DO ISLAMIC CRYPTOCURRENCIES PROVIDE DIVERSIFICATION OPPORTUNITIES TO INDONESIAN ISLAMIC INVESTORS?

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ABSTRACT

This study examines whether Islamic gold-backed cryptocurrencies (Onegram and X8X) provide any diversification benefits to the Islamic investors of Indonesia. We study the co-movements between return and volatility of cryptocurrencies and Indonesian Islamic equity indices during the pre-COVID-19 and COVID-19 periods. We employ Multivariate Generalized Autoregressive Conditional Heteroscedastic-Dynamic Conditional Correlation (M-GARCH-DCC) and Continuous Wavelet Transforms (CWT) for this study. We find that the COVID-19 crisis enhanced the spillover effect among the Islamic gold-backed cryptocurrencies and Islamic equities. We also provide evidence that Indonesian investors may invest in cryptocurrencies to minimize the equity sector risks during the pandemic. Our results bear significant implications for portfolio diversification strategies for Indonesian investors.

Keywords: COVID-19, Islamic gold-backed cryptocurrencies, Indonesian Islamic equity investors, Wavelet, MGARCH-DCC.
JEL classification: C58; F37; G14.

I. INTRODUCTION

The advent of the corona virus (COVID-19) in Wuhan, China, in early part of 2020 rapidly evolved from a province-level health issue to a cause of global breakdown. Though it has impacted human life at every level, it has impacted the global investments in unprecedented ways by causing fear, panic, and uncertainty. It eroded almost quarter of global wealth in March 2020. The global equity markets saw a decline of around USD6 trillion from Feb 24, 2020, to Feb 28, 2020.

Developing countries like Indonesia were no exception. Rather they were in an even worse position because of the underdeveloped health infrastructure, big population size and low per capita income in the country (Djalante et al., 2020). Indonesia, owing to its size and strategic location is considered a very important country in ASEAN and in the region (Rattanasevee, 2014). It is interesting to study the effect of COVID-19 on its investors and markets. Furthermore, Indonesia is also among the few countries who have developed and enforced structured reforms in its financial markets to grow as a global hub for Islamic finance (Diela, 2017). Studies like Juhro, Narayan, Iyke, and Trisnanto (2020) have found that the Islamic financial markets are significant for the economic development of Indonesia. But just like other countries, the Indonesian Islamic and conventional markets were adversely impacted during the pandemic period (Ali et al. 2020).

In existence of unprecedented levels of uncertainty owing to the pandemic, investors started searching for novel financial asset classes which can provide them with hedging opportunities for their portfolios. At least theoretically, Islamic investments used to be deemed as a safe-haven asset class, as by nature they were supposed to be dissociated from conventional financial assets during earlier crises like global financial crisis 2007-08 (Arif et al. 2022; Al-Yahyaee et al., 2020), but, as far as COVID-19 and its associated government regulations and restrictions are concerned, they adversely impacted both conventional and Islamic financial markets (e.g., Yarovaya et al., 2021; Bugan et al., 2021; ; Hasan et al., 2021, Chowdhury et al., 2021; Hung & Vo, 2021). This raises the need of different types of assets which could act as diversifiers/ safe havens for the portfolios of Islamic investors. Meanwhile, cryptocurrencies, one of the most important innovations in fintech have also emerged as a different asset class. As per Krückeberg and Scholz (2019), cryptocurrencies have high levels of internal correlation, almost no correlation with conventional assets and have high levels of liquidity. These three characteristics make them a distinct and separate asset class. So, during the pandemic times it has organically become very popular among the investors and managers (Corbet et al., 2020; Iqbal et al., 2021; Goodell and Goutte, 2021; Huang et al., 2021; Mariana et al., 2021).

As far as Islamic asset managers and investors are concerned the question arises whether cryptocurrencies are shariah compliant. Though there has been disagreement among scholars, the umbrella opinion is that it depends on the underlying features of the cryptocurrencies itself (Abu-Bakar, 2018). Initially, most of these cryptocurrencies were not shariah compliant, but recently Islamic gold-backed coins are offered which provide further potential for diversification is Islamic portfolios (Aloui et al., 2021). These Islamic gold-backed coins derive their value from the value of gold and are broadly considered shariah compliant. The Islamic sharia compliant financial assets are free from interest, gambling and

speculations. They restrict the investors from speculating and the Islamic coins can be exchanged with certain quantity of gold which enhances their worth as they have an intrinsic value as well (Aloui et al., 2021). As far as the newly developed asset class of cryptocurrencies are not explored much with respect to its potential for Islamic equity managers and investors.

In this study, our goal is to examine if Islamic gold-backed cryptocurrencies can provide hedging benefits during crisis like the COVID-19 pandemic. We are specifically looking at the hedging benefits for the Indonesian Islamic investors. Islamic finance is a fast-growing industry globally with a growth rate of 10.7% in 2020. The Islamic capital markets grew even faster with a growth rate of 26.9% in 2020 (IFSB, 2021). Muslim investors are only allowed to invest in shariah-compliant assets and only these assets can be utilized to build and diversify the portfolios (e.g., Aloui et al., 2015; Maghyereh et al., 2019; Alahouel and Loukil, 2021). Aloui et al. (2015) in their study on Gulf Cooperation Countries (GCC) find that the investment in sukuk could prove as a viable hedging strategy for Islamic equity portfolio holders especially during the volatile economic times. In contrast to Aloui et al. (2015), Alahouel and Loukil (2021) find that Islamic equities and sukuk are positively correlated and hence sukuk cannot be used as diversifiers. But they find that during the turbulent times, sukuk may provide diversification benefits to short term investors. Another strand of literature focuses on gold as a portfolio diversifier by Islamic investors as it is found to be an organic hedge during the economic busts (Kinateder et al., 2021; Bredin et al., 2015; Yousaf, 2021), since flight-to-safety trend and enhanced share of gold in investments have always been observed during the uncertain times. Maghyereh et al. (2018) study the impact of including gold in Islamic portfolios and find that its inclusion helps in optimizing the portfolios and enhance diversification benefits. Maghyereh et al. (2019) go further by studying the inclusion of gold in Islamic portfolios during varied horizons. They also confirm that inclusion of gold brings hedging benefits. Some studies like Trabelsi (2019) bring in other investment categories to see their hedging benefits (if any) for Islamic equity portfolios. They suggest that inclusion of gold and crude oil could be helpful in diversifying Islamic portfolios. Hasan et al. (2021) conduct a similar study during COVID-19 period by looking at different asset classes like oil, gold, bonds etc. against the Islamic equity investments and they report that gold can act as a safe haven for Islamic investors during the 2007-08 global financial crisis in comparison to COVID-19 period. We can see in the literature that basically the traditional shariah compliant asset classes like gold, sukuk etc. are explored to see whether they provide diversification benefits to Islamic investors or not.

The cryptocurrencies or in other words digital currencies have become extremely popular among investors, tech companies, policy making institutions, regulatory bodies, media etc. in the recent past, more specifically, during the COVID-19 times. Siswantoro et al. (2020) discuss different views and report high level of skepticism in accepting cryptocurrencies in Muslim majority countries. Several studies examine possible roles of different cryptocurrencies in Islamic finance industry (e.g., Eddine Bedoui and Robbana, 2019; Kakkattil, 2019; Ayedh et al., 2020). Some studies do not consider the shariah compliance of the cryptocurrency and examine its potential benefit (if any) in Islamic equity portfolios.

One such study is Mensi et al. (2020) which examines the impact of Bitcoin (which is generally regarded as non-shariah compliant) on different Islamic indices. They report that the Bitcoin impacts Japanese and Asia Pacific Islamic equity indices. In another study, Rehman et al. (2020) investigate the nexus between Islamic equity and Bitcoin and find the spillover of risk between the two.

As discussed earlier, the potential of Islamic gold-backed digital currencies is not studied for their potential to diversify portfolios of Islamic investors and manager until recently, where Yousaf and Yarovaya (2022) and Aloui et al. (2021) study the Islamic cryptocurrencies and find them to be a diversifier for Islamic portfolio investors and managers. However, in their works, they use global Islamic equity indies as a proxy of the Islamic equity indices which could possess different return and risk characteristics from Indonesian Islamic markets. Secondly, the global Islamic indices might also not be relevant to Indonesian Islamic investors. So, following Ali et al. (2020) we use the Indonesian Islamic index for our study. This paper contributes to the literature gap by studying whether the Islamic gold-backed cryptocurrencies could provide any hedging opportunities to Indonesian investors especially during turbulent times like COVID-19 period. As far as Islamic gold-backed digital currencies are concerned, following Yousaf and Yarovaya (2022); and Aloui et al. (2021), we employ Onegram and X8X. These two currencies are backed by gold.

This study extends the Islamic portfolio optimization strand of literature by studying the role of Islamic gold-backed cryptocurrencies as a new distinct asset class for Islamic investors which can be used as a shariah compliant diversifier for their portfolios. Another important feature of the under study Islamic gold-back cryptocurrencies is that they are found to be positively linked to gold (Aloui et al. 2021), this shows that these cryptocurrencies can be deemed to be less speculative as compared to other cryptocurrencies in the market. The literature on Islamic capital markets generally focuses only on traditional shariah compliant securities like gold, oil, sukuk etc. and their potential to be a good/bad hedge for Islamic equity investors and manager but this study tries to examine a new distinct shariah compliant asset class i.e. Islamic gold-backed cryptocurrencies. Second, this study also covers the pandemic period and tries to provide hedging solution to the Indonesian investors both Islamic and conventional in the turbulent times. So, this study does not only offer insights for Islamic investors and managers, but also to the conventional investors who are looking to hedge COVID-19 type of risk. In this study, we find that though generally the volatility of Indonesian Islamic equity is quite similar to the conventional market, but the volatility of Islamic market is subdued quicker, and it gets stabilized in relatively lesser time than the conventional market. We also report that the gold-backed cryptos have a potential to be a diversifier for Islamic portfolio managers and investors as the co-movements of Islamic equity market and Islamic gold-backed cryptos decoupled quicker than the conventional counterparts.

The rest of the paper is organized as follows. In the next section, we present data and methodology. Then, result analysis is presented in section 3. The final section, i.e. section 4, provides conclusion.

II. DATA & METHODOLOGY

As the COVID-19 pandemic is a relatively recent phenomena and the data are fast evolving as the pandemic spreads, the span of data available is limited. With the first confirmed case of COVID-19 in December 2019, our dataset starts in January 2019 and runs through until end of July 2022 on daily frequency. The global financial market during this time has been squeezed by a third in terms of market capitalization (Haroon and Rizvi, 2020). We focus on the Indonesian equity markets, both Islamic and conventional, and the gold based crypto currencies onegram coin and X8X. Daily returns are calculated using the equation $r_t = ln(P_t) - ln(P_{t-1})$. Here, r_t and P_t denote daily return and price at the business day t respectively.

The sample is bifurcated for robustness based on the work of Ali et al. (2020) and Khattak et al. (2022). The sample is split into pre-covid, epidemic and pandemic phases. Firstly, 1 Jan 2019 till 30 December 2019 is classified as pre-covid. Then December 31st 2019, the date of first reported covid case till 10th March 2020, is classified as an Epidemic. And lastly the pandemic phase which is ongoing is classified from 11th March 2020 till July 28th 2022, when WHO reclassified it as a global pandemic.

To understand the volatility and conditional correlations of the equity indices and cryptocurrency, we employ a Multivariate Generalized Autoregressive Conditional Heteroscedastic-Dynamic Conditional Correlation (MGARCH-DCC) model proposed by Engle (2002) and Pesaran & Pesaran (2010). The MGARCH-DCC is suitable to obtain the variance and correlations between assets over time. This method is popular and widely used and can be stated as:

$$r_t = \mu_t + \varepsilon_t \tag{1}$$

where $\mu_t = \mathrm{E}[r_{t|\Omega_{t-1}}]$, $\mu_t|\Omega_{t-1} \sim N(0, H_t)$, $H_t = D_t R_t D_t$, $D_t = diag\{\sqrt{h_{ii,t}}\}$, and $z_t = D_t^{-1}\varepsilon_t$. In this, $h_{ii,t}$ is the estimated conditional variance from the individual univariate GARCH model; D_t is the diagonal matrix of conditional standard deviations; R_t is the time-varying conditional correlation coefficient matrix of returns; and z_t is the standardized residuals vector with mean zero and variance one. The dynamic correlation coefficient matrix of the DCC model can be specified further as per Hsu Ku & Wang (2008):

$$R_t = \left(diag(Q_t)^{-1/2} Q_t (diag(Q_t))^{-1/2}\right) \tag{2}$$

where $Q_t = (q_{ij,t})$ and $(diag(Q_t))^{-1/2} = \left(diag \frac{1}{\sqrt{q_{11,t}}}, \dots, \frac{1}{\sqrt{q_{nn,t}}}\right)$ with $q_{ij,t} = \bar{\rho}_{ij} + a(z_{i,t-1}z_{j,t-1} - \bar{\rho}_{ij}) + \beta(q_{ij,t-1} - \bar{\rho}_{ij})$ in which $\bar{\rho}_{ij}$ is the unconditional correlations and the new time-varying conditional correlation coefficient is $\rho_{ij,t} = q_{ij,t}/\sqrt{q_{ii,t}q_{jj,t}}$.

Secondly, to investigate codependency and detecting the scale of correlations we follow Dewandaru et al. (2014) and Ali et al. (2021) and use wavelet transform (WSC) which is defined by:

$$WSC = R_{XY}^2(\tau, s) = \frac{|S(s^{-1}W_{XY}(\tau,s))|^2}{S(s^{-1}W_X(\tau,s)^2)S(s^{-1}W_Y(\tau,s)^2)} \tag{3}$$

where S is a smoothing operator in both time and scale. $W_{XY}Y$ is the cross-wavelet power (XWP) which captures the local covariance between the two time series at each scale. The WSC closely resembles a traditional correlation coefficient with $0 \leq R^2_{XY}(\tau, s) \leq 1$. As the WSC is restricted to positive values, we use the phase differences, $\emptyset_{XY}$, determining the lead-lag relationships:

$$\emptyset_{XY} = tan^{-1}\left(\frac{Im\{S(s^{-1}W_n^{XY}(s)\}}{Re\{S(s^{-1}W_n^{XY}(s)\}}\right) \tag{4}$$

where *Im* and *Re* are the imaginary and real parts of the smoothed XWP, respectively.

III. ANALYSIS
3.1. Descriptive Statistics
In Table 1, we provide the average returns and variances of the two indices for the Indonesian stock market, Islamic and conventional and also the two shariah compliant crypto tokens. The statistics are provided for the pre-covid period (1 Jan 2019 till 30 December 2019), epidemic phases (December 31st 2019 till 10th March 2020) and the pandemic phase (11th March 2020 till July 28th 2022).

The data suggest that for both Islamic index and conventional index, the returns were affected as covid-19 outbreak happened evidenced through drastic decline in average returns, but it has recovered in the pandemic phase albeit on an average basis. There is a sharp decline in returns during the epidemic phase for the two shariah compliant cryptos as well, with onegram coin recovering in pandemic, while X8X not really recovering. These findings for asset classes especially in the case of Indonesia is in-line with the findings of Narayan et al. (2022) who argue that asset price reaction to the different phases of COVID-19 has been heterogeneous. The behaviour of volatility and returns of the Indonesian equities and their seemingly quicker recovery is also in line with the earlier works of Arshad and Rizvi (2015) and Rizvi et al. (2018) who argue on the relative resilience of emerging markets in times of crises owing to the smaller size and depth of these markets.

Table 1.
Returns, Variances and Correlations

	Onegram Coin	X8X	Islamic Index	Conventional Index
Average Returns				
Pre-Covid	0.9107%	126.5283%	0.0085%	0.0063%
Epidemic	-0.4299%	0.3815%	-0.6553%	-0.5219%
Pandemic	1.0843%	-0.0680%	0.0516%	0.0648%
Average Variances				
Pre-Covid	2.5509%	14.0819%	0.0119%	0.0076%
Epidemic	1.8933%	14.1333%	0.0163%	0.0109%
Pandemic	2.2737%	8.6854%	0.0130%	0.0086%

Table 1.
Returns, Variances and Correlations (Continued)

	X8X + Conventional	X8X + Islamic	Islamic+ Onegram	Conventional + Onegram
	Average Correlations			
Pre-Covid	-0.0729%	-0.2634%	-0.0017%	-0.0014%
Epidemic	0.0549%	0.4305%	0.0020%	-0.0017%
Pandemic	-0.0375%	-0.0716%	-0.0019%	0.0010%

3.2. Correlations

Focusing on averages during the period the MGARCH DCC correlations presented in Table 1 suggest that the correlation between the Islamic indices and the shariah compliant asset based crypto actually improves to a positive relationship during epidemic phase while the conventional index's conditional correlation presents a mixed picture. While as we move towards pandemic, there is evidence of reversal of the behaviour. These findings don't provide a concrete argument as the law of averaging may skew the findings.

To investigate the time-varying behavior, Figure 1 provides plots across the whole sample period. The figure provides interesting insights. The correlation of the Indonesian Islamic equities with the asset based shariah compliant cryptos has a similar behaviour as compared to the conventional counterparts but with lesser magnitude of swings. As Figure 1 provides us insights into this, the peaks and troughs are more pronounced and frequent in the Islamic indices rather than the conventional ones. This unique behaviour of the Indonesian Islamic equities has been found by Narayan et al. (2022) who while investigating the Indonesian Islamic equities with other financial asset classes argue the similar but subdued reaction. Also to note is that the higher volatility in the correlation persists through the pandemic phase for conventional indices and cryptos while in Islamic index and crypto, it stabilizes sooner.
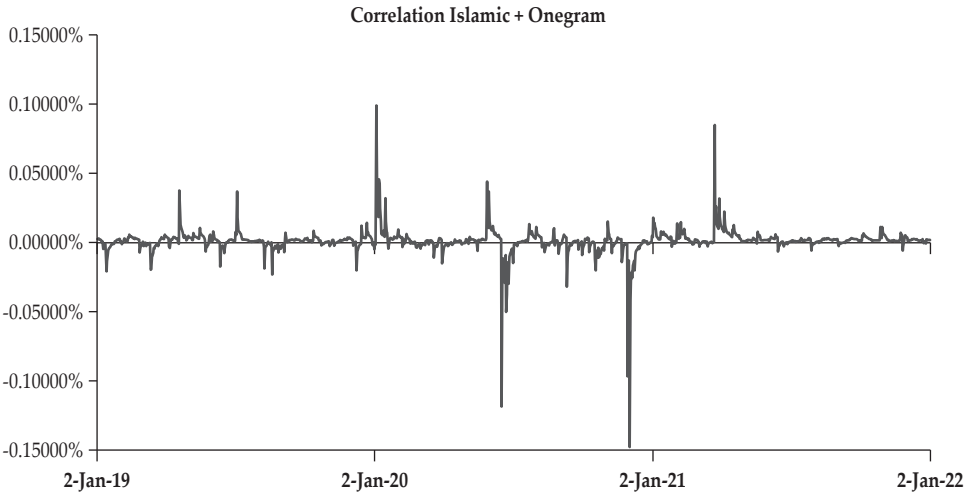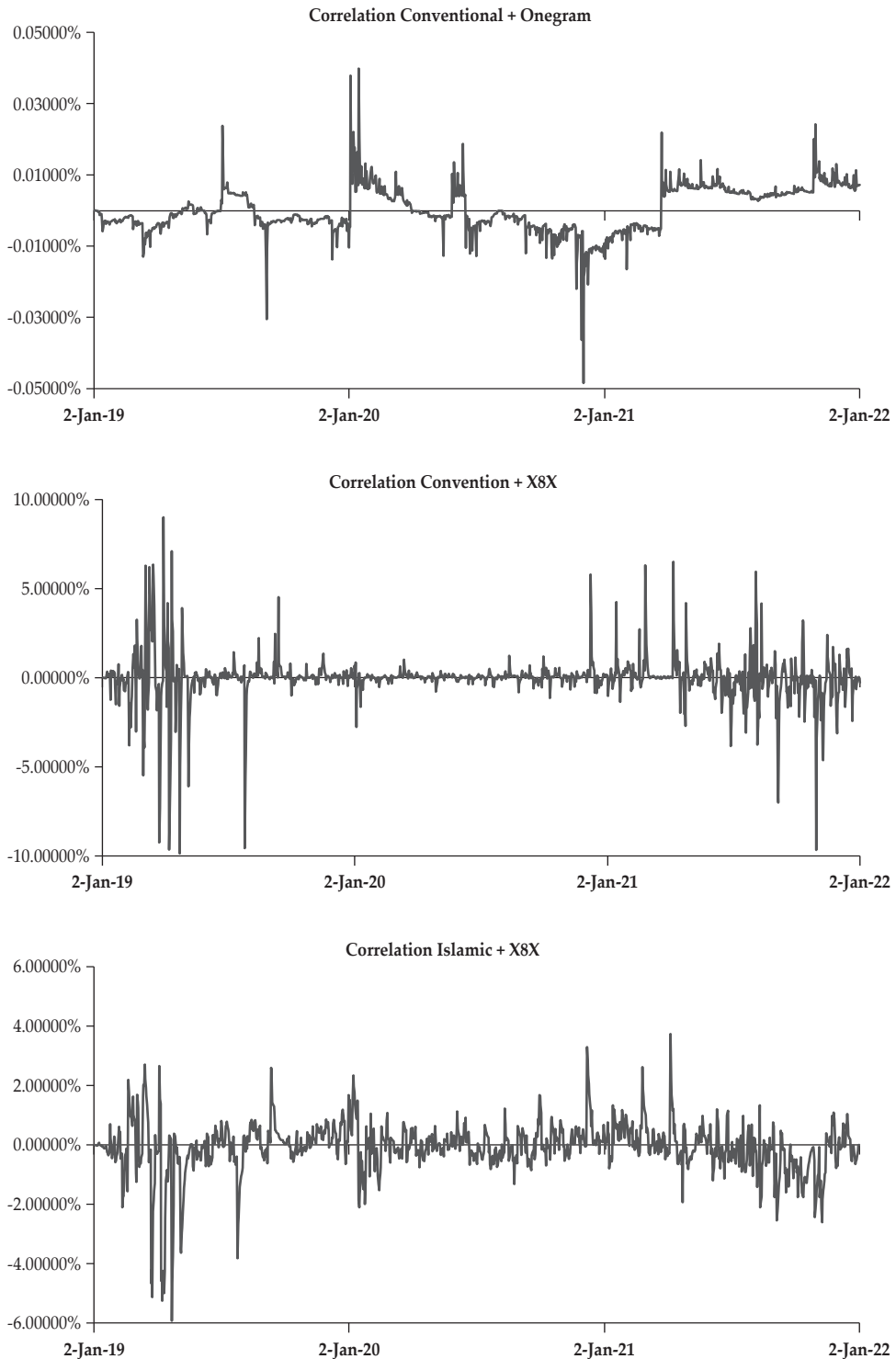

Figure 1.
Correlations across time MGARCH DCC

Correlation Conventional + Onegram

Correlation Convention + X8X

Correlation Islamic + X8X

Figure 1.
Correlations across time MGARCH DCC (Continued)

To understand the behaviour of the co-movements we also need to decompose it into different scales, for which we rely on continuous wavelet transformation. Figure 2 presents the evolution of co-movement pattern between the paired asset classes. It is presented through a contour plot, where the horizontal axis signifies time while the vertical axis represents frequency component (converted to time units of days). In interpreting the strength of the comovement relationship, the visual colour scheme ranges from blue (low coherency) to red (high coherency). The black portion in the coherency plots represent the statistically significant area at a 5% significance level estimated from a Monte Carlo simulation. This allows us to examine the different characteristics between the pair of asset classes in a time-frequency matrix. The wavelet coherence plots in Figure 2 provide further validity to our earlier findings, that while the interlinkage of the equity market and asset-based cryptocurrencies evolve as a consequence of the disruption in pandemic, the behavior is dynamic in nature. The plots further stress that the disruption in the strength of their relationship is primarily in the shorter horizons, as the impact is primarily visible up to 4-6 days impacts. But during the epidemic phase and the early days of pandemic, in 2020, there is evidence of change in the relationships with impacts up to 32 days especially with onegram coin, but moving on as pandemic phase prolonged, these relationships settled.
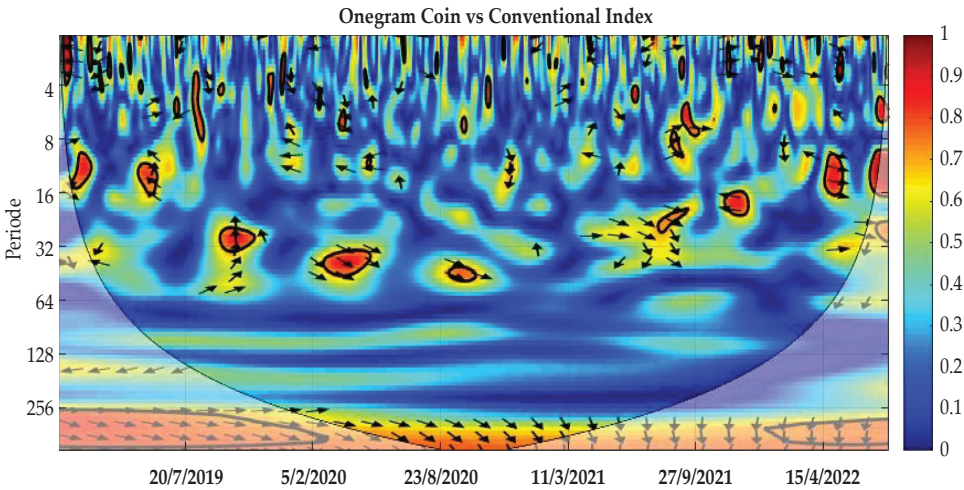

Figure 2.
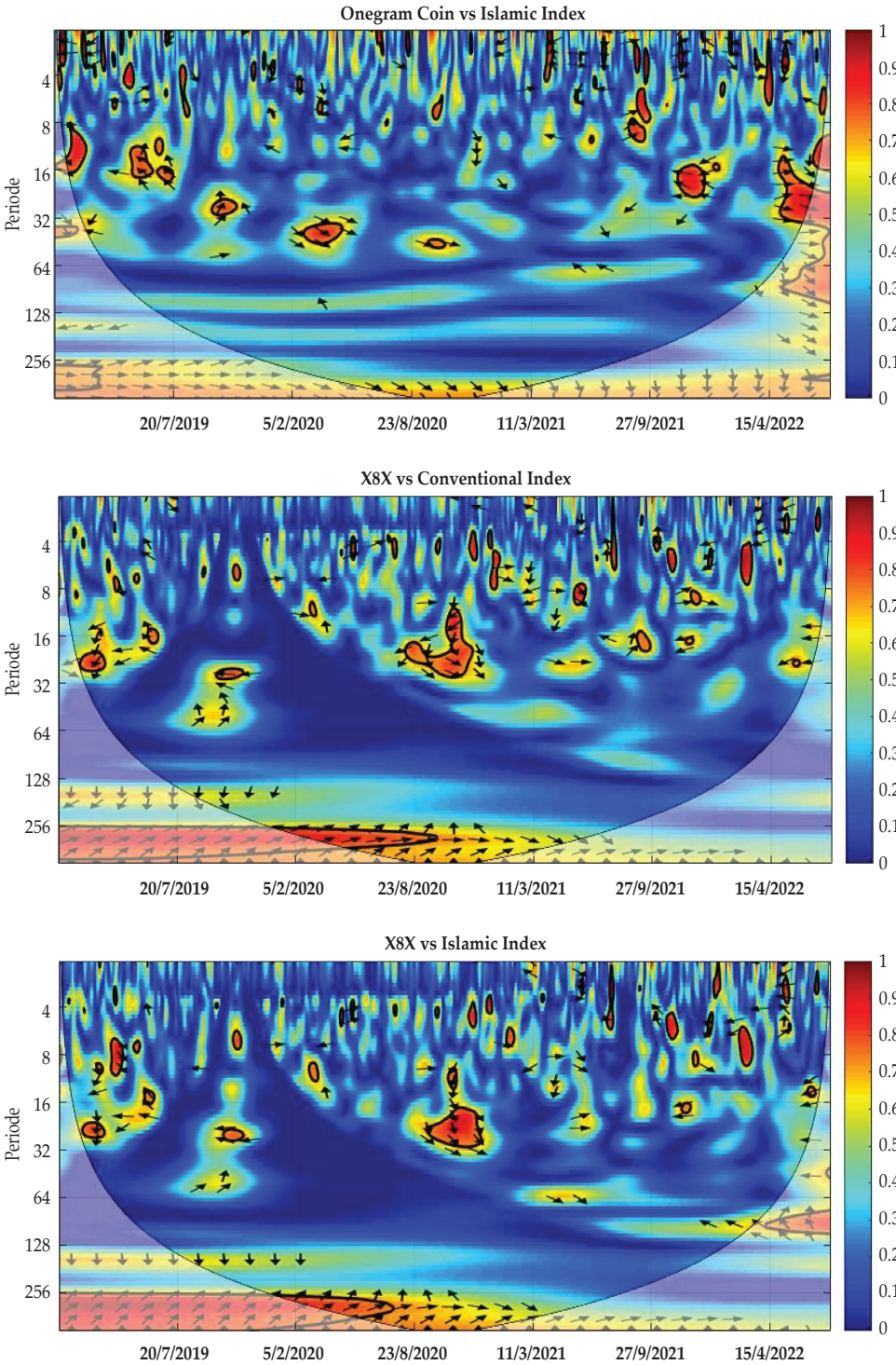**Wavelet Coherence Plots of Sample**

Figure 2.
Wavelet Coherence Plots of Sample (Continued)

IV. CONCLUSION

With COVID-19 outbreak, and the advent of unknown tomorrow, the global economy and markets entered a phase of uncertainty, risk and panic like never seen before at the start of 2020. This led to the financial markets declining and extreme volatility being witnessed. The world entered its first collective recession in a century during the first half of 2020, as governments raced to impose lockdowns, restrictions, movement control orders of varying intensity impacting the 6 billion plus population of this planet. With financial markets in tailspin, the search for asset classes which can help diversify and preserve wealth has been the go-to for finance enthusiasts. In this vein, we explored whether the trillion dollar shariah compliant industry and the crypto market provided some form of diversification or not. Our findings suggest that in terms of volatility the shariah compliant equity market of Indonesia faced volatility similar to its conventional counterparts but this volatility subdued quickly and stability prevailed relatively quickly than the conventional counterpart. While in terms of diversification benefit from the asset based crypto tokens, the Islamic equities in Indonesia provide a relatively diversifiable option, as the co-movements of Islamic and cryptos decoupled quicker as compared its conventional counterparts.

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