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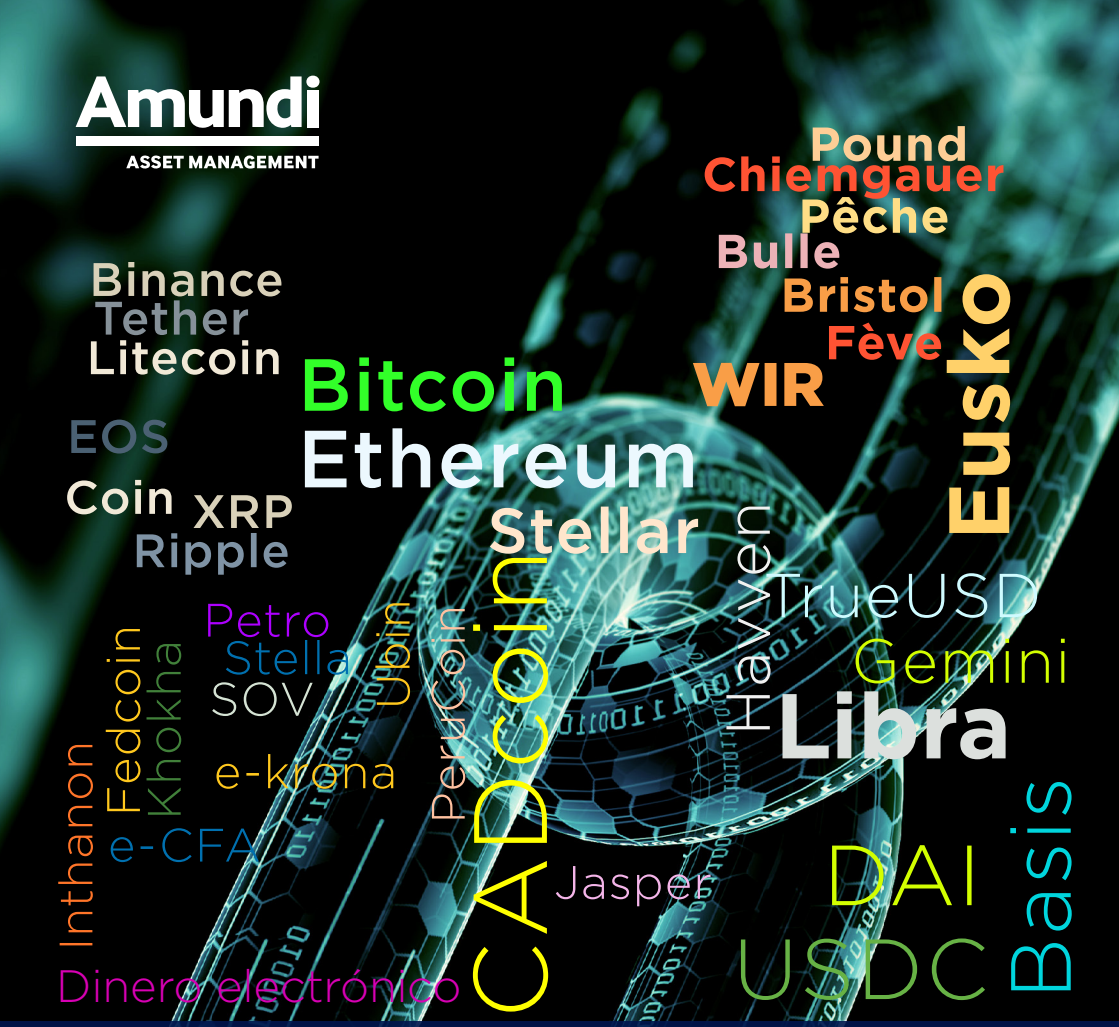

FX wars, currency wars & money wars

Part 2: Fiat Money vs. Cryptocurrencies Private vs. Public digital currencies...

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FX wars, currency wars and money wars

Part 2: Fiat Money vs. Cryptocurrencies – Private vs. Public digital currencies...

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Abstract (Part 2)

The first part of this study analysed the competition between USD, RMB and EURO and presented the challenges for China and Europe to develop a genuine international currencies, having the capacity to compete with the USD (see Part 1: "FX wars vs. currency wars: SD vs. EUR vs. RMB vs ..."; DP # 43, January 2020)). **However, currency competition goes well beyond the "simple" competition between sovereign currencies (USD, EUR, RMB, JPY, CHF...).** The advent of private digital currencies and very soon the first central bank digital currencies represent an important and new phenomenon: it shows that **the world has entered a "total digital (disruptive) era", and currencies are no exception.** In less than 10 years, additional forms of monies have surfaced: central banks digital currencies (a few), digital currencies (plenty), local currencies (some) and investment money (major projects ongoing), while electronic monies are gaining ground (vs. cash). **Digital**

> "Value does not exist outside the consciousness of men"
>
> *Carl MENGER (1840 – 1921), "Principles of Economics" – 1871 (1976 English editior*

(*) The first version of this article had been prepared for an Amundi Advisory Board meeting (7 November 2019). The author would like to thank all participants for their valuable comments

currencies are more financial assets than currencies, but electronic and digital currencies are gaining ground for different reasons:

- Ease of use,
- Speed of use,
- A major change in behaviour and habits (the "Everything and everybody connected")
- The inclusion of unbanked persons in electronic payment systems ...
- A certain mistrust of banks and fiat currencies: **part of their development is linked to the will of some investors / savers / consumers to go out of (traditional) money. Where to go?** In some emerging countries and in countries where credibility of fiat currency is low (means of payment), C-MONEY is attractive for payments. In advanced countries, where interest rates are low and Central bank's balance sheet has ballooned, there might be a FX rate problem (store of value,) not a credibility problem: going out-of money may mean investment in real assets for inflation hedge, or in gold for store of value properties.

> "Money is what money does"
>
> *J. HICKS (1904 – 1989), "Critical essays in monetary theory", The Canadian Journal of Economics – 1969*

Central bank money and bank money have now serious competitors. The benign neglect attitude of central banks at the very beginning of digital currencies (as regard bitcoin for example) has disappeared, and central bankers are now looking at the potential impact of stablecoins (the 2nd generation of (private) digital currencies) on monetary policy and financial stability. Nearly all central banks work on the feasibility of their own digital currencies, and some of them plan to launch such a currency (called the "central bank digital currency (the CB-DC), i.e. the 3rd generation of digital currencies (or cryptocurrencies). **Central Banks digital currencies have several advantages:**

- A better capacity (compared to cash) to fight more efficiently against money laundering and crime, tax evasion ... So many crucial topics in the post-crisis world that has given ethical and moral values a central role.
- A better capacity to manage monetary policy in an ultra-low and negative interest rates environment. Ironically, among the solutions to the Effective Lower Bound problem, we find i) cryptocurrencies (admittedly public ones, but echoing private currencies, cornerstone of one of the great authors of the Austrian School of Economics , F. A. Hayek), but also ii) the taxation of cash (one of the pivots of S. Gesell's analysis (1916), the author who inspired local currencies). This is also

why the developments of the last ten years cannot be treated with scorn or indifference, nor with systematic denial.

In short, the planets are aligned to make the development of digital currencies something other than a simple fad, an anecdotic or short-lived phenomenon. This does not mean that everything is possible, though:

- Cryptocurrencies are so far too much energy intensive: it is an unsustainable situation;
- Hacking and risks on infrastructure of digital currencies have to be considered;
- As long as these competing currencies do not have the attributes of real currencies, regulation will accompany their development as it does for any other financial asset (see PACTE law in France). If not, if they resemble too much to currencies (unit of account and store of value), they will probably not survive as they are ... or as they plan to be. The Libra project is undoubtedly the best illustration.

> "Cryptocurrencies are the expression of a libertarian-inspired movement of society that rejects centralized and standardized systems" ... "Cryptocurrencies bring wrong answers to a good question"
>
> *J. P. LANDAU (former Vice Governor, Banque de France), in "Les cryptomonnaies" (2018) et in L'Opinion (July 8, 2018))*

This document is not intended to explain how cryptocurrencies such as Bitcoin work in practice (supply and demand, mining, blockchain ...), but to present the 11 currency competitions / money wars we have identified, that currently exist or are likely to exist soon:

- **1st war - E-MONEY vs. B-MONEY**, i.e. electronic money vs. bank money: coexistence, complementarity or takeover?
- **2nd war - C-MONEY vs CB-MONEY and B-MONEY**, i.e. cryptocurrencies vs. central bank money and bank money: are cryptocurrencies genuine currencies?
- **3rd war - C-MONEY vs. CB-MONEY**, i.e. cryptocurrencies vs. central bank money: will cryptocurrencies compete with the currencies issued by CBs? Will C-MONEY represent risks for monetary policy, banks and financial stability?
- **4th war - new "currencies" C-MONEY vs "old" currency (GOLD),** i.e. cryptocurrencies vs. gold. Are cryptocurrencies safe have? Are cryptocurrencies substitutes of gold in times of crisis?
- **5th war - 1st generation of C-MONEY vs. 2nd generation of C-MONEY**, i.e. cryptocurrencies vs. stable coins;

- **6th war – US Stable coin (Libra) vs. Chinese stable coin (Venus) ...** a war to come soon?
- **7th war - C-MONEY vs. CB-DC**, i.e. cryptocurrencies vs. central bank digital currencies: Central banks and private cryptocurrencies - from caution to pragmatism;
- **8th war - E-MONEY and C-MONEY vs. CB-MONEY**, i.e. electronic money vs. cryptocurrencies vs. central bank money: the death knell for paper money?
- **9th war: CB-DC vs. Cash:** can CB-DC be considered as a good way to alleviate / eliminate the ELB (Effective Lower Bound) problem?
- **10th war: Retail CB-DCs vs. Wholesale CB-DCs**. Will central banks issue digital currencies?
- **11th war: Bank money (B-MONEY) vs. cryptocurrencies (C-MONEY) vs. central bank digital currency (CB-DC) vs local currencies (L-MONEY) vs. investment money (I-MONEY):** what is the value of money?

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Executive summary

1. The multiplicity of monies. Over the last decade, new currencies have emerged: cryptocurrencies, local monies. Investment monies are supposed to follow suit. Are they all genuine currencies? Why such a multiplicity of currencies? How many currencies for the International Monetary System? Is competition viable, a universal currency a utopia? Beyond these undoubtedly important questions, other topics surface, such as the impact on monetary policy, on seigniorage, on banks and on financial stability, or such as the "denationalisation" of currencies. Indeed, all the new "currencies" are private ones, potentially competing with public ones ...

2. The world has entered a "total digital (disruptive) era", and currencies are no exception. The kick-off was in 2009, when the Bitcoin was created. Alongside with the 1st generation of cryptocurrencies, high-performance technologies have been developed, making payments, which are backed by these cryptocurrencies, efficient and fast. Although these new (and numerous) currencies do not account for a large share of transactions (in volume and value), central banks are watching closely the 2nd generation of cryptocurrencies (i.e. stablecoins), concerned about the potential competition for their own currency (central bank money), worried about the potential impact on monetary policy and banking systems, interested in the opportunities offered in the environment of low interest rates, attentive to the necessary regulation of crypto-assets, and curious about the technologies used ... note that central banks may use these technologies for their own cryptocurrency project. Indeed, almost all central banks are involved in projects aimed at creating public digital currencies (called CB-DC, central bank digital currency), i.e. the 3rd generation of cryptocurrencies.

3. Bitcoin, the very first cryptocurrency, was created in 2009 and since then, many other cryptocurrencies have emerged (Ether, Litcoin, Ripple ...). There are fewer fiat currencies than countries, but there are at present 25 times more cryptocurrencies (4914 at present) than countries, which tends to confirm that cryptocurrencies are more (speculative) assets than currencies: mid-2019, although there are a large number of cryptocurrencies in circulation, the market was dominated mainly by Bitcoin ($ 132 billion) which is in first place, followed - by far - by Ethereum ($ 16 billion) and the XRP ($ 9.6 billion). These first three cryptocurrencies represented 80% of the total value of the market. And according to some estimates, 1000 people would hold 40% of the total amount of Bitcoin.

4. In around 10 years, the landscape of money has changed drastically. The mistrust of some central banks' currencies, the development of technology (fewer intermediaries, rapid execution, ease of use ...) are the main two reasons of this evolution. Seven different types of payment exist or may exist soon:

- **The central bank money**, i.e. notes and coins;
- **The central bank digital currency,** i.e. the digital counterpart of central bank money;
- **The cryptocurrency,** created (or "minted") by nonbanks, and issued on a blockchain (or alternatives). Bitcoin, Ether, Ripple are amongst the best-known examples;
- **The bank money,** which is currently issued by banks; this is the most widespread use of claim-based money, which typically covers commercial bank deposits;
- **The electronic money,** offered by new private sector providers. Some examples: Alipay and WeChat Pay in China, M-Pesa in East Africa, Paytm in India. Banks can also issue e-money;
- **The local money**, either cash or electronic. These means of payment are in paper or electronic format (or both), issued by associations and disseminated at the scale of cities or regions;
- **The investment money**, issued by private investment funds. These funds offer liquid investments but they do not yet offer means of payment. Shares in private investment funds or ETF could become I-MONEY, for example.

5. Electronic money (E-MONEY) and cryptocurrencies (C-MONEY) vs. central bank money (CB-MONEY): the death knell for paper money? Credit cards or electronic money in general are being used for an increasing number of ever smaller payments due to better, quicker, easier and more widespread infrastructure. The dissemination of electronic payments, and of cryptocurrencies to a lesser extent has reduced the use of notes and coins, i.e. central bank money. Central banks accompany this trend, by **removing high-denomination notes** from circulation and / or by taking **steps to limit payments in cash**. **With new forms of E-MONEY and C-MONEY, it is evident that payments are currently seeing another period of rapid innovation and transformation**. The use of e-payments is booming, while technology companies and financial institutions are investing heavily to be the payment providers of tomorrow. However, **despite the continuing digitalisation of the financial system, cash in circulation is not dropping for most countries**. The demand for cash still increase in several advanced economies since the Great Financial Crisis, driven by store-of-value motives. Negative rates represent another factor for accumulation of cash. The total elimination of paper money is nevertheless being seriously discussed, for at least two reasons:

- The rapid expansion of e-payments, it would help fight the black market and organised crime,
- It would free central banks from any constraints on how deeply they can cut interest.

6. Electronic money (E-MONEY) vs. bank money (B-MONEY): coexistence and complementarity more probable than takeover. Even when they are smaller than technology companies, banks are in most cases in a strong position because they have captive clients and most often benefit from strong distribution networks. They also sell financial services (including to e-money issuers (cash management, bank overdrafts protection, lines of credit, etc.). In addition, banks derive profits from maturity transformation transactions (they hold longer-term assets than deposits), they may offer higher interest rates than e-money providers (should they offer interest rates). The complementarity of b-money and e-money is also evident, especially in some emerging and low-income market economies, where e-money can draw poorer households and small businesses into the formal economy, familiarize them with new technologies, and encourage them to migrate from making payments to seeking credit, more complex saving instruments, accounting services, and financial advice provided by commercial banks. In advanced economies, the complementarity between electronic money providers and banks can turn into partnerships, the former using their data to estimate the creditworthiness of customers and sell their results to banks. It is also possible that some e-money providers migrate to the banking sector, reinforced by their knowledge of customers, their size, and attracted by the profitability of maturity transformation transactions.

7. Local money (L-MONEY) vs. bank money (B-MONEY) and central bank money (CB-MONEY). Either cash or electronic, local currencies appeared in the past decade. They are issued by associations and disseminated at the scale of cities or regions. These currencies are booming. There are about sixty local currencies currently in France. Four essential reasons for this:

- **A question of trust**: Financial crises incite actors to want to detach themselves from traditional monetary and financial systems;
- **A form of regionalism**: the declared desire to revitalise the local economic landscape and agriculture and help local productions;
- **Environmental awareness**: the desire to promote short circuits of consumption and reduce the carbon footprint of consumption.
- **A difficult economic situation**: weak growth favours the creation of local currencies, and vice versa. For example, while local currencies are developing in France, there has been a drying up in Germany over the past two years. History shows that, in the case of a healthy economy, the use of local currencies diminishes.

We are currently witnessing a revival of local currencies. However, given their technical characteristics (to some extent, local currencies are more vouchers than alternative currencies), **local currencies are not competing with CB-MONEY and B-MONEY, and they do not pose any problem to monetary policy.**

8. Cryptocurrencies (C-MONEY) vs central bank money (CB-MONEY) and bank money (B-MONEY): Cryptocurrencies cannot be considered as genuine currencies. Even if one can settle purchases with cryptocurrencies, store them, and consider them as assets, cryptocurrencies currently in circulation only partially fulfil the three essential functions of a currency: means of payment (medium of exchange), unit of account, store of value. As such, cryptocurrencies cannot be considered as genuine money. The very high volatility of cryptocurrencies and their environmental issues are also two additional drawbacks. Stablecoins address directly the issue of volatility while several Fin Techs have recently launched different projects to reduce the ecological footprint of their blockchains. Note that the adoption of cryptocurrencies is more rapid in countries where corruption and political instability are higher, confidence in the rule of law is lower, and regulatory quality is lower.

9. Cryptocurrencies (C-MONEY) vs. central bank money (CB-MONEY): cryptocurrencies do not have the potential to compete with the sovereign currencies issued by central banks. Size matters. The total market capitalisation of all cryptocurrencies is below USD 300 billion, while broad money (M3) in the US alone is around USD 14 trillion. The number of transactions in cryptocurrencies is anecdotic should one compare to sovereign currencies. In most of the countries, sovereign currencies should remain unchallenged for the foreseeable future. But there are, theoretically, places where the potential of cryptocurrencies might be more significant:

- Countries where the sovereign currency remains inconvertible;
- Countries where the population cannot access to financial services. McKinsey Global Institute concluded from a study that the provision of financial services by mobile phone could increase the GDP of emerging markets by 3.7 trillion US dollars within a decade;
- Countries where economic agents do not really trust the sovereign currency due to its poor record of (price) stability;
- Countries where economic agents do not really trust the sovereign currency due to political and / or economic uncertainty;
- Countries where there is a strong will to reduce the link to the USD;
- Countries where the cost of maintaining (or implementing) a "traditional" currency is too high;
- Countries where a centralised currency is not efficient;
- ...

10. Cryptocurrencies (C-MONEY) vs. central bank money (CB-MONEY): Policy makers, central bankers and regulators could not decide to ignore crypto-assets, of which cryptocurrencies, nor to ban them. Both extreme approaches would have been wrong. These assets had to be considered and treated as any other financial instrument, according to their size, their

complexity, and the underlying risks. Note that harmonising regulations (and taxation) is highly recommended across countries, taking into account the trans-border character of these assets. Cryptocurrencies do not endanger monetary policies and financial stability at present. To be more precise:

- Monetary policy will be marginally challenged by C-MONIES they only serve as a medium of exchange;
- If cryptocurrencies are considered as a good store of value, then both monetary and financial stability risks may be larger;
- If cryptocurrencies are also used as a unit of account, then the risks are even much larger;
- Cryptocurrencies should not have the capacity to be considered as safe haven and substitute for traditional currencies.

A larger adoption of cryptocurrencies all over the world, and a lower volatility of cryptocurrencies might change the game radically.

11. Cryptocurrencies (C-MONEY) vs. gold, i.e. an "old" currency vs. new "currencies". Are cryptocurrencies safe-haven like gold? Are cryptocurrencies substitutes to gold as macro-hedge assets? Due to the lack of data on C-MONEY, one cannot compare these assets in times of crisis. It has been established that gold is the sole asset which appreciated during major stress events: the 1980-1982 US recession, the LTCM fallout, September 11 events, the dot.com bubble, the Great Financial Crisis of 2018, the European debt crisis of 2011-2012 … Since the creation of Bitcoin, only the year 2018 (and especially the last quarter) might be considered as a reference stress period: the equity market tumbled, and the correlation between fixed income and equities were at a record-high. The data are clear: the ability of cryptocurrencies to serve as a liquid, safe-haven macro- hedge asset and store of value did not hold: Bitcoin's price fell 45% during the quarter, while the S&P500 and Nasdaq fell respectively 14% and 17%. Over the same period, gold rallied 8% and was inversely correlated with the S&P 500 and Nasdaq (and Bitcoin). In other words, cryptocurrencies are not a substitute for gold as a safe-haven. Gold is very different from cryptocurrencies: it is less volatile and more liquid than cryptocurrencies, and gold trades in an established regulatory framework. Last but not least, gold is well understood by investors and it has a favourable track record: its return rivals that of the equity market over different time horizons; it performs well in times of crisis and stress, and it has performed well during periods of inflation: it has acted for long as an important portfolio diversifier. **C-MONEY cannot compete with gold.** Bitcoin did not exist in 2008, when the Great Financial Crisis destroyed most financial markets, and it did not protect against the shock of 2018; it has also experienced phases of collapse without comparison, it is not a genuine safe haven, it is not the digital gold … But let's be fair to

Bitcoin and render unto Caesar the things that are Caesar's: Bitcoin has been, since its creation, an asset whose return exceeds all other assets: an initial investment of USD 100 in January 2011 is valued at $2.3 million at present (December 11). Tesla is ranked second, with a $100 investment now valued at 1324 (1224%). Amazon, another top performer of big tech, would have given a USD 972 (872%). Alibaba has performed the worst in our sample of big techs, doubling - only - an investment of USD 100 in 2014 to USD 218. Note that gold (without any major crisis, without any inflation, and with the longest business cycle in US history ...) has not performed well during the last decade: 4% only for the entire period of 2011 – 2019. **Because of its volatility, frauds, hacking, market rigging ... Bitcoin has received its fair share of criticisms and hostilities. But in terms of total return, Bitcoin is undoubtedly the investment of the last decade!**

12. Cryptocurrencies 1st generation vs. cryptocurrencies 2nd generation: the "stablecoins" seem to solve the problem of price volatility of crypto-assets that prevents their mass adoption, while retaining the benefits of a virtual currency (instantaneity, peer-to-peer exchange ...). The value of stablecoins is linked, indexed, to a currency (usually at a parity of one for one), a real asset (precious metal, gold or real estate for example), another cryptocurrency or a basket of assets. They have been adopted rapidly in some places, with significant success. M-Pesa in Kenya, Dinero electrónico in Ecuador, Alipay and WeChat Pay transactions in China are the best examples: 90% of Kenyans over age 14 pay with M-Pesa, and the value of e-money transactions in China, such as WeChat Pay and Alipay, surpass those worldwide of Visa and Mastercard combined. The total value of stablecoins almost tripled from €1.5 billion in January 2018 to more than €4.3 billion in July 2019 (tether the largest one), with tokenised funds initiatives accounting for more than 97% of the market. Stablecoins represent potentially major risks:

- **1st risk:** banks may lose too much deposits to stablecoin providers. Banks will have to compete with stablecoin providers and offer their own innovative solutions ... and higher interest on deposits.
- **2nd risk: monopolies.** Tech giants could use their networks to shut out competitors and monetise information. Access to data on customer transactions is crucial and strategic. New rules for data protection, control, and ownership are crucial too.
- **3rd risk: a threat to weaker currencies.** Where high inflation and weak institutions prevail, there is a risk that citizens give up local currencies for stablecoins in foreign currency. This new form of "dollarisation" would undermine monetary policy, local markets .... Will some countries be forced to ban or restrict drastically foreign currency stablecoins?

- **4th risk:** stablecoins might foster illicit activities. Stablecoin providers must prove that they can prevent the use of their networks for illicit activities like money laundering and terrorist financing.
- **5th risk:** the loss of "seigniorage". Central banks have long captured the profits stemming from the difference between a currency's face value and its cost of production.
- **6th risk: consumer protection:** This calls for legal clarity on the definition of stablecoins as financial instruments.
- **7th risk: financial stability.** It calls for a full transparency of the technicalities of stablecoins (see the controversies – scandal - about some stablecoins, of which Tether).
- **8th risk: hacking, infrastructure risk ...** It calls for top security processes.

13. Cryptocurrencies vs cryptocurrencies (C-Money vs. C-Money): US gobal stablecoin vs. Chinese (global) stablecoin ... Libra vs. Venus: a tough war to come soon? On August 19, to counter the Libra, Binance (the world's leading digital exchange, a Hong Kong Chinese company) announced they will soon launch their own competing project called "Venus". This project runs on their native Binance Chain and would constitute a "Belt and Road" version of Libra (an "independent and autonomous, regional version of Libra") that will resemble to the Belt and Road initiative of the Chinese government, a project that aims to connect Asia with Europe and Africa through land (Road) and sea (Belt) networks. Venus is expected to be a structure aimed at issuing crypto-assets backed by fiduciary currencies (fiats) at the scale of nations or geographic regions. To stimulate the creation of new digital currencies, Binance seeks to partner with governments or large companies with "regional influence" (as said in the official brochure). This stands in stark contrast to Facebook's stablecoin Libra model, which is sold as a unique, global cryptocurrency.

In other words, the future war between global stablecoins may be summed up as competition between dollar-dominated (Libra) or dollar-based stablecoins and a Chinese platform of national / regional bitcoins (Venus) that reinforce the "Belt and Road" initiative, one of the key projects of the Chinese government.

14. Cryptocurrencies (C-MONEY) vs. central banks digital currencies (CB-DC): most central banks have opened the door to the concept of cryptocurrencies and are currently working on it (analysis, project, implementation). Central banks initially adopted either a "benign neglect attitude" or, in most cases, pointed out the risks associated to cryptocurrencies: risk of bubble, organised crime financing, terrorism financing, tax evasion, speculation, money laundering, lack of governance,

deficient control, absence of regulation, risk of bank runs, lack of transparency ... however, in the very recent years, central banks' behaviour has changed ...This attitude lies on several factors:

- The increasing use of electronic payment methods and the increasingly lower use of coins and notes (Scandinavia the best example);
- An opportunity to create its own currency (Marshall Islands);
- The mistrust on some currencies (Venezuela);
- The multiplication of cryptocurrencies, a sign of growing demand;
- The will of China to be a major player on C-MONEY has forced other major countries to react;
- The decision of "small" or emerging countries struggling to switch to cryptocurrency (cheaper to manage);
- The "Big Tech" offensive, of which the Libra consortium (Facebook and 27 partners – at the very beginning - such as Visa, Mastercard, eBay, PayPal, Uber, Spotify, Iliad ...): a danger for cb-money;
- The technology never stopped improving: Blockchain is now overtaken by better technologies (Tangle, much more rapid than Blockchain, has for example been adopted by the Riksbank for its own public cryptocurrency e-krona).

15. Central bank digital currency (CB-DC) vs. Cash: CB-DC one of the solutions to alleviate / eliminate the ELB (Effective Lower Bound) problem. Negative interest rates can have a direct consequence on the amount of banknotes and coins in circulation. Central banks can set negative rates on bank reserves (some banks have done so), but without the capacity to do so on currency, there is an incentive to switch to currency: households may opt to "stash their savings under the mattress" rather than keep them in a bank account. Such a phenomenon, that hinders the effectiveness of monetary policy, is known as the Zero Lower Bound problem – or ZLB problem. With negative interest rates, the ZLB is known as the ELB (Effective Lower Bound Problem). The current economic conditions have given to ELB problem a central role: lower potential growth, ultra-low inflation, worsening demographics, rising inequality, weak productivity gains... are factors that have all lowered average nominal and real interest rates over the past 30 years. The macroeconomic volatility has also increased since the 2008 financial crisis, after more than two decades of "Great Moderation". As a consequence, monetary policy currently has lost room for manoeuvre to fight recessions, compared to the past.

Note that some studies reject the ELB problem, considering that the ELB does not necessarily reduce the effectiveness of monetary policy: without any doubt, the ELB restricts the ability of central banks to cut short-term interest rates much below zero, but it does not reduce the capacity to pilot long-term interest rates. Forward guidance and asset purchases play this role. Let's

assume the ELB problem exist, even partially. How to solve it? There are 4 solutions:

- **1st solution: Abolishing cash completely**: difficult to do it, especially when consumers tend to accumulate cash (high-denomination notes banknotes) for store-of-value motives. A ban on cash would face some major social acceptance issues, as only cash allows making anonymous transactions. It would also imply a loss of seigniorage income for the central bank.
- **2nd solution: Taxing the central bank currency**, a solution proposed by Silvio Gesell in 1916, and supported by Irving Fisher (1933) and John Maynard Keynes (1936). The idea is to avoid hoarding and accumulation of cash by penalising this behaviour. This solution is technically feasible: it already existed in the past with the different "depreciative currencies" that have emerged in Germany in the early 1930s, in Austria in the 1930s and in Switzerland in the 1940s. It is also economically coherent: it would break the negative deflationary spiral well described by I. Fisher, which explains the strong support to such a solution by this famous economist. However, this solution is also socially complicated and politically dangerous, even unfair: savings do not pay much, negative rates are comparable to taxation of savings, savers keep money for precautionary purposes, and the State would then tax this hoarding behaviour! Undoubtedly a complex solution.
- **3rd solution: End the Fixed Exchange Rate Between Central Bank Reserves and Currency.** The idea is to decouple cash (fiduciary money) from central bank money (reserves, which pay interest, potentially negative), and to link the two via an exchange rate. This exchange rate would be driven by the central bank to control the conversion of digital currency into cash. A central bank that would like to apply negative rates on excess reserves (i.e. bank deposits at the central bank beyond compulsory deposits), could, at the same time, penalise the conversion of these reserves into cash by controlling the rate of conversion of cash into reserves.
- **4th solution: Issuing a central bank digital currency (CB-DC)**: this would effectively relax the ELB constraint. By replacing cash (instead of abolishing it) with a digital currency, negative interest rates are possible. It would not need to affect seigniorage income, and preserve anonymity to its users, like banknotes (using DLT network).

To sum up, the current economic conditions have given to ELB problem a central role. By (partially) substituting for cash, a CB-DC could relax the so called "ELB constraint" on nominal interest rates, which could promote a stronger macroeconomic stability.

16. Cryptocurrencies (C-MONEY) vs. central banks digital currencies (CB-DC): will central banks create CB-DC? The opportunistic approach prevails. Even if risks and challenges are clearly identified, especially as regard banks, central banks have embarked in analysing CB-DCs and several CB-DCs may appear in the very near future. Many countries are currently working on it, such as Sweden (e-krona), Canada (Jasper project), European Central Bank and Bank of Japan (Stella joint research project), Thailand (Inthanon project), Singapore (Ubin project), South Africa (Khokha project), Uruguay, Senegal (e-CFA issued in Dec. 2016), Venezuela (Petro introduced in Dec. 2017), Bahamas, Peru (PeruCoin), China, Marshall Island (SOV introduced in 2019) ... Note there are three different variants of CB-DC:

- **1st variant: a "general purpose", "account-based" variant, i.e. an account at the central bank for the public**. This would be widely available and primarily targeted at retail transactions (but also available for broader use). This solution is difficult to implement in some countries, where the central bank admits its incapacity to manage millions of private accounts.
- **2nd variant: a "general purpose", "token-based" variant, i.e. a type of "digital cash" issued by the central bank for the general public**. This second variant would have similar availability and functions to the first, but would be distributed and transferred differently.
- **3rd variant: a "wholesale", "token- or value-based" variant, i.e. a restricted-access digital token for wholesale settlements** (for example interbank payments, or securities settlement).

According to the most recent BIS survey (end of 2018), 70% of central banks are currently (or will soon be) engaged in CB-DC work. Of those that are engaged in work, over half cover both general purpose and wholesale CB-DCs, with about a third focusing only on general purpose and an eighth only on wholesale. In the short term (up to three years), over 85% of central banks see themselves as either somewhat unlikely or very unlikely to issue any type of CB-DC. Beyond the short term (up to six years), an increased proportion of central banks consider the issuance of both types of CB-DC to be possible. Nevertheless, a majority still consider this move at least somewhat or very unlikely.

17. Bank money (B-MONEY vs. cryptocurrencies (C-MONEY) vs. central bank digital currency (CB-DC) vs local currencies (L-MONEY) vs. investment money (I-MONEY): what is the value of money? Behind all the potential wars between central bank money, bank money, electronic money, local currency, investment money and digital money, lies a central question about the value of a currency. The most important characteristic is undoubtedly the legal tender ("chartalism" approach): this determines the acceptability, the credibility of a currency. The euro, the dollar, the yen ... are

legal tender … in their respective countries. None of the 3041 cryptocurrencies is legal tender … so they are not currencies. According to the "functionalism" approach, which defines a currency as a unit of account, a medium of exchange (a means of payment) and a store of value, cryptocurrencies cannot be considered as currencies either. But the fiat currency - collateralised stablecoins are based on a fiat money or on a basket of currencies with legal tender, which gives them a huge additional advantage in comparison with the very 1st generation of cryptocurrencies (Bitcoin …). Will central banks remain complacent towards stablecoins as they did with the 1st generation of cryptocurrencies? One can have doubts on it …

Cryptocurrencies such as Bitcoin (no monetary utility, technically overwhelmed by the less volatile stablecoins, by far too much energy-consuming …) could, if they do not adapt, disappear or remain - at best - mere (marginal) speculative assets … while the Libra (too dangerous for central banks and financial stability) could never see the light of day, in any case not in the form originally desired by their creators …

18. Can central banks ban the Libra? Among the various crypto-currencies, the stablecoins are the most interesting. And among the stablecoins, the Libra is likely to be the most powerful project … But beware: the central banks cannot back the Libra, it's a fact. The next official reports will confirm this, no doubt. Can central banks ban the Libra? That is the question. To ban the Libra, it must be declared illegal (in the legal sense). But what would be the rationale behind it? The Libra Association is not an association of criminals, it does not carry out an illegal activity, contrary to the morals, or which represents a danger for the populations, for the climate … Contrary to what one can read, this is not the first time that central banks are faced with such a problem. In the 1930s, because of competition with legal tender currencies, especially Germany, Austria and France had banned the (yet effective) experiments in local currencies, while Switzerland left WIR thrive … It is the infringement of monetary sovereignty that led to these prohibitions. Currency being an attribute of the sovereignty of a state, **any "*money without a state*" (a way of qualifying the Libra) can only appear as an attack on the principles of sovereignty**. Libra is frequently presented as a currency (the "Zuck Buck"), as a substitute for Bitcoin (the "Bitcoin killer"), a global (universal?) currency (the "first globalcoin") or a private currency (a "money without State"). If the path of outright prohibition is not chosen, then it will be a question of restricting the use of the Libra and limiting its expansion. Several avenues are possible: either via the exchange regulations (as was the case in some countries concerning Bitcoin), or via a specific tax measures, by highlighting the lack of transparency and the risk of money laundering. … or finally by prohibiting / binding the banks via strict prudential rules with regard to the Libra … Answer in the coming months.

19. To conclude, the advent of private digital currencies and, potentially, of central bank digital currencies is an important phenomenon. It shows that the world is entering a "total digital (disruptive) era". Currency competition goes well beyond the "simple" competition between sovereign currencies (USD, EUR, RMB, JPY, CHF ...). Electronic and digital currencies are gaining ground because of their ease of use, speed of use, a certain mistrust of banks and currencies, a major change in behaviour and habits (the "Everything and Everybody connected"), but also the desire to fight more effectively against money laundering and crime ... The digital currencies also make it possible to better fight against the structural character of the ultra-low or negative rates, which explains why central banks are interested in it. In short, the planets are aligned to make these developments something other than a simple fashion phenomenon. This does not mean that everything is possible. Cryptocurrencies are so far highly energy intensive. But above all, as long as these competing currencies do not have the attributes of real currencies, regulation will accompany their development as it does for any other financial asset (see PACTE law in France). If not, they will probably not survive as they are. The Libra project is undoubtedly the best illustration. Maybe Libra will never see the light of the day: it is probably too ambitious ... but Libra is not alone: other projects have already been announced.

Introduction

The world of currencies is changing in a structural way, with the appearance of crypto-currencies, whose number has literally exploded since 2009, the date of the creation of Bitcoin. They are more financial assets than genuine currencies, and crypto-assets now have multiple uses: speculative tools, means of payment, utility token, security token ... the underlying technology allows crypto-assets to compete with traditional assets, and the currency may be no exception.

Will cryptocurrencies be able to compete with traditional currencies? This is the central question of this Discussion Paper.

Beyond the use of private consumers and speculators, there is also the question of the response or interest of governments and central banks. Almost all countries are concerned. Some see in cryptocurrency the possibility of having one's own currency and to free oneself from any national currency, US dollar in the lead: this is the case of small countries (which do not have the possibility of managing the functioning of a traditional national currency), or countries - often emerging - that want to reduce their dependence on the United States. This is also the case of countries where the currency has lost most of its credibility: cryptocurrency appears as the last chance for the country to reconcile citizens to its currency. This is also the case of countries - notably Northern Europe, Scandinavia in particular - in which traditional fiduciary money is being used less and less. This is the case finally of countries that see this currency as a great opportunity to better fight against fraud and money laundering. But these "public" currencies are also in competition with private cryptocurrencies that are likely to upset the monetary landscape.

In total, the competition of currencies is multiple (USD vs. EUR vs. RMB vs. cryptocurrencies (private vs. public ...)), and the stakes are numerous. It is necessary to explore all these "battlefields".

The first part of this study analysed the competition between USD, RMB and EURO and presented the challenges for China and Europe to develop a genuine international currencies, having the capacity to compete with the USD (see Part 1: "FX wars vs. currency wars: SD vs. EUR vs. RMB vs ..."; DP # 43, January 2020)). The second part focuses on cryptocurrencies. This document is not intended to explain how cryptocurrencies such as Bitcoin work in practice (supply and demand, mining, blockchain ...), but to present the 11 currency competitions / money wars we have identified, that currently exist or are likely to exist soon:

- **1st war - E-MONEY vs. B-MONEY**, i.e. electronic money vs. bank money: coexistence, complementarity or takeover?

- **2nd war - C-MONEY vs CB-MONEY and B-MONEY**, i.e. cryptocurrencies vs. central bank money and bank money: are cryptocurrencies genuine currencies?
- **3rd war - C-MONEY vs. CB-MONEY**, i.e. cryptocurrencies vs. central bank money: will cryptocurrencies compete with the currencies issued by CBs? Will C-MONEY represent risks for monetary policy, banks and financial stability?
- **4th war - new "currencies" C-MONEY vs "old" currency (GOLD),** i.e. cryptocurrencies vs. gold. Are cryptocurrencies safe have? Are cryptocurrencies substitutes of gold in times of crisis?
- **5th war - 1st generation of C-MONEY vs. 2nd generation of C-MONEY**, i.e. cryptocurrencies vs. stable coins;
- **6th war – US Stable coin (Libra) vs. Chinese stable coin (Venus) ...** a war to come soon?
- **7th war - C-MONEY vs. CB-DC**, i.e. cryptocurrencies vs. central bank digital currencies: Central banks and private cryptocurrencies - from caution to pragmatism;
- **8th war - E-MONEY and C-MONEY vs. CB-MONEY**, i.e. electronic money vs. cryptocurrencies vs. central bank money: the death knell for paper money?
- **9th war: CB-DC vs. Cash:** can CB-DC be considered as a good way to alleviate / eliminate the ELB (Effective Lower Bound) problem?
- **10th war: Retail CB-DCs vs. Wholesale CB-DCs**. Will central banks issue digital currencies?
- **11th war: Bank money (B-MONEY) vs. cryptocurrencies (C-MONEY) vs. central bank digital currency (CB-DC) vs local currencies (L-MONEY) vs. investment money (I-MONEY):** what is the value of money?

The main focus of the document is on the issues of digital currencies, challenges and risks, especially for monetary policy, financial stability, banks and central banks.

I. Multiplicity of currencies, nationalisation of currencies, universal currency, private currencies ... back to history

I.I. The value of money: from the Austrian School of Economics to digital currencies

The public nature of currencies has been contested by economists for a long time. The most emblematic example is unquestionably the **Austrian School of economics**. Led by Carl Menger (1840-1921), Eugen von Böhm-Bawerk (1851-1914), Ludwig von Mises (1881-1973) and Friedrich A. Hayek (1899 – 1992), Murray Newton Rothbard (1926 - 1995) and more recently Jesús Huerta de Soto Ballester (1956-). This school initially focused on business cycles and money. According to the Austrian theory, business cycles and recession are the inevitable consequence of monetary policies. An excessive expansion of bank credit causes an increase in the supply of money, artificially low interest rates, investment projects that do not match consumers' preferences .... Sooner or later, this imbalance leads to a recession. As a consequence, firms liquidate any failed investment projects and readapt their production structures, creating unemployment ...Many Austrian School economists call for returning to money based on the gold standard, which cannot be easily manipulated by any authority. Fiat currencies, not backed on gold, would be dangerous.

One of the most famous Austrian economists is **Friedrich A. Hayek** (1899 – 1992), 1974 Nobel prize. He went one step further in one of his books ("*Denationalisation of Money*" (1976)), in which he explains that governments should not have the monopoly over the issuance of money. He instead suggests that private banks should be allowed to issue non-interest-bearing certificates based on their own registered trademarks. These certificates (i.e. currencies) should be open to competition and would be traded at variable exchange rates.

The defenders of Bitcoin are recognized both in the Austrian School of Economics (the dangers of public currencies, the need to develop private currencies, the denationalisation of currencies ...) and in the theme of the universal currency. In 2018, Jack Dorsey (CEO of Twitter) did not hesitate to announce that "*in 10 years, there will be one currency, whether we are talking about the real world or the virtual, and this currency will be the bitcoin*". An enthusiasm close to smug optimism.

I.2. Universal currency, private currencies … back to (old and recent) history

Gresham's law (**Thomas Gresham** - 1519-1579) emphasized the impossible cohabitation of two currencies (""*bad money drives out good*", as regard silver vs. gold). For **J. Stuart-Mill** (1806 - 1873) "*the multiplicity of currencies is a tribal barbarism*."). He insists on the dangers of a multi-currency world. During the Latin Monetary Union (1865-1927), **The Economist** considered that "*if civilization could give a single currency to all men, it would be a great step to make them think that they are the same blood*." The theme of a **universal currency** has been the subject of concrete proposals, and even if these proposals have failed and if this idea may appear to be totally utopian, the world has sometimes flirted with this situation.

I.2.1. Universal currencies: the attempts / proposals of a public universal currency

The world has already flirted with a universal currency. There were two attempts and two proposals.

The adoption of a Spanish currency in the US represent the first "flirt" with a universal currency. The Latin Monetary Union was the first effective proposal: the French franc was at the base of the system … and it was about internationalizing it.

The second attempt occurred in 1944, during Bretton Woods negotiations. J. M. Keynes proposed the Bancor … it was not at that time a matter of internationalizing an existing currency, but of creating an international currency. Both experiences failed. However, the theme of the universal currency resurfaced in the early 2000s.

1st example: The Spanish monetary system in the 16th century ("real de a ocho" or "real of eight") and the US in the 18th - 19th century

The Spanish monetary system in the sixteenth century and the origin of the "peso de plata" or "real de a ocho" ("silver peso" or "real of eight") are a good example of potential universal currency. The Spanish silver pesos became even in the eighteenth century the means the most widespread metal payment within the 13 Anglo-American colonies.

This explains why, at the beginning of the wars of independence in 1776, the new United States Congress issued a paper money on which, unsurprisingly, the promise of metallic convertibility was printed in "Spanish milled dollars". It was at this point that the dollar became the currency of the United States, but it remained equivalent to the peso of silver for more than 80 years. In fact, the Congress of the United States of America had passed the monetary law of April 2, 1792, according to which it was decided that the coin denominated "dollar" would be in

silver and correspond to "real de a ocho" or American-Hispanic silver peso (peso duro), which was known to constitute the bulk of the money in circulation[1].

2nd example: the Latin Monetary Union

It was about internationalizing an existing currency, the French Franc. The 5-franc silver shield is worth 1/5 of the value of the British pound and corresponds to that of the US dollar and the Austrian guilder. As early as 1865, the countries of the Latin Monetary Union (Belgium, Greece, Switzerland, Italy and the Vatican) undertook to accept the franc: Latin America struck coins similar to the franc, while Russia showed its interest; 22 more countries are studying the issue, including England. But the gold discoveries (Australia in 1851 and California in 1847) end up causing an imbalance of prices, bimetallism suffers, and Gresham's law plays ("*bad money chases the good*"): the silver coins disappear. Then, in 1870, discoveries of silver mines generated a "lame bimetallism". In 1871, the unification of Germany is an additional step against the franc. Germany goes for the gold standard, as well as the Scandinavian countries ... the gold standard becomes widespread. Then, in 1914, the First World War is declared. All the countries of the Latin Union find themselves at war, and in very different situations (and different sides). The franc ceases to be a reference, and that ends in 1925/1927, with the end of the Latin Monetary Union.

3rd example: J. M. Keynes Bancor (Bretton Woods - 1944)

it was not at that time a matter of internationalizing an existing currency, but of creating an international currency. It is a question of depriving all national currencies of any role of international reserve. It was then necessary to fix the gold weight of the Bancor, and fix the price of the national currencies against Bancor. To guarantee the durability of the system, gold could be exchanged for Bancor, but not the other way around. This system was rejected at the Bretton Woods conference. Such a system could not be adopted today either, because it seems inappropriate to current needs and constraints: major role of central banks, high capital mobility, importance of financial markets ...

4th example: R. Mundell proposal (2000)

To alleviate the competition between currencies, Mundell made a proposal:

- To set FX rates at EUR 1 = USD 1 = JPY 100 ...

[1] *The current representation of the dollar, an "S" and two vertical bars, which correspond – for some people - to the two bars of "U" (for United) and the "S" of "States", is actually a direct inheritance of the "real de a ocho" Spanish currency: one of the two pillars that appears on the coin (one of the columns of Hercules) is surrounded by a banner bearing the currency of the sovereigns, and it forms a $.*

- To force central banks exchange currencies at this price
- The system would be managed by a triumvirate (Fed + BCE + BoJ).

It is therefore a monetary union on a world scale. Sovereignty is preserved, as well as the major role for central banks and the maintenance of seigniorage (pro rata the size of countries).

All four examples have in common the wish to promote a public currency as an international one. All four attempts failed, because of diverse reasons: political wills, wars, power of a dominant country... with digital currencies, and Tech giants offensive, fears of a private international currency might surface.

I.2.2. Universal currencies: the fears of a private universal currency

Tech giants have in common the will to develop their activities and a common currency might help. The Libra association (2019) is a consortium of giants in payments (Mastercard, PayPal, Visa...), in Technologies and marketplaces (booking Holdings, eBay, Facebook, Spotify, Uber ...), in telecoms (Iliad, Vodaphone), in Blockchain (Coinbase, Xapo ...), with Capital risk companies and non-profit organisations. All the technicalities are not known at present, but the basic principles are clear. Consumers exchange national currencies into Libra and can access to all goods and services delivered by the members of the Libra association. The amount of cash collected by the association is invested in Treasury Bills, in respect with a basket of currencies: USD (50%), euro (18%), JPY (14%), GBP (11%), SGD (7%). Note that the RMB is not part of the Libra (one of the initial "recommendation" of US Congressmen. As such, the Libra is a means of payment. But it can also be considered as a unit of account and as a store of value. Libra is frequently presented as a currency (the "Zuck Buck"), as a substitute for Bitcoin (the "Bitcoin killer"), a global (universal?) currency (the "first globalcoin") or a private currency (a "money without State"). As such, it might represent a risk for central banks (monetary policy, banking system, financial stability), should savings is invested in Libra instead of central bank money (cash) or bank money (bank deposits). In other terms, the Libra might also be considered as potential private universal currency (note that "Libra" is one of the numerous extensions of the Livre (a currency that exist (or existed) in several countries in history: France, England, Turkey, ... Will central banks (governments and regulators) be complacent with the Libra? Certainly not.

II. A modern taxonomy of money

II.1. Crypto-assets: what are we talking about?

Crypto-assets represent a group of very different assets, of which cryptocurrencies.

The table below gives a recap of this group.

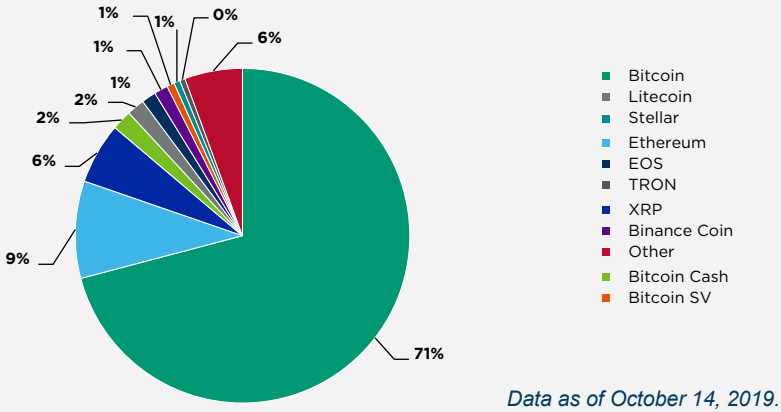
Table # 1: Crypto-assets – a recap table

Category	Crypto-asset	Definition
Crypto-payment	**Cryptocurrency**	Historical crypto-asset and virtual currency used as a means of payment, such as bitcoin launched in 2009
Service	**Utility token**	Token distributed during Initial Coin Offering (ICO), giving investors a certain number of units of service but not opening access to shareholder rights
Hybrid crypto-assets	**Security token**	Crypto-instrument opening for its holder the same rights as a classical instrument such as a stock
	Asset-based token	A classic financial instrument but distributed through a DLT (*Distributed Ledger Technology* – A DLT is a technology using independent computers (called nodes) to record, share and synchronize transactions in their respective electronic registers (instead of keeping centralized data as in a traditional registry). The best-known example of DLT is the blockchain)
	Stable coin or crypto-fiat currencies	Financial instrument distributed via a DLT technology, the value of which is backed by a classic asset such as central bank money, precious material or financial security. In some cases, *stable coins* are also traded in what looks like the securities lending / or derivatives markets with collateral
	Derivatives on crypto-assets	Swaps, options or other derivatives applied to crypto-assets
	Basket of assets or crypto ETF	Instrument whose value is based on a basket of crypto-assets, making it easy to diversify an investment

Source: Barquissau – Pertriaux (2019)

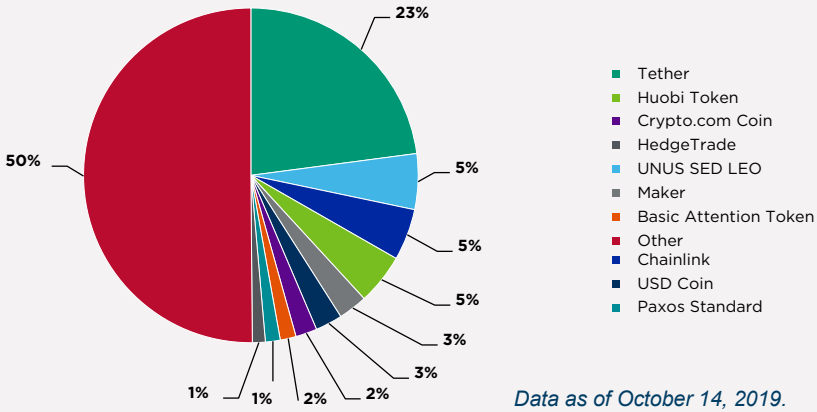
There are two major families of crypto-assets: plain crypto-assets and hybrid crypto-assets, and two major types: cryptocurrencies and crypto-tokens. Cryptocurrencies have money-like features, while crypto-tokens enable new functionalities such as equity-like features. The market shares of cryptocurrencies are highly concentrated, Bitcoin representing still around 70% of the outstanding amount (USD 200 Bln). Crypto-tokens are less concentrated, but in a much smaller market. The Top 10 crypto-tokens have a market value of about $9 billion.

Graph # 1: Market shares of cryptocurrencies



Data as of October 14, 2019.
Source: CoinMarketCap

Graph # 2: Market shares of Crypto-tokens



Data as of October 14, 2019.
Source: CoinMarketCap

Cryptocurrencies may represent attractive investment opportunities:

- These currencies are quoted every day;
- They represent a way to diversify further the portfolios due to the weak correlation with equities: less than 5% correlation between S&P 500 and the DLT10 index (a cryptocurrency index with the top 10);
- Cryptocurrencies are fully independent of central banks, which might give a specific attractiveness in specific periods;
- They are volatile ... and offer investment opportunities;
- Last but not least, they might be considered as an anti-inflation store of value, due to the limited volume issued. It is impossible to confirm such an assertion at this stage due to the lack of track record: the first cryptocurrency has been launched in 2009, 10 years ago, and inflation is absent during this period. The least one can say is that investment in bitcoin (or in any financial asset) is attractive in countries with triple digit inflation.

II.2. A modern taxonomy of means of payment —The "Money Tree"

The emergence of cryptocurrencies is the opportunity to categorise money differently. Using botanical analogies in monetary economics introduced by Bech & Garratt's (BIS - 2017), Adrian & Mancini – Griffoli (IMF – 2019a) compare different means of payment and highlight four attributes of means of payment:

- **The 1st attribute defining a means of payment is the "type"**

It can be either an **object** (money is the best example ... as long as the object is accepted) or a **claim** (transfer of a claim on an existing value: payment with a debit card for example). This type of payments is constantly growing because it simplifies transactions, but they require a complex infrastructure.

- **The 2nd attribute of means of payment is the "value"**

Is the repayment of the claim in currency at a **fixed value** or **variable value**? Fixed value claims guarantee repayment at a pre-determined nominal amount denominated in the unit of account. This makes payments very easy, without any dispute. Other types of claims can be exchanged at variable value, that is the market value of the assets supporting the claim.

- **The 3rd attribute of means of payments is the "claim"**

This only applies to fixed-value claims. The buy-back guarantee (backstop) can be either public (guaranteed by the government) or private (in this case it is based on the legal structures put in place by the issuer). The distinction is important because it affects the regulatory constraints and the level of trust of the users.

- **The 4th attribute of means of payments is the "technology"**

The central question concerns settlement: is it centralised or decentralised? Transactions using centralised technologies go through a central proprietary server. Decentralised transactions using DLTs (Decentralised Ledger Technologies) or blockchains are settled between multiple servers.

The attributes mentioned above (type, value, claim and technology) help distinguish among different means of payment, which have proliferated in recent years. Seven different kinds of payment exist or may exist soon at present:

- The cash money (central bank money excluding digital currency),
- The central bank digital currency,
- The cryptocurrency,
- The bank money,
- The electronic money,
- The local money,
- The investment money.

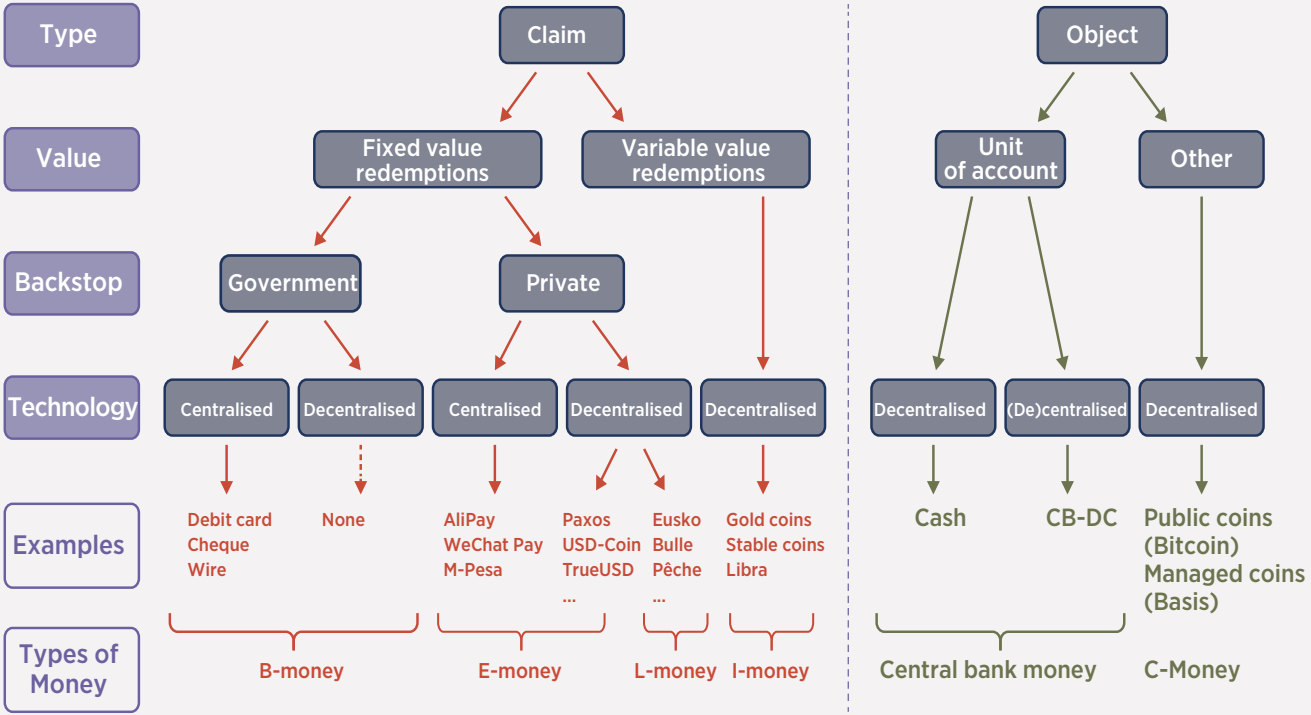
Table # 2: summary of monies and their attributes

	Type	Value	Backstop	Technology
Cash	Object	Unit of account	-	Decentralised
Bank money	Claim	Fixed value redemptions	Government	Centralised and blockchain
Electronic money	Claim	Fixed value redemptions	Private	Centralised and blockchain
Local money	Claim	Fixed value redemptions	-	Decentralised
Cryptocurrencies	Object	Other	-	Blockchain
CB-DC	Object	Unit of account	-	Centralised and blockchain
Investment money	Claim	Variable value redemptions	-	Blockchain

Source: adapted from IMF staff (Adrian & Mancini – Griffoli (2019a)

The "money tree" (adapted from Adrian & Mancini – Griffoli (2019a)) is a graphic representation of the positioning of the different means of payment as regard the attributes "type – value – backstop – technology".

Graph # 3: Taxonomy of money: the "money tree"



Source: adapted from IMF staff (Adrian & Mancini – Griffoli (2019a).
Note: CB-DC = central bank digital currency.

(1) CASH-MONEY, i.e. notes and coins;

(2) CB-DC, central bank digital currency, the digital counterpart of CB-MONEY. An increasing number of central banks envisage to launch their own digital currency (see section IV for details).

(3) C-MONEY, i.e. crypto-currency, created (or "minted") by nonbanks, and issued on a blockchain (or alternatives). Bitcoin, Ether, Ripple are amongst the best-known examples. **It is interesting to note that there are fewer fiat currencies than countries, whereas there are at present 15 times more cryptocurrencies than countries, which tends to confirm that cryptocurrencies are more (speculative) assets than currencies**. Bitcoin, the very first cryptocurrency, has been created in 2009 and since then, many other cryptocurrencies have emerged. About a year ago, in mid-September 2018, according to CoinMarketCap, there were 1,867 cryptocurrencies, worth $ 200 billion. One year later, there are 4914 in circulation (as of Dec. 10, 2019, according to CoinMarketCap), for a value of 198 billion dollars. Mid 2019, although there are a large number of cryptocurrencies in circulation, the market was dominated mainly by Bitcoin ($ 133 billion) which is in first place, followed - by far - by Ethereum ($ 16 billion) and the XRP ($ 9.6 billion). These first three cryptocurrencies represented 80% of the total value of the market. And according to some estimates, 1000 people would hold 40% of the total amount of Bitcoin. Cryptocurrencies may also be highly volatile. As mentioned above, as of December 2019, the market capitalisation of cryptocurrencies stood at around $198 billion, but it has gyrated wildly, with market cap peaking at $750 billion in early 2018, and tumbling to about $100 billion 12 months later.

(4) B-MONEY, which is currently issued by banks; this is the most widespread use of claim-based money, which typically covers commercial bank deposits. In many countries, most payments entail the transfer of funds from one bank account to another, from one bank to another, and across borders. These transfers are commonly done through centralised technologies, as in the case of debit cards, wire transfers, or checks. All banks' transactions are regulated and supervised.

(5) E-MONEY, i.e. electronic money, offered by new private sector providers. Some examples: Alipay and WeChat Pay in China, M-Pesa[2] in East Africa, Paytm in India. Banks can also banks can also issue E-MONEY as long as they deal with clients that do not benefit from deposit insurance. E-MONEY adoption can be very fast, due to its relative attractiveness as a means of payment. As Adrian & Mancini – Griffoli (2019a) mention, E-MONEY already

[2] ***M-pesa*** ™ *is a payment platform widely used in East Africa and especially in Kenya, based on the "on-us" model ("on us" = between members of the same group). Members transfer either bank deposits or cash to the mobile operator, who provides them with mobile credits. These credits can be transferred between users of the platform using mobile devices, or redeemed from the operator in exchange for cash or deposits.*

rules, in China and Kenya for example. "*Ninety percent of Kenyans over age 14 pay with M-Pesa, and the value of e-money transactions in China, such as with WeChat Pay and Alipay, surpass those worldwide of Visa and Mastercard combined*". E-MONEY is better integrated into our digital lives compared to B-MONEY or central bank money, and transfers in E-MONEY are cheaper and quicker, compared to card payments or bank-to-bank transfers (notably across countries). Last but not least, "*in some countries, users trust telecommunications and social media companies more than banks*".

(6) L-MONEY, i.e. local money, either cash or electronic. These means of payment are in paper or electronic format (or both), issued by associations and disseminated at the scale of cities or regions. These currencies are booming. There are about sixty local currencies currently in France. Four essential reasons for this:

- **A question of trust**: Financial crises incite actors to want to detach themselves from traditional monetary and financial systems. The first local currency, the "wir", was launched in Switzerland in 1934 in a context of economic and monetary crisis. It is now used all over Switzerland. In France, it is notably the European crisis of the beginning of the 2010s that has strengthened the willingness of individuals to emancipate themselves from the euro and which has been the real starting point for the creations of local currencies;
- **A form of regionalism**: the declared desire to revitalise the local economic landscape and agriculture and help local productions;
- **Environmental awareness**: the desire to promote short circuits of consumption and reduce the carbon footprint of consumption.
- **A difficult economic situation**: weak growth favours the creation of local currencies, and vice versa. For example, while local currencies are developing in France, there has been a drying up in Germany over the past two years. History shows that, in the case of a healthy economy, the use of local currencies diminishes.

Number of the existing local currency are "depreciative money" ("Schwundgeld" in German, "monnaies fondantes" or "monnaies franches" in French), i.e. currencies that depreciate over time[3]. This concept was created in 1916 by S. Gesell (a merchant from the Belgian part of Prussia), social activist, anarchist, libertarian and passionate about monetary theories): its originality comes from the fact that it is a currency that depreciates if we do not use it. Like the German Chiemgauer, the Swiss WIR was, until 1948, a depreciative money: those that are not used lose their value due to inflation. The system was designed from the beginning to encourage the circulation of

[3] *"Depreciative currencies" existed during ancient Egypt, the Middle Ages in Europe between the 10th and 13th centuries, and following the crisis of 1929.*

money. If we consider that it is the rotation of money that allows the economy to develop and prosper, then it must be as fast as possible. The notion of depreciative money is based on the recognition that the money-holder has an advantage over producers of goods and merchants, since it may differ in time from purchase, while the producer and retailer must sell his products as quickly as possible to prevent them from losing value. Gesell insisted that a currency that gradually depreciates in value would circulate much faster and would be more productive[4] than a currency allowing hoarding (hoarding is not therefore a crucial function for a currency ... it can even be counter -productive for the economy). Convincing experiences of forms of local currency (commonly known as "Stamp Scrip" or "Freigeld") took place during the Great Depression, notably in Germany in 1930 in Schwanenkirchen, in Bavaria (creation of the Wära") and in Austria in 1931 in Wörgl. The results were very positive, so much so that the literature of the time refers to the "miracle of Wörgl": the experience of the local money reduced unemployment by 25% at the time of its implementation (July 1932-September 1933), while it increased by 20% for the whole of Austria during the same period. In spite of this success, or maybe because of this success, these currencies were prohibited rather quickly (as early as 1931 in Germany and in 1933 in Austria) because they competed with the State and the central banks in their role as exclusive issuers of the currency. In France, a private network that used the "Valor" as a means of payment was created in 1933. Clearly inspired by the Wära, the "mutuelle nationale d'échange" was banned by the Ministry of the Interior in 1935. It should also be noted that academic economists paid (and still pay) little attention to these experiments, with the exception of Irving Fischer and J.M. Keynes (two major authors)[5].

[4] *According to S. Gesell, "our goods age, rust, spoil, break. When the currency has physical properties corresponding to the inconvenience and the losses which the goods cause us, then only, it will constitute the safe, fast and cheap instrument of the exchanges, since no one will prefer it to the goods, in any case and to none moment. Money that ages like a newspaper, which spoils like potatoes, rust like iron, evaporates like ether, such money can only be used as a means of exchange for potatoes newspapers, iron and ether; such money will not be preferred to the merchandise either by the seller or the buyer. The goods will be exchanged for such a currency only if a means of exchange is needed, and not in expectation of the advantages afforded by the possession of money".*

[5] *According to Irving Fischer,"Free money may turn out to be the best regulator of the velocity of circulation of money, which is the most confusing element in the stabilization of the price level. Applied correctly it could in fact haul us out of the crisis in a few weeks ... I am a humble servant of the merchant Gesell"). J.M. Keynes considered that "Gesell's chiefwork is written in cool and scientific terms, although it is run through by a more passionate and charged devotion to social justice than many think fit for a scholar. He also believed that "the future will learn more from Gesell's than from Marx's spirit". More recently, Lawrence Klein (Noble Prize in 1980) considered that "Academic economists are ready to ignore the 'crackpots', especially the monetary reformers. Johannsen, Foster and Catchings, Hobson and Gesell all had brilliant contributions to make in our day, but could receive no audience. It is hoped, that in the future economists will give a sympathetic ear to those who possess great economic intuition".*

The Swiss "WIR", a "local national" currency, and a forerunner of local currencies

The WIR (name that comes from "Wirtaschaft Ring", economic circle in German but also "wir" which means "we" in German) was created in 1931 by two Swiss businessmen and intellectuals, Werner Zimmermann and Paul Enz, and about fifteen SME leaders who were inspired by S. Gesell's ideas. The WIR bank was created in 1934. The WIR operates on a par with the Swiss franc and the operations are centralised at the headquarters of the WIR bank in Basel. The currency is totally scriptural, and members do not need cash. The WIR is a system of exchange-goods between SMEs that aims to facilitate trade between its members, through the clearing of debts, recorded on accounts from an internal monetary unit, the WIR. Thus, a comparison of the debts is made more than a payment: the selling company receives a credit in WIR and the buying company the amount of the corresponding debit.

The WIR and the Swiss franc are not in competition ... they are complementary. The WIR uses a unit of value associated with an official currency, the Swiss franc, but it is not exchangeable without tax or exit percentage. This forces the members to use it within the circle of participants thus creating a circuit of exchange of its own. The objective, as for all local currencies, is to establish a system that encourages spending in the business circle in order to promote mutual assistance and cooperation. The majority of transactions are bi-monetary, i.e. both WIR and Swiss franc.

Since 1998, the WIR has become a cooperative bank, adding to its original functions, a credit system in WIR at advantageous rates. The WIR Bank offers traditional banking services such as investments. It has also opened to the service to individuals and it provides its customers a WIR debit card to make payments. Members acquire WIRs either by depositing assets in Swiss currency that the bank converts into WIR currency (the reverse is not possible), either by selling or buying goods and services from other SME members of the circle, or by making a loan in WIR at very advantageous rates. It should be noted that WIR Bank has a long tradition of interest rates well below the CHF market level, which makes it easier for Swiss SMEs to cope with crises than in other countries. In the 1990s, when CHF rates averaged 6%, WIR rates were below 2%. Even now, with historically low rates, the WIR rates are lower than the CHF rates, but the attractiveness of the WIR is lower than before, and more so than the WIR holdings do not yield interest. Until 1948, the bank did not pay interest and the WIR was a "depreciative currency": a periodic tax was applied if the WIR did not circulate. To avoid double jeopardy (a tax and the loss of value due to inflation), the tax has been removed.

We are currently witnessing a revival of local currencies, with Switzerland being often presented as an example. It is not anecdotic: the "WIR" still exists and has been adopted by more than 60 000 SMEs (Small and Mid-size Enterprises), representing 20% of Swiss SMEs at present (see

insert). Other local monies exist in Switzerland: the "Leman", the "20 Val", the "Netzbon", the "Farinet", the "EPI". In the United Kingdom, the "Bristol pound" or the "Brixton pound". In Germany, the "Chiemgauer" (created in 2003 in Prien am Chiemsee, Chiemgau area, Bavaria). In Japan, the "Fureai Kippu" is a currency that can only be used to finance care or equipment for the elderly. This currency creates a network of solidarity that does not need yens (i.e. the State or BoJ) to function. Several local currencies have emerged in France recently. The Basque currency, "eusko", was created in January 2013. Exchanged between more than 3,500 individual members and more than 800 companies and associations, the eusko became the largest local currency in Europe, ahead of the "chiemgauer" in Germany and the "Bristol pound" or the "Brixton pound" in England. Other currencies were created: the "pêche" (i.e. peach) in Paris - Montreuil (May 2018), the "Rollon" in Normandy, the "Bulle" (i.e; bubble) in Angoulême, the "fève" (i.e. the Bean) in the Toulon region, the "Soudicy" in the Allier department...

Obviously, **given their technical characteristics (to some extent local currencies are more vouchers than alternative currencies), local currencies are not competing with CB-MONEY and B-MONEY, and they do not pose any problem to monetary policy.**

Note that the concept of local currency was legally recognized in France five years ago (Benoît Hamon's 2014 "social and solidarity economy" law). This law recognizes complementary local currencies as payment vouchers as long as they are part of a project of social utility. These currencies are only used in a limited range of partner companies in the area to which the currency is attached and which have responded to an ethical charter. The associations choose the parity of their local currency with the euro (usually set at one euro). Their value cannot increase because they have a social purpose and in no way speculative. If the demand for the local currency is greater than expected, the association may choose to put new units in circulation.

(7) I-MONEY, i.e. investment money, issued by private investment funds. These funds offer for long relatively safe and liquid investments but they do not yet offer means of payment. Shares in private investment funds or ETF could become I-MONEY. They can be tokenized, meaning they can be represented by a coin of any amount on a digital ledger. The I-MONEY is equivalent to E-MONEY, except that I-MONEY entails a claim on assets and it offers variable value redemptions into currency; it is thus an equity-like instrument... The I-MONEY can then be traded directly, at low cost, and constitute a payment. The basic principle is simple: if B owes A 1000 euros, B will transfer 1000 euros worth of a money market fund to A. However, the underlying fund have to be liquid and safe:

- If the fund is not liquid, its market price cannot be known at any point in time.
- If the fund does not hold very safe assets only, then the receiver might not accept to be paid in risky assets. Said differently, the I-MONEY has to be stable to be considered as a widespread means of payment.
- The I-MONEY cannot be highly unregulated too: I-MONEY represents a transfer of ownership of securities that could be across borders.

A tangible example of I-MONEY backed by a portfolio of assets may be Libra, the coin just announced by Facebook and members of the Libra Association.

Table # 3: A typology of monies

Type	Description
CB-MONEY	The central bank money, i.e. notes and coins
CB-DC	The central bank digital currency, the digital counterpart of central bank money
C-MONEY	The cryptocurrency, created (or "minted") by nonbanks, issued on a blockchain (or alternatives). Bitcoin, Ether, Ripple amongst the best-known examples
B-MONEY	The bank money, which is currently issued by banks; this is the most widespread use of claim-based money, which typically covers commercial bank deposits
E-MONEY	The electronic money, i.e. electronic money, offered by new private sector providers. Examples: Alipay and WeChat Pay in China, M-Pesa in East Africa, Paytm in India. Banks can also banks can also issue e-money
L-MONEY	The local money, either cash or electronic, on both. These means of payment are issued by associations and disseminated at the scale of cities or regions
I-MONEY	The investment money, issued by private investment funds. These funds offer relatively safe and liquid investments but they do not yet offer means of payment. Shares in private investment funds or ETF could become I-MONEY

III. The money wars between the existing and potential monies

III.1. 1st competition / war: B-MONEY vs. E-MONEY: coexistence, complementarity or takeover?

Will the advent of private electronic money outside the bank ring the death knell of bank money, or will a balance between these two currencies gradually be established, given a strong potential complementarity? The most likely scenarios are the **coexistence and complementarity** of E-MONEY and B-MONEY.

Even when banks are smaller than large technology companies, they are in a strong position, for at least three reasons (Adrian & Mancini – Griffoli (2019a)), which justify the scenario of **coexistence**:

- They have **captive clients** and most often have **strong distribution networks;**
- They also **sell financial** services, including to E-MONEY issuers (cash management, bank overdrafts protection, lines of credit, etc.);
- In addition, since banks derive profits from maturity **transformation transactions** (they hold longer-term assets than deposits), **they may offer higher interest rates than E-MONEY providers** (assuming they offer interest rates).

The complementarity of B-MONEY and E-MONEY is also evident, notably in some emerging and low-income market economies:

- E-MONEY can draw poorer households and small businesses into the formal economy,
- E-MONEY familiarize them with new technologies
- E-MONEY will encourage them to migrate from making payments to seeking credit, more complex saving instruments, accounting services, and financial advice provided by commercial banks

In advanced economies, complementarity could turn into partnerships between electronic money providers and banks, the former using their data to estimate the creditworthiness of customers and sell their results to banks. **Some E-MONEY providers could even migrate to the banking sector**, reinforced by their knowledge of customers, their size, and attracted by the profitability of maturity transformation transactions.

The takeover scenario has a low probability so far, even if a transformation of the current banking model is ongoing. At present, as Adrian & Mancini – Griffoli (2019a) recall, banks accept deposits but hold only a fraction of these in liquid assets such as central bank reserves and government bonds. The rest is lent to households and businesses and thus contributes to economic

growth. Banks are able to lend cash reserves that depositors keep for precaution to cover liquidity shocks as long as they are not hit at the same time. *"With electronic money, the deposit and credit functions of commercial banks could be split. The deposits we hold for payment purposes could migrate to electronic money and, in turn, could be held abroad, in government bonds or in central bank money. And those we hold in the form of savings could be routed to mutual funds, hedge funds and financial markets for credit allocation. The result would be a very different world and a very different banking model. How much cash would be stuck in e-money and no longer be available to lend to the private sector? Would it be a desirable world?"*. Difficult to answer even if at present, the probability of such a scenario is small.

III.2. 2nd competition / war: C-MONEY vs CB-MONEY and B-MONEY: Are cryptocurrencies genuine currencies?

III.2.1. What is a currency? Theories of money: Metallism vs. Chartalism vs. Functionalism vs. free-money

In modern times, four different theories exist.

Money can be tied to an underlying good having an independent market value. For long, money was tied to precious metals: gold, silver, or both precious metals. This theory is called ***metallism***. According to this approach, the value of money derives from the purchasing power of the commodity upon which it is based. The currency in a metallist monetary system may be made from the commodity itself (via a commodity-money) or it may use tokens (such as national banknotes) redeemable in that commodity. The term "metallism" was initially coined by the German economist Georg Friedrich Knapp (1905), while he described monetary systems using coins minted in silver, gold or other metals. Adherents of metallism are, of course, totally opposed to the use of fiat money, i.e. governmentally-issued money with no intrinsic value.

Another approach, known as ***chartalism***, points that money is a legal creation. As such, legal tender is more important than any link to any good, paper or not. The term was also coined by G. F. Knapp (1905). The name derives from the Latin word charta, in the sense of a token or ticket. Knapp argued that "money is a creature of law" rather than a commodity. He argued the state could create pure paper money and make it exchangeable by recognising it as legal tender. The functioning of the monetary system is then under the responsibility of the State.

According to the ***functionalism***, the most conventional definition and the most "popular" theory of money (developed in the 1870s by the English economist William Stanley Jevons), a money has to fulfil three basic functions: it has to be a means of payment, a unit of account and a store of value. Note, however, that one of the traditional functions of money (store of value)

can, under certain circumstances, be detrimental to economic activity and become a handicap. The accumulation of cash (for precautionary purposes, or to guard against negative rates, for example) is likely to structurally (and durably) modify savings behaviour and cause vicious circles "accumulation of cash – decline in bank deposits – decline in investment – lower growth – higher unemployment – lower interest rates – accumulation of cash… ".

Economic and monetary theory took up this subject in the years 1910s. S. Gesell (1916) was the first to suggest that the store of value function of money could become a strong handicap. According to the *"brilliant contribution of this crackpot"* (L. Klein, 1980 Nobel prize of economics), money is intended to exempt us from barter, it must ensure the exchanges. However, more importantly, it must especially ***accelerate*** the exchanges and make them less expensive. To avoid hoarding and accumulation of cash, Gesell introduced the concept of ***free-money*** and ***depreciative currencies*** (currencies losing value when hoarded too long).Later, in the 1930s, I. Fisher and J. M. Keynes (on deflation, liquidity trap, velocity of money and the negative impacts of the store of value function of money) referred to S. Gesell. I. Fisher considered himself as *"a humble servant of Gesell"* while Keynes admitted to having been inspired by *"Gesells' chiefwork"*. The negative impact of store of value function is coming back to the fore today (see in particular section IV.3 on the solutions to the "Effective Lower Bound Problem" (ELB problem)).

These four "theories of money" are summarised in the table below.

Table # 4: Metallism, Chartalism, Functionalism and Free-Money: theories of money"

Metallism	Money consists of or is tied to a good (a metal such as silver, gold…) with a market value
Chartalism	Fiat currency has value in exchange due to the existence of a legal tender and to the sovereign power to levy taxes on economic activity payable in the currency the state issue
Functionalism	Money functions as 1) means of payment, 2) unit of account, and 3) store of value
Free-Money	Money is intended to exempt us from barter; it must ensure the exchanges; it must especially accelerate them and make them less expensive

III.2.2. Cryptocurrencies are not currencies

According to the theory of *Metallism*, convertibility to a good (gold or silver in history) is key. Neither fiat currencies nor cryptocurrencies bear any convertibility to a good at present.

According to *Chartalism*, the existence of legal tender is the best way to define a currency. **Electronic versions of national currencies** are a legal tender issued by a country's central bank or monetary authority. In the same way, **Bank reserves** are a commercial bank's cash holdings on the central bank's balance sheet, and as such, they are backed by legal tender issued by the central bank. In contrast, **virtual currencies** are privately issued as a payment for goods and services that the private issuer or network participants in the virtual community provides. Virtual currencies such as game coins and rewards points are only valid within the specified community. They do not have a legal tender. Same for **cryptocurrencies**: they do not have a legal tender either. Some **stablecoins**, however, are fiat currencies-collateralised: they do not have a legal tender, but they are backed on legal tender currencies, which might give them additional stability, credibility and acceptability.

Let's look at cryptocurrencies through the *functionalism* and the functions of money primarily defined by S. Jevons.

1. **Means of payment**: Even if it is possible to exchange cryptocurrencies, no one is obliged to accept them as a means of payment. For example, in France, according to Article L. 111-1 of the Monetary and Financial Code, *"The euro is the only currency that has a legal tender"*. As such, it is recognized and accepted by everybody as a means of payment. Cryptocurrencies have no legal tender at present: they only partially fulfill the function of intermediaries of the exchanges. Few companies accept payment in bitcoin, the most liquid cryptocurrency. As a consequence, they cannot be considered as genuine means of payment.
2. **Unit of account**: goods and services are not priced in cryptocurrencies, companies do their reporting in "traditional" currencies, not in cryptocurrencies ... It seems impossible to change that: crypto-currencies are very volatile because they are based on a decentralized system. For **"traditional" currencies**, central banks have the role of adjusting the quantity of money available according to the demand that is made to prevent the exchange rate from rising or falling sharply. In the absence of a regulator, the supply and demand of **cryptocurrencies** are free: i) the demand depends essentially on the number of users and the number of transactions; ii) the supply is limited and depends on the algorithm that is associated with each of them. In addition, it is limited. If the demand increases (respectively drops) sharply, the value of the cryptocurrency will also increase (respectively drops). As a consequence, their value fluctuates enormously, preventing them from being used as units of account. Note that stablecoins (see section III.5.) represent an imperfect improvement in this field: their value aims to be relatively stable based on backed assets, but in reality, it also

fluctuates, in particular when they are not backed on safe assets. All in all, cryptocurrencies cannot be considered as genuine units of account.

3. **Store of value**: The store of value assumes that the asset can be saved and appreciate over time. Cryptocurrencies can be stored, but they do not appreciate when they are, since the value of a crypto-asset depends on the number of transactions. Thus, the only way to make the value of crypto-asset is speculation ... moreover, their fluctuations can be huge, upward as downward. Thus, cryptocurrencies cannot be considered as a genuine store of value.

Apart from these three economic functions, money also plays a role of **social cohesion** and **sovereignty**. These roles are also not fulfilled by cryptocurrencies that are not easily accessible for the entire population.

To conclude, even if one can settle purchases with cryptocurrencies, store them, and consider them as assets, **cryptocurrencies currently in circulation only partially fulfill the three essential functions of a means of payment, and they cannot be considered as genuine money either**. They cannot replace official currencies which continue to deliver traditional functions of money efficiently. Note that countries where corruption and political instability are higher, confidence in the rule of law is lower, and regulatory quality is lower tend to adopt cryptocurrencies more rapidly.

III.2.3. Cryptocurrencies are speculative assets prone to bubbles

The nature of Bitcoin is essential, for investors, for central banks and for regulators. As Gangwal – Longin (2019) recently stressed, *"Financial regulators have to identify the nature of bitcoin to know whether it should be just considered as an object of curiosity to be watched, or as a threat or risk to be regulated and supervised"*. Moreover, the nature of cryptocurrencies will also determine the place for regulation. For example, in the United States, securities are regulated by the Security Exchange Commission (SEC), commodities are regulated by the Commodity Futures Trading Commission (CFTC), and currencies are regulated by the Federal Reserve. In the same vein, the nature of cryptocurrencies will determine the risks: will cryptocurrencies impact the payment systems, financial stability, monetary policy, banks, price stability? The answers will be different depending on the nature and the magnitude of the risks.

The section above tend to confirm that cryptocurrencies are not monies...**If cryptocurrencies are not monies, what are they precisely?** Some studies are aimed at answering such a question. Among the different studies addressing these issues, the studies by Baur – Hong – Lee (2018) and Gangwal – Longin (2019) deserve a specific interest. Baur – Hong – Lee (2018) analysed the statistical properties of Bitcoin, especially the correlation with traditional asset classes such as stocks, bonds and commodities both in normal times and in periods of financial turmoil. Gangwal – Longin

(2019) have explored the nature of bitcoin by considering all its relevant possible dimensions: a currency, a commodity, a commodity-money, an investment, a speculative asset, a bubble, a Ponzi scheme, and a network. For each dimension, they examined the characteristics of bitcoin's value over time and particularly during extreme events.

- **Is Bitcoin a bubble?** Bitcoin has already experienced several major speculative episodes in its short history. Over the period July 2010 – June 2015, Baur – Hong – Lee find clear evidence for the existence of 3 bubbles in 2011 and 2 bubbles in 2013. Wheatley – Sornette – Reppen – Huber – Gantner (2018) identify five boom-bust episodes: May 25, 2012- August 18, 2012 (84 days), January 03, 2013 –April 11, 2013 (98 days), October 07, 2013 – November 23, 2013 (47 days), August 06, 2015 – December 18, 2017 (924 days) and March 31, 2017 – December 18, 2017 (155 days). Identifying close to 10 bubbles in 10 years is particularly rare.
- **Is Bitcoin a commodity-money?** In contrast to fiduciary money (which has no intrinsic value), commodity money has, in addition to the value of being a medium of exchange, an intrinsic value derived from the material of which it is made. In the beginning, money was a commodity: cattle, salt, seeds and, later, money and gold. As explained by Selgin (2015), "*beyond the traditional dichotomy between commodity and fiduciary money, two dimensions must be taken into account when classifying a currency: its non-monetary use and its scarcity*". Of course, the conditions of production imply that Bitcoin is rare, but its non-monetary use is limited (in intrinsic value or in number of individuals for which it has a value). It is therefore difficult to consider Bitcoin as a commodity currency.
- **Is Bitcoin a speculative asset?** A speculative asset is an asset with no intrinsic value to holding it. In that case, the price of a speculative asset is related to its supply and demand, and the economic agents expect a profit based on anticipations of future price movements. This definition applies correctly to Bitcoins.
- **Is Bitcoin a diversification asset?** Several studies conclude that adding Bitcoins to portfolios yields diversification benefits. Over the early period of bitcoin (2010-2013), Brière – Oosterlinck – Szafarz (2015) find low correlations (of returns) with traditional asset classes such as equities and bonds, and also with alternative investments. According to Gangwal (2016), the bitcoin's high return and low correlation with other financial assets can offset the market risk due to its high volatility.
- **Is Bitcoin a Safe Haven asset? Is Bitcoin the new "digital gold"?** In portfolio management, a safe haven is an investment that is expected to retain or increase in value during unfavourable market conditions. A safe haven limits the losses. For a few years, there is

a debate to know if bitcoin could be considered as the new digital gold: can bitcoin, like gold, serve a safe haven for investors in terms of crisis? All the studies conducted before mid-2018 are highly positive for Bitcoins. Gkillas and Longin (2018) have investigated the potential benefits of bitcoin during extremely volatile periods. Using multivariate extreme value theory to model the tail dependence structure, and by combining equity markets with bitcoin, they have found that "*the correlation of extreme returns sharply decreases during market crashes, indicating that bitcoin could provide the soughtafter diversification benefits during turbulent times*. They even concluded that such evidence indicates that bitcoin can be considered as the new digital gold. In the same vein, the Baur – Hong – Lee (2018) analysis find that Bitcoin is uncorrelated with traditional asset classes such as stocks, bonds and commodities both in normal times and in periods of financial turmoil.

Unfortunately, 2018 gives a different picture. Bitcoin has been created 10 years ago, and in the last 10 years, no crisis chocked seriously bonds and stocks. The track record of Bitcoin as safe haven and diversification asset is simply non-existent ... the year 2018 (not covered by the studies mentioned), with declines of both bonds and fixed income assets, tend to prove that Bitcoin is neither a "safe haven" (see section III.4. for further details about the behaviour of gold and Bitcoin in 2018), nor the "new digital gold".

All the studies nevertheless have a very consensual result: The Baur – Hong – Lee (2018) analysis of transaction data of Bitcoin accounts shows that **Bitcoins are mainly used as a speculative investment and not as an alternative currency and medium of exchange**. The conclusion of the Gangwal – Longin (2019) study is also crystal-clear: the interpretation of the characteristics of Bitcoin in terms of statistical properties allowed the authors to assert that **bitcoin should be considered as a speculative asset prone to bubbles**.

III.2.4. Cryptocurrencies have some assets, but two major drawbacks: volatility and environmental issues

The use of cryptocurrencies as a means of payment has several advantages:

- The absence of intermediaries: states, banks and other traditional financial intermediaries cannot influence a transaction,
- The absence of exchange fees (apart from the payment of "miners"): the crypto-asset is the same wherever you are in the world, so there is no charge to move from one currency to another,
- An internet access is sufficient to make a transaction (1.7 billion, the number of people not banked in the world),

- Transactions are carried out in strict confidence: a cryptocurrency is a digital asset designed to work as a medium of exchange transactions, to control the creation of additional units, and to verify the transfer of assets.

However, there are – at least – two major drawbacks:

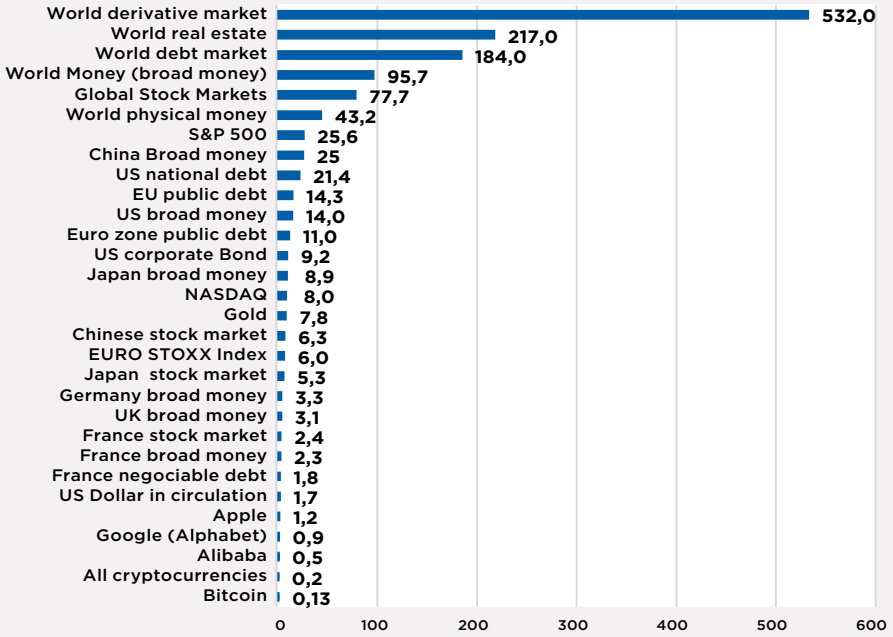
1. **High volatility.** The value of a cryptocurrency can vary from 10-20% or even 100-200% in just one day. However, it is less and less the case for the most valued cryptos like bitcoin. Stablecoins address directly this issue.
2. **Environmental issues. Cryptocurrencies are virtual, but the negative impact of most of them on the environment is very real**. This has been demonstrated in recent years by a number of scientific studies involving mining, the process by which transactions are validated on blockchains thanks to considerable computing power. At the end of July 2019, the average annual electricity consumption of bitcoin, for example, was 60 terawatt hours, according to the Cambridge Bitcoin Electricity Consumption Index. Said differently, the annual electricity consumption of Bitcoin alone is higher than that of Switzerland (58 terawatt hours), Qatar, Greece or New Zealand ... and is equivalent to 0.27% of that of the whole planet ... In 2017, bitcoin already consumed more energy than more than 150 countries. Each validation of a block of transactions in Bitcoin requires 300 KWH, the equivalent of working with a laptop during 1.5 years, using a freezer during nearly 2 years, or watching TV during around 1500 hours (source: EDF). One of the two VISA data centres require 2% of the electricity required by Bitcoin. The two VISA data centres analyse 200 million transactions per day while the Bitcoin network is made of 350 000 transactions only. That is the reason why several companies have recently launched different projects to reduce the ecological footprint of their blockchains. Bitcoin has announced they will soon unveil new technological solutions to halve the energy resources required for the mining operations. Litcoin (ranked # 4 in terms of capitalisation) is currently transforming its blockchain so that transactions are validated without the use of any mining.

III.3. 3rd competition / war: C-MONEY vs. CB-MONEY: will cryptocurrencies compete with the currencies issued by CBs?

The most likely answer is "NO". Size matters. The total market capitalisation of all cryptocurrencies is below USD 300 billion, while broad money (M3) in the US alone is around USD 14 trillion (see graph below). The number of transactions in cryptocurrencies is anecdotic compared to sovereign

currencies and in their current form and size, cryptocurrencies do not pose any immediate risk to financial market stability. Price volatility and size issues also raise concerns about the viability of cryptocurrencies as a medium of exchange and a store of value.

Graph # 4: Cryptocurrency market capitalization in comparison with other markets (in $ trillions)



Sources: Central Banks data, CoinMarketCap, Bloomberg

In most of the countries, sovereign currencies should remain unchallenged but there are places where the potential of cryptocurrencies might be more significant:

- Countries where the sovereign currency remains inconvertible;
- Countries where the population cannot access to financial services. McKinsey Global Institute concluded from a study that the provision of financial services by mobile phone could increase the GDP of emerging markets by 3.7 trillion US dollars within a decade;
- Countries where economic agents do not really trust the sovereign currency due to its poor record of (price) stability;
- Countries where economic agents do not really trust the sovereign currency due to political and economic uncertainty;
- Countries where there is a strong will to reduce the link to the USD;

- Countries where the cost of maintaining (or implementing) a "traditional" currency is too high;
- Countries where a centralised currency is not efficient...

Such countries already struggle with the phenomenon of currency substitution in the form of spontaneous "dollarisation" or "euroisation", cryptocurrencies may offer another avenue for currency substitution ... but for cryptocurrencies to compete better with sovereign currencies (including the "big ones"), significant progress on speed, transparency, safety, and ease of use seem still necessary. As Moody's (2019) recently recalled, there are four major uses of cryptocurrencies:

- **Speculative digital instruments,**
- **Potential alternative medium of exchange**,
- **Technological improvements in the new payment ecosystem**: *"The promise of DLT, which underlies cryptocurrencies, enables the decentralization of trust. It has the potential to modernize the financial infrastructure to build a new payment ecosystem as the economy becomes increasingly digitised"*.
- **New functionalities for providing access to goods or services**: *"Crypto tokens provide blockchain network participants with new functionalities other than serving as a payment intermediary. They can grant access to rights, goods and services on their blockchain platform"*.

III.4. 4th competition / war: "new" currencies (C-MONEY) vs "old" currency (GOLD)

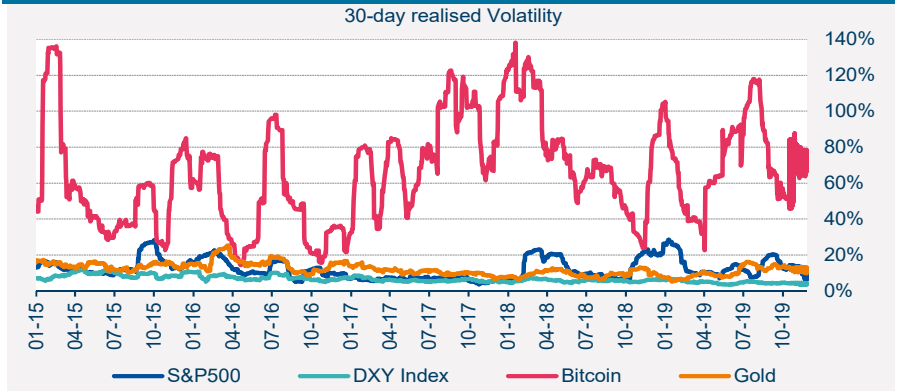
Some observers or analysts - strong advocates of cryptocurrencies in general and Bitcoin in particular - tend to consider that cryptocurrencies are diversification assets, especially in times of stress. In other words, cryptocurrencies could be considered as a safe haven, just like gold. It was all the easier to assert that since the creation of Bitcoin, there had been no real period of stress or crisis ... so there was no way to challenge such statements statistically ... until the end of 2018, when all classes of so-called traditional assets (bonds and equities) fell sharply. The least we can say is that Bitcoin has fell to keep its promises. During the last quarter of the year, the period during which stress and market decline were the strongest:

- Bitcoin was much more volatile than the assets it was supposed to hedge;
- Its performance was much worse than the market that suffered the most among traditional asset classes, i.e. the stock market;
- The correlation of its return with that of equities has been positive. There is no inverse relationship between negative S&P500 returns and positive Bitcoin returns.

- More specifically, for negative or extreme negative S&P500 returns, Bitcoin does not systematically yield positive returns which renders Bitcoin not a safe haven asset.
- Bitcoin is both uncorrelated with the S&P500 on average and in periods of extreme losses. This is also consistent with the excess volatility of Bitcoin.

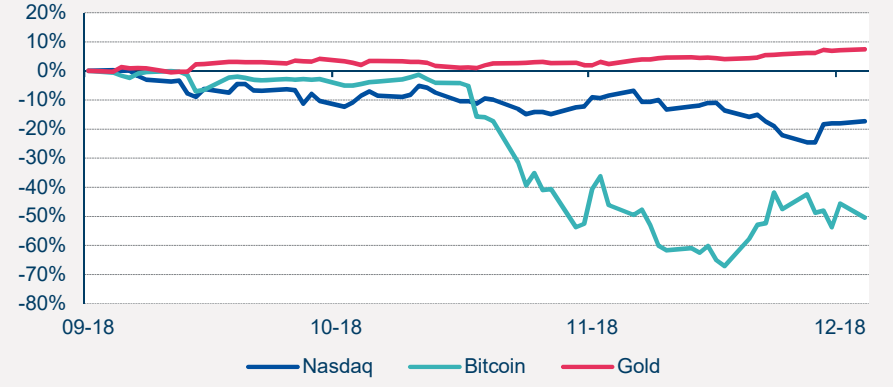
The graphs below summarise the lack of interest of bitcoin as safe haven in 2018. An asset with no history as a safe haven, and a poor track record during the first period of crisis it faces, is unlikely to be considered "safe" in an economic or financial crisis.

Graph # 5: Volatility of Bitcoin, S&P 500, DXY index and gold – 2012 – Oct. 2019



Source: Datastream, Amundi

Graph # 6: Bitcoin vs Nasdaq and gold - Q4 2018 price performance



Source: Datastream, Amundi

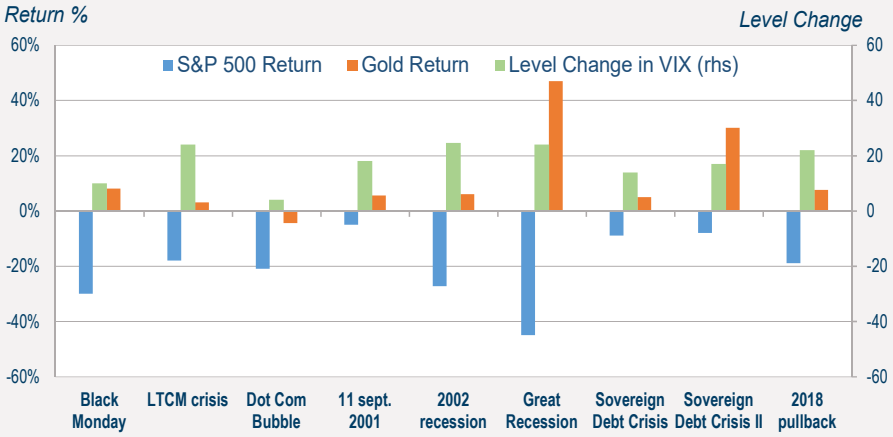
Table # 5: Performance and correlation: gold, bitcoin, Nasdaq and S&P 500 in 2018Q4

	Performances T4 2018	Correlation T4 2018			
		S&P500	Nasdaq	Bitcoin	Gold
S&P500	-13,5%	100%	96%	2%	-2%
Nasdaq	-16,8%	96%	100%	6%	6%
Bitcoin	-44,1%	2%	6%	100%	6%
Gold	7,5%	-2%	6%	6%	100%

Source: Datastream

At the same time, gold offered lower volatility, a positive performance, and negative correlation. In other words, Bitcoin has not been able to compete with gold at all as macro-hedging and safe haven values. History recalls that gold has appreciated during all periods of stress and crisis (equity market decline, volatility increase – graph # 7): Black Monday, LTCM crisis, Dot.com bubble burst, September 11, the 2002 recession, the great recession, the European sovereign debt crises, the 2018 pullback .... **Gold has long track record as a safe haven.**

Graph # 7: Gold price increases in systemic risk periods - S&P 500 and gold return vs VIX (*)

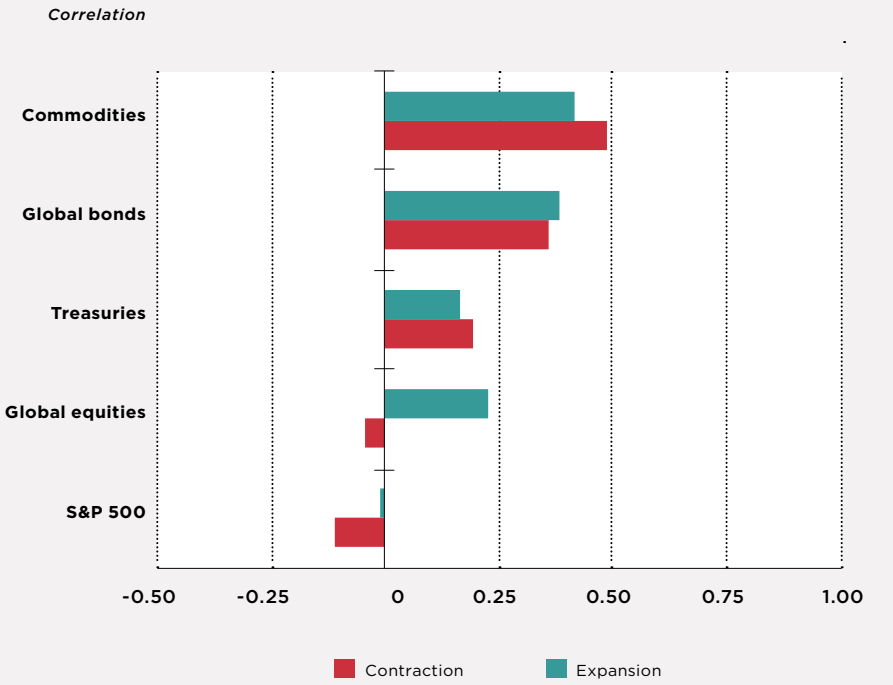


(*) The VIX is available only after January 1990. For events occurring prior to that date annualised 30-day S&P 500 volatility is used as a proxy.
Dates used: Black Monday: 9/1987–11/1987; LTCM: 8/1998; Dot-com: 3/2000–3/2001; September 11: 9/2001; 2002 recession: 3/2002–7/2002; Great Recession: 10/2007–2/2009; Sovereign debt crisis I: 1/2010–6/2010; Sovereign debt crisis II: 2/2011–10/2011; 2018 pullback: 10/2018-12/2018.

Source: Datastream, Amundi

Gold has little to no correlation with other major assets. As a consequence, it is effective as a portfolio diversifier, reducing portfolio risk and volatility. And even if gold is part of the commodities group, its correlation to other commodities is also limited. According to the World Gold Council (2019), *"gold's lack of correlation to other major assets transcends the economic cycle too, applying in periods of economic expansion and contraction (graph # 8). This means that gold is a valuable counter-cyclical asset".*

Graph # 8: Gold, an effective diversifier in periods of economic contraction: Correlation between Gold and other major assets (*)



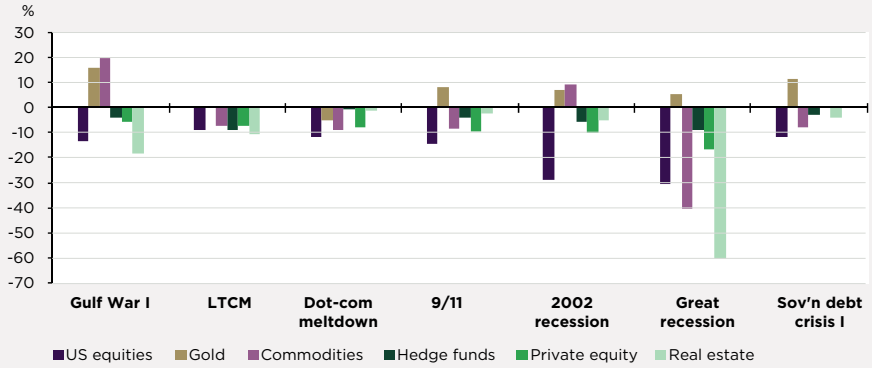
*As of 31 December 2018. Based on monthly returns from January 1987 to December 2017 of the S&P 500, MSCI ACWI ex US,JPMorgan US Treasury Index, BarCap Corporate Bond Index, S&P GS Commodity Index and LBMAGold Price. Business cycles as defined by the National Bureau of EconomicResearch (NBER).

Source: Bloomberg, ICE Benchmark Administration, NBER, World Gold Council

Moreover, history recalls that gold has been the sole asset to appreciate during all periods of stress and crisis, (see graph # 9). Bitcoin cannot compete with gold.

Graph # 9: Equities vs. gold vs. commodities vs. hedge funds vs. private equity vs. real estate in times of crisis

Returns during periods of systemic risk



Source: Bloomberg, World Gold Council

There are some similarities between the supply profile of gold and Bitcoin, though. The number of bitcoins increases around 4% per year, and it is engineered to decline to zero growth around 2140. In the same way, the production rate of gold is small and steady: on average, around 3000 tonnes of gold have been mined every year, i.e. the equivalent of 1.7% of the total stock of gold ever mined. Bitcoin's future diminishing growth rate and ultimate finite quantity, and gold's scarcity and marginal annual growth, are attractive attributes. This characteristic is not sufficient to consider that Bitcoin look like gold. In reality, **gold is very different from Bitcoin**:

- **Gold is less volatile than bitcoin** which moves, on average, 5% per day, i.e. a level nearly as high as the realised volatility of the VIX;
- **Gold has a more liquid market than Bitcoin**: Bitcoin trades US$2bn, on average, a day, which is roughly equivalent to the world daily trading volume of gold-backed exchange-traded funds (ETFs). The volume of trades in Bitcoin is less than 1% of the total gold market that trades approximately (US$250bn a day).
- **Gold demand is diverse, while Bitcoin demand is highly concentrated**: Gold has a 7,000-year history as an asset and a long-standing role as money. It is owned by central banks, as well as institutional and retail investors.
- **Gold supply is responsive:** another major difference with Bitcoin is the existence of a large recycling market. The gold market benefits from a very price-responsive recycling market (for example, when gold prices rise, some consumers sell gold, which limits the magnitude

of the fluctuations). For the past 25 years, recycled gold accounts for around a third of total supply. This helps maintain balance in the gold market and contributes to lower price volatility.

- **Gold has a well understood role in an investment portfolio**: cash, futures, options, ETF ... it is possible to include liquid products on gold in portfolios for long term investment, short terms investments, macro-hedging purposes. Bitcoin is a speculative asset only.
- **Gold holdings is safer than Bitcoin holdings**: the opportunities to spend bitcoin are rather limited, and transactions are quickly converted into fiat currencies due its price volatility.
- **Gold trades in an established regulatory framework, while regulation just started for cryptocurrencies**. Uncertainty still exist as regard the limitations and the authorisations, due to the risks / dangers for monetary policy, banks and financial stability. Gold trade is not banned anywhere, which is not the case for cryptocurrencies. Regulation might be reinforced as regard cryptocurrencies, while there is no uncertainty on gold.

To sum up, Bitcoin did not exist in 2008, when the Great Financial Crisis destroyed most financial markets, and it did not protect against the shock of 2018; it has also experienced phases of collapse without comparison, it is not a genuine safe haven, it is not the digital gold and it is the subject of irregularities and frauds ...

As mentioned earlier, Bitcoin's price has fluctuated immensely over the past 2 years, reaching more than $17,000 in December 2017 before dropping below $3,200 in November 2018. It trades at $7,100 at present (Dec. 12), down from almost $12,000 mid-August this year, that means -30% in 4 months. That said, **let's be fair to Bitcoin and render unto Caesar the things that are Caesar's: Bitcoin has been, since its creation, an asset whose return exceeds all other assets.**

The table below refers to the total Return (in %) on an initial investment of USD 100 in January 2011. Bitcoin squashes any other investment. Such an investment is valued at $2.3 million at present (December 11). Tesla is ranked second, with a $100 investment now valued at 1324 (1224%). Amazon, another top performer of big tech, would have given a USD 972 (872%). Alibaba has performed the worst in our sample of big techs, doubling an investment of USD 100 in 2014 to USD 218. Note that gold (without any major crisis, without any inflation, and with the longest business cycle in US history ...) has not performed well during the last decade: 4% only for the entire period of 2011 – 2019. **Because of its volatility, frauds, hacking, market rigging ... Bitcoin has received its fair share of criticisms and hostilities. But in terms of total return, Bitcoin is undoubtedly the investment of the last decade!**

Table # 6: Total return of an intial $100 investment in 2009 in different assets and indices		
	Total Return (%) on an Initial $100 Investment in 2011 (*)	Market cap in USD (Dec 11, 2019)
Bitcoin	2 324 874%	130 bln
Tesla	1 224%	64 bln
Amazon	872%	870 bln
Microsoft	576%	1.16 trln
Apple	575%	1.2 trln
Airbus group	574%	108 bln
Facebook	429%	577 bln
Nasdaq	401%	-
Google – Alphabet	352%	928 bln
JPMorgan	300%	421 bln
LVMH	258%	225 bln
S&P 500	201%	-
L'Oreal	199%	159 bln
Berkshire Hathaway	177%	544 bln
Walmart	176%	338 bln
Unilever	157%	120 trln
ENEL	134%	78 bln
Alibaba	118%	549 bln
Sanofi-Aventis	116%	123 bln
Nikkei	103%	-
Volkswagen	66%	86 bln
Total	61%	127 trln
Hang Seng	59%	-
Dax	57%	-
Euro-stoxx	54%	-
Siemens AG	46%	111 bln
Daimler AG	22%	59 bln
Gold (ounce)	4%	-
General electric	-19%	96 bln
Carrefour	-40%	13.4 bln
Telefonica	-48%	35 bln

Source: Datastream

** All data: January 3, 2011 (except Alibaba (September 19, 2014) and Facebook (May 18, 2012)) – December 11, 2019.*

III.5. 5th competition / war: 1st generation of cryptocurrencies vs. 2nd generation (stable coins) ... Bitcoin vs. Libra

The "stablecoins" (the 2nd generation of DCs) **appeared to solve the problem of price volatility of crypto-assets such as bitcoin** that prevents their mass adoption, while retaining the benefits of a virtual currency (instantaneity, peer-to-peer exchange). Their value is linked, indexed, to a currency (usually at a parity of one for one), a real asset (precious metal, gold or real estate for example), another cryptocurrency or a basket of assets. A stablecoin is issued by a central entity that must hold the actual assets to which it is attached, for example the equivalent of coins issued in escrow dollars. The best known are Tether ($ 3.5 billion in capitalisation), USDC, DAI, Havven, TrueUSD, Gemini ... and the Libra consortium built around Facebook. The most frequent criticism of stablecoins is the lack of decentralization, since the stable corner depends on an entity.

There are three types of stablecoins:

- **The "fiat-collateralized stablecoin":** the entity issuing the stable coin is the holder of a bank account containing in fiat currency the equivalent value of the issued tokens. If 10 million dollar-backed coins are in circulation at a 1 for 1 parity, then it must hold $ 10 million in a bank account. Examples: Tether and TrueUSD (both backed in US dollar).
- **The "crypto-collateralized stablecoin":** This is a stablecoin backed by another cryptocurrency. To offset the volatility of the underlying asset, the stablecoin must be over-backed. For example, an equivalent of $ 1,000 worth of bitcoins may be required to issue the equivalent of $ 500 worth of bitcoin-backed stablecoins. Even if the bitcoin loses one third of its value, the stablecoin remains covered. Examples: DAI and Havven (both backed by Ethereum), Bitshares, Maker.
- **The "non-collateralized stablecoin":** the stablecoin is in this case supported only by its value thanks to a "smart contract" (a contract that runs automatically). If the total demand for the stablecoin increases or decreases, then the contract will automatically change the number of coins in circulation to keep the price stable. Example: Basis, Basecoin, Kowala.

What are the advantages of a stablecoin?

- **An alternative to currencies for certain platforms:** given the lack of agreement with banks for access to foreign currencies, some Asian platforms do not accept the dollar. The stablecoins are a good alternative of means of payment.
- **A response to risk aversion:** A cryptocurrency with a stable price reassures many players to start with institutional investors who are mostly afraid of the risk of volatility;

- **A haven compared to traditional crypto-assets**: Investors are also banking on stablecoins for a short period of time until the market stabilises again. They do not make a profit but the funds are safe;
- **Potential attraction for retailers:** Due to its high volatility, retailers have almost always refused to accept bitcoin. If stablecoins prove to be stable, retailers could be tempted to integrate them into their payment systems.

Stablecoins still bear important risks.

Stablecoins represent significant improvements in terms of volatility and execution. They have been adopted rapidly in some places. M-Pesa ("on us" model on mobile phones) in Kenya (and East Africa), Alipay and WeChat Pay transactions in China are the best examples. 98% of Kenyans over age 14 pay with M-Pesa? While the value of e-money transactions in China, such as with WeChat Pay and Alipay, surpass those worldwide of Visa and Mastercard combined. But, as many authors and especially Adrian & Mancini – Griffoli (2019b)) points out, major risks remain.

- **1st risk: banks may lose too much deposits to stablecoin providers**. Banks will have to compete with stablecoin providers and offer their own innovative solutions ... and higher interest on deposits. As mentioned earlier, stablecoin providers could decide to engage themselves in maturity transformation by turning themselves into banks.
- **2nd risk: monopolies.** Tech giants could use their networks to shut out competitors and monetise information. Access to data on customer transactions is crucial and strategic. New rules for data protection, control, and ownership are crucial too.
- **3rd risk: a threat to weaker currencies**. Where high inflation and weak institutions prevail, there is a risk that citizens give up local currencies for stablecoins in foreign currency. This new form of 'dollarisation' would undermine monetary policy, local markets .... Will some countries be forced to ban or restrict foreign currency stablecoins?
- **4th risk: stablecoins might foster illicit activities**. Stablecoin Providers must prove they prevent the use of their networks for activities like money laundering and terrorist financing.
- **5th risk: the loss of 'seigniorage'**. Central banks have long captured the profits stemming from the difference between a currency's face value and its cost of production. As Adrian & Mancini – Griffoli (2019b) recall, *"Issuers could siphon off profits if their stablecoins do not carry interest but the hard currency backing them is invested at a return. One way to address this issue is to promote competition so issuers would eventually pay interest on coins"*.
- **6th risk: consumer protection**. This calls for legal clarity on the definition of stablecoins as financial instrument (see Loi Pacte in France).

- **7th risk: financial stability**. This calls for a full transparency of the technicalities of stablecoins (see the controversies about some stablecoins, of which Tether).
- **8th risk: hacking, infrastructure risk …** It calls for top security processes.

All in all, despite the risks mentioned above, stablecoins (i.e. the 2nd generation of cryptocurrencies) compete with the first generation of cryptocurrencies. They even may replace them. By no surprise, **some consider the Libra as "the Bitcoin killer"**.

What is Libra?

According to Libra Associaton's whitepaper, the Libra is "*designed to be a stable digital cryptocurrency that will be fully backed by a reserve of real assets — the Libra Reserve — and supported by a competitive network of exchanges buying and selling Libra. That means anyone with Libra has a high degree of assurance they can convert their digital currency into local fiat currency based on an exchange rate, just like exchanging one currency for another when traveling.*"

Here's the full list of Libra's 28 Founding Members (21 members at present - Mastercard, eBay, Visa and Paypal have quitted the association in 2019):

- **Payments**: Mastercard, PayPal, PayU, Stripe, Visa Inc.
- **Technology and marketplaces**: Booking Holdings, eBay, Facebook's subsidiary CalibraFarfetch, Lyft, MercadoPago, Spotify, Uber
- **Telecommunications**: Iliad SA, Vodafone
- **Blockchain**: Anchorage, Bison Trails, Coinbase, Xapo
- **Venture capital**: Andreessen Horowitz, Breakthrough Initiatives, Ribbit Capital, Thrive Capital, Union Square Ventures
- **Nonprofit and multilateral organizations, and academic institutions**: Creative Destruction Lab, Kiva, Mercy Corps, Women's World Banking

Libra would be a stablecoin pegged to a basket of 5 fiat currencies (with 2.4 bln potential clients over the world): the US dollar (50%), the Euro (18%), the Japanese Yen (14%), the British Pound (11%) and the Singapore Dollar (7%). Note the absence of the Chinese Yuan.

Each of Libra's Founding Members has allocated a minimum of USD 10 million each to fund the project.

Libra would be backed by low-volatility assets, such as "*bank deposits and short-term government securities in currencies from stable and reputable central banks.*"

The table below compares Bitoin and Libra and focuses on the major differences between these "monies": **the superiority of Libra to Bitcoin seems evident**.

Table # 7: Bitcoin vs. Libra: the major differences	
Bitcoin	**Libra**
Permissionless (public) blockchain	Permissioned (private) blockchain
Completely decentralized	Partly centralized
Trust resides in Bitcoin network to reach consensus	Trust resides in Libra Association as a "central bank"
High price volatility, based on market conditions	Stable value, pegged to fiat currencies
Finite supply (21 million BTC max)	Issuance based on demand and supply
Not backed by real-world assets	Backed by real assets
Any party with enough computing power can help govern Bitcoin	Only chosen entities are allowed to help govern Libra

Source: CoolBitX (2019).

III.6. 6th competition / war: US global stablecoin vs. Chinese (global) stablecoin … Libra vs. Venus: a tough war to come soon?

We have just shown that global stablecoins like Libra can compete with fiat currencies, only if they have the ability to appear as a means of payment, store of value, unit of account and safe haven. This is not the case (not yet?), but it is not necessary to swear anything. BoE governor Mark Carney, a Bitcoin-skeptic, said a few months ago (in August 2019) that "*a new global digital currency could dampen the domineering influence of the US dollar on global trade… If the share of trade invoiced in [a digital currency] were to rise, shocks in the US would have less potent spillovers through exchange rates*". He also suggested that "*a libra-like currency should become the world's reserve currency*" (note that a "*libra-like currency" does not mean a private global stablecoin, but a public digital basket of fiat currencies*".

Central banks are interested in the evolution of the monetary landscape, and more specifically in stablecoins. Note that there is no global stablecoin currently, only projects. A war between global stablecoins seems inevitable, though. In fact, the war that we identify between China and the United States on politics and economics, and between the US dollar and the renminbi, will be found at the level of global stablecoins.

Current stablecoins projects give pride of place to the US dollar. Libra (50% USD, with 2.4 billion customers) Walmart's Units (a stablecoin pegged to

the US dollar, with 275 million of customers) or Viber (a messaging app with more than 800 million issuers) are all "promoting" the US dollar. Walmart is not as big as the Libra association (275 million customers vs. 2.4 billion customers), but it represents at present 2442 stores in Mexico, 811 in Central America, 663 in the UK, 443 in China, 436 in Africa, 411 in Canada, 371 in Chile, 332 in Japan, 92 in Argentina, 22 in India...

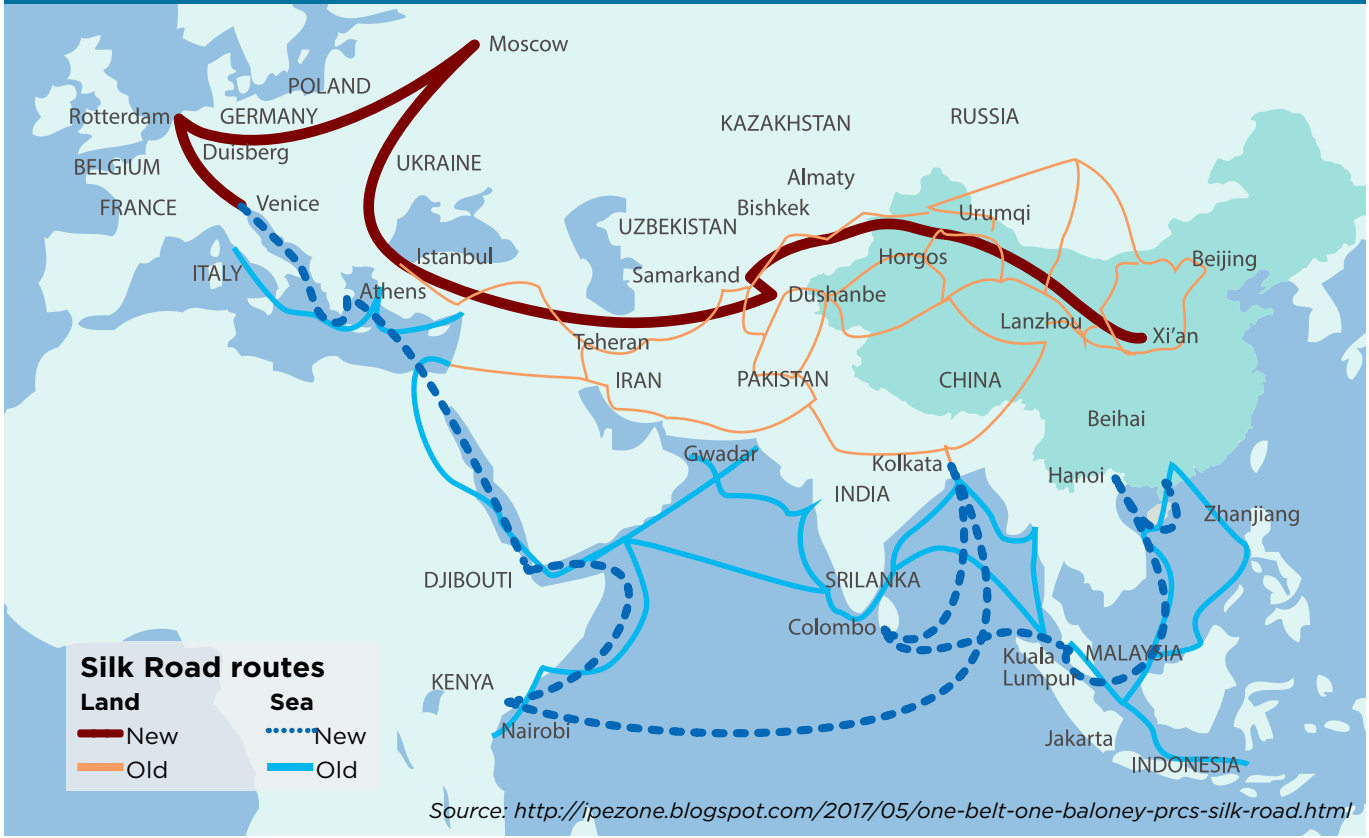
To counter the threat of Libra and possibly derail its chances of launching, the People's Bank of China (PBoC) has announced that they will release the DCEP (Digital Currency / Electronic Payments), their own stablecoin, based on the Chinese Renminbi. The DCEP might be the only large-scale stablecoin that the Chinese government will allow.

On August 19, to counter the Libra either, Binance (the world's leading digital exchange, a Hong Kong Chinese company) announced they will soon launch their own competing project called "Venus". This project runs on their native Binance Chain and would constitute a "Belt and Road" version of Libra (an "*independent and autonomous, regional version of Libra*") that will resemble to the Belt and Road initiative of the Chinese government, a project that aims to connect Asia with Europe and Africa through land (Road) and sea (Belt) networks. Venus is expected to be a structure aimed at issuing crypto-assets backed by fiduciary currencies (fiats) at the scale of nations or geographic regions. To stimulate the creation of new digital currencies, Binance seeks to partner with governments or large companies with "*regional influence*" (as said in the official brochure). This stands in stark contrast to Facebook's stablecoin Libra model, which is sold as a unique, global cryptocurrency.

Libra and Venus projects want to operate on a global mainstream scale, but Binance aims to "*develop localized stablecoins and digital assets pegged to fiat currencies across the globe*". Binance plans to approach countries case-by-case in order to avoid the regulatory avalanche that hit Libra. The Venus project targets non-Western countries, with China first.

In other words, the future war between global stablecoins may be summed up as competition between dollar-dominated (Libra) or dollar-based stablecoins and a Chinese platform of national / regional bitcoins (Venus) that reinforce the "Belt and Road" initiative, one of the key projects of the Chinese government (to see the scale of the project, see the map below).

New and old silk road routes map



Source: http://ipezone.blogspot.com/2017/05/one-belt-one-baloney-prcs-silk-road.html

IV. Will central banks create their own digital currencies? New wars coming ...

The position of central banks has evolved considerably in recent years: from indifference (at least in appearance) at the very beginning, central banks have become critical and sometimes even frankly hostile, highlighting the dangers of these so-called currencies. But central banks have, however, always looked closely at the technology that serves crypto-assets because it can make payments more efficient. They have therefore embarked on the study of digital currencies, in the idea that they themselves could launch their own digital currency, especially to counter the private digital currencies, or to improve payment systems ...

IV.1. 7th competition / war: C-MONEY vs. CB-DC – central banks and private cryptocurrencies

IV.1.1 From hostility to pragmatism

In the mid-2010, central banks (from democracies and "illiberal democracies") were sceptical or even negative about cryptocurrencies, although views might diverge drastically from a country to another (E. Lam (2017)). Randal Quarles, vice (chairman of the **Fed**'s supervisory committee, considered that cryptocurrency was likely to become an issue for monetary policy. **ECB** Vice-President Vitor Constancio referred to a "tulipmania" (a bubble), Benoît Coeuré warned about the instability of the price and the links with tax evasion and organized crime. Mr Draghi for his part considered that the impact of cryptocurrencies remains limited and safe ... so far. The **Reserve Bank of India** and the **Bank of Korea** were totally hostile to Bitcoin, because they fear that cryptocurrency would be used for money laundering and terrorism financing. Elvira Nabiullina, governor of **Russia**'s central bank, was fiercely opposed to any private currency, whether physical or virtual: according to Sergey Shvetsov, a deputy governor, the central bank even planned to block Web sites that provide access to bitcoin exchanges. The **People's Bank of China** had taken control of cryptocurrencies and banned trading. The **Bank of Japan** was still in the study phase. Mark Carney, governor of the **Bank of England**, spoke of a real revolution but did not think that the BoE would issue a digital version of the sterling anytime soon. The **Central Bank of New Zealand** believed in cryptocurrency, but not in the form taken by Bitcoin: more speculative than payment tool, he considered the current situation as a dangerous bubble. Same view in **Germany** and **Australia**, where the central bank governors were talking about speculation and not about payment. Same restriction also from the **Bank of France**: Governor F. Villeroy de Galhau recommended caution towards

bitcoin because of the lack of public institutions in its governance, and he recalled at that time that the examples of private currencies have always been badly finished in history. The attitude of **Morocco** was even more extreme: according to a recent statement by the governor of the central bank (November 2017), crypto-currencies violate the rules of exchange regulation, and any transaction is against the law and subject to sanction. **Bank of Canada** considered cryptocurrencies as financial assets and not as real currencies. The Netherlands and the Scandinavian countries went a little further, experimenting with cryptocurrencies. The **Dutch central bank** created its own cryptocurrency (the DNBcoin) to better understand how it works and recognizes the blockchain's interest in the settlement of financial transactions, including complex transactions. The **Central Bank of Sweden** and the **Central Bank of Norway** did not seem hostile to the introduction of digital currencies (Sweden ready to launch e-krona, according to the governor S. Ingves). The **Central Bank of Denmark** had a different opinion, and fears of seeing the digital currencies facilitate bank runs were mentioned. The **Bank of International Settlements (BIS)**, the central bank of central banks, recognized the success of cryptocurrencies, but also raised the risk of bank runs, which always goes hand in hand with a sharp contraction of bank deposits in particular. In other words, Bitcoin deserved a thorough analysis of the assets and especially the risks associated with it. All in all, **if the blockchain technology appeared useful - and in most cases irreversible - to all central banks, it was not the same for cryptocurrencies**. Indeed, central bankers associated cryptocurrencies to bubble, organised crime, terrorism financing, tax evasion, speculation, money laundering, lack of governance, deficient control, lack of regulation, potential bank runs, lack of transparency ...

In the mid-2010, although views might diverge drastically from a country to another, central banks were globally sceptical or even negative about cryptocurrencies. However, in very recent years, they have opened the door to the concept of cryptocurrencies. This attitude lies on several factors:

- The increasing use of electronic payment methods and the increasingly lower use of coins and notes (Scandinavia);
- An opportunity to create its own currency (Marshall Islands);
- The will to be a major player (China) ... currency competition as an incentive;
- The mistrust on some currencies (Venezuela, where it is also perceived as a way to circumvent embargos?);
- The multiplication of cryptocurrencies, a sign of growing demand;
- The decision of "small" or emerging countries struggling to switch to cryptocurrency (cheaper to manage);

- The "Big Tech" offensive, of which the Libra consortium (Facebook and 27 partners – at the very beginning - such as Visa, Mastercard, eBay, PayPal, Uber, Spotify, Iliad ...): a danger for cb-money;
- The technology never stopped improving and look attractive to central banks for their own projects. Blockchain is now overtaken by better technologies: Tangle, much more rapid than Blockchain, has for example been adopted by the Riksbank for its own public cryptocurrency e-krona.

European Central Bank policymakers have mixed feelings over Libra, but senior executives call it a "*wake-up call for central banks*". At a press conference at the end of June, the governor of the Banque de France, F. Villeroy de Galhau, has announced the creation, within the framework of the G7, of a working group dedicated to "stablecoins", i.e. indexed cryptocurrencies (like libra or tether) on conventional currencies. This group, led by Benoît Coeuré, Executive Board member of the European Central Bank, studied "*how central banks ensure that issuers stablecoins comply with the regulations*, "particularly with regard to consumer protection and the fight against money laundering. The task force has deliver its report last October:

By linking its value to that of a pool of assets, "*stablecoins might be more capable (than the first generation of cryptocurrencies) of serving as a means of payment and store of value, and they could potentially contribute to the development of global payment arrangements that are faster, cheaper and more inclusive than present arrangements*". "*Stablecoins, regardless of size, pose legal, regulatory and oversight challenges and risks related to i) legal certainty, ii) sound governance, iii) money laundering, terrorist financing and other forms of illicit finance, iv) safety, efficiency and integrity of payment system, v) cyber security and operational resilience, vi) market integrity, vii) data privacy, protection and portability, viii) consumer/investor protection and ix) tax compliance*". According tho the conclusions of the working group, "*stablecoins that reach global scale could pose challenges and risks to monetary policy, financial stability, the international monetary system and fair competition*".

IV.1.2. Will DCs represent risks for monetary policy and financial stability?

Policy makers and regulators could not decide to ignore crypto-assets, of which cryptocurrencies, nor to ban them. Both extreme approaches would have been wrong. They had to be considered and treated as any other financial instrument, according to their size, their complexity, and the underlying risks. Note that harmonising regulations (and taxation) is highly recommended, taking into account the trans-border character of these assets.

1st question: Will digital currencies cryptocurrencies have the potential to compete with the sovereign currencies issued by central banks?

The most likely answer is "NO". To some extent, the bitcoin and the Distributed Ledger Technology (DLT) can be considered as a success, but the role of DCs remains marginal. Mid-2018, i.e. 10 years after the creation of Bitcoin, the total market capitalisation of all cryptocurrencies was below USD 300 billion, while broad money (M3) in the US was around USD 14 trillion. The number of transactions in cryptocurrencies is anecdotic should one compare to sovereign currencies. This is definitely true in most of the countries, where sovereign currencies should remain unchallenged for the foreseeable future. For cryptocurrencies to compete better with sovereign currencies (including the "big ones"), significant progress on speed, transparency, safety, and ease of use seem still necessary.

2nd question: What are the risks if private cryptocurrencies serve as a medium of exchange?

All studies tend to conclude that as long as private cryptocurrencies are merely used as a medium of exchange and are not considered as a unit of account or as a store of value, the threats to monetary policy will be limited. In that case, cryptocurrencies circulated when the traditional money is exchanged by users wanting to use cryptocurrencies in transactions. In sum, cryptocurrencies are withdrawn from circulation) and exchanged back to traditional money as soon as the transaction is settled.

3rd question: Is financial stability at risk if private cryptocurrencies serve as a store of value?

The answer is YES ... however, in a previous section, we pointed out that cryptocurrencies could not be pretend to be considered as good store of value (capacity to transfer wealth from the present to the future), which is good for financial stability. In contrast to commodities (such as gold), private cryptocurrencies have no intrinsic value: they are nothing more than lines of computer code. Cryptocurrencies do not carry any legal value (they are not backed by a sovereign entity as is the case for traditional currency). The volatility of cryptocurrencies is one of the major stakes: it prohibits the widespread adoption, deteriorate the capacity to be a good store of value, and therefore limits any potential financial stability concerns. By no surprise, stablecoins emphasize this drawback.

4th question: Are monetary and financial stability at risk if private cryptocurrencies serve as a unit of account?

All studies conclude that the major risk for monetary policy would emerge if private DCs are generally accepted and used as units of account. In such a case, private cryptocurrencies could replace sovereign currency-denominated

regular money, including central bank money. According to Elliott – de Lima (2017), *"in the most extreme scenario, the economy is "bitcoinised", meaning that the alternative money would be used as the predominant form of money in the economy and euros would only be used for interactions with the government (such as to pay taxes), or even – one step further – that the government would accept private digital currencies for payment of tax obligations"*. What would be the consequences? In such a case, monetary policy would become less effective. If sovereign money no longer served as the base money in the economy, the central bank would essentially lose control over monetary conditions. The government's seigniorage income would also be reduced. A drain on regular money could also erode the central bank's capacity to act as lender of last resort in the event of bank liquidity shortfalls. The bigger the drain, the larger the erosion of this capacity, which in turn could increase the likelihood of bank runs. Last but not least, due to the limited supply of private cryptocurrencies (limited – and fixed - supply of amount), the takeover of cryptocurrencies might contribute to price deflation (goods, services and wages), with consequences that one can imagine.

5th question: Will cryptocurrencies substitute for traditional currencies as safe haven?

The answer is NO. It is unlikely that private cryptocurrencies serve as haven in flight-to-safety or flight-to-quality situations, and become substitute for traditional money. During crises, with a collapse in the banking sector for example, or if monetary policy fails to maintain price stability, it is unlikely to see economic agents fleeing to entirely new currencies such as cryptocurrencies. It seems much more reasonable to consider that they would go for long existing and trusted currencies such as established sovereign currencies (the usual suspects would be the USD, the CHF, the JPY ... or gold).

Stablecoins represent danger for financial stability. M. Kuroda (2019), governor of Bank of Japan, recently recalled that *"using stablecoins as a means of cross-border payment would facilitate and promote cross-border capital flows"*. In that sense, global stablecoins should deepen financial integration. However, financial stability might also be undermined by the emergence of stablecoins, and cooperative financial policies is a prerequisite to maintain it. "*That is the reason why the financial authorities and central banks have been coordinating and discussing how to address the issues raised by stablecoins"*.

To conclude on the potential risks of cryptocurrencies / stablecoins / global stablecoins (such as Libra) on monetary policy and financial stability:

- Monetary policy will be marginally challenged by these assets if they only serve as a medium of exchange;
- If these assets are considered as a good store of value, then both monetary and financial stability risks may be larger;

- If these assets are also used as a unit of account, then the risks are even much larger;
- Cryptocurrencies should not have the capacity to be considered as safe haven and substitute for traditional currencies;
- A larger adoption of cryptocurrencies / stablecoins / global stablecoins all over the world, and a lower volatility of cryptocurrencies might change the game radically. Stablecoins and global stablecoins like Libra are able to compete with the fiat currencies.
- As Bilotta – Botti (2019) recently stressed: "*maybe Libra will never see the light of the day … too ambitious perhaps*" … but Libra is not alone: other projects have already been announced, such as Telegram and Walmart. As regard central banks and financial stability, the risks that the Walmart units, Libra or any other project represent are similar..

IV.2. 8th competition / war: E-MONEY and C-MONEY vs. CB-MONEY, the death knell for paper money?

Will negative interest rate policies, e-commerce, new methods of payment and the fight against money laundering and organised crime spell the end of paper money?

In the countries with low or negative interest rates, a strong, if not uniform, tendency can be seen. If we look at the most recent data from the Swiss National Bank, we can see an increase in the demand for cash, particularly in high denominations: the number of 1,000-franc notes has grown steadily, doubling since the financial crisis. In the Eurozone, the trend is less clear. Nonetheless, data by the ECB show that demand for 500-euro notes has increased. In contrast, Sweden, which also applies negative interest rates, has seen a decline in the demand for high-denomination banknotes. Therefore, it is difficult to draw conclusions at this stage.

One reason why credit cards or electronic money in general are being used for an increasing number of ever smaller payments is better, quicker, easier and more widespread infrastructure. P. Volcker, a former chairman of the US Fed, even considered with a touch of humour that the ATM was the only financial innovation that had improved society (Volcker (2010)). The dissemination of electronic payments, and of cryptocurrencies to a lesser extent (one could say a marginal effect … so far) has reduced the use of notes and coins, i.e. central bank money. The table below points that, in value of transactions, cash represent in some countries the smaller – although still significant – portion of the payments. One can observe major differences between countries where cash is still important (Austria, Italy, Lithuania, Malta, Slovakia, Slovenia, Spain and Germany) and countries where cash has a secondary role (Belgium, Estonia, France, Luxemburg and Netherlands). Nevertheless, the importance of cash is globally diminishing.

Table # 8: Share of cash transactions per country (in number of transactions and in value of transactions)		
Country	Share of cash transactions per country in number of transactions	Share of cash transactions per country in value of transactions
Austria	85%	67%
Belgium	53%	32%
Cyprus	88%	72%
Estonia	48%	31%
Finland	54%	33%
France	68%	28%
Germany	80%	55%
Ireland	79%	49%
Italy	86%	68%
Latvia	71%	54%
Lithuania	75%	62%
Luxembourg	64%	30%
Malta	92%	74%
Netherlands	45%	27%
Portugal	81%	52%
Slovakia	78%	66%
Slovenia	80%	68%
Spain	87%	68%

Source: data from ECB – Deutsche Bundesbank – De Nederlandsche Bank (2019)

Central banks are not hostile to this trend. They in fact accompany and amplify it. There have been cases of countries **removing high-denomination notes** from circulation. The Fed eliminated $500 banknote, while Singapore is gradually eliminating its SGD 10,000 banknotes, which are no longer being printed. The European Central Bank decided, in May 2016, to stop producing €500 banknotes, suspected of facilitating illegal activities. The national central banks of the euro area stopped issuing the € 500 banknote at the end of April 2019. Others are taking **steps to limit payments in cash**. In France, for example, cash payments are limited to €1,000, compared to €3,000 previously. On the more extreme end, the Danish National Bank has announced that it

would no longer print banknotes as of the end of 2016 and that the country's retailers and restaurants would soon no longer be required to accept cash payments. Bulgaria, Croatia, Czech Republic, Greece, Spain, Portugal, Italy and many other countries have restricted the cash payments (see table below).

Table # 9: Cash payment limitations in Europe

Country	Cash payment limitations
Belgium	3,000 Euros (→ goods/services)
Bulgaria	9,999 leva (≈ 5,110 Euros)
Croatia	15,000 Euros
Czech Republic	350,000 CZK per day (≈ 14,000 Euros)
France	1.000 Euros (→ taxpayers based in France as well as for foreign salesmen) / 15,000 Euros (→ non-resident taxpayers)
Greece	1,500 Euros
Italy	2,999.99 Euros
Poland	15,000 Euros (≈ 62,220 PLN)
Portugal	1,000 Euros (→ goods and services between consumers and traders)
Romania	10,000 RON/person/day (≈ 2,260 Euros)
Slovakia	5,000 Euros (→ B2B-, C2B- und B2C-payments) / 15,000 Euros (→ natural person who is acting for purposes which are outside his or her trade)
Spain	2,500 Euros (→ residents) / 15,000 Euros (→ non-residents)

Source: European Consumer Centre Germany (2019)

With new forms of e-money and c-money, it is evident that payments are currently seeing another period of rapid innovation and transformation. The use of e-payments is booming, while technology companies and financial institutions are investing heavily to be the payment providers of tomorrow. However, despite the continuing digitalisation of the financial system, one can say, with Williams and Wang (2017), that ***"reports of the death of cash are greatly exaggerated***". Cash in circulation is, in fact, not dropping for most countries. "*The continuing demand for cash has been especially noticeable in advanced economies since the start of the Great Financial Crisis, but it is likely driven by store-of-value motives rather than payment needs*" (Bech and aalii (2018)).

The total elimination of paper money is nevertheless being seriously discussed, not only because of the rapid expansion of e-payments, and because it would help fight the black market and organised crime, but also since it would free central banks from any constraints on how deeply they can cut interest rates.

IV.3. 9th competition / war: Cash vs. CB-DC: Can CB-DC be considered as a good way to alleviate / eliminate the ELB (Effective Lower Bound) problem?

The total elimination of paper money is being seriously discussed, not only because it would help fight the black market and organised crime, but also since it would free central banks from any constraints on how deeply they can cut interest rates. Indeed, negative interest rates can have a direct consequence on the amount of banknotes and coins in circulation, as households may opt to stash their savings under the mattress rather than keep them in a bank account. Such a scenario would impact banks' liquidity but also hamper growth and the real economy. At its most extreme, a negative interest rate policy could even cause a decline in economic activity, with a noticeable deflationary impact. This illustrates one of the natural limitations of the negative interest rate policy. It is why some observers, including Kenneth Rogoff, former chief economist at the IMF, and Willem Buiter, former member of the Bank of England's Monetary Policy Committee, have called for the elimination of paper money: " *One cannot stash away cash if it doesn't exist anymore and payments become entirely electronic*". However, such an extreme measure would also eliminate states' rights (and advantages such as seigniorage) to print money.

The need for unconventional measures arose from a technological constraint – the inability to set negative interest rates on currency. Central banks can set negative rates on bank reserves (some banks have done so), but without the capacity to do so on currency, there is an incentive to switch to currency. Such a phenomenon, that hinders the effectiveness of monetary policy, is known as the Zero Lower Bound problem – or ZLB problem. This problem is not new. As Haldane (2015) recalls, it was discussed at the time of the previous largest and most damaging financial crisis, the Great Depression: J. M. Keynes (1936) warned of the ineffectiveness of low interest rates in his General Theory (the "liquidity trap" phenomenon). The ZLB problem disappeared from policy circles for roughly 70 years (Blanchard, Dell'Ariccia and Mauro (2010)). Moreover, based on studies conducted before the Great Financial Crisis, the ZLB problem looked nearly non-significant: according to Reifschneider – Williams (2000), for example, with a 2% inflation target, monetary policy would be constrained by the ZLB only around 5% of the time.

The current economic conditions have given to ZLB problem a central role. Lower potential growth, ultra-low inflation, worsening demographics, rising inequality ... are factors that have all lowered average nominal and real interest rates over the past 30 years. The macroeconomic volatility has also increased since the 2008 financial crisis, after more than two decades of "Great Moderation". As a consequence, monetary policy currently has lost

room for manoeuvre to fight recessions, compared to the past. In short, the ZLB resurfaced. Note that with negative interest rates, the ZLB is known as the ELB (Effective Lower Bound Problem).

Some studies reject the ELB problem, considering that the ELB does not necessarily reduce the effectiveness of monetary policy: by no doubt, the ELB restricts central banks' ability to cut short-term interest rates much below zero, but it does not reduce the capacity to pilot long-term interest rates. Forward guidance, asset purchases play this role (B. Coeuré (2015)). Let's assume the ELB problem exist, even partially. How to solve the ELB problem? There are 4 solutions:

1st solution: Abolishing cash completely: it is difficult to do it, especially when consumers tend to accumulate cash (high-denomination notes banknotes) for store-of-value motives. A ban on cash would also face some major social acceptance issues. Eliminating cash would infringe privacy rights, as only cash allows making anonymous transactions. Switching exclusively to electronic payments may create new security and operational risks. Last but not least, it would imply a loss of seigniorage income for the central bank.

2nd solution: Taxing the central bank currency. Another way for the authorities to remove the ELB without abolishing currency is to tax it, as proposed by Gesell (1916), and supported by Irving Fisher (1933) and John Maynard Keynes (1936) (see also Fukao (2005)). The idea is to avoid hoarding and accumulation of cash by penalising this behaviour. Here we find again the theme of depreciative currencies. As Gesell (1916) mentioned, *"As the owners of goods are always in a hurry for exchange, it is only just and fair that the owners of money, which is the medium of exchange, should also be in a hurry. Supply is under an immediate, inherent constraint; demand must therefore be placed under the same constraint."* This solution is technically feasible: it already existed in the past with the different "depreciative currencies" that have emerged in Germany in the early 1930s, in Austria in the 1930s and in Switzerland in the 1940s. It is also economically coherent: it would break the negative deflationary spiral well described by I. Fisher, which explains the strong support to such a solution by this famous economist. However, this solution is also socially complicated and politically dangerous, even unfair: savings do not pay much, negative rates are comparable to taxation of savings, savers keep money for precautionary purposes, and the State would then tax this hoarding behaviour! Undoubtedly a complex solution.

3rd solution: End the Fixed Exchange Rate Between Central Bank Reserves and Currency. The IMF (2018) has presented a solution for a gradual transition to demonetization: decoupling cash (fiduciary money) from central bank money (reserves, which pay interest, potentially negative), and linking the two via an exchange rate. This exchange rate would be driven by the central bank to control the conversion of digital currency into cash. In this way, an

economic agent who wishes to withdraw notes from an ATM should convert his deposits, valued in central bank money, into cash, at the conversion rate specified by the central bank. Conversely, a deposit of cash in his bank account would be valued in central bank money at the conversion rate which has been set. In other words, an agent who deposits 100 in cash could be credited a different amount on his bank account based on the value of the exchange rate.

In other words, a central bank that would like to apply negative rates on excess reserves (i.e. bank deposits at the central bank beyond compulsory deposits, as it is the case in the Eurozone in Japan, or in Switzerland or), could, at the same time, penalise the conversion of these reserves into cash by controlling the rate of conversion of cash into reserves.

4th solution: Issuing a central bank digital currency (CB-DC): it would effectively relax the ELB constraint. By replacing cash (instead of abolishing it) with an electronic currency, negative interest rates are possible. And it would not need to affect seigniorage income, and preserve anonymity to its users, like banknotes.

To conclude, the current economic conditions have given to ELB problem a central role. By (partially) substituting for cash, a CB-DC could relax the so called ELB - Effective Lower Bound's constraint on nominal interest rates, which could promote macroeconomic stability.

Table # 10: How to solve the ELB problem: a recap table

Solutions	Comments
1st solution: Abolishing cash completely	Difficult to do, especially when consumers tend to accumulate cash (high-denomination notes banknotes) for store-of-value motives.
2nd solution: Taxing the central bank currency	A solution initially proposed in the 1920s and supported by J.M. Keynes (1936). Undoubtedly a complex solution**.**
3rd solution: End the fixed exchange rate between central bank reserves and currency	A central bank that apply negative rates on excess reserves (i.e. bank deposits at the central bank beyond compulsory deposits) could, at the same time, penalise the conversion of these reserves into cash by controlling the rate of conversion of cash into reserves.
4th solution: Issuing a central bank digital currency (CB-DC)	By replacing cash (instead of abolishing it) with an electronic currency, negative interest rates are possible.

IV.4. 10th competition / war: Will central banks issue digital currencies? Retail DCs vs. Wholesale DCs

Central banks already expressed interest in the cryptocurrencies' underlying distributed ledger technology (DLT), which has the potential to improve the efficiency, the security, and also costs of existing **inter-bank payment systems**, as Bernanke pointed out very early, in 2013. Other central banks and Treasury followed suit. This new technology can also serve as a platform for the issuance of digital forms of banknotes – "Central Bank Digital Currency" (CB-DC).

Central banks are exploring the possibility of issuing digital money, for several reasons.

1. **The use of traditional cash is steadily declining** (Rogoff 2014). Electronic and digital payments are constantly growing;
2. **Cryptocurrencies have already provided a working digital alternative to cash**, replicating the original characteristics of cash in digital format, peer-to-peer (P2P), on a decentralised way;
3. **The demand for tokens linked to legal tender is increasing**. Used in the same way as cryptocurrencies, they do not carry high volatility in their value. CB-DC represent the best answer to such demand: the idea is to transform coins and banknotes into digital tokens with the same legal protection and the same price stabilisation as central bank money (CB-MONEY);

Central banks are still investigating the direct and indirect consequences on banks. Digital tokens issued by central banks might replace cash but also electronic payment systems operated by commercial banks. As Elliott and de Lima (2017) recalled, "*this could undercut the traditional financial intermediation role of commercial banks, which transform liquid liabilities into long-term assets. A central bank cannot take over the role of pooling liquidity to finance investments*". **In fact, there are three different variants of CB-DC** (Barontini -Holden (2019)):

- **1st variant: a "general purpose", "account-based" variant, i.e. an account at the central bank for the general public**. This would be widely available and primarily targeted at retail transactions (but also available for broader use).
- **2nd variant: a "general purpose", "token-based" variant, i.e. a type of "digital cash" issued by the central bank for the general public**. This second variant would have similar availability and functions to the first, but would be distributed and transferred differently.
- **3rd variant: a "wholesale", "token- or value-based" variant, i.e. a restricted-access digital token for wholesale settlements** (for example interbank payments, or securities settlement).

Some concrete examples.

- **1st example: the Fedcoin**. Proposed by Koning (2014) and not validated by the Federal Reserve), the Fedcoin is an example of a general purpose (or retail) CB-DC. The idea is to create a cryptocurrency that could be converted into US dollars, on par, in both ways. This conversion would be managed by the Regional Federal Reserve Banks. Unlike Bitcoin, for example, Fedcoin's offer would fluctuate with consumer demand: it would thus become a third component of the monetary base (at present cash and reserves). As Garratt and Wallace (2016) conclude, Fedcoin would not be a private "outside" competing currency, but rather an alternative form of sovereign currency.
- **2nd example: the Swedish e-krona.** In Sweden, for just over 10 years, the demand for cash has dropped to the point where many businesses are no longer accepting cash, and bank branches are no longer dealing or collecting cash. The Swedish central bank might launch an electronic money project – **e-Krona** - for retail payments. E-Krona is on the border between central bank deposit accounts and retail CB-DCs (Bech – Garatt (2017)).
- **3rd example: the CADcoin.** It is an example of a wholesale CB-DC. It has been used in simulations by the Bank of Canada in cooperation with several Canadian banks to demonstrate the feasibility of a wholesale payment system based on the DLT, but it has not been implemented. Ready to be implemented though.
- **4th example: the Ecuadorian Dinero electrónico**. The Dinero electrónico is an Ecuadorian mobile payment service in US dollars (the official currency), whose underlying accounts are offered by the central bank to individuals. They can open a secured account and can then deposit or withdraw their money. This is a (rare) example of a deposit account offered by a central bank.
- **5th example: the SOV in Marshall Islands.** The SOV might appear anecdotic, but it is representative though. There was a strong will to gain sovereignty through a national currency and to reduce the link to the USD while maintaining the cost of a "traditional" currency would be too high. Indeed, a centralised currency was not efficient (50000 citizens live in more than 1000 islands). A retail CB-DC was more appropriate. It has been created in 2018.

In total, even if risks and challenges are clearly identified, especially as regard banks, central banks have embarked in implementing CB-DCs. Several countries are currently working on it, such as Sweden (e-krona), Canada (Jasper project), ECB and BoJ (Stella joint research project), Thailand (Inthanon project), Singapore (Ubin project), South Africa (Khokha project), Uruguay, Senegal (e-CFA issued in Dec. 2016), Venezuela (Petro introduced in

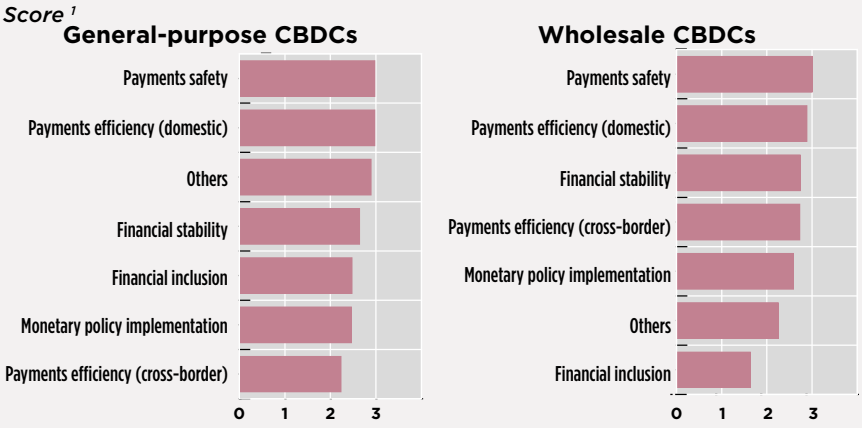
Dec. 2017), Bahamas, Peru (PeruCoin), China, Marshall Island where 50000 citizens live in more than 1000 islands (Sovereign/SOV project), Kazakhstan, Dubaï, United Arab Emirates, Switzerland, Ukraine, Albania, Vanuatu ...

To conclude, let's recap some results of the most recent BIS survey concerning the motivations of central banks on CB-DC. 63 central banks replied to the survey (conducted at the end of 2018), of which 41 are located in emerging market economies (EMEs) and 22 in advanced economies. The respondents represent close to 80% of the world's population and over 90% of the world's economic output.

The results are the following (source: (Barontini - Holden (2019)):

- 70% of respondents are currently (or will soon be) engaged in CB-DC work. Of those that are engaged in work, over half cover both general purpose and wholesale CB-DCs, with about a third focusing only on general purpose and an eighth only on wholesale.
- Many central banks in both advanced economies and EMEs are attempting to replicate wholesale payment systems using DLT (Canada, Singapore, South Africa ...).
- Central banks are increasingly collaborating with each other to carry out proof-of-concept work (ECB and the BoJ, BoC, MAS and BoE).
- For both types of CB-DC, payments safety and domestic efficiency are the most important motivating factors to central banks. Cross-border payment efficiency and monetary policy implementation are not main motivations.

Graphs # 10 and 11: Motivations for issuing a CB-DC, ranked in order of importance – General purpose CB-DC and wholesale CB-DC



[1] The score is calculated as an average of the options: "Not so important" (1), "Somewhat important" (2), "Important" (3) and "Very important" (4).

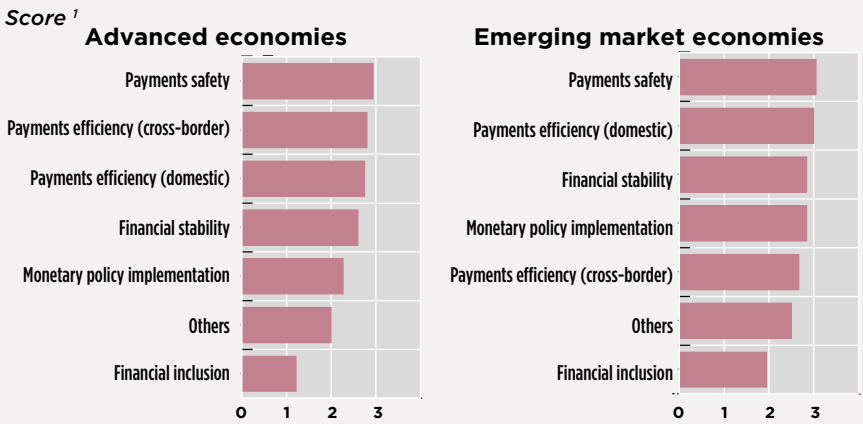
Source: Central bank survey on CBDCs.

For general purpose CB-DC, there are significant differences between emerging and advanced countries:

- EMEs value domestic payments efficiency and financial inclusion most, and cross-border payments efficiency is the least important. EME central banks also note that supporting digitalisation, incorporating the informal economy and fighting financial crime, are key motivators for potentially issuing a CB-DC
- In advanced economies, payments safety and financial stability are the primary motivators for potential issuance. Financial inclusion is clearly the least important factor. In qualitative commentary, some advanced economies are motivated by the prospect of a "less-cash" or even "cash-less" society.

For wholesale CB-DCs, both advanced economies and EMEs consider payments safety and efficiency the most important motivating factors). However, for EMEs, the cross-border dimension is somewhat less important.

Graphs # 12 and 13: Motivations for issuing wholesale CB-DCs, ranked in order of importance – Advanced economies and Emerging market economies



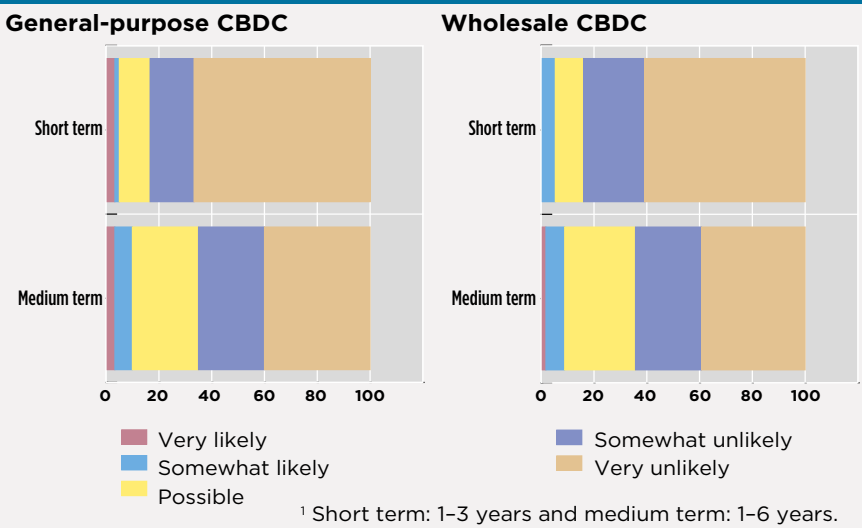
[1] The score is calculated as an average of the options: "Not so important" (1), "Somewhat important" (2), "Important" (3) and "Very important" (4).

Source: Central bank survey on CBDCs.

Will central banks issue CB-DC "soon"?

- In the short term (up to three years), over 85% of central banks see themselves as either somewhat unlikely or very unlikely to issue any type of CB-DC.
- Beyond the short term (up to six years), an increased proportion of central banks consider the issuance of both types of CB-DC to be possible. Nevertheless, a majority still consider this move at least somewhat or very unlikely.

Graphs # 14 and 15: Likelihood of issuing a CB-DC in the short and medium term – general purpose CB-DC and wholesale CB-DC



[1] Short term: 1–3 years and medium term: 1–6 years.

Source: Central bank survey on CBDCs.

IV.5. 11th competition / war: Bank money (B-MONEY vs. cryptocurrencies (C-MONEY) vs. central bank digital currency (CB-DC) vs local currencies (L-MONEY) vs. investment money (I-MONEY): what is the value of money?

Behind all the potential wars between central bank money, bank money, electronic money, local currency, investment money and digital money, lies a central question about the value of a currency. The most important is undoubtedly the legal tender ("chartalism" approach): this determines the acceptability, the credibility of a currency. Only the euro, the dollar, the yen ... are legal tender ... in their respective countries. None of the 4914 cryptocurrencies are legal tender ... so they are not currencies. According to the "functionalism" approach, which defines a currency as an instrument as a unit of account, a means of payment and a store of value, cryptocurrencies cannot be considered as currencies either. But the fiat currency - collateralised stablecoins are based on a fiat money or on a basket of currencies with legal tender, which gives them a huge additional advantage in comparison with the very 1st generation of cryptocurrencies (Bitcoin ...). In Europe, the ECU was not a genuine currency, but it drew credibility from the basket of the legal tender currencies which composed it ... It was not sufficient for the ECU to be imposed, hence the creation of the euro ... which derives its value from the fact that it replaces established, credible and accepted legal tender currencies

(Deutsche-Mark, French Franc, Spanish Peseta ...) which were based in the past on convertibility into gold which had proved itself as a currency. We find here the "regression theorem" of Ludwig von Mises, according to which cryptocurrencies of 1st generation – which do not rely on any currency – would have no value (as a currency). For some stablecoins (the fiat currency-collateralised ones), the question arises henceforth. Will central banks remain complacent towards stablecoins as they did with the 1st generation of cryptocurrencies? One can have doubts on it ... Note that European local monies and bank money (and CB-DC, of course, should a digital currency is created by the ECB), are convertible at par with the Euro and, as such, have the same value (according to von Mises definition) than the euro.

Cryptocurrencies such as Bitcoin (no monetary utility, technically overwhelmed by the less volatile stablecoins, consuming too much energy ...) could, if they do not adapt, disappear or remain - at best - mere (marginal) speculative assets ... while the Libra (too dangerous for central banks and financial stability) could never see the light of day, in any case not in the form originally desired by their creators ...

Conclusion

Currency competition goes well beyond the "simple" competition between sovereign currencies (USD, EUR, RMB, JPY, CHF ...). The advent of private digital currencies and very soon the first central bank digital currencies represent an important phenomenon: it shows that **the world has entered a "total digital (disruptive) era", and currencies are no exception**. In less than 10 years, additional forms of monies have surfaced: central banks digital currencies (a few), digital currencies (plenty), local currencies (some) and investment money (major projects ongoing), while electronic monies are gaining ground (vs. cash). **Digital currencies are more financial assets than currencies, but electronic and digital currencies are gaining ground for different reasons:**

- Ease of use,
- Speed of use,
- A major change in behaviour and habits (the "Everything and everybody connected")
- The inclusion of unbanked persons in electronic payment systems ...
- A certain mistrust of banks and fiat currencies: **part of their development is linked to the will of some investors / savers / consumers to go out of (traditional) money. Where to go?** In some emerging countries and in countries where credibility of fiat currency is low (means of payment), C-MONEY is attractive for payments. In advanced countries, where interest rates are low and Central bank's balance sheet has ballooned, there might be a FX rate problem (store of value,) not a credibility problem: going out-of money may mean investment in real assets for inflation hedge, or in gold for store of value properties.

Central bank money and bank money have now serious competitors. The benign neglect attitude of central banks at the very beginning of digital currencies (as regard bitcoin for example) has disappeared, and central bankers are now looking at the potential impact of stablecoins (the 2nd generation of (private) digital currencies) on monetary policy and financial stability. Nearly all central banks work on the feasibility of their own digital currencies, and some of them plan to launch such a currency (called the "central bank digital currency (the CB-DC), i.e. the 3rd generation of digital currencies (or cryptocurrencies). **Central Banks digital currencies have several advantages:**

- A better capacity (compared to cash) to fight more efficiently against money laundering and crime, tax evasion ... so many crucial topics in the post-crisis world that has given ethical and moral values a central role.
- A better capacity to manage monetary policy in an ultra-low and

negative interest rates environment. Ironically, among the solutions to the Effective Lower Bound problem, we find i) cryptocurrencies (admittedly public ones, but echoing private currencies, cornerstone of one of the great authors of the Austrian School of Economics , F. A. Hayek), but also ii) the taxation of cash (one of the pivots of S. Gesell's analysis (1916), the author who inspired local currencies). This is also why the developments of the last ten years cannot be treated with scorn or indifference, nor with systematic denial.

In short, the planets are aligned to make the development of digital currencies something other than a simple fashion, an anecdotic or short-lived phenomenon. **This does not mean that everything is possible, though:**

- Cryptocurrencies are presently too energy intensive: it is an unsustainable situation;
- Hacking and risks on infrastructure of digital currencies have to be considered;
- As long as these competing currencies do not have the attributes of real currencies, regulation will accompany their development as it does for any other financial asset (see PACTE law in France). If not, if they resemble too much to currencies (unit of account and store of value), they will probably not survive as they are ... or as they plan to be. The Libra project is undoubtedly the best illustration.

Can central banks ban the Libra ? That is the question. Among the various crypto-currencies, the stablecoins are the most interesting. And among the stablecoins, the Libra is likely to be the most powerful project ... But beware: the central banks cannot back the Libra, it's a fact. The next official reports will confirm this, no doubt. To ban the Libra, it must be declared illegal (in the legal sense). But what would be the rationale behind it? The Libra Association is not an association of criminals, it does not carry out an illegal activity, contrary to the morals, or which represents a danger for the populations, for the climate ... Contrary to what one can read, this is not the first time that central banks are faced with such a problem. In the 1930s, because of competition with legal tender currencies, especially Germany, Austria and France had banned the (yet effective) experiments in local currencies, while Switzerland left WIR thrive ... It is the infringement of monetary sovereignty that led to these prohibitions. Currency being an attribute of the sovereignty of a state, **any "*money without a state*"** (a way of qualifying the Libra, also referred as the "Zuck buck" for Zuckenberg buck (or dollar)) **can only appear as an attack on the principles of sovereignty**. If the path of outright prohibition is not chosen, then it will be a question of restricting the use of the Libra and limiting its expansion. Several avenues are possible: either via the exchange regulations (as was the case in some

countries concerning Bitcoin), or via a specific tax measures, by highlighting the lack of transparency and the risk of money laundering. … or finally by prohibiting / binding the banks via strict prudential rules with regard to the Libra (de Vauplane (2019)) … Answer in the coming months. As Bilotta – Botti (2019) recently stressed: "*maybe Libra will never see the light of the day … too ambitious perhaps … but Libra is not alone*": other projects have already been announced, such as Telegram and Walmart. Walmart is not as big as the Libra association (275 million clients vs. 2.4 billion clients), but with 2442 stores in Mexico, 811 in Central America, 663 in the UK, 443 in China, 436 in Africa, 411 in Canada, 371 in Chile, 332 in Japan, 92 in Argentina, 22 in India … In August 2019, Binance announced that Venus would constitute a "Belt and Road" version of Libra (an "*independent and autonomous, regional version of Libra*") that will resemble to the Belt and Road initiative of the Chinese government, a project that aims to connect Asia with Europe and Africa through land (Road) and sea (Belt) networks (Venus vs. Libra: a money war to come?). As regard central banks and financial stability, the risks that the Walmart units, Libra and Venus represent may be similar.

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