# Combining Islamic Equity and Digital currencies: Evidence from Portfolio Diversification

AbdelKader O. El Alaoui[1][2], Amina Dchieche[3] and Mehmet Asutay[4]

**Abstract**

Digital currencies are unregulated and potentially have a destabilizing effect coupled with increased concerns regarding capital gains and losses in a high volatility environment. When added to an equity portfolio, this currency may have a certain driving factors in terms of return and risks in the case of portfolio diversification. In this study, from the *Shari'ah* angle, we follow the position of Kahf (2017) who explained that Bitcoin is considered "Like any other currency". It has to be used under the "same conditions of exchanging currencies". Therefore, we explore the effect of adding digital currencies to Islamic portfolio by relying on the portfolio theory and comparing the risk and the return of Islamic portfolios with and without digital currencies. The results show that the performance of combined portfolios, of *Shari'ah* compliant stocks and digital currencies, improves; however, this depends more or less on the increase of the return rather than the reduction of total risk. Specifically, digital currencies may have a big role in bringing high risks with speculative effect in portfolio diversification. In the end, we provide some recommendations to investors to secure their Islamic portfolios if they are combined with digital currencies.

**Keywords**: Islamic Finance, Bitcoin and Cryptocurrencies, Portfolio Diversification, Portfolio Strategies, Islamic capital markets.

[1] Oxford Centre for Islamic Studies, Marston Road, Oxford OX3 0EE, UK

[2] ESCA - School of Management, Casablanca, Morocco

[3] International University of Rabat - Rabat Business School

[4] Durham Centre for Islamic Economics and Finance, Durham University Business School, UK

## I. Introduction

Since its inception few centuries ago, the fiat money based on a centralized banking system, relies on the political authority to maintain a certain confidence among the stakeholders in a specific country. The fiat currency's role is to serve as a medium of exchange, a unit of account and a storing value. The regulatory role of monetary policy guaranties the quantity of money in circulation through a specific policy in which debt and money creation are the core instruments in the heart of the system. Moreover, the currency was supposed to reflect the economic strength of a country based on the quality of its exportations using exchange rate value of the domestic currency against foreign currencies. Central banks intervene in the market to buy or sell their own currency to balance supply and demand at a certain value of the exchange rate.

With the help of computing, the emergence of advanced encryption and block-chain technologies applied to finance industry have given birth to a hundreds of virtual monies. This idea of digital crypto-currencies brings new challenges to the existing and well-established official currencies as the fiat money is still being manipulated by central banks in favor of big banks and financial institutions.

Used as new medium of exchange for settlement of purchased goods and services, digital currencies may be able to reduce transaction costs by avoiding mediation of financial intermediaries and becoming well accepted by large population.

Research in terms of impact of digital currencies on Islamic financial markets has become a subject of interest that needs an urgent examination by Muslim Scholars. While conceptual discussions on the *Shari'ah* validity of digital currencies can be found easily in the literature, empirical studies seem to be limited.

By having a quick glance to Islamic Finance principles, it is trivial to say that digital currencies could not be *Shari'ah* compliant since they are backed by no tangible asset. However, the virtual currency uses a highly technological encryption algorithm that needs a lot of efforts and energy to be generated. The more its quantity increases the more the digital currency becomes costly to be generated until attaining the maximum quantity allowed by the issuer. Although the digital currency is fabricated with no real backing asset (Kahf 2017), the security encryption effort and its complexity may offer a kind of intrinsic value to digital currency to become more acceptable as a recognized currency regarding the core principles of Shari'ah(Zainudin 2016).

The main concern formulated by Kahf (2017) is that Bitcoin can be manipulated, if it is being traded in small quantities, as it may be subject to speculation. He advocated thatvirtual currencies could become acceptable if a formal government handles and undertakes their

issuance. However, he did not bring any empirical evidence to support this idea. Moreover, major digital currencies are traded on daily basis and in large quantities. This may slightly reduce the speculation problem.

The debate on the *Shari'ah* compliance of digital currencies is still open and controversies still emerging with mixed positions on their *Shari'ah* validity.

In this study, we let aside the debate on the *Shari'ah* aspect. Our objective is to examine the potential impact of digital currencies in terms of volatility and return when they are added to Islamic portfolios. To the best of our knowledge, this is the first work to analyze the impact of three major digital currencies on portfolios' return and volatility of five important Islamic stock indices.

In this paper, we examine three research questions: (1) to what extent do digital currencies increase volatility when added to Islamic portfolios?; (2) Do they help Islamic portfolios to enhance their risk or return of Islamic portfolios?; and (3) how do they perform compare to those of Islamic portfolios?

To answer to those questions: we examine portfolios of Islamic stock indices during a period of five years: 2013–2018 in which we have added three major digital currencies. Portfolios have been classified into three categories (1) Dow Jones Islamic Indices portfolio (DIP); (2) Three major digital Currencies portfolio (DCP); and (3) the combined portfolio (DIP + DCP) based on the two previous ones. Based on daily prices, we compute weekly returns and volatility for the three portfolios. We apply the portfolio theory to optimize the utility of the studied portfolios. The results suggest that digital currencies may amplify the impact of uncertainty shocks in the stock markets. Specifically, only very small percentage of returns increases while total risk has more than doubled.

The rest of this paper is organized as follows. Section 2 presents the literature review. In Section 3, we present the data collection, the methodology and descriptive Statistic. We also define the portfolio evaluation and the European portfolio construction used in this study. In Section 4, we analyze the portfolio performance, in terms of returns and volatility, of the three proposed portfolios to examine changes in volatility when digital currencies are combined with Islamic portfolios. In Section 5, we compare the different policies related to the portfolio evaluation. Finally, we present our conclusions and policy implications in Section 6.

## 2. Literature review and theoretical background

In this section, we present the literature related to our topic. First, we discuss the digital currency and different opinions on its *Shari'ah* compliance then we touch on the Islamic indices portfolio performance. Some of these studies are summarized below.

### 2.1 Digital Currencies in Conventional Stock Markets

Since their inception in 2008, digital currencies based on blockchain technology are rapidly thriving and continue to evolve. Their reliability is ensured through their decentralization and depends on the consensus of the majority to validate a transaction. Therefore, large public is accepting them through time (Watanabe et al. 2016).

In the absence of money tender, the issuer does not have to be a legal entity or central bank, the exchange is based on peer-to-peer technique and payment methods are decentralized and can be independent of any clearinghouse (Nakamoto 2008). More importantly, there is no legal regulation. Digital currencies are private and quite independent having a good level of transparency in the sense that they can be watched and confirmed by any member of the system.When a new transaction is approved, it can't be reversely engineered or tampered (Sorrell et al. 2016).

Glaser et al. (2014) find that customers do use Bitcoin as a speculative investment instrument rather than a currency. In line with this result, Bouoiyouret al. (2015) confirm the extremely speculative nature of Bitcoin by taking into consideration the Chinese market index. Besides the real usefulness of Bitcoin in terms of economic rational, Kristoufek (2015) documented that Bitcoin is a unique instrument having both standard financial and speculative characteristics in the same market.Cheung et al. (2015) show that volatility and rapid price increases for Bitcoin in the "Mt Gox" stock exchange (a Tokyo-based cryptocurrency exchange that operated between 2010 and 2014).The collapse of "Mt. Gox", in 2014, may have served to increase awareness among investors around Bitcoin and other cryptocurrencies.

Dyhrberg (2016) results have shown that Bitcoin is similar to gold and can be used as a hedging instrument against market risk in the case of the FTSE index (Financial Times Stock Exchange Index).

### 2.2 Digital Currencies in Islamic Stock Markets

A number of verdicts (Fatawas) regarding bitcoins and digital currencies have been issued by scholars from across the world (Adam 2019, Billah 2019). Bergstra & Weijland (2014) classify Bitcoin as a system of type money-like informational commodity and it contributes to the understanding of the concept of money. Additionally, digital currencies have some advantages such as efficiency in terms of payment across borders (Nguyen et al. 2018, 2019). Another

advantage can be related to financial inclusion in Islamic Microfinance industry. For instance, in Indonesia, the Blossom Finance crowdfunding platform has adopted Bitcoin in the case of *Mudarabah* capital financing (Redman 2015) as it may help to enhance financial inclusion.

It is worthy to explore the potential validity of digital currencies according to Islamic Finance perspective. At this regard, more attention should be given to them (Gassner et al. 2019). Zainudin (2016) asserts that those currencies should have an intrinsic value as advocated by Islamic Finance principles. Noordin et al. (2018) then Dahir et al. (2019) documented that the technical features of digital currencies are apparently satisfying the prerequisites of currency from *Shari'ah* perspective except for the legal tender status. Therefore, they can insure the function of medium of payment.

According to Kahf (2017), digital currency could be acceptable if a formal government insures it issuance. One of the main concerns is that Bitcoin can be manipulated when traded in small quantity. He imposed on digital currencies the same exchanging conditions in terms of time of delivery and absence of speculation. In the same line, the regulator in Qatar prohibited any trading in Bitcoin (Al-Thani 2018). Al-Mansouri (2018), governor of the UAE Central Bank, recommended that digital currencies should not be issued by private parties nor be used for trading at the general level and must be issued by a ruling authority that has legitimacy.

Finally, Zubaidi (2017) point toward introducing a *Shari'ah* compliant digital currency fulfilling the conditions regarding Islamic finance perspectives.

Until the time to have a fully *Shari'ah* compliant cryptocurrency, it will be helpful to examine financial behavior of the major digital currencies and their impact when they are combined to Islamic Equity portfolios.

As we have presented above, there has been relatively little empirical work done to measure just how sensitive the risk-return profile of Islamic Equity portfolios are to changes in digital currencies when the latter are combined in the same portfolio.

It is interesting to bring a new point of view, based on portfolio theory, to the current debate on how sensitive the financial performance of Islamic Equity indices are to changes in digital currencies prices

## 3. Data Methodology and Descriptive Statistics

In this section, we present the data collection then, we provide necessary explanation of the methodology that has been used to obtain the empirical results: The return for both individual

El Alaoui Abdelkader O.; Dchieche, Amina, and **Asutay, Mehmet** (2021) "Combining Islamic Equity Portfolios and Digital Currencies: Evidence from Portfolio Diversification", in Nafis Alam and Syed Nazim Ali (eds.), *Fintech, Digital Currency and the Future of Islamic Finance: Strategic, Regulatory and Adoption Issues in the Gulf Cooperation Council*. London: Palgrave.

asset and a portfolio. Then, we provide the calculation formulas for both volatility and correlation for a portfolio having n assets.

### 3.1 Data collection

The data consists of three major digital currencies (BTC-USD, LTC and VEN) and five Islamic stock indices for major regions: DJ Islamic GCC, DJ Islamic (Global), DJ Islamic US, DJ Islamic Europe, DJ Islamic Asia/Pacific. Therefore, we use closing prices that we obtained from the "coinmetrics" and "yahoo finance" databases. The Dow Jones Islamic Indices closing prices is obtained from Datastream database.

Data is daily and is available for the period from 26 April 2013 to 06 Mai 2018, enabling us to assess the contribution of the three major digital currencies in Islamic portfolio diversification during the last five years including few important financial shocks.

### 3.2 Methodology

➢ **The return for an individual asset**

The return for an asset serie (stock index or digital currency) is expressed in logarithmic terms to reduce variance as follows:

$$r_{i,j} = Ln(P_{i,j}) - Ln(P_{i,(j-1)}) \qquad (1)$$

Where i is the asset i and j is the day j.

$P_{i,j}$ is the price of the asset i and the day j

➢ **The return for a portfolio**

After calculating the return for every series, we compute the return of the portfolio. This provides us with a time series of total return of each portfolio for the same period. The returnof a portfolio p is $R_{p,i,j}$ for nassets and the day j is computed based on the following formula:

$$R_{p,j} = \sum_{i=1}^{n} w_i r_{i,j} \qquad (2)$$

Where $r_{i,j}$ is the return of the asset i and j is the day j;

$w_i$ Is the weight of the asset i in the portfolio p.

The total weights of each portfolio is equal to 1 and determined by the following simple formula in which j is the day jand $w_{i,j}$ is the weight of each asset I within the portfolio:

$\Sigma w_{i,j} = 1$

➢ *The volatility for a portfolio*

The standard deviation $\sigma_{p,j}$of a portfolio p and for the day j is given as follows:

➢ $r_{i,j}$ , $r_{k,j}$are the returns of the assets i and k and for the day j
➢ $w_i, w_k$are the weight of the assets i and k.
➢ *cov*is the function covariance.

$$\sigma_{p,j}{}^2 = \sum_{i=1}^{n} . \sum_{k=1}^{n} w_i w_k \, cov(\, r_{i,j}, r_{k,j}\,)$$

➢ *The correlation between two assets*

The correlation $\rho_{r_i r_k}$between the return of two assets i and k, according to Pearson product-moment, is calculated as follows:

$$\rho_{r_i, r_k} = \frac{cov(r_i, r_k)}{\sigma_i \sigma_k}$$

The interaction between the assets constituting the portfolio is very important for the diversification concept. This interaction is determined through the correlations between all the portfolio's assets.

In our study, the portfolio's return and volatility change when we add (or remove) one digital currency to (from) the portfolio formed by only Islamic equity indices. This strategy is called active specific strategy. A portfolio with the maximum of the return and a minimum of risk is representing the optimal portfolio (maximum of Utility) for the investor.

## 4. Results and interpretation

### 4.1 Descriptive Statistics

We report the descriptive statistics of Islamic stock returns and digital currencies in Figure 2.1and Figure 2.2(see also- Table 2.1 in Appendix 1). While plotting returns for both Islamic stock (for each region) and Digital currencies in Figure 2.1, we noted two interesting results. First, Islamic returns seem to be much less volatile than Digital currencies returns, suggesting that Islamic indices are more secure than the latter and therefore more appropriate for investors from a high risk aversion perspective. This first result is in line with the literature as high

volatility may be indicative of speculative behavior regarding digital currencies compared to Islamic equity indices (Kahf 2017; Bouoiyour et al. 2015; Kristoufek 2015; Glaser et al. 2014).
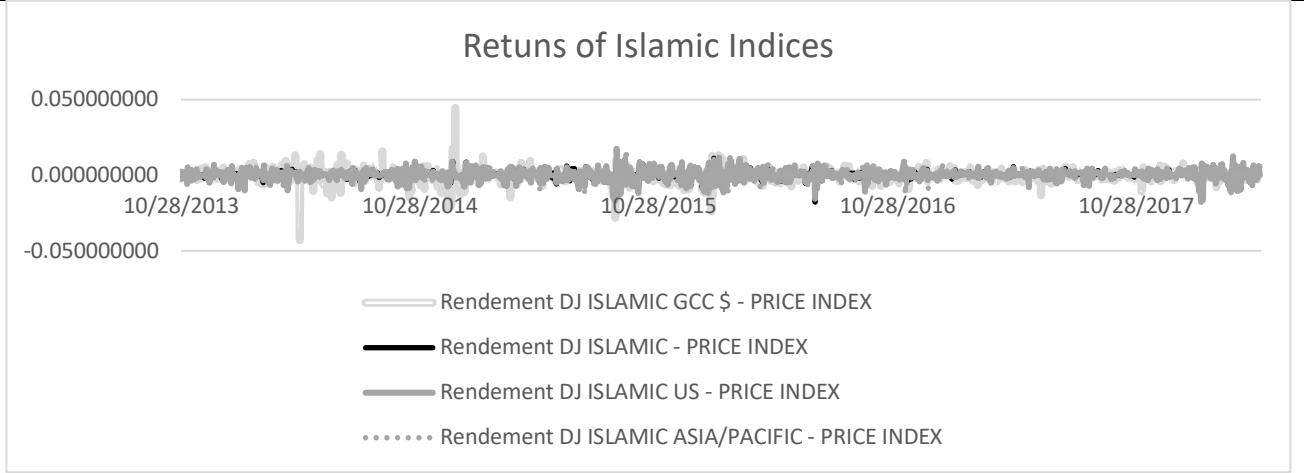


**Figure 2.1 Returns for DJ Islamic Indices from 2013 to 2018**
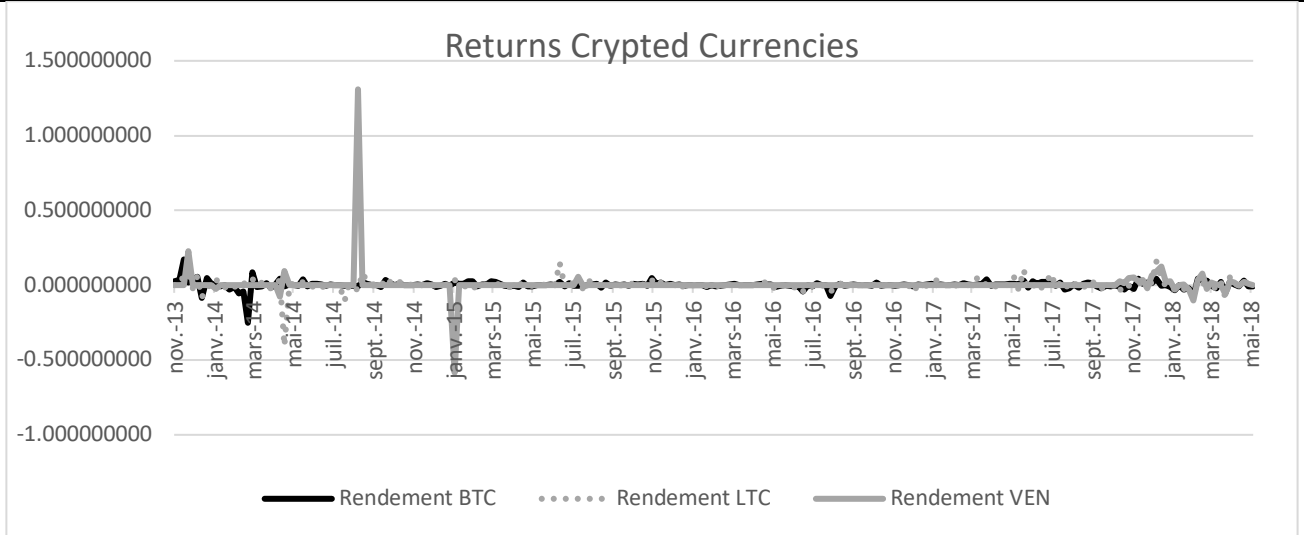


**Figure 2.2 Returns digital currencies from 2013 to 2018**

In addition, even though the latter period is characterized by significant volatility, probably due to the instability of the stock market, the degree of volatility varies according to the region, and is less marked for Asia-Pacific compared to the US and Europe. The correlation matrix has been built in order to investigate the linkages between Dow Jones Islamic GCC stock index and its regional counterparts (see Table 2.4 in Appendix 2).

In particular, these statistics shows different behavior for the three different periods during which digital currencies have known major shocks. Those three major identified Bitcoin long bubbles have been documented by Gerlach (2018). They occurred in three episodes between 2012 and 2018 and are given below:

Episode A. First Long Bubble: May 2012 - April 2013

Episode B. Second Long Bubble: July 2013 - December 2013

Episode C. Third Long Bubble: January 2016 - December 2017

The three episodes under consideration will allow to capture the potential impact of three major shocks on Islamic portfolios. Our results also provide several interesting findings.

As we are working with logarithmic differences, we can interpret these shocks as a proportional reaction to Islamic indices and the digital currencies as the latter provide a unique environment for studying a purely speculative financial market.

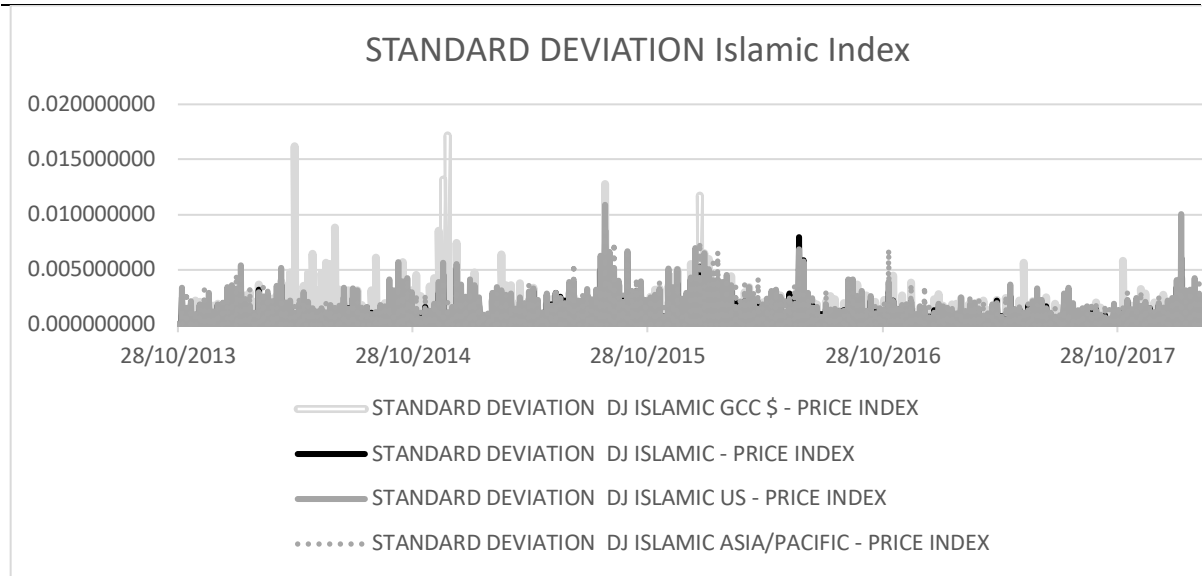The volatility for the Dow Jones Islamic Indices is given in Figure 2.3



**Figure 2.3 Volatility for the Dow Jones Islamic Indices from 2013 to 2018**

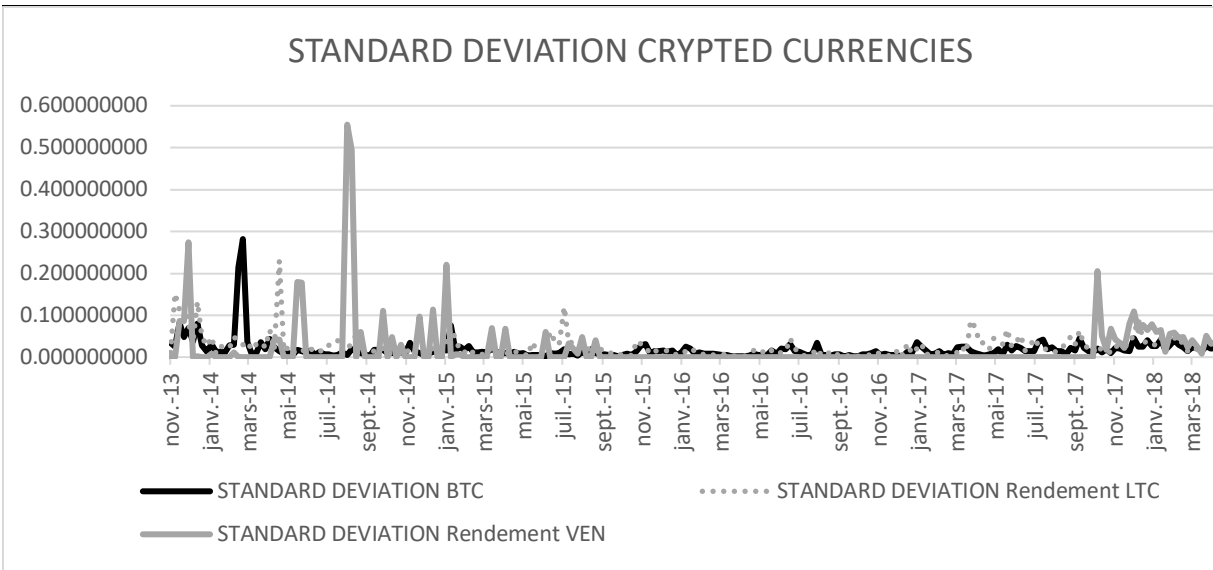The volatility for the digital currencies is given in Figure 2.4



**Figure 2.4 Volatility for the three digital currencies from 2013 to 2018**

El Alaoui Abdelkader O.; Dchieche, Amina, and **Asutay, Mehmet** (2021) "Combining Islamic Equity Portfolios and Digital Currencies: Evidence from Portfolio Diversification", in Nafis Alam and Syed Nazim Ali (eds.), *Fintech, Digital Currency and the Future of Islamic Finance: Strategic, Regulatory and Adoption Issues in the Gulf Cooperation Council*. London: Palgrave.

The volatility for Islamic stock returns indices shows low values compared to that of Digital currencies notably during the three episodes A, B and C indicating less risk for Islamic funds, particularly in Europe and the USA. This is in line with our previous intuition when analyzing the dynamics of digital currencies and Islamic financial indices. Moreover, the analysis of stock return averages shows that Islamic funds supplant digital currencies funds, particularly during shocks.

However, negative signs for average stock returns for the three episodes A, B and C highlight the impact of the digital currencies shocks on Islamic investments.

### 4.2 Correlation between GCC index and its counterpart indices and digital currencies

The analysis of the correlation matrix also provides interesting findings. First, we note strong linkages between Islamic finance indices happens only from one period week and may decrease significantly during a certain laps of time, which can be due to the fact that they display several similarities during those specific periods as they rely on the same set of *Shari'ah* principles then they diverge in terms of correlations.

Second, we note a significant decrease in Islamic stock indices correlations with Dow Jones Islamic GCC index for another specific period.

This may reflect the effect of the three episodes of shocks that led to considerable losses for digital currencies and could have a detrimental Impact if they would have been combined to Dow Jones Islamic GCC fund.
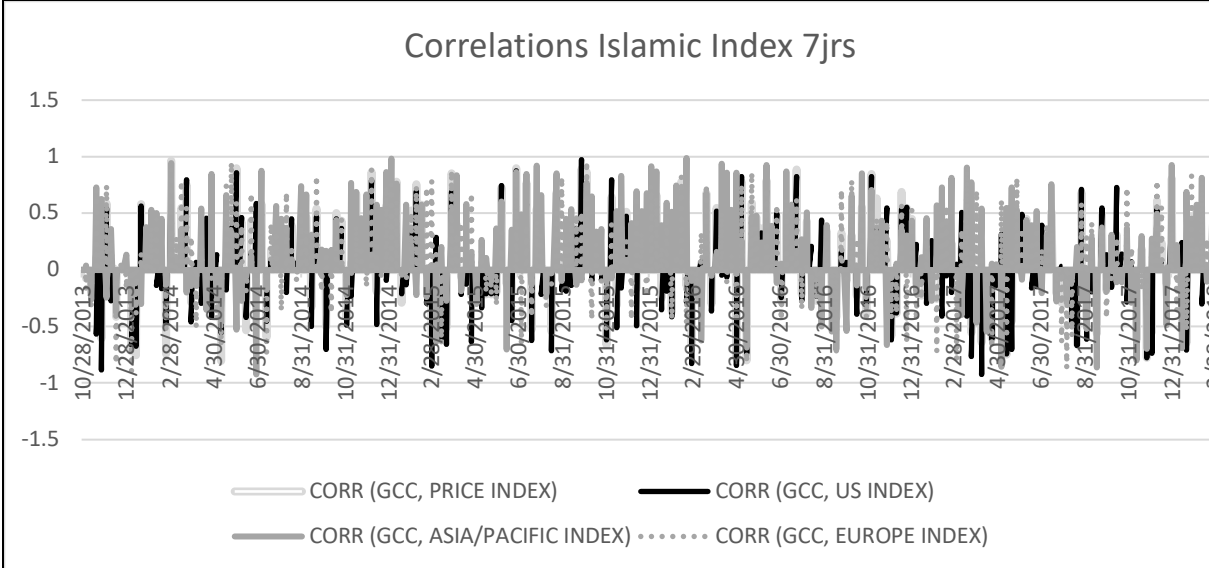


**Figure 2.5 Correlation between DJ Islamic GCC and its 4 counterparts from 2013 to 2018**

Figure 2.4 shows correlation between DJ Islamic GCC and its 4 counterparts. This weekly correlation is not stable and changing rapidly from one week to another.

In order to improve the investigation of the interaction dynamics between digital currencies and Islamic stock returns and check their linkages within the context of the three episodes of Bitcoin financial shocks, as well as explore the feedback effects between digital currencies and the Islamic finance industry, we modeled our data based on correlation computed for a horizon of one week from 2013 to 2018.
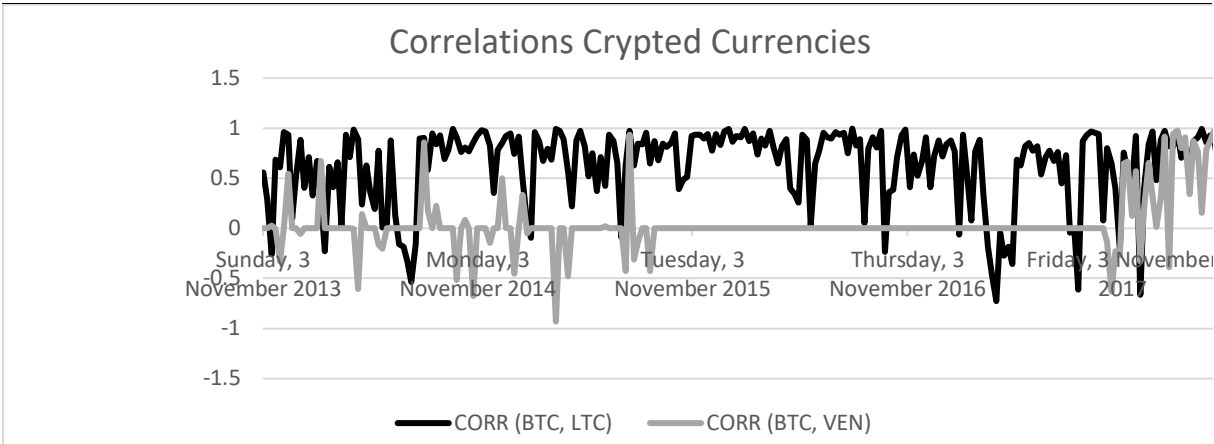


**Figure 2.6 Correlation between Bitcoin and its 2 counterparts from 2013 to 2018**

### 4.3 Computing returns for the three portfolios; Islamic, Digital and the combined

The three models of portfolios have been calibrated as pure Islamic equity indices, pure digital currencies portfolio and combined portfolio, solved and then simulated in Matlab to determine their returns illustrated respectively in Figures 2.7A, 2.7B and 2.7C.

We show two key results. Our first key result is the high finance uncertainty related to the pure digital currencies portfolio. The second is that this uncertainty decrease in the presence of Islamic equity indices.

Moreover, the results highlight that in period shocks with greater financial frictions uncertainty can be particularly damaging for Islamic equity portfolios.

The returns of the three portfolios; Islamic, Digital currencies and the combined portfolios are presented in Figures2.7A, 2.7B and 2.7C. High negative returns can be observed in different periods for the Islamic and Digital portfolios and particularly respectively in November 2016 and along the 2017 year for the Islamic portfolio, and during November 2013 and November 2017 for the Digital currencies portfolio. The combined portfolio shows positive and particularly values of returns; in the whole period except during very short moments in

November 2017 when the Islamic portfolio was registering high losses. This shows the positive effect of the diversification in terms of returns.
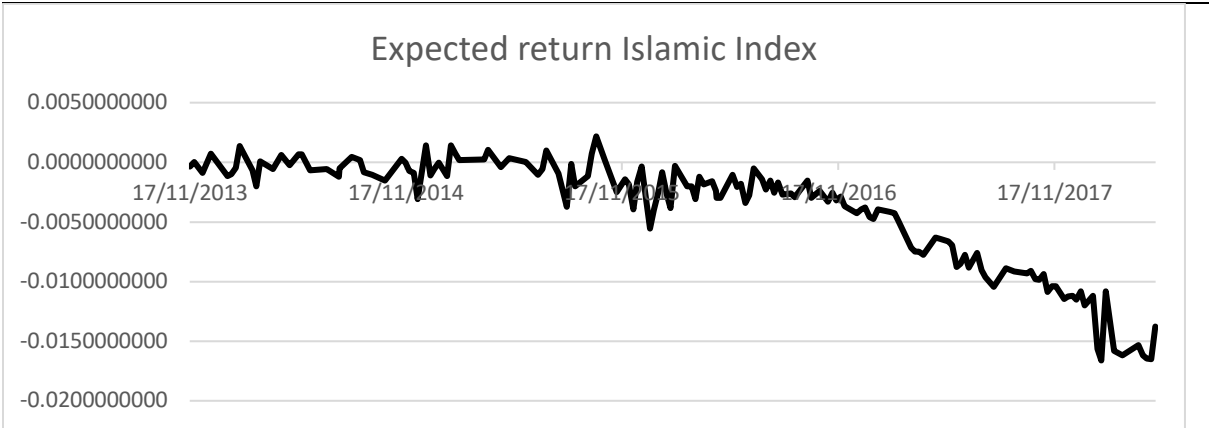


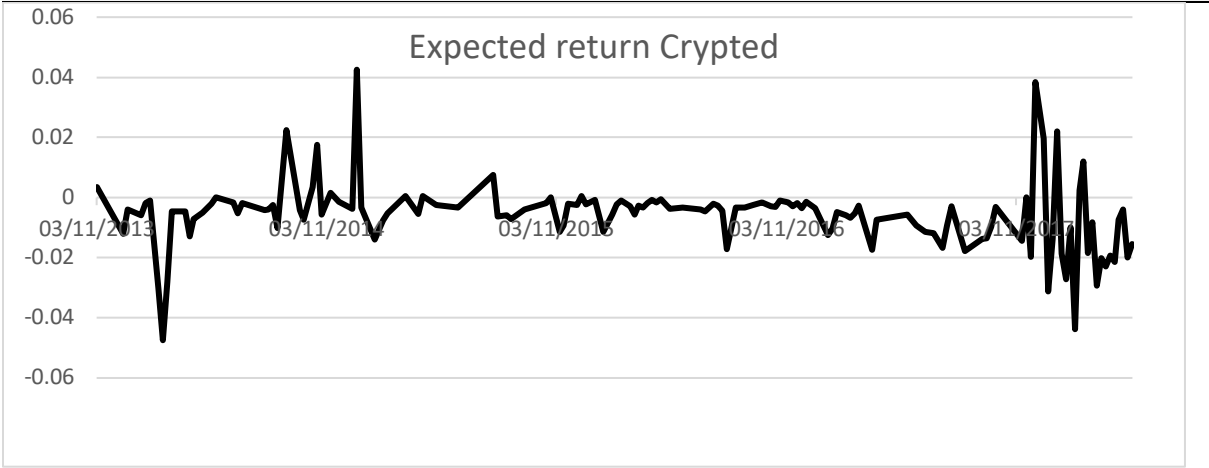**Figure 2.7A Returns for the Dow Jones Islamic Indices Portfolio from 2013 to 2018**



**Figure 2.7B Returns for the Digital Currencies Portfolio from 2013 to 2018**
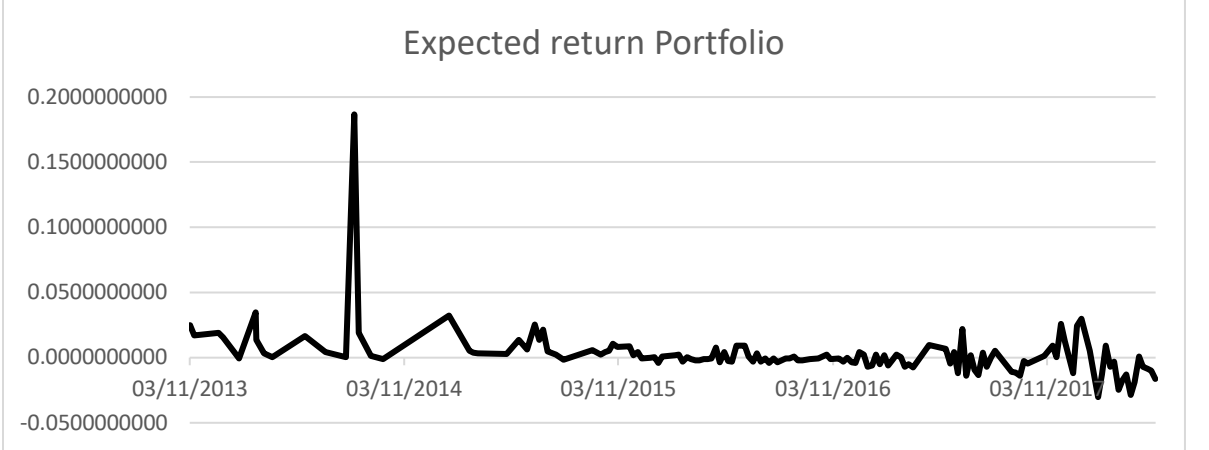


**Figure 2.7C Returns for the Combined Portfolio from 2013 to 2018from 2013 to 2018**

El Alaoui Abdelkader O.; Dchieche, Amina, and **Asutay, Mehmet** (2021) "Combining Islamic Equity Portfolios and Digital Currencies: Evidence from Portfolio Diversification", in Nafis Alam and Syed Nazim Ali (eds.), *Fintech, Digital Currency and the Future of Islamic Finance: Strategic, Regulatory and Adoption Issues in the Gulf Cooperation Council*. London: Palgrave.

### *4.4 Computing Volatility for the three portfolios: Islamic, Digital and the combined*

Figures 2.8A, 2.8B and 2.8C present the volatility of the three portfolios. The ups of the two first portfolios are absorbed in the combined portfolio. This shows the diversification benefit towards both Islamic and Digital currencies to reduce market shocks.
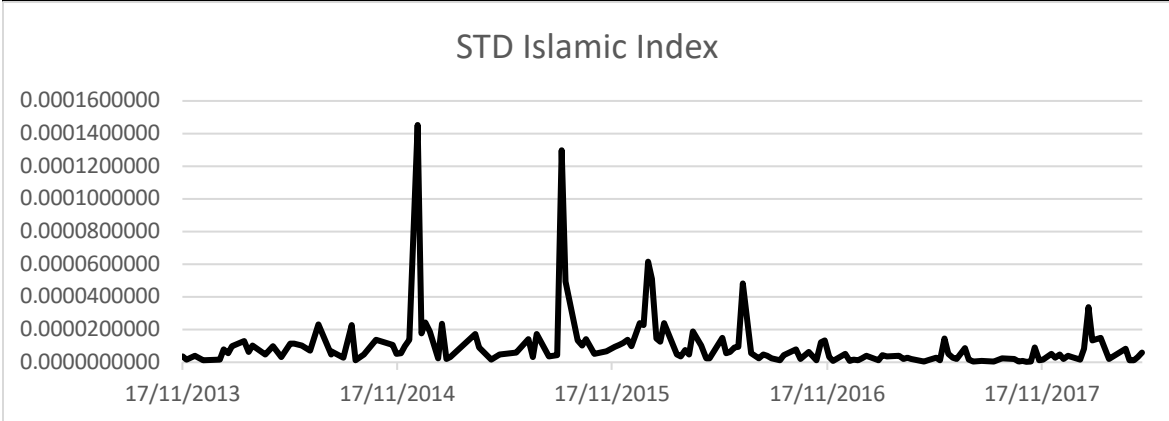


**Figure 2.8A Volatility for the Dow Jones Islamic Indices Portfolio from 2013 to 2018**
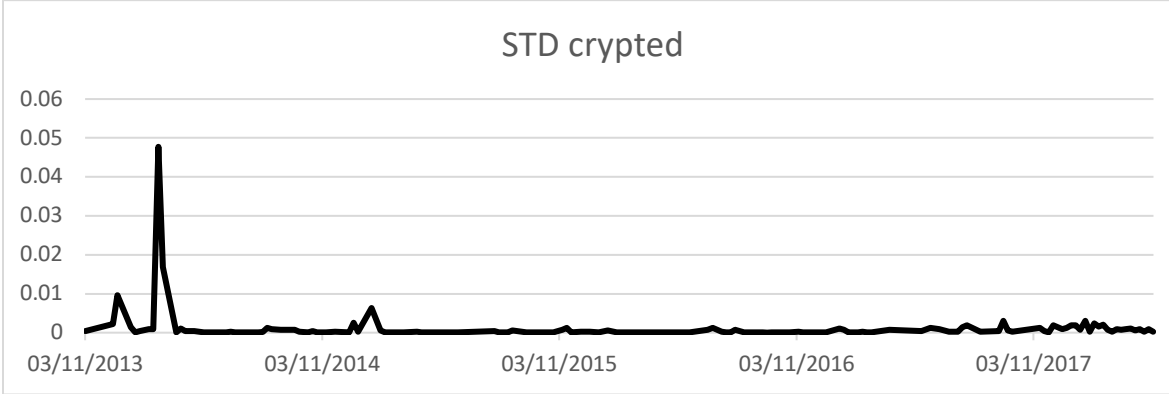


**Figure 2.8B Volatility for the Digital Currencies Portfolio from 2013 to 2018**
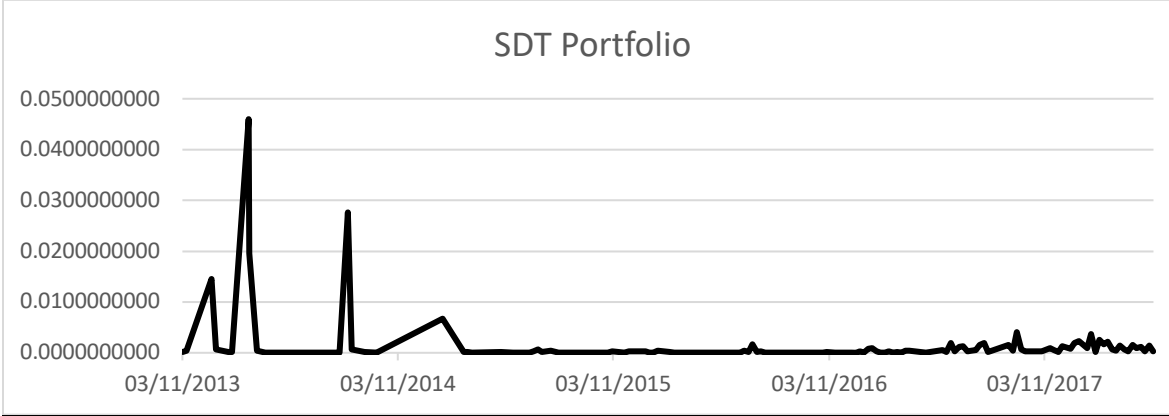


**Figure 2.8C Volatility for the Combined Portfolio from 2013 to 2018from 2013 to 2018**

In summary, our analysis highlights the negative impact of volatility shocks for individual portfolios while the combination of digital currencies with Islamic equity indices portfolios is beneficial for both of them. This means that the inclusion of digital currencies in Islamic

portfolios can increase return outside the period of cryptocurrency shocks and improve resource allocation (Elfakhaniand Kabir 2005; Raphie 2006; Fikriyah et al. 2007; Abderrezak 2008). However, when a shock happens, this brings a detrimental negative effect in terms of volatility.

| Table 2.5: Optimal Portfolio return and riskfor Islamic Indices &Digital currencies | | | | |
|---|---|---|---|---|
| | Islamic Indices | | Digital currencies | |
| | Retun | σ | Retun | σ |
| **Equal weights** | -0.01302 | 0.00212 | -0.00953 | 0.02591 |
| **Optimal Simplex** | -0.01333 | 0.00350 | -0.00963 | 0.02955 |

## IV. Conclusion

This study has examined the effect of adding digital currency on the return and the volatility of Islamic portfolios with a particular focus on the major cryptocurrencies. More than 15 big digital currencies have been considered of which only three have been chosen based on a comprehensive available data. The three main research questions have been addressed (1) To what extent do digital currencies increase volatility when added to Islamic portfolios? (2) Do they help Islamic portfolios to enhance their risk or return? and; (3) how do they perform compare to those of Islamic portfolios?

The consideration of the Islamic equity indices from different regions and the estimated return and volatility when combined with digital currencies has led to solid and meaningful findings particularly, connecting further Bitcoin to speculation. Particularly during the three different periods during which digital currencies have known major shocks as documented by Gerlach (2018).

Our results reveal that digital currencies promote in most cases more instability to the Islamic equity portfolios. Moreover, the digital currencies movements have a direct impact on the Islamic stock indices portfolios. Specifically, a shock to digital currencies prices has a larger impact on Islamic stock indices portfolios prices when both of them are combined in the same portfolio. The inclusion of digital currencies in Islamic portfolios can increase return outside the period of cryptocurrency shocks and improve resource allocation. These results should be of use to investors, managers and policy makers: The digital currencies should be avoided by the investors even if they may enhance returns for some specific periods of time (Oziev & Yandiev 2018).

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## Appendix 1

**Table 2.1: Excess Average Returns for Digital currencies (Daily & Annual)**

|  | BTC | LTC | VEN |
|---|---|---|---|
| **Daily Return (%)** | -0.0026504573 | -0.0026041252 | -0.0026184560 |
| **Annually Return (%)** | -0.0096276517 | -0.0094601495 | -0.0095119619 |
| **Variancefor Daily Return (%)** | 0.000891634 | 0.001239548 | 0.003933767 |
| **Variancefor Annually Return(%)** | 0.017034645 | 0.023681532 | 0.075154508 |

**Table 2.2: Variance covariance Matrix for Digital currencies**

|  | BTC | LTC | VEN |
|---|---|---|---|
| **BTC** | 0.0008734501 | 0.0003499651 | 0.0000297909 |
| **LTC** | 0.0003499651 | 0.0003499651 | 0.0000297909 |
| **VEN** | 0.0000297909 | 0.0001023751 | 0.0039263989 |

## Appendix2

**Table 2.3: Excess Average Returns for Islamic Stock Indices (Daily & Annual)**

|  | DJ IS GCC | DJ IS | DJ IS US | DJ IS | DJ IS EUROPE |
|---|---|---|---|---|---|
| **Daily (%)** | -0.003677593 | -0.00356353 | -0.00353817 | -0.003557348 | -0.00361905 |
| **Annually (%)** | -0.01333377 | -0.01292289 | -0.01283151 | -0.012900615 | -0.01312289 |
| **Daily(%)** | 3.34244E-05 | 2.6769E-05 | 2.9878E-05 | 2.8007E-05 | 3.0831E-05 |
| **Annually (%)** | 0.000538952 | 0.00043164 | 0.00048177 | 0.000451599 | 0.00049714 |

**Table 2.4: Variance covariance Matrix for Islamic Stock Indices**

|  | DJIS GCC | DJIS | DJIS US | DJIS ASIA/PAC | DJIS EUROPE |
|---|---|---|---|---|---|
| **DJIS GCC** | 1.226E-05 | 1.75E-06 | 1.18E-06 | 2.91E-06 | 2.30E-06 |
| **DJIS** | 1.756E-06 | 5.89E-06 | 6.70E-06 | 3.21E-06 | 5.69E-06 |
| **DJIS US** | 1.182E-06 | 6.70E-06 | 8.80E-06 | 1.86E-06 | 4.62E-06 |
| **DJIS ASIA/PAC** | 2.91E-06 | 3.21E-06 | 1.86E-06 | 7.39E-06 | 3.72E-06 |
| **DJIS EUROPE** | 2.304E-06 | 5.69E-06 | 4.62E-06 | 3.7206E-06 | 1.01E-05 |