



HAL
open science

WILL THE BRICS BE THE LEADERS IN CENTRAL BANK DIGITAL CURRENCIES?

Assen Slim

► **To cite this version:**

Assen Slim. WILL THE BRICS BE THE LEADERS IN CENTRAL BANK DIGITAL CURRENCIES?. *Economic Studies journal = Ikonomicheski Izsledvania*, 2021, 30 (3), pp.3-16. <hal-03518463>

HAL Id: hal-03518463

<https://hal.science/hal-03518463v1>

Submitted on 28 Feb 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY 4.0 - Attribution - International License

Will the BRICS be the leaders in central bank digital currencies?

SUMMARY

The study discusses the opportunity for the BRICS to implement a common supranational Central Bank Digital Currency (CBDC). Starting from the observation that many CBDC projects are being studied worldwide and that the subject needs to be treated in the academic literature, we have sought to propose a general definition of the concept of CBDC. Based on this definition, technical and monetary opportunities and constraints are studied in the case of the BRICS supranational CBDC project.

JEL: E42; E49; F33; G21

CONTACT information of the author

Assen SLIM

49 rue RASPAIL, 92270 Bois-Colombes, FRANCE

+33 634233955

assen.slim@inalco.fr

Will the BRICS be the leaders in central bank digital currencies?

Introduction

At the 11th Annual BRICS Summit in Brasilia in November 2019, the BRICS Business Council discussed the possibility of creating a central bank digital currency (CBDC for Central Bank Digital Currency). As national CBDC projects emerge worldwide, the BRICS will launch a joint supranational CBDC using blockchain technology immediately. Although the project is only at the discussion stage, it raises numerous questions on the technical aspects of its implementation and the opportunity for the BRICS to implement it. In addition, there needs to be more work on CBDC in the academic literature on cryptocurrencies and blockchain. This text aims to start from what is known about CBDCs to discuss the opportunity for the BRICS to launch their own supranational CBDC.

After briefly presenting cryptocurrencies and how they work (1), we will show how CBDC is an original development (2). Finally, we will discuss the opportunity for the BRICS to create a common supranational CBDC (3).

1. Cryptocurrencies and how they work

Bitcoin, the first of cryptocurrencies, was conceived as an alternative to the current monetary order. It is part of a general movement to challenge political and banking powers deemed unable to implement quality currency and an independent monetary policy. Bitcoin is thus thought of as a means of monetary appropriation by individuals, "a new area of freedom for several years," a "common good," and a "means of democratizing finance" (Nakamoto, 2008). This system replaces traditional trusted third parties (banks, financial intermediaries) with a technical infrastructure that generates trust without a central authority (De Filippi & Loveluck, 2016).

[Origin of the cryptocurrencies](#)

In the early 1980s, informal groups self-entitled "Cypherpunks" or "Crypto anarchists" started gathering to find out how to mix cryptography and information technologies. They decided to use the technical capacity of cryptography to create new systems (Castor, 2017). These groups aimed to conceive a decentralized IT protocol allowing individual collaboration without identifying the names and legal identities of the people exchanging information. In parallel, they developed a robust discourse against central institutions, starting with those run by the U.S. Government, as they considered their power to rule finance worldwide to be exorbitant.

In a direct reference to Marx, May called decentralized IT protocol “a technical revolution” that allows the exchange of almost anything (even drogues and illegal products) in perfect and fluid markets: “An anonymous computerized market will even make possible abhorrent markets for assassinations and extortion” (May, 1992).

Cyberspace is seen as a ground for social interaction for these groups: “government is not destroyed, but it simply becomes redundant without any possible intervention” (Dai, 1998). Several projects of decentralized electronic coin emerged from this conceptualization, giving out the bases for what would become the architecture of Bitcoin: “Digicash” (Chaum, 1983), “b-money” (Dai, 1998), “Bit gold” (Szabo, 1998 and 2005).

The founding article explaining the concept of Bitcoin was published in 2008. Its “author,” Satoshi Nakamoto¹, discusses how he has worked on this conceptualization since 2007 (Nakamoto, 2008). Nakamoto announces his desire to solve the problem caused by “third-party institutions” (banks, other financial institutions, and central banks). These intermediaries aim to solve potential conflicts (the reversibility of transactions and the eventual creation of arbitrary currencies). Still, this mediation also causes an increase in transaction costs and the frequency and intensity of monetary crises. Nakamoto suggests that creating a digital currency without third-party institutions could be possible. A money based on a collaborative, resilient, and secure Peer-to-Peer (P2P) architecture via specific technology.

The technical infrastructure of cryptocurrencies

Although each cryptocurrency is based on a specific technical infrastructure, they all have the same elements in common: a protocol, a blockchain, and mining. We will briefly present these elements in the case of Bitcoin.

The Bitcoin protocol is distributed to eliminate single checkpoints and build resilience across the system. A dual-key cryptographic system guarantees the “pseudonymity” of the stakeholders while making it impossible to falsify the identifiers and amounts of Bitcoins registered in users' electronic wallets. When making a payment, the issuer signs and authenticates their payment order with their private key. The beneficiary of the settlement will receive the sums sent to his address if this key matches the public key sent by the issuer to decrypt the transfer and authenticate the origin without revealing the identity of the actors.

The blockchain contains the history of all the transactions processed and validated by the Bitcoin system since its creation. Any validated transaction is written in a new block (a kind of transaction page) integrated into the blockchain. The latter is replicated identically in specific computers in the system, called “complete nodes.” There are, in fact, not one but several thousand copies of the blockchain, built and managed by as many computers all over the

¹ The mystery remains about the identity of the designer(s).

planet. Each “full node” keeps a copy of the blockchain up to date, downloads and checks the validity of the new blocks with rules recognized by all, then distributes them on the network.

Mining, finally, by resolution of "proofs of work" (or *PoW* for *Proof of Work*), corresponds to the stage where the new transactions issued are validated and registered in a new block added to the blockchain. It is carried out by "miners," voluntary users who, in addition to holding complete nodes, are provided with special software to validate new blocks. The validation process consists of the resolution of several complex mathematical equations dependent on an aleatory targeting system defined within the rules of the Blockchain. This aleatory feature guarantees that the same miner never validates the transaction (Ribeiro, 2016). This “randomness” avoids for a single miner from becoming more powerful than any other, which is one of the keys to the security of Blockchain. Once a first miner validates a new block, it must be confirmed by at least 51% of the network's total power, making block forgery almost impossible. The miners compete for the resolution of each *PoW*. Their chance of finding the right solution before the others depends directly on the calculation power they dedicate to it relative to the total calculating capacity accumulated in the network. Miners are "paid" in new bitcoins issued for their work and the resources mobilized. Initially, 50 bitcoins were issued every ten minutes, but this issue is halved every 210,000 blocks allocated (or approximately every four years). Today, the validation of a block emits 12.5 bitcoins. Of the 21 million bitcoins predicted by the initial algorithm, 85% are already in circulation. At this rate, the emission should continue until 2140. Mining requires three types of hardware. The first is a processor (CPU), the most accessible computing system available for mining, but its power is minimal. The second is a graphics card (GPU) with more powerful capabilities than a CPU. GPUs are assembled in a rig that usually contains a power source, a motherboard, risers or adapters, GPUs, and an air-conditioned stand to optimize their processing power. Thirdly, the Application-Specific Integrated Circuit (ASIC) holds a very high processing power. It is a specialized type of hardware that can only work with a few algorithms and cannot be used for anything other than mining. The ASIC usually comprises one or more chips that are disposed on a card, jointed by connectors (to allow it to connect to the Internet), a power supply unit, many ventilators, and a container. To increase their benefits, miners are incentivized to join groups of miners known as “pools.” These groups allow them to mine together and share the gains. It is also possible to join a cloud mining system. In this case, one pays other miners to rent out an unused part of their equipment. In return for their investment, the renters receive the gains from the leased equipment. However, people choosing this option take the risk of paying rent in advance without being guaranteed that the equipment will work efficiently or that it is not a scam.

The technical infrastructure of cryptocurrencies has proven to be efficient, secure, difficult to censor, and above all, incorruptible. It allows direct interaction between individuals without any use of a third party. It excludes any form of coercion. As a result, the transaction costs are almost zero, and the payment delays are reduced.

Beyond cryptocurrencies

Today Blockchain technology goes far beyond the reach of cryptocurrencies. As it drastically reduces transaction costs, intermediaries, and delays, this technology attracts start-ups, large corporations, and public administrators. It was quickly presented as a “trust machine” capable of “changing the world” (The Economist 2015). The blockchain focuses all the attention because it allows the storage of time-stamped information that can be consulted at any time, a bit like a data center, secure, incorruptible, and inviolable. You can undoubtedly store information relating to bitcoin payments there. Still, nothing prevents storing other data of a very different nature: proof of purchase, deeds of ownership, proof of payment, patents, tickets, etc.

To date, the academic work is mainly concerned with the technical infrastructure necessary for developing cryptocurrency (Rodima-Taylor *et al.*, 2017), the monetary nature of cryptocurrencies (Lakowski-Laguette & Desmedt, 2015), the interest of States to use them and emerging national regulations (De Filippi, 2014), or the role of cryptocurrencies as a new sociotechnical construct (De Filippi & Loveluck, 2016), (Rolland & Slim, 2017). Some other research has treated Blockchain with a more technological approach (Risius & Spohrer, 2017), (Meroni *et al.*, 2019), (Ruoti *et al.*, 2020) speaking about data and information controls (Cappiello *et al.*, 2019), the rules necessary to treat information (Yeoh, 2017), (Ólneš *et al.*, 2017), (van Rijswijk *et al.*, 2019) and discussing the role of the capitalist economic institution in the deployment of the technology (Davidson *et al.*, 2018). Some rare examples have attempted a classification of applications based on Blockchain technology (Ribeiro, 2016), (Godeborge & Rossat, 2016), (Labazova *et al.*, 2019).

They are different types of Blockchains. After the creation of Bitcoin, more than 1,500 cryptocurrencies have been launched. Each is based on a specific Blockchain technology (some are faster, others are more traceable, some are cheaper to trade with, and others have stricter authentication protocols). Blockchains are said to be “public” because the entirety of their repository (history of the transaction) is visible to everyone. A way of imagining a public Blockchain is by thinking about a “big public book, anonymous, impossible to falsify, that everyone can consult and read” (Ribeiro, 2016). There are two main public Blockchain types: the classical Blockchains and the “infrastructure” ones.

Classical Blockchains gather the information that everyone can consult. Therefore, they work as safe data centers (Kolb *et al.*, 2020). For example, the Blockchain of Bitcoin has all the blocks that trace all the transactions in Bitcoins ever since the first emission of a “block genesis” by Satoshi Nakamoto in 2009. These blocks stock all the electronic signatures and other data, including the purchases, the ownership of Bitcoins, the payments, etc.

The “infrastructure” Blockchains can keep and manage other types of information, such as “Smart Contracts.” The first Blockchain of this type, Ethereum, was conceived in 2013 by Vitalik Buterin, a Canadian developer of Russian origin. His white paper defines Smart Contracts as “cryptographic ‘boxes’ that contain value and only unlock it if certain conditions are met” (Buterin, 2013). Smart contracts are not contracts in the true sense of the term but more as stand-alone computer applications that have saved the terms of an agreement and that self-execute when the conditions of the agreement are met. They do not have legal authority themselves. When a legal contract exists, the smart contract is its technical application. They operate on the “if-then” principle (if the condition is verified, **then** the consequence is executed). The originality here lies in the fact that these smart contracts are written on a blockchain and therefore benefit from all the advantages of this technology (time stamping, inviolability, reduced transaction costs, etc.). They avoid the high costs of contract drafting, legal intervention, opportunistic behavior, and the ambiguities inherent in written language. We are sure that smart contracts will be executed as expected, quickly and without human intervention (a potential source of bias).

Buterin saw three great opportunities for implementing Blockchain infrastructures: “In general, there are three types of applications on top of Ethereum. The first category is financial applications, providing users with more powerful ways of managing and entering into contracts using their money. This includes sub-currencies, financial derivatives, hedging contracts, savings wallets, wills, and even some full-scale employment contracts. The second category is semi-financial applications, where money is involved, but there is also a heavy non-monetary side to what is being done; a perfect example is self-enforcing bounties for solutions to computational problems. Finally, there are applications such as online voting and decentralized governance that are not financial at all” (Buterin, 2013)

The emergence of private (or “permissible”) Blockchains (Blockchains that contain information that is only accessible by specific predetermined entities) and “consortium Blockchain” (a mix between public and private ones) helped to expand the diffusion of Blockchain technology to other economic activities.

Since then, countless outlets have opened up for these technologies: financial applications, insurance, traceability, content storage, control and certification, authentication, Internet of Things, collaborative activities, and fundraising by Initial Coin Offering (ICO) ... Companies highlight seven main factors of the attractiveness of the blockchain: non-falsifiable data, security by cryptography, a significant drop in transaction costs, authentication of data by consensus, community organization, public account register and speed of transactions. (Arreola *and all.* 2020). For instance, Wyman believes Blockchain could generate transaction cost economies of about 15 to 20 billion annually (Wyman, 2016).

ICOs are the best illustration of the use of the blockchain without cryptocurrencies. As opposed to an IPO (*Initial Public Offering*), which implies the launch of new stock in the trading market, the ICO is a “mechanism to raise external funding through the emission of tokens” (Momtaz, 2018). An ICO is a fund-raising exercise under the crowdfunding model that is

collected in cryptocurrencies. Concretely, a firm emits tokens that it sells as cryptocurrencies for launching a new project, and people (and firms) can buy these tokens. The ICO allows firms to overcome the very complex and challenging access to the venture capital system, which tends only to finance projects at a very early stage. Also, the tokens can be given many other uses, including buying the product at the origin of the ICO, being resold as a financial title, or being reconverted into fiat currency. Platforms such as *Waves* in Russia or *Trade.io* in Hong Kong allow firms to get started with a few clicks. In 2019, USD 2.83 billion was raised in ICOs worldwide after peaking at USD 13.54 billion in 2018 (Perreau, 2020). The ten largest ICOs to date: EOS (USD 4000 million), Telegram (1700), Bitfinex (1000), TaTaTu (575), Dragon Coin (320), HDAC (258), Filecoin (257), Tezos (233), Sirin Labs (157) and Bancor (153). ICOs are more frequently used to finance the launch of decentralized applications. Nevertheless, investors have no guarantee, and some ICO can be scams.

Therefore, there is a rapid evolution of the juridical and regulatory standards for launching ICOs. For example, in France, the PACTE law (22 May 2019) has a section dedicated to ICOs in its article 26. The law stipulates that the French Financial Market Authority (AMF) could deliver a pre-approval to ICO projects that provide guarantees of protection to investors, such as the provision of the funds raised. Moreover, the creators of tokens will have to be registered to operate in France, and the ICOs will have minimum standards for the number of people necessary to validate the projects (at least 150 people). Finally, ICOs must provide a white paper presenting the project's potential risks.

More than a technical revolution, blockchain could also become a vector for profound social change. In this context, central banks began to take an interest in this technology and consider the issue of central bank digital money (MDBC).

2. National CBDC or supranational CBDC for the BRICS?

We are witnessing a profusion of CBDC projects: China, Cambodia, Dubai, Estonia, France, Iran, Kazakhstan, Turkey, South Korea, Russia, Switzerland, Sweden, and Uzbekistan... Some projects are in the test phase (test launched in South Korea on April 7, 2020), but for the moment, only the Venezuelan CBDC project (the petro) was completed in 2018. Despite their differences, all these MDBC projects are nationwide. National CBDCs are an unexpected and original evolution of cryptocurrencies. Recall that cryptocurrencies were designed to reject any form of the central monetary authority. However, with the CBDCs, the central banks are taking the lead and are now seizing on these technologies.

Definition of national CBDCs

A domestic CBDC can be defined as a digital asset issued and destroyed by the central bank alone, exchanged with banknotes and reserves, permanently available for peer-to-peer transactions, and circulating on digital media. . The motive for issuing a CBDC commonly put forward by central banks is to offer a payment instrument that is perfectly liquid, secure and adapted to technological developments.

A distinction is made between wholesale CBDCs, i.e., accessible to all or some of the financial institutions in a country, and retail CBDCs, i.e., accessible to everyone (financial institutions, administrations, companies, individuals).

With wholesale CBDCs, it is thus possible to perform end-to-end transactions, including final settlement, in so-called "tokenized" assets on the blockchain. This will boost the capacity for innovation and the productivity of the financial sector. Retail CBDCs, on the other hand, reduce the transaction costs of retail payments while ensuring access to central bank money for all in a dematerialized form complementary to fiat money.

The BRICS: supranational CBDC or network of national CBDCs?

The BRICS are immediately involved in creating a common supranational CBDC. However, several options exist for creating a common CBDC without the BRICS having yet to express a clear strategy in this area.

The optimal option would be to create a common supranational CBDC managed collectively by the central banks of the five countries of the group. Each central bank should issue a determined volume of this supranational CBDC. All transactions in this common cryptocurrency would be recorded in a single private blockchain where only institutions chosen by the BRICS could "mine" the transactions to authenticate them. We can imagine in this option that, the supranational CBDC issued can be wholesale or retail.

A second option would be to create a network of national CBDCs within the BRICS and then define a supranational CBDC designed as a basket of national CBDCs, like the ECU in the 1979 EMS.

A third option would be to create a common supranational CBDC guaranteed to be 100% on deposits in national currencies (*fiat currencies*) of the BRICS with an international monetary authority set up for the occasion.

A fourth option would be to let one of the countries in the group (China or Russia, for example) create its own national CBDC and then have it adopted by the other BRICS.

Although the BRICS say they favor a joint supranational CBDC project, these options have yet to be discussed. Only China and Russia have planned to create national CBDCs. Brazil, India, and South Africa have yet to announce such plans.

The Chinese Central Bank (PBoC for *People's Bank of China*) announced on its site the upcoming launch (without giving any date) of a digital currency called DCEP (for *Digital Currency Electronic Payment*) on which it has been working since 2015. The stated objective of the PBoC is to provide an alternative to cash for retail payments. The DCEP would be issued based on a private blockchain. Its distribution would be based on commercial banks and Chinese web giants: Alipay (owned by e-commerce giant Alibaba), WeChat pay (owned by Tencent messaging), Industrial and Commercial Bank of China, Bank of China, Agricultural Bank of China, China Construction Bank, and Union Pay. These institutions would have direct access to the DCEP and oversee the opening and managing of the DCEP portfolios of the general public (individuals and businesses). Finally, the PBoC announces that there will be a cap per transaction to limit the use of the DCEP to retail payments and that a mobile application will be developed for easy access. The metropolis of Shenzhen (13 million inhabitants) was selected for the first DCEP test. As a result, Shenzhen Financial Technology Co. Ltd (a company specializing in blockchain and 100% owned by the PBoC Digital Currency Institute) was established there in 2018.

Since May 2016, Russia has been considering introducing a CryptoRuble. However, the legality of cryptocurrencies remained unresolved in the country due to solid dissensions between Russian institutions. In October 2017, Russian President V. Putin called for establishing a balanced regulatory environment for cryptocurrencies. Indeed, according to him, “the use of cryptocurrencies carries serious risks such as money laundering, tax evasion, and terrorist financing” (De, 2017). This shift has resulted in massive investments in mining infrastructure, particularly in eastern Siberia (Estecahandy & Limonier, 2020). At the same time, a bill On Digital Financial Assets (DFA) was tabled by the Russian Ministry of Finance (following the request of the President; List of instructions Pr-2132 of October 21, 2017) in the Duma on January 25, 2018. Eventually, Duma passed the DFA law on Wednesday, 22 July 2020. The new law, which will come into force on January 1st, 2020, gives legal status to cryptocurrencies in the country but prohibits their use for paying for goods and services. Cryptocurrencies are being recognized as an aggregate of electronic data capable of being accepted as payment means. The DFA law states, “possession of digital currency, its acquisition, and transfer by legal means are allowed only if declared.” It institutes the Central Bank of the Russian Federation (CBR) as the authority to issue digital currencies inside Russian jurisdiction and oversee the activities on the authorized platforms.

Brazil has yet to announce any plans for a national CBDC. However, with the most bitcoin transactions in Latin America, the country officially recognized cryptocurrencies as legal currencies in August 2019. In the process, the Mile Unity Foundation, the issuer of XDR (a stablecoin anchored on a basket of five currencies: dollar, euro, yen, Chinese yuan, and pound sterling), was received at the Brazilian Ministry of Industry and Trade in the prospect of using XDR on a large scale for international remittances from the country.

India has not announced any plans for a national CBDC. However, the Indian central bank (RBI for *Reserve Bank of India*) has declared itself in favor of introducing such a currency based on a private blockchain. RBI hopes to alleviate the corruption in the country and reduce the dependence of Indians working abroad on financial intermediaries when they make their

remittances. The Indian government, meanwhile, recently declared itself in favor of issuing a CBDC to reduce the population's dependence on other cryptocurrencies.

South Africa has also yet to announce any official plans for CBDC. However, the country's Central Bank (SARB for *South African Reserve Bank*) has declared itself in favor of a CBDC based on a private retail blockchain open directly to the population without going through the banks' intermediary. The objective would be the financial inclusion of the 11 million unbanked people and, in doing so, the stimulation of economic development.

3. The interest of a common supranational CBDC for the BRICS

The BRICS represent 41.6% of the world population (*i.e.*, 3.16 billion people), 23.6% of world GDP, 27.4% of inward FDI flows, 16.2% of world exports, 15.9% of world imports, and 11% of current world transfers. With such weight in the global economy, the joint CBDC project initiated by the BRICS will likely have repercussions worldwide. We will limit ourselves to discussing the interest of the BRICS alone, retaining the hypothesis of the issuance of a common retail CBDC open to all.

The advent of an international blockchain-based payment system

The issuance of a joint retail CBDC by the BRICS would offer an unprecedented international payment system to all economic players in these countries (banks and financial institutions, businesses, administrations, and individuals). According to the common CBDC model, user possibilities would differ. One can imagine four significant models of common retail CBDC (Figure 1)

FIGURE 1: THE FOUR MODELS OF COMMON RETAIL CBDC FOR THE BRICS

	Direct	Intermediated
With tokens	Token-based model without intermediation	Token-based model with intermediation
With accounts	Account-based model without intermediation	Account-based models with intermediation

The token-based model means that the CBDC is accessible to the public on dedicated wallets, which are opened and managed by intermediaries (token-based model with intermediation) or directly by the supranational monetary authority responsible for the common CBDC common (disintermediated token-based model). In the case of the BRICS, this would mean that users could use the common CBDC to settle international and national transactions,

placing orders directly from their wallets (via a computer, mobile phone, etc.). In addition, units would be transferred electronically from wallet to wallet.

The account-based model means that the common CBDC is stored on an account, accessible online, and associated with its holder. Banks (account-based model with intermediation) can open and manage this account directly by the supranational monetary authority responsible for the CBDC (disintermediated account-based model). In the case of the BRICS, users could make their national and international account-to-account payments.

Regardless of the CBDC model adopted by the BRICS, the resulting international payment system will benefit from all the advantages of blockchain technology: speed of payments, reduced transaction costs, security, timestamping and archiving of all transactions. Models without intermediaries (whether token-based or account-based) in which the central monetary authority responsible for the common CBDC directly ensure the availability to users of monetary units are those which would make it possible to reduce the sharp transaction costs and delays. However, adopting this model would be particularly restrictive for central banks, which are not used to dealing with so many counterparties and are not intended to ensure such granularity of the transactions carried out by all economic agents. Moreover, these models would call into question the very existence of financial intermediaries. Therefore, the BRICS will likely choose a standard CBDC model with intermediaries: banks, other payment service providers, insurers, agents/brokers, exchange offices, post offices, etc.

The BRICS have raised the idea of a mobile phone-based electronic payment system for the general public called BRICS Pay. The platform would use a mobile application linked to wallets (token-based model) or accounts (account-based model), allowing users from any BRICS country to settle their transactions with users in other countries.

Such an undertaking requires the BRICS to engage in an approach to ensure the interoperability of their existing infrastructures in international payments. The efforts to bring together the Russian (SPFS) and Chinese (CIPS) payment systems show a willingness to move in this direction. In addition, India plans to connect to the Russian central bank system through a service currently under development. Finally, the effort of international standardization of infrastructures based on a blockchain which has just been undertaken by the International Standard Organization within the framework of its ISO / TC 307 Technical Committee, will constitute an essential tool to make the MDBC project familiar to the BRICS operational.

Overcome the dollar and the constraints imposed by the United States.

Kirill Dmitriev, director of the Russian Direct Investment Funds (RDIF), said in November 2019 that “an efficient and functioning BRICS payment system could stimulate settlements between national currencies and ensure the stability of settlements and investments between our countries, which form more than 20% of the global inflow of foreign direct investment. Cryptocurrency payments will be made through the BRICS payment system, the creation of which is under discussion”. In other words, a common supranational CBDC would overcome

the dollar's hegemony in currency settlements between the BRICS. In 2019, the dollar represented nearly 50% of settlements within the group (against 14% for the ruble, for example). Beyond the dollar, the advent of a stand-alone payment system between BRICS would bypass the US SWIFT network for international payments, which would be particularly useful for countries targeted by US economic sanctions.

Stimulate economic activity and support growth.

Several pieces of information indicate that a CBDC will likely boost economic growth in the BRICS. Economists at the Bank of England have attempted to assess the potential impact of a CBDC that would be issued as a new monetary policy instrument and circulate alongside fiat money. The positive effect on the level of GDP would come in part from the purchase of assets it would finance. The authors estimate that a CBDC issue of up to 30 points of GDP (the equivalent of the average QE effort made by central banks after the subprime crisis) would generate a permanent increase in the level of GDP of 3% “due to the fall in real interest rates” and “a reduction in transaction costs” (Barrdear & Kumhof, 2016). In addition, the authors consider that adopting a countercyclical rule in setting interest rates would improve monetary policy transmission and better stabilize the economic cycle. It is also likely that the issuance of a CBDC will create an intra-day money market, i.e., exchanges of CBDCs between financial institutions for durations of less than a day. This would raise the question of switching to real-time monetary policy implementation.

It can be added that a common retail CBDC would offer users more excellent maneuverability than coins and banknotes. In addition, if the BRICS CBDC were to be based on an “infrastructure” blockchain, it could then integrate smart contracts which would automate payments, simplify invoicing and accounting monitoring, further reduce delays and even carry out fundraising (such as Initial Coin Offering - ICO type).

In addition, the CBDC would offer an alternative to traditional electronic payments (transfer, bank cards), which would help reduce the rents of established operators and stimulate consumption, trade, and activity accordingly (Hasan et al., 2013).

Reduce the use of historical cryptocurrencies.

A supranational CBDC for the BRICS would work like a stablecoin. It could thus be backed either by national CBDCs (which do not yet exist) or by a basket of national fiat currencies. If any collateral does not support it, the stability of its value could still be ensured by smart contracts, which will automatically buy back the CBDC in circulation when its price is too low and sell it when it is too high. Of course, this last option assumes that the common CBDC chosen by the BRICS is based on an “infrastructure” blockchain.

In any case, the issuance of a common supranational retail CBDC would offer more excellent guarantees of stability than historical cryptocurrencies issued on public blockchains, which present numerous risks: high volatility, high operational risk, liquidity risk, etc. (Agur, 2018). The CBDC chosen by the BRICS, appearing as a stable, functional, liquid payment instrument, should therefore be preferred by users to historical cryptocurrencies to settle transactions. At the same time, it will help preserve the monetary sovereignty of the BRICS against historical cryptocurrencies using public blockchains and private stablecoins with global reach (such as Libra).

Extend the BRICS area of influence.

A common retail CBDC, because of the strengths discussed above, could attract many more participants. Its adoption by other countries outside the group would *de facto* extend BRICS hegemony. One can imagine, for example, that the African countries of the former CFA franc zone are interested in the BRICS CBDC, especially since China is already very present economically in Africa. If such a scenario were to happen, we would witness unprecedented economic relations (trade, FDI, loans, current transfers, remittances) between Africa and the BRICS. We can therefore understand the reasons which push the Banque de France to speed up the schedule for developing a European CBDC so as not to give way to China! Moreover, it is not excluded that a local CBDC initiative emerges directly from the countries of UEMOA (West African countries) or CEMAC (Central African countries), or both groups combined. Such an initiative would constitute an authentic mode of emancipation for these countries, while the eco (replacement currency for the CFA franc) is contested even before it enters into force.

Conclusion

This foresight exercise made it possible to define the notion of CBDC and to establish a typology of possible models. It appeared that the desire of the BRICS to create a common CBDC is part of a more general movement which can be explained by the intensification of competition between international payment systems: historical cryptocurrencies which nibble at the monetary sovereignty of States, new Private stablecoins with global pretension carried by the digital giants (Facebook, Telegram, etc.) ... CBDCs finally are constrained choice for States in order not to fall too far behind in the blockchain race and to try to preserve a form of minimal monetary sovereignty.

Despite their common will displayed in November 2019, the BRICS are running in dispersed order with a prominent lead for China. Therefore, it is a safe bet that the future supranational payment system within the group will be primarily based on a Chinese CBDC.

Bibliography

Agur, I. (2018). Central bank digital currencies: An overview of pros and cons, in E. Gnan and D. Masciandaro, eds. *Do We Need Central Bank Digital Currency? Economics, Technology, and Institutions*. Vienna: Suerf pp. 116–117.

Arreola, F., Slim A. and Magnin E., (2020), Technologie Blockchain: au-delà des cryptomonnaies, *World Economic Forum and Gouvernance Think Tank Magazine* [online]. [Viewed 31 July 2020]. Available from: <https://fr.weforum.org/agenda/2020/06/technologie-blockchain-au-dela-des-cryptomonnaies/>

Barrdear, J. and Kumhof, M., (2016). *The macroeconomics of central bank issued digital currencies*, Working Paper 605, London: Bank of England.

Buterin V., (2013). Ethereum White Paper: A next-generation smart contract & decentralized application platform. [online]. [Viewed 9 August 2020]. Permanent link: https://blockchainlab.com/pdf/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf

Cappiello, C., Commuzzi, M., Daniel, F. and Meroni, G., (2019). Data Quality Control in Blockchain Applications, in C. Di Ciccio, R. Gabryelczyk, L. Garcia-Banuelos, T. Hernaus, R. Hull, M. Indihar Stemberger, A. Kö and M. Staples, eds. *Business Process Management: Blockchain and Central and Easter Europe Forum*. Cham: Springer pp. 166–181.

Castor, A., (2017). In Santa Barbara, An Annual Event Brings Together Those Closest to Bitcoin's Roots. *Forbes* [online]. [Viewed 9 August 2020], Available from: <https://www.forbes.com/sites/amycastor/2017/08/30/in-santa-barbara-an-annual-event-brings-together-those-central-to-bitcoins-roots/#7c6665437b60>

Chaum, D., (1983). Blind signatures for untraceable payments, in D. Chaum, A. Sherman, and R. Rivest, eds. *Proceedings of Crypto 82*. New York: Plenum, pp. 199–203.

Davidson, S., De Filippi, P., & Potts, J. (2018). Blockchains and the economic institutions of capitalism, *Journal of Institutional Economics*, **14**(4), 639–658.

De, N., (2017). Vladimir Putin: Cryptocurrency Poses 'Serious Risks,' *Coindesk.com* [online]. [Viewed 31 July 2020]. Available from: <https://www.coindesk.com/vladimir-putin-cryptocurrency-poses-serious-risks>

De Filippi, P.,(2014). Bitcoin: a regulatory nightmare to a libertarian dream, *Internet Policy Review* [online]. **3**(2). [Viewed 9 August 2020]. Available from: doi: 10.14763/2014.2.286

De Filippi, P. and Loveluck, B., (2016). The invisible politics of Bitcoin: governance crisis of decentralized infrastructure, *Internet Policy Review* [online]. **5**(4). [Viewed 31 July 2020]. Available from: doi: 10.14763/2016.3.427

Desmedt, L., and Lakomski-Laguerre, O., (2015), L'alternative monétaire Bitcoin: une perspective institutionnaliste, *Revue de la régulation* [online]. **18**(2). [Viewed 9 August 2020]. Available from: doi: 10.4000/regulation.11489

Estecahandy, H. and Limonier, K., (2020), Cryptomonnaies et puissance dans le calcul : la Sibérie orientale, nouveau territoire stratégique pour la Russie, *Hérodote – La Découverte*. **177-178**, 253–266.

Godefarge, F. and Rossat, R., (2006), *Principes clés d'une application Blockchain*, Lyon : EM Lyon.

Hasan, I., De Renzis, T. and Schmiedel, H., (2013). *Retail payments and the real economy*, Working Paper 1572, Frankfurt: European Central Bank.

Kolb, J., Abdelbaky, M., Katz, R. and Culler, D., (2020). Core Concepts, Challenges, and Future Directions in Blockchain: A centralized Tutorial, *ACM Comput. Surv.* [online], **53**(1). [Viewed 9 August 2020]. Available from: doi: 10.1145/3366370

Labazova, O., Ehling, T. and Sunyaev, A., (2019). From Hype to Reality: A Taxonomy of Blockchain Applications, *Proceedings of the 52nd Hawaii International Conference on System Sciences* [online]. [Viewed 9 August 2020]. Available from: doi: 10.24251/HICSS.2019.552

May, T., (1992). The Crypto Anarchist Manifesto. November. [online]. [Viewed 9 August 2020]. Available from: <https://www.activism.net/cypherpunk/crypto-anarchy.html>

Meroni, G., Plebani, P. and Vona, F., (2019). Trusted Artifact-Driven Process Monitoring of Multi-party Business Processes with Blockchain in C. Di Ciccio, R. Gabryelczyk, L. Garcia-Banuelos, T. Hernaus, R. Hull, M. Indihar Stemberger, A. Kö and M. Staples, eds. *Business Process Management: Blockchain and Central and Easter Europe Forum*. Cham: Springer pp. 50–70.

Momtaz, P. (2018). *Initial Coin Offering*. Available from: doi: 10.2139/ssrn.3166709

Nakamoto S., (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. [online]. [Viewed 9 August 2020]. Available from: <https://bitcoin.org/bitcoin.pdf>

Ólnes, S., Ubacht, J. and Janssen, M., (2017). Blockchain in Government: Benefits and implications of distributed ledger technology for information sharing, *Government Information Quarterly* [online], **34**(3), 355–364. [Viewed 9 August 2020]. Available from: doi: 10.1016/j.giq.2017.09.007

Perreau, C., (2020), ICO: définition, liste, la situation en France..., *Journal du Net* [online], mars. [Viewed 9 August 2020]. Available from: <https://www.journaldunet.com/economie/finance/1195462-ico-definition-liste-la-situation-en-france-decembre-2019/>

Ribeiro, A., (2016), La Blockchain et ses potentielles applications, *Université de Genève* [online]. [Viewed 9 August 2020]. Available from: <https://archive-ouverte.unige.ch/unige:89544>

Rijswijk van, L., Hermsen, F. and Arendsen, R., (2019), Exploring the future of Taxation: A Blockchain Scenario Study, *Journal of Internet Law*, **22**(9), 639–658.

Risius, M., and Spohrer, K., (2017). A Blockchain Research Framework, *Business & Information Systems Engineering*, **59**(6), 385–409.

Rodima-Taylor, D. & Grimes, W. (2017). Bitcoin and Beyond, in M. Campbell-Verduyn, eds. *Cryptocurrencies and Digital Payments rails in networked global governance: a perspective on inclusion and développement*. London: Routledge pp. 109–132.

Rolland, M., and Slim, A., (2017), Economie politique du Bitcoin: l'institutionnalisation d'une monnaie sans institutions, *Economie et Institutions* [online]. **26**. [Viewed 9 August 2020]. Available from: doi: 10.4000/ei.6023

Ruoti, S., Kaiser, B., Yerukhimovich, A., Clark, J. & Cunningham, R. (2020). Blockchain Technology: What Is It Good For? *Communication of the ACM*, **63**(1), 46–53. [Viewed 9 August 2020]. Available from: doi: 10.1145/3369752

Szabo, N., (1998). Secure Property Titles with Owner Authority. [online]. [Viewed 9 August 2020]. Available from:
<http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/securetitle.html>

Szabo, N., (2005), Bit Gold. [online]. [Viewed 9 August 2020]. Available from:
<http://unenumerated.blogspot.com/2005/12/bit-gold.html>

The Economist (2015), *The trust Machine: how the technology beyond bitcoin could change the world*, October 31st – November 6th.

Website of the Central Bank of China (PBoC)

<https://www.centralbanking.com/organisations/peoples-bank-of-china-pboc>

Website of the Central Bank of India (RBI)

<https://www.rbi.org.in/>

Website of the Central Bank of South Africa (SARB)

<https://www.resbank.co.za/Pages/default.aspx>

Website of the Central Bank of Russia (CBR)

<https://www.cbr.ru/eng/>

Website of the Central Bank of Brazil (BCB)

<https://www.bcb.gov.br/en>

Wyman, O., (2016). *The Fintech 2.0 Paper. Rebooting Financial Services*, Santander: InnoVenture.

Yeoh, P., (2017). Regulatory issues in blockchain technology. *Journal of Financial Regulation and Compliance*, **25**(2), 196–208. [Viewed 9 August 2020]. Available from: doi: 10.1108/JFRC-08-2016-0068