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CRYPTO-CURRENCIES AND THE FUTURE OF MONEY

EXECUTIVE REPORT

2019

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Executive Summary

The shortcomings of existing financial systems became widely criticised in the aftermath of the 2007–08 financial crisis leading to an unprecedented wave of interest in new ways of efficiently executing economic transactions while ensuring high levels of transparency and accountability. With over 2,000 in existence at the time of writing this report, cryptocurrencies have received a great deal of attention as a potential tool for radically altering financial landscapes for the betterment of society. The purpose of this report is to provide a comprehensive overview of how crypto-currencies could be used to achieve this purpose. This includes how cryptocurrencies currently function relative to the intentions of their pioneers, and how the general public, use, understand, and trust them.

Some of the main findings include:

— Modern discussions and debates about crypto-currencies tend to confuse 'money' with 'systems of payments' or, the mechanism by which transactions are processed and settled.

— Cryptocurrencies have the potential to vastly improve systems of payments if designed and implemented correctly.

— In practice, existing cryptocurrencies have failed to achive the objectives envisioned by their pioneers and would generally not be considered as money.

— New innovations (stablecoins, proof of stake, CBDCs) are helping to make digital currencies more realistic candidates to replace traditional money and create benefis for users across large volumes of transactions.

In addition to these technical challenges, the value added in this report comes from a unique empirical examination of how citizens undertand cryptocurrencies and trust in different institutions to issue and manage money across a unique sample of eight countries including Argentina, Brazil, France, Germany, Mexico, Spain, the UK and the US.

Some of the main findings include:

— Knowledge, use, and understanding, of crypto-currencies remains highly limited in all countries.

— The vast majority of citizens in all countries agree that money should continue to be issued by central banks.

— While all central banks enjoy a significant trust premium when it comes to the creation and management of money, large differences exists between Latin American countries (Argentina, Brazil, Mexico) and European countries (France, Germany, Spain, UK) and the US.

— Countries where central banks experience lower trust premiums are more open to adopting new digital currencies issued by alternative institutions

— Trust in Facebook to issue and manage a currency remains very limited, especially in Europe and the US.

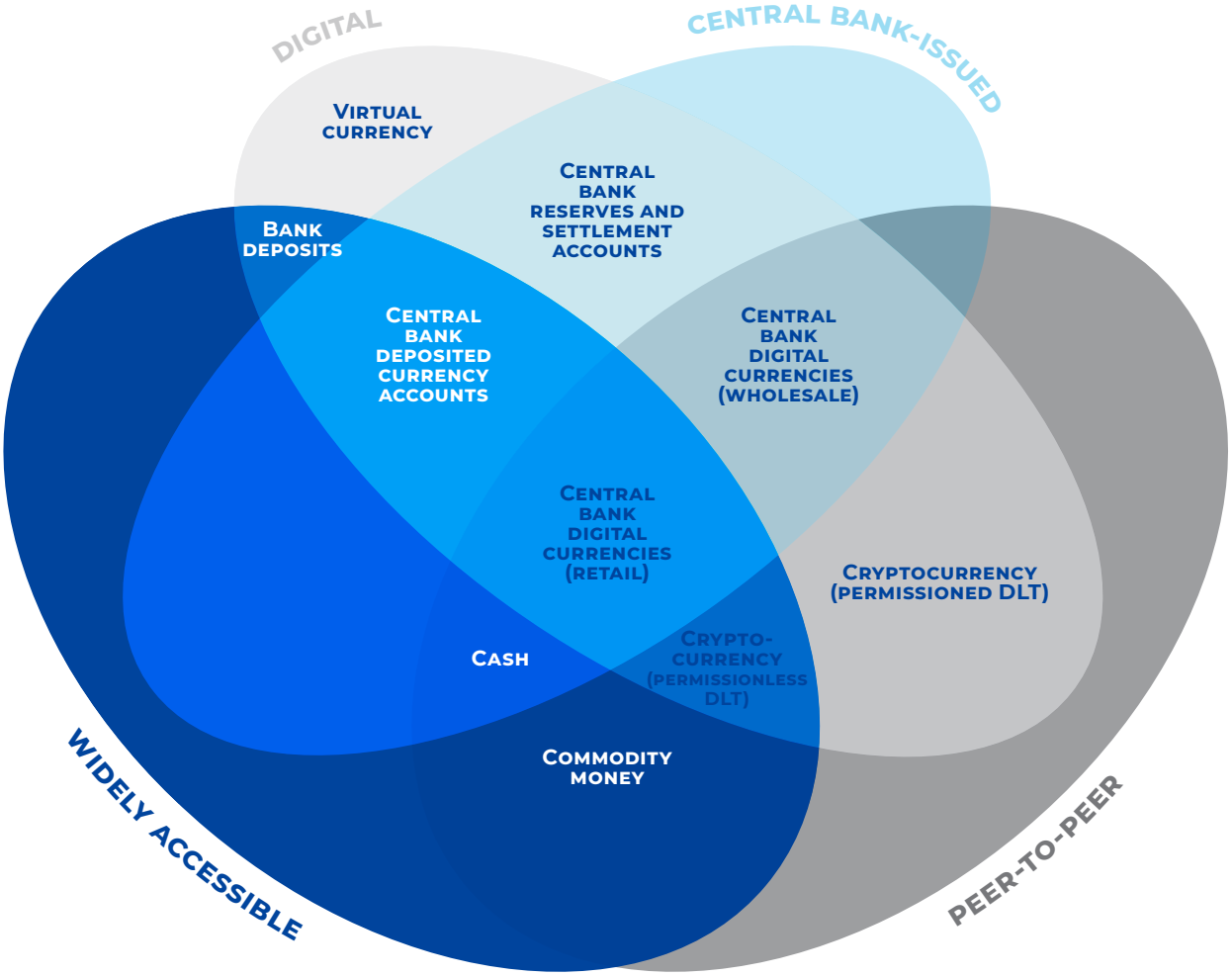
— The degree of acceptability and price stability play a key role in determining preferences for holding of money, regardless of who is issuing it.

Introduction/ Preface

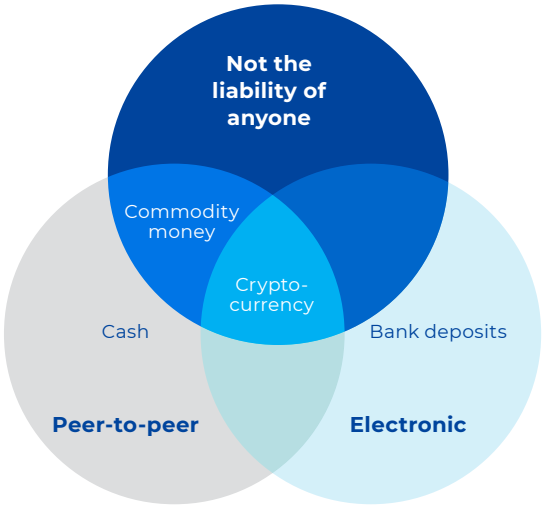
Since their inception in 2008 and subsequent enthusiasm, media attention, delusion, reflection, and continuous innovation, 'cryptocurrencies' have become one of the most interesting and perhaps misunderstood phenomenon of the early 21st century. Their popularity and potential for 'disrupting' and improving traditional financial systems have led to an ever-expanding list of media commentaries, research papers, and policy reports.

It is probably no coincidence that Nakamoto (2008) proposed a new type of money which would effectively remove the need for third party participants in transactions amidst widespread displeasure aimed at existing financial institutions that became apparent in the aftermath of the 2007-08 financial crisis. With over 2,000 cryptocurrencies in existence at the time of writing this report, cryptocurrencies have since become progressively embraced by speculative investors with growing market caps, but have yet to be adopted by the wider public as a viable form of money due to a combination of practical technical challenges, a lack of trust in issuing authorities, and a limited understanding of how to use them (how they work).

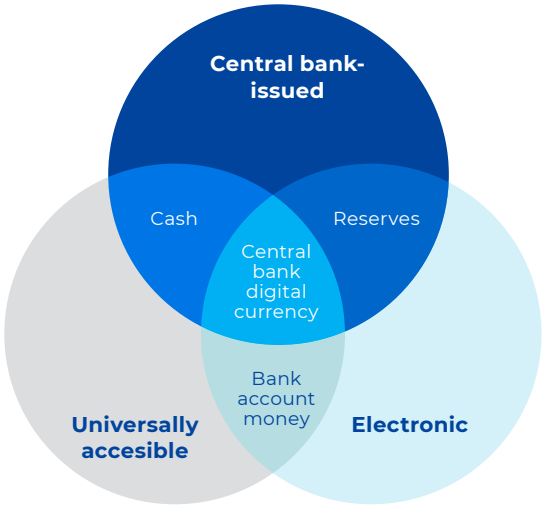
In a broader context of technological innovations of the 21st century, the idea of money has become a phenomenon with a wider range of feasible possibilities, some of which were proposed as far back as the early 20th century. To give some idea of the new range of types of money, the Bank for International Settlements (BIS) published a series of taxanomies including the 'money flower' (page 5) and more general taxonomes which distinguishes between central bank issued cur-rencies (which are a liability on the central bank balance



CRYPTOCURRENCY, CPMI (2015)



CENTRAL BANK DIGITAL CURRENCY, BJERG (2017)



Source: Bank for International Settlements (BIS)

sheet) and private sector iussued digital currencies (which are not anyones liability). Within this wider context, there exist a variety of types of money, each of which has different underlying characteristics, or attributes.

Some of the more fundamental questions that arise when considering 'monetary ecosystems' revolve around who creates the money and what is their relationship with the entity who creates and obtains value from it. This is especially important in a fiat currency environment where the value of money (digital or physical) depends on the degree of trust users have in those who isued or back the currency. The purpose of this report is to provide a more comprehensive overview of how the general public use, understand, and trust cryptocurrencies across a unique sample of eight countries.

The value added of the report can be found in Part V which will review the results from a new IE Center for the Governance of Change Survey on 'Cryptocurrencies and The Future of Money'. From a diverse sample of countries (Argentina, Brazil, Mexico, France, Germany, Spain, UK, USA), the results show that residents place a statistically significant trust premium on central bank backed money, and money with high degrees of acceptability. They also tend to place high discounts on large degrees of price variation. However, the size of these effects varies substantially across countries with those in Latin America (Argentina, Brazil, Mexico) being much more open to alternative forms of money than their European and American counterparts (US, UK, Spain, France, Germany).

I. Currency Competition, The Chicago Plan, and Trust

CURRENCY COMPETITION

Episodes of extreme inflation caused by irresponsible policymakers are dotted throughout history, often causing long lasting economic hardships on a country's population due to the irresponsible printing of new money (often to finance new government debt). A recent well documented case in Venezuela is shown below. With the possibility that policymakers can take advantage of their monopoly powers when it come to the creation and management of money, some have questioned whether the granting of such a monopoly is good for society.

TABLE 1. **Inflation in Venezuela**

INFLATION IN VENEZUELA (2010 – 2024)

Year	% change (inflation)	CPI (2010=100)
2010	27.36	100.00
2011	28.987	128.99
2012	19.527	154.17
2013	52.662	235.37
2014	64.687	387.62
2015	159.693	1006.61
2016	302.637	4053.00
2017	968.95	43324.58
2018*	1,555,146*	673803764
2019*	10,000,000*	67381050226261
2020*	10,000,000*	6738172403899950000
2021*	10,000,000*	673823978584751000000000
2022*	10,000,000*	67383071684689000000000000000
2023*	10,000,000*	6738374551764070000000000000000000000
2024*	10,000,000*	673844193550962000000000000000000000000000

Source: IMF World Economic Outlook, April 2019.

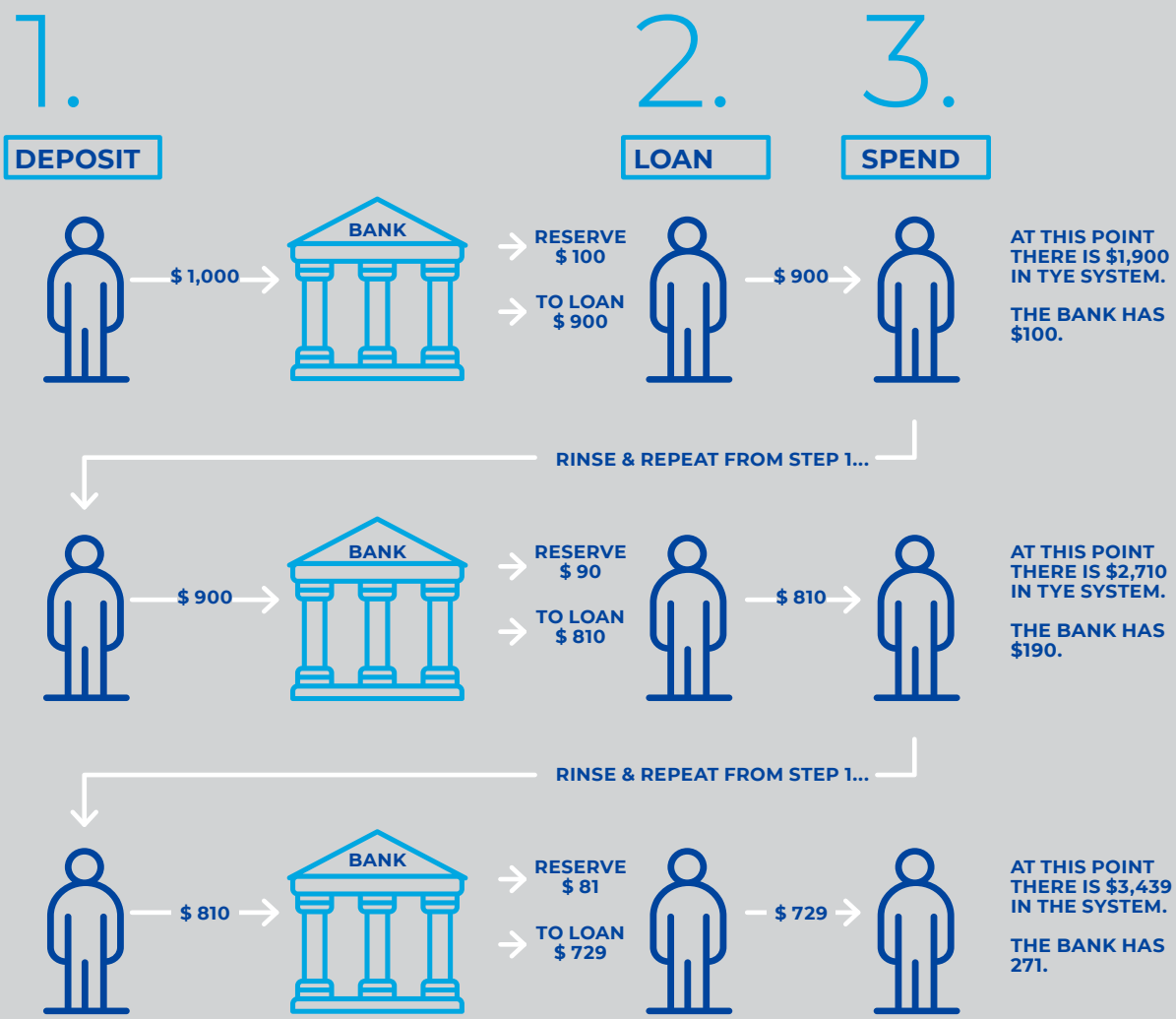
In his 1976 paper (*Choice in Money*) and 1978 book (*The Denationalization of Money: An Analysis of the Theory and Practice of Concurrent Curriencies*), Hayek asked 'Why should we not let people choose freely what money they want to use?' - currencies issued by governments pursuing responsible monetary policy would tend to displace gradually those of a less reliable character. From this perspective, competition would "impose the most effective discipline on governments" for the appropriate management of the quantity of currency in circulation" protecting money from political manipulation (Hayek, 1978a; Hayek, 1978b). To avoid the inflationary bias inherent in any international monetary policy coordination, he suggested that national currencies should be related by a system of flexible, market-determined exchange rate, and individuals should be allowed to substitute between various currencies to meet their needs without government prohibition or intervention. These questions have become prominent in the midst of a wave of privately issued cryptocurrencies which have similar designs to those envisioned by Hayek – privately designed to meet specific purposes and compete with government/commercial bank issued money. The idea that commercial banks have considerable power when it comes to the creation of money has been another highly criticised component of existing financial systems (fractional reserve banking) in the aftermath of the 2007/08 financial crisis.

FRACTIONAL RESERVE BANKING AND THE CHICAGO PLAN

The fractional reserve system is a banking system in which all depository institutions (commercial banks, credit unions, other banks) are required to maintain reserves against transaction deposits, which include demand deposits, negotiable order of withdrawal accounts, and other highly liquid funds. Reserves, or collateral, against these deposits can take the form either of currency on hand (vault cash) or balances at the Central Bank.

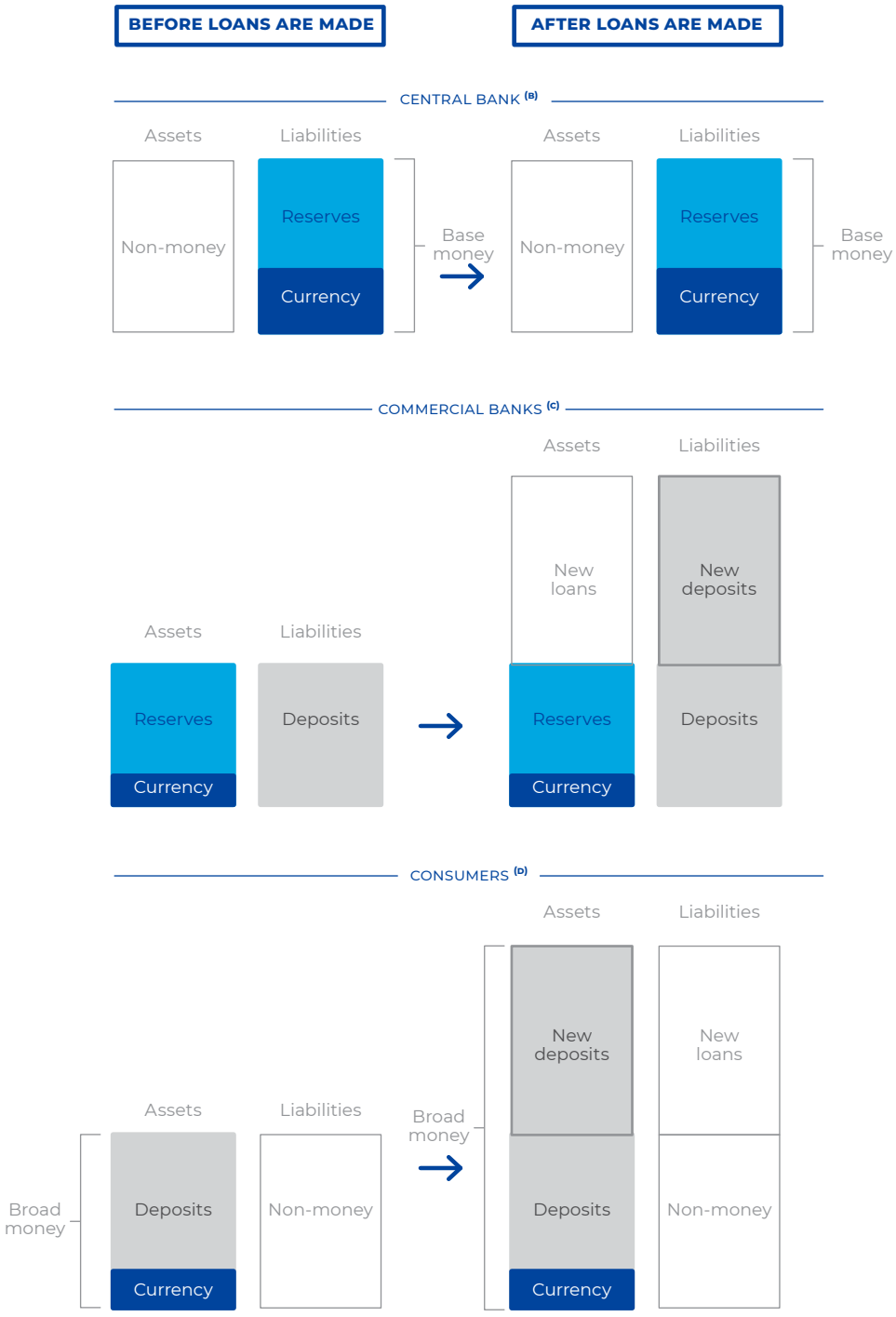
Fractional reserve banking can be simply explained with the scenario to the right where 1,000 of central bank issued 'base money' is deposited at a commercial bank. Where the bank is required to hold a percentage (10 in this case) of their loan liabilities in reserves, they can loan out 900 backed by a 100 deposit (first row). If we suppose that the household taking the loan purchases a house from another household, the house seller will likely deposit those funds back in the bank. In this case, the bank can again lend out 90% those new deposits (second row).

FIGURE 1 **The Basic Fractional Reserve Banking Cycle**



Source: Coactus, V. (2017). "Why Fractional-Reserve Banking Would Be Limited in an Unhampered Market", Medium. https://medium.com/@ViCoactusMedia/why-fractional-reserve-banking-would-be-limited-in-an-unhampered-market-2e6e2adc7869

FIGURE 2. **Money Creation in the UK (base and broad)**



Source: Mcleay et al., 2014.

A) Balance sheets are highly stylized for ease of exposition: the quantities of each type of money shown do not correspond to the quantities actually held on each sector's balance sheet.

(B) Central bank balance sheet only shows base money liabilities and the corresponding assets. In practice the central bank holds other non-money liabilities. Its non-monetary assets are mostly made up of government debt. Although that government debt is actually held by the Bank of England Asset Purchase Facility, so does not appear directly on the balance sheet.

(C) Commercial banks' balance sheets only show money assets and liabilities before any loans are made.

(D) Consumers represent the private sector of households and companies. Balance sheet only shows broad money assets and corresponding liabilities — real assets such as the house being transacted are not shown. Consumers' non-money liabilities include existing secured and unsecured loans.

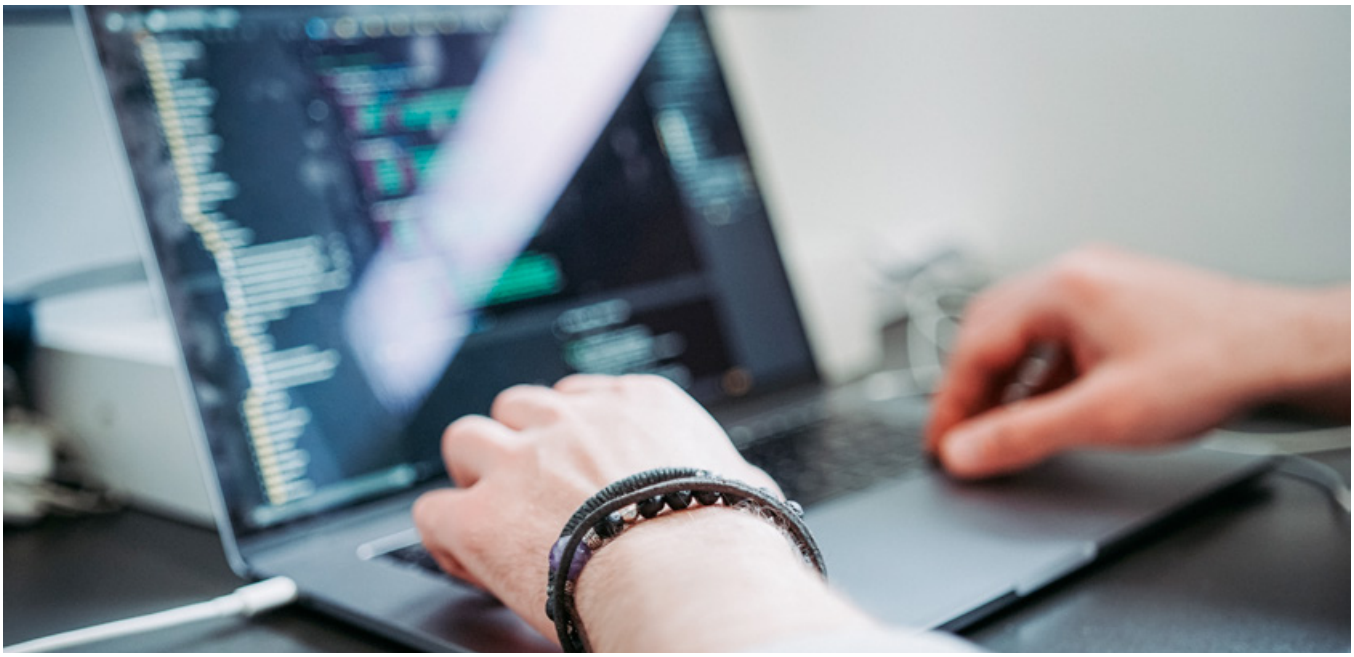
As this cycle continues, the amount of 'broad money' in the economy grows significantly (second and third row). In the last row, there is now 3,439 total money in the economy from the initial 1,000 in central bank issued money. In Figure 2, we can see how fractional banking works from a balance sheet perspective (central bank, commercial banks, consumers) before and after uncollateralized loans are made (base money compared with broad money).

As a practical example, in the UK about 97% of the broad money supply is made up of uncollateralized loans, with only about 3% supported by central bank money. This system comes with both advantages (more liquidity for small businesses and households) and disadvantages (moral hazard problem and boom-bust cycles). Central banks still maintain control over the supply of money but this is through a combination of influencing interest rates and setting capital reserve requirements and adequacy ratios.

Under the Chicago Plan (initially proposed by Irvin Fisher in the 1930's), all demand deposits held by commercial banks must be matched by an underlying asset such as cash. This means that these banks cannot lend out customers' demand deposits as they do under the fractional reserve system, which would significantly decrease liquidity in 100% backed reserve countries (for example 97% of money in the UK would need to be replaced with central banks base money).

Where banks can only lend against proven reserves, the risk of bank runs would vanish and banks could also benefit from such arrangement, as more savings and time deposits would be brought to banks due to freedom of the economy from great booms and depressions. With a 100% cash reserve requirement, all deposits are fully accessible to the depositors at any point in time, so that banks act merely as their trustees or custodians. The absence of leverage in the Chicago Plan prevents the freezing of loans during depression, and effectively eliminate the management and domination of industry by banks during bad times. In the words of Martin Wolf, chief economics commentator at the Finance Times, this would end 'too big to fail' in banking (Wolf, 2014).

We can get a better idea of the role that trust has come to play in an era of fiat money with fractional reserve banking by examining four simple scenarios from a balance sheet perspective (see next page). The first scenario involves a transaction between the central bank and household under the gold standard (or any other asset backed money such as stablecoins). Because paper money is backed by physical gold (or another valuable asset), this scenario does not require households implicit trust in the central bank as each unit they borrow is backed by a unit of physical gold of the same value.



1. CENTRAL BANK PRINTS 100 BACKED BY 100 OF GOLD RESERVES AND PROVIDES LOAN TO HOUSEHOLD 1

'COLLATERALIZED' MONEY

CENTRAL BANK FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+200**
GOLD	+100
LOAN	+100
LIABILITIES	**+100**
MONEY	+100

HOUSEHOLD 1 FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+100**
MONEY	+100
LIABILITIES	**+100**
LOAN	+100

The second scenario involves a similar transaction between the central bank and a household under fiat money. Because paper money is not backed by physical gold, there is now a difference between the cost of producing the paper money and the value to its users. This creates a premium (seignorage) which requires a relationship of trust and confidence in the issuing authority.

2. CENTRAL BANK PRINTS 100 FIAT CURRENCY AND PROVIDES A LOAN TO HOUSEHOLD 1

'UNCOLLATERALIZED' MONEY

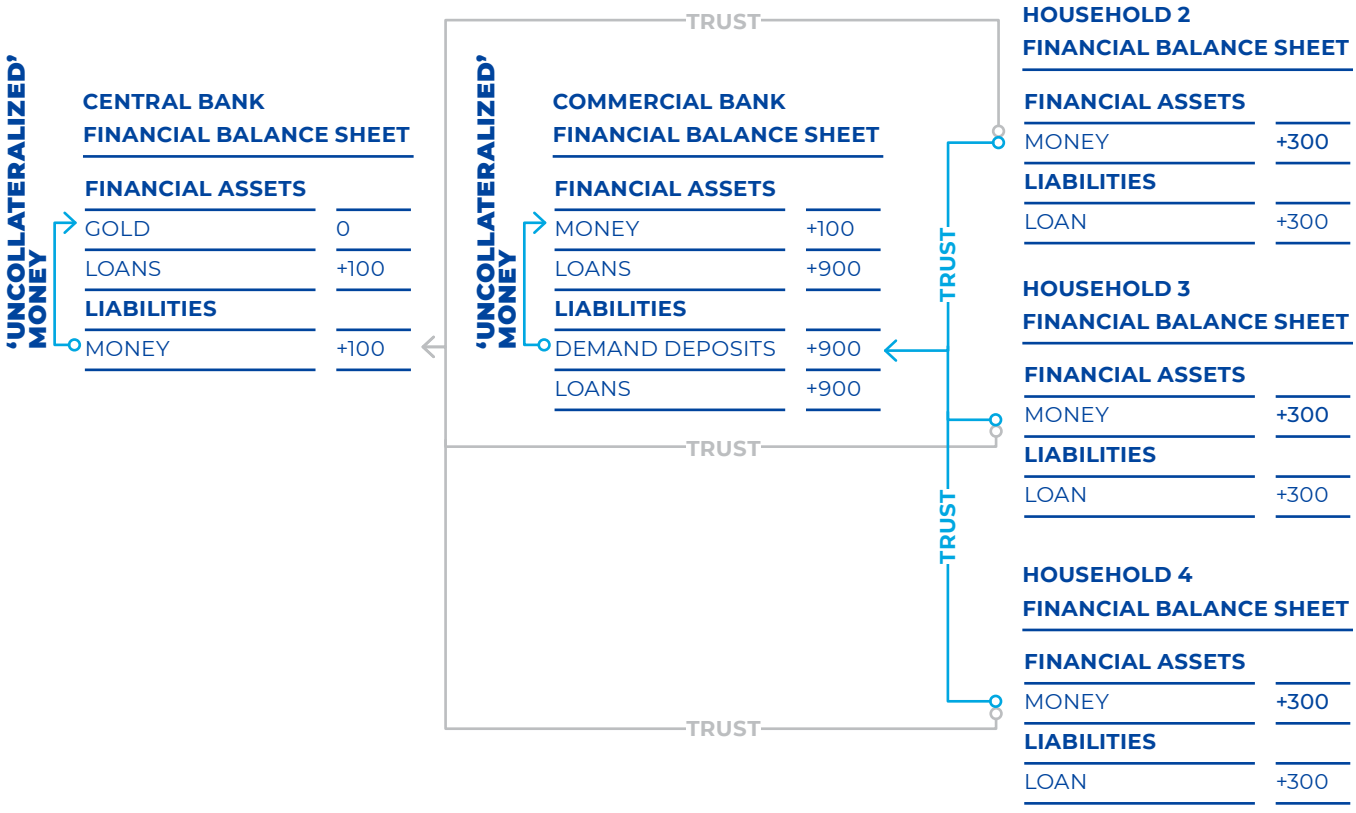
CENTRAL BANK FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+100**
GOLD	0
LOAN	+100
LIABILITIES	**+100**
MONEY	+100

TRUST

HOUSEHOLD 1 FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+100**
MONEY	+100
LIABILITIES	**+100**
LOAN	+100

In the third more realistic scenario, the central bank lends 100 in fiat currency to a commercial bank who, under fractional reserve banking, can lend out more money than they hold on deposits (say 90%). In this case there now exists several relationships of trust between commercial banks, depositors, borrowers, and the central bank.

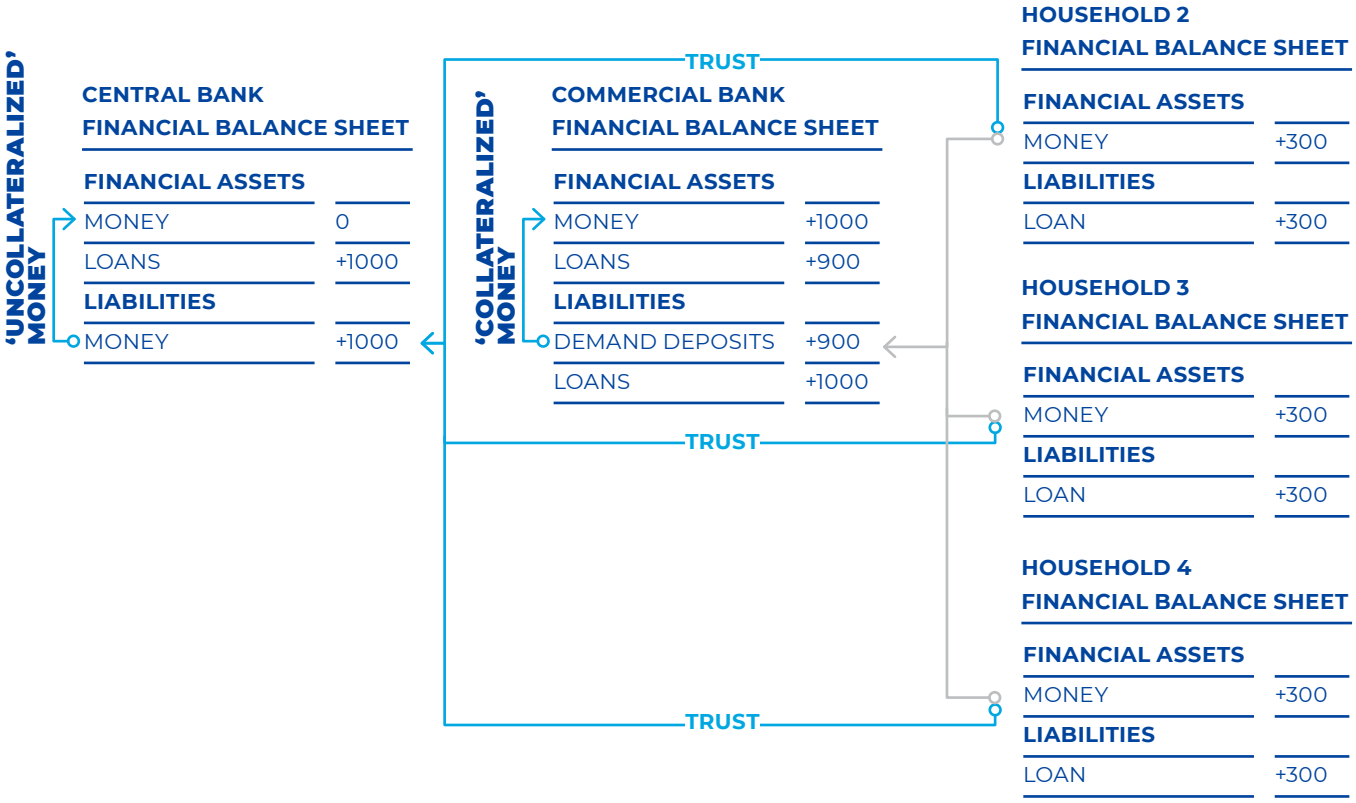
3. COMMERCIAL BANK BORROWS 100 FROM CB AND LENDS 900 TO HOUSEHOLDS 2, 3, AND 4



At this point, there exists 100 in central bank (narrow/outer) money which requires a relationship of trust between the central bank and households, and 900 in commercial bank (inner) money which requires a relationship of trust between households and commercial banks. As noted above, the only time where the vulnerabilities are exposed in the fiat currency fractional reserve system is when trust in these institutions erodes.

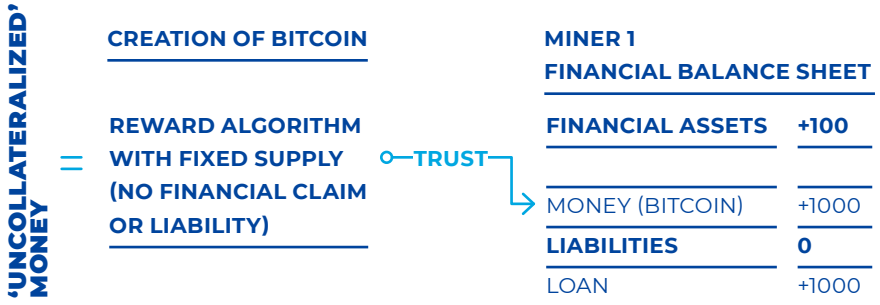
Lastly, we can impose the Chicago Plan restrictions on scenario 3 which now requires commercial banks to hold an equivalent value of assets to their liabilities (demand deposits). In this case, commercial banks would need to borrow at least 900 from the central banks in order to fulfil the 100% reserve requirement.

4. COMMERCIAL BANK BORROWS 1000 FROM CB AND LENDS 900 TO HOUSEHOLDS 2, 3, AND 4 UNDER CHICAGO PLAN



Comparing this with a peer-to-peer issued cryptocurrency, like Bitcoin, no liability is created when a bitcoin is mined. For example, the supply of bitcoin is increased by rewarding those who successfully validate transactions making it a transaction and not a financial contract (as was the case with bank money). The issuer is not an institution or entity and the currency is not backed by any authority. This creates a challenge when accounting for bitcoin. One option is to treat it like monetary gold which is the only existing financial asset with no liability. But as noted in Ali, et al. (2014), gold is a tangible asset which you can physically store.

5. BITCOIN MINER 1 RECEIVES 100 FOR SOLVING A BLOCK



A second option, used by stablecoins (i.e. Libra), is to fully collateralize all digital money with other liquid assets such as high quality government and corporate bonds in which case the scenario is similar to that under the gold standard from scenario 1 where there is no need for a relationship of trust to be created given the backing of that digital currency by other high quality financial assets.

6. STABLECOIN CRYPTOCURRENCY ISSUER CREATES 100 BACKED BY 100 OF UNDERLYING ASSETS AND SELLS TO HOUSEHOLD 1

'COLLATERALIZED' MONEY

DIGITAL CURRENCY ISSUER FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+200**
UNDERLYING ASSETS	+100
LOAN	+100
LIABILITIES	**+100**
MONEY	+100

HOUSEHOLD 1 FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+100**
MONEY	+100
LIABILITIES	**+100**
LOAN	+100

Once cryptocurrencies have been acquired, users do not need rely on trust between themselves or any institution to ensure its value because of the collective security embedded in the blockchain technology. This means that miner 1 can make transactions with miner 2 without any requirement that they trust each other. Again, this is similar to trading with physical gold (or under the gold standard) but does not require a physical validation of the legitimacy of the gold.

7. CRYPTOCURRENCY OWNER 1 MAKES TRANSACTION OF 100 WITH OTHER NETWORK MEMBER 2

'COLLATERALIZED' MONEY

DIGITAL CURRENCY ISSUER FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+200**
UNDERLYING ASSETS	+100
LOAN	+100
LIABILITIES	**+100**
MONEY	+100

HOUSEHOLD 1 FINANCIAL BALANCE SHEET	
FINANCIAL ASSETS	**+100**
MONEY	+100
LIABILITIES	**+100**
LOAN	+100

Note that cryptocurrencies in this example are limited to transactions and not financial contracts. This means that no financial relationships are created, and no liabilities will exist, on anyone's balance sheet. In the case of Bitcoin, these tokens are created by a mining reward algorithm and backed by the collective pool of people who own it. If that collective pool loses trust in bitcoin, its value diminishes. In the case of stablecoins, the collective pool is assured of the value of their currency by the holding of high-quality assets of equivalent value.

In summary the leveraged way in which money is currently being created has the potential to (again) destabilize financial systems only when trust in those institutions erodes. These destabilizations often lead to short revivals of Austrian school ideas regarding the role of money and banking in society (for example, Fishers seminal paper following the Great Depression). It is likely no coincidence that the Nakamoto (2008) paper emerged at the same time as the most recent financial crisis was occurring. In fact, one of the core motivations of Bitcoin's creators was the eradication of middlemen and/or money creators who profit from these activities.

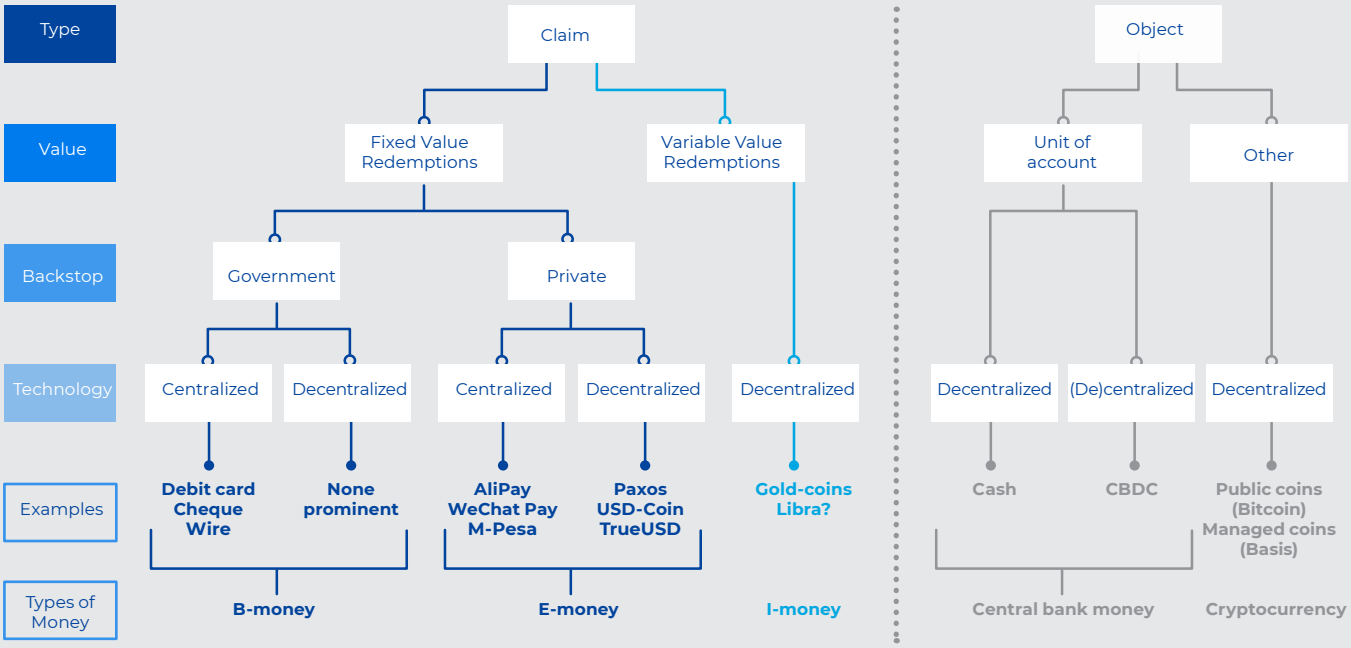
II. Money in the 21st Century

A 2019 IMF report argued that the two most common forms of money today (central bank and commercial bank issued) will face tough competition in the future and could even be overtaken by new alternative options (Adrian and Mancini-Griffoli, 2019).

Building on this and the work of other academics/institutions, Adrian and Mancini-Griffoli, 2019 provide a further dissection of money according to its 'type' (is it a claim on another entity or an object), 'value' (fixed, variable or a unit of account), 'backstopper' (government, private sector), and, degree of centralization ('technology'). From Figure 3, we can see that several types of digital money have already been widely adopted (AliPay, WeChat Pay, M-Pesa), while others probably do not qualify as money based on our definition of broad money above.

FIGURE 3.

Types of Money in the Digital Era



Source: Adrian and Mancini-Griffoli, 2019

Thinking about this in the context of cryptocurrencies, these bring a combination of new and old ideas about money. Firstly, ownership rights are managed in a decentralized network as advocated by Hayek using a distributed ledger (no backstop). Because of this, there is no central authority responsible for managing currency ownership rights, ensuring price stability, and regulating illicit transactions. Blockchain technology also has a decentralized accounting system where 'miners' are the bookkeepers and no debtor/creditor relationship (i.e. cryptocurrencies are not a liability on anyone's balance sheet). This decentralized management of ownership of digital assets is a fundamental innovation of Nakamoto (2008). More importantly, the system of payments infrastructure envisioned by Nakamoto (2008) was created with the intention to disrupt the current financial system, by affecting all business and government agencies that monopolized the creation of money in the 20th century. There are also good reasons for getting rid of cash ranging from public health considerations[1] to the clamping down on money laundering, financing of illegal activities and tax-evasion which are made easier with the use of untraceable, and easy to move, cash.[2]

1. See https://www.scientificamerican.com/article/dirty-money/; http://money.com/money/4621673/money-cash-currency-bacteria-disease-sickness/)
2. See Sands, 2016 and Rogoff, 2017

III. What are Cryptocurrencies?

The ambition in Nakamoto (2008) was to create a fair, borderless, and secure currency, which can be used across a large network of anonymous participants. This stood on the shoulders of decades of innovation in databases, cryptography, and network protocols, which all combined to give the innovation in 'blockchain' technology.

Blockchain technology enables an exchange of trust via a tamperproof, publicly auditable, record of transactions between parties with no requirement of a pre-existing trust in each other or need for a central authority to govern and manage the network.

The initial underlying philosophy behind the Bitcoin system (or broadly any 'decentralised' network) was to ensure that no one entity can act to censor transactions or prevent a person(s) from joining the network. Rather, each interconnected participant in the network had a 'voting' right given they have computational processing power. We can see a depiction of this decentralized network in Figure 4 below.

FIGURE 4. **Centralized, Decentralized and Distributed Ledger Technology**

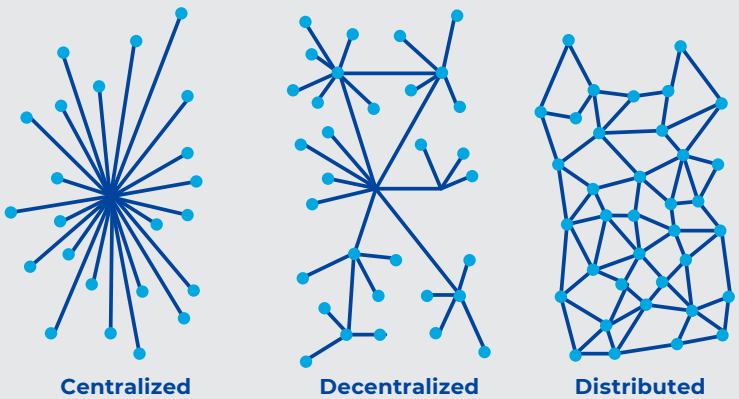


Image Source: Baran, P. On Distributed Communications. Rand Corporation, 1964.

The motivation behind Bitcoin and other Distributed Ledger Technology (DLT) apparatus involves the application of cryptography to monetary networks in order to eliminate trusted third parties across messaging systems. Most people already use cryptography when using internet applications, in sending or signing off on packets of data or messages (e.g. https protocol for internet browsing or Whatsapp for secure peer to peer messaging). When considering blockchain innovation, it allows the same principle, of elimination of third parties in financial transactions through the use of payment tokens. Some of the potential benefits of blockchain technology applied to monetary systems include:

- **Decentralisation**: no single point of trust, no single point of control (no central authority), no single point of failure.
- **Security and Anonymity**: non-repudiation and irreversibility of records with pseudo-anonymous transactions.
- **Transparency, Auditability, and Governance**: anyone can join participants can verify the veracity of records directly, without external querying.

In practice, cryptocurrencies (including Bitcoin) have become something different than what was initially envisioned by Nakamoto (2008). While there is a great deal of competition (Hayek money) in the cryptocurrency market, Bitcoin and other high-profile cryptocurrencies have failed to stabilize their value and subsequently increase the level of trust and acceptability in society. We will examine these further in section V.

From 2013, the growth in the number of cryptocurrencies has been impressive. A 2019 Institute and Faculty of Actuaries paper reported that there were 66 varieties of crypto-assets in 2013, 644 in 2016, 1,335 at the end of 2017, and 2,116 in January of 2019.[3]

The same trend can be seen in terms of market capitalization where crypto-assets have grown exponentially from around USD 10 billion at end-2013 to USD 572.9 billion at end-2017. In terms of trading platforms for crypto assets, as of April 2018, the number had exceeded 10,000. Among the over 2,000 cryptocurrencies in existence, the market share distribution is relatively congested.

3. See https://www.actuaries.org.uk/system/files/field/document/Understanding%20CBDCs%20Final%20-%20disc.pdf

Given the current state of cryptocurrencies in practice which do not function as money, there remain several barriers to overcome when comparing these with the objectives from Nakamoto (2008). We can classify some of these challenges as relating to:

- **Token supply**: supply of tokens often fixed and not actively managed leading to fluctuations in their value.
- **Decentralization**: single point of failure problem can still exist where large mining pools gain more than 50% control of the network.
- **Security and anonymity**: with pseudo-anonymity, the right balance must be found between being able to identify conspicuous large transactions and maintain high degrees of personal privacy.
- **Transparency and governance**: with existing consensus protocols, governance is often congested among a few parties of dedicated miners. [4]

4. See Gervais, et al., 2014.

IV. Central Bank Digital Currencies (CBDCs)

> **"The key innovation of digital currencies is the 'distributed ledger' which allows a payment system to operate in an entirely decentralised way, without intermediaries such as banks. This innovation draws on advances from a range of disciplines including cryptography (secure communication), game theory (strategic decision-making) and peer-to-peer networking (networks of connections formed without central co-ordination)"**
>
> — *Ali et al, 2014.*

The discussion from the previous chapter suggests that a Hayek type digital currency has so far been unsuccessful in achieving achieve its creators intended purpose. The technology introduced by Nakamoto (2008), however, is still extremely valuable when it comes to improving money and, more importantly, it's payment systems. This can be achieved by incorporating blockchain technology into existing institutions, mainly central banks.

While providing greater access to digital forms of currency is not a new idea (see Tobin 1986; Brunner and Meltzer 1971), it has recently gained traction given the debate about the role of monetary authorities in the future of currency and systems of payment. Even though it is issued by the same monetary authority, CBDC can be considered as a disruptive change to existing system of payments which can be relatively slow and tedious. For example, some international transactions can take several days to pass through regulatory checks and clearing houses. The potential use of blockchain technology for improving the efficiency of money raises many questions about the role of central bank money, direct access to central bank liabilities and the structure of financial intermediation.

Some of the characteristics and advantages of a well-designed CBDC would include a practically costless medium of exchange where individuals could hold accounts directly with the central bank. This would allow the central bank to have an additional tool for conducting monetary policy, better information on potentially fraudulent activities, and avoid intermediary costs associated with commercial bank lending, especially for lower income households (Kumhof and Noone,

2018). CBDCs could also act as an interest-bearing risk-free store of value, with a rate of return in line with similar assets such as short-term government securities (Bordo and Levin, 2018). A well designed CBDC would also overcome the price stability issue that exists with most privately issued cryptocurrencies (with the exception of stablecoins) by actively managing the supply in line with an underlying basket of goods and services.

The Bank for International Settlements (BIS), which works as central bank 'hub' for central banks, has spent a considerable amount of resources trying to understand how monetary authorities across the globe are tackling this issue of cryptoassets. According to Carstens (2019), central banking committees based at the BIS identified two main varieties of CBDCs:

- **A wholesale CBDC that would be restricted to a limited group of users and used for inter-bank payments and other settlement transactions;**
- **A retail CBDC that would be widely accessible to everyone. This could be based either on digital tokens or on accounts.**

An account-based CBDC could be implemented via accounts held directly at the central bank. Such an approach "would be reminiscent of the early years of central banking, when individuals and nonfinancial firms held accounts at the Bank of England and the Sveriges Riksbank." [5] The reason that these individual accounts were discontinued was largely due to the impractical technicalities involved with maintaining such a large volume of accounts. Given the new technology available to central banks, this former barrier would no longer exist with the use of an integrated accounting system into the CBDC framework.

In terms of active and evolving research agendas, the Bank of England was one of the forerunners when it comes to studies into cryptocurrencies and CBDCs (Kumhof and Noone 2018; Barker, *et al.*, 2018; Barrdear and Kumhof, 2016; Ali, *et al.*, 2014).[6] The Sveriges Riksbank has also been investigating whether an e-krona would provide the general public with continued access to central bank money and increase the resilience of the payment system (Skingsley, 2016; Riksbank, 2017). Other than the British and Swedish monetary authorities, several central banks are developing new research agendas for CBDCs. These include the National Bank of Denmark (Gurtler *et al.*, 2017), the Reserve Bank of Australia (Lowe, 2017), the Bank of Canada (Engert *et al.*, 2017) and many others.

Only about half of the central banks doing work on CBDCs have moved to testing this idea. According to a recent BIS report, this means that central banks are examining the benefits, risks and challenges of potential issuance from a conceptual perspective. As of 2018, only approximately a tenth of the central banks engaged with CBDCs have moved to the phase of experimenting with the different types of possible technologies, by developing pilot arrangements.

5. See Bordo and Levin, 2018.
6. For the most comprehensive work done by the Bank of England regarding CBDCs and their implications, see Kumhof and Noone (2018). Also see Benes and Kumhof (2012).

V. Perceptions of Money and the Future of Cryptocurrencies

> **"It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence"**
>
> — *Arrow, 1972.*

A key theme in this report is the importance of trust in maintaining a successful fiat currency. This trust has traditionally been vested in public institutions (central bank), but digital methods of payment performed by private companies have successfully existed for many years (credit cards, debit cards, etc). A more recent example can be found in Kenya where a recent study by Kaminska (2015) found that M-Pesa "appears to have succeeded because Safaricom, which is 40% owned by the multinational giant Vodaphone, is trusted by the public more than the Kenyan banking system." She notes, however, that that "M-Pesa really resembles a money transmission service more than a standalone currency, since its sponsor collateralizes units of M-Pesa with Kenyan hard currency deposits in escrow accounts" (Kaminska, 2015). In this case, central banks remain responsible for the creation and management of narrow money, but the private sector takes over when it comes to system of payments (transacting with money).

Despite the key role that trust plays in maintaining/preserving the value of fiat currencies, there is surprisingly little empirical work surveying the general public, especially across a diverse sample of countries. In order to help rectify this gap, the IE Center for the Governance of Change designed a two-stage survey on *'Cryptocurrencies and The Future of Money'* which was conducted across representative samples of the adult population in eight countries (US, UK, Germany, France, Spain, Argentina, Brazil, Mexico). The first stage asked

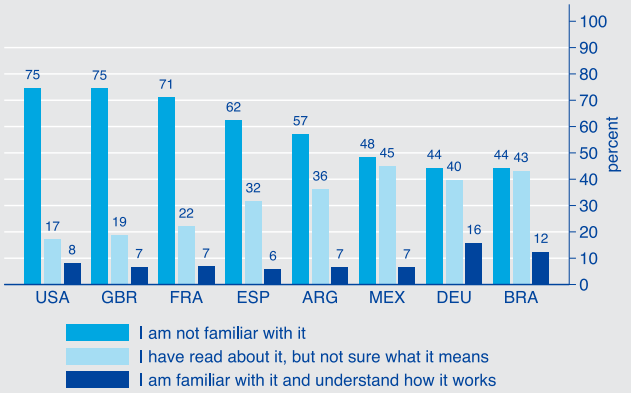
respondents about their opinions regarding different types of money (cash, credit cards, digital payment companies (PayPal, AliPay, AmazonPay, etc.) and cryptocurrencies (Bitcoin, Libra) and their understanding of how money is created and managed. In the second stage, we conducted a conjoint survey experiment where respondents were provided with a range of hypothetical currency choices based on five underlying attributes in order to estimate comparable magnitudes for people's willingness to own that type of money.

CURRENT UNDERSTANDING OF, TRUST IN, AND PREFERENCES FOR, MONEY

In terms of understanding and trust in traditional money issuers and managers, there is limited general public understanding and historically low levels of trust:

FIGURE 5

Understanding of Fractional Reserve Banking



Source: IE Survey 'Cryptocurrencies and The Future of Money'.

> **"The public has almost never really understood what the Fed is or what it does... What's different today is that there is a combination of confusion and strong opinions: People don't quite know what the Fed does, but public trust in the Fed is at a historic low. It's that combination that is dangerous."**
>
> — *Peter Conti-Brown, Wharton School, University of Pennsylvania.* [7]

New results from our survey suggest, unsurprisingly, that the majority of respondents are either, not familiar with fractional reserve banking (between 44 and 75%), or, are familiar with it but not sure what it means (between 17 and 43%). Interestingly, the two financial centres of the world (US and UK) rank amongst the lowest in terms of understanding fractional reserve banking with around half of the degree of understanding in Germany.

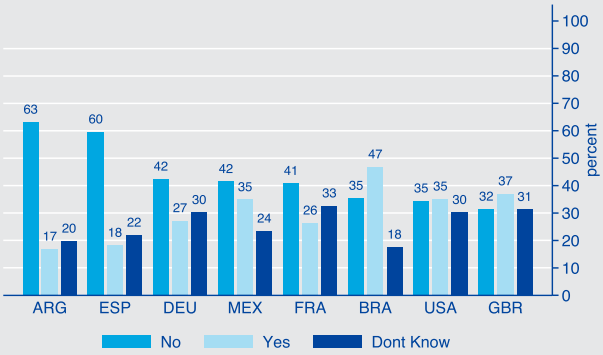
In a 2012 UK Government Office for Science research paper, Dr Y.V. Reddy, (former Governor of the Reserve Bank of India) noted that: "Trust is difficult to measure, but on the basis of surveys conducted and anecdotes reported in the media, there appears to be an erosion of trust in the financial sector as a whole, and banking in particular, in advanced economies" (Vanston, 2012, p.3). There is continued evidence of this erosion of trust over ten years after the financial crisis. For example a 2018 YouGov poll of 2,250 adults conducted on behalf of campaign group Positive Money found that 66% of adults in Britain do not trust commercial banks to work in the best interests of society with only 20% stating that they do trust banks to work in the best interest of society.[8]

7. See: https://www.nbcnews.com/business/economy/nobody-really-knows-what-fed-does-they-think-it-s-n786091
8. See https://positivemoney.org/2018/08/british-public-dont-trust-banks

FIGURE 6

Government response to Financial Crisis

GOVERNMENT HAS TAKEN MEANINGFUL STEPS BY REGULATING THE BANKING SECTOR SINCE 2008 TO PREVENT ANOTHER FINANCIAL CRISIS

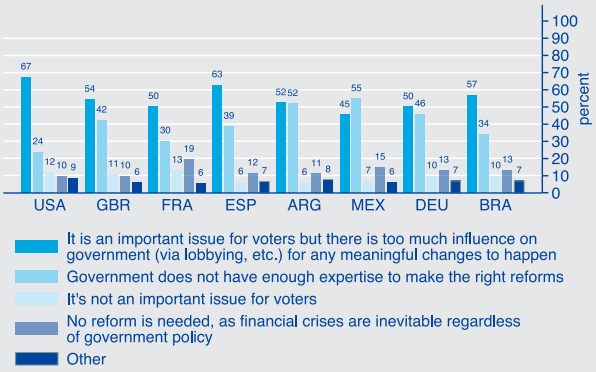


Source: IE Survey 'Cryptocurrencies and The Future of Money'.

FIGURE 7

Explaining Government Response to Financial Crisis

WHY NO MEANINGFUL STEPS HAVE BEEN TAKEN



Source: IE Survey 'Cryptocurrencies and The Future of Money'.

Part of this lack of trust may come from people's attitudes toward government's regulatory response to the financial crisis. From Figure 6, we can see that high proportions of respondents in our survey felt that government has not taken meaningful steps in regulating the banking sector since 2008 across all countries. We can also see that there is considerable amount of variation with the majority of respondents in Argentina, Spain, Germany, Mexico and France believing that government has not taken meaningful steps in regulating the banking sector since 2008. In Brazil and the UK, a slight majority believe that government has taken meaningful steps, while Americans were split ad 35% -35%.

Given the high levels of dissatisfaction with government response to the financial crisis, we asked those respondents who answered 'no' to the previous question to identify why they feel that government has not taken meaningful steps. From Figure 7, it appears that the majority of respondents in almost all countries in our sample felt that 'it is an important issue for voters in their countries, but there exists too much influence on government via lobbying for any meaningful changes to take place'.

Interestingly, the two financial centres of the world (UK and US), along with Spain, had the highest levels of agreement that government was overly influenced by lobbying efforts which prevented meaningful reforms from taking place. This continued erosion of trust and lack of effective government response may contribute to an increasing willingness for people to adopt alternative ways to store money. For example, a 2018 Bain survey of 151,894 consumers in 29 countries found that 29% of respondents trust at least one tech company more than their primary bank and 54% of respondents trust at least one tech company more than banks in general (Bradley et al., 2018).

Despite a movement towards private third-party payment systems, our survey results suggest that they still prefer that central banks create and manage money. From Figure 8 we can see that the majority of respondents (between 65% and 89%) in all of the countries in our sample trust central banks and commercial banks to create and manage money (as their first/second choice). Specifically, central banks are the most trusted across all countries and commercial banks with the exception of Germany who prefer the central government to commercial banks, are the second choice for respondents. In the case of Mexico, the central bank and commercial banks have fairly equal levels of trust while government has incredibly low levels.

FIGURE 8

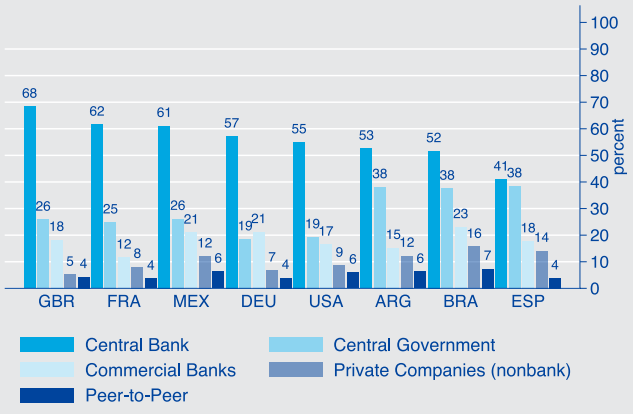
Trust in Institutions for Creating and Managing Money

Source: IE Survey 'Cryptocurrencies and The Future of Money'

These results do not show very optimistic prospects for the successful launch of Hayek type currencies with very limited support for private companies (i.e. Facebook) or peer-to-peer networks to create and manage money. Putting this together we can see from Figure 9 below that central banks are the most preferred institution for creating and managing money with varying degrees of support (from as high as 68% in the UK to as low as 41% in Spain).

FIGURE 9

Who Should Create and Manage Money in your Country?



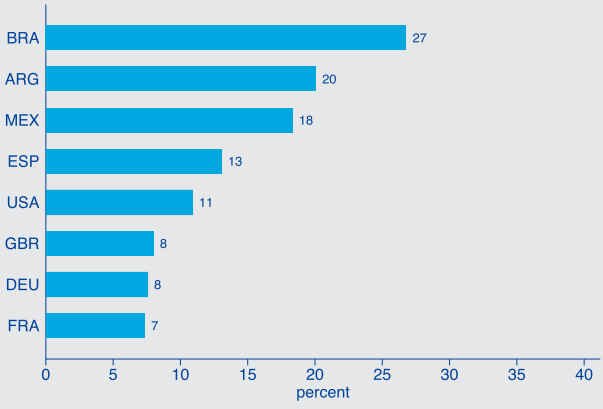
Source: IE Survey 'Cryptocurrencies and The Future of Money'.

OWNERSHIP OF CRYPTOCURRENCY

In a June 2018 ING survey on cryptocurrencies, 8% of Americans, 6% of UK residents, 8% of German residents, 6% France residents and, 10% Spain residents reported owning cryptocurrencies.[9]

FIGURE 10

Ownership of Cryptocurrencies



Source: IE Survey 'Cryptocurrencies and The Future of Money'

9. See: Exton, 2018.

Comparing these with the 2019 IE survey, there has been an increase in all countries, with the exception of Germany where ownership levels remained unchanged. Specifically, there was a 3% increase in American ownership of cryptocurrencies, a 2% increase in UK ownership, a 1% increase in French ownership and a 3% increase in Spanish ownership of cryptocurrencies.

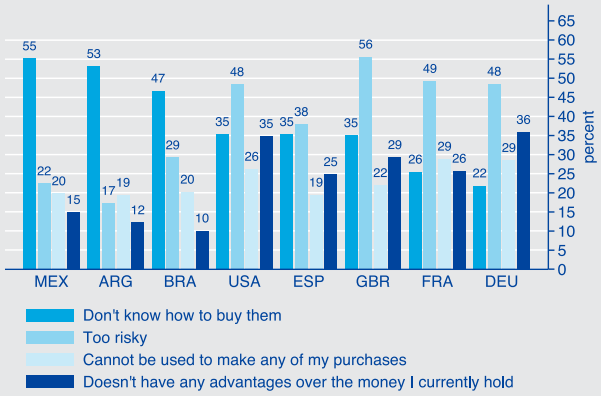
Among owners of cryptocurrencies, these are predominantly held as investments, especially in countries where ownership levels are highest. In almost all countries, only about 2% or owners claim to use these specifically for purchases. For those who don't own cryptocurrencies, we found that, in the case of Mexico, Argentina and Brazil, the reason for not owning cryptocurrency was not due to a lack of interest, but not knowing how to buy them. In the case of Mexico, 55% of respondents said they did not own cryptocurrencies because they didn't know how to buy them with 53% and 47% in Argentina and Brazil, respectively.

For the US, UK, Spain, France and Germany, the majority of respondent did not own cryptocurrencies because they felt they were too risky. There was also a higher emphasis on cryptocurrencies not having an advantage over the currencies which were currently being used.

FIGURE 12

Reason for not Owning of Cryptocurrencies

WHY DO YOU NOT OWN CRYPTOCURRENCIES



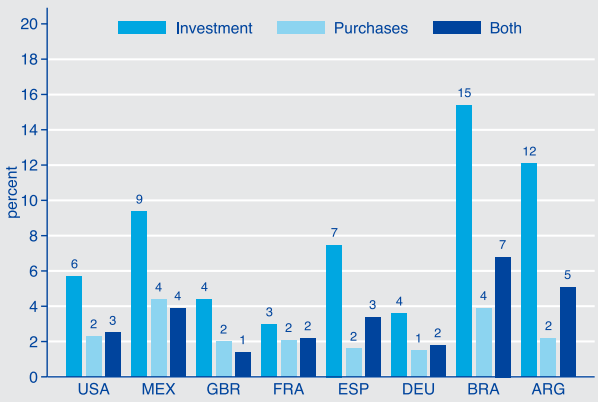
Source: IE Survey 'Cryptocurrencies and The Future of Money'.

In general, these results suggest that countries with a less stable history of monetary stability are more open to new types of money. This brings us to the future of cryptocurrencies.

FIGURE 11

Reason for Ownership of Cryptocurrencies

DO YOU OWN CRYPTOCURRENCY AS AN INVESTMENT OR FOR PURCHASES?



Source: IE Survey 'Cryptocurrencies and The Future of Money'.

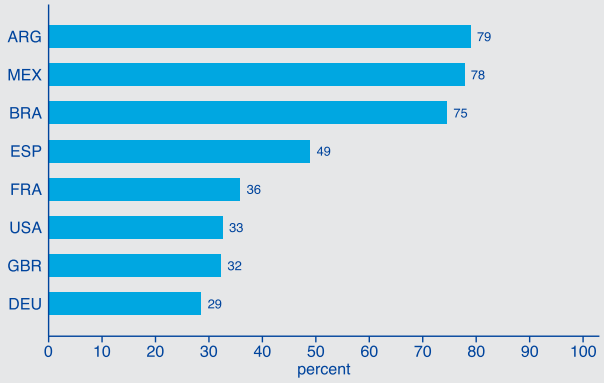
FUTURE OF CRYPTOCURRENCIES

As discussed in the previous section, cryptocurrencies have not yet manifested themselves as intended by their early pioneers. Mainly, as useful form of money, relative to other already established options (physical and digital). This doesn't mean that cryptocurrenices will not become slowly integrated into societies as their infrastrcuture improves. For example, Facebook's Libra aims to widen access to financial services and lower transaction costs while ensuring the value of the coin by being fully backed by low-volatility assets, including bank deposits and government securities in currencies from stable and reputable central banks. Holders of Libra will not be paid interest that the underlying assets generate – the cash-flow will be used for the Foundation. The presence of negative interest rates on some of the underlying assets may force the foundation to rebalance their holdings to avoid passing a loss on to their customers or to pass on these costs to owners of that currency. Banking system may well spur on the back of it – not unlike the existent repo-based shadow-banking system in Bitcoin. The block-chain starts as permissioned, with a prospect of being permissionless – again, it is unclear why the founding partners (i.e. the 'permissioned' parties) would choose to give up this privilege in the future.

To get an idea of willingness to use a generic effective cryptocurrency (one that fulfils all of the requirements of a successul form of money), we asked respondents about their willingness to use this type of money issued by a private company.

FIGURE 13

Willingness to use of a New Effective Cryptocurrency



Source: IE Survey 'Cryptocurrencies and The Future of Money'.

Suppose that a new cryptocurrency was designed by a private company (or group of companies) that could be used to make all of your day-to-day transactions (it is accepted by all sellers) and has a stable value over time (low inflation/deflation). This currency could also be converted to other currencies at a very small cost. Would you prefer to use this currency over your current method of payment?

For those who ansered 'no' to the above proposition, our survey followed up by asking respondents why they would not prefer an effective privately issued crypto-currency to their existing currency options.

As can be seen from Figure 14, in all but two countries from our sample (US and UK), the most likely reason for not supporting a new effective currency was a lack of trust in new currencies. In the case of the US and UK, respondents felt that crypto-currencies do not offer any advantages over the money they already use (the dollar and pound).

The recent high profile announcement of Facebook's Libra has led to a variety of surveys and articles written on it's viability in terms of consumers willingness to trust it. The results have not been overly positive. For example, a June, 2019 Viber survey of 1,000 US and, 1,000 UK residents found that nearly half of respondents in both countries (49%) say they would not trust Facebook at all, and less that 3% and 2% of US and UK respondents, respectively, said they would be willing to try Libra for payments (Viber, 2018).

Another July, 2019 CivicScience survey of 1,799 American adults found that 40% of respondents claimed that they trusted Libra less (35% much less) than Bitcoin and other cryptocurrencies. Only around 2% of all respondents claimed that they trusted Libra more than other more This sentiment is similar in Germany where a July, 2019 German citizen's movement Finanzwende survey of 2,093 adult residents found that 71% of respondents were skeptical about Libra with only 12% claiming they would welcome it (Finanzwende, 2019). To gain a broader understanding of people's trust in the Libra across a wider range of countries, we asked 1,000 respondents

FIGURE 14

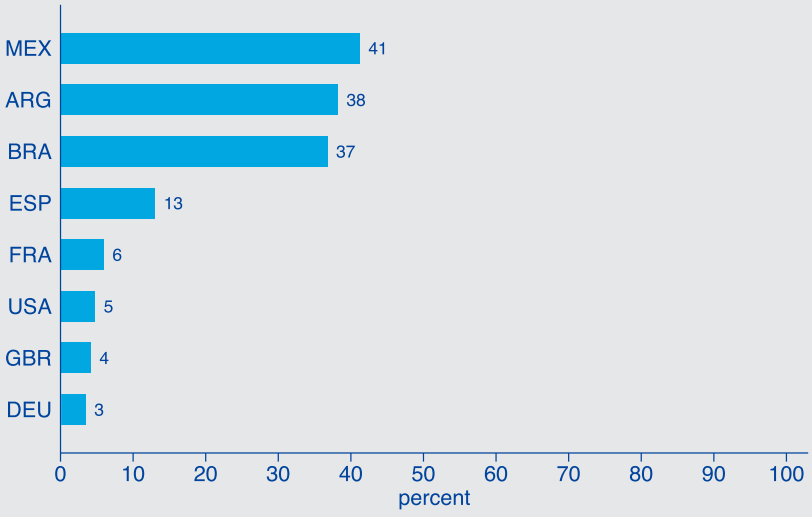
Reasons for Not Supporting a New Effective Cryptocurrency

Source: IE Survey 'Cryptocurrencies and The Future of Money'.

in each of the eight countries in our sample whether they would trust Facebook to issue and manage a new cryptocurrency. As can be seen in Figure 15 below, the results widely vary across countries.

FIGURE 15

Trust in Facebook to Issue a New Currency



Source: IE Survey 'Cryptocurrencies and The Future of Money'.

CONJOINT ANALYSIS

To gain a deeper understanding of what people want in an ideal currency, we provided survey respondents in each of the eight countries in our sample, with ten frames, each of which provided them with a choice between three hypothetical currencies with varying attributes. For the purpose of this exercise, we characterized 'money' as having five underlying attributes:

1. **Issuer/backer** refers to who Issues and/or backs that currency. This could be a central bank, a commercial bank (private SECTOR company), or a peer-to-peer network like Bitcoin (private sector nonbank).

2. **Acceptability** refers to where are able you use the currency. Is your currency accepted by all sellers of goods/services or only some sellers of goods/services (within the area in which you buy/sell goods and services)?

3. **Transaction costs** are there costs involved in making the transaction (these are commonly known as 'fees', 'premiums' or 'spreads').

4. **Price Stability** refers to the expected change in the amount of goods and/or services you can buy over the course of a month with the same amount of currency (i.e. x$ in October will be worth y$ in November)

5. **Digital/physical.** All currency that is stored outside of your personal physical possession can be considered as digital.

Each of these attributes was assigned between two and four options shown in Table 2 below.

TABLE 2

Attributes and Attribute Options for types of Money

ATTRIBUTE	OPTIONS
Issuer/Backer	Central bank Private sector commercial bank Private Sector peer-to-peer network
Acceptability	All sellers accept the currency 80% of sellers accept the currency 40% of sellers accept the currency
Transaction Cost	Zero 0.1-1% of the transaction value 1-10% of the transaction value
Price Stability	Max monthly inflation/deflation of 0 % (100=100) Max monthly inflation/deflation of 0 - 1% (100 = 99, or 100=101) Max monthly inflation/deflation of 1 - 10% (100 = 90, or 100=110) Max monthly inflation/deflation of 10 - 50% (100 = 50 or 100 = 150)
Digital/Physical	Digital Physical

This produces 240,000 observations reflecting the preferences of residents in Argentina, Brazil, France, Germany, Mexico, Spain, the US and UK, for money across our five attributes. The most straightforward way to interpret the results in a meaningful way is by examining the average marginal effects of each attribute choice. Effectively, these can be viewed as premiums/discounts place on specific characteristics of money which are comparable with each other in magnitudes. The results are shown in Figure 16 for each country separately. The general results are consistent with the findings throughout this report.

Mainly, respondents place a significant premium on money created by central banks, with the least preferred option being peer-to-peer. The magnitudes vary quite a bit across countries with Germany placing a very large premium on central bank money (0.18) and Mexico placing a lower premium on central bank money (0.04). Acceptability had a relatively consistent impact across all countries with American respondents placing the largest discount on low acceptability types of money. Transaction cost effects were also fairly consistent across countries with significant aversions when moving from 0% to between 0.1-1%, but only slightly higher aversion rates when moving, from 0.1 to 1%, to between 1 and 10%, of the transaction costs. With respect to inflation, it appears that while respondents certainly prefer no inflation/deflation, they are much more comfortable in the 0.1 to 10% range that beyond that. This is especially true in the case of Argentina (-.023 compared with no inflation). Interestingly, the results for digital/physical were mixed across countries. In Argentina, Brazil and Mexico, respondents preferred digital money to physical money. While the magnitudes were not large (between 0.02 and 0.04) there were statistically significant. In Spain, France, Germany, the UK, and US, respondents still marginally prefer to own physical cash over digital money. Again, the magnitudes here were not large compared with other attributes but were statistically significant.

FIGURE 16. **Attributes of Money Conjoint Analysis Results (point estimates and standard deviations)**

Data Source: IE Survey 'Cryptocurrencies and The Future of Money'

Thinking about these results in the context of current types of money, cash, credit cards, and debit cards, all have very high levels of acceptability and relatively low transaction costs in most advanced economies. Central banks with a history of stable inflation and/or a reputation as trustworthy creators and managers of money lead to the expectation of low levels of inflation with cash, credit cards and debit cards. Overall, these three highly used types of money score quite highly in the context of our conjoint analysis.

Comparing this with existing cryptocurrencies, these have low levels of acceptability and large price fluctuations which are two of the least desired characteristics of money. As noted above, these is also a trust premium enjoyed by central banks creating an additional trust barrier for the much less preferred alternatives, including Facebook. In general, the results suggest that cryptocurrencies, especially those which are privately issued, have a long way to go before they might be able to compete with or overtake traditional forms of money like cash, credit cards and debit cards backed by central and commercial banks.

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