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Hayek and the cryptocurrency revolution

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Abstract. The emergence of cryptocurrencies has been one of the most notable monetary phenomenon of the last decade. Many academics and analysts have found a clear precedent to this event in Friedrich Hayek's latest monetary work, *Denationalization of money*. The aim of this article is to analyze what we can learn about cryptocurrencies by re-reading this book. As will be proven, Hayek would surely have rejected the idea that Bitcoin and cryptocurrencies with similar characteristics could be accepted as money in the market. Furthermore, this paper will prove that a very close connection between Stablecoins and private money exists, in the line with the Austrian economist's predictions in a context of monetary competition.
Keywords: cryptocurrencies; Hayek; Bitcoin; Stablecoins; currency competition
JEL classification: E14, E42, B31

[es] Hayek y la revolución de las criptomonedas

Resumen. La irrupción de las criptomonedas ha sido uno de los fenómenos monetarios más notables de la última década. Muchos académicos y analistas han encontrado un claro antecedente a este acontecimiento en la última obra monetaria de Friedrich Hayek, *Denationalization of money*. El objetivo de este artículo es analizar qué podemos aprender sobre las criptomonedas a través de la relectura de esta obra. Como se demostrará, Hayek rechazaría que el Bitcoin y criptomonedas de características similares puedan llegar a ser aceptadas como dinero en el mercado. Además, se mostrará que existe una conexión muy estrecha entre las Stablecoins y el dinero privado que el economista austriaco predice que surgiría en un contexto de competencia monetaria.
Términos clave: Criptomonedas; Hayek; Bitcoin; Stablecoins; competencia monetaria
Clasificación JEL: E14, E42, B31

Sumario: 1. Introduction. 2. *Denationalization of money* and cryptocurrencies. 2.1. Context and main ideas of *Denationalization of money*. 2.2. The cryptocurrency universe. 2.3. The connection between *Denationalization of money* and cryptocurrencies. 3. Decentralised cryptocurrencies: Bitcoin and Altcoins. 3.1. What are Bitcoin and Altcoins? 3.2. Are Bitcoin and Altcoins fully monetisable? 3.3. What could the role of Bitcoin and the Altcoins be? 4. Stablecoins. 4.1. What are Stablecoins? 4.2. Collateralised Stablecoins. 4.3. Non-collateralised Stablecoins. 4.4. Hayek's teachings on the search for a stable value. 5. Conclusions. References.

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1. Introduction

The irruption of cryptocurrencies has been one of the most surprising events of the last decade in the money world. Initially, cryptocurrencies were seen as a modern curiosity, and even as an eccentricity. At the time, these products were considered one more example of irrational exuberance that had given rise to an enormous, worldwide bubble; now, a growing number of people believe that they will condition the future of the international monetary system[2].

Among other consequences, cryptocurrencies have reanimated interest in *Denationalization of money* (1990), the bold work that Friedrich Hayek published in 1976. For many, this book is a clear harbinger of this new monetary phenomenon. In this work, the Austrian economist theorised about how a competitive money-emission market would be organised and what the consequences would be for the economic world.

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[2] For example, Mark Carney (2019), governor of the Bank of England, has said, in a meeting of central bank governors that, talking about cryptocurrencies, "Technology has the potential to disrupt the network externalities that prevent the incumbent global reserve currency from being displaced."

The aim of this article is to analyse the phenomenon of cryptocurrencies from the viewpoint of the theoretical construction offered in *Denationalization of money*. Although this work belongs to a different era, the results obtained are highly gratifying. As we shall see, it must be noted that Bitcoin and similar cryptocurrencies would have characteristics that, according to Hayek's reasoning, would prevent them being accepted by the market as substitutes for state fiat currencies. Moreover, we shall insist that these cryptocurrencies can have the effect of accelerating inflation in countries suffering convulsive situations.

At the same time, we have found a clear parallel between the companies issuing Stablecoins and banks that issue private currency in Hayek's model. Starting with this connection, we shall analyse *Denationalization of money*, to see what it can teach us about this type of cryptocurrency. We believe that this contributes to the existing literature on cryptocurrencies.

Throughout this article, we shall use the following scheme. In section 2 we shall provide a summary of *Denationalization of money*, indicating its main weaknesses. In parallel, we shall briefly explain how cryptocurrencies have emerged and we shall offer a classification of them that will help us throughout this work. In the last part of this section, we shall indicate the main points connecting the phenomenon of cryptocurrencies and Hayek's work. In section 3 we shall study the first group of cryptocurrencies, which we have designated as Bitcoin and the Altcoins. In section 4, we shall analyse the second group of cryptocurrencies, the Stablecoins. Finally, in section 5, we shall set out the main conclusions of this work.

2. *Denationalization of money* and cryptocurrencies

2.1. Context and main ideas of *Denationalization of money*

Friedrich Hayek wrote about monetary issues during his entire academic life. The study of his work on currency demonstrates that his understanding of the essence and function of money followed a constant path (cf. White 1999). Specifically, the impossibility of a neutral currency, lack of confidence in the capacity of governments to administer money correctly and his rejection of competitive devaluations and monetary policy as a means to stimulate production are ideas that we find repeatedly in all of his works on this subject. However, his prescriptions for monetary policy did change over the years. In the course of his work, he proposed different institutional frameworks, all conceived to limit abuse of currency by governments and so, according to his view, permit the harmonious progress of the economic process.

Denationalization of money is the end of his search. Clearly, this monetary proposal emerges from his concept of the market as a discovery process. In essence, in his judgement, the problem of secular inflation is a result of the lack of competition in the monetary world, so this would end if free circulation of the state fiat currencies existing in different territories were to be permitted and, at the same time, companies were allowed to issue private currencies.

According to Hayek, this institutional framework would oblige the different issuers (public and private) to provide a currency with a stable purchasing power. In this way, the incentives for over-issuing would disappear and the market would be allowed to discover which currency was best at each moment in time. Moreover, because of this, the Austrian economist predicted that Keynesian-inspired monetary policies would disappear, and as a result, States would have to maintain a strict fiscal policy. In addition, Hayek thought that there would be currencies that would be used outside the political frontiers of countries, and that this would eliminate the traditional balance of payments problems, leading to greater worldwide economic integration.

Denationalization of money was published during the decomposition of the Bretton Woods monetary system (1973) (Eichengreen 2000, cap. 4). At that time, there was enormous concern regarding the effects of inflation on economic activity and debate on what could be done to limit it. Hayek's proposal had a great impact among professionals, and gave rise to heated debates on monetary questions (cf. Howard 1977; Friedman and Schwartz 1987; Issing, White and Vaubel 2000; Kelsey 2003; Ferris and Galbraith 2006; Endres 2009; Luther 2013; Fantacci 2019).

However, *Denationalization of money* does have at least two weak points. Firstly, it does not consider the importance of network effects and the information costs related to money. The Austrian economist imagined that, with a suitable institutional framework, the competition between different currencies would be very strong, since users of money (i.e., the clients of the issuing companies or institutions) would change to a different currency even in the case of minor changes in its purchasing power (cf. Hayek 1990, 116). However, the public has a greater tolerance to inflation that is assumed in *Denationalization of Money*. Milton Friedman (1984) considered that individuals would only seek alternative currencies when they suffered from serious levels of inflation. As empirical proof, Friedman referred to the monetary experience in Mexico at the start of the 1980s. In this country, there was considerable freedom to use foreign currencies, but despite this, only when there was heavy inflation, a partial dollarization took place (approximately 20% of the monetary mass) (cf. Echarte 2019, cap. 3; Luther 2016). It can thus be said that, up to a point, money functions as a natural monopoly in the area in which it is used. For this reason, currency issuers have a certain degree of freedom to obtain seigniorage benefits before currency substitution processes commence.

Secondly, Hayek assumes that the legalisation of competition between currencies would lead to the inevitable end of many state fiat currencies, given the superiority of private companies to protect the stability of the purchasing power of their own currencies. However, there are reasons to doubt the alleged inferiority of state fiat currencies (Claeys et al. 2018, 8). In the first place, this analysis overlooks that fact that state currencies are used to pay taxes, and that this is an important factor in the stability of the demand for them. In second place, in recent decades, developed societies have implemented a series of institutional rules that offer central banks incentives and good practices that maintain the stability of their currencies. Proof of this are the low rates of inflation seen in developed countries since 1990. Finally, countries form part of global institutions that can provide them with sufficient financing to defend their state currencies if needed.

Despite these weak points, Hayek's analysis has a freshness and a sharpness that maintains its relevance even today. In addition, it must be noted that *Denationalization of money* is not simply a proposal for monetary policy. It can be considered Hayek's monetary legacy since it expresses his most refined and mature understanding of how money works.

2.2. The cryptocurrency universe

Cryptocurrencies are offspring of the digital revolution that has taken place over the last few decades. They could be defined as a type of digital currency that is based on cryptography and on the *Blockchain* technology. These technologies allow the creation of new monetary units to be decentralised and guarantee a fund transfer system that is quick, simple, relatively anonymous and, above all, transparent. Their most notable characteristic, apart from their intangibility, is that they are developed without needing to be controlled by Central Banks or other institutions (Gomá 2018; MacKenzie 2019, cap. 1-3; Ammous 2018, cap. 8).

We must realise, however, that cryptocurrencies are not free of controversy. In many cases, they have been used to evade taxes, to launder money or for illegal transactions (cf. Náñez 2019; Cheah and Fry 2015). At the same time, possession of these "alphanumeric codes" is not risk-free for their owners since cases of robbery and fraud have been detected. Despite this, cryptocurrencies have made their way into our globalised world and, the way things are going, it does not look like a passing fad.

The first and most famous cryptocurrency was Bitcoin, launched in 2009. The popularity of this currency grew quickly. Subsequently, many more cryptocurrencies have appeared, with different characteristics and functionality. In April 2020, CoinMarketCap had more than 5,000 cryptocurrencies registered. Despite this impressive number, the market is still dominated by Bitcoin (See Chart 1).

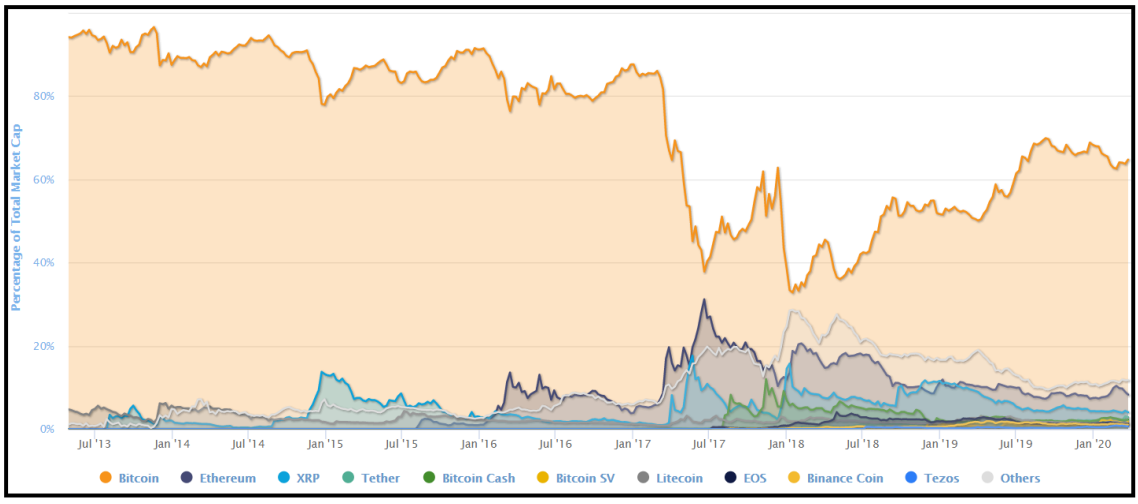

Chart 1: Market quota of the main cryptocurrencies by market capitalisation
Source: https://coinmarketcap.com/charts/

The universe of cryptocurrencies is enormous and grows day by day. As there is no consensus regarding the classification of the different types, in this article we shall use a functional classification:

1) Altcoins: Their name is an abbreviation of the expression "alternative to Bitcoin". Sometimes, this name is used to refer to any cryptocurrency other than Bitcoin. However, we shall only use it to refer to those that are like Bitcoin. We shall include all cryptocurrencies whose main characteristic is their decentralised creation. These cryptocoins are regulated by an algorithm that determines the rate of growth of the money supply and hence, is not controlled by any state, bank, financial institution or company. Generally, additional monetary units are created through a decentralised network of "miners" and each cryptocurrency possesses its own Blockchain. Examples of

this type of cryptocurrency are Bitcoin Cash, Litecoin, XRP, EOS, etc.

2) Stablecoins: These cryptocurrencies are designed to try to correct the problem of the volatility of the trading values of Bitcoins and Altcoins. In general, the issuing company of each Stablecoin oversees the stability of its purchasing power. Examples of this type of cryptocurrency are Tether, Dai, USD Coin, USDx Stablecoin, etc.

3) Tokens: Cryptocurrencies designed for specific functions that are only operative within the platform in which they have been created. For example, there are Exchange Tokens that have been created by cryptocurrency exchange platforms, whose objective is to facilitate traffic within these platforms (e.g., Binance Coin, Huobi Token and KuCoin).

4) Central Bank Digital Currencies (CBDCs): Presently, several Central Banks are considering the creation of a digital version of their currencies or have already done so. There are various motives for this, and perhaps, soon, state fiat currencies will cease to have a physical format (cf. Quian 2019; Bindseil 2019).

In this work, we will concentrate on analysing the first and second group from the viewpoint of *Denationalization of Money*.

2.3. The connection between *Denationalization of money* and cryptocurrencies

As we have said, *Denationalization of money* is a work of reference as regards the emergence of cryptocurrencies (cf. Gaurav 2019; ECB 2012, 22). In this work, although Hayek made his own predictions about how a competitive currency-issuing market would develop, he alerted his readers as to the innovative and disruptive character of the market process. In his words, "A hope one may cherish is that, as competition usually does, it will lead to the discovery of yet unknown possibilities in currency" (Hayek 1990, 126; cf. Huerta de Soto 2005, chap. 2 and 2009, chap. 1). The surprising development of the cryptocurrency market is entirely in line with this statement.

The links between *Denationalization of money* and cryptocurrencies are notable. We can mention here at least four clear connections:

a. Philosophy: Cryptocurrencies and Hayek's proposal imply openly questioning the prerogative of governments to be the sole issuers of money (cf. Nakamoto 2008).
b. Competition between currencies: Just like money in Hayek's model, cryptocurrencies are not legal tender, and their implantation in the market is based on voluntary acceptance by the parties.
c. Rejection of traditional monetary policy: The monetary rule of most cryptocurrencies is fixed and independent of arbitrary factors and political interests. Similarly, Hayek considered that the competitive process would lead currency issuers —public and private— to protect the interests of their clients and forego discretionary monetary policies that could place the value of the different currencies at risk.
d. Confidence in the issuer is substituted by other elements: In existing fiat currency systems, the credibility of the issuer has played a central role. In *Denationalization of money*, Hayek proposes replacing confidence in a monopolistic issuer with the guarantee of a competitive process, that is, by mutual oversight of the various issuers (public and private) in their struggle to maintain and increase their market share. For cryptocurrencies this also happens, as we shall see, with Stablecoins. In the case of Bitcoin and Altcoins, confidence has been replaced by issuing money with an inalterable algorithm and cryptographic proof of transfer (Nakamoto 2008).

3. Decentralised cryptocurrencies: Bitcoin and Altcoins

3.1. What are Bitcoin and Altcoins?

When designing Bitcoin, the goal of Satoshi Nakamoto —or of the team of programmers hidden behind this pseudonym— was to create an alternative currency that was independent of States. Despite this, many experts and analysts believe that cryptocurrencies are not currently money, but rather digital assets.

This view has been expressed by the European Central Bank (ECB 2015, 23-24):

> From an economic perspective, the virtual currencies currently known about do not fully meet all three functions of money defined in economic literature: i) medium of exchange (…); ii) store of value (…); and iii) unit of account (…). Indeed, certainly in the case of Bitcoin, (…), virtual currencies have a limited function as a medium of exchange because they have a very low level of acceptance among the public. In addition, the high volatility of their exchange rates to currencies – and therefore in terms of most goods and services – renders virtual currency useless as a store of value even for short-time purposes, let alone for the purpose of being a longer-term savings instrument. Finally, both the low level of acceptance and the high volatility of their exchange rates and thus purchasing power make them unsuitable as a unit of account. Therefore, although it cannot be excluded that more stable virtual currencies will emerge and be used by a much wider group of users, [cryptocurrencies] such as Bitcoin cannot be regarded as full forms of money at the moment.

The concept of money presented by Hayek in *Denationalization of money* could enrich the comprehension of the monetary dimension of crypto-

currencies. According to him, "although we usually assume there is a sharp line of distinction between what is money and what is not, and the law generally tries to make such a distinction so far as the causal effects of monetary events are concerned, there is no such clear difference. What we find is rather a continuum in which objects of various degrees of liquidity, or with values which can fluctuate independently of each other, shade into each other in the degree to which they function as money" (Hayek 1990, 56). In fact, the Austrian economist considered that it is better to use the term money as an adjective, rather than a noun; this implies that some goods would possess a greater degree of "moneyness" than others.

Within this framework, we can consider Bitcoin and the other Altcoins as assets in the process of becoming monetised (cf. Rallo 2013). Whether these assets can become consolidated in world markets as a generally used means of exchange is, of course, still to be seen.

Based on their behaviour in recent years, we can undoubtedly say that Bitcoin and the other Altcoins show a tendency to improve their monetary quality. Evidently, their use as a means of exchange is still marginal, but there are clear examples that lead us to think that progress is being made. For example,

- Despite the growing number of people who possess cryptocurrency, the most important on-line marketplaces (Amazon, eBay, Walmart, etc.) do not accept cryptocurrencies in their systems. This has given rise to business opportunities for companies that mediate between owners of cryptocurrency and these marketplaces. For example, Alagoria[3] allows users to buy in Walmart and HomeDepot; Forra[4] facilitates Ebay purchases; Olodolo[5] can be used in Aliexpress, etc.
- Many debit cards allow their owners to use their cryptocurrency to purchase real goods and services. Among these, we can cite Basecoin Card, Wirex Visa Card, Cryptopay, Uquid, MCO Visa Card, SpectroCoin Card, Revolut Virtual Card, BitPay, etc. Each of these cards has its own characteristics, such as the number of countries in which they can be used, the cryptocurrencies they support and their policies as regards commissions. In each case, different financial operators have found an attractive business opportunity in this market.
- Several websites advertise businesses where payment can be made in cryptocurrencies. Generally, these sites allow users to search for sellers that accept cryptocurrencies, filtered by product category and geographic area. Among these, we can name BitcoinPeople[6] and Coinmap[7]. Many organisations also accept donations in cryptocurrencies.

In view of all this, even if it cannot be said that Bitcoin and the other Altcoins are commonly accepted means of payment, we believe their use is undoubtedly increasing. Thus, based on Hayek's theoretical structure, it can be said that Bitcoin and the other Altcoins are assets in the process of being monetised, that is, their liquidity is increasing.

Furthermore, following the work of Juan Ramón Rallo (2019b), we can add that this type of cryptocurrency[8] has the following characteristics:

- They are real assets, since they are not the financial liabilities of any economic agent (bank, company, state, etc.). Individuals who possess Bitcoin monetary units are the owners of a unique alphanumeric code that they can exchange with whoever they wish, whenever they wish.
- They are intangible or digital assets.
- They are decentralised assets, due to the form in which they are issued —there is no single issuer— and to the way in which users exchange payments, via a public validation process based on consensus (Blockchain).
- They are private assets, since they have emerged from a private initiative, and not from a state.

The source of the value of Bitcoins and the Altcoins has frequently been debated. It is often alleged that their value is entirely fictitious or speculative, since there is no real asset that supports the value of these cryptocurrencies. Consequently, it is often said that the intrinsic value of these currencies is zero (cf. Fernández-Villaverde 2018).

In *Denationalization of money* we find an answer to this. In Hayek's opinion (1990, 111), "Money is valued because, and in so far as, it is known to be scarce, and is for this reason likely to be accepted at the going value by others. And any money which is voluntarily used only because it is trusted to be kept scarce by the issuer, and which will be held by people only so long as the issuer justifies that trust, will increasingly confirm its acceptability at the established value"[9].

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3 Website: https://alagoria.com/
4 Website: https://forra.io/
5 Website: https://olodolo.com/
6 Website: https://bitcoinpeople.online/
7 Website: https://coinmap.org/
8 As we shall see, these characteristics are very different from those of the other group of cryptocurrencies that we have mentioned, Stablecoins.
9 In fact, Hayek (1990, 109) considered that the role of gold in the case of currencies backed by this metal was poorly understood. "It ought by now of course to be generally understood that the value of a currency redeemable in gold (or in another currency) is not derived from the value of that gold, but merely kept at the same value through the automatic regulation of its quantity."

Bitcoins and Altcoins have the property of possessing an absolute scarcity, since the number of units of these cryptocurrencies is fixed and inalterable, being determined by an algorithm. This is the basis of the confidence of their users. Thus, following Hayek's reasoning, this undeniable and irrevocable scarcity makes it possible for these currencies to have a market value and to be exchanged by users (Ammous 2018, 237-238).

For example, Bitcoin is programmed so that the maximum number of monetary units is equivalent to 21 million bitcoins. Specifically, the algorithm that regulates this cryptocurrency determines that new bitcoins are constantly generated at a rate of approximately one every 10 minutes until this amount is reached. Its programmed growth allows us to calculate that, by the year 2140, all the bitcoins that can exist will have been generated. Since this cannot be changed, it generates confidence for the users of this currency who know that there is a finite number of monetary units[10].

At this point, we should nuance the relationship between Hayek and Bitcoins/Altcoins. Generally, as we have said, Hayek is considered the intellectual father of cryptocurrencies. This is obvious from their underlying philosophy, the disruption that they imply, and their private and competitive character. Nevertheless, as regards Bitcoin and Altcoin cryptocurrencies, if we look at their fixed monetary rule, the clearest connection that we can find is with Milton Friedman, who argued that the monetary supply should increase at a fixed, inalterable rate (Friedman and Schwartz 1987; cf. Fantacci 2019). However, as we shall argue below, Stablecoins are like the money that Hayek thought would emerge in a competitive market of monetary issuance.

3.2. Are Bitcoin and Altcoins fully monetisable?

Following the theoretical framework provided by Hayek, Bitcoin and Altcoins are assets in the process of monetisation that derive their value from their absolute scarcity. Now we shall study the stability of their purchasing power and the perspectives for this type of cryptocurrency to achieve full monetisation.

The experience of the last decade shows that the exchange rates of Bitcoin and Altcoins have been highly volatile. From the perspective of the monetisation of these cryptocurrencies, this has two consequences, but in opposite directions. On the one hand, their volatility has been essential in popularising Bitcoin and the Altcoins among people who see them as an opportunity to make quick profits. On the other hand, however, this is a serious problem when it comes to monetising them in the market.

The origin of this volatility can be found, of course, in the monetary rules of these cryptocurrencies that, as said previously, have a fixed, inalterable monetary supply. This rigidity prevents a dynamic equilibrium between supply and demand for each of them. Since the money supply is rigid, when demand increases (or decreases), its exchange rate in dollars or other state fiat currency increases (or decreases).

In *Denationalization of Money*, Hayek argues that the key element for a currency to be accepted on a large scale by the market is the stability of its purchasing power. In fact, Hayek (1990, 51-53) predicts that, in the context of monetary competition, currencies with the most stable purchasing power will be the winners.

Because of this, following Hayek's theory, we can say that Bitcoin and the Altcoins will never achieve a high degree of monetisation. Few people are willing to be paid in a means of payment that can lose a considerable percentage of its value in a few hours. For something to be an international monetary reference and have a presence in everyday economic exchanges, its purchasing power must be highly stable.

It is true that the liquidity or degree of monetisation of this type of cryptocurrency has improved over time. However, it must be said that businesses that accept payment in these cryptocurrencies are not assuming an exchange risk. The system works "just as Visa and Mastercard enable merchants to accept credit and debit cards from customers whose accounts are denominated in a foreign currency" (White 2015, 385).

At the same time, it must be stressed that a large part of the demand for Bitcoin and the Altcoins is completely speculative. Proof of this is the high number of inactive Bitcoin accounts; specifically, according to a study by Digital Asset Data[11], during 2019, 60% of the existing bitcoins had not been used in any transaction (NewsBitcoin.com 13/Jan/2020; cf. Cheah and Fry 2015, 34)[12].

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[10] It would be a mistake to deduce that Hayek is forgetting the important role played by the assets possessed by a currency-issuing bank. Obviously, the quality of the assets against which the currency is issued is essential to manage its purchasing power in the market. That is, it is not the same for the issuing bank to possess gold or dollars as it is to possess a mortgage that may possibly not be paid. As we shall see below, Hayek offers several indications regarding how issuing banks should manage their assets. In the case of Bitcoins and Altcoins, this is irrelevant, since there is no issuing bank, that is, these cryptocurrencies are intangible and decentralized assets. However, as we shall see, in the case of Stablecoins, whose nature is that of financial liabilities, these considerations are relevant.

[11] Digital Asset Data specialises in the analysis of the cryptocurrency market (website: https://www.digitalassetsdata.com/).

[12] As a theoretical exercise, we could imagine a world in which the market only used Bitcoins as money. If we assume that financial institutions would not be able to use fractional reserve banking, the money supply would be fixed and this monetary system would be similar to a pure cash system. In this scenario, if the velocity of money were constant, there would be a process of secular deflation as the size of the economy grew; obviously, in situations in which money circulated more quickly, prices could rise. Presumably, in this world, the purchasing power of Bitcoin would tend to increase over time. However, if we assume that financial institutions could expand the monetary supply via a fractional reserve banking, this monetary framework would be similar to the classic gold standard system and prices would have a certain degree of instability (cf. Hayek 1990, 123-124; Huerta de Soto 2011, caps. 4-6; Hayek 1989; Claeys et al. 2018, 9-10).

A comparison between Bitcoin/Altcoins and state fiat currencies shows the great differences between these two groups of currencies. Particularly, modern Central Banks have achieved stability in the value of their currencies by intervening in the monetary market. If a currency shows a tendency to increase in value, the monetary authority will generally buy assets to inject a greater quantity of the currency, and vice versa[13].

Thus, it seems obvious that, even if they had a sufficiently stable network of users, the algorithms behind Bitcoin and the Altcoins make it impossible to achieve a dynamic equilibrium between the supply and the demand. According to Hayek's schemes, these cryptocurrencies will never achieve full monetisation.

3.3. What could the role of Bitcoin and the Altcoins be?

If we accept the theoretical framework proposed by Hayek, Bitcoin and the Altcoins cannot replace state fiat currencies. However, this does not mean that they cannot have —or, rather, that they do not have— a role to play.

In *Denationalization of Money*, one can deduce that there are parallels between the role of gold in Hayek's system and the potential destiny of Bitcoin and the Altcoins. As we know, his proposal consisted in liberalising the circulation of national currencies and in permitting different agents to issue private currencies, including the possibility of issuing coins made of gold or other metals. Hayek is categorical about the possibilities of gold becoming a currency in general use:

> It may be that, with free competition between different kinds of money, gold coins might at first prove to be the most popular. However, this very fact, the increasing demand for gold, would probably lead to such a rise (and perhaps violent fluctuations) of the price of gold that, though it might still be widely used for hoarding, it would soon cease to be convenient as the unit for business transactions and accounting. There should certainly be the same freedom for its use, but I should not expect this to lead to its victory over other forms of privately issued money, the demand for which rested on its quantity being successfully regulated to keep its purchasing power constant.
>
> The very same fact which at present makes gold more trusted than government-controlled paper money, namely that its total quantity cannot be manipulated at will in the service of political aims, would in the long run make it appear inferior to token money used by competing institutions whose business rested on successfully so regulating the quantity of their issues as to keep the value of the units approximately constant" (Hayek 1990, 130-131).

In fact, and in line with Ametrano (2016, 20), if we replace the word "gold" with "Bitcoin" in the above quote, we obtain a very accurate description of the behaviour of this cryptocurrency. Clearly, Bitcoin and the Altcoins can be considered "digital gold". In this sense, their failure to become widely accepted currencies may be empirical proof of Hayek's hypothesis that purchasing power stability is essential for a private currency to be accepted by the public.

If we assume that Bitcoin and the Altcoins are digital reserve assets with a certain degree of liquidity, then there are least two opportunities for their use:

Firstly, Bitcoin and the Altcoins could potentially be used massively by citizens in countries with convulsive economic and social situations who want to protect their personal wealth. There was a recent example of this in Argentina. In August 2019, Mauricio Macri suffered a significant and unexpected defeat by his adversary, Alberto Fernández, in the primary elections known as PASO. This caused the Argentinian Peso to depreciate strongly with respect to the dollar, going from 45 *pesos* per dollar on August 11 to 60 *pesos* per dollar on 15 August. At the same time, the *peso* depreciated strongly with respect to Bitcoin, from 511,044 *pesos* per bitcoin on August 11 to 604,016 pesos per bitcoin on August 14. Similar behaviour can also be seen in other countries, such as Venezuela, Turkey, South Africa, Iran, etc., in which citizens have found a different way to protect their wealth in the face of political uncertainty. According to Hayek's teachings, this new gateway for capital evasion will generate a tendency to accelerate inflationary processes in the national currencies of these regions. As we know, inflation is not merely a problem of the monetary supply, but also of demand. Hence, even if the supply does not increase, if the demand for state fiat currency falls, its purchasing power also falls. By offering a way out in situations of economic and social repression, this type of cryptocurrency may accelerate inflation of the state fiat currency in countries where the situation is convulsive (cf. Carrick 2016; Sayed and Abbas 2018).

Secondly, it is possible that this type of cryptocurrency could be converted into reserve assets by large Central Banks (Ammous 2018, 279-280). They could adopt this strategy for two reasons. On the one hand, to have more tools available to intervene in monetary markets, and on the other hand, to have an interna-

[13] We should remember how the implementation and consolidation of state fiat currencies has progressed: "The state had been instrumental in ensuring the ascendance of fiat money. To build a network of users, states often resorted to some sort of backing, originally in the form of a non-financial asset with intrinsic value (commodity money, e.g. gold) and/or coercion. This took the form of legal tender (i.e. the mandatory acceptance of banknotes and coins for their full face-value to make payments and to discharge debt) or the obligation to pay taxes in the official currencies. But once the network is established and consolidated, as long as its participants maintain trust in the stability of the currency, backing and coercion become less important" (Claeys et al. 2018, 6).

tional means of payment accepted by all in the case of a world-wide conflict or crisis, a role also played by gold.

4. Stablecoins

4.1. What are Stablecoins?

The volatility of Bitcoin and the Altcoins has led to the development of a new type of cryptocurrency, "Stablecoins". These cryptocurrencies are designed to minimise the volatility of their exchange value, and ideally to have a stable value (Mita et al. 2019). To achieve this, these cryptocurrencies can select diverse standards of value as a reference: fiat currencies (normally the dollar), commodities (gold, oil, etc.) and even a basket of different cryptocurrencies[14]. The reference asset most chosen is a state fiat currency.

Stablecoins can be classified into two groups, as a function of the strategy used to maintain their value over time:

- Collateralised Stablecoins: Each of these currencies requires the existence of an issuing institution that, by managing collateral and actively intervening in the money market, guarantees that the market price of the currency corresponds 1:1 with the price of the asset chosen as the reference. The economic nature of this type of Stablecoin is different from that of Bitcoin and the Altcoins (Rallo 2019a). Collateralised Stablecoins are financial liabilities issued by a company, and their value is determined by the quality of the collateral and by the credibility of the issuer[15]. Therefore, possession of a Stablecoin collateralised with euros is like having a current account in Banco Santander in Spain. The only advantage of Banco Santander, compared to a company that issues Stablecoins, is that the bank's liabilities are guaranteed by the Deposit Guarantee Fund for Credit Entities and, ultimately, by the European Central Bank. This means that having 1000 euros in a Banco Santander account is practically the same as having 1000 euros in cash, given the enormous security that the banking system now offers to individuals. Obviously, the circumstances are different for the holder of a collateralised Stablecoin.
- Non-collateralised Stablecoins: These cryptocurrencies are governed by an algorithm that modifies their supply to guarantee that their market price corresponds 1:1 with the value of the asset chosen as a reference. This is intended to achieve a dynamic adjustment between supply and demand for a cryptocurrency of this type. This type of Stablecoin is not yet in wide use. Note that these cryptocurrencies are intangible assets, unlike collateralised Stablecoins.

Obviously, the potential attractiveness of Stablecoins is high, since they offer many of the characteristics of cryptocurrencies —speed, low commissions on transfers, anonymity— while they resolve theoretically their main defect, volatility. However, their popularity is still very low because of a general lack of acceptance of cryptocurrencies in the real-world economy and doubts about the stability of their value over time.

There is a strong connection between Stablecoins and the model described in *Denationalization of money* (Porter and Rousse 2016, 156). Specifically, the Austrian economist was convinced that, in a context of monetary competition, the market would tend to select the currencies with the most stable purchasing power. Hayek (1990, 73-74) maintained that the main reason for this is that a currency with a more stable value would enable its users to minimise the inevitable effects of uncertainty. This allows individuals to improve their ability to predict future events and to use business or personal accounting efficiently[16].

As mentioned above, the current importance of Stablecoins in the cryptocurrency market is secondary. In fact, there are experts who consider that Stablecoins are not —and will never be— capable of achieving their aim, i.e., stable market values (Mita et al. 2019; Chohan 2019). Obviously, if their use became general, this would demonstrate the accuracy of Hayek's prediction about the public's preferences.

In *Denationalization of money* Hayek develops several topics that help to understand the progress and the challenges of Stablecoins. Let us see what he can teach us.

4.2. Collateralised Stablecoins

Hayek (1990, section VIII) imagined that the liberalisation of currency production would give rise to the creation of issuing companies with characteristics like those that currently issue collateralised Stablecoins. This type of cryptocurrency, therefore, is remarkably similar to Hayek's concept of private currencies. As a result, *Denationalization of money* offers certain valuable insights that help to understand this type of Stablecoin:

[14] The reason for using a basket of cryptocurrencies as a reference standard for a Stablecoin is that the fluctuation in the overall value of many different cryptocurrencies will necessarily be less than that of a single cryptocurrency.

[15] We should remember that Bitcoin and the Altcoins are intangible assets and their value is derived directly from the appreciation of their users.

[16] At the same time, as an additional argument that is not applicable in our present context, a stable currency generates greater macroeconomic stability. Hayek was aware that this fact alone would not drive individuals to choose currencies with stable purchasing power. However, the Austrian economist considered that regions that used stable currencies would tend to be more prosperous and, over time, would tend to be imitated by other regions.

a) Trust. Unlike Bitcoin and the Altcoins, collateralised Stablecoins have a centralised structure. This means that this type of cryptocoin requires the existence of an issuing company that guarantees the dynamic equilibrium between the demand and the supply of the cryptocurrency, and hence of the stability of its market price in relation to the chosen reference. For many analysts, this is undoubtedly one of the weak points of this type of Stablecoins, since they require that users trust the issuing entities.

For Hayek, the problem of trust in the issuing entity —a problem that is also found in the different public issuing monopolies— can be resolved via competition. In his words, "Competition would certainly prove a more effective constraint, forcing the issuing institutions to keep the value of their currency constant (in terms of a stated collection of commodities)[17], than would any obligation to redeem the currency in those commodities (or in gold). And it would be an infinitely cheaper method than the accumulation and the storing of valuable materials" (Hayek 1990, 48).

This phenomenon can already be observed in the collateralised Stablecoins market. Currently, the most popular Stablecoin of this type is Tether, both in capitalisation volume and in daily transactions[18]. The issuing company of this cryptocurrency (Tether Ltd.) guarantees that the market price of its cryptocurrency will be 1:1 with respect to its different nominal currencies, in Dollars, Euros or Yens. As a result, the holder of a 1 dollar-tether (its symbol is USTD) cannot exchange it directly with the company for 1 dollar but is guaranteed that he/she can sell it on the market at this price. Consequently, in this case, possessing a tether, in theory, means possessing a dollar. This Stablecoin thus creates a bridge between state fiat currencies and cryptocurrencies.

In recent years, Tether has become a key currency in the cryptocurrency market and is used by traders when they perceive risks. For example, if investors have invested capital in bitcoins and they believe that the price of bitcoins might drop, they can exchange them for tethers and so protect their capital; later when the uncertainty has passed, they can convert their tethers back into bitcoins[19]. As we can see, this way of investing avoids converting cryptocurrency into fiat currencies (dollars, etc.), with all the associated problems, such as slowness, legal impediments, taxes, etc.

Since April 2017, doubts have emerged regarding the ability of Tether Ltd to maintain the 1:1 parity with the different fiat currencies (euro, dollar, yen). The lack of credibility has at times caused serious fluctuations in its market value (see Chart 2).

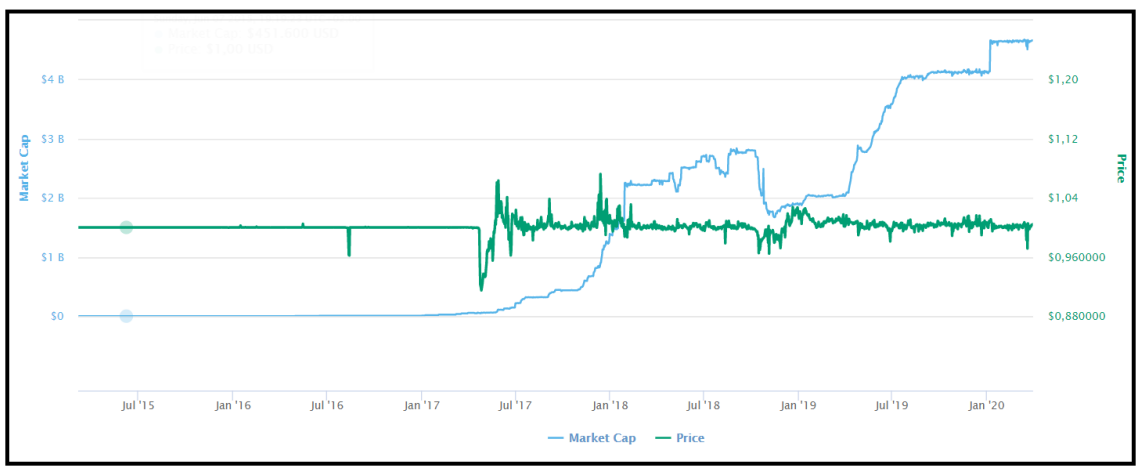

Chart 2. Market price of Tether (USDT) from 2015 to 2020
Source: https://coinmarketcap.com/currencies/tether/

This situation has given rise, as it is natural, to other similar companies entering the market to displace Tether. These competitors include Paxos Standard (PAX), TrueUSD (TUSD) and Dai (DAI). In many of these cases, in order to gain the public's trust, the issuing companies have attempted to offer additional guarantees, such as periodic external audits, and have even attempted to issue cryptocurrency backed 100% by state fiat currencies and redeemable in them, as is the case of TrueUSD.

As Hayek predicted, competition acts as a system to uphold confidence in the issuing institutions.

b) The issuing process of collateralised Stablecoins. Hayek was aware that currency issuing companies could follow different routes to introduce their cur-

[17] We shall go deeper into this below.

[18] On April 5, 2020, according to CoinMarketCap, Tether was the fourth-largest cryptocurrency as regards market capitalisation ($6,185,093,696), with only Bitcoin ($124,372,363,025), Ethereum ($15,838,038,053) and XRP ($7,903,674,657) ahead of it.

[19] It can be seen in Chart 2 that from July 2017 to March 2020, Tether's capitalisation (blue line) has grown, due, among other motives, to the fall in value of Bitcoin.

rencies. However, with the intention of eliminating doubts about the viability of his proposal, he explained what he would do if he intended to introduce a new currency, the "private Swiss ducat". Here we can find some guidelines that may be useful in the case of collateralised Stablecoins. Hayek (1990, 46-47) affirmed that

> The only legal obligation I would assume would be to redeem these notes and deposits on demand with, at the option of the holder, either 5 Swiss francs or 5 D-marks or 2 dollars per ducat. This redemption value would however be intended only as a floor below which the value of the unit could not fall because I would announce at the same time my intention to regulate the quantity of the ducats so as to keep their precisely defined purchasing power as nearly as possible constant. (…) And I would announce that I proposed from time to time to state the precise commodity equivalent in terms of which I intended to keep the value of the ducat constant, but that I reserved the right, after announcement, to alter the composition of the commodity standard as experience and the revealed preferences of the public suggested.

From this, we can deduce that Hayek thought it necessary that the new currency be perceived by the market as trustworthy. Consequently, he thought that a good strategy would be to create a floor value under which the value of the currency could not fall, and he announced a legal obligation to redeem this currency.

At the same time, the issuing institution promised users that the new currency would have constant purchasing power referred to a specific basket of goods —something that we shall explain below. This is essential, because users need to know the specific purchasing power of the new currency at the time it is issued. A currency only makes sense as a relationship of values. For this reason, the new currencies need a reference to past purchasing power[20].

Finally, we can see that the value of this currency is independent of the value of other currencies. Hayek specified that the issuing bank could modify the composition of the basket of goods chosen as the value standard, as indicated by the experience and preferences of the public. Here, we can deduce that for the Austrian, there was an inevitable business component in the management of a currency.

As a result, although the ultimate basis of Hayek's model lay in competition, issuing companies would also have to care for the trustworthiness of their currencies as perceived by the market. Consequently, the better the audit processes or legal guarantees, the greater the acceptance of a centrally issued cryptocurrency. At the same time, Hayek believed that the promise by the issuing company to maintain a stable purchasing power over time was essential.

To illustrate this, we can discuss the announced "launch" of Libra into the cryptocurrency market in autumn 2020. Libra is a collateralised Stablecoin that will be issued by a conglomerate of companies acting as the legal entity Libra Association (which includes Facebook, Spotify, Uber, Anchorage, Shopify, Ribbit Capital and others). This Stablecoin is backed by a basket of state fiat currencies and short-term financial instruments (Triple-A bonds, etc.). Since Facebook is one of the companies promoting the creation of Libra, and the project is supported by other large companies, its launch has created expectations that it will be used massively. It has also created certain discomfort among several international institutions such as the International Monetary Fund or the European Union or the Bank for International Settlements (cf. CNBC 2019, min 5:27; Claeys and Demertzis, 2019, 4-5). Following Hayek's insights, the Libra Association has published detailed information regarding the characteristics of its cryptocurrency, with the clear intention of gaining the confidence of the public[21]. When the moment comes, the Libra Association will announce the purchasing power of its cryptocoins so that users have a reference.

c) Collateral management. Hayek (1990, 49) explained that "To achieve its announced aim of maintaining the purchasing power of its currency constant, the amount [of money] would have to be promptly adapted to any change of demand, whether increase or decrease". This would only be possible via correct management of the collateral maintained by the issuing company. In *Denationalization of money*, Hayek (1990, 50) offers several guidelines on how these companies' assets should be managed. In his opinion, the issuing bank "would have to be prepared, to maintain the value of the ducat [its liabilities], to buy back substantial amounts of ducats at the prevailing higher rate of exchange. This means that it would have to be able rapidly to liquidate investments of very large amounts indeed. These investments would therefore have to be chosen very carefully if a temporary rush of demand for its currency were not to lead to later embarrassment when the institution that had initiated the development had to share the market with imitators".

In view of this, we can deduce that Stablecoins must be backed by stable liquid assets. An asset of this type must be selected to guarantee the value of

[20] Hayek (1990, 31) clearly accepted Ludwig von Mises' regressive theory of money: "It is probably impossible for pieces of paper or other tokens of a material itself of no significant market value to come to be gradually accepted and held as money unless they represent a claim on some valuable object. To be accepted as money they must at first derive their value from another source, such as their convertibility into another kind of money". It has been alleged that Bitcoin has demonstrated that this theory is false, since this currency did not have a prior non-monetary value. However, this is not so, since in its origin, the first bitcoins had a status as collector's items for the communities of cryptographers who attempted to "mine" bitcoins using their own computers, i.e., the first bitcoins had a prior non-monetary value for certain persons (Ammous 2018, 243-244).

[21] All available information can be found in their web site: https://libra.org. The Libra "White Paper" makes especially interesting reading.

the currency. Only in this way can an issuing bank comply with its promise.

If the bank used the issue of its cryptocurrency to acquire risky or low-liquidity assets —such as long-term mortgages, junk bonds, stocks, etc.—, there could be situations in which, following a fall in the market price of its currency, it would not be able to withdraw sufficient money from the market to maintain its purchasing power without incurring heavy losses. In this situation, those assets would have to be sold at substantial discounts and this would endanger the financial viability of the issuing company.

Hayek (1990, 50) indicated that managing these banks would be like how Central Banks manage their fiat currencies.

Following these guidelines, it is not necessary for a Stablecoin issuing company to guarantee their convertibility into other assets[22]. Quite simply, the value of their currency can be controlled if the issuing company can manage its assets adequately. In fact, the main risk for users of these Stablecoins is precisely bad management of the collateral by the issuing company. As we have noted, Hayek considered that the quality of the collateral would be guaranteed by the existence of fierce competition between the issuing companies.

d) Stability of value. As mentioned previously, Stablecoins are intended to maintain a stable value over time. To achieve this, the issuing institutions work to maintain a fixed exchange rate with respect to a chosen asset, whatever this may be: a fiat currency, oil, gold, etc. As a result, the stability of the purchasing power of these cryptocurrencies in relation to other goods in the economy will depend on how the purchasing power of the chosen reference standard evolves.

In the short term, we can say that Stablecoins that use real assets such as gold or oil as a reference will tend to be more volatile than those that use a fiat currency as a reference. In the long term, everything depends on the evolution of monetary policy in developed countries. If the relatively moderate inflation of the last three decades is maintained, then it is possible that collateralised Stablecoins using fiat currencies as a reference standard may maintain a certain stability. It will all depend on how these nations deal with their future problems, such as the enormous accumulation of public debt, pensions and health costs in societies that are increasingly ageing, or the recent economic crisis caused by the coronavirus pandemic.

In *Denationalization of Money*, Hayek insists forcefully that it is impossible for state fiat currencies to maintain their purchasing power long term. In his words, "I do not think it an exaggeration to say that history is largely a history of inflation, and usually of inflations engineered by governments and for the gain of government" (Hayek 1990, 34). He even considers that democratic governments are even less capable of holding down inflation, given their continuous temptation to manipulate the currency to benefit certain groups or to achieve certain political-economic objectives (Hayek 1990, 103).

It should not be forgotten that this blunt statement was made during the 70s, amid a period of stagflation. Currently, the Central Banks have institutional constraints that have worked well to prevent them from mismanaging their currencies, at least regarding the inflation rate. It will be necessary to see whether the tendency of the last three decades is maintained, since this will undoubtedly affect the purchasing power of those Stablecoins that use fiat currencies as reference standards.

4.3. Non-collateralised Stablecoins

A few comments are necessary about non-collateralised Stablecoins. As we have explained, cryptocurrencies of this type are not governed by an issuing company. These cryptocurrencies are programmed so that the algorithm destroys some monetary units if their value drops below that of the reference asset (for example, 1 dollar) and creates new units if their price rises above that of the reference asset. In this way, the market price of the crytocoin corresponds 1:1 with the value of the asset chosen as a reference. As we can see, the central element of such a cryptocurrency is the automatic nature of the mechanism that modifies its supply.

For many, the main advantage of this type of Stablecoin is precisely that it is an asset (like Bitcoin and Altcoins), and so is not a liability of any agent. This avoids problems derived from lack of trust in an issuing company. The main disadvantages are in its operational complexity. Some examples of cryptocurrencies of this type are Fragments, Carbon, and the now extinct Basis.

It is not easy to know what Hayek would have thought about the future of this type of Stablecoin, given the technological leap involved. Probably, he would agree that via this protocol, it is possible to guarantee parity between the market price of the Stablecoin and the chosen reference asset. However, he would certainly think that achieving this objective does not guarantee a stable value for such a currency in the medium and long term, due to the instability of the value of the reference assets in this term, whichever it may be. In the following section, we shall

[22] Most issuing companies of Stablecoins affirm that they have ample reserves of their chosen reference asset(s) to back their cryptocurrencies. In many cases, this does not mean that there is any possibility of converting the cryptocurrency into said asset, nor that 100% of its assets are of this type. However, there are some Stablecoins that are completely backed by assets and that can even be converted into them, so they act as though they were deposit certificates of these assets. When the assets are commodities, the possession of cryptocoins with these characteristics is a way of investing in these commodities while avoiding some intermediaries who operate in these markets. Digix Gold Token (DGX), in which 1 DGX can be redeemed for 1 gram of gold, would be a good example.

analyse Hayek's contributions as to how to achieve the objective of permanently stabilising the value of a currency.

Regarding non-collateralised Stablecoins, it is interesting to note that Hayek considered that managing a currency that aspired to maintaining a stable value over time —and not just parity with a reference asset— requires a certain degree of anticipation and business discretionality. In his words,

> The dealings of an issue bank in other currencies would therefore never be a purely mechanical affair (buying and selling at constant prices) guided only by the observed changes in the purchasing power of the other currencies; nor could such a bank undertake to buy any other currency at a rate corresponding to its current buying power over the standard batch of commodities; but it would require a good deal of judgement effectively to defend the short-run stability of one's own currency, and the business will have to be guided in some measure by prediction of the future development of the value of other currencies (Hayek 1990, 65-66).

So, very possibly, Hayek would reject the idea that a non-collateralised Stablecoin could be designed that would be able to maintain a stable purchasing power over time, due to the impossibility of creating an automatic protocol capable of emulating the criterion of a businessman in an uncertain world (Hayek 1945; Ametrano, 2016).

4.4. Hayek's teachings on the search for a stable value

Considering the arguments of *Denationalization of money*, a comment should be made about the concept of the stability of the purchasing power of a currency that may help in the design of future Stablecoins.

According to Hayek, in practice, it is not possible for goods or currencies to have perfectly stable purchasing powers over the course of time. The value or purchasing power can be defined as the relationship between two objects and, thus, there is no absolute concept of value. In this sense, "What we mean when we habitually but carelessly use such expressions as 'Beer is more stable in value than beetroot' (and this is the most we can ever assert with any meaning) is that the relative value of beer, or its rate of exchange, tends to remain more stable with a larger number of other goods or over longer periods, than is true of beetroot and many other goods" (Hayek 1990, 70).

Hayek (1990, 74-75) suggests that issuers of private currencies would have to seek and establish a reference standard to adjust the value of their currency. In his system, state fiat currencies would not be a good reference asset, given that he predicted that this type of currency would suffer heavy depreciation due to the irruption of private competition.

Nor did he consider practical nor viable that currency issuers should use a basket of end consumer goods as a reference to adjust the purchasing power of their currencies. He gave two reasons:

1. The cost of living differs from one place to another, and a private currency needs an international perspective.
2. There is a considerable temporal lapse between injections/withdrawals of money and the impact on the price of consumer goods.

Hayek believed that currency issuers would find that the best way to guarantee that their currencies had a stable purchasing power was to use a combination of raw materials, agricultural products and semi-terminated and standardised industrial products. In his view, these goods are negotiated in international markets and their prices are clearly internationalised. Additionally, these products are more sensitive to changes in economic conditions, and so corrective measures to alterations in their prices (contraction/expansion of the amount of money) could be adopted earlier.

In this sense, following Hayek's teachings, a Stablecoin that aspired to having a stable value over time would have to use a basket of real goods as a reference, and not fiat currencies. We shall have to see whether the optimum basket of goods is, in effect, as predicted in *Denationalization of money*.

In any case, it is obvious that, in the current state of the cryptocurrency market, Stablecoins —whether collateralised or not— that are linked to state fiat currencies do so in order to take advantage of the network effects that these currencies already possess (Luther 2016). For now, Stablecoins only aspire to act as a bridge between state fiat currencies and Bitcoin and Altcoins, but not to be a substitute for existing state currencies. For that reason, issuing companies are offering the options that have the most potential for success amongst users. If circumstances change, the strategies of these companies would probably change too, and we could check how accurate or mistaken Hayek's prediction was.

5. Conclusions

In this article, we have analysed the phenomenon of cryptocurrencies from the viewpoint of the monetary contributions offered in *Denationalization of money*. We have attempted to demonstrate that, contrary to what is frequently claimed, Hayek would reject the idea that Bitcoin and the Altcoins are currencies that could be accepted massively by the market. These cryptocurrencies can be classified as digital assets whose monetisation process will never be completed. According to Hayek, it can likely be demonstrated empirically that the existence of these cryptocurrencies tends to accel-

erate the inflation processes of national currencies in those countries with convulsive situations, since they offer their citizens a new way to protect their wealth.

At the same time, we have discussed the clear connection between issuing companies of collateralised Stablecoins and the private issuing banks described in *Denationalization of money*. From this connection, we have been able to draw conclusions that help to understand this type of cryptocurrency, such as the keys to managing the collateral assets, the role played by competition and the possible market entry routes of these currencies.

Finally, we have concluded that it is probably impossible to design non-collateralised Stablecoins that can maintain a stable value over time, since this requires a business component that is difficult to emulate in a computer algorithm.

We would like to finish by saying that *Denationalization of money* is Hayek's monetary legacy. As we have confirmed, this work does not just contain the mature monetary thought of an economist who dedicated his entire life to the study of money. It is a clairvoyant guide for understanding the new world of monetary competition that we are headed towards and in which we already live.

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