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A Comparative Analysis of Hedging and Safe-Haven Properties of Cryptocurrencies and Commodities

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This paper examines the hedging and safe-haven properties of cryptocurrencies (stablecoins, non-stablecoins), and commodities (gold and crude oil) and compares the hedging and safe-haven properties of cryptocurrencies and commodities using daily closing prices from January 2018 to December 2024. The study adopts dynamic conditional correlation (DCC) model to generate dynamic correlations and estimate dummy variable regressions to test the hedging and safe-haven features of the instruments against stock returns of the G7 countries. Results indicate that gold has hedging and safe-haven capabilities, while crude oil is more of a safe-haven. Similar to gold, stablecoins exhibit hedging and safe-haven features, while non-stablecoins, like crude oil exhibit safe-haven features. Thus, the hedging and safe-haven properties of stablecoins are comparable to gold, while those of non-stablecoins are comparable to crude oil. These results imply that when discussing the hedging and safe-haven properties of cryptocurrencies, and traditional safe-haven and hedging instruments, it is important to distinguish between stablecoins and non-stablecoins, and gold from crude oil.

Keywords: Cryptocurrencies, crude oil, gold, hedging instrument, safe-haven asset, stablecoins, non-stablecoins

JEL Classification: E20, E22, E44, G11

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1. Introduction

The emergence of cryptocurrencies as alternative financial assets has no doubt reshaped the global financial ecosystem. Chaum (1983) laid the foundation of cryptocurrencies when he conceptualized the DigiCash. However, it remained muted until the launch of Bitcoin in 2009, which became a watershed in the development of digital currencies (Nakamoto, 2009). The market has since expanded to include

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a variety of cryptocurrencies such as stablecoins like Tether (USDT) and USD Coin (USDC), and non-stablecoins like Ethereum. The market for cryptocurrencies has also witnessed tremendous growth with Bitcoin and Ethereum leading the park with market capitalization of $2.1 trillion and $4 billion, respectively as at January 2025 (CoinMarketCap, 2025). This growth has attracted significant interest from scholars, who have sought to understand their price volatility, associated risk, and safe-haven and hedging behaviour (Holub & Johnson, 2018; Karimo & Ochoche, 2025).

Typically, safe-haven assets maintain their values or appreciate during periods of market stress, offering refuge for investors. Hedging instruments on the other hand, reduce investment risk by offsetting potential losses in one asset with gains from another (Kroner & Ng, 1998). Historically, commodities such as gold and crude oil, have exhibited these features. Gold, for instance, has long been considered as a safe-haven and a hedging instrument due to its intrinsic value, limited supply, and low or negative correlation with other asset classes (Baur & McDermott, 2010). Crude oil is more volatile, though, it could also serve as a hedge and safe-haven asset, particularly during geopolitical events affecting global oil supply (Sadorsky, 2001; Baur & Lucey, 2010; Reboredo, 2012).

However, the emergence of cryptocurrencies has triggered debates about their potential to rival Gold and Crude oil as hedging and safe-haven instruments (Chemkha *et al.*, 2021; Rashid *et al.*, 2022; Conlon *et al.*, 2025). The cryptocurrency market is in two segments: non-stablecoins and stablecoins. Bitcoin and Ethereum are two major coins in the non-stablecoins market. They dominate the digital asset landscape due to their decentralized architecture and investment appeal. Their inherent volatility raises questions about their reliability during periods of market stress, though, their decentralised nature, limited supply, and perceived resistance to inflation have led to speculations about their potential as safe-haven assets.

In contrast, fiat-collateralized stablecoins such as USDT (Tether) and USDC (USD Coin) are designed to maintain a stable value by being backed by reserves of traditional fiat currencies. Their low volatility and consistent peg to the U.S. dollar make them attractive candidates for risk-averse investors seeking stability in turbulent market conditions.

There is a burgeoning literature on the diversification, hedge and safe-haven benefits of cryptocurrencies and commodities, and the dissimilar behaviour of stablecoins and non-stablecoins (Karimo & Ochoche, 2025; Dyhrberg, 2016; Bouri *et al.*, 2017; Kristoufek, 2013). However, extant literature is bereft of studies comparing the safe-haven and hedging characteristics of stablecoins and non-stablecoins and commodities simultaneously.

Theoretically, the justification for comparing stablecoins and non-stablecoins as risk-management assets is rooted in the fundamental differences in their design and investor motivation/perception (Nguyen *et al.*, 2022; Nittayakamolphun *et al.*, 2022; Yan *et al.*, 2021; Baumöhl & Výrost, 2020; Wang *et al.*, 2020). Stablecoins (USDC, USDT) are designed to function as a store of value and a medium of exchange, which theoretically makes them highly analogous to fiat currency cash or near-money assets like Money Market Funds (MMFs). Based on the "flight-to-safety" dynamics, investors could flee into stablecoins during times of financial turmoil within the crypto space (or even broader markets) because of their low volatility and redeemability for fiat currency, implying that they are more likely to exhibit safe-haven or strong hedging properties.

Non-stablecoins (BTC, ETH), in contrast, are characterized by high volatility, no physical backing, and are driven significantly by speculation and investor sentiment. The speculative demand theory suggests that these assets behave more like highly volatile technology stocks during crises. This implies that they are more likely to be diversifiers during normal times but could fail as a safe-haven, or even correlate with risk assets, during a crash. The sharp contrast in their design features (stability vs. volatility) necessitates a separate empirical analysis of their risk-management roles.

The study addresses the problem of lack of a unified, three-way comparative framework that simultaneously assesses the distinct risk-management features of stablecoins, non-stablecoins, and key traditional commodities against stock indices. A critical gap in the existing literature is the limited empirical separation of cryptocurrencies. Most earlier studies grouped all cryptocurrencies together, primarily focusing on Bitcoin's role versus gold. There has been no deliberate attempt to distinguish the capabilities of stablecoins and non-stablecoins as hedges and safe-haven assets,

especially not in comparison with major commodities like Gold and Crude Oil. Also, there is the issue of incomplete Benchmarking. While some studies compare stablecoins to Bitcoin, or Bitcoin/Gold to Crude Oil, few simultaneously benchmark the newest financial technology (Stablecoins) against its speculative crypto peers (BTC/ETH) and the two dominant, yet distinct, traditional commodities (Gold/Oil). Moreso, since the emergence of cryptocurrencies, there has not been an event that put the global economy in a direr situation than the Covid-19, thus studies that examined the safe-haven behaviour of cryptocurrencies prior to the Covid-19 may have concluded too hastily. The current study fills this gap by providing an asset-class-specific roadmap for investors and policymakers, and using data that includes the period of Covid-19 to properly situate the hedging and safe-haven features of cryptocurrencies.

This study examines the hedging and safe-haven features of stablecoins, non-stablecoins, gold and crude oil, and compares these features for stablecoins versus non-stablecoins, gold versus crude oil, and cryptocurrencies against gold, and crude oil. The study contributes to extant literature by comparing two of the most prominent stablecoins (USDT and USDC) and non-stablecoins (Bitcoin and Ethereum) as hedging instruments and safe-haven assets for G7 countries (Canada, France, Germany, Italy, Japan, UK and the US) stocks, and against two notable global commodities (gold and crude oil) that have long been considered as hedging and safe-haven assets. We argue that stablecoins may exhibit distinct hedging and safe-haven properties compared to non-stablecoins. Due to their inherent stability, stablecoins may offer a more reliable hedge against market volatility and serve as a more effective safe-haven asset during periods of market distress. Conversely, non-stablecoins, with their volatile price movements, may not consistently provide the same level of hedging or safe-haven benefits.

Earlier studies focused primarily on Bitcoin, examining its correlation with traditional assets and its potential as a hedge against inflation (Dyhrberg, 2016). This is understandable since Bitcoin was the first and most prominent cryptocurrency. More recent studies have expanded the frontiers to include other cryptocurrencies, such as Ethereum, Litecoin, and Tether and have explored their behaviour during different

market conditions (Bouri *et al.*, 2017; Shahzad *et al.*, 2019), though, the literature is lacking in specific attempt to distinguish between the performance of stablecoins and non-stablecoins in these regards. We argue that concluding on the safe-haven features of cryptocurrencies without a clear demarcation between stablecoins and non-stablecoins may give a misleading posture.

Furthermore, we argue that stablecoin may compete more favourably with commodities as hedge and safe-haven assets compared to non-stablecoins. Gold's role as a time-tested haven is well-documented (Baur & Lucey, 2010), and crude oil's hedging properties have also been explored in depth. Recent studies, such as Klein *et al.* (2018), have begun to include Bitcoin in comparative analyses, examining its correlation with traditional assets during market turbulence. There is, however, limited empirical evidence on the comparability of stablecoins and non-stablecoins hedge and safe-haven properties against those of time-tested commodities like gold and crude oil.

Findings from this study have significant implications for investors, policymakers, and researchers. By understanding the hedging and safe-haven properties of stablecoins and non-stablecoins, investors can make more informed decisions about portfolio diversification and risk management strategies. Policymakers can gain insights into the potential role of stablecoins versus non-stablecoins in the financial system and the regulatory frameworks necessary to ensure their safe and responsible development. The study will open a new debate on cryptocurrencies expanding the frontiers of knowledge of their comparability with traditional hedge and safe-haven commodities.

The rest of the study is structured as follows: Section 2, provides a review of the literature highlighting the insights from theory and empirical studies; Section 3 is the methodology; Section 4 provides the results and discussion; and Section 5 presents the conclusion and policy implications.

2. Literature Review

2.1 Theoretical Literature

Theoretically, the hedging and safe-have features of an asset is based on its correlation with assets in the same portfolio. Thus, the correlation among financial assets

is critical for portfolio managers as they are useful tools for understanding the relationship that exists between assets (hedging, safe-haven asset or a diversifier) and for selecting assets to be included in a portfolio. The modern portfolio theory (MPT) provides the foundation for the analysis and underpins this study. Markowitz (1952 and 1959) formulated the MPT, which has become the cornerstone for modern portfolio theories (Karimo *et al.*, 2022; Tumala, *et al.*, 2023). The central thesis of the MPT is that portfolios formulated using assets with lower correlation between them would have an overall lower risk, regardless of the individual asset risk. An asset whose introduction reduces the risk of a portfolio is regarded as a hedging instrument as it hedges against possible loss in other assets, suggesting that the hedging instrument should have a negative correlation with other assets in the portfolio. Safe-haven assets on the other hand are assets that reduce risk of a portfolio during periods of general economic downturns such as recession, and geopolitical tensions suggesting that such instrument should have a negative correlation with other assets in the portfolio during periods of global risks.

Consequently, assets should be selected not only based on their individual characteristics but also on their correlation with other assets. Equipped with the correlations, a portfolio manager can form a portfolio with the same expected return but lower risk than one based solely on individual asset characteristics. By emphasizing the importance of correlations in returns and risks for portfolio diversification, the MPT provide the foundation for empirical evaluation of the co-movement among financial assets to understand their roles in a portfolio whether as a pure diversifier, hedging instrument and or a safe-haven. Historically, gold and crude oil have exhibited the hedging and safe-haven behaviour, while cryptocurrencies are relatively new but may compete with the traditional assets on these features, especially the stablecoin segment of the crypto market.

2.2 Empirical Literature

The literature on hedging and safe-haven properties of cryptocurrencies is relatively new and evolving. The growth in the literature reflects the rapid rise of cryptocurrencies to prominence as financial assets and their attraction as potential hedging instruments and safe-haven assets. The rapid growth of the crypto market has also

led to it being compared to traditional hedge and safe-haven commodities such as Gold and Crude Oil. However, there is mixed evidence in the literature regarding the safe-haven and hedging features of cryptocurrencies and commodities.

A strand of the literature suggests that cryptocurrencies are diversifiers and do not possess hedge capabilities but could be safe-haven assets (Gunawan & Anggono, 2021; Bedowska-Sójka & Kliber, 2021; Charfeddin *et al.*, 2020; Thampanya *et al.*, 2020; Wang *et al.*, 2019; Bouri *et al.*, 2017). These studies focus mostly on Bitcoin, Ethereum, Bitcoin Cash, Litecoin and Ripple which are non-stablecoins.

Another strand of literature argues that these features are present, weak or inconsistent (Just & Echaust 2024; Tan *et al.*, 2023; Bedowska-Sójka & Kliber, 2021; Shahzad *et al.*, 2019; Olde, 2021). For example, Tan *et al.* (2023) focusing on the East Asia- 5 markets, revealed that cryptocurrencies have dissimilar hedging and safe-haven capabilities across various stock indices and exchange rates. Bitcoin, Litecoin, and Ethereum offered strong hedge properties on most of the East Asia-5 equity indices. Bitcoin and Litecoin only provided a haven for the Japanese Yen, and Stellar provided a hedge for the Taiwanese equity indices and the Chinese Yuan. These studies affirm Bitcoin's potential as a safe-haven asset but largely overlook the broader spectrum of cryptocurrencies, including stablecoins and other non-stablecoins. The differentiation between stablecoins and non-stablecoins is an emerging area in cryptocurrency research. Stablecoins, pegged to fiat currencies or other assets, exhibit lower volatility compared to non-stablecoins like Bitcoin and Ethereum thus, may have relatively distinct behaviour. However, most studies have focused narrowly on Bitcoin or Ethereum, failing to account for the unique attributes of stablecoins. Gambarelli *et al.* (2023), included stablecoins in their analysis and provided evidence that stablecoins are safe havens but that non-stablecoins are pure diversifiers.

Also, gold's time-tested haven and hedging features have come under questioning. While Baur & Lucey (2010) and Junttila *et al.* (2018) suggest that gold is a safe-haven asset, Thampanya *et al.* (2020) focusing on the Thai stock market, showed that gold has no safe-haven or hedging capabilities. This conclusion is supported by findings from Bedowska-Sójka and Kliber (2021) suggesting that the safe-haven

features of gold evaporated during the COVID-19 pandemic. In addition, the hedging features of crude oil have also been explored in depth with divergent findings (Abid *et al.*, 2020; Xu, *et al.* 2020; Junttila *et al.*, 2018). For instance, Xu, *et al.* (2020) and Abid *et al.*, 2020 showed that crude oil is a haven, but Junttila *et al.* (2018) suggested otherwise.

In summary, most studies on cryptocurrencies focused on Bitcoin, Ethereum, Litecoin and Ripple which are non-stablecoins. Wang *et al.* (2019) covered a wider range of cryptocurrencies but did not provide a comparative analysis of stablecoins and non-stablecoins, and of cryptocurrencies and commodities. Klein *et al.* (2018) in their comparative investigation of cryptocurrencies and commodities also used Bitcoin. Despite the unique risk-return dynamics of cryptocurrencies in comparison to assets like gold and oil, the uniqueness of stablecoins relative to non-stablecoins, and the changing role of commodities as hedge and safe haven assets, this area of research remains underexplored.

This study fills the identified gap by distinguishing between stablecoins and non-stablecoins. Most studies have focused on Bitcoin or a limited set of cryptocurrencies, without explicitly differentiating between stablecoins and non-stablecoins. By examining the hedging and safe-haven properties of cryptocurrencies in relation to traditional safe-haven assets, and distinguishing between stablecoins and non-stablecoins, the study offers insights into the unique contributions of cryptocurrencies to the global financial market. Incorporating gold and crude oil into the analysis provides a comprehensive understanding of the role of cryptocurrencies in a broader spectrum of safe-haven assets.

2.3 Stylized Facts

We report the return series in Figures 1. In Panel A, we show the return series of cryptocurrencies and traditional hedging and safe-haven instruments with stablecoins in the first row and non-stablecoins in the second. The last row has Gold and Crude oil returns. Panel B has the stock market return series. Table 1 shows the time to maximum market drawdown from the period of highest gains, the time to recovery from the maximum drawdowns and the maximum drawdown computed using the *'PerformanceAnalytics' R* package (Peterson *et al.*, 2024).

In Figure 1, Panel A, all the potential and traditional hedge and safe-haven assets show significant spikes in 2020, which coincides with the COVID-19 pandemic period. During this period, the cryptocurrency market witnessed significant growth. For instance, the price of Bitcoin surged by over 640 per cent, rising from around $7,300 in early 2020 to over $46,800 by the end of the year. In Table 1, Crypto prices plummeted following the December 2017 Crypto Winter, with Bitcoin and Ethereum recording maximum drawdowns of 83 per cent and 94 per cent by December 2018. The market was still on the path of recovery when the COVID-19 pandemic set in. The pandemic aided the rapid recovery of the crypto market, particularly the non-stablecoin segment to the pre-Crypto Winter levels by November 2020 and February 2021 for Bitcoin and Ethereum. In comparison to Stablecoins, Non-Stablecoins were the biggest losers during the December 2017 Crypto Winter, though, they became the fastest to fully recover to the pre-crypto winter levels aided by the pandemic, while recovery in the stablecoin segment has remained sluggish with Tether (USDT) and the USD Coin (USDC) still on the path of recovery and remained below the pre-Crypto Winter levels two years after.

Although, the crypto market witnessed a significant surge in prices, stablecoins such as the USD Coin plummeted in early 2020 when the pandemic started and reached a maximum drawdown of 7 per cent in March same year and rebounded to a path of recovery. USDT plummeted during the Crypto Winter and reached a maximum drawdown of 10 per cent in November 2018 but rebounded to the path of recovery about a year before the pandemic, though, the pandemic-aided surge in crypto prices could not help these Stablecoins to full recovery.

The surge in the crypto market during the pandemic could be attributed to increased interest and investment in the market as investors sought alternatives to traditional financial markets, which were highly volatile during this period. This was further amplified given the decentralized nature of cryptos, which made them attractive to investors who were concerned about potential market interference by central banks and governments. Also, studies found that cryptocurrencies, particularly Bitcoin, showed significant market efficiency and were seen as potential safe-haven or hedge against traditional market risks.

Similarly, all the stock returns showed significant spikes during the COVID-19. However, the pandemic, which aided the crypto market recovery after the Crypto Winter, coincided with significant drawdowns in the traditional asset markets with all the G7 stocks reaching their maximum drawdowns of between 32 per cent and 42 per cent in March 2020. These markets fully recovered from November 2020 to April 2021 except the UK, which fully recover in February 2023.

In Table 1, Gold and crude oil returns started their downward paths in March and June 2014 with gold reaching its maximum drawdown of 24 per cent in December 2015, while crude oil continued in this path reaching its maximum loss of about 135 per cent several years after, specifically in April 2020. Crude oil rebounded to its pre-crash level in June 2019, which is about 471 days after reaching its trough, but it took about 878 days after reaching its trough, for gold to fully recover. The divergent behaviour of these commodities suggests that they may not have similar hedging and or safe-haven property.

Overall, non-Stablecoins are relatively more susceptible to huge losses during periods of heightened market risks, though, they recover more rapidly under favourable market conditions. The pandemic exposed traditional stock market assets to heightened risk and losses (Figure 1 and Table 1) however, this period was a boom time for cryptocurrencies, driven by increased demand, investor interest, and the unique advantages offered by decentralised digital currencies with stablecoins being the biggest gainers relative to non-stablecoins. These divergent behaviours during the pandemic make cryptocurrencies potential hedging and safe-have assets hence the need for a comprehensive analysis to provide empirical support for these characteristics.

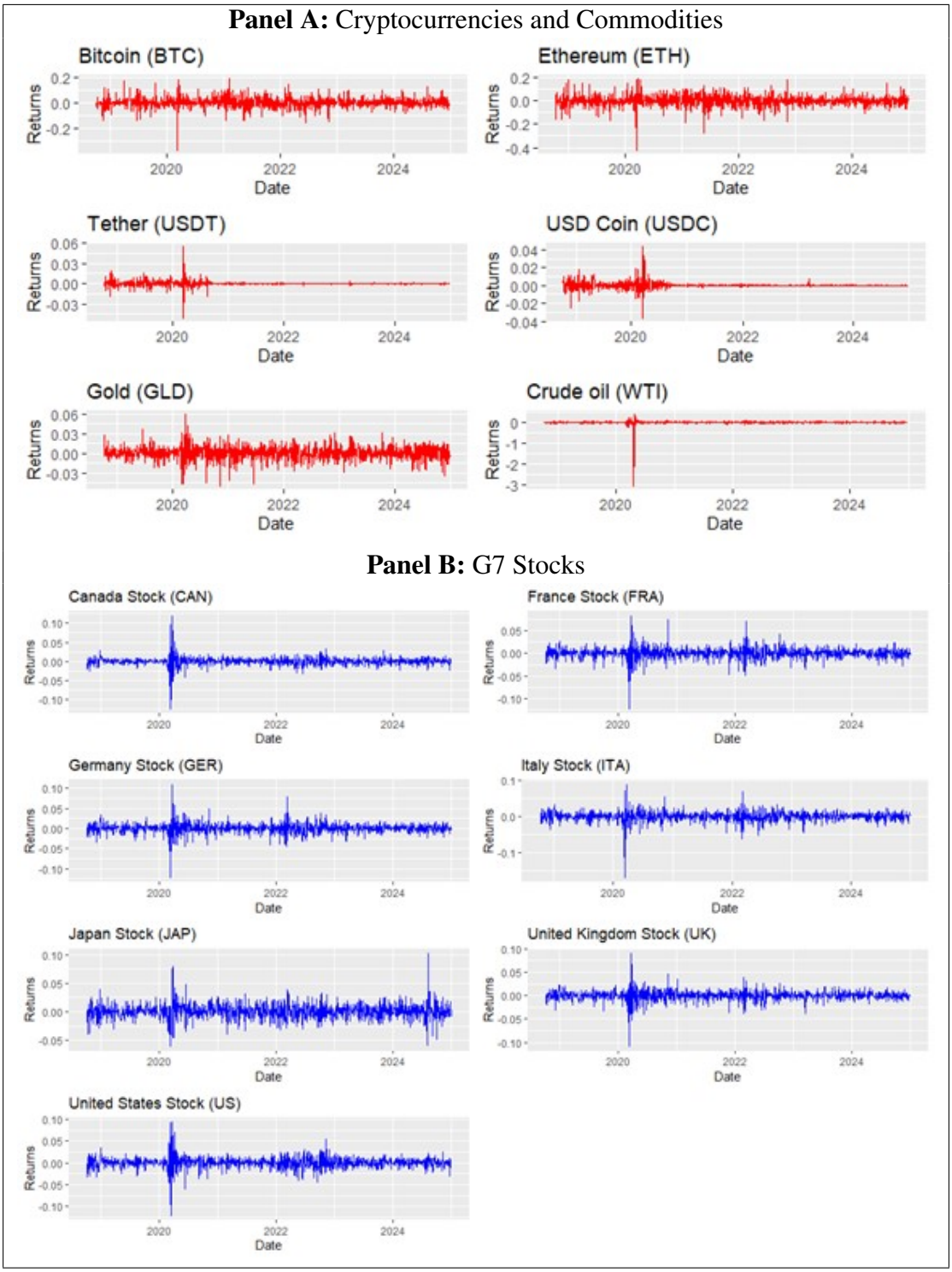

Figure 1: Asset returns

Table 1: Maximum drawdowns and time to full recovery

	From	Trough	To	Depth	Length	To Trough	Recovery
Non-Stablecoins							
BTC	17/12/2017	15/12/2018	30/11/2020	-0.834	1080	364	716
ETH	14/01/2018	14/12/2018	02/02/2021	-0.94	1116	335	781
Stablecoins							
USDT	13/12/2017	14/11/2018	NA	-0.103	2578	337	NA
USDC	31/01/2020	18/03/2020	NA	-0.071	1799	48	NA
Commodities							
GLD	17/03/2014	17/12/2015	20/06/2019	-0.238	1323	445	878
WTI	23/06/2014	20/04/2020	02/03/2022	-1.351	1936	1465	471
Stock							
Canada	21/02/2020	23/03/2020	07/01/2021	-0.374	221	22	199
France	20/02/2020	18/03/2020	06/04/2021	-0.386	287	20	267
Germany	20/02/2020	18/03/2020	28/12/2020	-0.388	217	20	197
Italy	20/02/2020	12/03/2020	04/06/2021	-0.415	328	16	312
Japan	03/10/2018	19/03/2020	06/11/2020	-0.318	506	352	154
UK	23/05/2018	23/03/2020	03/02/2023	-0.366	1188	466	722
US	20/02/2020	23/03/2020	18/08/2020	-0.339	126	23	103

3. Data and Methodology

3.1 Data

The study obtained daily closing cryptocurrency and stock price data from Yahoo Finance using the *'getSymbols'* function from the *'quantmod' R* programming package (Ryan, *et al.*, 2021). The data obtained spans the period from January 2018 to December 2024. Prior to analysis, we used the *'na.omit'* function from the *'quantmod' R* library to remove all missing observations, which trimmed the data to start from October 2018 to December 2024. We use two Stablecoins (Tether (USDT), and USD Coin (USDC)) and two non-stablecoins (Bitcoin (BTC) and Ethereum (ETH)) as the representative cryptocurrencies, and two commodities (Gold (GLD) and the West Texas Intermediate (WTI) crude oil) prices as representative traditional hedging and safe-haven assets. The representative G7 stock indices are the Toronto Stock Exchange, the CAC 40 index of the Euronext Paris, the DAX 40 index of the Frankfurt Stock Exchange, and the FTSE MIB Index of the Borsa Italiana for Canada (CAN), France (FRA), Germany (GER) and Italy (ITA), respectively. Other G7 representative stock indices are the Nikkei 225 Index of the Tokyo Stock Exchange, the FTSE

100 Index of the London Stock Exchange, and the Standard & Poors (S & P) 500 for Japan (JAP), the United Kingdom (UK) and the United States (US), respectively. The selected exchanges are some of the largest by market capitalisation and most liquid globally.

We compute the return series as follows:

$$r_t = ln\left(\frac{p_t}{p_{t-1}}\right) \times 100 \tag{1}$$

Where r_t and p_t denote stock return and stock price index at time t, respectively, and ln is the natural log operator. A key advantage of this transformation is the removal of unit root, hence there was no need to test for unit root.

3.2 Model Specification

The study estimates a Dynamic Conditional Correlation (DCC) model developed by Engle (2002) to examine the volatility and dynamic correlation of the hedging and safe-haven assets and stock market returns. The DCC-GARCH allows for the estimation of conditional variances and covariances, providing a dynamic measure of how relationships evolve over time (Engle, 2002). We retrieved the dynamic correlations and used them as the dependent variable in a dummy variable regression model to test the hedging and safe-haven features of the selected stablecoins, non-stablecoins, and commodities.

The estimation of the DCC-GARCH model is in two stages. In the first stage, the standard GARCH model for the individual return series was estimated. The model is specified as follows:

$$r_{i,t} = \mu_{i,t} + e_{i,t} \tag{2}$$

$$\mu_{i,t} = E\left(r_{i,t}|\Omega_{i,t}\right) \tag{3}$$

$$e_{i,t} = h_{i,t}^{1/2}\varepsilon_{i,t} \tag{4}$$

$$h_{i,t} = Var\left(r_{i,t}|\Omega_{t-1}\right) = Var\left(e_{i,t}|\Omega_{t-1}\right) \tag{5}$$

where $\varepsilon_{i,t}$ $i.i.d.(0,1)$, Ω_{t-1} is the information set available at time $t-1$. Equation (2)

is the mean equation of the *ith* asset, (3) defines the conditional mean return. The error term $e_{i,t}$ is made up of two components: the volatility component $\left(h_{i,t}^{1/2}\right)$ and a random process $(\varepsilon_{i,t})$ as defined in (4) and (5).

In practice, the conditional mean of asset returns are modelled using $ARMA(p,q)$ processes, hence (3) is respecified as follow:

$$\mu_{i,t} = \mu_{i0} + \sum_{j=1}^{p} \psi_{ij} r_{i,t-j} - \sum_{j=1}^{q} \eta_{ij} e_{i,t-j} \tag{6}$$

In addition, the conditional volatility of daily asset returns are commonly modelled as GARCH(1,1) process. The GARCH(1,1) process outperforms higher order ARCH and GARCH processes (Bollerslev, 1986). Moreover, the GARCH(1,1) process does not account for asymmetry. This is important for this study because testing for hedging and safe-haven properties implies testing for asymmetries (non-linearity), hence it is beneficial to allow for asymmetries in the dynamic correlations. The standard GARCH(1,1) takes the form:

$$h_{i,t} = \omega_i + \alpha_i e_{i,t-1}^2 + \beta_i h_{i,t-1} \tag{7}$$

where the condition $\omega_i, \alpha_i, \beta_i > 0$ reflects the presence of ARCH and GARCH effect and $\alpha_i + \beta_i < 1$ ensures stationarity.

The second stage involves estimating the parameters of the DCC model. The DCC equation is defined for a positive definite conditional covariance matrix Q_t and it is specified as follows:

$$H_t \equiv D_t R_t D_t \tag{8}$$

where $D_t = diag\left(h_{11,t}^{1/2}, h_{22,t}^{1/2}\right)$ and R_t is the correlation matrix. $z_{i,t} = \epsilon_{i,t} / \sqrt{h_{ii,t}}$ are the standardized residuals from stage one.

$$R_t \equiv Q_t^{*-1} Q_t Q_t^{*-1} \tag{9}$$

where $Q_t = (q_{ij,t})$ and $Q_t^* = (q_{ij,t}^*) = \sqrt{(q_{ii,t})}$ is a diagonal matrix. The joint volatility

of any pair (portfolio) of assets is defined as follow:

$$Q_t = (1-a-b)\bar{Q} + a(\varepsilon_{t-1}\varepsilon'_{t-1}) + bQ_{t-1} \tag{10}$$

Where $\bar{Q}$) is the long run target (unconditional variance matrix of $\varepsilon_{i,t}$); and a and b are the nonnegative scalars parameters that govern the short- and long-run dynamics of the conditional correlation and must satisfy the condition $a+b<1$ for stability and stationarity. If the condition $a+b<1$ is violated such that $a+b=1$, then the process is integrated (IGARCH-like). Shocks to the correlation are permanent, and the unconditional variance is infinite. The process has no tendency to revert to a fixed mean. If $a+b>1$, then the correlation process is explosive (non-stationary). The conditional correlations would grow indefinitely, leading to nonsensical and statistically unsound results. Thus, the stationarity condition $a+b<1$ is an essential safeguard that allows the DCC-GARCH model to provide sensible and reliable estimates of dynamic correlation.

The DCC between the i^{th} instrument and the j^{th} stock return at time t is defined as follows:

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t}q_{jj,t}}} \quad for \quad i,j=1,2,...,n, \quad and \quad i \neq j \tag{11}$$

where $\rho_{ij,t}$ is the dynamic conditional correlation of hedging and safe-haven instrument i and stock return j at time t. The dynamic correlation is analysed to ascertain the hedging and safe-haven capability of the cryptocurrencies.

In line with previous studies (Baur & McDermott, 2010; Ratner & Chiu, 2013) we apply a dummy variable regression to the dynamic correlation data to test the hedging and safe-haven properties of stablecoins, non-stablecoins and commodities. The regression model is specified as follows:

$$\hat{\rho}_{ij,t} = \psi_0 + \psi_1 D\left(r_j q_1\right) + \psi_2 D\left(r_j q_5\right) + \psi_3 D\left(r_j q_{10}\right) \tag{12}$$

where $r_j q_k$ represents the k^{th} quantile of asset j return, $(r_j q_k)$ is a dummy variable that takes on the value of one whenever event $r_j q_k$ is observed and zero otherwise; the constant term, and coefficients of the dummy variables are denoted as $\psi_m (m =$

$0, 1, 2, 3$). The 1^{st}, 5^{th} and 10^{th} quantiles of the stock returns represent extreme market conditions (periods of heightened risk). Other variables remained as defined. Thus equation 12 suggests that there is a non-linear relationship between the dynamic correlations and stock returns if the $\psi'_m s$ are statistically significant. If the constant term is zero or negative, then a weak hedge is confirmed but if it is negative and statistically significant then the asset is a strong hedge. However, positive values indicate that the asset does not possess hedging property, thus it is a diversifier. If the coefficients on the dummies are negative the asset is a weak safe-haven but if they are negative and statistically significant, then they are classified as strong safe-haven. Otherwise, they do not possess the safe-haven property. If an instrument does not possess hedging and safe-haven features, then they are classified as pure diversifiers.

3.3 Estimation Procedure

The estimation begins with computing return series for all the stock indices obtained as indicated in (1). Then the univariate GARCH(1, 1) models for each asset were specified and estimated simultaneously with the bivariate DCC models using R programming language. Upon estimation of the DCC models, the dynamic correlation of each pair of assets were retrieved and used as the dependent variables in (12).

4. Results and Discussion

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics. The minimum values of all the return are less than zero and the maximum values lie between 0.04 and 0.38, suggesting that there were times when these assets made losses and there were times when they made positive returns. Their mean and median values are close to zero suggesting that they have symmetric distributions. Except stablecoins (USDT and USDC) that are positively skewed, the other return series show negative skewness. Quintessential of financial assets, all the assets are fat tailed, indicating that their distributions are non-Gaussian.

To provide preliminary evidence, we estimated the static unconditional correlation between each stock return and cryptocurrencies, and commodities and present the results in Table 3.

Table 2: Descriptive Statistics

	Minimum	Median	Mean	Maximum	Std. Dev.	Skewness	Kurtosis
Non-Stablecoins							
BTC	-0.372	0.000	0.002	0.187	0.038	-0.418	9.21
ETH	-0.423	0.000	0.001	0.189	0.046	-0.626	7.59
Stablecoins							
USDT	-0.051	0.000	0.000	0.055	0.003	0.893	97.275
USDC	-0.037	0.000	0.000	0.043	0.003	1.441	52.585
Commodities							
GLD	-0.05	0.001	0.001	0.059	0.01	-0.169	4.019
WTI	-3.06	0.002	-0.003	0.377	0.094	-26.395	827.188
Stock indices							
Canada	-0.123	0.001	0.000	0.12	0.011	-1.117	36.894
France	-0.123	0.001	0.000	0.084	0.012	-0.83	13.026
Germany	-0.122	0.001	0.000	0.11	0.012	-0.496	14.306
Italy	-0.169	0.001	0.000	0.089	0.014	-1.784	23.158
Japan	-0.061	0.001	0.000	0.102	0.013	0.338	5.465
UK	-0.109	0.001	0.000	0.091	0.01	-0.974	15.925
US	-0.120	0.001	0.001	0.094	0.013	-0.504	13.959

Table 3: Correlation between potential hedge instruments and Stock returns

	Non-Stablecoins		Stablecoins		Commodities	
Asset	BTC	ETH	USDT	USDC	GLD	WTI
Canada	0.317	0.332	-0.175	-0.146	0.198	0.125
France	0.225	0.238	-0.105	-0.111	0.034	0.091
Germany	0.224	0.242	-0.098	-0.094	0.071	0.084
Italy	0.255	0.264	-0.174	-0.148	0.047	0.099
Japan	0.031	0.046	0.007	-0.008	0.039	0.078
United Kingdom	0.198	0.209	-0.120	-0.129	0.054	0.104
United States	0.326	0.350	-0.157	-0.150	0.114	0.126

Stablecoins (USDT and USDC) returns show negative correlation with all the stock market returns, while non-stablecoins and commodities showed positive correlations. The correlation values are generally low, though, they suggest that stablecoins have the potentials of being hedge instruments while non-stablecoins are more likely to be pure diversifiers. Commodities, with their much more lower values also suggest possible hedging features. However, we need a more in-dept empirical analysis to

confirm these preliminary findings.

4.2 Dynamic Correlation

The dynamic correlation estimated using the Standard DCC model is presented in Figure 2. The dynamic correction of Bitcoin and Ethereum with the stock returns were mostly positive, suggesting that these non-stablecoins do not possess hedging capabilities. Before the COVID-19 pandemic in 2020, the dynamic correlations were low, however, there was a significant leap in 2020 shifting most of the correlations to a higher level after the pandemic, suggesting that these cryptocurrencies may possess safe-haven capabilities.

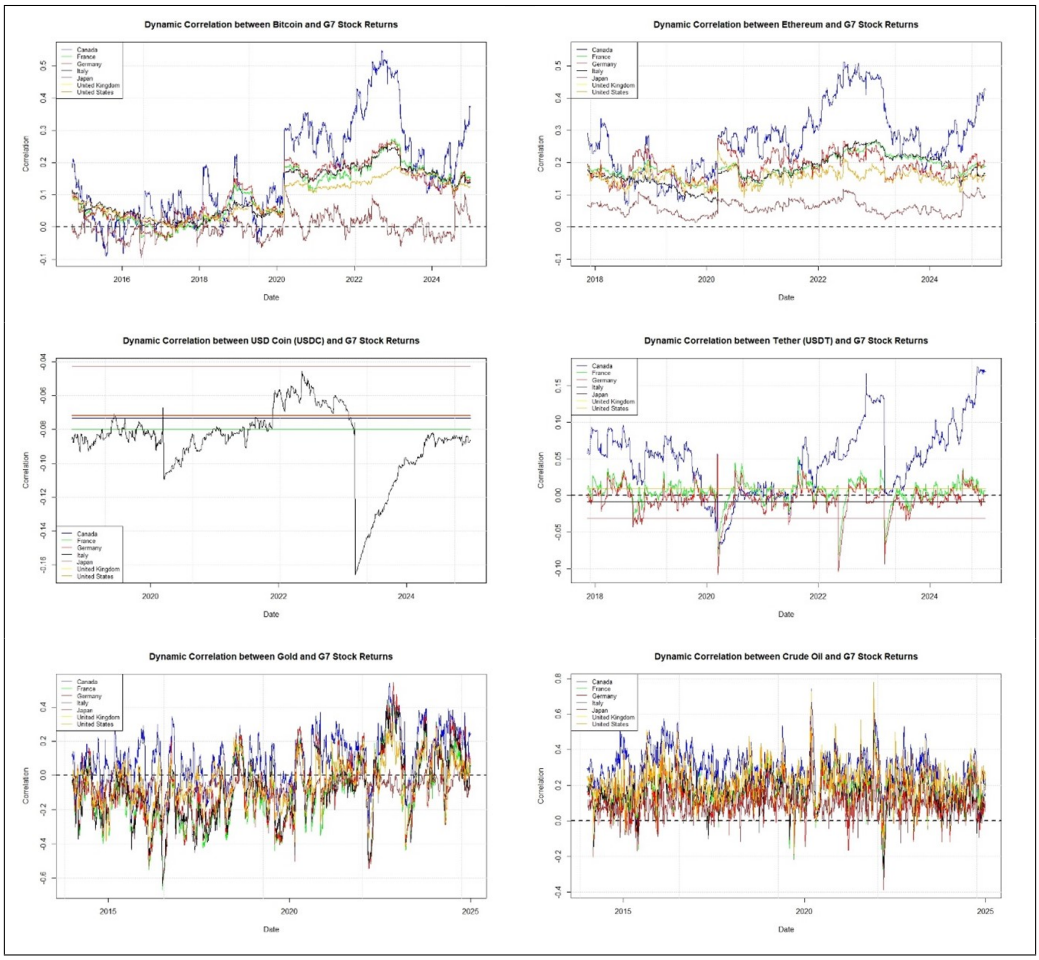

Figure 2: Dynamic correlation between the hedging instruments and G7 stock returns

For stablecoins, the dynamic correlations are mostly negative lying below the zero line indicating that these coins are likely to possess hedging capabilities. However, for USDC, it was the correlation with the Italian stock that showed a significant fall during COVID-19 suggesting that USDC could be a safe-haven asset for the Italian stock. For USDT the correlation with Canada, France, Germany and Italy show shifts during the COVID-19 suggesting that the USDT could be a haven for these four markets. The correlation with Japan and the UK was negative as well but did not show shifts hence USDT could be a hedge instrument for these two markets. The correlation with the US is positive and did not show a significant shift indicating that USDT is likely to be a pure diversier for the US stock.

For commodities, the correlation with stock returns is quite volatile, though, that of gold is more negative than being positive, while that of crude oil is more positive. This suggests that gold is likely to possess hedging capabilities while crude oil may not. Furthermore, there seems to be a shift in the correlation of gold with some stock returns after COVID-19 suggesting that gold may likely remain a safe-haven asset, but the same cannot be said about crude oil.

4.3 Test for hedge and safe-haven features

The hedging and safe-haven test results of cryptocurrencies (Stablecoins and Non-Stablecoins), and traditional hedging and safe-haven commodities (Gold and Crude oil) are presented in Table 4.

The results show that the constant terms for the Bitcoin and Ethereum models are all positive and statistically significant, safe for the Japanese stock under Bitcoin, which is statistically not significant. Thus, on average, the correlation between Bitcoin and Ethereum with each of the G7 stock returns is positive, suggesting that Bitcoin and Ethereum are not hedge instruments for these assets, though, it turns out that Bitcoin is a weak hedge instrument for the Japanese stock.

The coefficient of the 10th percentile (Q10) of the Canadian return turns out to be negative and statistically significant indicating that during extreme market conditions, the correlation between Bitcoin and Canadian stock return is negative, thus Bitcoin is a strong safe-haven asset for the Canadian stock.

Table 4: Hedge and safe-haven test

	Constant	Q1	Q5	Q10	Constant	Q1	Q5	Q10
	Non-Stablecoins: Bitcoin(BTC)				**Non-Stablecoins: Ethereum(ETH)**			
Canada	0.085^{a}	0.103^{b}	0.026	-0.032^{a}	0.275^{a}	-0.037^{b}	-0.011	-0.022^{c}
	(0.006)	(0.048)	(0.017)	(0.009)	(0.007)	(0.007)	(0.014)	(0.013)
France	0.100^{a}	0.027	-0.012	0.006	0.185^{a}	0.007	-0.003	-0.005
	(0.004)	(0.019)	(0.011)	(0.007)	(0.002)	(0.008)	(0.006)	(0.004)
Germany	0.106^{a}	0.039^{b}	-0.005	0.002	0.187^{a}	-0.006	-0.014^{b}	-0.001
	(0.004)	(0.017)	(0.012)	(0.008)	(0.002)	(0.007)	(0.006)	(0.004)
Italy	0.106^{a}	0.040^{b}	-0.009	-0.007	0.177^{a}	-0.001	-0.017^{b}	-0.001
	(0.003)	(0.019)	(0.010)	(0.007)	(0.002)	(0.001)	(0.007)	(0.005)
Japan	0.002	0.004	0.001	-0.002	0.061^{a}	-3.0E-04	-0.011^{a}	0.001
	(0.002)	(0.006)	(0.005)	(0.003)	(0.001)	(0,005)	(0.004)	(0.003)
UK	0.087^{a}	0.017^{c}	0.017^{b}	-0.009^{c}	0.155^{a}	0.002	-0.004	-4.0E-04
	(0.003)	(0.009)	(0.008)	(0.005)	(0.001)	(0.004)	(0.003)	(0.003)
US	0.152^{a}	0.067^{b}	0.006	0.034	0.270^{a}	-0.043	0.053^{b}	-0.045^{a}
	(0.008)	(0.033)	(0.024)	(0.017)	(0.008)	(0.026)	(0.024)	(0.016)
	Stablecoins: Tether (USDT)				**Stablecoins: USD Coin (USDC)**			
Canada	0.049^{a}	0.030^{a}	1.2E-04	1.5E-04	-0.073^{a}	4.2E-08	-4.0E-08	-1.8E-10
	(0.003)	(0.007)	(0.007)	(0.005)	(1.3E-08)	(7.1E-08)	(4.1E-08)	(3.0E-08)
France	0.006^{a}	0.002	-0.001	-2.0E-04	-0.080^{a}	-1.8E-08	-4.5E-09	-9.0E-09
	(0.001)	(0.003)	(0.002)	(0.002)	(7.9E-09)	(2.8E-08)	(2.6E-08)	(1.7E-08)
Germany	-0.005^{a}	-0.001	0.006^{b}	-0.005^{b}	-0.072^{a}	-5.2E-08	5.8E-08	-6.5E-08
	(0.001)	(0.003)	(0.003)	(0.002)	(1.3E-08)	(5.4E-08)	(6.1E-08)	(4.4E-08)
Italy	-0.008^{a}	3.8E-07	-5.8E-07	2.3E-07	-0.086^{a}	4.9E-04	4.1E-08	-0.005^{c}
	(1.0E-07)	(4.2E-07)	(4.2E-07)	(2.5E-07)	(0.001)	(0.004)	(0.003)	(0.003)
Japan	-0.031^{a}	-7.7E-09	1.7E-09	-8.3E-09	-0.043^{a}	2.9E-08	-2.7E-08	-5.9E-09
	(3.2E-09)	(1.5E-08)	(1.2E-08)	(1.0E-08)	(9.4E-09)	(4.3E-08)	(3.2E-08)	(2.2E-08)
UK	0.010^{a}	$8.5E-7^{b}$	1.8E-07	-2.2E-07	-0.072^{a}	4.4E-08	5.4E-09	-9.7E-09
	(1.0E-7)	(3.8E-07)	(3.9E-07)	(2.8E-07)	(8.8E-09)	(3.3E-08)	(3.3E-08)	(1.9E-08)
US	0.055^{a}	-0.006	0.011	-0.004	-0.057^{a}	-0.003	0.006^{c}	-0.004
	(0.003)	(0.009)	(0.007)	(0.005)	(0.001)	(0.006)	(0.003)	(0.003)
	Commodities: Gold (GLD)				**Commodities: Crude Oil (WTI)**			
Canada	0.025^{a}	0.116^{a}	-0.048^{b}	0.022	0.309^{a}	-0.097	0.041^{b}	0.015
	(0.008)	(0.042)	(0.023)	(0.015)	(0.006)	(0.062)	(0.017)	(0.012)
France	-0.178^{a}	0.075	-0.037	0.005	0.163^{a}	-0.067^{b}	-0.001	0.021
	(0.011)	(0.059)	(0.034)	(0.196)	(0.006)	(0.031)	(0.022)	(0.013)
Germany	-0.163^{a}	0.102	-0.059^{b}	0.027	0.133^{a}	-0.051	0.027	-0.003
	(0.010)	(0.062)	(0.026)	(0.023)	(0.006)	(0.034)	(0.019)	(0.012)
Italy	-0.156^{a}	-0.010	-0.042	0.016	0.174^{a}	-0.005	0.006	0.013
	(0.010)	(0.070)	(0.028)	(0.020)	(0.006)	(0.034)	(0.017)	(0.010)
Japan	-0.071^{a}	-0.003	-0.025^{b}	0.005	0.090^{a}	-0.006	-0.007	-0.004
	(0.003)	(0.016)	(0.012)	(0.009)	(0.003)	(0.014)	(0.009)	(0.006)
UK	-0.079^{a}	0.106^{c}	-0.051^{b}	0.009	0.217^{a}	-0.096^{b}	0.020	0.008
	(0.007)	(0.054)	(0.022)	(0.015)	(0.006)	(0.041)	(0.022)	(0.014)
US	-0.103^{a}	0.016	-0.033	0.021	0.197^{a}	0.123^{a}	0.014	0.03^{a}
	(0.009)	(0.043)	(0.023)	(0.018)	(0.004)	(0.032)	(0.014)	(0.010)

Note: Values in parenthesis () are standard errors, while the superscripts a(b)c denote statistical significance at 1%(5%)10%.

For France, Germany and Italy the coefficient of the 5th percentile is negative, while for Japan and the United Kingdom, it is the 10th percentile that is negative but are all statistically not significant indicating that during periods of extreme market conditions, the correlation between Bitcoin and these stock returns are negative, but weak. The coefficients on the 1st, 5th and 10th percentiles of the United States stock return are positive indicating that extreme market conditions do not affect the positive relationship between Bitcoin and the United States stock returns. Thus, our results suggest that Bitcoin is a strong safe-haven asset for the Canadian stock, a weak safe-haven for the French, German, Japanese and United Kingdom stocks, and a pure diversifier for the United States.

Ethereum shows negative signs at different percentiles of the G7 stock returns, but it is the 1st percentile for the Canadians and the 5th percentile for the German, Italian, Japanese and the 10th percentile for the United States is statistically significant. Thus, Ethereum is a strong haven for the Canadian, German, Italian, Japanese and United States stocks and a weak haven for the French and United Kingdom assets.

Non-stablecoins do not have hedging features for the G7 stock markets, though, they have a mixture of weak and strong safe-haven properties. These findings are consistent with the strand of literature suggesting that cryptocurrencies are not good hedging instruments but are safe-haven assets (Gunawan & Anggono, 2021; Bedowska-Sójka & Kliber, 2021; Charfeddin *et al.*, 2020; Thampanya *et al.*, 2020; Wang *et al.*, 2019; Bouri *et al.*, 2017).

Under the stablecoins segment of cryptocurrencies, the constant term of Tether (USDT) for Canada, France, the United Kingdom and the United States turned out to be positive and statistically significant, indicating that USDT is not a hedging instrument for the Canadian, French, UK, and US stocks. This negates our results from the statistic unconditional and dynamic conditional correlation analyses, suggesting that correlation analysis could be misleading hence, the need for in-depth empirical analysis. USDT is a strong hedge instrument for the German, Italian and Japanese stocks as the constant terms in these models are negative and statistically significant.

USDT turns out to be a pure diversifier for the Canadian stock only as the coefficient

on each of the 1st, 5th and 10th percentiles of the stock return are positive suggesting that the correlation between the two increases during extreme market conditions. For the other markets, USDT shows negative signs at different percentiles, though, it is the 10th percentile for Germany that is statistically significant, indicating that USDT is a weak safe-haven for the French, Italian, Japanese, the UK and the US stocks and a strong safe-haven for the German.

The constant term of the USD Coin (USDC) in each of the G7 models is negative and statistically significant, suggesting that USDC is a strong hedge instrument for each of the G7 stocks. USDC has negative signs at the 1st, 5th and 10th percentiles of the market returns however, none is statistically significant. Thus, USDC is a weak safe-haven asset for each of the G7 stocks.

Overall, our results indicate that stablecoins are both hedge instruments and safe-haven assets, though, they are weak in some cases. These findings are consistent with the strand of literature arguing that cryptocurrencies are hedging and safe-haven assets, but that these features are weak in some instances (Just & Echaust 2024; Tan *et al.*, 2023; Bedowska-Sójka & Kliber, 2021; Shahzad *et al.*, 2019; Olde, 2021). Non-stablecoins, on the other hand, are mainly safe-haven for the G7 stocks. This finding is contrary to Gambarelli *et al.* (2023) argument that non-stablecoins are pure diversifiers.

On commodities, the Gold model shows that the constant term of Canada is positive and statistically significant indicating that the correlation between Gold and the Canadian stock return is positive, hence Gold is not a hedge instrument for the Canadian stock. The constant term for the rest of the G7 stock returns are negative and statistically significant, suggesting that the correlation between Gold and these stock returns is negative, hence Gold is a strong hedge instrument for these markets.

The stock return shows negative signs at different percentiles, they are either statistically significant or not. Specifically, the 5th percentile of the Canadian, German, Japanese and UK stock returns are negative and statistically significant indicating a nonlinear relationship between gold and the stock returns. During periods of extreme market conditions, the correlation between Gold and these stock returns declines, thus investors in these stock markets can find a safety net in Gold during periods of

heightened stock market risk, which suggests that Gold is a strong safe-haven asset for these markets. The 1st, 5th and 10th percentiles of the French, Italian and the US stock returns are negative, though, they are statistically not significant, indicating that gold is a weak safe-haven asset for these stock markets. Thus, Gold is both a hedge and safe-haven asset for the G7 stock markets. These results contrast with findings from Bedowska-Sójka and Kliber (2021), and Thampanya *et al.* (2020) but are consistent with Baur & Lucey (2010) and Junttila *et al.* (2018).

In the crude oil model, the constant term for all the G7 stock returns is positive and statistically significant, indicating that Crude oil return has a positive correlation with each of the G7 stocks, which suggests that Crude oil is not a hedging instrument for the G7 stocks. Except for the US market, the 1st percentile of the stock return shows a negative sign for the rest of the G7 stocks, though, it is France and the UK that are statistically significant. Thus, Crude oil is a strong safe-haven asset for the French and UK markets but a weak safe-haven asset for the Canadian, German, Italian, and Japanese stocks. These findings are consistent with Xu, *et al.* (2020) and Abid *et al.* (2020). For the US market, Crude oil turns out to be a pure diversifier, which is consistent with Junttila *et al.* (2018).

Stablecoins share similar properties with Gold as a hedge and safe-haven asset, while non-stablecoins are similar to crude oil being safe-haven but not hedge instrument.

4.4 Diagnostic Test Results

The DCC-GARCH models diagnostic test results are presented in Table 5. The ARCH and GARCH terms in all the models are non-negative and lie between zero and unity as expected and are statistically significant. These indicate that a shock in a current period has a positive impact on the correlation in the following period and that correlation is persistent, high correlation in the current period leads to higher correlation in the following period.

Also, the sum of the ARCH and GARCH terms in all the models are less than unity. Together with the non-negative ARCH and GARCH terms, these results satisfy the stability and stationarity requirements for the conditional covariance matrix, suggesting that the correlation process is mean-reverting and that the unconditional variance (or correlation) exists and is finite or well-defined. When there is a large shock to

the correlation structure such as extreme market events, its impact will eventually fizzle out (temporary), and the correlation will tend towards its long-run equilibrium. These results indicate that the models are adequate for investment and policy analysis.

Table 5: DCC-GARCH Diagnostics

	dcca1	dccb1	Shape	dcca1	dccb1	Shape
	Bitcoin (BTC)			**Ethereum (ETH)**		
Canada	0.011***	0.986***	5.012***	0.010**	0.987***	5.855***
	(0.003)	(0.004)	(0.250)	(0.005)	(0.008)	(0.475)
France	0.003**	0.997***	4.699***	0.003	0.997***	4.932***
	(0.001)	(0.002)	(0.210)	(0.002)	(0.004)	(0.307)
Germany	0.003*	0.996***	4.531***	0.003	0.997***	4.929***
	(0.002)	(0.003)	(0.183)	(0.003)	(0.010)	(0.312)
Italy	0.002**	0.997***	4.793***	0.003**	0.998***	5.229***
	(0.001)	(0.001)	(0.220)	(0.002)	(0.006)	(0.334)
Japan	0.006	0.973***	4.371***	0.000	0.946***	5.844***
	(0.005)	(0.023)	(0.175)	(3.7E-5)	(0.133)	(0.467)
UK	0.002	0.998***	4.343***	0.006	0.969***	4.836***
	(0.001)	(0.002)	(0.171)	(0.007)	(0.044)	(0.300)
US	0.013***	0.984***	4.488***	0.028*	0.958***	5.898***
	(0.003)	(0.004)	(0.197)	(0.015)	(0.026)	(0.483)
	Tether (USDT)			**USD Coin (USDC)**		
Canada	0.002	0.993***	5.066***	0.000	0.930***	6.722***
	(0.004)	(0.003)	(0.286)	(0.001)	(0.320)	(0.765)
France	0.002	0.950***	4.688***	0.000	0.919***	6.210***
	(0.007)	(0.042)	(0.284)	(0.001)	(0.195)	(0.664)
Germany	0.001	0.956***	4.552***	0.000	0.915***	5.922***
	(0.007)	(0.028)	(0.267)	(0.001)	(0.248)	(0.582)
Italy	0.000	0.907***	4.883***	0.001	0.781***	6.339***
	(0.001)	(0.236)	(0.312)	(0.018)	(0.159)	(0.682)
Japan	0.000	0.954***	4.854***	0.000	0.930***	6.244***
	(0.0002)	(0.246)	(0.319)	(0.001)	(0.191)	(0.748)

Table 5 Cont'd:

	dcca1	dccb1	Shape	dcca1	dccb1	Shape
	Tether (USDT)			**USD Coin (USDC)**		
UK	0.000	0.921***	4.401***	0.000	0.902***	5.603***
	(0.007)	(0.011)	(0.194)	(0.001)	(0.092)	(0.512)
US	0.004	0.985***	5.074***	0.016	0.846***	6.438***
	(0.004)	(0.015)	(0.339)	(0.014)	(0.091)	(0.704)
	Gold (GLD)			**Crude Oil (WTI)**		
Canada	0.039***	0.924***	6.496***	0.033***	0.912***	7.611***
	(0.009)	(0.021)	(0.432)	(0.011)	(0.046)	(2.321)
France	0.042***	0.936***	5.266***	0.051***	0.869***	6.124***
	(0.008)	(0.014)	(0.275)	(0.014)	(0.038)	(0.034)
Germany	0.040***	0.938***	5.085***	0.047***	0.888***	6.208***
	(0.008)	(0.014)	(0.258)	(0.012)	(0.032)	(0.192)
Italy	0.040***	0.939***	5.591***	0.043***	0.893***	6.448***
	(0.009)	(0.015)	(0.314)	(0.013)	(0.038)	(0.237)
Japan	0.012***	0.922***	5.634***	0.054***	0.763***	6.603***
	(0.007)	(0.047)	(0.331)	(0.017)	(0.210)	(1.849)
UK	0.030***	0.939***	5.409***	0.055***	0.815***	6.293***
	(0.008)	(0.019)	(0.287)	(0.020)	(0.082)	(0.079)
US	0.035***	0.941***	5.744***	0.027***	0.922***	6.623***
	(0.015)	(0.015)	(0.341)	(0.010)	(0.033)	(0.456)

5. Conclusion and Recommendations

The emergence of cryptocurrencies has reshaped the financial market landscape, with Bitcoin and Ethereum leading the market. There is ongoing debate about the safe-haven features of cryptocurrencies and their potential to rival gold and crude oil, with divergent findings. However, there is a limited effort aimed at distinguishing between stablecoins and non-stablecoins and comparing cryptocurrencies and the time-tested hedging and safe-haven commodities of gold and crude oil. This paper addresses a critical gap in financial literature by providing a unified, three-way comparative framework for assessing the risk-management features of stablecoins, non-stablecoins, and traditional commodities against G7 stock indices. It provides a comprehensive analysis of the hedging and safe-haven properties of stablecoins,

non-stablecoins, gold, and crude oil, and compares their behaviours during periods of heightened market risk captured as the 1st, 5th and 10th percentile of the return distributions.

The study uses data from Yahoo Finance, analyzing two stablecoins (USDT and USDC), two non-stablecoins (BTC and ETH), and two commodities (gold and crude oil) against the G7 stocks. Employing a DCC-GARCH model our results indicate that stablecoins are both hedging instruments and safe-haven assets, while non-stablecoins are mostly safe-haven assets. Gold is both a hedging and safe-haven asset, whereas crude oil is mainly a safe-haven asset.

Thus, the hedging and safe-haven features of stablecoins are comparable to gold, while non-stablecoins are comparable to crude oil. These suggest that investors can seek a safety net for their assets during periods of market turbulence in stablecoins, non-stablecoins, gold and crude oil. However, investors seeking to cover losses from the G7 stock markets can leverage stablecoins and gold markets only.

These findings have plausible implications for policymakers and investors. For Policymakers, there is the urgent need to move away from a "one-size-fits-all" approach to cryptocurrency regulation and establish clear, distinct frameworks for stablecoins and non-stablecoins. Since stablecoins are found to be effective hedges and safe-havens comparable to gold, their stability is critical to the broader financial ecosystem. Regulatory frameworks must ensure that fiat-collateralized stablecoins have robust, audited reserves that are fully liquid and consistently maintained to back their peg and reinforce their "flight-to-safety" appeal. Policymakers should gain insights into the potential role of stablecoins in the financial system and the necessary regulatory frameworks to ensure their safe and responsible development. Regulations should treat them closer to near-money assets like Money Market Funds (MMFs) due to their design as a store of value and medium of exchange.

Non-stablecoins (like Bitcoin and Ethereum) are primarily driven by speculation and are characterized by high volatility, behaving more like volatile technology stocks during crises. Policymakers should implement strong risk disclosure requirements to protect retail investors, clearly articulating that these assets are highly speculative and prone to extreme drawdowns (e.g., Bitcoin's 83% and Ethereum's 94% drawdown

during the Crypto Winter). Acknowledge the need for a clear demarcation between stablecoins and non-stablecoins in financial policy to avoid drawing misleading conclusions about the entire cryptocurrency market. Non-stablecoin regulation should focus on market integrity and preventing fraud, given their high correlation with traditional risk assets during crashes.

For Investors, leveraging the study's findings to optimize portfolio diversification and risk management by understanding the distinct roles of these assets is recommended. For risk averse investors seeking a reliable hedge against G7 stock market volatility and a safe-haven during crisis, Stablecoins (USDT, USDC) are a new, effective instrument comparable to Gold. Allocate a portion of the risk-off segment of the portfolio to these assets for their ability to offer a more reliable hedge and counterbalance during market distress. Gold remains a time-tested asset that exhibits both hedging and safe-haven properties. It is recommended for investors seeking to reduce overall portfolio risk during normal periods and preserve capital during extreme market stress.

For Diversification purposes, non-stablecoins (BTC, ETH) should be viewed primarily as diversifiers during normal times, not consistent hedges, and only as a safe-haven during certain periods of market stress (comparable to Crude Oil). Their use in a conservative portfolio should be limited, acknowledging their high volatility and potential for extreme losses (e.g., up to 94% drawdowns). Crude oil is confirmed to be more of a safe-haven than a hedge. Investors can use Crude Oil for a geopolitical hedge, as its safe-haven property often activates during events affecting global supply. While non-stablecoins are susceptible to huge losses during market risks, they have shown a capacity for rapid recovery under favorable market conditions, evidenced by their surge during the COVID-19 pandemic. Investors with a higher risk tolerance may consider the non-stablecoin segment for speculative growth rather than portfolio protection.

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Table A1: Stock Indices, Foreign Exchange Rates, and Cryptocurrencies

Country	Symbol	Description
G7 Stock Indices		
Canada	S&P/TSX Composite	The S&P/TSX Composite is the headline index for the Canadian equity market. It is the broadest in the S&P/TSX family and the basis for multiple sub-indices including equity indices, Income Trust Indices, Capped Indices, GICS Indices, and market cap-based indices.
France	CAC 40	A broad-based index of common stocks composed of 40 of the 100 largest companies listed on the forward segment of the official list of the Paris Bourse.
Germany	DAX	The DAX® index measures the performance of the 40 largest companies on the German stock market. It represents about 80 percent of Germany's market capitalization of listed stock corporations.
Italy	FTSE MIB	The FTSE MIB Index is the primary benchmark index for the Italian equity market and represents the large-cap component of the FTSE Italia All-Share Index. Capturing approximately 80% of the domestic market capitalization. The FTSE MIB Index measures the performance of the 40 most liquid and capitalized Italian shares.
Japan	Nikkei 225	The Nikkei Stock Average (Nikkei 225) is the premier index of Japanese stocks. It is a price-weighted equity index, which consists of 225 stocks in the Prime Market of the Tokyo Stock Exchange.
United Kingdom	FTSE 100	The FTSE 100 is a market-capitalisation-weighted index of UK-listed blue chip companies. The index is part of the FTSE UK Series and is designed to measure the performance of the 100 largest companies traded on the London Stock Exchange that pass screening for size and liquidity.
United States	S&P 500	The S&P 500® is widely regarded as the best single gauge of large-cap U.S. equities. The index includes 500 leading companies and covers approximately 80% of market capitalization.

Table A1 Cont'd:

Country	Symbol	Description
Cryptocurrencies		
Tether	USDT	Tether is one of the oldest and most widely used stablecoins. It is the largest stablecoin in terms of market capitalization. It is pegged to the US dollar and is known for its high liquidity.
USD Coin	USDC	USD Coin is a stablecoin that is tied to the U.S. dollar. It is the second-largest stablecoin. USDC and USDT together account for 80% of the capitalization of the global stablecoin market.
Bitcoin	BTC	Bitcoin is the first and most popular cryptocurrency. It is decentralized and widely used as a store of value and medium of exchange. It is the largest crypto by market capitalization.
Ethereum	ETH	Ethereum is a decentralized platform that enables smart contracts and decentralized applications (dApps). Its native crypto, Ether is the second largest by market capitalization.
Commodities		
Gold	GLD	Gold is a classic hedge tool against inflation or other economic disruptions. Many owners of gold store it in the form of bullion bars or coins specifically for this purpose. However, the recent financial crisis has convinced some economists not to believe gold serves as a secure hedge tool.
Crude oil	WTI	WTI is a light, sweet crude oil, which refers to its low density and low sulfur content and is often used for conversion to gasoline and diesel fuel. Although WTI is priced out of Cushing, Oklahoma, this benchmark contract is tied to energy markets around the world. As a result, trading WTI is an efficient way to trade on both U.S. and international events relating to crude oil.