Determining the Appropriate Investment Strategy and Identify the Leading Monetary System before and during the Covid-19 Pandemic Crisis: A Case Study of Crypto-Currency, Gold Standard, and Fiat Money

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Abstract

The study has two main objectives: firstly, to examine the opportunity of the Momentum and Contrarian investment strategy for three different monetary systems to trade currencies in Forex markets using Symlet wavelet decomposition approach. Secondly, to examine the co-movements between the three monetary systems using wavelet coherence analysis. The findings indicate that an investor with momentum strategy can consider investing in Bitcoin and Gold market, while the contrarian investment strategy is more advisable for the fiat money market during crisis period. Furthermore, the wavelet coherence analysis indicates that Bitcoin currency is the most leading monetary system during the Covid-19 pandemic crisis, followed by gold. However, US dollar mostly leads Bitcoin during non-crisis periods, while Gold is found to lead the US dollar throughout the sample period of the study. This suggests that the cryptocurrency system or gold standard should be considered as the alternative monetary system for better economic stability specially during the crisis period. Moreover, Bitcoin and gold had an anti-phase correlation before the Covid-19 pandemic crisis,

which implies better benefits of hedging in the non-crisis period, while during a crisis they are moving together across different horizons. In contrast, Bitcoin and Fiat Money are strongly correlated during non-crisis periods, while during covide-19 pandemic crisis the correlation is statistically insignificant. Overall, the outcomes offer significant guidance for policymakers in understanding which monetary system leads to better economic stability during the crisis period and provides many implications for market players such hedging and Diversification investments strategy in forex markets.

Keywords: Bitcoin, gold, Fait money, Momentum and contrarian investment strategy, Wavelet coherence analysis, Covid-19 pandemic.

Introduction

With a universal monetary crisis seemingly just around the corner, there are several major efforts being made by the privets sector to replace the fiat money system as the medium of exchange with gold standard or cryptocurrencies system, and some countries have seriously considered challenging the dollar as the world's reserve currency. This challenge was more prominent at the height of the Covid-19 pandemic crisis when the existing monetary system failed to address the coronavirus threat and all forex markets faced sharp fluctuations in foreign exchange rates, witnessing extreme volatility during the pandemic crisis. Furthermore, the concept of money is no longer just a medium of exchange, a store of value, a unit of accounts, a standard of deferred payments, but it serves as an investment asset or a commodity (Indra, 1992). Thus, adequate knowledge about the relationship between monetary systems and their exchange rates has significant implications for policy makers in conducting monetary policy as well as for investors in allocating financial assets. on the other hand, according to the Portfolio Theory, the lack of a relationship between the two investment assets (different currencies from the monetary systems,) is very important for portfolio investments diversification strategic in reducing market risks and achieving normal returns (Bautista, 2003; Sánchez, 2008; Andrieş et al., 2017; Ali et al. 2018; Alareeni, 2018; Alqallaf and Alareeni, 2018; Merza Radhi and Sarea, 2019).

In particular, understanding co-movements among the three monetary systems, namely, fiat money, gold standard, and cryptocurrencies before and during the covid-19 pandemic crisis is the main concern for policymakers to know which monetary system is most stable as well as to determine the leading monetary system during a crisis. Additionally, understanding

the co-movements of the three monetary systems before and during covid-19, will provide additional information on asset allocation and portfolio design. This is due to the fact that the differ relationship among the three monetary systems may indicate the presence of asymmetric information in the forex market. Furthermore, understanding the price behavior of the three monetary system currencies during the crisis period is very vital, not only to understand relations between different currencies prices but also for business and trading strategies and helps investors to make the right investment decision either to sell, buy or hold that specific currency in portfolio investment specifically during the crisis period.

Traders usually follow investment strategies such as Momentum and Contrarian strategy to trade currencies in Forex markets. Based on to the momentum anomaly approach, assets tend to maintain their past behavior (Chan et al., 1996). In other words, Momentum anomaly empirically refers to rising asset prices which continue to rise, or falling prices which continue falling further, vice versa for contrarian anomaly. The momentum strategy is to sell currencies that have performed poorly in the past and to purchase currencies that have performed well in the past (Kandır & Inan, 2011). The basis of the momentum strategy is that the tendency to win will continue as a consequence of increase in demand for winning assets in the past due to the investors' late response to new information (Jegadeesh & Titman, 1993). Meanwhile, the contrarian anomaly indicates a situation when the price of the assets that has fallen (increased) in the past, will increase (decrease) in the future with the reverse movement of prices and there will be an increase (decrease) in the rates of returns. Thus, based on the Contrarian strategy, investors may sell the currencies in the forex market when the prices of the currencies increase and to purchase currencies when the prices decrease. The performance of momentum and/or contrarian strategies can be appraised by investigating the associations between price movements of the three monetary systems.

Knowledge and experience about the currencies' price behaviour before and during crisis periods are the key fundamentals in successfully trading in the forex market. Part of having a solid base of trading knowledge lies in knowing how these three monetary systems generally relate with and react against each other during the crisis period. This study therefore has three objectives: a) to determine the momentum and contrarian investment strategy in cryptocurrencies, fiat money, and gold markets, before and during the Covid-19 pandemic crisis; b) to determine the leading monetary system before and during the Covid-19 pandemic crisis; c) to identify a safe haven investment asset among the three types of currencies during the Covid-19 pandemic crisis and also determine whether there is any divarication investment strategy between the three monetary systems during and after Covid-19.

Literature Review

Currencies are a central feature in our current economic system, but not always. As an invention, money has arisen from inefficiencies in the trade mechanism, which has existed since the early days of human civilization. The world has witnessed the development of the three monetary systems that have been widely accepted for international trader, which are gold standard, fiat money and cryptocurrencies. Gold's function as a replacement currency represents its traditional position as a medium of exchange (Baur, 2010) and is a precious resource widely coveted throughout numerous cultures. The position of Gold as a substitute currency is often connected by recent US dollar price hedge positions (Sjaastad, L. A., 2008; Zagaglia & Marzo, 2013), with a close connection to its market stability rather than certain macroeconomic and financial factors (Batten, Ciner & Lucey, 2010). The financial literature regarding gold has attracted further interest from regulators, fund managers and risk assessors with particular focus on gold serving as a substitute currency, safe haven asset of inflation hedge, with the hope that the usage of gold may allow the achievement of greater risk diversification in investors' portfolios.

For years now, risk managers and financial media have been intrigued by the growing Gold valuation and the falling USD valuation. In comparison, the usage of gold as a safe haven against USD change or as a safe haven in times of recession against the peaks in USD is on the rise. As the dollar decreases in value in comparison with other currencies, along with the fact that gold is priced in dollars mainly, it becomes comparatively easier to import and to boost the market for goods from international buyers. This rise in external demand therefore influences the dollar price of gold to increase, creating a negative connection between gold and the pound. Furthermore, gold serves as a global trading commodity and is an advantage for investors which can potentially rationalize the rise in demand and the appreciation of the gold price during times of crisis and volatility.

The possible relationship between gold and currencies, especially US dollars, has been explored by a few econometric methods. The function of gold in the monetary sector (GBP, USD, and JPY) under the univariate GARCH method was analyzed in Capie et al. (2005) and it was found that gold and USD were adversely linked. In order to examine the link between gold and USD, Joy (2011) implemented DCC-GARCH to allow feedback from these two assets. He explored how gold will function in the form of a dynamic condition's association toward the U.S. currency, utilizing a standard for stable, circumstances that has been reliable over the past 23 years. He suggested that the hedging property was greater than found to be by Capie and al. (2005), but not significant enough to be safe haven.

The bivariate GARCH (see Engle, 2002) and versions of BEKK (see Spargoli & Zagaglia, 2008) were used by Zagaglia and Marzo (2013), and they observed that the 2007 crisis did not influence the co-movement. A copula strategy was used by Reboredo (2013) to

investigate gold as a safe haven against the US dollar to determine the significance of the unconditional dependence between gold and the currency to see whether it is in accordance with the view that gold will serve as a buffer against US currency-value volatility. The degree to which gold can be shown to be successful either in the drastic upside or downside cycle is often seen to be a symmetrical threshold dependency between dollars and the gold exchange rate. The dependence structure of Reboredo (2013) draws diametrical conclusions from Joy (2011) and argues that gold can act as an effective safe haven against the extreme U.S index. Marzo and Zagaglia (2010) used the GARCH model and found that the shocks of the exogenous volatility had raised the market's uncertainty to generate a stable price for gold, rather than the US Dollar. Ghosh, Levin, Macmillan and Wright (2002) note that gold will function as a long-term inflation buffer because gold price fluctuations correlate with US price rates. Figuerola-Ferretti and Gonzalo (2010) provide an equilibrium model of non-linear market discovery that found gold and silver do not act as suitable shields for the same types of risk, under strong dollar and low volatility. As for momentum (contrarian), Caliskan and Najand (2016) observed that after substantially favorable (negative) stock level, the price of gold continues to rise (drop). In commodity futures markets including silver and gold, Miffre and Rallis (2007) established 13 competitive momentum strategies. Erb and Harvey (2006) demonstrated that a 12-month and one-month momentum approach in the same markets is competitive profit-wise.

In addition, the exacerbated financial instability in the new millennium has disrupted the US dollar's monopoly. Chinn and Frankel (2006) believed that the euro could be detrimental to the US dollar as the key global reserve currency by 2020. The dollar's position as the global reserve currency is accepted by the advocates; and the dollar tends to control the international economy because of network externalities (contagion or network); but critics (including the prominent British economist, John Maynard Keynes) reject the notion of a single dominant reserve currency (Taskinsoy, 2019).

After the introduction of the euro with the country-specific effects model, Pérez-Rodríguez (2006) discovered correlations between the EUR, GBP and JPY. Throughout this analysis, the relationship between these currencies is shown to fluctuate substantially over the time from 1999–2004 and throughout, there was a strong association between the EUR and GBP. Boero et al. (2010) also demonstrate improvements in the bivariate structure at three pairs of exchange rates calculated against the USD with non-parametric plotting and with a rigorous semi-parametric approach to approximate copula models. The EUR-GBP and the EUR-JPY pairs demonstrate the main improvements in the first years after the euro launch, while the extent of reliance between the EUR and the Swiss franc persists. Patton (2006) was able to identify more associated pairs between the Swiss franc and the USD and JPY-USD in depreciating relative to the USD than in appreciating them. He reveals that the dependency of the exchange rates between the DEM / USD and JPY / USD is asymmetrical by using a time-

varied copula model. He also notices that the degree of dependence is greater than when the currencies depreciate.

Tamakoshi and Hamori (2014) discuss how Europe's recent financial crisis has influenced the projected DCCs among the currency markets that have demonstrated higher dependence during joint appreciation cycles than during joint depreciation times. Through applying a standard copula method, Loaiza-Maya et al. (2015) checked the contagion of six Latin American countries in the exchange rates. Their results showed that Argentina, Chile, Colombia, and Mexico had more contagion with one another, and that even in times of substantial currency decline and appreciation there were variations in contagion.

Further, the EUR / USD and JPY / USD dependence levels were investigated by Dias and Embrechts (2010). They employed a copula-GARCH approach that varied over time with the suggested definition for interdependence, thereby providing stronger results than alternate dynamic model benchmarks. Nekhili et al. (2002) examined the analytical distribution of exchange rates for USD/ DEM at various frequencies and related them to well-known constant time processes. However, the cross-wavelet method utilized by Nikkinen et al. (2011) analyzed interdependence and revealed the exchange rate lead-lag relationship over multiple timescales. The three global currencies (euro, pound, and yen) vis-à-vis the U.S. dollar were strongly correlated over various time scales and the predicted exchange rate likelihood densities indicated significant lead-lag relationships.

With innovation of cryptocurrencies as a new monetary system, Bitcoin is considered as one of the most popular and used cryptocurrencies worldwide, having both restricted availability and shorter-term supply inelasticity, which is like gold (Dwyer, 2015). In addition to having an inherent value absence like fiat money (Selgin, 2015), bitcoin's scarcity is believed to be the reason for the notion of it being considered as a digital commodity currency. The case of freely circulating currency today (Friedman, 1953) notes that nation states should preserve fiscal freedom to prevent economic instability. The uniqueness in cryptocurrencies is that they are genuinely supranational, physical, and autonomous. There are some of the properties of gold in cryptocurrencies too: availability is limited, and they are both fungible and universal (Dwyer, 2015). Nevertheless, it is worth mentioning that the position of the nation state in monetary relations (Plassaras, 2013) still poses the biggest hurdle for widespread acceptance of cryptocurrencies. Successful digital currencies such as Bitcoin actually do not have an impetus for national governments to implement. Widespread use of cryptocurrency may also weaken the power of central banks.

Many have defined cryptocurrency as "a currency", as stated. Nevertheless, currencies are signed with a fixed rate of adoption. If Bitcoin-style cryptocurrencies are currencies, do they behave like them? However, limited research is available that utilized sophisticated

analysis methods, including the multifractal Quantile Non-linear Distributed Lag (QNARdL) model and Copulas, to address the issue of whether Bitcoin is valuable as a currency or not. Nevertheless, in 2013, it was argued that the bulk of essential roles of currencies were not carried out by Bitcoin (Yermack, 2013). He argued that cryptocurrencies have lost substantial market utility and are of low interest. A variation of the nonlinear ARDL (NARDL) model was used by Bouri et al. (2018) after adding Quantile regression, known as a Quantile Nonlinear Autoregressive Distributed Lag (QNARDL). This allows for asymmetrical action and asymmetry in the distribution of the location of the dependent variable. The analysis of the QARDL showed that the relationship between Bitcoin price and gold price is statistically significant, but differs in the short and extended terms, with an asymmetric, non-linear and quantile dependency that shares some specific fundamental factors between the Bitcoin and gold markets (Bouri et al., 2018).

Multifractal asymmetrical detrended cross-correlation analysis (MF-ADCCA) can quantify the scaling nature of a variety of peculiarities in cross-relations as the time series rises or drops (Marinakis, 1994). Usage of the MF-ADCCA among the main traditional currencies (Swiss Franc, British pound, Yen and Australian dollars) and cryptocurrencies (Bitcoin, Litecoin, Ripple, Monero, Dash) shows that Bitcoin and its fork, Litecoin, are among the cryptocurrencies with the highest multifractal conduct. Less multifractal activity is generally found in smaller cryptocurrencies, such as Monero and Ripple (Kristjanpoller & Bouri, 2019). Average motions and joint intense movement between time series are distinguished by copulas that allow researchers to quantify both tail dependency and asymmetric dependency (Bouri et al., 2018). Application of Copulas together with the Granger causality test shows that global financial stress contributes to Bitcoin returns from the left tail (low performance) and the right tail (higher performance). This is not found in the middle (average performance), however. This means that Bitcoin can serve as a safe haven for nearly 60 days against global financial turmoil (Bouri et al., 2018).

Bitcoin, being open to momentum and contrarian strategies is implied by studies from Jiang, Nie and Ruan (2018), Al- Yahyaee, Mensi and Yogae (2018), Cheah, Mishra, Parhi and Zhang, (2018), to be inefficient, and such findings are complemented by other studies suggesting that the cryptocurrency markets are extremely volatile (Dyhrberg, 2016; Katsiampa, 2017; Baur, Hong & Lee, 2018). Furthermore, Corbet, Lucey, and Yarovya (2018) as well as Cheung, Roca, and Su (2015) showed crypto-currency bubbles, further complementing the notion of the Bitcoin market being speculative. The diversification potential of Bitcoin is explored in another series of studies on volatility clustering in this regard by Bariviera (2017) and Phillip, Chan and Peiris (2018). Bitcoin has diversification benefits, as reported by Dyhrberg (2016), while Research from Baur, Dimpfl, and Kuck (2017) reported the statistical properties (first and second periods, with correlation) of Bitcoin to be distinct from the gold and dollar properties. Besides, this is corroborated by Bouri,

Jalkh, Molnár and Rouhausd (2017), Bouri, Molnár, Azzi, Roubaud, and Hagfors (2017) and Feng, Wang and Zhang (2018), as a strong hedge alongside the e safe haven properties of Bitcoin.

Dyhrberg (2016) explores the value of Bitcoin for investors and assesses the hedging attributes and argues in favor of hedging capabilities of cryptocurrency, and that it should be used in a portfolio to reduce potential adverse risk effects. Bouoiyour and Selmi (2017) examined how Bitcoin may serve as a safe haven and hedge in the U.S. financial markets, and found Bitcoin's position as a safe haven and hedge differs across time (time-variant), and it offers weak safe haven features in the short and long terms. More recently, al-Khazali et al. (2018) revealed that a gold reaction was more pronounced than the Bitcoin reaction from positive and negative macroeconomic shocks or news. In fact, contrary to Bitcoin, which is termed as digital gold by some, real gold returns and volatility respond more consistently, in spite of its recognized role as a safe haven, in response to macroeconomic shocks or news. As can be seen from the brief discussion, the literature is incomplete in terms of examining time-varying properties of Bitcoin in the crisis periods. Hence, we are trying to examine, in this paper, the investment strategy and safe haven properties of Bitcoin and other monetary systems through Wavelet model.

Data and Data Sources

The study employed the daily data for modeling the co-movement association among the three monetary systems, which are cryptocurrency (Bitcoin currency), Gold Standard (the CMX Gold future (100 ounce) and Fiat money that was dominant in the U.S dollar index covering the period from 1st January, 2015 to 19th June, 2020, resulting in a total of 1411 observations, In which, the US Dollar Index denotes the measurement value of the US dollar in relation to a basket of foreign currencies including Euro (EUR), Japanese yen (JPY) Pound sterling (GBP), Canadian dollar (CAD), and Swedish krona (SEK), Swiss franc (CHF) in the fiat money system. These data were extracted from https://www.investing.com/.

Methodology

Decomposition

To determine the diversification strategy, the time series data (noisy signal) at level N should be decomposed first as proposed by Berghorn (2015). Several types of wavelet methods are available to calculate wavelet decomposition at N level, e.g., Daubechies, Harr and Symlets, etc. We used Symlet at a level of 4 for our analysis, since Symlet is known as the most appropriate choice for signal decomposition for a sample such as ours as also used by Jammazi et. al. (2015).

The transformed time series wavelet function can therefore be defined as:

$$Y(t) \approx \sum_b S_{a,b}\, \phi_{a,b}(t) + \sum_b d_{a,b}\, \psi_{a,b}(t) + \sum_b d_{a-1,b}\, \psi_{a-1,b}(t)$$
$$+ \cdots \sum_b d_{1,b}\, \psi_{1,b}(t) \tag{1}$$

where: a^1 corresponds to the number of cycles or frequencies (dilation controlling parameters); b refers to the number of parameters (translation-controlling) or the coefficients; $\phi_{a,b}(t)$ is the father wavelet function, and $\psi_{1,b}(t)$ is the mother wavelet function. They both are defined as:

$$\phi_{a,b}(t) = 2^{-\frac{a}{2}}\, \phi(2^{-a}\, t - b) \tag{2}$$

$$\psi_{a,b}(t) = 2^{-\frac{a}{2}}\, \psi(2^{-a}\, t - b)$$

Father wavelet represents low frequency or smooth time series parts, and mother wavelet represents high frequencies or detailed parts.

The scaling function $\phi_{a,b}(t)$ can be used to produce $S_{a,b}$ approximating coefficients or smooth coefficients as defined below:

$$S_{a,b} \approx \int \phi_{a,b}(t)\, Y(t)\, dt \tag{3}$$

By elaborating the wavelet function $\psi_{a,b}(t)$, the wavelet feature $d_{a,b}$ wavelet coefficients or description coefficients can be obtained. This can be formulated as:

$$d_{a,b} \approx \int \psi_{a,b}(t)\, Y(t)\, dt \tag{4}$$

These coefficients measure the total contribution of wavelet functions to the total time series (Masih et al., 2010).

The Continuous Wavelet

We then use the wavelet coherence framework as defined by Morlet (1982) to explain the co-movement and examine interdependence between the monetary systems in terms of both frequency and time.

$$\Psi_{a,b}(t) = \frac{1}{\sqrt{b}}\, \varphi\left(\frac{t-a}{b}\right), \Psi(.) \subset L^2(\mathbb{R}) \tag{5}$$

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1. In the case of a discrete signal $Y(t)$ of a supposed length 2^a, the nexus has to be: $N \geq 2^a$

where: a denotes the time domain that specifies the wavelet's exact location and b corresponds to its position on the frequency domain. Through factor $\frac{1}{\sqrt{b}}$, normalization is done to get the wavelet unit variance (Yang, Jing Cai, & Hamori 2017).

Following Rua and Nunes (2009) and Yang, Jing Cai and Hamori (2017), the continuous wavelet transformation (CWT) is deployed. The defined form for CWT is:

$$W_x(a,b) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{b}} \Psi\left(\frac{t-a}{b}\right) dt \tag{6}$$

The CWT is estimated by $w_{x(a,b)}$ through the basis of projection of mother wavelet Ψ on the sample time series $x(t) \in l^2$ (R). CWT will decompose and reconstruct the function $x(t) \in l^2$ (R) as the following:

$$x(t) = \frac{1}{C_\psi} \int_0^{\infty} \left[\int_{-\infty}^{\infty} W_x(a,b)\psi_{a,b}(t)da\right] \frac{db}{b^2}, b > 0 \tag{7}$$

For power spectrum analysis, variances may be representated as:

$$\|x\|^2 = \frac{1}{C_\psi} \int_0^{\infty} [|W_x(a,b)|^2 \, da] \frac{db}{b^2}, b > 0 \tag{8}$$

where: the square power of of $|W_x(a,b)|$ represent wavelet power spectrum which can explicate the range of local variance x (t) scale by scale (Yang, et al, 2017).

According to Torrence and Webster (1999), wavelet coherence of two time series can be defined as:

$$R_n^2(b) = \frac{IB\left(b^{-1}W_n^{xy}(b)\right)I^2}{B\left(b^{-1}IW_n^x(b)\right)I^2 . B\left(b^{-1}IW_n^y(b)\right)I^2} \tag{9}$$

whereas b is a wavelet scale, and B is a smoothing parameter. The continuous transform of the time series Y is represented by Wn^x(b). The X and Y Time Series cross-wavelet transforms are represented by Wn^{xy} (b).

The phase pattern

We used the wavelet phase difference following Bloomfield (2004) to assess the dependency and causality between different monetary systems. For the two-time series of x(t) and y(t), the phase difference among them is represented as follows:

$$\emptyset_{xy} = tan^{-1}\left(\frac{\Im\left\{B\left(b^{-1}W_{xy}(a,b)\right)\right\}}{\Re\left\{B\left(b^{-1}W_{xy}(a,b)\right)\right\}}\right),$$

(10)

$with\ \psi_{xy} \in [-\pi, \pi]$

Arrows reflect phase patterns on the wavelet coherence maps. These phase patterns also elucidate the causality between two variables. We may explain that, if the arrow points to the right, X (t) and Y (t) are in-phase. On the other hand, if the arrow points to the left, X (t) and Y (t), are anti-phase. Arrows can also explain the causal relationship between the two variables. In this case, if the arrow points left-up or right-down, it denotes that X (t) follows Y (t). If the arrow points left-down or right-up, it suggests that Y (t) follows X (t) (Yang et al., 2017; Pal & Mitra, 2017).

Findings and Discussion

Descriptive Statistics

To describe the daily market prices behavior of the Bitcoin currency, gold and U.S dollar index, several descriptive statistics tests were conducted and their results are shown in Table 1, which displays the average daily price of USD 4329.024; USD 96.28623, and USD 1349.498 for Bitcoin currency, gold and U.S dollar index respectively. The average daily risk of 4000.351, 2.769857 and 130.2146 are as measured by standard deviation. It revealed that the market prices of the three forms of currencies were more highly volatilized.

Table 1. Descriptive statistics for Bitcoin, dollar index and gold during the period of the study

	BITCOIN	DOLLAR_INDEX	GOLD
Mean	4329.024	96.28623	1349.498
Median	3611.500	96.49000	1327.600
Maximum	18972.30	103.6050	1768.900
Minimum	164.9000	88.50500	1070.800
Std. Dev.	4000.351	2.769857	130.2146
Skewness	0.631871	-0.293657	1.019642
Kurtosis	2.482158	3.266915	4.254410
Jarque-Bera	109.6586	24.46801	337.0069
Probability	0.000000	0.000005	0.000000
Observations	1411	1411	1411

Furthermore, Table 1 shows that the skewness values for the variables range from -0.293657 to +1.019642, with only one extreme value being outside the -1 to +1 limit as recommended by Hair et al. (2006), which is the Gold market prices distribution with the value of 1.019642. The positive skewness indicates a greater probability of a larger increase in each variable than a decrease, while the negative sign is reversed. Thus, since the Bitcoin and gold market prices were skewed to the right, it inferred that the price would increase in the near future if the distribution continued to be skewed to the right. Nevertheless, the dollar index was skewed to the left, inferring that the price would decrease in the near future if the distribution continued to be skewed to the left. Additionally, Table 1 shows that the kurtosis values of the daily prices for Dollar index and gold are distanced from normality as the range value of the Kurtosis is more than threshold of 3 as recommended by Stock and Watson (2006). Further, the normality test by Jacque-Berra (2016) rejects the null hypothesis of normal distribution at 1% significant level of for all variables.

Decomposition and Coherence Analysis

As the aim of the study was to determine the investment strategy for different monetary systems before and during the Covid-19 pandemic, and to ascertain the leading monetary system before and during covid-19 pandemic crisis. as well as to investigate whether investors in the forex market would be able to find an investment asset that could be characterized as a safe haven asset among the three monetary systems. In other words, whether there is any diversification investment strategy between the three monetary systems at the height of and towards the later phases of the Convid-19 pandemic.

Toward this end, we first decomposed the monetary system series using wavelet, then reconstructed the approximations to determine the appropriate investment strategy. Secondly, the sensitivity of different monetary systems with each other are explored at various investment horizons by analyzing their time and frequency dynamics. This helped us to determine whether these asset classes, through having a relatively lower correlation, could offer a safe haven asset during a pandemic at various investment horizons. This would also help us see the lead-lag relationship among the three monetary systems.

Decomposition Investment Strategy (Momentum and Contrarian Strategy)

As mentioned before, to ascertain the appropriate investment strategy, we decomposed the time series using wavelet, and then reconstructed them using approximation coefficients at a scale of 1 to 6. The figures (1,2, and 3) show the outcomes. The red line graphs are the original time series signal, whereas the green line graphs on the right side are the volatility at different scales. Finally, the blue line graphs are the reconstructed time series based on the approximated signal resulting from the decomposition.

Momentum and Contrarian Investment Strategy in Bitcoin Currency Market

As can be seen from Figure 1, an investor with momentum strategy can consider investing in Bitcoin market as its price index is going up trend-wise during the Covid-19 pandemic crisis. On the other hand, those with contrarian strategy may have reason for concern as the upward trend is not sustainable in the long run. In this case, contrarian strategy seems to be appropriate as Bitcoin price may have reached its peak already. Any further increase will be just overvaluation and will further weaken the investor's buying power. This finding is consistent with studies by Jiang, Nie and Ruan (2018), Al- Yahyaee, Mensi and Yogae (2018), Cheah, Mishra, Parhi and Zhang, (2018), which suggest that Bitcoin is prone to inefficiency. This could imply, according to our understanding, the Bitcoin market is being opened to momentum and contrarian strategies. However, we cannot determine a preferred investment strategy just yet. For that reason, we will need to use wavelet coherence to examine the degree of correlation between Bitcoin and other monetary systems during the Covid-19 pandemic, and whether this correlation is in-phase or not as discussed in the second section of the coherence analysis.
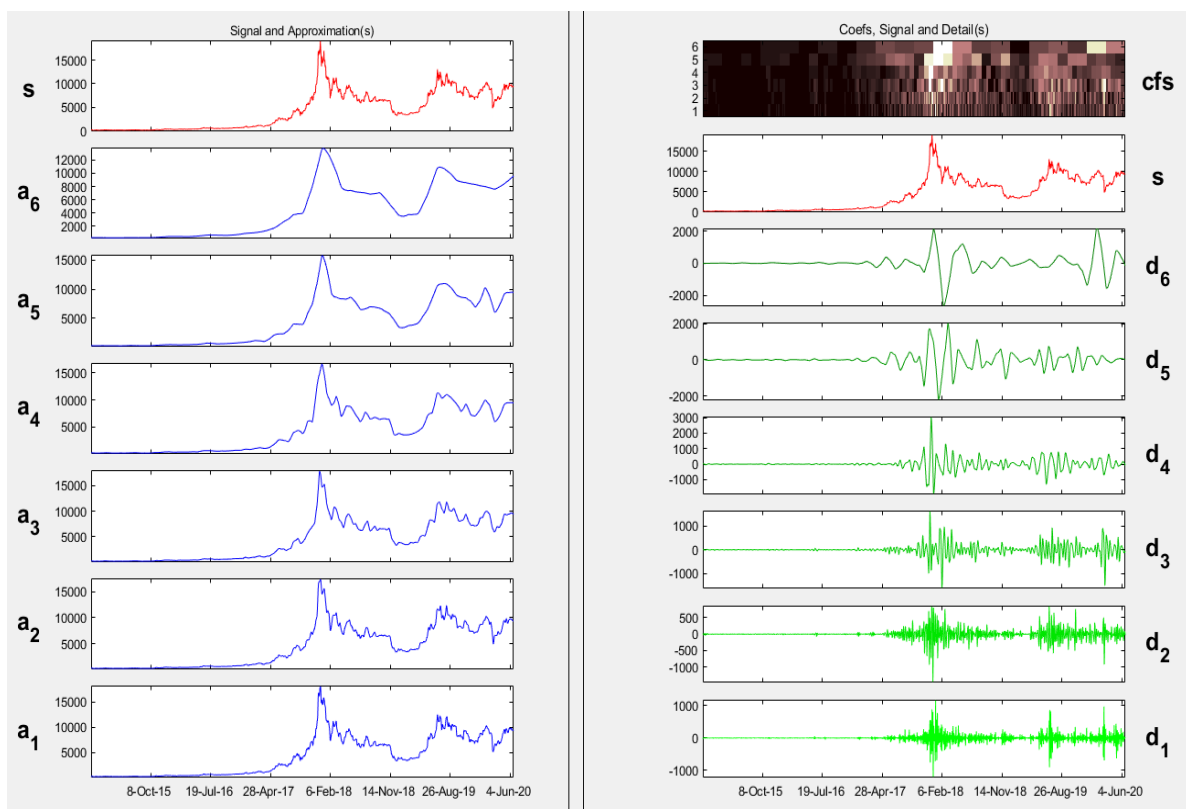

Figure 1. Bitcoin Market Trend

Momentum and Contrarian Investment Strategy in Gold market

As illustrated in Figure 2, gold is also having a bullish run, which is going through the roof during the period of the Covid-19 pandemic. This is largely attributed to the panic buying of gold during the crisis period. Hence, momentum investment strategy followers can invest in gold, whereas those with contrarian strategy need to be cautious in investing in Gold during the Covid-19 crisis as the sharp spike in the volatility is foretelling. This is consistent with research done by Sjaastad, L. A. (2008), Zagaglia and Marzo (2013) who found people resorting to gold in times of crisis, thereby pushing the price of gold high. This is particularly relevant among short-term investors as revealed by Bredin, Conlon and Potì (2015).
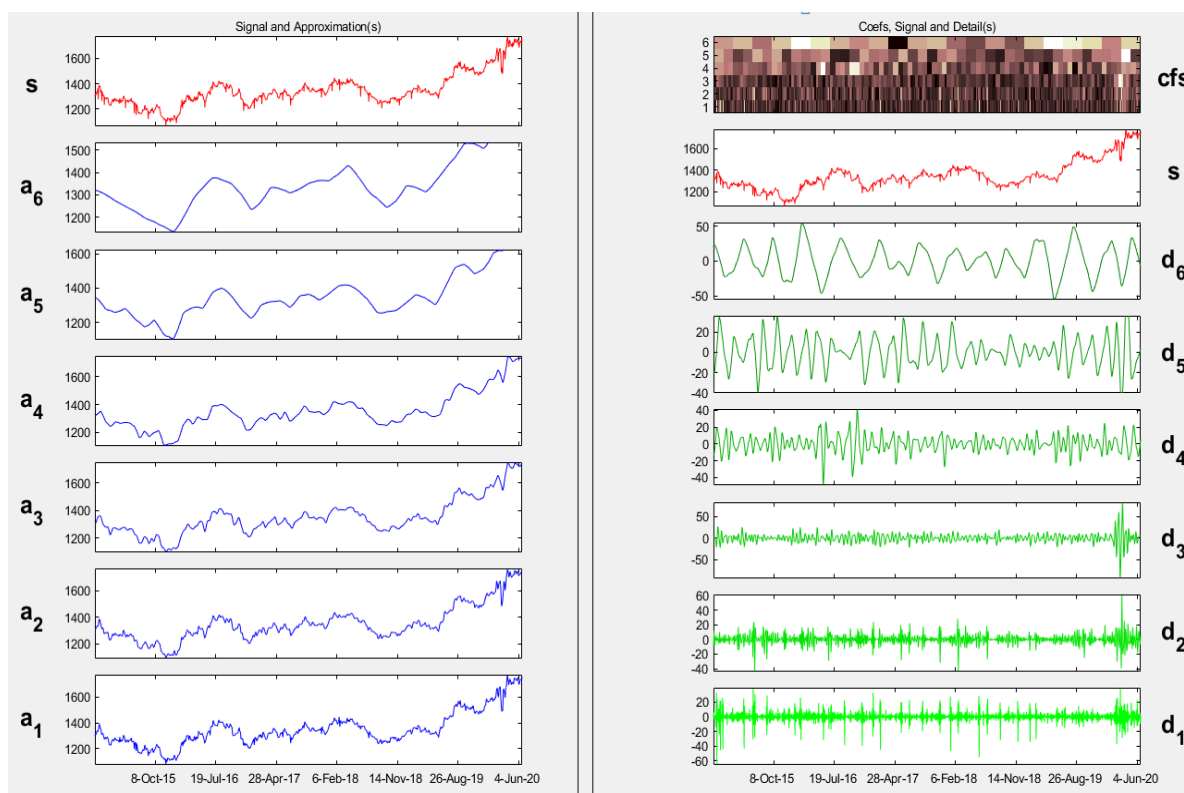

Figure 2. Gold Market Trend

Momentum and Contrarian Investment Strategy in US Dollar market

As depicted in Figure 3, US dollar index faced a downward trend largely during the crisis periods such in early 2018, when US imposed a wide range of tariffs on goods imported from China, Canada and the European Union, and as those entities retaliated by imposing tariffs on US goods also, the US economy and consequently, the US Dollar suffered. This is captured in the analysis as we can see a large drop in early 2018. However, the US dollar recovered, as

depicted by an upward trend after mid-2018. further, when the Covid-19 crisis occurred and the price war erupted in early 2020, the US dollar started dropping again. Hence, we can conclude that the US dollar is not a good option for momentum investment strategy during a crisis, while the long-run contrarian investment strategy is more advisable during crisis periods as the dollar index drops sharply in a crisis, when investors can buy and hold till the crisis is over when then can then sell. In other words, those with momentum investment strategy may chose not to invest in US dollar. However, investors with contrarian strategy may have reason to be optimistic, as the bearish trend will nr only short-term, and the US dollar is expected to bounce back owing to the huge stimulus package announced by US government. Here, contrarian strategy seems to preferable as it is most likely that the US dollar will recover sooner than later as Covid-19 starts to weaken. However, this finding rum contra to studies from Goldberg and Tille (2006) who argued for an insulation of dollar against market shocks during a period of uncertainty.
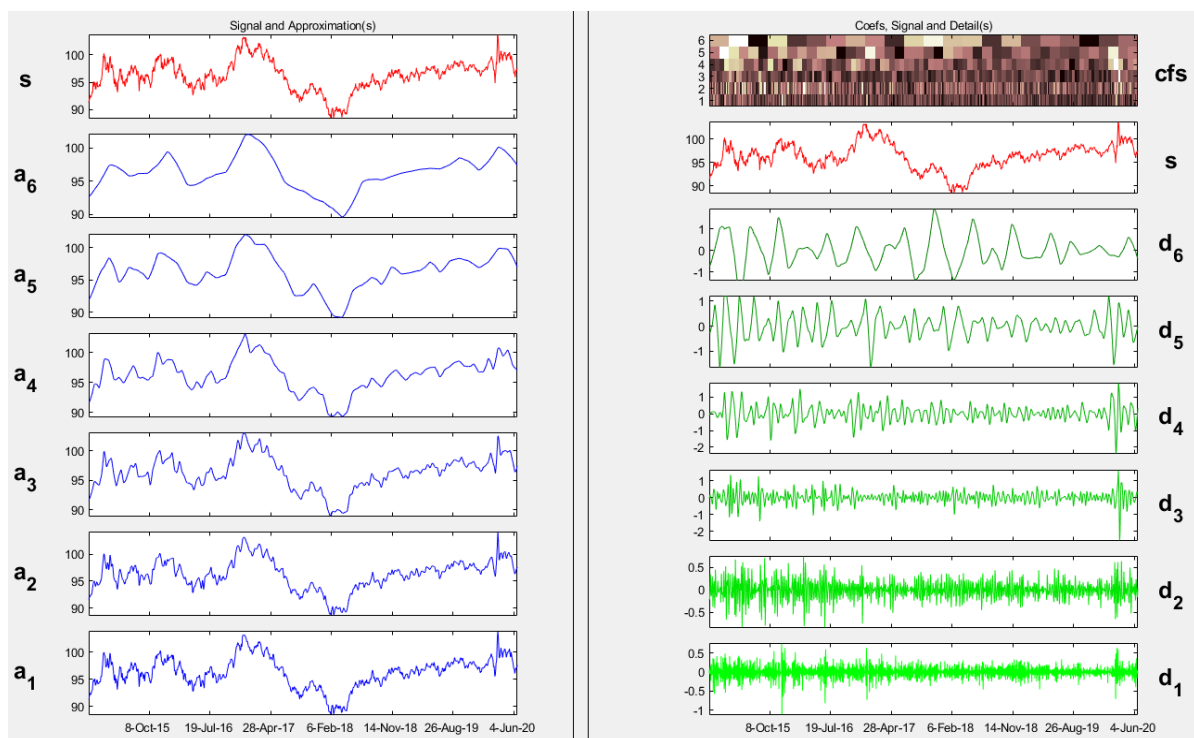

Figure 3. US Dollar Market Trend

Coherence Analysis (Led Lag, safe haven assets for Investment strategy)

Moving forward, to explore the diversification strategy and observe the lead-lag relationship, we analyzed the time-frequency dynamics through wavelet coherence. Figures 4, 5, and 6 display the Wavelet coherences among the different monetary systems. The yellow zone in the sample area on the right (left) side of the wavelet coherence (WTC) implies that there is a

substantial correlation at the beginning (end) of the sampled period. Cold areas outside the main areas represent time and frequencies without significant correlation. The arrows pointing up and refer to the causal link between different monetary systems. Left-down or right-up arrows refer to the first variable being in the lead whereas left-down/or right-up arrows indicate that the second variable is leading.

Bitcoin vs Gold

As illustrated in Figure 4, the degree of association between Bitcoin and gold was insignificant for the period before the pandemic in the horizon between 64 and 256 weeks, while in some of those between 64 and 128 weeks, we note a strong correlation during the pandemic, while In comparison, for 32- to 64-week sampling period, there were three strong correlation periods in mid-2016, early-2018 and then from late-2018 which continued until the end of the sample period. For the shorter-term investor horizons, there were patches of strong correlation here and there, but it was very prominent in early 2020, which included the Covid-19 pandemic times as well. Therefore, we can see that for longer terms such as 128-week to 256-week horizons, for investors of either gold or Bitcoin, they can be a safe haven for one another during pandemic times. However, for 8-week to 64-week horizon, either gold or Bitcoin does not seem to provide a safe haven for the other to limit their exposure to market downturns in the pandemic periods.
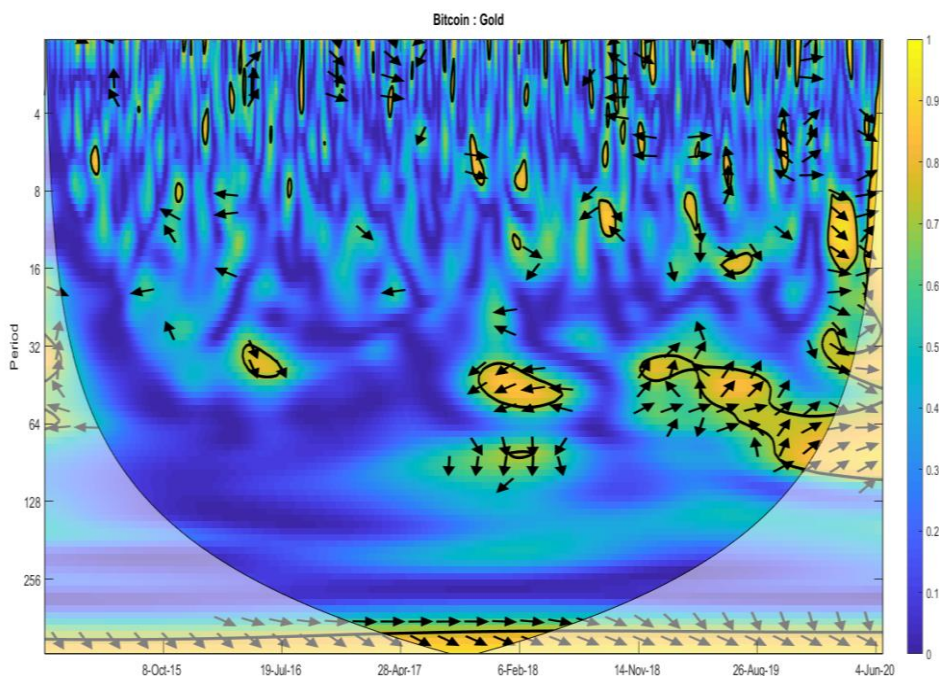

Figure 4. Bitcoin vs Gold

Moreover, the correlation between Bitcoin and gold implies that of a complex partnership. They mostly had an anti-phase relationship before the Covid-19 pandemic, but

during the pandemic period, they appeared to be in a phase suggesting that they were moving together across different horizons. This is understandable as market demand for both showed an uptrend during the pandemic times. Also, we note that during pandemic times, gold led Bitcoin for a 32-week to 128-week horizon. However, for the shorter term of an eight-week to early 32-week horizon, Bitcoin led at the beginning of the pandemic, but then it started following gold for the remainder of the sample period. This finding is in line with Bouri et al. (2018) who used a variation nonlinear ARDL (NARDL) after adding Quantile regression, known as QNARDL. Their analysis revealed that the association between Bitcoin price and gold price is statistically significant, but differs in the short and long terms, with an asymmetric, non-linear and quantile dependency (Bouri et al., 2018).

Bitcoin vs US Dollar

As depicted in Figure 5, for the whole sample period for horizon of 64 to 256 weeks, the degree of correlation between Bitcoin and US dollar was only significant between early-2017 to mid-2018. In comparison, for 32- to 64-week horizon of the sample period, in mid-2018, there was a strong correlation, while during pandemic times the correlation was insignificant. We also see pockets of correlation here and there for the shorter-term investor horizons, but it was still insignificant in the pandemic times. This implies that for Bitcoin and US dollar investors, one can act for the other as a safe haven across different investor horizons to limit their vulnerability to market disruptions during the Covid-19 pandemic.
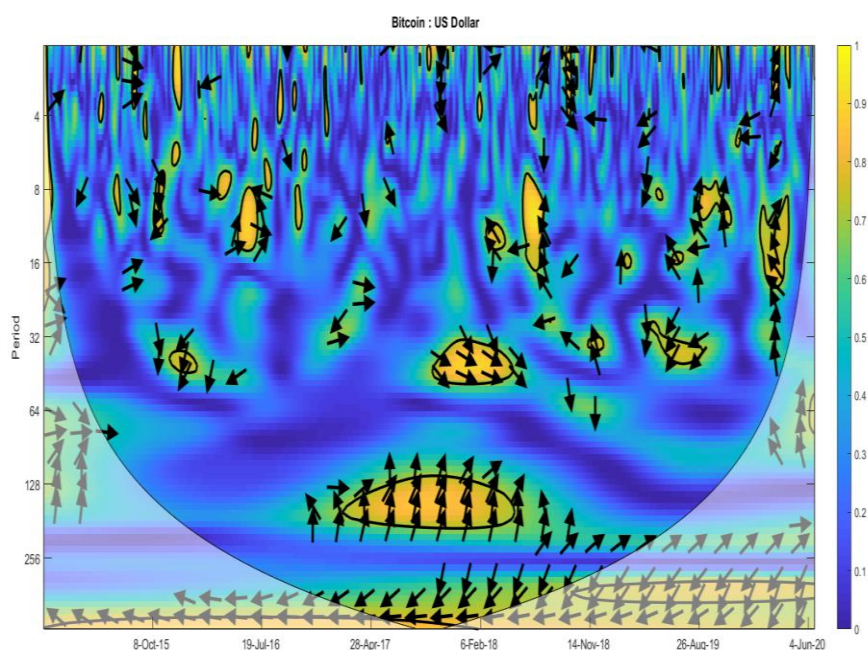

Figure 5. Bitcoin vs US Dollar

Furthermore, the correlation between Bitcoin and US dollar also suggests that they have a dynamic relationship. Until 2018, they mostly had a mixed relationship across horizons alternating between being in-phase and anti-phase. However, for the latter half of the sample period, they mostly had an anti-phase relationship. We also note that for the first half of the sample period, US dollar mostly led Bitcoin, while for the latter half, the reverse was the case across different horizons. This finding is supported by studies from Baur, Dimpfl, and Kuck (2017) found in first and second periods, with correlation, the statistical properties of Bitcoin to be distinct from dollar properties.

Gold vs US Dollar

In Figure 6, as exposed, the degree of correlation between gold and the US dollar was significant for the period from early-2016 to early-2018 for the 128- to 256-week horizon, but not significant during pandemic times. For the short to mid-term horizons between eight and 64 weeks, the correlation was significant in patches in mid-2015, mid-2017, mid-2018, mid-2019, and mid- 2020, which included the beginning of the covid-19 pandemic as well. However, for the other shorter-term horizons of four to eight weeks, the correlation was insignificant during covid-19 pandemic times. This implies that for investors of gold and US dollars, one can serve as a safe haven for the other across all horizons, except 8- to 32-week horizons.
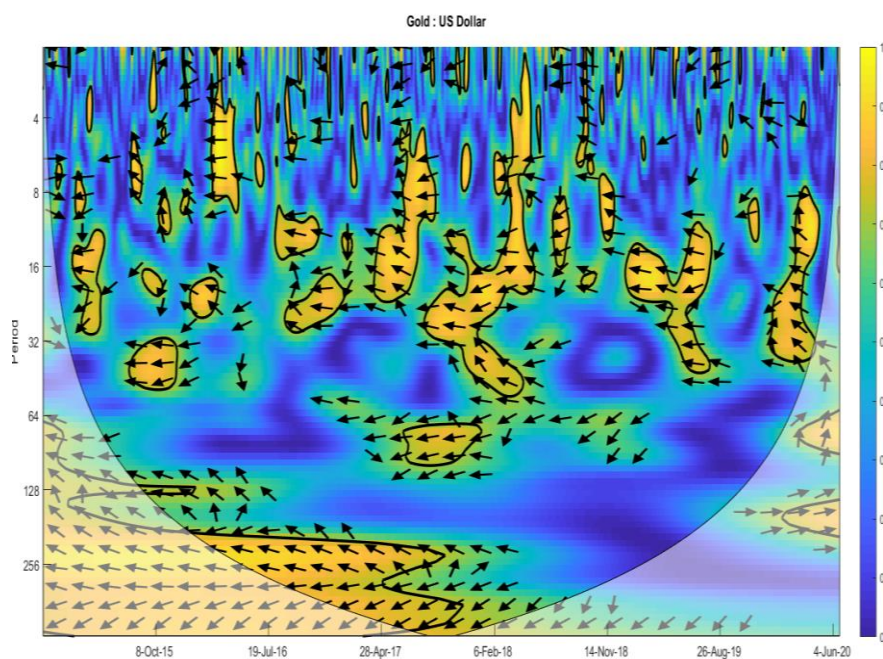

Figure 6. Gold vs US Dollar

The relationship between gold and the US dollar often suggests a similar pattern of being anti-phase, implying that one moves against the other. This is observed throughout the

sample period. We also find that Gold led the US dollar throughout most of the sample period, except in some periods in mid-2015 and mid-2018 for some investor horizons. For our focus period of Covid-19, gold led the US dollar where the correlation was significant. The wavelet coherence is consistent with the research by Joy (2011) who showed that gold has been the safe haven and hedge against the US dollar over the last 23 years - that is, on average, a gold-price gain has been adversely linked to US dollar returns. However, this must be taken with caution as evidenced by Hood and Malik (2013); Gürgün and Ünalmış (2014), and Bampinas and Panagiotidis (2015) who maintain that these benefits have varying efficacies, in various financial markets and over time.

Conclusion

This study had three main aims: first, it endeavoured to determine the momentum and contrarian investment strategy in cryptocurrencies, fiat money, and gold markets before and during the Covid-19 pandemic crisis. Second, the study sought to determine the leading monetary system before and during the Covid-19 pandemic crisis, and third, it was to identify a safe haven investment asset among the three types of currencies during the Covid-19 pandemic crisis and also determine whether there is any divarication investment opportunity among the three monetary systems during and after the eventual end of the Convid-19 pandemic. To do so, the study first decomposed the monetary system series using wavelet model, then reconstructed the approximations to determine the appropriate investment strategy. Secondly, the sensitivity of different monetary systems with each other were explored at various investment horizons by analysing their time and frequency dynamics using the wavelet coherence framework. Findings of the study show that an investor with momentum strategy can consider investing in Bitcoin and Gold markets when the price index is going up trend-wise during Covid-19 pandemic crisis times. In this case of contrarian investment strategy, it seems to be appropriate for the cryptocurrency market as Bitcoin price may have reached its peak already, while investors need to be cautious about investing in gold during the Covid-19 crisis using the contrarian strategy as the sharp spike in the volatility is indicative. In contrast, the US dollar is not a good option for momentum investment strategy during a crisis period, while the counterion investment strategy is more advisable during crisis period as the dollar index drops sharply in a crisis period when investors can buy and hold until the crisis is over when they can sell.

The findings also indicate that Bitcoin currency was the leading monetary system during the pandemic crisis. In the short-term, such as an 8-week to early 32-week horizon, Bitcoin led at the beginning of the pandemic, before starting to follow gold for the remainder of the sample period. Furthermore, the US dollar mostly led Bitcoin during the non-crisis periods, while Bitcoin led the US dollar during the period of the pandemic crisis. Besides, the outcomes indicate that gold led the US dollar throughout most of the sample period,

especially during the period of Covid-19. These results therefore suggest that the current fiat monetary system can be re-designed or replaced by cryptocurrency system or gold standard, as these monetary systems could lead to economic stability during the crisis period. In other words, reform the monetary system that would remove the ability of banks to create money and return this power to public body, working in the interests of socio- economic stability and as a whole bring significant advantages during periods of crisis.

Moreover, the correlation between Bitcoin and gold implies a complex partnership, which was mostly an anti-phase relationship before the Covid-19 pandemic, while during the pandemic, they appear to be in a phase suggesting that they were moving together across different horizons. This was understandable as market demand for both was trending upwards during the pandemic. In contrast, Bitcoin and Fiat Money (dollar index) had strong correlation during the non-crisis period, while during the Covide-19 pandemic the correlation was statistically insignificant. Overall, the findings of this study will offer an effective investment stagey in developing an effective portfolio diversification strategy among the three monetary systems for investors in the forex market.

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Bibliographic information of this paper for citing: