Entrepreneurship
ISSN: 1314-9598; 2367-7597
Volume: VIII, Issue: 1, Year: 2020, pp. 94-108

APPLICATION OF BLOCKCHAIN IN BANKING COMPLIANCE ACTIVITY

Nedyalko Valkanov[1]

Received: 10.04.2020, Accepted: 28.04.2020

Abstract

Introduction and penetration of blockchain based technologies alongside with the appearance of cryptocurrencies gave financial sector not only a strong competitor in the face of different fintech alternatives but also a powerful possibility for response to complex and burdening present-day regulatory environment. The article examines possible applications of distributed ledger technology for the needs of modern banking compliance. The study emphasizes that this innovation could be treated as a factor that inevitably changes the way modern banks respond the expectations of surrounding regulatory framework. On the basis of presented facts and analysis are proposed several assumptions for future integration of blockchain technologies into banking compliance activities in shorter and longer term.

Keywords: *blockchain, banking, compliance, financial regulations*
JEL Codes: *G21, K20, O30*

1. Introduction

It will not be exaggerated if we characterize last decade as disruptive for credit institutions in the face of rising regulatory compliance requirements and competition from alternative providers of financial services. Appearance of new players like fintechs, providing new low-cost possibilities in the field of payments, lending, saving, investments and etc., makes banks encounter radically different type of market environment and urges them to rethink their traditional stereotypes regarding business models and product distribution channels. Meanwhile regulatory burden following global financial crisis of 2007-2008 continues to increase biting more and more significant shares from their incomes. Introduction of regulations like Basel 3, AMLD 4 and 5, GDPR, IFRS 9, PSD 2 requires additional expertise and resources in this regard.

[1] Department of Finance, University of Economics – Varna, Assoc. Prof. PhD., e-mail: n.valkanov@ue-varna.bg

Meanwhile imposed sanctions for different cases of non-compliance cost global banking community trillions of dollars. Following these trends banks have little choices but to embrace new technological innovations. By outsourcing activities to specialized RegTech firms or developing their own high tech compliance solutions, they change traditional conservative approaches for complying with regulatory requirements and attract the smart arsenal of artificial intelligence, big data and blockchain technologies. At the same time global supervisors appeal for testing the potential of these modern technologies for regulatory purposes. And first results are already a fact – Monetary Authority of Singapore and Bank of Canada report for a successful experiment of cross-border and cross-currency payments, using central bank digital currencies based on the blockchain technology (Monetary Authority of Singapore, 2019). Another example is the implemented and launched in October 2018 by the Hong Kong Monetary Authority blockchain-based trade finance platform (Hong Kong Monetary Authority, 2019).

The research focuses on the potential benefits of attracting the blockchain technology into banking compliance toolkit and more precisely in customer identification activities for the purposes of anti-money laundering, counter terrorist financing and for prevention of other financial crimes and violations. The study aims to clarify arguments supporting the thesis that distributed ledger technology (DLT) inevitably changes the way modern banks respond the expectations of surrounding regulatory environment.

In the text below blockchain is treated as disruptive technology that creates new opportunities in vast areas of finance and banking, as well as in the area of ensuring strong know your customer (KYC) and customer due diligence (CDD) policies. Based on the interpretation of facts and analysis below, there are drawn several conclusions outlining the future acceptance of the distributed ledger technology for the needs of banking compliance in shorter and longer term.

2. Blockchain as a disruptive innovation

Appearance of the blockchain technology could be linked with the introduction of cryptocurrencies, and more specifically Bitcoin in 2009. In short, how exactly this technology works and why it conceptually differs from conventional database structures[2]. Blockchain is based on the distributed ledger technology (DLT) made up of interconnected batches (blocks) containing

[2] Traditional databases models are centralized – where information is stored on a single location, and decentralized – where it is placed on different connected locations.

information for each individual database entry. It appears to be an upgraded type of distributed storage of data where information is encrypted and distributed among all participants in the network according to the rules integrated into the ledger. An identical copy of this register is available for all participants in the system, each change in it is signed (hashed) with a cryptographic key and leads to the generation of a new block in the chain. Every new block contains information about the previous ones, which guarantees protection against data manipulation.

In addition, the creation of new blocks should be validated by solving a complex mathematical algorithm from the computer systems of all peer-to-peer participants in the respective blockchain network. One of the most significant advantages of a blockchain architecture is that it does not allow retroactive changes in the database. In short, it is a shared database storing encrypted information and where all changes are available only after the approval (consensus) by all participants in the system (Valkanov, 2019a., pp. 192-193).

As far as technological aspects of DLT remain out of the focus of this research, it is important to highlight some of its applications in the financial industry apart from the cryptocurrencies[3].

DLT-based payment systems. Their appearance could be directly connected with cryptocurrencies but the potential of the innovative technology quickly spreads across the financial industry. Except the example from Singapore, mentioned above, we could highlight the Santander One Pay FX system, allowing customers of Spanish Banco Santander to make international payments between individuals up to £10 000 a day. Swiss UBS together with 14 global banks is also developing a crypto-based payment mechanism for settlement of cross-border trades[4]. It is doubtless banks see the potential of real-time, secure and

[3] It is too early to say if and when cryptocurrencies will become an alternative to conventional money. As at the end of 2019 different regulators apply separate approaches – cryptocurrencies are legalized and treated favorably in countries and jurisdictions like USA, Canada, Japan, Australia, Hong Kong, European Union, while in some countries their usage is restricted (for example China and Russia). Meanwhile cryptocurrencies remain highly vulnerable to cybercrime and fraud. According to Ciphertrace 2019 Q2 report, "outright thefts as well as scams and other misappropriation of funds from cryptocurrency users and exchanges cryptocurrencies amount approximately $4.26 billion" (Ciphertrace, 2019, p. 4).

[4] Barclays PLC, Nasdaq Inc., Credit Suisse Group AG, Bank of New York Mellon Corp., Canadian Imperial Bank of Commerce, State Street Bank & Trust Co., Banco Santander SA, Commerzbank AG, ING Groep NV, KBC Group NV, Lloyds Banking Group PLC, Mitsubishi UFG Financial Group Inc. and Sumitomo Mitsui Banking Corp. – see: PMNTS (2019).

significantly cheaper alternative of traditional wire transfers. According to Accenture survey, 90% of 32 global commercial banks are exploring the benefits of blockchain technology in the area of payments (Accenture, 2016, p. 3). Leading use cases that have been explored are connected with intra-bank cross-border operations, cross-border remittances and corporate payments (Accenture, 2016, p. 5). SWIFT also does not stay back in the race. In 2019 the company declares its plans to use blockchain, enabling payments on DLT-based trade platforms to be initiated within trade workflows and automatically passed on to the banking system (SWIFT, 2019).

Smart contracts. According to definition of Investopedia, smart contracts are self-executing contracts with the terms of the agreement written into computer code, existing across a distributed, decentralized blockchain network (Investopedia, 2019). The most significant advantage of smart contracts is their traceability and irreversibility due to the distributed ledger they are based on. Today smart contracts meet wide acceptance among different businesses.

International trade. Blockchain based platform We.trade, developed by Belgian banking group KBC for small and medium business customers is a good example for the embrace between DLT and banking industry. The platform facilitates international trade by digitalization of the whole documentary credit process allowing the buyer to generate an electronic order form, which to be accepted by the vendor and after that follows a generation of smart contract setting out the payment terms. The project is supported by seven other EU banking groups - Banco Santander, Deutsche Bank, HSBC, Natixis, Rabobank, Société Générale and UniCredit.[5] Similar applications of DLT for the needs for international trade are due to gain more and more popularity upgrading classical international trade instruments like letters of credit, bills of lading, bill of exchange and etc.

Funds raising and lending. Another direction in which DLT develops rapidly during last years is connected with the funds raising platforms. Initial Coin Offering (ICO) gained popularity following the boom of cryptocurrencies. Now ICO is fast growing fundraising mechanism for financing of new projects. Investors receive crypto tokens in exchange for other cryptocurrencies[6]. Some

[5] See KBC (2019).

[6] The blockchain token is a digital representation of a real tradeable asset, created during the process of ICO. When speaking about creation of virtual securities, sometimes the term *security token offering (STO)* is used in order to distinguish it from other types of ICOs, connected with creation of different types of tokens – payment, equity or utility (Laurent et. al., 2018, p. 63).

analyzers (Hurder, 2018; Laurent et. al., 2018) even point a process of tokenization of economy (or "token economy") in near future. In practice ICO represents a flexible similarity of traditional Initial Public Offerings, standing still outside the scope of regulations[7].

DLT could also be found in the innovative crowdlending process. The technology is adapted in some platforms for peer-to-peer (P2P) lending, granting loans in cryptocurrencies[8], as well as in combination between crypto and conventional currencies[9].

Another example for DLT-based financing instrument are the Contingent convertible bonds (CoCo bonds). Similar to hybrid securities, they represent a tokenized bond instruments combining features of equity and debt. Like regular bonds, investors gain dividends but just after crossing a defined threshold, the bond converts to equity, saving issuers both the cost of the remaining coupons and the need to repay the security (Deloitte, 2016, p. 12).

Serving the unbanked. Different estimations show around one third of world population being unbanked or underbanked (Accenture, 2015, p. 7). Even in worlds` largest economy – USA, number of unbanked Americans amounts to 15.6 million, while 51.1 million US adults are underbanked (Mire, 2018a). All this suggest the potential of different DLT-based solutions executing basic financial operations – transfers, lending, insurance. Modern smartphones provide all necessary technical requirements for mobile banking, storing of mobile wallets and participation in DLT networks – secure biometrical identification, near field communication (NFC) chips for contactless payments and enough computing power to access DLT networks. Moreover, the number of mobile phone users is predicted to rise globally over 7 billion in 2021 which prevails significantly the number of banked population[10].

3. Blockchain for compliance issues

[7] In this regard US Securities and Exchange Commission issued a statement declaring that while "these digital assets and the technology behind them may present a new and efficient means for carrying out financial transactions, they also bring increased risk of fraud and manipulation because the markets for these assets are less regulated than traditional capital markets" – see SEC (2019).

[8] https://saltlending.com; https://ethlend.io.

[9] https://coinloan.io; https://blockfi.com; https://www.myconstant.com; https://ampleinvest.com.

[10] See: https://www.statista.com/statistics/218984/number-of-global-mobile-users-since-2010

As pointed in brief, applications of DLT show a great potential for future development and a possible "upgrade" of the architecture of financial instruments and infrastructure. The compliance field is no exception to this trend. Circumstances like that more than 200 financial regulations are being updated on daily basis, the compliance staff in large banking groups constantly rises and the adequate response to present day regulations is a serious challenge to financial institutions (Valkanov 2019a, pp. 50-51), prove the opinion that new stricter and complex regulatory environment requires a conceptually new approach by the side of banking institutions. And the technology of distributed ledger is namely that cornerstone showing the direction of future development in the field of bank regulation. Furthermore, DLT gives bilateral opportunities when speaking about interaction between supervisors and supervised institutions. More precisely here we can point following three types of mutual benefits:

1) *Individual benefits*, expressing in improved and reliable toolkit for preparation of different compliance task by separate credit institutions. Examples for such tasks are: customer identification, monitoring of operations, authorization and verification of customer profiles, and etc.
2) Benefits for *financial supervisors* by obtaining the possibility to create shared and secure databases containing negative information, sanctions and embargo lists and etc., as well as the opportunity to spread updated information in real-time regime to banking compliance filters (Stavrova and Valkanov, 2018, pp. 28-30).
3) Benefits *for financial sector* –manipulation of DLT databases is possible only after consent, they are secure and changes in them are irreversible, which creates the possibility for sharing information between all participants in the sector.

DLT follows introduction of two other major innovative technologies in the field of compliance – *big data* (BD) and *artificial intelligence* (AI). Their integration is becoming more common in different KYC / CDD tasks related with customers onboarding, data analyses and finding relations in databases, ensuring business continuity, regulatory reporting and etc. In general, these activities could be summarized in following directions: *1) collection of data* (transformation of analog information in digital; voice and speech recognition); *2) data analysis* (data mining; analogical reasoning; rules-based expert systems); *3) machine learning* (self-learning and deep learning); *4) speech processing* (analysis of human speech; automated voice reactions; conversion of speech into text); *5) business continuity* (accidents management; evaluation of business processes); *6) automated processes and robotization* (monitoring of operations; automated

verification of customer profiles; check-up of databases; finding anomalies; reporting)[11].

In the light of this DLT supplements tools, using BD and AI, could be considered as a peculiar technological basis for transition to basically new approach for ensuring effective compliance function in banks referred in some researches as compliance 2.0. This new approach could be considered as coordinator between different policies in the fields of security and risk management (Valkanov, 2019a, p. 165). The need for such high-tech compliance is ubiquitous but especially crucial for so-called "neobanks" – digital banking institutions without physical branches, providing their services entirely throughout virtual platforms[12]. Their positioning as providers of financial services is constantly growing during last years. Offering cheaper prices, especially for money transfer services and having in mind their minimal operational costs, the potential of such fintech companies for gaining new market shares from traditional credit institutions is out of doubt.

And here comes the challenge with the provisioning of adequate customer identification. Commonly used techniques for remote customer identification used by such digital banks include:

- request for a picture from valid identification document (national ID card or international passport) in high resolution;
- face capture with the camera of PC or mobile device;
- online video chat (via Skype or other software) between customer and bank`s employee;
- verification of collected data from different registers and databases.

Following the marked above identification mechanisms, effective ID management could be pointed as a factor of critical importance for responding present day compliance requirements. In this respect can be brought out and developed the potential of DLT. In that sense of thought, it is not unexpected to claim that one of the most significant benefits of blockchain in the financial industry is the automation of the KYC process (Petrov, 2018, p. 25). The strength of DLT for the needs of compliance could be sought in three directions.

First is the possibility for *provision of reliable customer information*. Nowadays data veracity is a matter of primary concern not only form banks, but for financial sector and its regulators themselves. Something more, according to some opinions (Dentos, 2019) existing KYC processes contain certain

[11] See: Valkanov (2019a), pp. 207-208.

[12] Examples here are fintechs like Paysera, Transferwise, Monzo, Revolut, Atom Bank, Tinkoff.

inefficiencies like: information asymmetries between financial institutions and regulators; duplication compliance work and disproportionate amount of time and resources on manually validating and coordinating the completion and reconciliation of different KYC documentation, as opposed to assessing client risk.

Significant security level, possible due to the irreversibility of operations, transparency, as well as the need for consensus for each database entry change solve existing problems of sharing data.

Traditionally for the needs of their KYC / CDD operations, banks rely on following two types of databases:

- internal private databases containing negative customer information (black lists);
- external public databases with information from governments, regulators and other authorities[13].

Maintenance of different databases for the need of KYC/CDD by single banking institutions is not only bulky and expensive, but most important is the risk of loss of information due to technical reasons, negligence or by intention. This situation changes dramatically when using unified common databases maintained by regulators (Valkanov, 2019c, p. 23). Such ledgers can consolidate information from different public and private sources under the supervision and rights management of the regulatory agency. The idea for sharing the customers` database with supervisory agency may also be proposed.

Interesting is one experiment made in 2017 by KPMG in Singapore, fintech company Bluzelle Networks, three banks operating in Singapore (HSBC, OCBC, Mitsubishi UFJ Financial Group) and the Singaporean regulator IMDA for developing a proof-of-concept KYC utility on a blockchain platform. The enterprise aimed to test the technical aspects of a blockchain KYC platform and more precisely its functionality, security, and scalability. The experiment passed test scenarios defined by Singapore's financial regulator (MAS) and during the tests platform remained stable and responsive even at a high volume of information flow. Test results proved its performance was strong, with transaction times remaining swift even as transaction concurrency and complexity increased; used data remained secure and confidential, with access

[13] See for example the Sanctions list of the US Office of Foreign Assets Control (https://sanctionssearch.ofac.treas.gov) and the Consolidated list of persons, groups and entities subject to EU financial sanctions (https://data.europa.eu/euodp/bg/data/dataset/consolidated-list-of-persons-groups-and-entities-subject-to-eu-financial-sanctions).

limited only to those with the correct authentication codes; platform resisted tampering by third parties and last but not the least, potential cost savings were estimated to be between 25 and 50 percent by reducing duplication and providing a clear audit trail (Maguire et al. 2018, p. 4).

Second, *sharing of databases* with other financial institutions, as well with supervisors. According some points of view (Auer, 2019) DLT could facilitate financial institutions not only to gain advantages in customer identification process but allow effective interactive communication inside the bank (as part of internal risk management), as well as with external regulators and authorities. Using blockchain instruments like smart contracts, Merkle (hash) trees, homomorphic encryption and etc. enable the possibility banks to define individual for each regulator and authority access rights and thus to share only required data complying with data protection requirements (Auer, 2019, p. 13).

Sharing databases via DLT could also be considered as an attempt to reduce financial frauds. Large number of so-called white collar crimes and misconduct behavior connects with data breaches and manipulation due to unauthorized access to accounting and information systems. A vivid example here is the unauthorized transactions of Société Générale`s trader Gerome Kerviel in 2008 causing a €5 billion loss to the bank. Secure DLT can facilitates regulators` confidence they receive a trustworthy data and a connected platform allows them observe real-time updates eliminating lags in reporting and thence time for data manipulation (Mire, 2018b). Another successful proof-of-concept for sharing KYC/CDD data is the completion of the mutual project between Deutsche Bank, HSBC, Mitsubishi UFJ Financial Group (MUFG), Treasuries of Cargill and IBM. In 2017 the consortium demonstrated the abilities of a platform that provides banks a secure, decentralized and efficient mechanism for collecting, validating, storing, sharing, and refreshing of trusted KYC information of corporate customers (Fintechnews, 2018).

Third game changing direction comes as a direct consequence of databases sharing. It expressing in the possibility to *embed blockchain mechanism* in existing products and services. The aim is to improve traceability of complex financial transactions for the needs of anti-money laundering and contra terrorist financing. Example here are complex transactions connected with trade finance. Namely money laundering through trade finance appears to be one of most complex and actual scheme for disguising the origin of illegal funds[14]. And here

[14]Trade based money laundering schemes use legitimate trading activities as a screen for laundering capitals with illegal origin. Usage of complex documentary financial instruments in international trade creates favorable conditions for the inflow of illegal

again as examples can be cited recent initiatives of monetary authorities in Hong Kong and Singapore who in 2018 launched the Global Trade Connectivity Network – a cross-border infrastructure based on distributed ledger technology that comprehensively digitises trade finance transactions between the two jurisdictions. (Monetary Authority of Singapore, 2017).

Embedding DLT in different products and services – e.g. payments, forex, trading, securities, derivatives, is a revolutionary technological innovation with the rank of game changer in the ease of administration and quality of regulatory oversight and compliance (Mire, 2018b).

4. Scenarios for future development

After highlighting some general trends and examples for DLT penetration in different compliance related areas, we could summarize several trends for future development of the collaboration between blockchain technological innovations and banking compliance. Conditionally and without claiming exhaustiveness, these trends could be categorized in shorter and longer period.

Following trends could be outlined in *short term*.

1) Expanding the existing *collaboration between banks and with RegTech and SupTech companies*. According to some opinions (Mesropyan, 2018) financial services institutions achieve leverage effect by their cooperation with RegTech and SupTech firms in the field of compliance[15]. Applying distributed ledger technology enables process efficiencies and resource optimization.

2) *Sharing of compliance activities*. As mentioned above, directions for sharing compliance activities could be inside bank institution (disseminating the realization of the compliance function across the whole organization together with the overall risk management policy), among the financial sector (by sharing information and creating common distributed databases with other participants) and with regulators (via DLT-based two-way real-time data sharing mechanism).

3) Increasing the *automation and robotisation of operations and processes*. Data sharing and aggregation, data-driven insights generation, platform development, cloud computing and blockchain-based platforms for compliance,

---

capital and its subsequent legalization through fictitious trading operations. For more money laundering schemes and their counteraction see: Valkanov (2019b), pp. 42-64.

[15] *Regulatory Technology* (RegTech) and *Supervisory Technology* (SupTech) firms represent two significant branches of the fintech industry. For less than a decade, their presence as providers of regulatory expertise changed dramatically the traditional landscape for interaction between banks and regulators. The possibility for outsourcing different compliance tasks to the tech firms bank can be considered as opportunity for cost optimization, especially in time of constantly increasing regulatory costs.

and on-demand compliance expertise are some examples in this direction (Mesropyan, 2018). In addition to currently applied AI-based instruments for speech and text recognition, data manipulation, case-based reasoning, machine and deep learning and etc. DLT positions as integral part of modern high tech compliance. It can be predicted that banks` investments in technological solutions combining blockhain, big data manipulation, cloud computing and artificial intelligence will continue to grow in the coming years[16].

In *longer term* we could predict following tendencies.

1) *Fully automation of daily compliance activities*. Even now dominant part of compliance tasks relies on different platforms and computer technologies. It is obvious this trend will remain and continue to expand. Establishment of automated interaction channels "bank – customers", "bank – financial sector" and "bank – regulator" could be expected in not so far future.

2) *Compliance as a Platform*. Following the tendency for imposition and transition to the platform model in modern economy ("software as a service", "data as a service", "infrastructure as a service" and etc.) modern compliance is far beyond from its previous statute of ordinary performer of regulatory tasks. Numerous activities falling in the scope of present compliance competences (anti-money laundering, counter terrorist financing, prevention of financial crimes and financial misconduct, business continuity, as well as counteraction to all nonfinancial risks) predetermine its future development based on the platform concept – an unitary compliance function with omnipresence all across organizational structure[17].

3) *Complete redesign of banking compliance activities*. Mentioned above development trends are feasible in parallel with the assumption for total redesign of compliance activities – from different routine tasks to competencies on strategic level, connected with the establishment of the compliance function and the organization of the respective structure.

4) *Roboregulators*. Different SupTech initiatives, undertaken by some regulatory agencies represent only a signal for future switching to fully automated supervision. This vision connects with regulatory framework having the ability to provide automated compliance solutions. Except significant cost reduction,

[16] According to some estimations investments in RegTech industry rise with 48% each year and expectations are their volume in 2022 to rose above $76 billion per year. Alongside investments of financial industry and especially banks in different RegTech initiatives are expected to rise steadily as well – see Valkanov (2019a), p. 179.

[17] The concept for Compliance as Platform (CaaP) model is presented in Valkanov (2019a).

establishment of fully automated regulators (roboregulators) could be associated with better integrity, objectivity and possibility for immediate supervisory response.

In this line of thoughts Auer (2019) suggests the concept of embedded supervision based on DLT. Although the focus there are decentralised markets, this concept is fully applicable to different platform-based providers of financial services, including neobanks. One of the major conclusions in the research is embedded should promote low-cost compliance and a level playing field for small and large firms (Auer, 2019, pp. 1-2).

5. Conclusion

Application of distributed ledger technologies for compliance issues is a radically new concept gaining fast popularity. As a new technology, it may also cover some currently unknown vulnerabilities. As a positive point in this regard could be considered attempts of different financial authorities and regulators to test potential DLT-based solutions before enabling them in compliance practice. Increasingly frequent information about successful DLT tests are encouraging arguments giving confidence in near future blockchain could turns in irrevocable part of modern compliance toolkit.

REFERENCES

Accenture (2015). Billion Reasons to Bank Inclusively. *Accenture Banking*. Available online: https://www.accenture.com/se-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Dualpub_22/Accenture-billion-reasons-bank-inclusively.pdf

Accenture (2016). Block Chain Technology. How Banks are Building a Real-Time Global Payment Network, Available online: https://www.accenture.com/_acnmedia/PDF-35/Accenture-Blockchain-How-Banks-Building-Real-Time-Global-Payment-Network.pdf

Auer, R. (2019). Embedded Supervision: How to Build Regulation into Blockchain Finance, Bank for International Settlements, Available online: https://www.bis.org/publ/work811.pdf

Ciphertrace (2019). Cryptocurrency Anti-Money Laundering Report, 2019 Q2, Available online: https://ciphertrace.com/wp-

content/uploads/2019/09/CipherTrace-Cryptocurrency-Anti-Money-Laundering-Report-2019-Q2-3.pdf

Deloitte (2016). Over the Horizon. Blockchain and the Future of Financial Infrastructure, Available online: https://www2.deloitte.com/content/dam/Deloitte/mt/Documents/financial-services/gx-fsi-blockchain-deloitte-summary-mt.pdf

Dentos (2019). Using blockchain for KYC/AML compliance, 28 May 2019, Available online: https://www.dentons.com/en/insights/articles/2019/may/28/using-blockchain-for-kyc-aml-compliance

Fintechnews (2018). IBM Completes Proof-of-Concept Blockchain-Based Shared KYC, 3 January 2018, Available on: https://fintechnews.sg/14420/blockchain/ibm-completes-poc-blockchain-based-shared-kyc-deutsche-bank-hsbc-mufg-cargill-ibm-treasuries/

Hong Kong Monetary Authority (2019). Website. Key functions. Trade Finance, https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/research-and-applications/trade-finance/

Hurder, St. (2018). The Economics of Tokenization Part I: Not Everything Can (or Should) be Tokenized, Medium, 30 May, 2018, Available online: https://medium.com/prysmeconomics/the-economics-of-tokenization-part-i-not-everything-can-or-should-be-tokenized-ed9b32f5a0f2

Investopedia (2019). Smart Contracts, Available online: https://www.investopedia.com/terms/s/smart-contracts.asp

KBC (2019). We.trade and KBC Trade Club, https://www.kbc.be/corporate/en/article/financing/trade/smoother-secure-international-trade.html

Laurent, P., Th. Chollet, M. Burke, T. Seers (2018). The Tokenization of Assets is Disrupting the Financial Industry. Are You Ready? *Inside. Triannual insights from Deloitte*. Issue 19, October 2018, pp. 62-67, Available online: https://www2.deloitte.com/lu/en/pages/technology/articles/tokenization-assets-disrupting-financial-industry.html.

Maguire, E. et al. (2018). Could Blockchain be the Foundation of a Viable KYC Utility? KPMG International, Available online: https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/03/kpmg-blockchain-kyc-utility.pdf

Monetary Authority of Singapore (2017). Singapore and Hong Kong launch a joint project on cross-border trade and trade finance platform, Available online: https://www.mas.gov.sg/news/media-releases/2017/singapore-and-hong-kong-launch-a-joint-project-on-cross-border-trade-and-trade-finance-platform

Mesropyan, E. (2018). How European Banks Are Using RegTech Solutions, *Medici*, 6 June 2018, Available online: https://gomedici.com/how-european-banks-are-using-regtech-solutions

Mire, S. (2018a). Blockchain In Banking: 14 Possible Use Cases, *Disruptor Daily*, 17 October 2018, Available online: https://www.disruptordaily.com/blockchain-use-cases-banking/

Mire, S. (2018b). Blockchain In Compliance: 6 Possible Use Cases, *Disruptor Daily*, 3 December 2018, Available online: https://www.disruptordaily.com/blockchain-use-cases-compliance

Monetary Authority of Singapore (2019). Central Banks of Canada and Singapore conduct successful experiment for cross-border payments using Distributed Ledger Technology, 02 May 2019, Available online: https://www.mas.gov.sg/news/media-releases/2019/central-banks-of-canada-and-singapore-conduct-successful-experiment-for-cross-border-payments

Petrov, D. (2018). Application of blockchain and smart contracts in the financial industry. *Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series*, Vol. 7, №2, pp. 24-33, Available online: https://ideas.repec.org/a/vra/journl/v7y2018i2p24-33.html.

PYMNTS.com (2019). UBS Leads New Blockchain Settlement Coin Consortia, 3 June 2019, Available online: https://www.pymnts.com/blockchain/2019/ubs-crypto-cross-border

Securities and Exchange Commission, SEC (2019). Spotlight on Initial Coin Offerings (ICOs), Available online: https://www.sec.gov/ICO

Stavrova, E., N. Valkanov (2018). Correspondence Interrelations Between Banks and Systems for Information Discovery in Databases Created for Them. *Economics and Management*, Vol. XV, Issue: 2, pp. 27-43, Available online: http://em.swu.bg/images/SpisanieIkonomikaupload/Spisanieikonomika2018/CORRESPONDENCE%20INTERRELATIONS%20BETWEEN%20BANKS.pdf

SWIFT (2019). Payments: Looking to the Future, Available online: https://www.swift.com/future-of-payments

Valkanov, N. (2019a). Compliance v pomosht na finansovoto regulirane, Varna: Science and Economics.

Valkanov, N. (2019b). Banking System and Money Laundering. Varna: E-Litera Soft, Available online: https://www.ceeol.com/search/book-detail?id=733930

Valkanov, N. (2019c). Mitigation of Regulations Burden in Financial Sector by Application of High Tech Solutions. *Economics and Management*, Vol. XVI, Issue: 1, pp. 19-30, Available online: http://em.swu.bg/images/SpisanieIkonomikaupload/Spisanieikonomika2018/C

ORRESPONDENCE%20INTERRELATIONS%20BETWEEN%20BANKS.pdf