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Denationalisation of Money in the Digital Era: Public Collateralised Stablecoins as the Future of Money

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Resumo:

Considerado um dos fenómenos monetários mais notáveis dos últimos anos, cada vez mais se espera que o surgimento das criptomoedas venha alterar o panorama dos sistemas monetários internacionais. Adicionalmente, este evento também redespertou o interesse na obra *Denationalisation of Money*, de Hayek, na qual o autor propõe um sistema competitivo que visa evitar as recorrentes ondas de depressão económica causadas pela intervenção governamental abusiva no mercado monetário. Esta dissertação baseia-se na literatura existente para compreender se as ideias presentes nesta obra continuam relevantes, quase meio século após a sua publicação original. Além disso, a dissertação também explora se e como as criptomoedas podem representar a próxima etapa da evolução monetária. Argumenta-se que a obra *Denationalisation of Money* é provavelmente ainda mais relevante hoje do que quando originalmente publicada, atendendo ao seu notável poder explicativo acerca das criptomoedas, especialmente nos seus estágios iniciais de adoção. Considerando estas tecnologias como uma inovação descontínua relativamente às formas atuais de dinheiro, esta dissertação concentra-se em explorar de que forma as *stablecoins* públicas colateralizadas – herdeiras do Ducado Suíço de Hayek – poderiam ampliar o seu uso como meio de troca, levando a uma implementação completa da proposta do economista austríaco. Conclui-se que os governos e as suas instituições devem garantir um enquadramento institucional, legal e regulatório adequado, assim como uma transição de paradigma suave. Este processo de renúncia ao poder exercido sobre o mercado monetário visa a defesa do interesse público e extravasa a concessão de independência institucional aos bancos centrais.

Códigos JEL: B25, B52, E42

Palavras-chave: Criptomoedas; *Stablecoins* Colateralizadas; Hayek; *Denationalisation of Money*

Abstract:

Perceived as one of the most remarkable monetary phenomena in recent years, the advent of cryptocurrencies is increasingly expected to change the landscape of international monetary systems. This event has also resprung interest in Hayek's *Denationalisation of Money*, in which the author proposes a competitive framework to prevent recurrent waves of depression caused by abusive governmental intervention in the monetary market. This dissertation bases itself on the existing literature to understand whether the ideas within Hayek's work remain relevant, nearly half a century after its original publication. Moreover, it also explores if and how cryptocurrencies can represent the next stage of monetary evolution. We argue that Hayek's *Denationalisation of Money* is probably even more relevant today than when originally published. Its explanatory power on cryptocurrencies is remarkable, particularly in their early stages of adoption. Considering these technologies as a discontinuous innovation in present-day forms of money, this dissertation focuses on how public collateralised stablecoins – heir to Hayek's Swiss Ducat – could further their usage as a medium of exchange, leading to a broad implementation of the Austrian economist's proposal. It is concluded that governments and their institutions ought to be involved, ensuring an adequate institutional, legal, and regulatory framework, as well as a smooth transition of paradigm. The process of giving up the power exercised over the monetary market aims to defend the public interest and goes beyond granting institutional independence to central banks.

JEL codes: B25, B52, E42

Keywords: Cryptocurrencies; Collateralised Stablecoins; Hayek; Denationalisation of Money

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1. Introduction

The landscape of money creation and monetary policy may be undergoing one of the most significant changes since the widespread adoption of monetary regimes of fiat money. The increasing significance of digital currencies in the portfolios of individuals, as well as in the minds of policymakers, poses a challenge to both academics and civil society (Adrian & Mancini-Griffoli, 2019). These assets, especially crypto assets, have been spotlighted in recent years, particularly since they made their way out of the digital world and started being accepted as a medium of exchange in real-world transactions. The advent of cryptocurrencies, an offspring of the digital revolution that has taken place over the last few decades, is perceived by Sanz Bas (2020) as one of the most remarkable monetary phenomena in recent years. Although initially scoffed at, these assets are present and increasingly considered a beacon for the future of international monetary systems.

This event has also resprung interest in Hayek's (1990) *Denationalisation of Money* (Sanz Bas, 2020). In this work, first published in 1976, the author questions the generally accepted belief that monetary policy ought to be conducted by the government, or its institutions, in a monopolistic framework. Alternatively, he proposes a system of private banks issuing their own currency based on a proprietary registered trademark. Issuing institutions would compete for market acceptance, attained through the provision of a stable purchasing power for the holders of their currency. The threat of being driven out of the market due to failure to fulfil such a role, associated with profit maximisation, would give rise to a highly efficient monetary system. Although rapidly dismissed as utopian by many contemporary economists, these ideas presently serve as a reference to analyse the nature and emergence of cryptocurrencies.

Through a critical lens, this dissertation takes on Hayek's teachings, ultimately seeking to answer if and how cryptocurrencies can represent the next stage of monetary evolution. To do so and considering the sharp criticism of the subversion evidenced in *Denationalisation of Money*, Chapter 2 revisits the history of money, from its spontaneous origins and throughout the ages, focusing on how states have managed it. This step is also crucial to evidence the evolution of monetary policy and institutions since the 1970s. Chapter 3 thoroughly reviews Hayek's (1990) work. Chapter 4 explores the digitalisation of money and payment systems with an emphasis on crypto assets. Chapter 5 presents the literature relating the two previous chapters. In Chapter 6 a critical discussion based on the revised literature shall be held, hoping to answer the research question. Chapter 7 concludes.

2. On money

In this chapter we try to outline the history of money. Yet, it is unclear exactly when money became "the dice of politicians" (Hayek, 1999, p. 240) as we know it today. Thus, this dissertation will first delve into its genesis and then into how it evolved under governmental influence. This shall be crucial to complement Hayek's (1990) argument and to confront it with the developments in monetary policy that have since taken place, particularly, the generalised independence of central banks.

2.1. The genesis of money

Although crucial for the functioning of any modern economy, there is no unanimous definition of money (Banco de Portugal, n.d.). Ali et al. (2014) define money as 'something' that serves, simultaneously, as a medium of exchange (*i.e.*, an object with which payments are made), a store of value (*i.e.*, an object with which purchasing power, the ability to buy goods and services, can be differed into an unknown future date), and a unit of account (*i.e.*, an object with which the value of any particular item is measured). In fact, according to the European Central Bank (ECB) (2012), money, as a tool created and shaped by the evolution of society, displays a great capacity to evolve and adapt over time.

Menger (1892) argues that the – almost – unlimited salableness of money is a special case of the generic economic phenomenon of different salableness of commodities, *i.e.*, the greater or less facility at which different commodities may be disposed of. In a primitive barter economy, the economic man directs his efforts by only considering in his bargaining process the value in use of the commodities he seeks to acquire. In such a situation, everyone is bound to get only the goods they directly need and to reject those they either do not need or are sufficiently provided with. The number of bargains completed in such an economy would be limited as trade becomes onerous. Historically, certain commodities have displayed a greater, more constant, and more effective demand than others because they satisfy a universal need that is always unsatisfied, making them more appealing to traders (Menger, 1892). Therefore, under barter trade, acquiring certain goods can be achieved with greater ease and security by bringing those goods that traders seek to the market. Thus, through mediate exchange, the economic man faces a more favourable prospect of satisfying his needs (*i.e.*, in attaining their economic goals) than he would if he had confined himself to direct exchange.

As exchange expanded through space and time, individuals learned – out of economic self-interest – to carefully swap their less saleable goods for those that are easily saleable, ensuring purchasing power "not only 'here' and 'now', but as nearly as possible unlimited in space and time generally, over all other market-goods at economic prices" (Menger, 1892, p. 248). These goods are characterised by their relative costliness, easy transportability, and fitness for preservation. Menger (1892) points out that both practice and habit are determining factors for the most saleable goods to ultimately become accepted by every economic agent, especially with the intention of exchanging them way again. Yet, the willingness to accept a medium of exchange presupposes knowledge regarding the interest of other economic agents to accept them. Initially, only a few people recognise the advantage of using a certain commodity as a medium of exchange. According to Menger (1892), most individuals adopt a certain commodity as a medium of exchange because they observe the success of 'first movers' in acquiring what they need by doing so. Thus, the genesis of a medium of exchange derives from "the most discerning and capable economic subjects" (Menger, 1892, p. 249) using highly saleable goods for their own economic gain over a considerable period. When generally accepted as such, these goods' salableness is further increased, extending the disparity between them and all other goods. At some point, this distinction ceases to be gradual and becomes evident and absolute: at this point, it is possible to recognise which goods have become money and which have not (Menger, 1892). As shall be explored in Chapter 3, Hayek (1990) rejects this stance.

Even though Menger (1892) concludes that money is not a state institution generated by law but an organic social institution, the author acknowledges that state recognition and regulation have perfected money to meet the changing needs of commerce. In the case of precious metals – one of the earliest and most prominent forms of commodity money, according to both Menger (1892) and the ECB (2012) –, initially treated by weight like other commodities, salableness greatly increased through coinage. The author considers a universally accepted function of state administration to fix coinage to include all grades of value, ensure coins' genuineness, weight, and fineness, and promote their circulation. Government intervention is necessary to legally recognise certain commodities as money to reduce insecurities associated with trade and, where more than one commodity was admitted as a legal form of payment, the governor ought to determine a definite ratio of value among them. Once again, it is worth noting that, in Chapter 3, Hayek's (1990) reasons for disputing this claim shall be presented.

Alchian (1977) offers an alternative explanation for the emergence of money. The author argues that imperfect knowledge about the availability and attributes of goods, as well as varying costs associated with assessing and conveying information, leads to the use of money as a medium of exchange. Specialisation occurs in a society where individuals possess different levels of knowledge about different goods. Some become reputable sources of information about specific goods, while others specialise in the buying, selling, and inventorying of those goods. Alchian (1977) suggests that trade between a specialist and a non-expert results in lower transaction costs compared to trade between two non-experts. But if a good can be easily and widely identified, minimising the costs of exchange, it becomes money. Alchian (1977) emphasises that the primary function of money is not keeping track of debts and credits but rather facilitating transactions and serving as a medium of exchange in the majority – if not all – economic exchanges.

According to Baird (2000), Alchian's (1977) contribution is an important complement to Menger's (1892), even if the former is inadequate from an Austrian perspective. Menger's (1892) view on the spontaneous emergence of money assumes that the costs of recognising the attributes of goods are null but the costs of finding willing exchange partners are positive. On the other hand, according to Baird (2000), Alchian's (1977) analysis assumes that the costs of recognising attributes of goods are positive, while the costs of finding willing exchange partners are zero. In reality, both sets of costs are positive (Baird, 2000).

2.2. From medieval commodity money to present-day fiat currencies

Redish (1993) regards models such as Menger's (1892) and Alchian's (1977) as useful since they are the simplest way to capture the elements of a system in which natural resources constraint the money stock. However, the author claims systems in which commodity money served both as the medium of exchange and as the unit of account to be fiction. Such systems refer to a scenario in which, for example, lumps of gold are used to make payments in weight, and not in the number of coins – *i.e.*, no agent is verifying their fineness and weight, stamping a mark on them. Even in European medieval commodity money standards, coins were traded by their value as a unit of account, which differed from the medium of exchange.

According to Redish (1993), from the XIII century, it was common for European monetary authorities to proclaim precious metal coins, namely those made of gold and silver, whether domestic or foreign, to be legal tender for a specific unit of account values. In fact, particularly by the beginning of the early modern period, the monarch held power to define

the unit of account and run the mint – a privilege the monarch could let others run in exchange for a fee (seignorage). Thus, unlike textbook commodity money scenarios, the monetary authority fulfilled a role and could benefit from depreciating the currency. Furthermore, Redish (1993) considers the comparison between commodity money, rigidly anchored by nature, and fiat money, as a whim of the monetary authority, an oversimplification. According to the author, models such as Menger's (1892) and Alchian's (1977) assume that the money stock (M) equals the stock of monetary precious metal, which, in the case of Great Britain, the example provided, was gold (G). M is, thus, expressed in units (ounces) of gold. Yet, in practice, the money stock equals the stock of monetary gold multiplied by a factor determining the ratio between the number of monetary units per unit of precious metal (PG), which was at the government's discretion. Recalling earlier notation, M=PG*G, with PG and, therefore, M denominated in terms of the unit of account. In the British case, PG and M were expressed in pounds sterling (£stg) per ounce of gold.

Redish (1993) evidences two primary causes for the depreciation of a currency, *i.e.*, by definition, an increase of PG. On the one hand, the depreciation of a currency might result from what the author calls a technical adjustment. With the legal tender value of silver and gold coins – circulating in tandem to respectively fulfil low- and high-value transactions – being determined by the ruler, adjustments of their values were necessary to respond to changes to their market value. If these corrections were not made, according to Gresham's Law, the 'good' (undervalued) money would soon circulate at a premium and, eventually, be driven out of circulation. To restore the concurrent par circulation of these coins, monetary authorities would adjust their relative value at the mint, which was typically made by raising the legal tender value of the undervalued metal. Alternatively, currency depreciation could be caused by a need for revenue (Redish, 1993). In fact, in the early medieval period, this power was abused to generate seignorage revenue, especially because alternative sources of income (*i.e.*, tax structures) were still in their infancy. As sources of revenue with fewer distortionary side effects developed, monarchs gave up this power. Yet, during wars, when the crown could not promptly collect large sums of money through taxes or bond sales, they would sacrifice the monetary system. Thus, the author concludes that the commodity standard was more like fiat money than its simple models may suggest because monetary authorities were able to set the price of monetary gold. Therefore, economic agents were required to formulate expectations on the extent to which this discretionary power would be used.

During the XVI century, in Europe, paper notes started replacing precious metal coins as a medium of exchange (Redish, 1993). Initially, these notes were 100 per cent backed by coins. The issue of these notes – that could be transferred from individual to individual – came from the dawn of goldsmith banks (Ali et al., 2014). Commonly known as IOUs, bank notes represented a written promise to pay back money owed, as receipts for gold deposits banks were entrusted with. Although these pieces of paper were not intrinsically valuable, they could be exchanged for a fixed quantity of the underlying commodity, making it easy to carry and transfer significant amounts of money (ECB, 2012). As fractionally backed paper money and private note-issuing banks developed, a system of central banks – *i.e.*, a system of institutions, usually of private nature, with a monopoly over the right to issue notes that were granted the status of 'legal tender' – was established (Redish, 1993). Redish (1993) finds it crucial to understand what forces drove the emergence of central banks across different political, social, cultural, and economic institutions, as this event paved the way for a fiat money standard. The breakthrough of fractional reserve banking gave private banks and the public sector an impetus to reduce the reserve ratio. Under this system, the money supplied could be written as M=k*PG*G, where k is the reverse of the reserve ratio. According to Redish (1993), this arrangement would encourage the emergence of a natural monopoly among private-sector banks by centralising reserves. In turn, it would increase the profitability of the monopolistic issue of notes as well as rent-seeking activities targeting that end. Thus, governments were directly or indirectly impelled to reclaim a share of these profits and enact legislation fostering further profits, namely enabling banks to reduce the reserve ratio while preventing the risk of fraud and maintaining the gold anchor.

Ali et al. (2014) present an alternative reason for central banks to come to life. These authors find money and payment systems to be intrinsically linked. For money to function as a medium of exchange, a system that enables transfers of value (*i.e.*, a payment system) must be in place, as well as a means of recording the values stored (*i.e.*, a ledger) if the transaction is to be cleared by any means but its physical exchange. As Carstens et al. (2022) put forward, when economic agents make a payment, they are simultaneously trusting money itself and the payment system that executes the transaction: two crucial elements of any economy. This means that central banks ought to issue sovereign currency, provide the means to ensure the ultimate finality of payments and ensure the smooth functioning of payment systems, safeguarding their integrity through regulation and supervision of private services. Under a system of bank notes, in the earliest days, each bank would keep its own

ledger, and no interbank settlement would take place, meaning that these notes could only be redeemed at the bank and branch where they were issued (Ali et al., 2014). Therefore, interbank (or interbranch) payments were costly as they required the bearer of the note first to convert it into gold and then physically transport it to the new bank (or branch). Eventually, the pressure to reduce these transaction costs led banks to accept claims from each other, making trade more convenient. However, under this arrangement, the payee's bank would be exposed to the payer's bank position until the gold settlement could be arranged. In a tolerable way, this risk could be handled if note acceptance was limited to a small number of banks. Yet, as the number of banks in the system increased, the need for an increase in efficiency arose. Thus, a 'clearing' bank was created, sitting at the system's centre, holding the accounts of all member banks (usually the central bank of a given economy).

According to Redish (1993), western economies were considerably distant from medieval commodity money standards by the late XIX century. However, certain elements of the former had subsisted, namely the fact that coins were still an important component of circulation, convertibility remained a cornerstone feature of the monetary system, and the Atlantic economy's growth was often associated with the international gold standard. The author argues that the lengthening of the anchor chain – *i.e.*, diminishing the link between the money stock and the commodity, attained through the grant of legal tender status to paper money – was a significant step towards fiat money standards, as it affected the ability of the commodity to anchor the system. While under a commodity standard the quantity of coinage represented an endogenous response to the mint price and economic principles, by the end of the XIX century, there was a consensus that currency ought to be managed and that central banks should act as a lender of last resort. Thus, Redish (1993) concludes that "while the system had become less automatic, the requirement of convertibility provided a credible anchor for the system and in turn limited the scope for governments to try to manipulate the currency to earn seignorage" (p. 758).

Until 1914, economising on gold was mostly a domestic affair (Redish, 1993). Likewise, until this date, institutional innovations occurred mostly at a national level. Yet, after the beginning of World War I, innovations developed on an international scale, namely the general abandonment of the gold standard during this conflict. In the 1920s, the gold standard was, in a way, re-established with two concerns in mind: the possibility of a lack of gold, which drove people away from commodity money, and prevailing hyperinflation in

Eastern Europe, reminding everyone of the dangers of fiat money. In fact, the League of Nations played a key role in the return to the gold standard, although one economising on this precious metal, as well as in the establishment of central banks fostering international coordination and the best use of available gold. However, in 1929, countries started abandoning the gold standard in the face of internal and external gold drains (Redish, 1993). This led to an 'adjustable peg' exchange rate system, culminating in a generalised devaluation, universally regarded as a beggar-thy-neighbour policy. Yet, the price of gold was still a target of monetary authorities, who usually did not revalue their reserves to reflect their value increase.

In contrast with the isolationist stance adopted after the previous World War, by the end of World War II, the United States of America got more involved in international affairs, adopting an active role in the development of institutions stimulating European economic recovery (Redish, 1993). This was done through the signing of the Atlantic Charter in 1941, committing the United States and the United Kingdom to establish a multilateral trading and exchange system when the war ended, and through the development of a proposal for the International Monetary Fund (IMF) as well as a new international monetary system, by 1943. The Bretton Woods system, signed in 1944, extended the interwar gold-exchange standard, fixing currency parities with the U.S. dollar, and the former to gold. To do so, the United States agreed to buy and sell gold at $35 per ounce. The author concludes that this system further lengthened the anchor chain (increasing k), with resource economisation reaching epic proportions.

Nevertheless, the Bretton Woods system was short-lived (Redish, 1993). By 1960, a speculative crisis drove the price of gold from $35 to $40 per ounce in London. This crisis was only resolved due to strong legal barriers to capital mobility and the intervention of central banks, which helped the United States stabilise the price of gold. Then, as the United Kingdom devalued their currency in 1967, and a run on gold occurred, forcing the consortium of central banks to sell $3 billion worth of gold in early 1968, a two-tier gold market was established, and the price of gold was no longer stabilised. In this two-tier gold market, central banks would trade gold amongst each other at $35 per ounce. All other gold would only be traded in the free market and the 25 per cent gold backing established by the Federal Reserve for its notes was abandoned. Additionally, the IMF tried to solve the concerns regarding the relative scarcity of gold by introducing the Special Drawing Rights (SRD), which impacted the world money supply. Under this scope, M=k*PG*(G+SRD).

However, the quantity of SRD agreed to emit by the international community was extremely limited. The ultimate demise of the gold link came in 1973 with United States President Richard Nixon announcing the definite suspension of the convertibility of U.S. dollars into gold after announcing it as a temporary measure in August 1971. According to Redish (1993), the collapse of this system is generally attributed to four causes: increasing mobility of capital, making currencies vulnerable to speculative attacks, which threatened currencies with a fixed exchange rate in a fractional reserve scheme; the generalised belief in the power of bureaucrats to willingly manage fiscal and the monetary policy simultaneously, which offset the natural equilibrating processes of the gold-based standard and prevented the adjustment of balance-of-payments; the legitimisation of devaluation as a policy tool rendered speculative attacks rational and weakened the fundamentals to uphold a nominal anchor; and the use of seignorage to finance the war. Yet, the fundamental cause for the collapse of this system was the same that impacted the XIX-century economies: economic growth largely exceeded the growth rate of the gold stock, raising the real cost of commodity-based money. Three alternative policy choices could have been undertaken to avoid such an outcome: a much wider role for SDRs, allowing for the growth of the monetary base, while removing the anchor and establishing international fiat money; a major depreciation of the U.S. dollar, shifting the anchor and serving either as a temporary stop-gap or a recurrent decision which would lead to the demise of the anchor; or to engineer a worldwide deflation, accepting the higher costs of the anchor.

Following the collapse of the Bretton Woods arrangements, a fiat currency regime was established. It is worth noting that, thus far, individuals in the West had only dealt with fiat money during wartime periods, when printing money was used to finance a war. Although similar to commodity-backed money, fiat money is conceptually different, for it cannot be redeemed for a commodity (ECB, 2012). IMF members – which add up to 190 countries – have always been free to determine their form of exchange rate, whether it is a free-floating currency, pegging it to another currency or a basket or currencies, adopting the currency of another country, participating in a currency bloc, or forming part of a monetary union (IMF, n.d.). IMF members cannot, however, peg their currency to gold. In this context, according to Croce and Khan (2000), most developed countries opted for more flexible exchange regimes, making room for adopting discretionary monetary policies. This meant that governments simultaneously held unrestricted control over the two pillars of macroeconomic policy: monetary and fiscal policy (Bandaogo, 2021). According to Bordo

(2007), the main goal of monetary policy is to ensure price stability, or stability in the value of money, which is associated with a sustained low inflation rate. Yet, governments, as decision-makers subject to political cycles, tend to act in a short-sighted manner (Mersch, 2017), favouring an inflationary bias that stimulates output and lowers unemployment (Bandaogo, 2021). This tendency – also known as the time inconsistency problem of monetary policy – is often associated with acute periods of inflation, namely, the great inflation observed in the 1970s. During such periods, agents' decisions, particularly on investment, saving, and production, are distorted, leading to slower economic growth (Croce & Khan, 2000). To counter this tendency, since the mid-1980s, it became common for countries to grant institutional independence to their respective central bank, entrusted with a clear mandate to achieve price stability. Central banks in industrialised countries usually target an inflation level between 1 and 3%. On the other hand, according to Mersch (2017), independent central banks rely on the principles of accountability and transparency. Accountability – necessary to legitimise independent central banks in a democratic society – refers to their political duty and the ex-post explanation and justification of autonomous decision-making. Transparency, in contrast, aims to increase the effectiveness of central banks' policies by communicating them in a timely manner, making the public aware of their objectives, behaviours and decisions.

Following the 2007-2008 financial crisis, however, central banks' powers, tasks and responsibilities have expanded beyond those associated with traditional monetary policy (Mersch, 2017, Bandaogo, 2021). In fact, Bordo (2007) claims that modern monetary policy includes two additional goals. The first is attaining a stable real economy, which can be interpreted as either high employment and high and sustainable economic growth or smoothening the business cycle by offsetting economic shocks. The other, financial stability includes ensuring a smoothly running payments system and the prevention of financial crises. Carstens et al. (2022) state that monetary systems that can fully serve society must be safe and stable – with public and private participants who are accountable to the public –, efficient and inclusive, granting users control over their data, with fraud and abuse being prevented, and must adapt to changing demands and be open across borders, to support international economic integration. According to Bandaogo (2021), accountability is more difficult nowadays because, unlike price stability, which can easily be assessed by comparing the target and recorded values of a given indicator – such as inflation level –, financial stability is a much more abstract concept. The increase in the scope of central banks' actions sparked the

debate regarding their independence, particularly in the context of the Covid-19 pandemic, because if, on the one hand, political forces urge central banks to enact specific policies to mitigate the economic impacts of this event, on the other hand, the wider scope of central bank's mandates implies enacting policies that impact governments' balance sheets in the long-run.

It is important to notice that in modern economies, central banks do not directly control the amount of money in circulation, as most of it is created by private financial institutions through the grant of loans. Yet, they influence it through monetary and macroprudential policies and regulations (Banco de Portugal, n.d.). In fact, according to Adrian and Mancini-Griffoli (2022), modern money is credit, with a wide set of counterparties who must trust the asset, not each other. The ECB (2012) argues that people willingly accept it in exchange for goods and services out of trust in the issuing institution. Modern central banks target money aggregates – *i.e.*, monetary liabilities of monetary financial institutions (MIFs) and central government, including the post office, the treasury, etc., relative to non-MIF residents excluding central governments (ECB, n.d.) –, which differ in the scope and liquidity of their instruments (Banco de Portugal, n.d.). This way, these institutions ensure that money and credit growth are aligned with the monetary and financial stability of the economy.

3. On *Denationalisation of Money*

Hayek, like most Austrian School economists, believed that, if the management of money is in the hands of the government, the gold standard is the only satisfactory system (ECB, 2012). Yet, *Denationalisation of Money*, originally published in the seventies of the XX century, questions the general yet tacitly accepted belief that a given nation must be provided by its government with its own distinctive and exclusive currency. Hayek (1990) posits that, for free enterprise and market economy to survive, governments' monopoly over money and national currency systems must be replaced with free competition between private issuing banks. In this chapter, we shall analyse this work, starting with Hayek's (1990) definition of money and his historical perception of monetary policy. Then this dissertation shall present and examine his proposal and its immediate and far-reaching effects.

3.1. Hayek's definition of money

Hayek (1990) – inspired by the teachings of Menger – regards money as *the* generally accepted medium of exchange. Although a widely accepted medium of exchange would suffice for an object to be considered as such, a generally accepted medium of exchange tends to acquire the further functions of a unit of account and store of value. The author does not find it necessary for a single kind of money to prevail within a given community: experience dictates that people may accept different types of money at current exchange rates, for different purposes, such as holding, making contracts of deferred payments, or accountability. Yet, these different kinds of money differ from each other in more than one dimension.

Hayek (1990) proposes differentiating monies according to their acceptability (or liquidity) and stability (or expected behaviour or variability), where the expectations regarding the latter should dominate the former. Unlike Menger (1892), Hayek (1990) finds no clear distinction between what is and is not money. Rather, he finds a continuum in which objects of different degrees of liquidity shade into each other on the degree to which they function as money. The notion that such a distinction exists is an unfortunately held assumption that the law conveniently tries to push. The author's etymological concern is also worth highlighting, as he mourns that 'money' is used as a noun rather than "an adjective describing a property which different things could possess to varying degrees" (Hayek, 1990, p. 56). For this reason, the author tends to favour the word 'currency' in his proposal.

3.2. Money at the hands of the government

For over two millennia, the government prerogative, *i.e.*, the government's exclusive right to supply money, was limited to punching marks on bars of precious metals, attesting to its fineness or to the monopoly of minting coins made of said metals (Hayek, 1990). Yet, during the Middle Ages, and contradicting experience, the superstition that it was a governmental act that bestowed value upon money arose. As coinage spread, governments began to realise its potential as an instrument of power and a source of gain. Thus, they neither claimed nor were conceded the exclusive right to create money in the name of the greater good, but because it was perceived as an essential symbol of power, asserting the sovereignty of the ruler over a given region and its people. The *valor impositus* doctrine was widely adopted and used to impose the same value on coins containing smaller amounts of precious metal, *i.e.*, of lesser intrinsic value.

Assuring the provision of a uniform and recognisable sort of money to its people under adverse circumstances, even if under a monopolistic framework, was undoubtedly a useful task performed by the government (Hayek, 1990). Surely, the existence of a single easily recognisable kind of money may have been very useful in teaching people how to calculate in money, making price comparison easier, and fostering competition and a market economy. This system was also very useful to attest to the genuineness of metals used as money, whose process of assaying is very specialised, mainly in regions further from economic centres, where the one identifiable authority that could provide such a statement was the government. However, the price of such convenience is periods of inflation and instability – often pointed out as a chief inherent defect of capitalism – caused by abusive governmental interventions in the monetary market. These episodes were furthered by the widespread adoption of paper money and the absolutist regimes that governed Europe. Hayek (1990) also refers to the fractional reserve system as "a most unfortunate hybrid" (p. 91) one, where responsibility for the total quantity of money is divided in a way that neither commercial nor central banks can effectively control it. The main need for central banks comes from commercial banks incurring liabilities payable on demand in a unit of currency some other bank has the sole right to issue, creating money redeemable in terms of other money. This division of credit creation among one central bank and several commercial banks produces a necessary instability, as the institutions providing credit must reduce their outstanding obligations precisely when all other agents demand more liquidity.

The transition from the gold standard and fixed exchange rates into fractional reserve banking and floating exchange rates fostered central banks' discretionary powers and worsened problems associated with the government's prerogative (Hayek, 1990). Tokens of no intrinsic market value cannot be accepted as money, except if these objects derive their value from other sources, namely by representing a claim on some valuable object such as another kind of money. Under a wide spectrum of new sorts of money, governments operate a power beyond their comprehension and have abused it to defraud people. Even if we assumed that democratic governments could know what general interest demands to be done regarding monetary policy, it is unlikely that they will act accordingly. Once allowed to benefit populational groups or sectors, a government, whose goal is to gain the support of sufficient voters to command a majority, will seek to appease these dissatisfactions, by manipulating the quantity of money. Indeed, monetary policy is, according to the author, the cause of depression, rather than the cure. Giving in to the cries for cheap money causes production misdirections that later cause inevitable reactions. In the words of Hayek (1990), "the past instability of the market economy is the consequence of the exclusion of the most important regulator of the market mechanism, money, from itself being regulated by the market process" (p. 102). The author believes that market order uses prices to provide relevant information to individuals, and, thus, only the observation of current prices of certain commodities can provide information on the direction in which money must be spent.

Hayek (1990) claims the need for 'legal tender' to be the first great misconception frequently used to justify the government's monopoly over the issue of money. However, in the people's minds, this status has become "surrounded by a penumbra of vague ideas about the supposed necessity for the state to provide money" (Hayek, 1990, p. 37). This generalised belief is reminiscent of the medieval idea that the state stamp somehow bestows value upon an object that otherwise would not possess it. This is only true to the extent that the government can force one to accept it as a substitute for what was originally agreed upon. Even the supposed need for a governmental stance on what is money relies on a naïve belief that money, as a tool, was invented and made available to humankind by some original creator. This stance completely disregards the spontaneous generation of undesigned institutions through a process of social evolution of which money, law, language, and morals are prime examples. Ultimately, 'legal tender' is referred to as a legal device to force people into accepting something they never wanted as the fulfilment of a contract, which may intensify the uncertainty of dealings. Nonetheless, governments must be free to determine

in which currency taxes must be paid and to make contracts in any currency it chooses, which may be used to support their currency or those it wishes to favour. Yet, the author does not find a reasonable justification for the government to refuse other units of account as the basis for assessing taxes. Additionally, even courts would need to decide on the currency in which non-contractual payments, such as damages and compensations for torts, would have to be paid.

The other misconception Hayek (1990) dealt with is the pertinence of Gresham's Law, as the belief that bad money will drive good money out of the market is often used to justify the absolute necessity of a governmental monetary monopoly. Yet, this is only true if applied to different kinds of money among which a fixed exchange rate has been established by law. Under variable exchange rates, money of inferior quality would be valued at a lower rate and people would try to get rid of it as soon as possible, particularly under the threat of further devaluation. Hayek (1990) believes that this selection process fosters the widespread adoption of the money deemed as best, quickly driving out inconvenient or even worthless money. The author recalls the experience of the great German inflation when all sorts of objects of relatively more stable value became used as money, namely cigarettes, potatoes, eggs, or even foreign currencies, such as the United States dollar.

3.3. The proposal within *Denationalisation of Money* and its immediate effect

Hayek (1990) impels the Common Market countries to formally place no obstacles to the free dealing of each other's currency throughout their territories or to any form of banking business exercised by an institution legally established. Preferably, this proposal would include the neutral countries of Europe and, eventually, the nations of North America. Part of these banking activities would involve the free competitive issue of notes, resembling managing cheque (current) accounts, denominated in a unit exclusive to each institution, under a brand name protected by trademark against unauthorised use or forgery. Yet, Hayek (1990) does not expect all banks to issue their own currency. Those choosing not to must accept deposits and grant credits in terms of a currency overviewed by another institution. In fact, as long as this transition happened without the collapse of existing currencies, the author expects the main concern of individual commercial banks to be deciding whether to establish their own currency or to, alternatively, select a currency or set of currencies in which

to conduct their future business. Most banks would opt for the latter. Consequently, they would lose the business of running cheque accounts to issuing banks, reducing their activity to the administration of less liquid capital assets.

Hayek (1990) explains how he envisages private token currencies being introduced and generally accepted as money. The issuing institution could offer non-interest-bearing certificates or notes, as well as announce its readiness to open current cheque accounts in terms of the distinct registered trademarked currency created, such as the Swiss Ducat. The only assumed obligation would be to redeem these notes and deposits on demand with a fixed parity to other national currencies, keeping a 100 per cent cash reserve of the currencies in which its issue was expected to be redeemed. This convertibility rate would merely serve as a floor below which the unit's value could not fall, for at the same time, the intention to keep the unit's purchasing power as stable as possible would be announced. Periodically, its precise commodity equivalent – which could be altered as experience and the revealed preferences of the public were made known to the issuing bank manager – would be announced without being necessary nor desirable for the issuer to tie itself to it legally.

Initially, these notes and certificates would be created through short-term loans or sales against other currencies made available to the public. They would be sold at a premium, managed as freely available for general business, relative to the currencies in which they were redeemable, which was expected to increase as government currencies depreciated. This depreciation would swiftly increase demand for stable currencies and install the competitive system of similar but differently named issuing enterprises. Once the regular market establishes itself, currencies would be issued through ordinary banking business, *i.e.*, short-term loans.

The trust upon which this system would rest would not be much different from the one upon which all systems rested until the introduction of governmental deposit insurance schemes: everyone trusted banks to conduct their business in ways that always allowed for the exchange of demand deposits for cash, despite being known that every individual could not exercise this right at the same time. Achieving the announced aim of a constant purchasing power currency would require a timely adaptation to changes in demand, whether increase or decrease. Yet, as long as the currency's value was kept somewhat constant, there would be little reason to expect a decrease in its demand. In fact, the author finds it more likely for an excess in demand to occur.

In the context of a competitive commodity reserve scheme of money creation, the storage of a large variety of commodities would prove to be expensive, and the usage of a few commodities would, in turn, reduce the value of the proposal (Hayek, 1990). Yet, according to the author, convertibility is a needed safeguard against a monopolist, but not against competing suppliers that can only be kept in the market if they provide money as advantageous as others. If the issuer is trustworthy, people will accept the established value, and realise that the risk of holding it is smaller than the risk of holding an asset they possess no special information on. Considering clearly distinguishable units issued competitively, the author expects the public to be provided with a better quality of money, which would offset the inconvenience of encountering – but not necessarily handling – more than one kind of money. Under this condition, the value of the currency issued by one bank would not necessarily affect nor be affected by the supply of currency from other institutions, whether private or governmental.

As a very profitable venture, no rational decision-maker would want to risk losing their share of the monetary market. The financial success of its institution would depend on the ability to establish credibility and trust that the bank would carry out its declared intentions of maintaining the purchasing power of its money constant. Failing to do so would culminate in the loss of the business. Several competing different currency issuers would compete through the quality of the currencies offered for sale or loan, with each issuer being able to regulate the quantity of its currency, seeking to make it the most acceptable to the public. Hayek (1990) expects a currency generally anticipated to preserve its purchasing power approximately constant to be in continuous demand. Thus, one could trust each issuing bank to try to achieve this goal better than any monopolist who risks nothing by depreciating their own currency.

Once the issuers establish themselves as credible providers of currencies that suit the needs of the public, there would be no obstacle to their general acceptance as means of payment, to the detriment of national currencies. In fact, the appearance and increasing use of new currencies are expected to decrease the demand for the latter and, eventually, bring their demise. This would be the process through which all unreliable currencies would be driven out of the market. In this scope, the choice of currency to employ in contracts and accounts is far too important for business, and every piece of information is crucial. For this reason, Hayek (1990) expects the press to play a key role within his proposal, as they would

scrutinise the information released by the agencies, shaming misconducting managers, which is expected to enhance competition.

Among available kinds of currency, Hayek (1990) expects four interdependent uses of money to dictate people's choice: its use for cash purchases of commodities and services, holding reserves for future needs, contracts for deferred payments, and as a unit of account. Yet, he expects the use of money as a reliable unit of account to trump all others when determining people's preference for a stable-value currency. Indeed, only under this circumstance would realistic calculation be possible in production and trade, particularly the chief task of accounting: ensuring sustainable stocks of capital and that only true net gains are shown and made available to shareholders.

Disturbances caused by changes in monies' value operate through the effects on contracts for deferred payments and on the use of a given currency as the basis for calculation and accounting. Both decisions must bear in mind that the future individual movement of most prices is unpredictable, as they signal unknown events. People will tend to prefer a currency with stable value relative to certain commodities because it minimises the effects of unavoidable uncertainty about price movements as the effect of errors in different directions are expected to cancel each other out. This will not, however, occur if the median of the deviation of individual prices does not cluster at zero. Moreover, what prices people will seek to keep constant is unknown, leading to different collections of commodities moving differently. In fact, successful economic action depends largely on the ability to approximately predict future prices. These estimations depend on present prices and the estimation of their future trends. Yet, determining them depends on circumstances unknown to most individuals. Indeed, the chief function of prices is to communicate, as fast as possible, signs of change which one does not and cannot know about but require their plans to be adjusted. There is no perfect correspondence of the individual plans, and no money is required to make an indirect exchange without influence on relative prices. No real money can ever be neutral in this sense, and the best systems possible are the ones where the inevitable prediction errors are rapidly corrected. The nearest approach to such an idyllic condition would be one where the average prices of 'original factors of production' were kept constant, which can hardly happen, given the difficulty of measuring the average price of land and labour. Its nearest practical approximation is keeping prices of raw materials, as well as other wholesale goods, stable, which one could hope competing currencies to ensure.

Therefore, there would be no need to fear false demands for more money based on the idea that more money is needed to secure adequate liquidity. The amount required of any currency will always be the one that can be issued or kept in circulation without causing a direct or indirect increase or decrease in the price of the basket of commodities that is to be kept constant. This rule will satisfy all legitimate demands that satisfy the 'needs of trade', which will happen as long as the stated collection of goods can be bought or sold at the stated price and the changes in money supply do not interfere with this condition. Yet, while good and bad currencies circulate side by side, individuals cannot protect themselves against the latter's effects by only using the former. As relative prices of different commodities must be the same in terms of the different concurrent currencies, the price structure effects are caused by inflation or deflation of a widely used competing currency. For this reason, the benefits of a stable course of economic activities produced using stable money would only be achieved if most transactions used stable currencies. Although displacement of bad money would come fairly soon, occasional disturbances to the price structure and general economic activity would occur, until the public learnt to reject tempting offers of cheap money.

On the other hand, since prices differ from region to region, businesses would prefer a kind of money accepted across more regions. Each enterprise would be greatly concerned with calculating and accounting for the prices of widely traded products, such as raw materials, agricultural foodstuffs, and certain semi-finished industrial products. As these are traded on regular markets, their prices are promptly reported and given their sensitivity, the detection of and actions against general price movements would be easily made. Hayek (1990) expected people, in regions broader than national territories, to agree on a standard set of wholesale prices of commodities to treat as the standard of value relative to which currencies must be kept constant. This would lead certain wider-reach banks to keep refining their reference basket, without causing substantial fluctuations in the relative values of the reference currencies within the region.

There is, however, no necessity for the whole internal structure of prices to move together relative to other countries. This situation is neither natural nor desirable. Excluding regions that were kept under the rule of dictators who did not let go of their power over money, the competitive system proposed could lead to different currencies dominating certain areas, because of different preferences regarding the commodity equivalent to be kept constant. Additionally, Hayek (1990) expected only one currency to be generally used in ordinary dealings in larger areas. Yet, this will not mean a return to a monopolistic position

if potential competition forces the dominant issuer to keep the value of its currency stable. The author also claims that competition *in posse* (potential competition) is likely to be nearly as effective as competition *in esse* (de facto competition) as long as it does not involve innovation. This feature would not, however, pose a challenge for payments beyond the individuals' region. Additionally, the areas dominated by a certain currency would not present sharp or fixed borders, and large fluctuating overlapping areas would exist.

3.4. Broader effects to the proposal within *Denationalisation of Money*

The issuing scheme proposed by Hayek (1990) would present consequences that would extend beyond providing people with better money. Although governments should not try to control the development of the system proposed, new rules of law would be needed to provide a legal framework within which new banking practices could successfully develop. Yet, Hayek (1990) was sceptical of the advantages of treaties immediately adopted internationally, for they undermine experimentation with alternative arrangements.

On the other hand, monetary policy would neither be needed nor possible under a competitive issuing scheme. Within a region or nation, there would not exist a definitive quantity of money, and the individual currency issuers would seek to maximise the aggregate value of their currency according to the willingness of the public to hold it. Moreover, problems related to the balance of payments would cease to exist due to the disappearance of distinct territorial currencies. These problems are consequences of the unnecessary adoption of national currencies, which only concern the money monopolist within a given territory. Additionally, the author refers to the abolition of central banks, as we know them, as a natural consequence of the abolition of governments' money monopolies. Although some of its functions may still be required – especially lender of last resort or holder of the ultimate reserve – one could expect a private issuing bank to fulfil such a role. This system would also demise the ability to fix interest rates, a price itself, that must be determined through competitive forces. The interest rate would be determined by balancing the demand for money for spending purposes with the supply of money that guarantees constant price levels, leading savings and investment decisions to approximately add up. Yet, this market would still be affected by the government's net volume of borrowing, just not with the adverse effects of the past.

This scheme is also expected to impact government finance and expenditure. It is impossible for a central bank subject to political control or under serious political pressure

to regulate the supply of money in a way that is compatible with the smooth operation of the market process. If the competitive scheme of currencies would provide a stable value of money, as well as stable business conditions, governments are no longer necessary as an antidote against unemployment. Thus, there is no good reason to allow for successive government deficits. In fact, it is more important to prevent government expenditure from becoming a cause of general instability than to keep gambling on the unlikely chance that government will mitigate economic activity shocks in a timely manner. Although, at times, governments need to borrow from the public to meet certain requirements or to finance certain investments, this should not be done through the creation of additional money.

Finally, and despite the international character of this proposal, the author expects trust in these institutions to be linked to the trust in the government under which they are established. Thus, under normal circumstances, these institutions would establish themselves in small wealthy countries for which international business is an important source of income, as these countries are expected to be particularly careful with managing their reputation regarding financial health. It is also worth noting that inevitably certain movements would arise, seeking to pressure governments to favour (less efficient) national institutions, which could represent a return to the present system. Yet, the main danger would come from governments' intent to limit international movements of currency and capital, perceived as the biggest threat not only to a working international company but to personal freedom. The abolition of the government monopoly of money creation would also foster individual freedom, as it would make it increasingly impossible for governments to keep track of international movements and give dissidents the full ability to escape the grasp of oppression.

4. Money and payment systems in the digital era

Modern payment systems still employ the same process as XVI century goldsmiths, as payments are made by reducing the balance in a customer's account and increasing the balance in the recipient's account by an equivalent amount (Ali et al., 2014). Yet, the technologies employed to record and transfer the balances between banks are entirely different. The first section to this chapter explores the technological developments of the last 70 years, which led to digital currency schemes, representing both a new decentralised payment system and a new currency (Ali et al., 2014). The second section tries to establish a broad coherent conceptual structure to the world of decentralised finance (DeFi) by favouring the definitions the IMF (2022) put forward, for this institution presents a holistic view on the topic. Then, stablecoins shall be championed as the main candidates to function as a medium of exchange in the digital realm. Section 4.4 explores the different kinds of stablecoins and section 4.5 their advantages and limitations. This chapter shall implicitly evidence a preliminary parallel between public collateralised/reserve-backed stablecoins and Hayek's (1990) work. It will also be crucial to understand the analysis carried out in Chapter 5.

4.1. Technological developments: from payment systems to new currency schemes

The technological developments of the second half of the XX century and early 2000s have affected payment systems in two ways: records and ledgers have been converted from paper to electronic form, increasing the speed of completing transactions and reducing operational risk (*i.e.*, the risk that one of the banks involved in the transaction ceases to exist, whether temporarily or permanently); and the development of low-cost technology fomented the development of new payment schemes. Mobile money schemes, in which money is stored as credit on a smart card or a system provider's book while relying on national currencies, are perhaps the most prominent example of the latter. The development and adoption of this sort of scheme are relevant in areas where traditional banking infrastructure is limited. In developed economies, they arise as a response to the high margin associated with existing banking systems and are adopted because of their ease of use. Therefore, technological innovation has made payments more accessible to a broader range of users while still relying on a trusted centralised entity. This trend has been reinforced by

the Covid-19 outbreak, which increased the usage of digital and contactless payments due to a multitude of reasons, of which the public's fear of contagion and the surge in e-commerce may be highlighted (Committee on Payment and Market Infrastructures, 2021). In fact, in a Mastercard (2020) study, 79 per cent of worldwide respondents admitted to the use of contactless payments, citing safety and cleanliness as decision drivers. 64 per cent of adults worldwide have also already made or received at least one digital payment (Demirgüç-Kunt et al., 2022).

On the other hand, technological innovations have fostered the emergence of alternative currencies and a decentralised structure to payment systems relying on cryptography (Ali et al., 2014). According to Prasad (2022), as the era of physical currencies ends, the age of digital currencies commences. Ali et al. (2014) state that most digital currencies are cryptocurrencies. Presently, there are nearly 420 million crypto users worldwide, most (63%) being male individuals under the age of 34 (72%), with at least a bachelor's degree (71%) and an average annual income of 25.000 United States dollars (Triple-A, 2023). Most are based in Asia (260 million), then North America (54 million), Africa (38 million), South America (33 million), Europe (31 million) and Oceania (1,5 million). In recent years, crypto markets have (significantly) evolved and, for that reason, focus as well as terminology have shifted from the narrow notion of 'cryptocurrencies' to the broader scope of 'crypto assets' (Houben & Snyers, 2020). Indeed, given the ever-expanding nature of the concept of 'crypto assets', and the vast range of assets denominated as such, there seems to be no unanimity regarding the terminology to be employed (Sanz Bas, 2020).

4.2. The world of decentralised finance (DeFi)

DeFi refers to the set of alternative markets, products and systems relying on crypto assets and smart contract software built using certain types of technology, notably distributed ledger technology (DLT). The latter refers to a means of saving information through a distributed ledger, *i.e.*, a database that is stored, shared, and synchronised on a computer network, whose data update requires consensus among the network participants. Of this sort of technology, the renowned blockchain is an example. Blockchain refers to a specific distributed ledger in which transaction details are stored in blocks of information. A new block of information is added to the chain when a transaction is validated via a computerised process. This technological background enables the development of crypto assets – a term

employed by the IMF (2022) as synonymous with cryptocurrencies –, private sector digital assets that rely primarily on cryptography and DLT or similar technology, which can be divided into four categories: utility tokens, stablecoins, security tokens and unbacked crypto assets. Utility tokens grant the holder a right to access a current or prospective product or service to be provided by the issuer or the issuing network. Stablecoins consist of crypto assets that aim to maintain a fixed value relative to a specified asset or basket of assets. Security tokens refer to crypto assets that meet the definition of security – a negotiable financial instrument, designed to be traded on an organised or 'over the counter' exchange, such as investment fund shares (IMF, 2009) – in the jurisdiction where they are issued, transferred, exchanged, or stored. Unbacked crypto assets are neither tokenised traditional assets nor stablecoins.

Broadly, one could refer to cryptocurrencies as digital assets, *i.e.*, digital instruments issued or represented using distributed or similar technology, excluding digital representations of fiat currency. Perhaps this definition is better understood if complemented with Menon's (2022) definition of digital assets: anything of value whose ownership is represented in a digital or computerised form. Moreover, according to the author, the digital asset ecosystem is characterised by relying on a distributed ledger (or a blockchain), cryptography (*i.e.*, advanced encryption techniques that ensure safe transactions) and tokenisation (*i.e.*, the usage of software programs to convert ownership rights over an asset into digital tokens that can be stored, sold, or used as collateral). Therefore, digital assets must not be understood as e-money: a stored monetary value or prepaid product representing a claim enforceable against the provider to repay the balance on demand and in full (IMF, 2022). E-money represents the storage of a record of funds or values available to the consumer on a prepaid card or electronic devices, such as a computer or a cell phone, being accepted as a payment instrument by other than the issuer, implying multipurpose use.

4.3. A medium of exchange for the digital asset ecosystem

According to Menon (2022), a digital asset ecosystem requires a tokenised medium of exchange that facilitates transactions and "unlocks untapped economic potential" (p. 14). Three candidates are expected to fulfil such a role: Bitcoin-like cryptocurrencies, stablecoins and central bank digital currencies (CBDCs), whether wholesale (*i.e.*, those whose use is restricted to financial intermediaries, resembling commercial banks' deposits held by the central bank) or retail (*i.e.*, digital cash issued by the central bank to the general public).

Recalling the IMF's (2022) contribution, CBDCs are merely a potential new form of digital money. Yet, these are central bank liabilities denominated in an existing unit of account, also serving as a medium of exchange and store of value. Considering the previously presented definitions, CBDCs are not cryptocurrencies because they are not private. They merely expand central bank forms of money, not representing a step towards Hayek's (1990) proposal. For this reason, this dissertation will not delve into their case.

When first introduced, private cryptocurrencies, such as Bitcoin and altcoins (*i.e.*, digital currencies alternatives to Bitcoin), were expected to revolutionise payments (Prasad, 2022). These assets were expected to increase efficiency, as they do not rely on central bank money or trusted intermediaries (e.g., commercial banks and credit card companies), reducing the amount of total paid fees to conduct transactions. Yet, they are inept as money, as they fail to perform any of the three conventional functions of money (ECB, 2015; Menon, 2022): they fail as a medium of exchange due to their very low level of acceptance among the general public; they are useless as a store of value for both short- and long-term purposes, due to their high volatility of exchange rates to currencies and most goods and services; these two factors also make them unsuitable as a unit of account (ECB, 2015). Many cryptocurrencies widely traded nowadays are utility tokens representing a stake in blockchain projects. These assets are actively traded beyond the blockchain, being heavily speculated on, causing their prices to be detached from their underlying economic value, leading to extreme price volatility, which rules them out as tokenised currency or even investment assets (Menon, 2022).

On the other hand, Menon (2022) expects stablecoins – provided they are well-regulated and securely backed by high-quality reserves – to fulfil such a role. In the past couple of years, stablecoins have experienced tremendous growth (Liao & Caramichael, 2022) and are beginning to find acceptance outside the crypto ecosystem, most notably since Visa and Mastercard allow transactions to be settled using USD Coin (Menon, 2022). They are expected to serve as a breakthrough innovation in the future of payments (Liao & Caramichael, 2022), especially if they render payments cheaper, faster, and safer (Menon, 2022). Stablecoins combine the benefits of stability and tokenisation, which enables them to be used as payment instruments on distributed ledgers (Menon, 2022) and to play a key role in digital markets (Liao & Caramichael, 2022). Liao and Caramichael (2022) posit that stablecoins are a nascent, broadly defined technology that can take many forms, showing

high innovation potential. This means that their current implementations and status in the regulatory landscape do not reflect their full potential technological deployments.

4.4. Exploring stablecoins

Liao and Caramichael (2022) categorise stablecoins according to three types: institutional or private, public reserve-backed, and public algorithmic. Traditional financial institutions have developed institutional or private stablecoins (alias tokenised deposits) and are implemented on private (permissioned) DLTs, being economically and functionally similar to products offered by money transmitters, such as Paypal (Liao & Caramichael, 2022). For this reason, they will not be considered for the goal of this dissertation.

According to Liao and Caramichael (2022), most existing stablecoins circulate on public blockchains. Public reserve-backed stablecoins are backed by cash-equivalent reserves, such as bank deposits, Treasury bills, and commercial paper. They are also denominated as custodial stablecoins and are issued by intermediaries, serving as custodians of cash-equivalent assets, who offer 1-for-1 redemption of their stablecoin liabilities for fiat currencies. Alternatively, public algorithmic stablecoins represent the remaining fraction of existing public stablecoins. Using alternative mechanisms to stabilise their price instead of relying on the soundness of underlying reserves, algorithmic stablecoins are maintained by systems of smart contracts – which Menon (2022) defines as computer programs embedded in a distributed ledger that automatically execute actions when pre-determined conditions are met – operating solely on a public blockchain. In contrast, reserve-backed stablecoins are issued as a liability on a firm's balance sheet.

Liao and Caramichael (2022) delve into the stability of a public reserve-backed stablecoins' peg, whose instability arises in two forms. Investor redemption risk from the issuer relates to the safety and soundness of a stablecoin's reserves, as a run dynamic could be triggered if stablecoin holders mistrust its backing. This run could impact other asset classes, as stablecoin reserves are sold to meet redemption demand and markets and services that depend on stablecoins through interoperable smart contracts, amplifying the distress. The authors expect this type of instability to be addressable with proper institutional or regulatory guidelines – such as transparent financial audits – and adequate liquidity and quality requirements of stablecoin reserves. On the other hand, supply and demand imbalances in the secondary market, the second form of peg instability for public reserve-backed stablecoins, happen because they are traded on both centralised and decentralised

exchanges. Therefore, these stablecoins are vulnerable to demand shocks that temporarily dislocate their peg until the issuer adjusts the supply. This is particularly relevant during crypto market distress because public stablecoins serve as a store of value on public blockchain-based markets, drawing high demand due to investors' rush to liquidate their (speculative) positions into stablecoins. In fact, during previous extreme episodes of crypto market distress, stablecoins served as a digital safe asset, appreciating while more speculative crypto assets experienced a temporary freefall (Liao & Caramichael, 2022). The price behaviours of major public reserve-backed stablecoins are exceptional and very different from prime monies', which tend to experience large outflows during episodes of distress, such as the 2008 Global Finance Crisis and the 2020 Covid-19 market turmoil. These episodes evidence stablecoins' potential to serve as a digital haven during market distress.

Furthermore, Liao and Caramichael (2022) find four main uses for the various forms of stablecoins, driving their growth. Notably, stablecoins are used to transact digital assets, especially cryptocurrencies, on public blockchains, replacing fiat balances, as they make near-instantaneous permanent (24/7/365) trading possible without relying on non-DLT payment systems or custodian holdings of fiat currency balances. Stablecoins (both public and institutional) are also used to facilitate near-instant (24/7) peer-to-peer (non-intermediated) and especially cross-border payments, with potentially low fees. Institutional stablecoins are commonly used to transfer funds near-instantly across firms' subsidiaries to manage internal liquidity and regulatory requirements and facilitate wholesale transactions in existing financial markets. Finally, given that they are programmable and composable, public stablecoins are used in decentralised public blockchain-based markets and services, whose protocols allow for market making, collateralised lending, derivatives, and asset management, among other services.

4.5. Stablecoins' perks and drawbacks

Stablecoins' defining features – cryptographic security and programmability – encourage the previously presented cases of their usage and others. These features offer the potential to drive innovation to make stablecoins useful beyond these cases (Liao & Caramichael, 2022). Liao and Caramichael (2022) expect stablecoins technologies to be implemented and drive innovation in several growth areas, in the future, such as promoting a more inclusive payment and financial system, by removing the need for intermediation and allowing direct participation in the market. As stablecoins encourage growth and innovation

in payment systems, allowing for faster and cheaper payments across digital wallets, they lower payment barriers and pressure existing payment systems to provide their users with better services. The authors expect this to happen because of DeFi's growth. However, its challenges must also be addressed, namely the complexity of users' experience, the lack of consumer protection, frequent hacking, protocol dysfunctions and market manipulations. Additionally, most DeFi protocols only support the trading and lending of cryptocurrencies and non-fungible tokens (NFTs). If these protocols mature beyond this state and become integrated with broader real-world financial markets, DeFi could allow investors participate directly (*i.e.*, without intermediation) in markets. Reciprocally, this growth will likely increase the usage of stablecoins. On the other hand, stablecoins may play a crucial role in the tokenisation of financial markets, which is expected to entail converting securities into digital tokens on DLTs and trading and serving them with stablecoins. Once again, this would allow for real-time settlements at very low costs for delivery-versus-payment transactions, which could increase liquidity, transaction speeds and transparency while reducing counterparty risk, trading costs and other barriers to market participation, as well as fractional ownership of tokenised assets and more transparent price discoveries, especially in certain asset classes, such as real estate. Payment-versus-payment transactions would also allow for near-instantaneous execution. Both types of transactions in tokenised financial markets would benefit from the programmability of DLTs, through the automation of security serving and regulatory requirements. Complete or even partial tokenisation of markets would also benefit the usage of stablecoins. Finally, stablecoins could foster next-generation innovations, such as Web 3, representing a move from centralised web platforms and data centres toward decentralised networks. According to the authors, this paradigm change would shift the revenue of internet services and social media platforms from advertisements to microtransactions, relying on efficient, integrated online payment systems. This, too, would favour the usage of stablecoins.

Carstens et al. (2022) discuss crypto's structural flaws, which prevent it from serving as a sound basis for the monetary system. The authors' first concern is the lack of a sound nominal anchor, as this system relies on volatile cryptocurrencies and stablecoins seeking to maintain a fixed value to a sovereign currency. The authors go on to claim that "if central money did not exist, it would be necessary to invent it" (Carstens et al., 2022, p. 11). Yet, considering the previously revised literature, and as shall be further argued in Chapter 5, this claim is false, as stablecoins' value may be pegged to any asset or basket of assets. The second

concern is that crypto induces fragmentation, particularly relevant when money is analysed as a social convention characterised by network effects, which the authors claim to be anchored in a trusted institution (*i.e.*, the central bank). This institution ensures the currency's stability and transactions' safety and finality (settlement and irreversibility). As crypto's decentralised nature relies on anonymous validators, who are moved by incentives in the form of fees and rents, to confirm transactions, the authors expect congestion to dominate this system, preventing scalability. Carstens et al. (2022) find crypto to be neither stable nor efficient, besides being a largely unregulated sector, whose participants are not accountable to society. Moreover, frequent fraud, theft and scams raise serious concerns regarding market integrity. Narain & Moretti (2022) discuss the challenges of regulating crypto, calling out for a global response that brings order into the markets, helping instil confidence in the consumer, providing the limits of what is permissible, and a safe space for useful innovation to occur. Therefore, this response must be coordinated – filling the gaps in cross-sector and cross-border regulation and ensuring a level playing field –, consistent – by aligning with mainstream regulatory approaches across activity and risk spectrum –, and comprehensive – by covering all actors and aspects of the crypto ecosystem.

5. The digital money revolution and Hayek's *Denationalisation of Money*

This chapter revises the literature that relates Hayek's (1990) work to cryptocurrencies. Hence, the gap between the literature revised in chapters 3 and 4 is bridged. The present chapter confirms the link between Hayek's (1990) proposal and public collateralised stablecoins. It also presents a few broader effects to the proposal within *Denationalisation of Money* in the modern world.

5.1. From *Denationalisation of Money* to cryptocurrencies

Sanz Bas (2020) refers to the advent of cryptocurrencies as one of the most surprising monetary phenomena of the last decade. Initially regarded as a modern curiosity, an eccentricity, or just another example of the irrational exuberance that fosters asset bubbles, these currencies are present and increasingly considered a beacon for the future of international monetary systems. Their appearance has, additionally, resprung interest in Hayek's (1990) *Denationalisation of Money*, first published in 1976 (Sanz Bas, 2020). As presented in Chapter 3, this work contains ideas regarding the organisation of a competitive money market and its consequences. Although they were rapidly dismissed as utopian by many contemporary economists, these ideas are now perceived as heralding the monetary phenomenon of cryptocurrencies, serving as a reference to analyse their nature and emergence.

Sanz Bas (2020) points to two weak points of *Denationalisation of Money*. First, it disregards the importance of network effects and money-related information costs. The author argues that Hayek's (1990) work presupposes a 'suitable' institutional framework allowing money users to easily switch among currencies, which would happen in the face of changes in their purchasing power, even those of minor scale. Yet, Sanz Bas (2020) affirms that the public has a greater tolerance to inflation than what is assumed in *Denationalisation of Money*. To back this claim, the author quotes the work of Friedman (1984, as cited in Sanz Bas, 2020), which poses that individuals would only seek alternative currencies when they suffered from serious inflation, as happened in Mexico in the 1980s. Although Mexican people benefited from the freedom to use foreign currencies, partial dollarisation only took place in the face of heavy inflation. Therefore, to a certain extent, money functions as a

natural monopoly in the area in which it is used, making way for issuers to benefit from seigniorage before currency substitution processes commence.

Second, Hayek (1990) assumes the inherent inferiority of state fiat currencies in preserving purchasing power (Sanz Bas, 2020). Consequently, the Austrian believed that the former would rapidly be abandoned in favour of privately issued currencies in the face of an adequate legislative framework. However, Sanz Bas (2020) disputes this reasoning, based on three reasons. On the one hand, state fiat currencies are used to pay taxes, which is a central determinant of stable currency demand. On the other hand, institutional rules implemented in developed societies provide central banks with incentives and good practices that ultimately maintain the stability of their currencies, as can be attested by analysing the low inflation rates in these nations since the 1990s. Lastly, according to Sanz Bas (2020), Hayek's (1990) *Denationalisation of Money* disregards global institutions in which countries take part and may "provide them with sufficient financing to defend their state currencies if needed" (Sanz Bas, 2020, p. 17).

Sanz Bas (2020) refers to *Denationalisation of Money* as "a clairvoyant guide for understanding the new world of monetary competition that we are headed towards and in which we already live" (p. 27) and adopts its perspective to analyse cryptocurrencies. However, this market is still embryonic (Sanz Bas, 2022). Four noteworthy connections between the Austrian's work and (broadly defined) cryptocurrencies can be highlighted (Sanz Bas, 2020). First, from a philosophical perspective, both Hayek (1990) and cryptocurrency arrangements imply openly questioning the government's exclusive right to issue money. Second, like Hayek's proposal, cryptocurrency schemes foster competition among currencies, as they do not benefit from a 'legal tender' status. Therefore, their market implementation is based on voluntary acceptance by economic agents. Third, the monetary rule of most cryptocurrencies – fixed and independent from arbitrary and political interests – implies the dismissal of traditional monetary policy. As pointed out in Chapter 3, the work of Hayek (1990) expects competition to lead currency issuers – both public and private – to protect the interests of their clients, which involves preserving the purchasing power of the currency they manage. To do so, currency issuers must forego risky discretionary monetary policies. Fourth, both Hayek and cryptocurrency arrangements ultimately replace the vital role played by the credibility of the monopolistic issuer, under fiat currency systems, with other elements.

5.2. *Denationalisation of Money* and Bitcoin-like assets

Starting with Bitcoin and altcoins, Sanz Bas (2020) openly disputes the generally held belief that these assets embody the proposal encompassed in *Denationalisation of Money*, also disputing Hayek's status as their theoretical father. In fact, based on their rigid monetary rule, these arrangements are more closely linked with Friedman's teachings, advocating a fixed and inalterable rate of money supply increase (Sanz Bas, 2020). The author regards them as assets finding increasing acceptance as a medium of exchange (even if their use as such is still marginal) and consequently in the process of becoming monetised (*i.e.*, their liquidity is increasing). Sanz Bas (2020) further claims that Bitcoin and altcoins seek to replace the credibility of the monopolistic issuer with an inalterable money-issuing rule and cryptographic proof of transfer. Even though their value is often claimed to be merely speculative, fictitious, or even null, as no real asset supports it, Hayek (1990) defends that "money is valued because (…) it is known to be scarce, and is for this reason likely to be accepted at the going value by others" (p. 112). Moreover, he adds that

> 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 (Hayek, 1990, p. 112).

Recalling Bitcoin and altcoins' property of absolute scarcity, one can affirm that, according to Hayek's reasoning, individuals can value and trade them (Ammous, 2018, as cited in Sanz Bas, 2020). However, for Sanz Bas (2020), this feature prevents their complete monetisation process, as it makes it impossible for Bitcoin and altcoins to ever achieve a dynamic equilibrium between their supply and demand, even under a sufficiently stable network of users. This fact is presented as part of the first of Hayek's eight predictions regarding the situation we currently live in, with state fiat currencies and private cryptocurrencies coexisting: Bitcoin and altcoins are unable to ever become money (Sanz Bas, 2022).

While Sanz Bas (2020, 2022) claims that, according to Hayek's (1990) proposal, Bitcoin and altcoins cannot replace state fiat currencies, this need not mean they cannot have a role to play in the crypto ecosystem. Sanz Bas (2020) draws clear parallels between the role the Austrian expected gold to play in the system proposed and potential future developments in Bitcoin and altcoin technologies:

> It may be that, with free competition between different kinds of money, gold coins might at first prove to be the most popular. But this very fact, the increasing demand for gold, would probably lead to such a rise (and perhaps also 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 so as 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, pp. 130-131).

According to Sanz Bas (2022), by replacing the word 'gold' in the above quote with 'Bitcoin', we are left with an accurate description of the behaviour of this cryptocurrency. This is also consistent with the contribution of Ametrano (2016), who points to the monetary policy of this sort of asset to affirm that Bitcoin has established itself as a digital gold rather than a currency. This statement is identified as Hayek's second prophecy: Bitcoin and (certain) altcoins can come to be used as digital gold (Sanz Bas, 2022). Therefore, "their failure to become widely accepted currencies may be empirical proof of Hayek's hypodissertation that purchasing power stability is essential for a private currency to be accepted by the public" (Sanz Bas, 2020, p. 21). In this sense, the author foresees two possible opportunities for Bitcoin and altcoins to be used as digital reserves with a certain degree of liquidity. On the one hand, these assets could be massively used by citizens of countries going through periods of social, economic, or political convulsion seeking to protect their wealth. The author refers to multiple examples, such as Venezuela, Turkey, and South Africa. Yet, he goes into greater detail when exploring the case of Argentina. In August 2019, after the surprising electoral victory of Alberto Fernández, in the primary elections, the domestic currency depreciated, going from 45 pesos per dollar, on August 11, to 60 pesos per dollar, on August 15. At the same time, the quote on Argentinian pesos also depreciated when compared to Bitcoin, going from 511.044 pesos per bitcoin (August 11) to 604.016 (August 14). On the other hand, Sanz

Bas (2020) believes Bitcoin and altcoins could become reserve assets of large central banks for two reasons: either to widen the range of tools available to intervene in the monetary market or to possess an international means of payment that is accepted on a global scale that can be used during periods of conflict or crisis, as happens with gold.

5.3. *Denationalisation of Money* and stablecoins

Sanz Bas (2020) offers preliminary evidence of a clear relationship between stablecoins and the competitive money creation framework introduced in *Denationalisation of Money*. According to the author, stablecoins replace confidence in the monopolistic issuer with the guarantees of a competitive process, fostering mutual oversight of the various issuers, whether public or private, whose goal is to maintain and increase their market share, as proposed by Hayek (1990). These currencies provide the most attractive features of Bitcoin and altcoins – anonymous speedy transfers with low commissions – while simultaneously overcoming their volatility defect. Sanz Bas' (2020) analysis proceeds by differentiating collateralised from non-collateralised stablecoins, concluding that, while the former are very similar to Hayek's (1990) concept of private currencies, the latter could hardly be designed in a way that provides their users with stable value over time (Sanz Bas, 2020).

In fact, Hayek's sixth prophecy states that non-collateralised stablecoins could not prosper in a context of a search for reference standards different from state fiat currencies. Non-collateralised stablecoins, as exposed in Chapter 4, are not governed by an issuing institution (Sanz Bas, 2020). Instead, they are governed by an algorithm that destroys (creates) monetary units when the currency value drops (rises) below (above) that of the reference asset. Therefore, these cryptocurrencies' central element is the automatic nature of the mechanism modifying its supply. Moreover, like Bitcoin and altcoins, collateralised stablecoins are an asset, rather than a liability of the issuers, which is regarded by Sanz Bas (2020) as their main advantage since it avoids problems derived from a lack of trust in governing companies. Furthermore, the author refers to their operational complexity as their main disadvantage. Considering the technological leap involved, Sanz Bas (2020) finds it hard to know what Hayek would have thought about the future of this sort of asset. While the governing algorithm makes it possible to keep the parity between the market price of a given stablecoin and its reference asset in the short term, this is unlikely to occur in the medium and long term, considering the reference assets' value instability. Besides, Sanz Bas (2020) recalls that, according to Hayek (1990), the management of a currency seeking to provide a

permanent, stable value over time could "never be a purely mechanical affair" (Hayek, 1990, p. 65). In fact,

> 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, p. 65).

Therefore, a certain degree of anticipation and business discretion is required (Sanz Bas, 2020). Hence, the author finds it impossible to design a non-collateralised stablecoin that can maintain a stable value over time, as it requires a business component that cannot (or that can hardly) be emulated in a computer algorithm.

On the other hand, the first prediction, evidenced by Sanz Bas (2022), refers not only to the incapacity of Bitcoin and altcoins to become money but also to the certainty that collateralised stablecoins could develop to do so. *Denationalisation of Money* provides useful insights that help understand collateralised stablecoins, particularly on four dimensions. The first of these dimensions relates, as previously stated, to trust. Collateralised stablecoins, considering their centralised structure, require the existence of an issuing institution that guarantees the stability of their market value relative to a specific reference asset, and, hence, the dynamic equilibrium between their demand and supply. Therefore, collateralised stablecoin users must trust the institution overseeing their currency of choice – which is pointed out by Sanz Bas (2020) as one of the primary defects of this scheme. However, the author recalls that trust issues – whether in a private issuing entity or in public issuing monopolies – could, in the scope of Hayek (1990) proposal, be overcome through competition. Sanz Bas (2020) evidences that this phenomenon is already observable in the collateralised stablecoin market, where Tether (USDT) – then the most popular stablecoin in terms of capitalisation value and daily transactions – is used to hedge risks related to cryptocurrencies markets. Moreover, when doubts arose about its issuer's (Tether Ltd.) ability to maintain the 1:1 parity with different fiat currencies, severe fluctuations in the market value of USDT were noticed. These vulnerabilities encouraged similar companies to enter the market to displace Tether. In some cases, issuing companies, seeking to gain the public's trust, have attempted to offer additional guarantees, such as periodic external audits and the issuance of currencies 100% backed by state fiat currencies (and redeemable in them). Sanz Bas (2020) concludes that this validates Hayek's (1990) prediction: "competition acts

as a system to uphold confidence in the issuing institutions" (Sanz Bas, 2020, p. 23). Indeed, Sanz Bas (2022), according to the teachings of the Austrian economist, expects collateralised stablecoins' purchasing power to become increasingly more stable as new issuing companies (threaten to) enter the market.

On the other hand, Sanz Bas (2020) refers to *Denationalisation of Money* as a work of reference to understand how collateralised stablecoins are issued. The author recalls how Hayek (1990) proposed issuing private currencies, concluding that the market must perceive them as trustworthy. To this end, the Austrian proposed establishing a floor below which the currency's value could not fall and announcing a legal obligation to redeem it. Additionally, it would be promised that the new currency would have constant purchasing power, relative to a specific basket of goods, which could be altered by the issuers, as experience and the preferences of the public indicated, signalling "an inevitable business component in the management of a currency" (Sanz Bas, 2020, p. 24). To this extent, Sanz Bas (2020) stresses, once again, that although the ultimate basis of Hayek's (1990) model is competition, issuing institutions would also have to care for the trustworthiness of their currencies as perceived by the market, concluding that the acceptance of a centrally issued cryptocurrency will benefit from better audit processes or legal guarantees. To illustrate his stance, the author refers to the case of Libra (later known as Diem). This collateralised stablecoin was meant to be issued by a conglomerate of companies, such as Facebook, Spotify and Uber, under the legal entity of Libra Association and backed by a basket of state currencies and short-term financial assets, namely triple-A bonds, whose launch was announced for the autumn of 2020. Additionally, to avoid being deemed US-centric, this project was technically based in Switzerland, then an emerging crypto hub (Murphy & Stacey, 2022). At the time of writing, considering that this stablecoin was issued and supported by some of the largest and most reputable companies, it was expected to be used massively, despite creating discomfort among international institutions. Moreover, Sanz Bas (2020) claims that this association has taken on Hayek's (1990) insights and has published detailed information regarding the characteristics of its cryptocurrency in an attempt to gain the public's confidence. It may, however, be appropriate to state that, despite the author's reasoning, the Libra (or Diem) stablecoin has since failed, with its remainings being sold in January 2022 to Silvergate Capital Corp (Murphy & Stacey, 2022). Murphy and Stacey (2022) refer that this project failed because Facebook was not merely one of the parties involved but its main promoter. At the time of the development and launch of this project, Facebook

suffered intense political backlash – especially following the Cambridge Analytica scandal – which eventually also drove their partners away.

Sanz Bas (2020) also employs *Denationalisation of Money* to explore how the issuers of this type of stablecoins manage their collateral. Hayek (1990) argued that to maintain the purchasing power of its currency constant the issuer would need to be promptly ready to adapt its supply to any change in demand, which would only be possible through the correct management of the collateral held. According to the Austrian, issuing banks

> would have to be prepared (…) to buy back substantial amounts of ducats at the prevailing higher rate of exchange. This means that it would have to be able to rapidly liquidate investments of very large amounts. 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 (Hayek, 1990, p. 50).

Sanz Bas (2020), thus, concludes that to guarantee their value, stablecoins must be backed by stable liquid assets, making it possible for the issuer to comply with their promise. The author further states that if the issue of stablecoins were used to acquire risky or low liquidity assets – such as long-term mortgages, junk bonds or stocks –, under certain circumstances, the issuing company would not be able to intervene in the market, following a fall in the market price of their currency, to maintain their purchasing power, without incurring significant losses. Sanz Bas (2022) claims that, from a Hayekian perspective, competition ought to lead stablecoin issuing companies to exhibit increasingly liquid balance sheets, allowing them to intervene more efficiently in secondary markets. Therefore, they do not necessarily need to guarantee the convertibility of stablecoins into other assets. Stablecoins' value depends on how well their issuer manages the inherent collateral, which is the main risk to which collateralised stablecoin users are exposed. Summing up, Sanz Bas (2020) evidences that Hayek (1990) expected the quality of the collateral to be guaranteed by the existence of (fierce) competition among issuing companies.

Finally, Hayek's (1990) work can be used to analyse how collateralised stablecoins could ensure a stable value, *i.e.*, a fixed exchange rate relative to a chosen reference asset, over time. Sanz Bas (2020) asserts that the stability of these currencies' purchasing power will, thus, depend on the evolution of the purchasing power of the reference standard. In the short run, the author expects stablecoins using real assets, such as gold or oil, as a reference

to be more volatile than the ones pegged to state fiat currencies. However, in the long term, this fact will depend on how the monetary policy in developed countries evolves. If the relatively moderate inflation of the last three decades is kept, Sanz Bas (2020) expects stablecoins using fiat currencies as a reference to maintain a certain stability. Nevertheless, the author refers to the accumulation of public debt, pensions and healthcare costs in ageing societies and economic crises such as the one triggered by the coronavirus pandemic, as examples of factors that may undermine this goal. Sanz Bas (2020) recalls that for Hayek (1990) state fiat currencies cannot maintain their purchasing power in the long run, stressing that this statement was made amid a period of stagflation. However, when evaluated through the inflation rate, modern central banks face institutional constraints that have successfully prevented them from mismanaging their currency. Sanz Bas (2020) concludes that assessing whether this tendency is kept is necessary since it will ultimately affect the purchasing power of stablecoins using fiat currencies as a standard.

Most recently, Sanz Bas (2022) has stated that until mid-2021 adopting state fiat currency seemed like a good business strategy, as it benefited from major network effects provided by these currencies. However, if the inflationary process that has unravelled in developed economies persists for too long, economic agents may develop an interest in currencies that provide them with stable purchasing power in the medium and long term. Then, the author expects stablecoin issuing companies to experiment with new value standards, as predicted by Hayek (1990). Besides, following the Austrian's proposal, Sanz Bas (2022) expects them to adopt a reference basket of commodities and other semi-finished goods. It is worth noting that, when compared to the Austrian's proposal, Sanz Bas (2022) excludes agricultural products from feasible reference standards. Such a stance may be credited to the work of Friedman (1951). Considering their need for standardisation, to be traded in broad markets, supplied under competitive conditions, and their physical and economic storage limits, commodities that can be used as a monetary standard are limited to agricultural field crops, metallic mineral products, and highly standardised manufactured products. Yet, the impossibility of controlling short-term growing conditions of agricultural output, which depends on unpredictable conditions, rules these products off the bundle.

5.4. *Denationalisation of Money* in the modern world

To conclude this chapter, we are yet to address the last two of Hayek's prophecies listed by Sanz Bas (2022). Firstly, the author expects the monetary and fiscal policy of the

states to become more orthodox. Sanz Bas (2022) refers that Hayek believed monetary stability to be an easy-to-attain goal if that were the authentic ambition of the government. Yet, the lack of competition in this realm leads them to forego this goal in favour of more visible ends, such as financing public deficits and direct economic intervention. Therefore, monetary stability cannot be attained due to an institutional design problem. Sanz Bas (2022) points to the development of CBDCs as evidence that current competition between state fiat currencies may be greater than one may believe. As none of the major countries wants its currency to lose its relevance as an international medium of exchange or store of value, those in charge of monetary policy worldwide are expected to adopt traditional measures to respond to the present-day context of crisis and inflation. Nowadays, major fiat currencies compete not only amongst each other but also with the possibility of a globally accepted stablecoin managed by a powerful group of enterprises. Then, Sanz Bas (2022) concludes that considering the increasing competitiveness in this field of business, the monetary and fiscal policy of the states shall become more rigid and stern, as Hayek (1990) predicted.

Lastly, the transition to a system of competitive money creation is, according to Sanz Bas (2022), inevitable. Recalling another of Hayek's works, where the author states "(…) that any hope for a voluntary abdication by governments of their present monopolies of the issues of circulating currency is utopian" (Hayek, 1999, p. 247), Sanz Bas (2022) concludes that the public monopoly over the issue of money will only be brought down through a process that governments cannot stop. The author finds collateralised stablecoins to remarkably resemble Hayek's (1990, 1999) concept of a competitive currency and claims competition between private and public currencies to be inevitable, and cryptocurrencies have merely accelerated this process. Furthermore, the author evidences a global need for stable and cheap mediums of exchange in the context of increasing globalisation to arise. Thus, Hayek would regard this as an opportunity for private currencies to fulfil such a role and overthrow state fiat currencies. Whether they can seize it or not is something that ultimately only time will tell.

6. Critical discussion

According to the literature reviewed, Hayek's (1990) *Denationalisation of Money* remains as relevant as it was when originally published. Perhaps, even more so as the world undergoes a revolution that threats to dethrone state-issued fiat arrangements as the international standard of monetary policy in favour of privately issued currencies. This phenomenon provides a concrete background to this work and a sense of practicality that it appeared to lack thus far. As stated by Sanz Bas (2020), *Denationalisation of Money* should be used as a reference to analyse the nature and emergence of cryptocurrencies. Yet, one must bear in mind certain political, social, and technological developments that have since taken place – and how they interplay with one another – impacting the validity of Hayek's (1990) proposal. On the one hand, the European Common Market has evolved into the European Union (EU), currently with 27 member states, and promotes the establishment of an internal market, namely through the free flow of goods, services, people, and capital – which is already a small step towards the Austrian's proposal. Iceland, Liechtenstein, Norway, and Switzerland, also participate in this market. All EU members take part in the Economic and Monetary Union, deepening the integration of these economies, through the coordination of economic, fiscal, and monetary policies, with 20 of them sharing a common currency, *i.e.*, the Euro. Additionally, in this scope, central banks were granted independence to pursue their mandates to achieve price stability in a way that is freer from political influence than the institutional frameworks that followed the collapse of the Bretton Woods system. On the other hand, on a socio-technological level, digitalisation in today's world extends to nearly every aspect of daily life. As technology develops, people become increasingly connected through the widespread usage of the internet, smartphones, and social media, which are particularly relevant as they join the press as sources of information for the masses. So, information flows much faster and the world becomes much more integrated. In fact, when we compare Hayek's (1990) expectations of how technology would develop to accommodate its proposal, one cannot help but to be amazed by how much his vision was surpassed and how the reverse happened: his vision came to life *because* of these unforeseeable technological developments. Nevertheless, these events are insufficient to eliminate the explanatory power *Denationalisation of Money* holds on cryptocurrencies. This is particularly true in the early stages of market penetration of these technologies, in which, as shall be argued, we are currently living.

Presently, cryptocurrencies are starting to find acceptance as media of exchange, deemed by Menger (1892), Alchian (1977) and Hayek (1990) as the chief function of money. They have done so in an organic manner, *i.e.*, out of individuals' self-interest, particularly because they enable permanent near-instantaneous transfers of value, in exchange for low commissions, thus being mainly suitable for cross-border payments. These features are particularly relevant for trade, which the revised literature seems to evidence as *the* driver for monetary innovation. Moreover, considering cryptocurrencies' technological background, one can expect them to keep evolving while adequately adapting to the needs of society. Yet, cryptocurrencies' acceptance is not wide, let alone general. In fact, even if we considered that every crypto owner intended to use them as money – which we know to be false, particularly because Bitcoin-like assets are widely held for speculative purposes –, its average global rate of adoption would be around 4,2% (Triple-A, 2023).

According to Moore (1991), there are two types of innovations: continuous and discontinuous. Continuous innovations refer to the normal upgrading of products, which does not require behavioural adaptation from their users. Alternatively, discontinuous innovations refer to those products that alter people's behaviours or other products and services they rely on, being particularly recurrent in high-tech industries. Based on the literature, this dissertation regards privately issued cryptocurrencies rejecting state fiat currencies as a unit of account – from here on referred to as 'cryptocurrencies' – as an example of the latter. Thus, it is relevant to analyse them through the lens of the technology adoption life cycle theory, which poses that technology is sequentially absorbed by society according to a set of five groups of unique psychographic profiles, representing different attitudes towards technology adoption (Moore, 1991).

Innovators aggressively pursue new technology, as it is one of their core interests, being interested in any major technological advance, often making technological purchases simply for the pleasure of exploring its new properties. This is a very narrow, but crucial, segment in any given market as innovators' endorsement reassures other players in the market that the product works. *Early adopters*, on the other hand, also buy into new product concepts very early in their life cycle. They find it easy to imagine, understand, and appreciate the benefits of new technologies, relating their potential benefits to their other concerns. Yet, unlike innovators, early adopters are not technologists. These agents are key to opening further high-tech market segments, as they base their buying decisions on their intuition and vision. *The early majority* resemble early adopters' ability to relate to technology but are driven

by a strong sense of practicality. They know many technological innovations to be passing fads, so they want well-established references to be installed in the market, before investing in the technology themselves. In contrast, *the late majority*, although resembling the former group, does not feel comfortable handling technological products. For this reason, before adopting a new technology they expect it to become an established standard, with lots of support available and then tend to acquire it from large well-established companies. Finally, *the laggards* do not value technology – for a multitude of reasons – and only acquire it when incorporated into other products they are accustomed to.

Cryptocurrencies are still in their early stages of adoption. It seems reasonable to state that these technologies have conquered innovators but are far from reaching the market segment of the early majority. On the one hand, they are no longer an exclusive interest of technologists, who desire them just for 'the thrill of it'. However, they are simultaneously yet to develop market references that are perceived as credible by the general public and, consequently, establish themselves as more than a fad. Moreover, we can further sustain this claim if we base our analysis on Hayek's (1990) contribution. The author predicted early – *i.e.*, when a regular market is yet to be established – money creation, under a private competitive arrangement, to occur through sale against state currencies and for gold (or alike) currencies to dominate the market.

In the context of the early stages of technological adoption, Moore's (1991) contribution is particularly relevant, as the author evidences a small leap – a crack – between the innovators and the early adopters, but also a huge gap – a chasm – between the early adopters and the early majority. The former occurs when a new technological product cannot be readily translated into a major benefit, *i.e.*, "the enthusiasts love it for its architecture, but nobody else can figure out how to start using it" (Moore, 1991, p. 13). Early adopters pursue a radical discontinuity between the old and the new ways in favour of a competitive edge, being prepared to face established resistance and deal with the inevitable bugs and glitches of innovations that have just come to the market. The key to conquering this segment is to evidence a strategic leap forward made possible by the new technology, with an intrinsic value and appeal to the non-technologists. In contrast, the early majority seeks evolution rather than revolution, *i.e.*, "they want technology to enhance, not overthrow, the established ways of doing business" (Moore, 1991, p. 15). They seek to minimise the discontinuity with the old ways in their search for productivity improvements and are not willing to be subject to the bugs and glitches of new technologies, *i.e.*, "they want it to work properly and to

integrate appropriately with their existing technology base" (Moore, 1991, p. 15). Thus, herein it is advocated that cryptocurrencies are presently navigating their way through the early adopters' market segment. At this stage, a conundrum arises. On the one hand, early adopters do not serve as a good reference for the early majority. On the other hand, considering the early majority's concern not to disrupt their organisations, their buying decisions are heavily influenced by existing reliable references. Therefore, when promoters of high-tech products try to transition between visionary early adopters and mainstream consumers, they are operating without a reference base and support in a market that critically depends on these factors.

Herein, cryptocurrencies adopting state fiat currencies as a unit of account, whether issued by private institutions or directly issued by public institutions, are considered a form of continuous innovation. Moreover, let us consider them as the main competition to privately issued cryptocurrencies rejecting state fiat currencies as a unit of account in a race to become money in this new digital era. In this context, one may feel hopeless when trying to imagine how the latter could come out on top and embody Hayek's (1990) monetary legacy. Yet, the revised literature provides some interesting avenues on how to answer this concern. To do so, this dissertation suggests taking a step back and focusing on the main candidate to do so: public reserve-backed stablecoins – here on simply referred to as 'collateralised stablecoins'. As presented in Chapter 5, these assets may function as a unit of account and as a store of value, but to achieve this end they must increase their usage as a medium of exchange. On the one hand, one could – naively – expect this to occur naturally as time goes by, either because societies become increasingly digitalised or because like original money people observe the success of early adopters in attaining their economic goals. Yet, this stance is unlikely to occur, since collateralised stablecoins will always trail behind state currencies, even in their digital form.

Alternatively, as here proposed, one should start by recognising that this transition will require the state to be involved, providing an institutional, legal, and regulatory framework, as well as ensuring that this transition occurs smoothly. As Hayek (1955) puts it, may the state be an agent of 'cultivation' rather than 'control': let it embrace the change rather than antagonise it. Drawing inspiration from the literature revised, the state could, similarly to what presently happens with commercial banks, limit issuing operational licenses to firms subject to periodic financial audits, particularly on the liquidity and quality of their reserves. Additionally, the state could extend bank guarantees to licenced operators. Of course,

eventually, in a digitalised world, predatory offers – *i.e.*, currencies issued by firms without a permit to operate in the reference territory – would be made known to the public. Although unfortunate, this would pose no major change to the current state of affairs. It is not uncommon to read about digital firms operating in jurisdictions different from the one where they possess their servers, making a profit off their clients, often in ways that are detrimental not only to both competition and to the clients themselves. This situation is particularly common among gambling, streaming, and banking websites. The fact that the public is increasingly aware of these scams can be partially interpreted as a form of the public learning "to reject tempting offers of cheap money" (Hayek, 1990, p. 89). Of course, this applies primarily to poorly run businesses, of which the crypto world is full of examples. Additionally, in the context of a digitalised world that is permanently connected, Hayek's (1990) hint about postponing an articulated international response cannot be pursued for it would quickly lead to the demise of this new system, through arbitrage.

Although Hayek (1990) perceives the government as a selfish institution, it must be stated that throughout history, governments have taken steps towards the greater good. We can think about the generalised independence of central banks and the adhesion to the Euro area as examples of this fact – although one may discuss how independent central banks are, as they ultimately rely on governmental fiscal expenditure to ensure their subsistence (Bolt et al., 2023). Particularly, and once again recalling the revised literature, one could state that the former was an inevitable change that needed to occur: the same way Sanz Bas (2022) refers to overthrowing public monopoly over money creation as inevitable. To commence this transition, governments – and their institutions – must recognise Hayek's (1990) criticism regarding their incapacity to conduct monetary policy. People must be reminded of the adverse conditions that lie ahead: high levels of accumulated public debt, pension and healthcare costs in an ageing society, as well as economic shocks triggered by phenomena such as the coronavirus pandemic or the invasion of Ukraine. Moreover, this transition must be handled responsibly to avoid the collapse of existing currencies, a matter of the greatest concern to Hayek (1990). This ought to be a phased process, not an abrupt one. During this transition period, as public fiat currencies languish, collateralised stablecoins issuers shall seek new reference standards of value for their currencies. According to the proposal within *Denationalisation of Money*, a basket of goods should be expected to be adopted.

7. Concluding remarks

This dissertation has revisited *Denationalisation of Money* to determine whether this work is still relevant nearly half a century after its original publication. We have found that, considering certain events that have since taken place – namely on the political, social, and technological scope, with the two most relevant events being the generalised independence of central banks and the digital revolution –, this work maintains its relevance and irreverence. Particularly, this work is most relevant as a guide to analyse cryptocurrencies as a discontinuous monetary innovation, even more so, in their early stages of adoption. Based on the revised literature, public collateralised stablecoins have been championed as the heir to the Swiss Ducat in this potential new monetary framework.

Yet, one should not expect the proposal within *Denationalisation of Money* to instil itself without political guidance. As the dangers of monopolistic public control over monetary policy – although severely mitigated – remain present, and central bank independence from governmental power is not perfect, some authors regard this transition as inevitable. In fact, other factors may contribute to the inevitability of this transition, such as the recent economic shocks caused by the Covid-19 outbreak and the invasion of Ukraine, leading to the present inflation crisis. Moreover, as their mandates spread, accountability and transparency become more difficult to ensure, which may incentive central banks to misbehave. Yet, Hayek's (1990) argument relied on the central banks' capacity to prevent national currencies from collapsing. Instead of an abrupt libertarian or even anarchist stance, this dissertation advocates a moderate and smooth transition in which governments gradually make way for this new reality, providing an adequate legal, institutional, and regulatory framework, that ultimately would serve the public interest. Careful discussions on a multitude of topics ultimately aiming to ensure a steady course towards the full embodiment of Hayek's proposal are still necessary, namely which functions the state or its institutions ought to preserve in an increasingly complex monetary landscape.

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