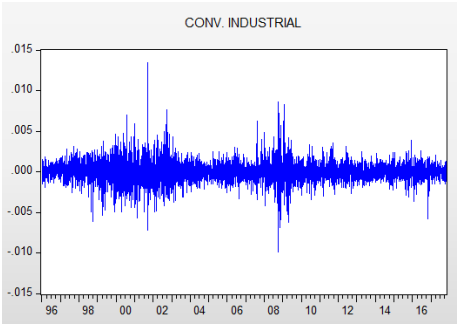








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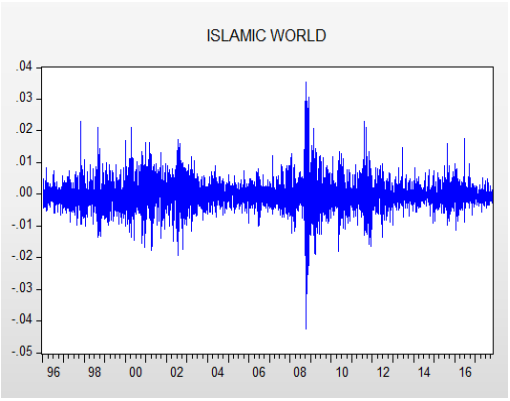
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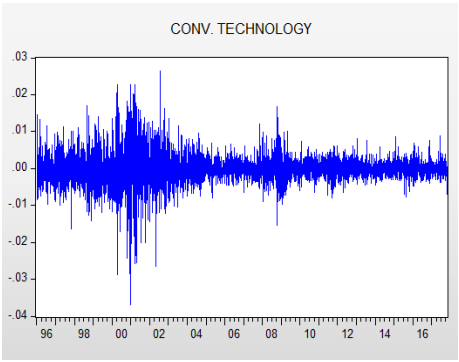
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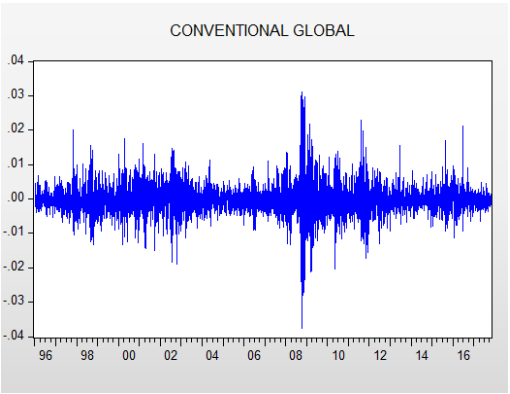
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