



The future of blockchain in the European banking system

For European banks, the potential benefits of using blockchain technology do not diminish the controversy surrounding it. From scalability challenges to the “blockchain trilemma” of recording information correctly, cost efficiently and in a decentralised way, the European banking industry is navigating the risks and regulatory issues of blockchain as it takes a global lead in the adoption of this new technology.

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Abstract: Blockchain technology has sparked intense debate in recent years. In the financial industry, this debate has centred almost exclusively on the rise, and more recently on the relative decline, of cryptocurrencies and the risks of these instruments. However, blockchain technology has far wider implications for markets and banks. To get in front of emerging challenges, the European banking industry has spearheaded some key

blockchain-based platforms, including for trade finance. These initiatives have recently been backed by the European Commission, which made the financial applications of blockchain technology a central part of its 2018 FinTech Action Plan.

What is blockchain?

Blockchain is probably the most talked- and written-about technology of recent years.

Although configurations can vary, blockchain can be understood as a distributed ledger technology (DLT) in which information is recorded in a large ledger in “blocks” that are linked and encrypted to be secure and unalterable. Blockchain’s key virtue is decentralisation, which enables information to be recorded without the need for intermediaries. It is paradoxical, then, that financial institutions –the ultimate “middlemen”– stand to benefit from blockchain disintermediation.

Applications of blockchain in the European banking sector

The trajectory of blockchain in the European banking industry has been marked by several distinct phases. 2017 was a year of experimentation and strategic configuration, while 2018 was devoted to testing the technology and rolling out DLT-based initiatives. Will 2019 be the year blockchain technology finally takes off in Europe’s banking sector?

It is hard to be certain, but Europe finds itself at an interesting juncture. While BigTech players in Europe have been scarce, European banks have emerged as leaders in the adoption of these new financial technologies (mainly via cooperation platforms). Meanwhile, regulatory initiatives have been developed to promote, or at least provide, legal protection for blockchain applications in the EU.

Throughout 2018, the European Commission pursued several initiatives that suggest blockchain may play a key role in the configuration of the Digital Single Market (DSM), a target that the banking industry is working to meet. It was hardly surprising when the EU invited major European firms and start-ups to a DSM forum in 2018 to create

the International Association for Trusted Blockchain Applications (IATBA), in which Spain and its banks are strongly represented. The EU expects the IATBA to be fully operational by the first quarter of 2019 and to become the public face of technological cooperation and development in the region, competing with Asia and the US in the DLT arena.

Recent blockchain initiatives in Spain’s banking industry and beyond

Europe’s banks have pioneered some of the world’s most important DLT-based platforms, with Spain’s financial institutions playing an important role in most of them. In 2018, some Spanish banks began promoting blockchain transaction use cases in certain fields, such as asset securitisation and loan approval. To an extent, these initiatives have been test environments for analysing how these types of transactions can be sped up, at what cost and at what level of security.

Early results appear promising. As in other areas of technological uptake, these initiatives are not only being led by the supply side, but also by growing demand from non-financial corporates for blockchain-based banking services. In a 2018 Cognizant survey of 1,570 senior executives at large European firms, 42% said they expected that banking and financial services would be where blockchain would have the biggest impact in the coming years (Cognizant, 2018).

Perhaps the best example to date of DLT addressing corporate demand for more agile financial services is in large-scale trade finance. In a field where bookkeeping, financing and payment transactions for large-scale exports can take days and even weeks to close (a single transaction can involve multiple firms across the globe), international

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banks have begun to cooperate. Spearheaded by European banks, this collaboration has enabled trade transactions to be automated and monitored as never before.

Table 1 shows the world's top five trade finance platforms. Four of the five are markedly European in profile (three of the five include Spanish banks): Voltron, Marco Polo, Batavia and We.Trade. The fifth, the Hong Kong Trade Finance Platform (HKTFP) was developed by the Monetary Authority of Hong Kong and is expected to be operational in 2019.

These platforms cover multiple activities, from transaction payments and credit underwriting

to the execution of trades via smart contracts, all at speeds that allow transactions to close within 24 hours. Although it is too soon to tell, a growing share of global trade will likely be channelled through these platforms thanks to cooperation between technology firms and financial institutions. This collaboration is strengthened further by cooperation among the various platforms themselves, with some banks participating in more than one platform at the same time.

As Table 1 shows, DLT-based trade finance is currently dominated by large financial institutions, but there are also initiatives at the national level involving smaller players

Table 1 International initiatives and the role of European banks in blockchain-based trade finance platforms

	VOLTRON	MARCO POLO	BATAVIA	WE.TRADE	HKTFP
Technology partners	R3 and CryptoBLK	R3 and TradeIX	IBM	IBM	Hong Kong Monetary Authority
Member banks	HSBC, BBVA, Natwest, Bangkok Bank, BNP Paribas, ING, USBancorp, Mizuho, Scotiabank, SEB, CTBC Bank, Intesa Sanpaolo	Natixis, Standard Chartered, Natwest, Bangkok Bank, BNP Paribas, ING, SMBC, OP Bank, Commerzbank, DNB	BMO, UBS, Erste, Caixabank, Commerzbank	HSBC, Société Générale, Santander, Unicredit, Natixis, KBC, Deutsche Bank, Nordea, Rabobank	HSBC, Standard Chartered, DBS, ANZ, Hang Seng Bank, Bank of China, BEA
Core activity	Digitisation of paper-based letters of credit (generally generated manually) to speed up transaction turnaround and reduce fraud	Improving recordkeeping systems to speed up payments and the discounting of receivables	Development of smart contracts to enable the tracking and monitoring of trade transactions in real time	Using smart contracts to enable the development of receivable discounting and invoicing capabilities for European SMEs	Digitisation of the production chain and recordkeeping for corporate transactions and connection with other platforms
Milestones	In May 2018, it completed a letter of credit for a shipment of soybeans from Argentina to Malaysia in 24 hours (the standard turnaround time without blockchain is 5 to 10 days)	In October 2017, it was the first platform to digitally discount receivables and simultaneously secure credit risk for an undisclosed logistics company	In April 2018, it ran two pioneering import pilots that automatically monitored each stage of the import of German cars and Austrian textiles into Spain	In July 2018, this platform announced it was operational in 11 European countries and that it had completed 7 "live" or real-time trades involving 10 European firms	Activity is expected to begin in early 2019

Source: CBInsights (2018) and authors' own elaboration.

and technology providers. One example in Spain is the alliance of Cecabank and Grant Thornton, which created the country's first Blockchain Banking Consortium in May 2017, Niuron. The Niuron platform includes eight banks (in addition to Cecabank) that share banking apps based on blockchain technology: Abanca, Bankia, Caixabank, Caixa Ontinyent, Ibercaja, Kutxabank, Liberbank and Unicaja Banco. Niuron has two objectives: 1) to provide an observatory from which to monitor the technology and generate technical, legal and business know-how; and, 2) to back joint, blockchain-based banking initiatives aimed at transforming the sector, from biometric identification to data protection or regulatory compliance.

The blockchain trilemma

Given the possibilities blockchain offers for the banking industry and the success of many of the pilot initiatives outlined above, why has this technology not seen faster development and uptake? The answer lies with the original vehicle for blockchain: cryptocurrencies. Their volatility, alternative uses (which authorities cannot always control) and, above all, the recent and significant loss of value and confidence, have created some unease in the market.

Some economists have focused their criticism on the correction of digital currencies' valuations. While blockchain advocates insist that it is not the application (currency) that counts, but the underlying technology (blockchain), critics have countered that defence. The Project Syndicate blog recently stated:

In reality, blockchain is one of the most overhyped technologies ever. For starters, blockchains are less efficient than existing databases. When someone says they are running something "on a blockchain," what they usually mean is that they are running one instance of a software application that is replicated across many other devices. The required storage space and computational power is substantially greater, and the latency higher, than in the case of a centralized application. Blockchains that incorporate

"proof-of-stake" or "zero-knowledge" technologies require that all transactions be verified cryptographically, which slows them down. Blockchains that use "proof-of-work," as many popular cryptocurrencies do, raise yet another problem: they require a huge amount of raw energy to secure them. (Roubini, 2018).

And, ironically:

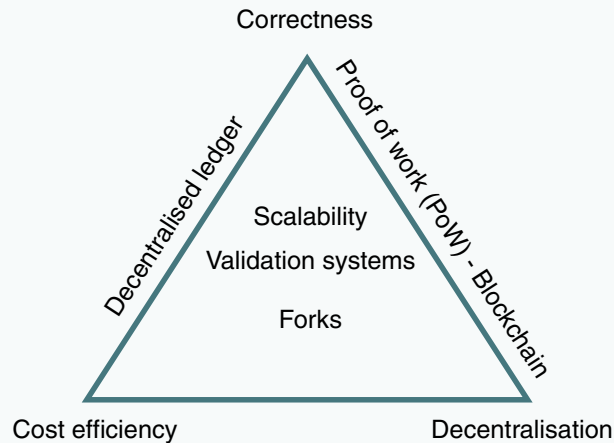
For the moment, the real question is if and when global regulation will stamp out privately constructed systems that are expensive for governments to trace and monitor. Any single large advanced economy foolish enough to try to embrace cryptocurrencies, as Japan did last year, risks becoming a global destination for money-laundering. (Japan's subsequent moves to distance itself from cryptocurrencies were perhaps one cause of this year's gyrations.) In the end, advanced economies will surely coordinate on cryptocurrency regulation, as they have on other measures to prevent money laundering and tax evasion. (Rogoff, 2018).

The shadow cast by cryptocurrencies is not the only problem facing DLTs. The blockchain economy itself faces technological limitations that can be summed up by the "blockchain trilemma" (a term coined by economists Abadi and Brunnermeier, 2018) or the "scalability trilemma" (originally described by Ethereum founder, Vitalik Buterin [2015]). The blockchain trilemma is illustrated in Exhibit 1.

Because the blockchain is written by anonymous users, consensus is reached by making the ledger publicly viewable and verifiable. As Exhibit 1 shows, a DLT should ideally record all information correctly and in a cost-efficient, decentralised manner that avoids concentration of power.

The issue is that no ledger to date has been able to satisfy these three conditions simultaneously. Many blockchain applications fail to reach sufficient operating scale to reduce their energy consumption and other

Exhibit 1

The blockchain trilemma

Source: Abadi and Brunnermeier (2018) and authors' own elaboration.

costs (computing, verification, time) below the costs of centralised ledgers. Scalability is also important to verify that records (a financial transaction, for example) are correct. However, not all potential users will have access to the computing capabilities needed to verify the algorithms in various parts of the blockchain, thus limiting its size and, sometimes, decentralisation. This issue is further complicated when verification technology is divided into one or more technologies or the verification protocol of a blockchain network is changed. This phenomenon is known as a “fork” and is a common problem with cryptocurrencies that have several versions.

Without being too technical, verification implies (among other issues) the ability to add a “solution” to the algorithm so that the blockchain can continue to be written. Blockchain provides the “proof of work” that verifies the correctness of the information recorded. Other protocols, such as “proof of stake” have been put forward to enable faster verification. Proof-of-work systems sometimes make it too costly to verify records. Although costs are lower with a proof-of-stake system, decentralisation is lost (as this protocol implies fewer participants and more

centralised control) — another example of the trilemma.

It has been suggested that in certain contexts, centralisation could be the “lesser evil”, or the part of the trilemma that could be “sacrificed”. Specifically, the concentration of verification systems could make sense when transactions are relatively delimited among a smaller group. However, this route breaks with an essential part of the DLT philosophy (decentralisation) and introduces possible market power rents more typical of intermediation.

In the financial sector, it could make sense to sacrifice some decentralisation in exchange for an equivalent cost savings in markets where competition is already high. In the banking industry, for example, margins have fallen considerably and competition has increased due to, among other things, the push for digitisation, growing competition from non-banks and cost cutting. The trade finance example presented earlier suggests the potential for significant efficiency gains, even at the price of using somewhat more centralised protocols.

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As shown in Exhibit 2, there is a range of possible applications for blockchain in banking and finance. In the markets, blockchain can make equity trades faster and more secure, paving the way for more open and competitive trading. It could also make it easier to verify private investments and provide access to more potential suppliers. It too enables the development of more secure or complementary asset clearance, settlement and custody systems. Paradoxically, blockchain could even make it possible to manage and account for something as unelectronic as cash more efficiently, enhancing traceability and ownership recordkeeping.

Payments is another area of significant development for DLTs. The limitation in this case is the failure of cryptocurrencies like Bitcoin to live up to their expectations. The utility of cryptocurrencies as a store of value or speculative asset may be up for debate, but

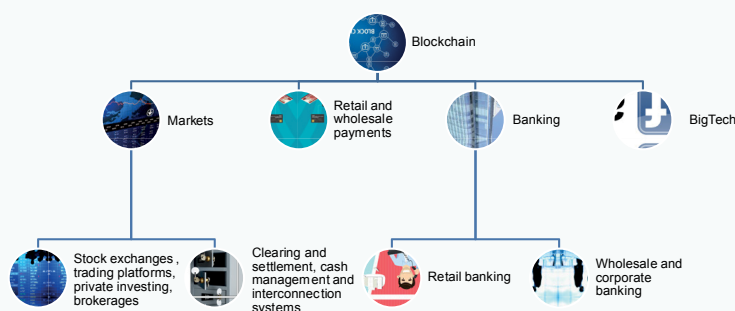
there is general consensus that they have not worked as a means of payment. Regardless, the large card operators and other electronic payment instruments are already developing and testing blockchain technology to shorten settlement times for national and, above all, international payments. Payments may be ripe for blockchain expansion in the near future.

In banking, there are broad possibilities in both the retail and wholesale segments. Beyond the realm of trade finance, there is scope for using distributed ledgers to improve efficiency, turnaround times and verification in areas such as:

- Real-time lending underpinned by borrower risk management based on smart contracts;
- Property valuations and verification;

Exhibit 2

Potential use for blockchain in banking/finance and competition



Source: Authors' own elaboration.

- Development of tailored personal financial tools;
- Management of liquidity and cash, virtual portfolios and management of currencies/remittances;
- Audit and control of counterparty risk;
- Mitigation of operational risk; and
- Regulatory compliance.

Finally, in the environment depicted in Exhibit 2, it is important not to forget BigTech players like Facebook, Apple, Amazon, Google and Netflix. The use of DLTs is the natural next step for companies that control the key input for distributed ledgers: information. This may imply faster customer access systems for their own financial transactions, stepping up competitive pressure on the banks.

International regulation and risks of blockchain: A European perspective

The definitive development of blockchain technology in the European banking system will depend largely on how it is regulated. As Table 2 shows, the EU stands out in the international arena in its efforts to promote the use of blockchain technology. It is important to single out the regulatory and supervisory debate on the most extensive application of blockchain technology to date: cryptocurrencies. Although the International Monetary Fund has urged the main global central banks to make progress on creating so-called central bank digital currencies (CBDCs), both the European Central Bank and, more vehemently, the US Federal Reserve, are reluctant to go much further than experimental tests and do not deem it

necessary, for the time being, to launch their own CBDCs.

However, the scope for blockchain expansion goes well beyond private or monetary authority virtual currencies. Once again, Europe stands out. In March 2018, the European Commission set up a blockchain technology taskforce, and that same month launched a FinTech Action Plan that prominently featured blockchain-based projects. Indeed, the first objective listed in the Action Plan is to enable the financial sector to make use of the rapid advances in new technologies, such as blockchain, artificial intelligence and cloud services.

While the Action Plan seeks to make markets safer and easier for new players to access, its three main objectives are to enable innovative business models to reach scale in the EU, to support the uptake of technological innovation in the financial sector, and to enhance cybersecurity and integrity in the financial sector.

The UK has been home to regulatory and supervisory pioneers. The Financial Conduct Authority (FCA) has created laboratories to simulate the market launch and oversight of FinTech companies, or the so-called “regulatory sandbox”. Projects that analyse how blockchain could assist with regulatory compliance in financial services are a particularly important part of this endeavour. Within the sandbox, the FCA is running Project Innovate, which is targeted specifically at financial firms that use DLT.

These testing grounds, action plans and nascent regulations on the use of blockchain in banking and finance also consider the risks that must be managed for appropriate uptake

“ The European Commission’s FinTech Action Plan aims to enable innovative business models to reach scale in the EU, support the uptake of technological innovation and enhance cybersecurity and integrity in the financial sector. ”

“ If blockchain technology cannot be shared among operators or platforms, or is so exclusive that it makes competitors incompatible, demand and large-scale adoption are unlikely. ”

of these technologies. First, they share the industry's concerns about profitability. To the extent that the proposed applications or solutions involve too many costs (mainly due to scalability problems), market launches

will not be viable. However, applications and platforms that do not allow for a certain degree of standardisation and interoperability do not appear to be very viable. Once again, scalability is the issue. If the technology cannot

Table 2 International regulatory initiatives related to blockchain

European Commission	<ul style="list-style-type: none"> - The European Commission's blockchain technology taskforce has been working since March 2018. - In March 2018, the European Commission launched a FinTech Action Plan with implications for blockchain technology and the financial sector. - As early as 2016, the European Commission made virtual currency exchange platforms and custodian wallet providers "obliged entities" under the fourth Anti-Money Laundering Directive.
European Central Bank	Despite acknowledging the potential significance of blockchain technology, in September 2018 the ECB said that it was still fragile technology and too soon to contemplate a European digital currency.
International Monetary Fund	<ul style="list-style-type: none"> - The IMF has insisted on the need for regulations to mitigate risks while permitting the development of blockchain technologies but has also emphasised the need for coordination. - Since 2016, it has been issuing reports that identify the risks and benefits of DLTs, particularly in the financial industry. - In November, IMF Managing Director Christine Lagarde said it would be advisable for central banks to consider developing their own digital currencies.
The Financial Conduct Authority (FCA), UK	<ul style="list-style-type: none"> - The FCA is analysing the ways in which blockchain could assist with regulatory compliance in the financial services arena. - It is working on Project Innovate for the development of financial firms that use DLT, which it has been nurturing since 2016 in its regulatory sandbox.
Germany's Federal Financial Supervision Agency (BaFin)	This authority has mainly taken a preventative stance, signalling that the absence of a European DLT authority may lead to issues in areas such as money laundering.
Central Bank of Sweden	This monetary authority is analysing the ways in which digital currencies can accelerate (even more) the substitution of cash with electronic payment methods in Sweden.
US Federal Reserve	The Federal Reserve has been working with IBM since 2018 on the development of blockchain-based digital payment systems for possible use as a central bank currency in the future. However, in December 2018, the Fed said that it was not convinced that a DLT-enabled central bank digital currency is advisable.

Source: CBInsights (2018) and authors' own elaboration.

be shared among operators or platforms, or is so exclusive as to create incompatibilities among competitors, large-scale adoption is unlikely (demand-wise).

Finally, the supervisors have their eye on how blockchain could introduce new risks to financial stability, especially in terms of counterparty and operational risks if the proposed applications fail. However, they are also looking at potential benefits in the areas of privacy, compliance and transparency from an oversight standpoint.

References

ABADI, J., and M. BRUNNERMEIER (2018), *Blockchain Economics*, mimeo, Princeton University, https://scholar.princeton.edu/sites/default/files/markus/files/blockchain_paper_v3g.pdf

BUTERIN, V. (2015), *Notes on scalable blockchain protocols*, mimeo, https://github.com/vbuterin/scalability_paper/blob/master/scalability.pdf

CBINSIGHTS (2018), *How Blockchain Could Disrupt Banking*, <https://www.cbinsights.com/research/blockchain-disrupting-banking/>

COGNIZANT (2018), *Blockchain in Europe: Closing the Strategy Gap*, <https://www.cognizant.com/whitepapers/blockchain-in-europe-closing-the-strategy-gap-codex3320.pdf>

ROGOFF, K. (2018), *Betting on Dystopia*, Project Syndicate, <https://www.project-syndicate.org/commentary/cryptocurrencies-are-like-lottery-tickets-by-kenneth-rogooff-2018-12>

ROUBINI, N. (2018), *The Blockchain Pipe Dream*, Project Syndicate, <https://www.project-syndicate.org/commentary/blockchain-technology-limited-applications-by-nouriel-roubini-and-preston-byrne-2018-03?barrier=accesspaylog>

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