How does Liquidity affect Crypto Markets?

João Filipe Batalha Mendonça

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Abstract

Title: How does liquidity affect crypto markets?

Author: João Filipe Batalha Mendonça

What is money? The answer to this question has suffered changes in the past century. From coins to paper money, will the next change be from bank and credit money to digital currencies? The emergence of cryptocurrencies may challenge the status quo. This dissertation investigates the dynamics around liquidity and Stablecoins, crypto tokens pegged to fiat currencies. I found that crypto markets are inelastic as a flow of $1, proxied by the change of one dollar in Stablecoins, is associated with a variation in the market capitalization of other cryptocurrencies of $11. Besides, this relationship also happens with a lag of 1 month, led by changes in non-stable crypto market cap, supporting the hypothesis that the issuance of Stablecoins result from demand pressures. A bi-directional causality was established. Furthermore, World Liquidity impacts crypto markets with a lag of 2 months, and for each $1000 change in liquidity, the total crypto market cap varies $3.9 in the same direction, with a significant uni-directional causality from liquidity to crypto, evidence of inefficiencies in the markets. Finally, the correlation between Bitcoin and U.S. Tech stock returns increased, on average, by 0.4 after the start of the pandemic.

Keywords: *Cryptocurrencies, Stablecoins, liquidity, uncertainty, causality, correlation Bitcoin/Tech stocks, Covid-19*

Resumo

Titulo: Como é que a liquidez afeta os mercados de criptomoedas?

Autor: João Filipe Batalha Mendonça

O que é dinheiro? A resposta a esta pergunta sofreu mudanças no último século. Das moedas ao dinheiro em papel, será a próxima mudança do dinheiro em forma de depósitos e de crédito para as moedas digitais? O aparecimento de criptomoedas pode desafiar o status quo. Esta dissertação investiga a dinâmica em torno da liquidez e das moedas estáveis, criptomoedas ligados às moedas fiduciárias, com o objectivo de manter a paridade. Concluí que os mercados cripto são inelásticos uma vez que um fluxo de $1, medido pela mudança de um dólar em moedas estáveis, está associado a uma variação na capitalização de mercado de outras criptomoedas de $11. Além disso, esta relação também acontece com um atraso de 1 mês, liderado por alterações na capitalização do mercado cripto não estável, apoiando a hipótese de que a emissão de moedas estáveis resulta de pressões da procura. Foi estabelecida uma causalidade bidirecional. Além disso, a Liquidez Mundial impacta os mercados cripto com um atraso de 2 meses, e por cada variação de liquidez de $1000, a capitalização total do mercado cripto varia $3,9 na mesma direção, com uma causalidade unidirecional significativa da liquidez para a cripto, evidência de ineficiências nos mercados. Finalmente, a correlação entre os retornos da Bitcoin e das ações tecnológicas aumentou, em média, 0,4 após o início da pandemia.

Palavras-chave: *Criptomoedas, moedas* estáveis*, liquidez, incerteza, causalidade, correlação bitcoin/ações de tecnologia, Covid-19*

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1. Introduction

Bitcoin is a word that entered the dictionary of the financial world only in the last decade. However, it has already conquered its space, found its lovers and haters, but no one can deny its success, as in less than 10 years its market capitalization increased from less than a Billion American Dollars to more than a Trillion. Some counter arguments rely on its high volatility, lack of intrinsic value, or use for illegal purposes. Other alternative cryptocurrencies appeared after, such as Litecoin and Ethereum, having different features but with the same concept, a decentralized and trustless payment system, with immutable and public transactions recorded in a chain of blocks (blockchain).

The ecosystem, composed of blockchains, developers, users, investors, exchanges, and custodians, was still incomplete without a proper medium of exchange, role that highly volatile tokens were unable to play. Stablecoins are the answer for this problem, as liquidity can be stored through them, making the bridge between the real economy, the dollarized financial world and crypto.

Due to very low entry barriers, this market attracted new investors, and after the notoriety it gained in the last few years, investment banks and hedge funds joined as well.

There are some variables that might have played a role in the evolution of this market. In the last 14 years (since Satoshi Nakamoto published the white paper of Bitcoin) liquidity soared, with central banks applying record-low interest rates, buying treasuries from their own governments, and even corporate bonds. Two global events happened in this period: the 2008 financial crisis (and then sovereign debt crisis in Europe) and the burst of Covid-19 pandemic, which influenced the actions of policymakers. This last one produced major plans of economic aid to finance people not to work and stay at home, avoid contact with others and protect public health. These were times of high uncertainty.

In the last months of this period, another economic variable became a theme in the newspapers and in everyday conversations – inflation – to which central banks responded with vigorous interest rate increases.

This dynamic of increasing and draining of liquidity impacted financial markets, especially risky assets, prone to higher volatility.

First of all, this thesis aims to fill the gap in the existent literature on the relationship between liquidity and the crypto market value, its flows and storage, the role of uncertainty, Covid-19, and the evolution of the correlation with tech stocks. Moreover, it will also bring a perspective on how investors have perceived these assets in different periods, and, finally, understanding the impact of Stablecoins in other cryptocurrencies will help to shape the regulatory process of this new asset class.

In sum, I study the triangular relationship between liquidity, Stablecoins and total crypto market, if and how synchronized they are, and the magnitude of impacts, through a multiplier mechanism, in order to have a better perception of the relative dimension that links these variables.

After observing patterns on the correlation between the two largest cryptocurrencies and traditional markets, namely, the technology sector, I will show how it has evolved, how changes in liquidity and uncertainty influenced it, and how much of it can be explained by a virus, with the form of a crown, that disrupted the world as we used to know.

2. Literature Review

In this section I will revisit the existing literature on cryptocurrencies: the comparison between Bitcoin and money, Stablecoins, the investment perspective on the crypto asset class, and its relationship with economic variables.

2.1. Money

From salt to coins, from paper money to Bitcoin (BTC), money has evolved over the centuries. The use of something as a means of exchange allowed the acceleration of trade. Milton Friedman predicted that a form of e-cash would be created (Friedman, 1999), which would allow a two-part transaction without them knowing each other. The European Central Bank characterizes money as an accounting unit, mean of exchange and store of value, making it difficult to conclude that Bitcoin has reached or will ever reach currency status.

Assets that constitute a good store of value are usually illiquid and scarce, in opposition to media of exchange, rather abundant and liquid, so that they hold their value over the short run. A unit of account just needs to be widely accepted and be used as the price basis.

Bitcoin's volatility and acceptance excludes itself from the last two functions, being used as a speculative investment and not a medium of exchange (Baur et al., 2018), unable to compete with standard currencies (Ciaian et al., 2016). A model, built as competition between dollar and BTC, as media of exchange concluded that volatility would not invalidate this function and also, monetary injections influence the price of Bitcoin (Schilling & Uhlig, 2019).

Although its demand is comparable to that of government-issued monies, it is currently money in a relatively small scope (Hazlett & Luther, 2020), being clustered together with developing countries' currencies, whose movements influence cryptocurrencies markets with a lag of four months (Levulytė & Šapkauskienė, 2021).

Unlike fiat currencies, controlled by central banks and without a cap in supply, the scarcity of Bitcoin can be trusted once it is just a mathematical formula, granting it the reserve asset status in the crypto world, which uses Stablecoins as medium of exchange and U.S. dollars as unit of account, solving the conflict in the nature of money (Coppola, 2021).

2.2. Stablecoins

Stablecoins are pegged to inflationary currencies, which means their real yield is negative. They can be a safe haven in certain circumstances, with USD-pegged ones outperforming the gold-pegged, and act as an efficient diversifier in normal market conditions (G. J. Wang et al., 2020). Besides, during episodes of crypto market turbulence, they serve as a digital safe asset while other crypto assets, more speculative, freefall (Liao and Caramichael, 2022).

For businesses to use Stablecoins, there is still a limitation: verification of reserves depends on traditional auditing, despite the blockchain ledger recording the ownership and transfer of tokens (Calle and Zalles, 2019). Moreover, their functions and uses can differ from e-money, namely in providing liquidity to Decentralized Finance (Sokolov, 2021).

In 2021, the U.S. Treasury Secretary Janet Yellen suggested that "well-designed and subject to appropriate oversight", Stablecoins can be valuable as a payment option (Livni and Lipton, 2021).

Considering a different perspective, Tether (USDT), the most popular Stablecoin, facilitates trading in cryptocurrencies without using traditional currencies, and so acting as a safe haven or store of value. Markets of Bitcoin and Ether (ETH), the second largest cryptocurrency in market capitalization, traded against USDT are more liquid and with lower fees than against USD (Barucci et al., 2022).

Transparent money flows have the power to boost market efficiency, as significant positive abnormal trading volume and returns were identified in the hours around Stablecoin transfers, varying the effects on the type of sender or receiver (Ante et al., 2021a).

With the capability to considerably boost competition and innovation in financial services by reducing the dependence on traditional intermediaries, Stablecoins also bring new challenges. Financial stability, market integrity, and consumer protection are traditionally protected by regulators through these middlemen and new regulation is needed to fill this gap. Carrying benefits such as real-time, low-cost programmable payments, financial inclusion, and decentralized finance (Catalini et al., 2021), some of their potential risks rely on payment safety, illegal trades, and technology advancement (C. Li & Shen, 2021).

Regarding its stability, Stablecoins are statistically unstable and Bitcoin volatility granger cause their volatilities (Grobys et al., 2021). Their stabilization is mostly driven by the demand side,

while the supply, i.e., events of issuance, comparable to central bank intervention, plays a minor role (Lyons & Viswanath-Natraj, 2021).

On the influence of Stablecoins in crypto assets pricing dynamics, it was concluded that they reflect the growing demand for these assets rather than acting as a stimulant in times of sharp increase in value (Kristoufek, 2021). An event study revealed market downturns in the week before issuance and positive abnormal returns in the twenty-four hours around it, indicating their role in price discovery and market efficiency (Ante et al., 2021b).

A more individualized research was conducted by Griffin & Shams (2020) to determine whether Bitcoin prices were influenced by Tether or not, i.e., if it was supply-driven (pushed), case in which Bitfinex, the private company and exchange behind the Stablecoin, would print USDT to push BTC price up, or demand-driven (pulled), situation where the supply of Tether would increase when its price passed the 1 USD level. The results suggested intra-month manipulation as BTC price was pushed by USDT supply, indicating that Tether was not fully backed by USD but release end of month (EOM) reports to claim so, resulting in negative BTC returns at EOM, in which USDT supply increased.

Also, using Granger causality tests, Wei (2018) concludes that Tether grants did not cause Bitcoin returns and that its rally in 2017 is unlikely to be result of manipulation by Tether. It is shown a positive association between grants and the rise of trading of crypto in the following day and after periods of negative BTC returns, the trading of USDT increased.

The relationship between crypto assets, financial markets and the real economy has already been established and Stablecoins have a role in it as the changes in circulating tokens have been correlated with the issuance of commercial paper, in the cases it is incorporated in the reserves and so backs their peg. Despite not impacting the rates, the additional demand is offset with an expansion of supply, and consequently, impacts the financing mix of firms. This link happens in normal circumstances, and not just in extreme events, which emphasis its importance in the interplay between cryptocurrencies dynamics and the financing of real economy (Barthelemy et al., 2021). They also constitute a risk transmitter connecting traditional and crypto markets to a deeper extent, with the re-dollarization of the latest (Huang et al.,2021).

Regulating this new financial sector is certainly a challenge. This way, it was analyzed how some possible rules would impact the issuers and users. Mandatory capital requirements, i.e., excess reserves, would benefit the welfare of users, while stipulating the riskiness of the reserve assets might destabilize the price and requirements for the issuer to keep a fixed exchange rate

would wipe out the economic surplus from risk sharing between users and issuers. Moreover, even if stability is long-lasting, a debasement[1] event brings a permanent price volatility, in what can be called an instability trap (Y. Li & Mayer, 2021).

One way to understand the functioning of Stablecoins is through the idea of shadow banking i.e., the conversion of risky assets that behave like money in calm times but illiquid when uncertainty rises, which causes the collapse of the system, contraction of liquidity provisions, increase of the associated premium and discount rates, and consequently, the fall of asset prices and investment (Moreira & Savov, 2017). Studying MakerDAO's DAI token, the first decentralized Stablecoin, it was shown that peg volatility is related to collateral risk, and once safe forms of collateral were introduced, the stability of the exchange rate increased, supporting the shadow banking thesis (Kozhan & Viswanath-Natraj, 2021).

2.3. Investment

Along with gold and the Swiss Franc, Bitcoin is considered one of the main safe assets in the market(Janson & Karoubi, 2021). However, for G7[2] stock markets, gold is unquestionably both a safe haven and hedge, outperforming Bitcoin, which only serves these two purposes in Canada, in out-of-sample hedging effectiveness and diversification benefits (Hussain Shahzad et al., 2020).

Another study proves that, under fear sentiment conditions, investors disinvest, and Bitcoin's price is unfavorably impacted, challenging its safe haven properties. Besides, it impacts VIX (Chicago Board Options Exchange's Volatility Index), which indicates that it can be used as an indicator for a deeper analysis of the fear index (Su et al., 2022).

Evidence from China suggests that Shanghai Interbank Offered Rate (SHIIBOR) has a mean spillover effect on Bitcoin, while gold, monetary and bond markets (against which can be hedged) have volatility spillover effect. In the reverse order, the most popular crypto currency only affects gold market, being a safe haven in the case of extreme price fluctuations in the monetary market (G. Wang et al., 2019).

[1] Debasement occurs when the peg is broken and the markets valuation of the Stablecoin significatively differs from 1 USD

[2] G7 is an informal grouping of wealthy Western nations, namely the United States, Britain, Canada, France, Germany, Italy and Japan

Using the tree Fama and French factors and applying them to cryptocurrencies' data, it was found that market, size, and momentum capture the cross-sectional expected returns, and long-short strategies formed by ten characteristics produce substantial and statistically significant excess returns(W. Liu et al., 2020). Moreover, momentum presents a robust time-series effect, while investor attention proxies forecast future returns significantly, which used to show low exposure to macroeconomic factors, stocks, currencies, and commodities (Y. Liu & Tsyvinski, 2021).

Regarding portfolio composition choices, adding Bitcoin to the basket of assets available to an American investor, shifts the efficient frontier upwards, increasing returns and Sharpe Ratio. The higher the target risk is, the bigger the weight it will represent and if short selling is permitted, it brings even larger gains (J. P. Li et al., 2021).

The relationship between cryptocurrencies and traditional markets changed with the Covid-19 pandemic, from a role of hedge opportunity to become a part of the global market, connected to currencies, stocks and commodities. Although the complexity of the crypto market has increased to be similar to Forex market at the level of individual time-series, due to growth of transaction frequency, turnover and number of participants, it is still less synchronized and the information flows at a slower pace, which results in more frequent arbitrage opportunities (Wątorek et al., 2021).

2.4. Economic Variables

2.4.1. Inflation

Working as an inflation hedge is one of the key characteristic crypto advocates propose. This argument is based on the scarcity comparison between fiat currencies, controlled by central banks and with virtually infinite supply, and most cryptocurrencies, whose maximum quantity of tokens is defined in the protocol.

There are some contradictory studies in this matter. It was identified a positive relationship between crypto returns and forward inflation expectations during the Covid-19 pandemic but not in any other period (Conlon et al., 2021), inflationary pressures causing rising Bitcoin prices (Choi & Shin, 2022), fluctuations in BTC prices causing change in forward inflation rate, and in the case of big shocks (one standard deviation), the impact in expected inflation is permanent, but the relationship is not driven by the pandemic (Blau et al., 2021).

Consumer Price Index (CPI) - a common measure for inflation – is used to support the short-term hedging capabilities of Bitcoin, the bidirectional volatility transmission, and the puzzling result of causality from BTC price to CPI (L. Wang et al., 2022).

2.4.2. Monetary policy and liquidity

It is undeniable that crypto markets and economic variables are linked. For instance, monetary policy announcements have an impact on local Bitcoin interest and trade volume, even though the associated demand dissipates within a week. This reaction only happens where inflation risk is unusual (Marmora, 2022). Money supply is also connected to the most popular cryptocurrency through a negative effect on its price, a causality in both directions, as well as volatility transmission (L. Wang et al., 2022).

One of the variables of interest for this thesis is liquidity and whether it affects crypto markets or not. The liquidity creation by banks affects equity markets, and when it reaches excessive rates, peaks in equities follow peaks in liquidity, with approximately three months lag for the German market (Weber, 2016). A bi-directional causality between stock returns and money supply advocates for the efficient markets hypothesis, as information concerning the rate of growth of the money supply is incorporated into stock returns (Rogalski & Vinso, 1977).

The response of Governments to the health crisis our planet faced since the beginning of 2020 relied on massive liquidity injections to help people stay at home and not risking public health or falling into poverty. Huge programs were designed and employed. The economic results can be questioned, and employment effects show that programs did not hit the target, at least in an efficient way, bearing in mind their size (Granja et al., 2020). Some of these funds fled to Bitcoin trading reflecting the wealth shock, with higher incidence among people without families and at exchanges for non-professional investors, supporting the thesis of misuse of stimulus checks. Although the economic impact payments (EIPs) had a significant effect on the USD-BTC trading pair, it was modest, with a growth of 3.8 percent in trade volume and 7 basis points in price (Zimmerman & Divakaruni, 2021).

2.4.3. Uncertainty

Uncertainty is another economic variable researchers find interesting and whether crypto is a safe haven or not in such circumstances is still a matter of discussion.

Early studies showed Bitcoin acted as a hedge against global uncertainty at shorter investment horizons (Bouri et al., 2017).

Under intensified uncertainty, Bitcoin prices decline (Choi & Shin, 2022), while its volatility decreases with shocks in American economic policy, as well as in Japan. Furthermore, the correlation between Economic Policy Uncertainty (EPU) and Bitcoin volatility increased after the creation of its futures market (Matkovskyy et al., 2020). The negative effect in returns comes together with a bidirectional volatility transmission and a puzzling causality from BTC to EPU (L. Wang et al., 2022).

It was found that EPU has predictive power on BTC returns, acting this way as a hedge against uncertainty (Demir et al., 2018). More recently, this relationship was studied at a deeper extent, concluding that the causality with returns only happens in extreme market conditions, while in normal and bullish times, EPU causes Bitcoin volatility, mainly driven by negative changes in Economic Policy Uncertainty (Mokni, 2021). Moreover, the effect differs from short to long time horizons, being significantly negative and positive, respectively, despite the magnitude decreasing with increasing horizons (Hernandez et al., 2022 and Nasreen et al., 2022).

The role of Covid-19, as an event of extreme uncertainty, has been crucial. During these times, return and volatility spillovers got to levels never seen before, while Bitcoin is a transmitter of volatility to other markets, distancing itself from safe haven's properties and gold and the only global factor causing higher BTC volatility is EPU (Elsayed et al., 2022).

Periods of high uncertainty highlight the existing positive correlation between Bitcoin, stocks and gold (Z. Li et al., 2022). The effect differs geographically, with opposite responses in the United States of America and Japan (negative) and China (positive). Uncertainty in equity markets, Federal Open Market Committee (FOMC), the gross domestic product, and other macroeconomic data, adversely impacts BTC market (Shaikh, 2020). The predictive power of China EPU in Bitcoin returns is also significant, and the ban on crypto trading was reflected in it (Cheng & Yen, 2020).

3. Data Sources and Construction

This section describes the origin of the data used to conduct the analysis for this study and the process of assembling the variables.

The first challenge of this thesis was measuring flows to crypto markets and their impact in its total valuation. To quantify flows to this market, I found a proxy – the market capitalization of Stablecoins – and used it to explain the market capitalization of all cryptocurrencies.

The *Stablecoin Market Cap* is an imperfect measure as investors do not need them to buy other cryptocurrencies, not all issuers have a 100% fiat collateral (it is questioned if any has), some are backed by other tokens, and centralized exchanges can have less assets in their wallets than what clients see in their accounts, while many crypto projects hold Stablecoins in their treasuries, to pay for workers, future investments or as a savings account. Nevertheless, I decided to use it because the data was publicly available and trustworthy as it can be audited through the immutable blockchain. On the other side, using real money flows would require all exchanges, the current and past ones, giving me access to confidential historical data, an unlikely scenario. This data was obtained by extracting and summing the daily historical market capitalization of all Stablecoins (including the ones which are no longer stable) from CoinMarketCap[3], the most used website to follow the prices of crypto assets, reaching in 2021 13.2 billion page views.

To quantify the behavior of the crypto market, I use the weekly market capitalization of all assets, retrieved from Statista, but whose source is CoinMarketCap. While for American stocks, there are indexes which are widely accepted as "the market", such as the S&P 500 or the Dow Jones, no consensus exists in crypto so the widely used measure is the total market cap.

When combining these two variables, I utilized both weekly and monthly data, the two available frequencies and with enough observations at the same time, from 25th February 2015 up to 28th September 2022. Once Stablecoins are incorporated in the *Total Crypto Market Cap*, I created a new variable, the *Non-Stable Crypto Market Cap* (*NS*), by subtracting the *Market Cap of Stablecoins* (*S*) from *Total Crypto Market Cap* (*TC*).

$$\boldsymbol{NS_t = TC_t - S_t}$$

[3] Data retrieved from https://coinmarketcap.com/

For the Multiplier analysis, the dollar values were used. However, to study the time series effects, the log returns were computed, as follows.

$$\boldsymbol{tc_t = log\ (TC_t) - log(\ TC_{t-1})}$$

$$\boldsymbol{ns_t = log\ (NS_t) - log(NS_{t-1})}$$

$$\boldsymbol{s_t = log\ (S_t) - log(\ S_{t-1})}$$

Besides, to investigate if current returns can be explained by past returns, a new variable was created – the *Non-Stable Crypto Market Cap Momentum* (*nsm*) – by computing the log return of the two previous months (weeks) of market capitalization of all cryptocurrencies except Stablecoins.

$$\boldsymbol{nsm_t = log\ (\ NS_{t-1}) - log\ (\ NS_{t-3})}$$

Furthermore, another key objective was linking cryptocurrencies behavior with monetary and real economic variables. For the monetary side, I chose Global Liquidity i.e., all the cash and credit available to financial markets, after the immediate needs of the real economy have been fulfilled[4], which constitutes the aggregate value of Central Bank liquidity, private sector liquidity and cross-border capital flows. In opposition to Money Supply, it employs a sources of funds approach, while M2[5], for instance, is based on uses of funds. This data, from 28th February 2015 to 30th September 2022, was provided by CrossBorder Capital for research purposes.

As before, for the multiplier analysis, I use the dollar values of *World Liquidity* (*WL*), while for time-series regressions, the log returns are applied. A variable with the *3-month cumulative World Liquidity variation* (*cwl*) is also used.

$$\boldsymbol{wl_t = log\ (WL_t) - log(\ WL_{t-1})}$$

$$\boldsymbol{cwl_t = log\ (WL_t) - log(\ WL_{t-3})}$$

When examining the multiple possible effects of liquidity on crypto markets, I use the *Total Crypto Market Cap* values, as Stablecoins are no longer the explanatory variable.

[4] Based on the definition of liquidity by CrossBorder Capital, an independent investment advisory and macro research firm specialized in the monitoring of Global Liquidity Flows

[5] M2 is a measure of the money supply that includes cash, checking deposits, and other types of deposits that are readily convertible to cash such as CDs, according to Investopedia

I also include a *Total Crypto Market Cap Momentum* (*tcm*) variable, by computing the log return of the two previous months (weeks) of market capitalization of all cryptocurrencies.

$$\boldsymbol{tcm_t = log\ (TC_{t-1}) - log\ (TC_{t-3})}$$

Additionally, I retrieved, once again, from CoinMarketCap, the daily prices of the two largest crypto currencies, Bitcoin (BTC) and Ethereum (ETH), since data is available (2014 and 2016, respectively), and computed the returns (*btc* and *eth*, respectively).

$$\boldsymbol{btc_t = log\ (BTC_t) - log(\ BTC_{t-1})}$$

$$\boldsymbol{eth_t = log\ (ETH_t) - log(\ ETH_{t-1})}$$

To understand how investors perceive crypto I decided to test its relationship with risky stocks and chose the technology sector as I could work with data from Kenneth R. French Library[6], specifically the 10 industry Portfolios and the daily returns of the Tech sector (*tech*), comprising firms which run their activities on computers, software, and electronic equipment. Then, I calculate the 90-day rolling correlation between the returns of each of the two chosen cryptocurrencies and tech stocks (*rbtc* and *reth*).

$$rbtc_t = \frac{n\sum_{t=-90}^{0} btc_t tech_t - (\sum_{t=-90}^{0} btc_t)\ (\sum_{t=-90}^{0} tech_t)}{\sqrt{[n(\sum_{t=-90}^{0} btc_t^2)\ (\sum_{t=-90}^{0} btc_t)^2][n(\sum_{t=-90}^{0} tech_t^2)\ (\sum_{t=-90}^{0} tech_t)^2]}}$$

$$reth_t = \frac{n\sum_{t=-90}^{0} eth_t tech_t - (\sum_{t=-90}^{0} eth_t)\ (\sum_{t=-90}^{0} tech_t)}{\sqrt{[n(\sum_{t=-90}^{0} eth_t^2)\ (\sum_{t=-90}^{0} eth_t)^2][n(\sum_{t=-90}^{0} tech_t^2)\ (\sum_{t=-90}^{0} tech_t)^2]}}$$

Moreover, to measure uncertainty, I employ the monthly Global Economic Policy Uncertainty (GEPU) at purchasing power parity[7], retrieved from the website[8] "Economic Policy Uncertainty". Since it will be used to explain 90-day rolling correlations, I compute the *3-month average of GEPU* (*3GEPU*) and its log value (*3gepu*).

[6] Website link: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[7] The GEPU Index is a GDP-weighted average of national EPU indices for 21 countries: Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States
[8] Website link: https://www.policyuncertainty.com/global_monthly.html

$$\mathbf{3GEPU_t} = \frac{\mathbf{1}}{\mathbf{3}} * (\mathbf{GEPU_t} + \mathbf{GEPU_{t-1}} + \mathbf{GEPU_{t-2}})$$

$$\mathbf{3gepu_t} = \mathbf{log}\ (\mathbf{3GEPU_t})$$

For a similar purpose, the *3-month average World Liquidity* (*3WL*) and its log value (*3wl*) are computed.

$$\mathbf{3WL_t} = \frac{\mathbf{1}}{\mathbf{3}} * (\mathbf{WL_t} + \mathbf{WL_{t-1}} + \mathbf{WL_{t-2}})$$

$$\mathbf{3wl_t} = \mathbf{log}\ (\mathbf{3WL_t})$$

Finally, I include a dummy variable for COVID-19 (*COVID*), equal to one after the World Health Organization declared the pandemic state (11th March 2020), to understand its explanatory power on the relationship between crypto and tech sector.

$$\mathbf{COVID} = \begin{cases} \mathbf{1}\ \boldsymbol{if\ date} > \mathbf{11/03/2020} \\ \mathbf{0} \qquad \boldsymbol{otherwise} \end{cases}$$

4. Methodology

My first goal for this thesis was obtaining a number for the multiplier in crypto markets i.e., how much would the *Total Crypto Market Cap* change with an inflow of 1 dollar. For this purpose, I used simple regressions, being the dependent variable the total market cap and the independent one, the *Stablecoin Market Cap*, as explained in section Data Sources and Construction. It was tested with and without intercept.

$$\boldsymbol{TC_t = \propto + \beta\, S_t + \ \varepsilon_t}$$

However, part of the total market cap corresponds to *Stablecoin Market Cap*, creating an endogeneity problem, so an additional test was done with *Non-Stable Market Cap*.

$$\boldsymbol{NS_t = \propto + \beta\, S_t + \ \varepsilon_t}$$

Then, I wanted to deeper understand this relationship, whether changes in Stablecoin Market Cap influence changes in other crypto assets valuation, and if so, check for possible lagged effects. Additionally, the non-stable momentum variable is added in the last regression. Here, two different time basis were employed, monthly and weekly, and the regressions are computed with increasing complexity, adding up one more independent variable each time, in the order presented below.

$$\boldsymbol{ns_t = \propto + \beta_1\, s_t + \beta_2 s_{t-1} + \beta_3 s_{t-2} + \beta_4 s_{t-3}\ + \beta_5 nsm_t + \ \varepsilon_t}$$

The existing literature explores this relationship in both ways. Kristoufek (2021) studied if Stablecoins reflected growing demand or acted as stimulants in periods of increase in value of crypto assets. Griffin and Shams had the same idea but only for Tether and Bitcoin, the largest crypto currencies of each category. This way, with elementary regressions, I present an alternative method but with identical purpose, trying to explain Stablecoin Market Cap variation with returns of other cryptos, and opening the possibility of this effect happening with delays of one, two and three months (or weeks).

$$\boldsymbol{s_t = \propto + \beta_1 ns_t + \beta_2 ns_{t-1} + \beta_3 ns_{t-2} + \beta_4 ns_{t-3}\ + \ \varepsilon_t}$$

Next, I introduce a new variable, *World Liquidity*, to the previous dataset, and employ the same methods as before: first, the multiplier mechanism with both *Total Crypto Market Cap* and *Stablecoin Market Cap,* and then the return analysis with lagged variables, to which I add a *3-*

month cumulative World Liquidity in case dispersed effects are not significant but as an aggregate they are.

$$\boldsymbol{TC_t = \propto + \beta\, WL_t + \varepsilon_t}$$

$$\boldsymbol{S_t = \propto + \beta\, WL_t + \varepsilon_t}$$

$$\boldsymbol{tc_t = \propto + \beta_1 wl_t + \beta_2 wl_{t-1} + \beta_3 wl_{t-2} + \beta_4 wl_{t-3} + \beta_5 tcm_t + \varepsilon_t}$$

$$\boldsymbol{tc_t = \propto + \beta_1 cwl_t + \beta_2 tcm_t + \varepsilon_t}$$

$$\boldsymbol{s_t = \propto + \beta_1 wl_t + \beta_2 wl_{t-1} + \beta_3 wl_{t-2} + \beta_4 wl_{t-3} + \beta_5 tcm_t + \varepsilon_t}$$

$$\boldsymbol{s_t = \propto + \beta_1 cwl_t + \beta_2 tcm_t + \varepsilon_t}$$

Furthermore, in line with Grobys et al. (2021) and Wei (2018), I performed Granger Causality Tests for the possible combinations between *Total Crypto Market Cap, Stablecoin Market Cap* and *World Liquidity*.

Finally, in order to study the relationship between crypto assets and tech stocks, I make use of three explanatory variables: Global Economic Policy Uncertainty, World Liquidity and Covid-19, separately and combined between them, presenting five regressions for each major crypto asset. Differently from previous research, which are developed around Bitcoin returns and volatility, I want to use the independent variables to explain the correlation with risky stocks, with the intention of taking conclusions on the relative perceptions of investors regarding these two asset classes. The combinations with both *WL* and *GEPU* are excluded because the number of observations is limited, and they would take explanatory power from each other.

$$\boldsymbol{rbtc_t = \propto + \beta_1 3gepu_t + \beta_2 COVID + \beta_3 3wl_t + \varepsilon_t}$$

$$\boldsymbol{reth_t = \propto + \beta_1 3gepu_t + \beta_2\, COVID + \beta_3 3wl_t + \varepsilon_t}$$

5. Results

This section outlines the empirical work carried out for the purposes of this paper. The first subsection exhibits the findings on the relationship between Stablecoins and the global crypto market, while the second subsection outlines the link with Global Liquidity and the third one, the association with tech stocks.

5.1. Empirical Evidence on The Effect of Stablecoins on the Crypto Market

Stablecoins, as part of the Crypto Universe, have experienced a similar evolution in latest years, reaching a peak Market Capitalization of 183 billion U.S. Dollars, in May 2022, right before the collapse of Terra/Luna ecosystem, which involved the debasement of UST, their algorithmic Stablecoin. As Figure 1 suggests, both Total Crypto and Stablecoin Market Cap, came across exponential increases in valuation in 2021, with major losses in 2022, more severe for the global than for the stable market.

Figure 1: Evolution of Total Crypto and Stablecoin Market Cap since 2015

For the first multiplier models, presented in table 1, I consider both the hypothesis of *Total Crypto Market Cap* behaving like a direct proportionality of *Stablecoin Market Cap* (1) or the intercept value being different from zero (2). All results are significant at 1%, which

Table 1: Multiplier Mechanism using Stablecoin Market Cap

	Total Crypto Market Cap		Non-Stable Crypto Market Cap	
	(1)	(2)	(3)	(4)
Stablecoin Market Cap	**12.63*** **	**11.32*** **	**12.08*** **	**10.80*** **
	(42.30)	(35.73)	(19.57)	(16.50)
Constant		**1.72*10^{11} *** **		**1.68*10^{11} *** **
		(8.35)		(4.00)
Observations	395	395	395	395
Adjusted R-squared	0.819	0.764	0.793	0.729

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

demonstrates the strength of this relationship, even in the regressions whose dependent variable is the *Non-Stable Crypto Market Cap* (models 3 and 4). The coefficients range from 10.80 to 12.63, which can be interpreted as "a variation of 1 U.S. Dollar in the Market Cap of Stablecoins is associated with a variation, with the same signal, of 10.80 U.S. Dollars in the Market Cap of other, Non-Stable, cryptocurrencies" and "a variation of 1 U.S. Dollar in the Market Cap of Stablecoins is associated with a variation, in the same direction, of 12.63 U.S. Dollars in the Market Cap of all cryptocurrencies".

These conclusions support the Inelastic Markets Hypothesis, defended by Gabaix & Koijen (2021) in their paper "In Search of the Origins of Financial Fluctuations: The Inelastic Markets Hypothesis". An investment of $1 in the stock market increases the aggregate value of the market by $5, due to the inelastic preferences of agents, such as Mutual Funds, required to maintain a share on equities. In opposition to this theory, if markets were perfectly elastic, each dollar in and out of the market would not produce a multiplier effect and in an infinite elasticity scenario, each dollar in or out would produce zero effect and all agents would agree on the price of securities.

Elasticities are the inverse of the coefficients presented, ranging from 0.079 to 0.093, which seems to indicate crypto markets are approximately twice less elastic, compared to the stock market. This conclusion is based on a different methodology, so its value is limited. Nevertheless, it is puzzling as I expected that a new market, with less established rules and

mandates would be more elastic. Two theories to explain this behavior are the long-term perspective from holders of cryptocurrencies and the lock of tokens in the treasuries of projects, which would reduce the elasticity and boost the multiplier effect.

Moreover, with the inclusion of a significant constant, the coefficients drop, which suggests other significant and positive factors can help explain *Total Crypto Market Cap*.

Table 2: Model testing monthly variation in Non-Stable Crypto Market Cap

Non-Stable Crypto Market Cap △%					
	(1)	(2)	(3)	(4)	(5)
Constant	0.030	0.013	0.014	0.002	-0.008
	(0.882)	(0.352)	(0.361)	(0.056)	(-0.178)
Stablecoin Market Cap △%	**0.216***	0.176	0.177	0.191	**0.253***
	(1.733)	(1.369)	(1.362)	(1.454)	(1.709)
Stablecoin Market Cap △% 1 month before		0.156	0.159	0.141	0.195
		(1.216)	(1.2)	(1.051)	(1.329)
Stablecoin Market Cap △% 2 months before			-0.012	-0.040	-0.031
			(-0.095)	(-0.297)	(-0.234)
Stablecoin Market Cap △% 3 months before				0.113	0.128
				(0.872)	(0.977)
Non-Stable Crypto Market Cap Momentum					-0.088
					(-0.911)
Observations	88	88	88	88	88
Adjusted R-squared	0.023	0.028	0.016	0.014	0.012

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

The *Non-Stable Crypto Market Cap* variations are only significantly affected by the variation in *Stablecoin Market Cap* in the same month, while lagged effects and even the returns of crypto in the previous 2 months have no explanatory power. The coefficient for the regression with only the two above mentioned variables and the intercept (1) is 0.216, significant at 10%, indicating that an increase of 1 percent in the *Market Cap of Stablecoins* is associated with an increase of 0.216 percent in the *Market Cap of Other Cryptocurrencies*, in the same month. This is not a causality test but the lack of significancy from Stablecoins in the prior months

suggests that crypto price appreciation was not driven by the issuance of newly minted tokens pegged to fiat currencies. Such a result may be important to understand this new asset class and how it should be regulated.

When time span decreases and I use weekly frequency (Table 3), the significance of Stablecoins variations disappear and the Momentum variable becomes significant at 5%, which indicates crypto returns have some autocorrelation effect, the increase (decrease) of prices on the past 2 weeks attracts (pushes away) investors and it reflects on returns of that week.

Table 3: Model testing weekly variation in Non-Stable Crypto Market Cap

	Non-Stable Crypto Market Cap △%				
	(1)	(2)	(3)	(4)	(5)
Constant	**0.011***	**0.011***	0.009	0.007	0.006
	(1.921)	(1.785)	(1.412)	(1.054)	(0.952)
Stablecoin Market Cap △%	0.067	0.067	0.057	0.047	0.020
	(1.127)	(1.113)	(0.939)	(0.771)	(0.324)
Stablecoin Market Cap △% 1 week before		0.009	0.005	-0.007	-0.024
		(0.155)	(0.086)	(-0.109)	(-0.404)
Stablecoin Market Cap △% 2 week before			0.076	0.072	0.070
			(1.253)	(1.188)	(1.158)
Stablecoin Market Cap △% 3 week before				0.092	0.088
				(1.536)	(1.479)
Non-Stable Crypto Market Cap Momentum					**0.089****
					(2.533)
Observations	391	391	391	391	391
Adjusted R-squared	0.01	-0.002	0	0.003	0.017

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Analogously, I studied the impact of variations of Non-Stable Crypto Market Cap on Stablecoins (Table 4) and the results, with many significant coefficients, show that the demand for pegged tokens is created by the returns of other cryptocurrencies. There is one variable whose p-values are always close to zero, the *Non-Stable Crypto Market Cap △% 1 month before*, with coefficients between 0.435 and 0.448, evidence that the *Stablecoin Market Cap*

runs with a lag of 1 month relative to the remaining market, supporting the theory that the changes in demand for Stablecoins reflect changes in prices of crypto assets, which materialize in demand for non-stable cryptocurrencies (regression (5) in Table 3) and for Stablecoins, both with a lagged effect.

In regressions (1) and (2), the non-lagged variable is significant at 10% while in (4) and (5), it is the *two-month lagged non-stable return*.

The explanatory power of Non-Stable Crypto to Stablecoins (Table 4), measured by the R-squared, increased substantially when compared with the opposite direction (Tables 2 and 3). All this supports the findings of Ladislav Kristoufek and the idea that Stablecoins reflect the remaining market behavior rather than induce it.

Table 4: Model testing monthly variation in Stablecoin Market Cap

	Stablecoin Market Cap △%			
	(1)	(2)	(3)	(4)
Constant	**0.138*** **	**0.111*** **	**0.103*** **	**0.097*** **
	(5.516)	(5.119)	(4.770)	(4.427)
Non-Stable Market Cap △%	**0.156***	**0.134***	0.1249	0.121
	(1.733)	(1.743)	(1.650)	(1.606)
Non-Stable Market Cap △% 1 month before		**0.448*** **	**0.440*** **	**0.435*** **
		(5.824)	(5.805)	(5.773)
Non-Stable Market Cap △% 2 months before			**0.150***	**0.144***
			(1.986)	(1.912)
Non-Stable Market Cap △% 3 months before				0.107
				(1.394)
Observations	88	88	88	88
Adjusted R-squared	0.023	0.293	0.317	0.324

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Finally, Granger Causality Tests presented in Table 5 indicate a bi-directional causality, significant at 1%, between *Stablecoin Market Cap* and *Non-Stable Crypto Market Cap*, which reinforces the hypothesis of an interdependent market, where stable and the other cryptocurrencies are complementary assets.

Table 5: Granger Causality Test for Stablecoin and Non-Stable Crypto Market Cap

	Stablecoin Market Cap_x	Non-Stable Crypto Market cap_x
Stablecoin Market Cap_y	1	0.0001
Non-Stable Crypto Market cap_y	0	1

5.2. Empirical Evidence on the Effect of World Liquidity on the Crypto Market

The last 7 years were a period of massive increase in cash and credit available for financial markets after the needs of the real economy were satisfied. From its bottom, in 2015, to the peak, in the beginning of 2022, world liquidity increased 50% or $60 Trillion, of which some may have gone to crypto and Stablecoins, as their market cap indicate in figures 2 and 3. But in which proportion?

Figure 2: Evolution of World Liquidity and Total Crypto Market Cap since 2015

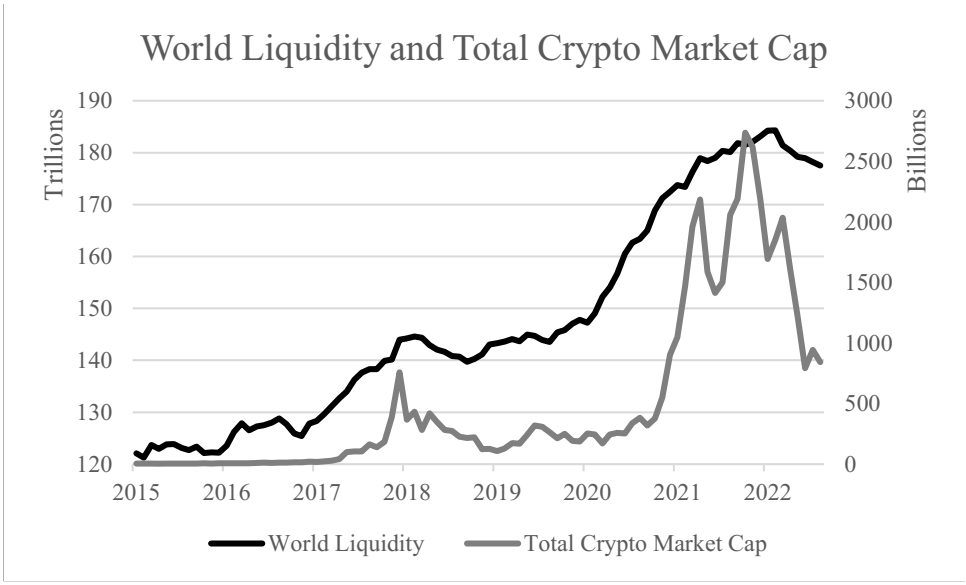

Figure 3: Evolution of World Liquidity and Stablecoin Market Cap since 2015

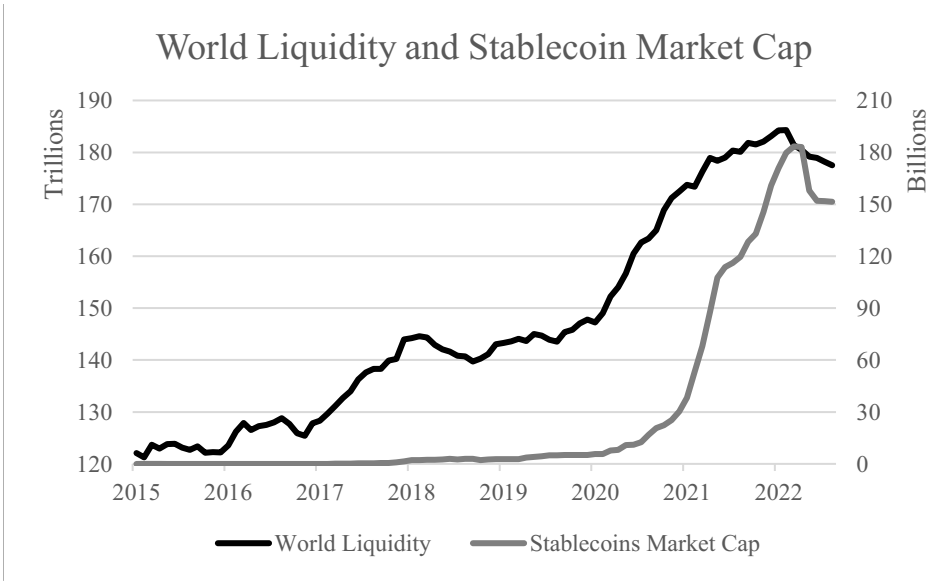

Table 6 answers that question. An increase (decrease) of $1 in *World Liquidity* leads to an increase (decrease) of $0.0039 in *Total Crypto Market Cap* and $0.0002 in *Stablecoin Market Cap*, or with a different scale, a $1000 change in Liquidity leads to a change of $3.9 and $0.20, respectively, in the same direction. These results show the relative importance of crypto in the investing landscape, while also confirming its dependence on liquidity.

Table 6: Multiplier Mechanism using World Liquidity

	Total Crypto Market Cap		Stablecoin Market Cap	
	(1)	(2)	(3)	(4)
World Liquidity	**0.0039*** **	**0.0039*** **	**0.0002*** **	**0.0002*** **
	(8.76)	(8.71)	(6.83)	(6.79)
Constant		**2.59*10^{-17} *** **		**1.66*10^{-18} *** **
		(8.71)		(6.79)
Observations	92	92	92	92
Adjusted R-squared	0.173	0.164	0.134	0.124

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Furthermore, *World Liquidity* significantly (at 1%) and positively influences *Total Crypto Market Cap* with a lag of two months, as it would be expected from an alternative investment, performed mostly by individuals rather than banks, who receive credit in the first hand. The

first model outputs a significant impact of 5.951% in *Total Crypto Market Cap* per 1% change in *World Liquidity*, in the same month. However, this coefficient becomes not significant when lagged variables are introduced. The last model delivers the most significant independent variable, the *Cumulative World Liquidity ∆% 3 months before,* which aggregates the variation of World Liquidity in the four months (three past and the current one) that seemingly indicates a positive relationship between liquidity and crypto valuations.

Table 7: Model testing monthly variations in Total Crypto Market Cap with Liquidity

	Total Crypto Market Cap △%					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.037	0.028	0.012	0.014	0.015	0.014
	(1.163)	(0.834)	(0.359)	(0.405)	(0.409)	(0.411)
World Liquidity △%	**5.951***	4.592	4.018	4.087	4.184	
	(1.826)	(1.305)	(1.152)	(1.161)	(1.164)	
World Liquidity △% 1 month before		3.579	1.446	1.492	1.548	
		(1.019)	(0.395)	(0.405)	(0.415)	
World Liquidity △% 2 months before			**6.289***	**6.570***	**6.623***	
			(1.804)	(1.779)	(1.775)	
World Liquidity △% 3 months before				-0.851	-0.737	
				(-0.242)	(-0.204)	
Total Crypto Market Cap Momentum					-0.013	-0.014
					(-0.156)	(-0.181)
Cumulative World Liquidity △% 3 months before						**3.930****
						(2.559)
Observations	85	85	85	85	85	85
Adjusted R-squared	0.027	0.028	0.054	0.042	0.031	0.031

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Studying the impact of liquidity in Stablecoins, I found an interesting pattern. Likewise with Total Crypto Market Cap, the same month variation is only significant when modeled alone (displaying a 6.601 coefficient with a p-value lower than 5%). On the other hand, the significant

Table 8: Model testing monthly variations in Stablecoin Market Cap with Liquidity

	Stablecoin Market Cap △%					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	**0.118*** **	**0.103*** **	**0.104*** **	**0.095*** **	**0.090*** **	**0.090*** **
	(4.392)	(3.748)	(3.628)	(3.239)	(3.483)	(3.602)
World Liquidity △%	**6.601** **	4.460	4.486	4.199	1.891	
	(2.416)	(1.536)	(1.529)	(1.431)	(0.727)	
World Liquidity △% 1		**5.639***	**5.738***	**5.545***	4.224	
month before		(1.947)	(1.863)	(1.804)	(1.566)	
World Liquidity △% 2			-0.291	-1.462	-2.728	
months before			(-0.099)	(-0.475)	(-1.01)	
World Liquidity △% 3				3.555	0.862	
months before				(1.214)	(0.330)	
Total Crypto Market Cap					**0.298*** **	**0.300*** **
Momentum					(5.089)	(5.245)
World Liquidity △% 3						1.350
months before cumulative						(1.198)
Observations	85	85	85	85	85	85
Adjusted R-squared	0.054	0.085	0.074	0.079	0.298	0.299

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

lagged effect is the one with 1 month only (for Total Market Cap it was the 2-month). This is a puzzling result as, based on the findings of *Stablecoin Market Cap* being influenced by previous changes in *Non-Stable Crypto Market Cap,* I would expect significant *World Liquidity* coefficients for Stablecoins with larger lag than for Total Crypto. However, Table 1 presents a sound explanation for this result as Stablecoin coefficients with 1-month lag are significant to explain variations in other cryptocurrencies. The *Momentum* variable acted as expected, with significance at 1% and positive factors.

Such findings made me perform an additional test, with the same dependent variable used in Table 2, the *Non-Stable Crypto Market Cap*.

The sixth model strengthens the argument that Stablecoins are more linked to crypto than other macroeconomic factors, once the *Momentum* variable is significant, while *Cumulative World Liquidity* is not.

Additional Test

The results for the test are similar to those presented in Table 7, in spite of the two-month lagged World Liquidity variation coefficients turning not significant in models with other independent variables. Isolated, it has a p-value lower than 5% and a coefficient of 7.123, advocating for the influence of liquidity in crypto markets.

Table 9: Model testing monthly variations in Non-Stable Market Cap with Liquidity

	Non-Stable Crypto Market Cap △%						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.038	0.027	0.012	0.012	0.012	0.014	0.030
	(1.192)	(0.835)	(0.363)	(0.343)	(0.345)	(0.404)	(0.959)
World Liquidity △%	**5.769***	4.296	3.657	3.649	3.743		
	(1.778)	(1.231)	(1.052)	(1.041)	(1.047)		
World Liquidity △% 1		3.951	2.310	2.296	2.357		
month before		(1.135)	(0.644)	(0.632)	(0.642)		
World Liquidity △% 2			5.565	5.538	5.592		**7.123****
months before			(1.651)	(1.589)	(1.588)		(2.253)
World Liquidity △% 3				0.111	0.224		
months before				(0.033)	(0.065)		
Non-Stable Crypto Market					-0.013	-0.012	
Cap Momentum					(-0.161)	(-0.154)	
World Liquidity △% 3						**3.885****	
months before cumulative						(2.538)	
Observations	88	88	88	88	88	88	88
Adjusted R-squared	0.024	0.028	0.047	0.035	0.024	0.054	0.045

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

To conclude this subsection, I performed Granger Causality Tests on the variables explored before and drew tables 10, 11 and 12, presenting the p-values for all combinations possible.

World Liquidity granger causes *Total Crypto Market Cap,* significant at 1%, highlighting the power cash and credit availability has in the pricing dynamics of crypto markets. The opposite causality direction offers no significance for the thresholds traditionally established (1%, 5% and 10%), unlike what Rogalski and Vinso (1997) found for stock market returns, which were not caused by the changes in money supply but seemed to cause it.

My findings point to inefficient crypto markets as World Liquidity information is not incorporated in the returns. Besides, the lack of reverse direction causality may be a consequence of the smaller size of this new asset class, unable to influence Liquidity.

Taking Stablecoins out of the equation, the pattern persisted, while isolated Stablecoins and World Liquidity establish a puzzling bi-directional causality, with p-values lower than 1%. A longer time frame will bring more information to the table, along with more research in this virgin field.

Table 10: Granger Causality Tests with World Liquidity and Total Crypto Market Cap

	World Liquidity_x	Total Crypto Market Cap_x
World Liquidity_y	1	0.157
Total Crypto Market Cap_y	0.004	1

Table 11: Granger Causality Tests with World Liquidity and Non-Stable Crypto Market Cap

	World Liquidity_x	Non-Stable Crypto Market Cap_x
World Liquidity_y	1	0.104
Non-Stable Crypto Market Cap_y	0.012	1

Table 12: Granger Causality Tests with World Liquidity and Stablecoin Market Cap

	World Liquidity_x	Stablecoin Market Cap_x
World Liquidity_y	1	0.0019
Stablecoin Market Cap_y	0.003	1

5.3. Empirical Evidence on the Relationship Between Crypto and Tech Stocks

Covid-19 turned the World upside down, people were paid for staying home, freedom became a scarce good in developed Democracies, and markets prospered at the same time. This subsection aims to fill a gap in crypto academic literature. "How does cryptocurrencies correlate with stocks?", "What does this correlation depend on?", "Was it affected by the pandemic?" are some of the questions I will address.

The correlations Tech/Bitcoin and Tech/Ethereum present a similar pattern, as shown in figure 4. Although these measures are volatile, it is possible to observe a movement alongside the same-period *average Global Economic Policy Uncertainty*, especially in the pandemic period (grey area), where the values seem generally higher than before, when they fluctuated between -0.3 and 0.3 most of the time in opposition to oscillations between 0.3 and 0.6 predominantly.

Figure 5 draws attention to a different factor – World Liquidity – and the upward trend that it experienced, coincident with the overall evolution of the correlations studied. Independently of the factors that may have caused it, the market, as an aggregate of investors, changed its perception or attitude towards crypto assets, from an independent (relative to tech stocks) and alternative asset class to part of the market and, consequently, correlated with the remaining assets.

Figure 4: Evolution of uncertainty and the correlation Tech stocks/Cryptocurrencies since 2015

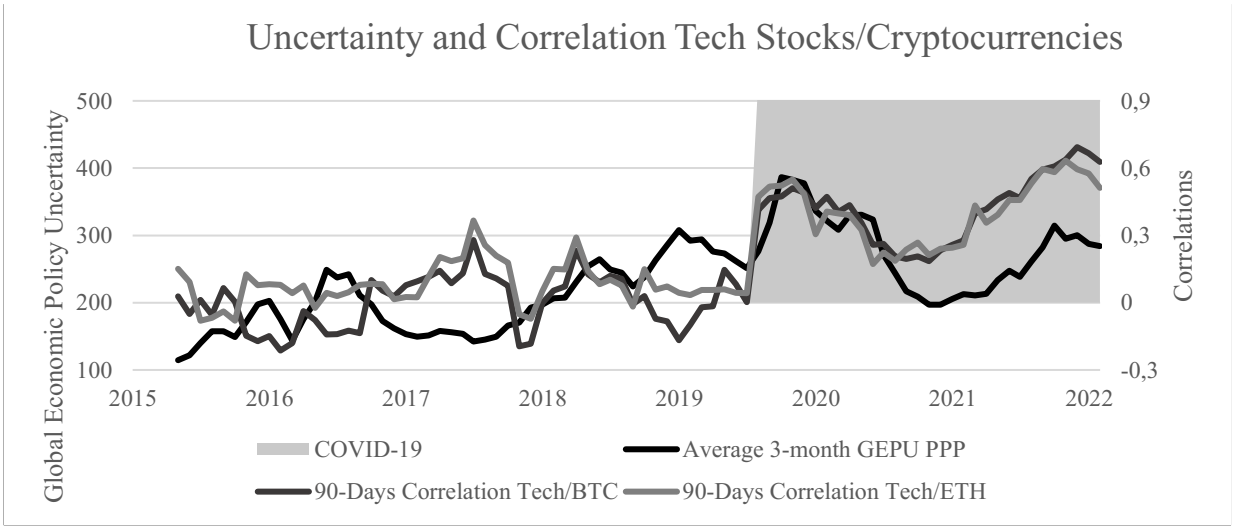

Figure 5: Evolution of liquidity and the correlation Tech stocks/Cryptocurrencies since 2015

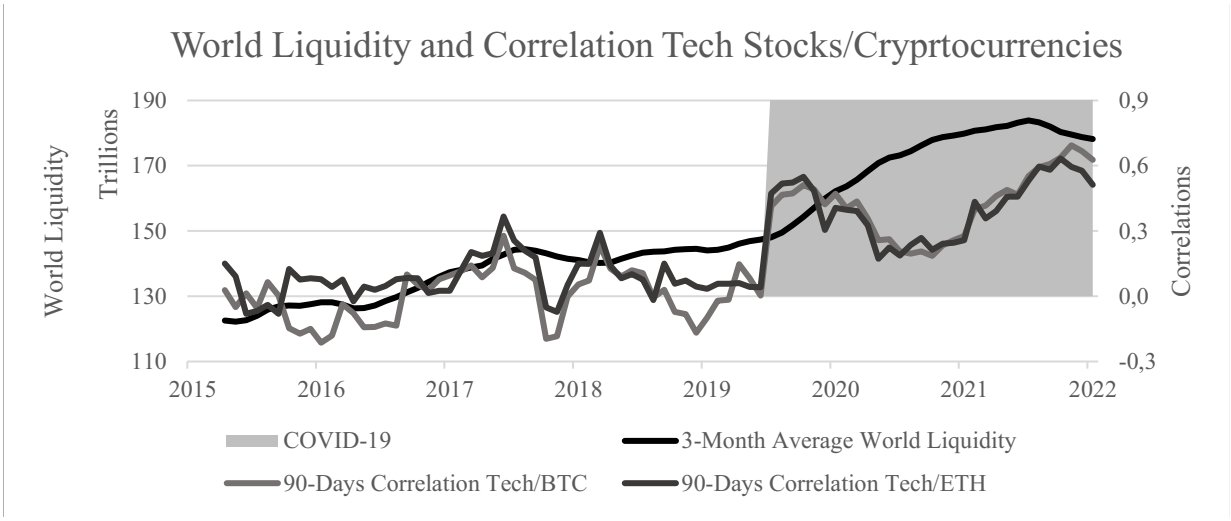

Table 13: Model testing the correlation Bitcoin/Tech stocks

Correlation between Bitcoin and U.S. Tech sector returns

	(1)	(2)	(3)	(4)	(5)
Constant	**-1.291*** **	0.204	0.024	**-39.179*** **	-3.243
	(-4.651)	(0.914)	(1.56)	(-10.658)	(-0.498)
Global Economic Policy	**0.273*** **	-0.035			
Uncertainty	(5.176)	(-0.808)			
COVID-19		**0.417*** **	**0.400*** **		**0.374*** **
		(11.677)	(14.085)		(6.304)
World Liquidity				**1.206*** **	0.101
				(10.697)	(0.502)
Observations	105	105	105	105	105
Adjusted R-squared	0.199	0.654	0.655	0.522	0.652

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Global Economic Policy Uncertainty returns a positive and significant (at 1%) coefficient, when used as the only explanatory variable for the *Correlation between Bitcoin and U.S. Tech sector*

returns. The same happens with *World Liquidity*. However, if the control variable, *COVID-19*, is added, both lose their significance to the dummy variable. Besides, all the regressions with *COVID-19* explain more than 65% of the variation of the dependent one.

The pandemic led to an increase, on average, of the *Correlation between Bitcoin and U.S. Tech Stock Returns* of 0.4 (median coefficient value). Such result brings an interesting topic for further studies. Some of the reasons for this shift might be the entry of crypto assets into the portfolios of hedge funds, the rise of retail investors during lockdowns, and some psychological or behavioral change.

Finally, the models presented in Table 13 were subject to a robustness test (Appendix 1), in which Bitcoin was substituted by the second largest cryptocurrency, in Market Capitalization, Ethereum. These two assets are usually correlated, so I expected the same results.

In fact, most of my expectations were confirmed. Nevertheless, *World Liquidity* remains significant after controlling for *COVID-19.* This points to differences between the two assets, such as the sensitivity to macroeconomic variables. In spite of persisting significant, the magnitude of the impact of COVID-19 decreases, displaying a median coefficient of 0.305, 25% lower than in Table 13, relative to Bitcoin.

Correlation varies between -1 and 1, so intercepts or factors out of this range have no real translation.

6. Conclusion

The aim of this dissertation is to investigate the interplay between liquidity and crypto markets as well as the role of Stablecoins. How cryptocurrencies correlate with tech stocks and how it changed with the pandemic provides material for further research.

I provide evidence of a significant double-digit multiplier mechanism between Stablecoins, a proxy for flows, and Total Crypto Market Cap (or Non-Stable Crypto Market Cap), which points to an inelastic market.

Furthermore, the previous relationship is studied with lagged variables, in order to understand the temporal dynamics. Although there is some significance in the relationship within the same month, where a change of 1% in Stablecoin Market Cap is associated with a change of, on average, 0.235% in Non-Stable Crypto Market Cap, the most significant results are given by lagged variables.

The prior two-weeks variation of other cryptocurrencies Market Cap positively affects weekly changes in market cap, suggesting some autocorrelation and sentiment-lead investments, which leads to adoption of Stablecoins, as the changes in Non-Stable Crypto Market Cap is associated with a, one month later, change of Stablecoin Market Cap in the same direction, as well as 2 months, but less significatively. This behavior advocates for theories of demand-driven adoption of Stablecoins rather than boosting mechanism of crypto prices, consistent with the scarce existent literature. I also found a bi-directional causality between these two variables.

World Liquidity suffered a substantial expansion in the period studied (2015-2022) starting to shrink in the last year. For each change of 1000 U.S. Dollars in all the cash and credit available for financial markets, the aggregate valuation of crypto markets varies by 3.9 U.S. Dollars. Despite the existence of some significant association in the same month returns with Total Crypto, World Liquidity changes lead to crypto variations in the following month, consistently. The direction in which the availability of funds go is consistent with crypto returns, which may indicate that this market is still inefficient and does not incorporate this public information. Causality tests reinforce that Total and Non-Stable Crypto Market Caps are caused by World Liquidity, but do not cause it.

Such findings can be valuable in the following years, when regulation of Stablecoins and, in general, crypto assets will be created and implemented. Understanding these relationships will be helpful for regulators, investors, and researchers.

Additionally, I showed the positive impact of uncertainty, liquidity and above all, Covid-19 had in the correlation between tech stocks and cryptocurrencies returns, which are increasingly perceived as similar.

To conclude, this is a relatively new asset class, so there is not much historical information to use, which constitutes one of the major limitations of this study, as not even a full economic cycle has happened, and so the existing literature is not extensive and is mostly focused on one cryptocurrency – Bitcoin. Others are the imperfect measure of flows Stablecoins constitute, the lack of transparency in centralized exchanges which limit data collection, and the different methods used, more relevant in the multiplier models.

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8. Appendix

8.1. Appendix 1: Model testing the correlation Ethereum/Tech stocks

Correlation between Ethereum returns and U.S. Tech sector returns

	(1)	(2)	(3)	(4)	(5)
Constant	**-1.689*** **	-0.227	**0.080*** **	**-36.524*** **	-6.739
	(-4.845)	(-0.815)	(5.097)	(-10.037)	(-1.023)
Global Economic Policy Uncertainty	**0.350*** **	0.058			
	(5.435)	(1.106)			
COVID-19		**0.305*** **	**0.324*** **		**0.276*** **
		(9.829)	(12.641)		(6.304)
World Liquidity				**1.125*** **	**1.035*** **
				(10.093)	(5.154)
Observations	82	82	82	82	82
Adjusted R-squared	0.261	0.663	0.662	0.555	0.662

t-statistics in parentheses

* Significance at 10%; ** Significance at 5%; *** Significance at 1%