CRYPTOCURRENCY RETURNS DURING COVID: Implications for Its Status as a Currency

Juliet U. Elu

Department of Economics, Morehouse College, Atlanta GA, USA

ABSTRACT

To the extent that currency is a store of value, during times of uncertainty, its value could potentially be higher, providing holders a strategy to avoid capital losses on assets such as equities or bonds and to secure capital gains. The recent and ongoing COVID pandemic provides an opportunity to assess how crtypocurrency fares as a store of value, as the pandemic has disrupted economies, possibly inducing speculative motives for holding cryptocurrency. This paper sought to establish if Bitcoin and Ethereum generated any excess returns over the recent time period covering the pandemic. Parameter estimates from a Capital Asset Pricing Model revealed that neither Bitcoin nor Ethereum realized excess returns during the COVID pandemic. This suggests that to the extent that a standard and generally acceptable medium of exchange has a speculative component to its demand, crytopcurency such as Bitcoin and Ethereum may not be good candidates as a medium of exhhange.

Key words: Cryptocurrency, Bitcoin, Asset Pricing

JEL classification: E41, E44, G10, G11, G12

1. Introduction

The emergence of highly volatile digital currencies started as digital electronic currencies and deposits, created and reproduced on computers with no collateral nor regulation, which is a critical challenge (Dwyer, 2015). Cryptocurrencies are the implementation of blockchain technology which

involves encoding and decoding that allow peer to peer financial ledgers used as transaction currency in a network with no regulation, government, or asset backing. The block-chains are searchable ledgers where all transactions are confirmed in minutes by network computers working to perform complex algorithms. Each network maintains a copy of the ledger, while creation of new groups in the network is allowed. The system allows for new transactions to be recorded with no intermediation as the process continues. Anyone can join the block-chain network by downloading the Bitcoin software and submitting transactions to the network with no security constraint.

There are many types of cryptocurrencies around the world, with Bitcoin and Ethereum being among the most widely held. These digital currencies come with challenges and benefits for both developed and developing economies, but international communities are exploring ways to integrate cryptocurrencies as an integral robust instrument to promote inclusive growth in their economies. Although these economies are characterized by high added value, faced with numerous obstacles, many of the developing countries cannot adequately respond to the demands of the digital economy. Inadequate access to the latest technology, sophisticated telecommunications infrastructure, low computer literacy as well as numerous cultural and socio-economic factors are just some of the challenges that developing countries face (Lazović and Duričković, 2014). As the world increasingly shifts towards digital payments and currencies, central banks around the globe are exploring how such emerging technologies can be used to address pain points in the financial system, while at the same time providing the implicit trust and protection of a central bank.

A fundamental question is whether cryptocurrencies have the functions and characteristics to serve as legal tender/medium of exchange or store of value (Xin and Wang, 2017; Nadarajah, and Chu, 2017), or are they simply a speculative asset (Cheah and Fry, 2015). The use of cryptocurrencies as legal tender significantly varies from country to country. Some countries such as USA, EU, Canada, Singapore, Japan, etc. have recognized the expediency of using them and are working to create a legal framework that enhances the legal status of virtual currencies (as electronic money, as exchange funds, as a specific type of currency, etc.), while other countries (China, the Russian Federation) reject cryptocurrencies and prohibit their circulation (Dniprov

2019). The conservative nature of financial systems in some of these countries resulted in a ban, but the innovative process has not stopped the processes of using cryptocurrencies since they were removed from circulation. Recently, many developing economies, especially those in South America, such as El-Salvador, Paraguay, Venezuela, and Anguilla, have declared bitcoin as a legal tender accepted as a medium of exchange due to weak macro-policies that have pepertuated hyperinflation in their economies, However, bitcoin serves as legal digital currency in Denmark, France, Germany, Iceland, Japan, Mexico, Spain, and the United Kingdom. Countries with implicit bans include Bahrain, Burundi, Cameroon, Central African Republic, Gabon, Georgia, Guyana, Kuwait, Lesotho, Libya, Macao, Maldives, Vietnam, and Zimbabwe, while countries such as Algeria, Bangladesh, China, Egypt, Iraq, Morocoo, Nepal, Qatar, and Tunisia have absolute bans (Bajpai, Rasure, and Velasquez, 2021).

The recent and ongoing COVID pandemic provides an opportunity to assess how cryptocurrency fares as a store of value, as the pandemic has disrupted economies, possibly inducing speculative motives for holding cryptocurrency. This paper examines whether Bitcoin and Ethereum generated any excess returns over the recent time period covering the pandemic. We estimate parameters from a Capital Asset Pricing Model to determine if the COVID pandemic is a source of excess cryptocurrency returns, which could be a driver of speculative demand.

In this paper, we explore the extent to which, like money, two highly-traded cryptocurrencies have a speculative component, which will situate them as having a degree of moneyness, and thus possible candidates to be standard currency. Our approach is to situate the possible speculative money-holding motive for cryptocurrency within the Capital Asset Pricing Model (CAPM). The basic idea is that if cryptocurrency is like money, it should also realize speculative returns during times of heightened uncertainty such as a disease pandemic. Below, we estimate several specifications of a CAPM for two cryptocurrencies – Bitcoin and Ethereum – to consider if either has a speculative component, similar to money, that could render it a candidate for use as a standard medium of exchange.

2. Framework for Assessing Excess Returns on Cryptocurrency

We appeal to the Capital Asset Pricing Model (CAPM) of Linter (1962) and Sharpe (1964). Given the wealth maximizing objective of cryptocurrency holders, a CAPM specification of equilibrium expected return on equity is:

$$\mu_i = r + \frac{\sigma_{ip}}{\sigma_p^2}(\mu_p - r)$$

where:

r is the risk-free rate of return,

μ_p is the expected return on the market portfolio,

σ_p^2 is the variance of return on the market portfolio and

σ_{ip} is the covariance between the return on cryptocurrency and the market portfolio.

Defining $\beta_i = \frac{\sigma_{ip}}{\sigma_p^2}$, the CAPM enables a specification of the expected return on equity as a linear function of the expected return on the market portfolio relative to the risk-free return: $\mu_i - r = \beta_i(\mu_p - r)$, where β_i is a measure of market/systematic risk associated with holding the equity.[3] Since it is

[3] This follows from assuming that wealth maximizers are risk averse and prefer to receive a fixed payment τ to a random payment of wealth $W = \sum w_i \mu_i$, where $0 \leq w_i \leq 1$ is the weight of asset i in the wealth portfolio, and μ_i is the expected return on asset i. If an individual is indifferent between $E[U(W)]$ and $U[E(W) - \tau]$ then these two payments must be equal or $E[U(W)] = E(U(E[W] - \tau) = U(E[W] - \tau)$, where E is the expected value operator, and $U(\cdot)$ is a utility function. Let $z = -U''(E(W))/U'(E(W)$, where $U^n(E[W])$ is the n^{th} derivative of $U(\cdot)$ with respect to its argument evaluated at $E(W)$, a first order Taylor expansion—neglecting higher order terms—on both sides of the indifference relationship with respect to W allows representing utility as $U = U^i(E[U(W)]) = \mu_p - 1/2(z\sigma_p^2)$, where $\mu_p = \sum w_i \mu_i$, and $\sum w_i = 1$.

impossible to eliminate this risk through portfolio diversification, holders of the cryptocurrency are compensated for bearing the risk with a higher return relative to the risk-free return — an excess return.

In a non-barter economy, an individual is likely to possess both speculative and transactional motives for holding coin and currency. Standard monetary theory posits that both speculative and transaction demands for coin and currency are generally determined by factors such as the level of interest rates and the degree of risk aversion over risky assets (Walsh, 2010). In this context, Ethereum and Bitcoin can be viewed as having some degree of "moneyness" with quantities held by individuals being a function of the interest rate, and their degree of risk aversion.[4]

For Bitcoin and Ethereum, we estimate a CAPM specification in the form:

$$\mu_{it} - r = \beta_o + \beta_{it}(\mu_p - r) + \beta_c COVID_{it} + \varepsilon_{it}$$

where: β_o is a constant, *COVID* is a binary variable equal to unity in time periods after the first emergence of COVID-19 in China on 12/31/2019 , and ε_{it} is a stochastic error term.

With daily return data from *Yahoo Finance* between 9/25/2014 – 9/25/2021, we estimate Ordinary Least Squares (OLS), Fixed Day Effects , and Generalized Autoregressive Conditional Heteroskedasticity with a first

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The maximization of $U^i(\cdot)$ subject to $\sum w_i = 1$ generates a solution for the relative return on equity i as $\mu_i - r = \beta_i(\mu_p - r)$, where $\beta_i = \frac{\sigma_{ip}}{\sigma_p^2}$.

[4] As for the "moneyness" of cryptocurrency, Harwick (2016) notes that they have potentially ideal qualities for being a medium of exchange: (1.) *Portability*. Cryptocurrencies excel here because they have no extension in physical space. (2.) *Durability*. Though coins can be "lost", they will not get worn out or depreciate. (3.) *Divisibility*. Bitcoins are divisible to eight decimal places. In principle there is no technical limit to the divisibility a protocol might allow, and (4.) *Security*. Protocol-level theft and counterfeiting is extremely difficult.

order autoregressive and moving average (GARCH(1,1)).[5] The GARCH(1,1) specifications are particularly warranted as financial time series typically exhibit a characteristic known as volatility clustering whereby large changes tend to follow large changes, and small changes tend to follow small changes, resulting in a serially-dependent error term (Engle, 1982; 2001; Bollerslev, 1986). As this volatility can reflect the underlying changing risk preferences inducing investors to rebalance their asset portfolios, GARCH(1,1) specifications can mitigate the bias of estimated parameters of asset demand functions that omit unobserved individual risk preference characteristics.

3. Results

Table 1 reports a statistical summary of the covariates in our regression specification. Parameter estimates for the CAPM specifications of Bitcoin and Ethereum are reported in tables 3 and 4 respectively. The major insight across the CAPM specifications, for both Bitcoin and Ethereum, is that the COVID pandemic was not a source of excess returns. To the extent that a major disease pandemic such as COVID induces economic uncertainty, it does not appear that these two cryptocurrencies have a speculative component driven by uncertainty. Thus unlike money, which individuals can hold to avoid capital losses on assets such as equities or bonds that can emerge during disease pandemics, Bitcoin and Ethereum do not appear to have this property.

The estimated Beta (β_{it}) , which measures systematic risk, is informative of each cryptcurrency's speculative attributes. A Beta that is less (greater) than unity means that the asset is theoretically less (more) volatile than the market such that adding this asset to a portfolio makes it less (more) risky than the same portfolio without (with) the asset. In this context, as a

[5] Our GARCH specifications for the conditional mean of our dependent variable $y_{it} = \mu_{it} - r$ is of the form:

$$y_{it} = \Sigma\beta_{it}x_{it} + \Sigma\rho_j(y_{it-j} - \beta_{t-j}x_{it-j}) + \Sigma\Theta_k\varepsilon_{it-k} + \varepsilon_{it}$$

$$\sigma^2_{it} = \gamma_o + \Sigma\gamma_i\varepsilon^2_{it-j} + \Sigma\delta_i\sigma^2_{it-j}$$

where the $x_{(t)t-(j)}$ are regressors, $\beta_{(t)t-(j)}$ are regression parameters, ρ_j is an autoregression parameter, Θ_k is a moving average parameter, $\varepsilon_{(t)(t-j)}$ is an error term, α_o is a constant, and '?:$\sigma^2_{it(t-j)}$ is the variance of the error term. To maximize the degrees of freedom in our time series, we specify estimate the GARCH specifications with j = k = 1─both the moving average and autoregressive processes are of degree 1.

cryptocurrency, relative to Bitcoin, Ethereum in more money-like, as adding it to a portfolio reduces risk. However, to the extent that the COVID pandemic is a source of risk and uncertainty that creates opportunities to realize speculative excess returns, neither cryptocurrency seems to have provided such an opportunity.

Table 1. Covariate Summary

Covariate	Mean	Standard Deviation	Number of Observations
Year	2017.35	2.17	2719
Excess Return on Bitcoin[a]	-.0600	.6420	1345
Excess Return on Ethereum[a]	.0046	.0680	1489
Excess Return on Market Portfolio[b]	.0167	.1285	119
COVID19[c]	.2101	.4076	2719

Notes:
[a]*Source: Yahoo Finance* on 9/25/2021. The risk-free rate is measured as the daily return on the 13-week Treasury Bill.
[b]*Source*: *Yahoo Finance* on 9/25/2021. The risk-free rate is measured as the daily return on the 13-week Treasury Bill. The return on the market portfolio is measured as the daily return on Standard & Poor's index.
[c]Binary variable measuring the days in which the global COVID pandemic was present.

Table 2. BITCOIN CAPM Parameter Estimates:Daily Excess Returns 2014 - 2021

Specification	*(OLS)*	*(Fixed Day Effects)*	*(GARCH(1,1))*
Regressand:	$\mu_{it} - r$	$\mu_{it} - r$	$\mu_{it} - r$
Regressors:			
β_o	.0017	.0017	.0019
	(.172)	(.010)[a]	(.167)
$(\mu_p - r)$	1.01	1.01	1.01
	(.000)[a]	(.000)[a]	(.000)[a]
$COVID_{it}$	.0019	.0020	.0020
	(.495)	(.470)	(.938)
Number of Observations	1345	1345	1345

Notes:
Approximate P-values in parentheses. [a]Significant at the .01 level

Table 3. ETHEREUM CAPM Parameter Estimates: Daily Excess Returns 2014 - 2021

Specification	*(OLS)*	*(Fixed Day Effects)*	*(GARCH(1,1))*
Regressand:	$\mu_{it} - r$	$\mu_{it} - r$	$\mu_{it} - r$
Regressors:			
β_o	.0056 (.019)[a]	.0055 (.000)[a]	.0021 (.377)
$(\mu_p - r)$	.0060 (.258)	.0053 (.353)	.0076 (.005)[a]
$COVID_{it}$	-.0011 (783)	-.0011 (.819)	.0010 (.825)
Number of Observations	1170	1170	1170

Notes:
Approximate P-values in parentheses.
[a]Significant at the .01 level

4. Conclusion

This paper considered the extent to which, like money, two highly-traded cryptocurrencies have a speculative component, which situates them as having a degree of moneyness, and as possible candidates for a standard currency. Our approach situated the possible speculative money-holding motive for cryptocurrency within the Capital Asset Pricing Model (CAPM). To the extent that currency is a store of value during times of uncertainty, its value could potentially be higher granting holders a strategy to avoid capital losses on assets such as equities or bonds and to secure capital gains. In this context, the current COVID pandemic provides an opportunity to assess how crtypocurrencies fare as a store of value, as the pandemic has disrupted economies, possibly inducing speculative motives for holding cryptocurrency.

Parameter estimates from the CAPM specification revealed that the COVID pandemic did not result in speculative excess returns for Bitcoin or Ethereum. Thus, unlike money which individuals can hold to avoid capital losses on assets such as equities or bonds that can emerge during disease pandemics, Bitcoin and Ethereum do not appear to have this property. This suggests that to the extent that a standard and generally medium of exchange has a speculative component to its demand, crytopcurencies such as Bitcoin and Ethereum may not be good candidates as mediums of exchange.

The volatility of many cryptocurrencies, especially Bitcoin, makes it difficulty for them to serve as a medium of exchange. Price stability over an appropriate period through central bank policies is essential to maintain economic stability. Macroeconomic stability in developed and developing economies requires policy prescription that can ensure a stable growth path with minimum exogenous or external shocks. Government policies must provide buffers against currency and interest rate fluctuations in the global markets. However, this is a necessary, but insufficient, condition because exposure to currency fluctuation, excessive debt burden, and unmanageable inflation can cause economic crises and economic collapse. Developing economies have also resorted to financial market deepening to support long-term growth, but robust micro and macro policies are needed to reap the benefits of deepening. Countries in South America currently using bitcoin as legal tender must reassess their macro policies given the volatility of these coins. In the last couple of years, due to hyperinflation in these countries, many are willing to take the risk of using bitcoin as their legal tender. The results reported in this paper suggest that Bitcoin and Etherum are not good candidates as mediums of exchange, at least in the USA. However, for countries that adopted cryptocurrency as a legal tender, there is room for more research on the impact in their economy.

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