

Economic Studies

Using Blockchain in Financial Services

Dr. Heba Abdel Monem



صندوق النقد العربي
ARAB MONETARY FUND



USING BLOCKCHAIN IN FINANCIAL SERVICES

DR. HEBA ABDEL MONEM

ARAB MONETARY FUND

2019



©Arab Monetary Fund 2019

All Rights Reserved

The material in these publications are copyrighted. No part of this study may be Copied and/or translated or re-reproduced in any form without a written consent by AMF except in the case of brief quotations where reference must be quoted.

The views expressed in these studies are those of the author (s) and do not necessarily reflect the views of the AMF.

These economic studies are the product of the staff of the Economic and Technical Department at the Arab Monetary Fund (AMF). The Fund publishes these studies which survey issues pertinent to monetary, fiscal, banking, trade and capital market policies and their impact on Arab economies.

All correspondence should be addressed to:

Economic and Technical Department

Arab Monetary Fund

P.O. Box 2818

United Arab Emirates

Telephone No.: +9712-6171552

Fax No: +9712-6326454

E-Mail: economic@amfad.org.ae

Website: www.amf.org.ae



CONTENTS

1. Introduction	1
2. Blockchain Evolution	4
3. Blockchain as an Enabler to Cryptocurrencies.....	9
4. Blockchain and Financial Services: Challenges and Opportunities..	12
4.1 Blockchain Opportunities for Traditional Financial Services.....	13
4.2 Blockchain and Financial Inclusion	19
4.3 Using Blockchain in Providing Financial Services: Current Challenges	21
5. Blockchain: The Advances in Policy Making	23
6. Blockchain: Central Banking Approach.....	28
6. 1 The Impact of cryptocurrencies.....	28
6.2 The Impact of Central Bank Digital Currency (CBDC)	32
7. Blockchain: Central Banks' Stances	35
8. Blockchain in Arab Countries and the Role of the Arab Monetary Fund.....	38
9. Conclusion and Policy Implications.	43

1. Introduction

The Distributed Ledger Technology (DLT) is a database that maintains a growing list of records. Blockchain is an example of the DLT in which transactions are grouped in blocks, recorded sequentially in a chain of blocks⁽¹⁾. Blockchain records are time-stamped and stored cryptographically in a chronological manner, which makes them immutable and tamperproof⁽²⁾. The ledger and its included records are trustworthy without the need for a central authority⁽³⁾.

For any transactions to be added, the parties of the ledger must confirm the validity of this transaction. The verification process happens through a complex process called a consensus that removes the need for a third party or custodian ⁽⁴⁾. This kind of secured databases could keep tracks on the ownership of any physical, digital, or financial assets in a peer-to-peer manner without the need for a central authority⁽⁵⁾. Transparency, security, trustworthiness, and effectiveness are among the advantages of the DLT platforms.

The “consensus” process used to validate the accuracy of the ledger determines the type of the blockchain. If the consensus process is opened for all the involved parties without a specific owner, the blockchain is called “permissionless blockchain”. This kind of database

¹ Deloitte, “5 blockchain technology use cases in financial services powering innovation in the industry.”

² BISsearch, “Blockchain Technology in Financial Services Market - Analysis and Forecast: 2017 to 2026 (Focus on Opportunity and Use Case Analysis)”.

³ Deloitte, “5 blockchain technology use cases in financial services powering innovation in the industry.”

⁴ The BI Intelligence, (2017). “Bitcoin 101: Understanding Blockchain Technology, Bitcoins, and the Rise of Cryptocurrency”, Dec.

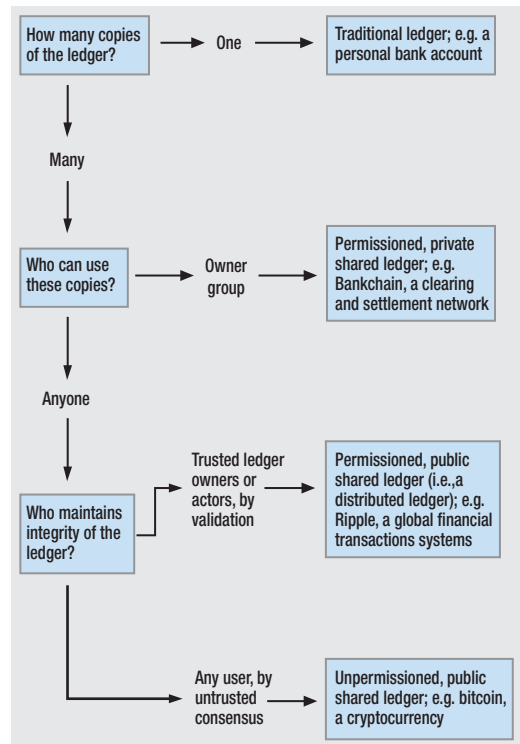
⁵ UN, International Telecom Union (2017). “Digital Financial Services Distributed Ledger Technologies and Financial Inclusion”, ITU-T Focus Group.

is a public database where every participant can access the database and has right to read, write, or modify it as long as he follows the rules and his changes are acceptable by the others.

While if the consensus is reached by pre-selected participants, then the blockchain is called “permissioned blockchain” and it could be public or private. In public permissioned blockchain, only permitted participants have the rights to write and modify the ledger where other participants can only see the ledger’s content. In some cases, other participants may not be allowed to see certain data sets of the ledger.

In private permissioned blockchain, only permitted parties can read and write to the ledger so as for a new record to be added it should be checked through a limited consensus process, which makes the verification process faster and efficient. This case is mainly used for providing financial and government services ⁽⁶⁾.

Chart (1)
Types of Blockchains



Source: Consult Hyperion.

⁶ UN, International Telecom Union (2017). “Digital Financial Services Distributed Ledger Technologies and Financial Inclusion”, ITU-T Focus Group.

One of the interesting features of the blockchain technology is the use of the concept of “smart contracts” in which all terms, conditions and business rules are embedded within each transaction using encoded programming language so as the smart contract could define the rule under which any payments should occur.

Although DLT was initiated to serve as a platform for cryptocurrencies, it has invaluable potential uses in many industries like financial services, property registries, medical records, and government services ⁽⁷⁾.

There are many reasons behind the growing global interest in the blockchain technology as follows ⁽⁸⁾:

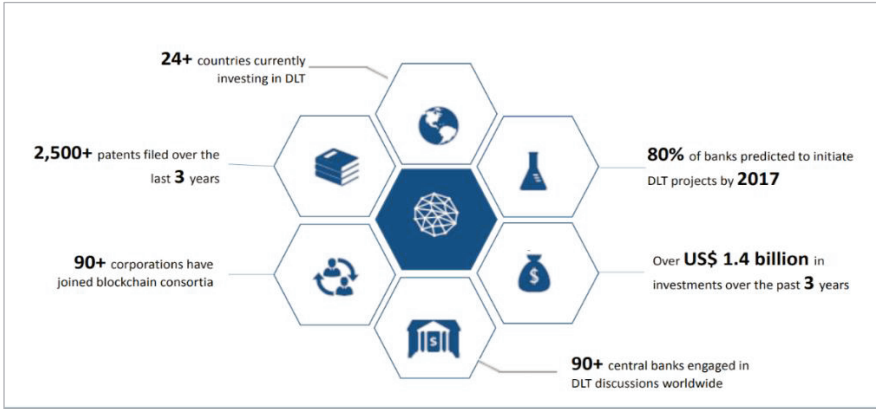
- The broader use of the blockchain would lead to global economic gains estimated at USD 3.1 trillion by 2030⁽⁹⁾.
- 10 percent of the world GDP will be stored in the blockchain in 2025.
- A blockchain has a growing global market that is expected to worth USD 20 billion by 2024.
- USD 1.4 Billion is invested in the blockchain over the past three years.
- 24 countries are engaged in the global blockchain race.

⁷ Medici, “Know More about Blockchain: Overview, Technology, Application Areas and Use Cases.”

⁸ Transparency Market Research; World Economic Forum; Global Blockchain Council, Dubai Future Foundation.

⁹ WEF in collaboration with PwC (2018). “Building Block(chain)s for a Better Planet ”, Fourth Industrial Revolution for the Earth Series, Sep.

Chart (2)
The Uprising of Blockchain Technology



Source: World Economic Forum.

2. Blockchain Evolution

The last twenty years have witnessed a speedy and notable uprising of the blockchain technology starting from the original Bitcoin protocol (the first generation: blockchain 1.0) to the Ethereum (the second generation: Blockchain 2.0) reaching what is called today the killer (the third generation: Blockchain 3.0). Along this journey, the technology has evolved from just a database to a full-fledged globally distributed cloud computing platform⁽¹⁰⁾.

The blockchain technology rooted back in 1998 when the Chinese engineer Wei Dai proposed a crypto-currency system called ‘b-money’ in which individuals can create money through solving complex computational puzzles⁽¹¹⁾. However, as his proposal missed many

¹⁰ Complexity labs, Evolution of Blockchain.

¹¹ The Origins of Blockchain: Pizzas, Spam, and Byzantine Generals.

implementation details, Hal Finney, the late well-known computer scientist tried in 2005 to overcome this challenge through introducing the concept of “reusable proofs of work” to create a concept for a cryptocurrency running on centralized trusted backend systems.

The year 2008 witnessed the birth of the technology that is known now as “blockchain” by unknown person or group known as “Satoshi Nakamoto”. The concepts and technicalities are described in a white paper, termed “Bitcoin: A Peer-to-Peer Electronic Cash System.”⁽¹²⁾ Accordingly, the Bitcoin platform was developed in 2009 based on the blockchain technology and served as the public ledger for all cryptocurrencies transactions and marked the first generation of the Blockchain technology (Blockchain 1.0 or Grandpa Bitcoin).

Within a few years and specifically in 2013, the second generation of the blockchain (Blockchain 2.0 or Child prodigy Ethereum) has emerged. Ethereum has been developed by Vitalik Buterin a Russian-Canadian programmer as an open-source, public, blockchain-based distributed computing platform using smart contract functionality (that can include all kinds of extremely advanced terms and conditions of any transaction). By the year 2015, this system has been launched and attracted the attention of many specialized developers, supporters, and enterprises ⁽¹³⁾.

The power of Ethereum platform lies in extending the blockchain technology from just a database supporting cryptocurrencies to a more general platform that could run many decentralized applications in diversified fields among which financial services and any industry that could benefit from using smart contracts. Ethereum which is a massive globally distributed cloud computing platform is considered now as the

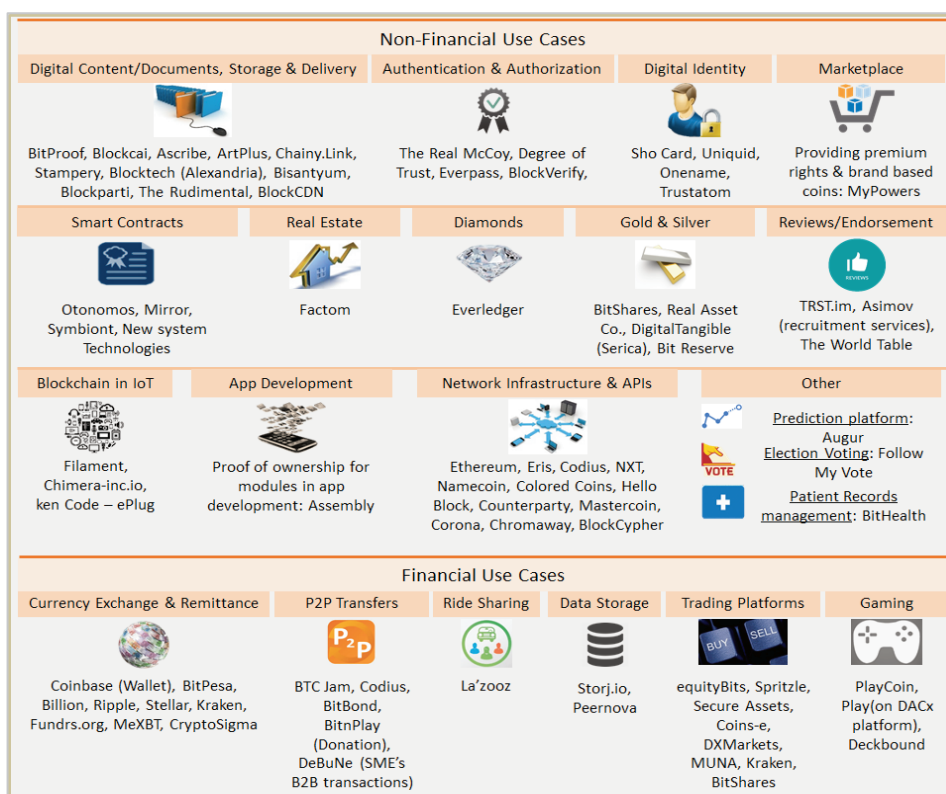
¹² Nakamoto S. (2008). “Bitcoin: A Peer-to-Peer Electronic Cash System.”

¹³ Narayanan V, (2015). “A brief history in the evolution of blockchain technology platforms.”

largest and most popular platform for building distributed applications⁽¹⁴⁾. Ethereum market cap has hit over USD 100 billion through the period (2015-2018).

Chart (3)

Financial and Non-Financial Uses of Blockchain Technology



Source: Medici, "Know more about Blockchain: Overview, Technology, Application Areas and Use Cases."

Ethereum gathered million dollars in unregulated venture capital route through Initial Coin Offerings (ICO). However, USD 70 million was

¹⁴ Narayanan V, (2015). Ibid.

hacked within a few hours. Accordingly, Ethereum was pushed to change the rules of the blockchain in a process called “blockchain fork” which entails a radical change in the blockchain protocol to add new features and to reverse the effects of any hacking or catastrophic bugs.

The first and second generations of blockchain faced many obstacles that prevent their widespread use. In addition to the abovementioned security problems, proving the ownership of an asset without a central authority through the consensus process is a time-consuming process. For running any transaction in Ethereum platform, each node needs to calculate all the included smart contracts in the network in real time which resulted in a lower speed⁽¹⁵⁾. Therefore, the maximum number of transactions that could be executed through the Bitcoin platform doesn't exceed 7 transactions per second, while it reaches 15 transactions in the case of the Ethereum platform. This number of transactions is very limited compared to the number of transactions that can be executed via Visa network which can handle more than 24 thousand transactions per second. Also, executing small transactions through these platforms is very costly as the cost reaches USD 20 per transaction which makes it prohibitively expensive for small ones ⁽¹⁶⁾. Consequently, the third generation of the blockchain (Blockchain 3.0 or the killers) is currently being developed to overcome the challenges mentioned earlier. This generation aims to enhance the security level, reduce the transaction cost, and shorten transaction time to make it possible to be used in a wide-scale. Many different organizations are currently working on building the required infrastructure for the third blockchain generation such as Dfinity, NEO, EOS, IOTA and Ethereum itself⁽¹⁷⁾. One recent innovation

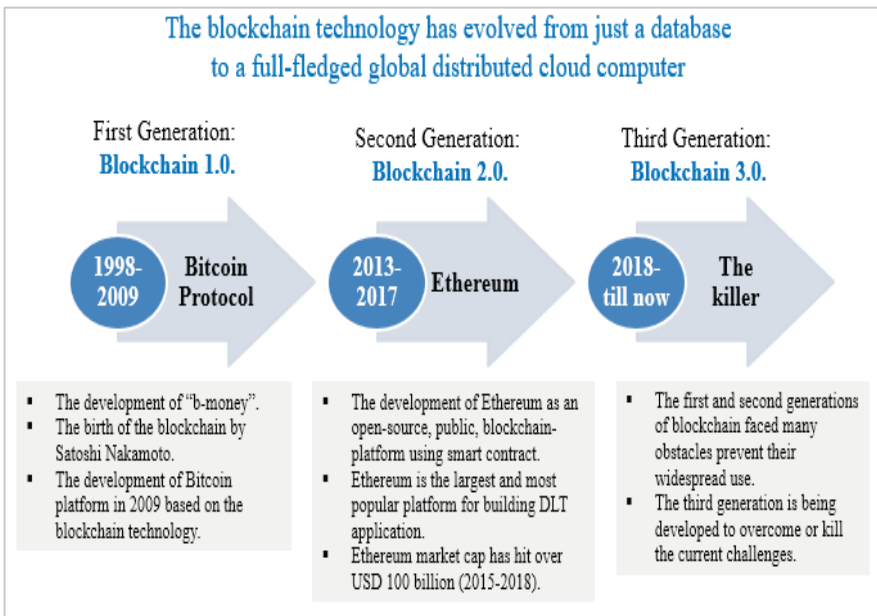
¹⁵ Complexity labs, Evolution of Blockchain.

¹⁶ Pickering J. and Moore F. (2017). “These are the Major Roadblocks Stopping Bitcoin from Becoming a Mainstream Currency”.

¹⁷ Narayanan V, (2015). “A brief history in the evolution of blockchain technology platforms.

in this area is the “Lightning Network” within which there is no need to store nonsignificant transactions on the main blockchain. Nonsignificant transactions could be executed “off-chain” through small communities without being registered in the main blockchain. This approach would reduce the workload and enable executing small transactions more efficiently. The proof-of-concept of this project was running last year, and it is expected to fully operational soon⁽¹⁸⁾.

Chart (4)
The Uprising of Blockchain Technology



¹⁸ Narayanan V, (2015). Ibid.

3. Blockchain as an Enabler to Cryptocurrencies

Cryptocurrencies are systems that allow for the storage and transmission of units of value like Bitcoins. These systems use cryptography and the blockchain technology to make transactions secured and, in some cases, anonymous⁽¹⁹⁾.

There are more than 2000 different cryptocurrencies exist now. However, Bitcoin is the most popular, trusted and traded cryptocurrencies (around 85 percent of the market capitalization) followed by Ripple and Ethereum.

Cryptocurrencies like Bitcoin could be obtained through a process called “mining” in which the miners use super powerful computers that consume massive energy to solve sophisticated computational puzzles to mine

Box (1): Types of Currencies

Money whatsoever has basic functions to perform. It is a medium of exchange – a mean of payment with a value that everyone trusts, a unit of account allowing goods and services to be priced, and a store of value. Here are some of the types of currencies being traded now:

- Real Currency

It has a stored value such as gold, silver, copper and any other commodity based on its weight and measurement.

- Representative money

Consists of banknotes that could be swapped against a certain amount of gold or silver.

- Fiat Money

Money that is declared as a legal tender and issued by a central bank but, unlike representative money, it couldn't be exchanged with a specific gold weight. It has no intrinsic value; however, people accept it in exchange for goods and services because it is backed by central banks (European Central banks (ECB)).

- Virtual money

Used primarily for online entertainment in the virtual world.

- B-money

It is the early proposal created by Wei Dai for an anonymous, distributed electronic cash system.

- Digital currency/electronic money

Money that available only in the digital form includes virtual, and crypto-currencies or even central bank issued "digital base money."

¹⁹ The BI Intelligence, (2017). “Bitcoin 101: Understanding Blockchain Technology, Bitcoins, and the Rise of Cryptocurrency”, Dec.

Bitcoins⁽²⁰⁾. The mining process requires over 1.5 billion dollars a year in electricity consumption being equal to those consumed in some countries like Denmark or Morocco.

As the mining process is very complex and energy-intensive, the mining activities have shifted to certain countries around the globe characterized by cheap energy sources especially in China where 60 percent of the mining activities are located. This challenge hinders the mass production of cryptocurrencies⁽²¹⁾.

There are some dedicated exchanges in which cryptocurrencies trading occurs like GDAX, Kraken, Bitfinex, and Gemini.⁽²²⁾ The market capitalization of cryptocurrencies has soared by the end of 2017 to reach over USD 300 billion compared with around USD 15

Box (1): Types of Currencies

- Cryptocurrency

It is a currency in which encryption regulates the generation and transfer of funds that can be exchanged for goods and services via peer-to-peer networks. A significant feature of Cryptocurrencies is that they are not issued by central banks, nor backed by them (the economist, 2017). B-Money and Bit Gold are examples of cryptocurrency that existed before Bitcoin. Nevertheless, Bitcoin considers the first Blockchain-based currency. These currencies exist without a central point of control like a central bank. These are not regarded as money from a legal perspective (ECB.)

- Central bank Digital Currency (CBDC)

According to the BIS, CBDC is a new form of digital central bank money that can be distinguished from reserves or settlement balances held by commercial banks at central banks. There are various design choices for a CBDC, including access (widely vs. restricted); degree of anonymity (ranging from complete to none); operational availability (ranging from current opening hours to 24 hours a day and seven days a week); and interest-bearing characteristics (yes or no), (BIS, 2018).

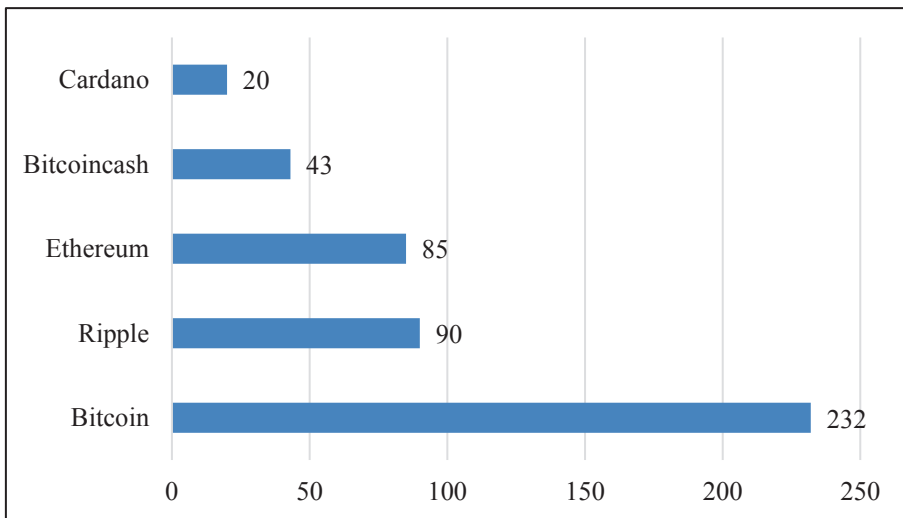
²⁰ This process of money creation would be explained into more details in the following part of this document which addresses the Blockchain and central banking.

²¹ Complexity Lab, "The Evolution of Blockchain."

²² The BI Intelligence, (2017). "Bitcoin 101: Understanding Blockchain Technology, Bitcoins, and the Rise of Cryptocurrency", Dec.

billion in January of the same year ⁽²³⁾. Some industry expected that the market capitalization would reach USD 1 trillion before the end of 2018 ⁽²⁴⁾. However, the market capitalization of cryptocurrencies dropped to USD 105 billion by the end of 2018 showing the volatile nature of this currency.

Chart (5)
Top cryptocurrencies' Market Capitalization Billion USD (2018)



Source: CoinMarketCap.

²³ The BI Intelligence, (2017). Ibid.

²⁴ The BI Intelligence, (2017). "Op. cit.

4. Blockchain and Financial Services: Challenges and Opportunities

Despite the advancements that have been witnessed in the financial services over the past decades, middle- and back-office functions in many financial activities are mostly slow and inefficient. Many financial firms suffer from running multiple and sophisticated procedures involving many counterparties, manual processes, and third-party service providers⁽²⁵⁾.

Some believe that the blockchain technology could dramatically transform the financial services in a way that the internet had transformed the media industry. It could enable people to have financial services without financial intermediaries or what so-called the “internet of value” or the idea of “the narrowing of the banking sector”.

Over the past few years, a rising number of financial institutions showed growing interest in deploying DLT technology in the financial services to overcome some of the legacy inefficiencies within the financial systems. In 2016, about 70 global banks and financial institutions have engaged in a consortium led by R3, the famous blockchain company and released a prototype of “Corda”. Corda, which raised a capital reached USD 150 billion in 2018 is a permissioned distributed ledger dedicated only to financial services using smart contracts features.

According to recent studies and reports, blockchain technology can offer countless opportunities for traditional financial services. Also, it could help to increase financial services outreach, hence fostering financial inclusion.

²⁵ Accenture (2015). “Blockchain Technology: Preparing for Change.”

4.1 Blockchain Opportunities for Traditional Financial Services

Blockchain technology provides various opportunities for the traditional financial services including among which:

- Increasing the efficiency of the financial transactions through reducing its cost and making it fast, secure and traceable across the financial system.
- Ensuring transparency, and trustworthiness which are two elements at the heart of the financial transaction.
- Facilitating cross-border settlements and improving back-office infrastructure.
- Smoothing true peer-to-peer cash and transfer of assets.
- Increasing financial inclusion by affording easy, and digitalized financial transactions at a relatively low cost to billions of un-banked persons around the globe especially in developing countries.

Banks could benefit from using blockchain in many and diversified **banking activities**. Using blockchain in the banking sector, could enhance trust, efficiency, transparency, avail information, increase the availability of the banking services and reduce time and cost associated with providing such services. “Know Your Customer” (KYC) procedures are among those areas. This process consumes considerable time and money; yet, banks still struggle to detect some ill-legal financial activities like money laundering, tax evasion, and terrorism finance.

Distributed ledger Technology could enable banks to share industry-wide KYC utility which could be used to verify customer data in a more efficient and accurate way. Also, DLT may provide a more efficient alternative to credit bureaus that compile consumer credit information from banks⁽²⁶⁾.

According to industry's estimates, 15 percent of the international banks are using blockchain and the number is anticipated to increase significantly in the coming years as 91 percent of the banks were expected to invest in blockchain solutions by 2018⁽²⁷⁾. This will lead to a tangible reduction in the cost of different banking operations and significant value saving.

Box (2)

A diversified scope of potential uses of DLT in the financial industry

There is a diversified scope of potential uses of DLT in the financial industry. Below some of the financial services activities that could benefit from DLT:

- Remittances.
- Identity (ID) Systems.
- Electronic know your customer (eKYC).
- Small medium enterprise (SME) finance.
- Digital rights management.
- Insurance contracts.
- Interoperability between banking and payment platforms.
- Clearing and settlement (C&S).
- Shareholder voting.
- Credit provision.
- Trade finance.
- Clearing houses.
- Share registries.
- Property registration.
- Notarization of data.
- Supply chains.
- Correspondent banking.

Source: UN, International Telecom Union (2017). "Digital Financial Services Distributed Ledger Technologies and Financial Inclusion", ITU-T Focus Group.

²⁶ Menon R. (2017). "Economic Possibilities of Blockchain Technology", Keynote Address by the Managing Director, Monetary Authority of Singapore, at Global Blockchain Business Conference, October.

²⁷ Jo Lang, (2017). "Three uses for blockchain in banking," IBM, October.

For instance, blockchain would help the world's largest investment banks lower their operational costs by between \$8 billion to 12 billion a year by 2025 (Approximately 25 percent of their operational cost)⁽²⁸⁾. The reduction will be across many business activities (Table 1).

Table (1)
Areas of Expected Cost Reduction by Using Blockchain in the
World's Largest Investment Banks

Expected cost reduction	Cost reduction areas
70% of reporting costs	<ul style="list-style-type: none"> These gains could be attained through more streamlined, and optimized data quality, transparency, and internal measures.
50% of central operations costs	<ul style="list-style-type: none"> Reducing the cost of know-your-customer (KYC) or identification and client onboarding.
50% of business operations costs	<ul style="list-style-type: none"> Reducing the cost and time of trade support and clearance and settlement processes. This cost saving would result from reducing or removing the need for data reconciliation, transaction confirmation, and automation of clearance and settlement processes.
30% to 50% of compliance costs	<ul style="list-style-type: none"> This would be both at the product and procedural level, due to the improved transparency and auditability of financial transactions.

Source: Accenture Consulting (2017). "Banking on Blockchain: A Value Analysis for Investment Banks."

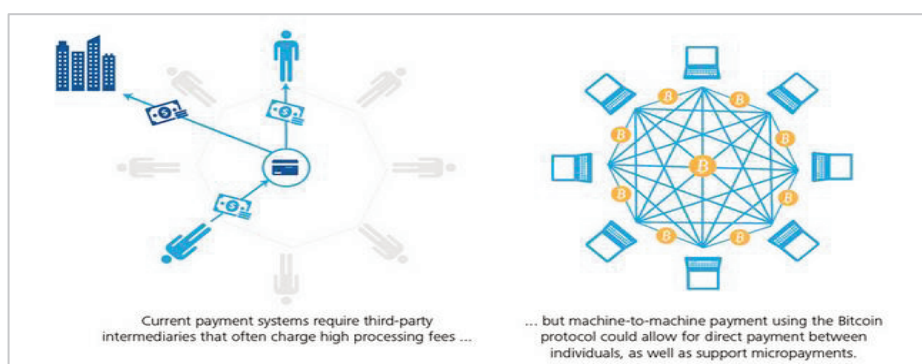
Using blockchain in payment Systems is another promising area. Clearing and settlement processes involve multiple processes and parties while the process itself is heavily regulated which creates bottlenecks

²⁸ Accenture Consulting (2017). "Banking on Blockchain: A Value Analysis for Investment Banks."

that delay settlement time and increase the costs⁽²⁹⁾. Using DLT can facilitate real-time, point-to-point transactions hence reduce settlement times from days to minutes⁽³⁰⁾. DLT-based solutions could also meet the performance needs of a Real-Time Gross Settlement (RTGS) system and strengthen the resilience and reliability of the settlement systems.

Currently; Ripple which is one of the DLT platforms, offers a blockchain-based technology and network for faster settlement of international payments, has more than 75 banking clients globally⁽³¹⁾.

Chart (6)
Current versus Machine to Machine Payment System



Source: Dupress.

Stock Exchanges are trying to benefit from using blockchain technology in reducing the cost, and fostering the speed of trading and settlements

²⁹ IBM, (2017). "Streamline Transactions and Tap into New Revenue Sources With IBM Blockchain"

³⁰ IBM Institute for Business Value, (2017). "Bridging the divide: How CLS and IBM moved to blockchain," October.

³¹ IFC (2017). "Blockchain in Financial Services in Emerging Market: Part I Current Trends"; EMCompass, Aug.

securely⁽³²⁾. NASDAQ is leading the world's top exchanges to adopt blockchain. NASDAQ used blockchain in 2015 to enhance the capabilities of its Private Market Platform which was launched in 2014 to enable pre-IPO trading among private companies ⁽³³⁾. Additionally, NASDAQ has tested a blockchain-based trading platform in order to increase the efficiency of the trading process. The blockchain technology will be used to trace and record all the investors' transactions in real-time. Similarly, the London Stock Exchange (LSE) has recent plans to develop a blockchain platform to be used for issuing SMEs private shares ⁽³⁴⁾. Overall, the use of blockchain technology can help international stock exchanges to save around USD 50-60 billion a year resulted from the reduction of operation and information technology expenses⁽³⁵⁾.

Blockchain technology could encourage global **Remittances** by reducing the cost and time required to transfer money. It could enable instant and relatively low-cost money transfer services across the borders. This technology could boost the global remittances which estimated at around USD 500 billion every year using the traditional remittances channels⁽³⁶⁾. In some of the regions that are the major sources for global remittances like the Gulf Cooperation Council Countries (GCC) region (25 percent of the world's annual remittance transactions), using blockchain could reduce remittances fees by around 10-20 percent.

Blockchain could also serve **Trade Finance** well. Traditional trade finance requires multiple manual processes and stringent procedures. The sophisticated trade finance process based on typically paper-based

³² The International Banker (2017). "How Stock Exchanges Are Utilising Blockchain Technology", Dec.

³³ Medici, "Know More about Blockchain: Overview, Technology, Application Areas and Use Cases."

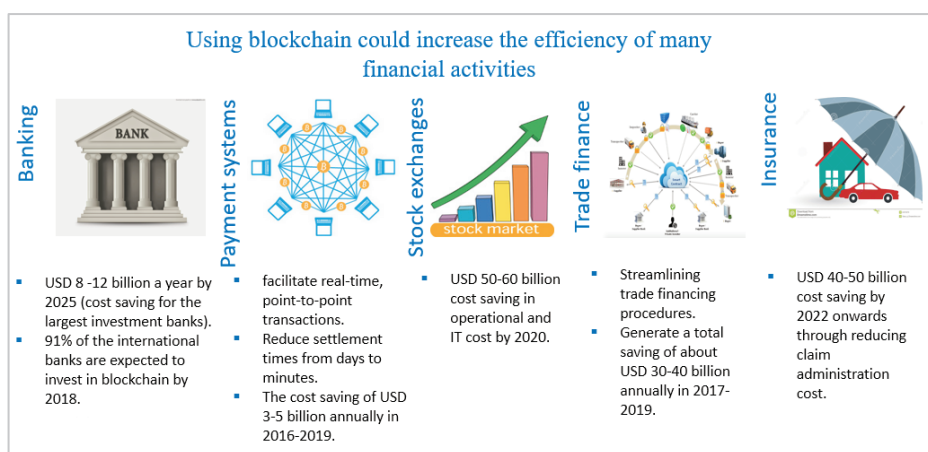
³⁴ The International Banker (2017). Op. Cit.

³⁵ BISsearch, "Blockchain Technology in Financial Services Market - Analysis and Forecast: 2017 to 2026 (Focus on Opportunity and Use Case Analysis)."

³⁶ Arabian Business (2018). "Banking on bitcoin: Cryptocurrency's growth in the Gulf."

letters of credit makes access to finance more difficult for around 50 percent of the SMEs that don't have credit sources⁽³⁷⁾. The use of DLT will enable banks and trade financing institutions to automatically store, secure, and exchange contracts details and financial terms; coordinate trade logistics and payments on an integrated real-time network; and streamline digital trade processes ⁽³⁸⁾. Streamlining trade financing procedures would help bridging part of the trade finance gap especially in developing countries; generate a total saving of about USD 30-40 billion years annually⁽³⁹⁾.

Chart (7)
Potential Use Cases of Blockchain and Their Benefits



Source: Accenture Consulting (2017). "Banking on Blockchain: A Value Analysis for Investment Banks." and BISsearch, "Blockchain Technology in Financial Services Market - Analysis and Forecast: 2017 to 2026 (Focus on Opportunity and Use Case Analysis)."

³⁷ SME Finance, (2017). " World Bank Group", November.

³⁸ IBM, "Build Customer Trust and Enhance the Banking Experience with IBM Blockchain."

³⁹ BISsearch, "Blockchain Technology in Financial Services Market - Analysis and Forecast: 2017 to 2026 (Focus on Opportunity and Use Case Analysis)."

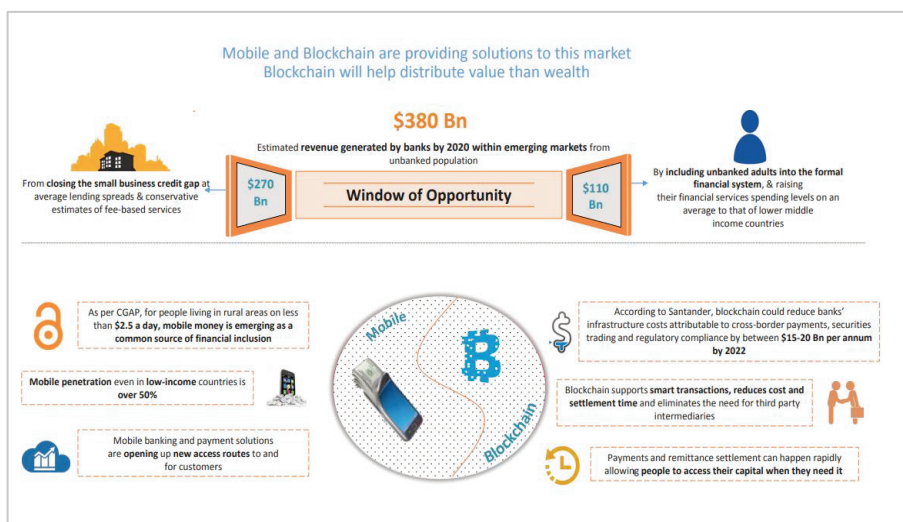
Accordingly, many banks and financial institutions have been testing the frontiers of using blockchain technology in financial services to unleash the untapped opportunities. Going forward, many issues should be resolved like scalability issues, how to comply with common financial standards, regulations, and legislation (this issue will be addressed in the following sections).

4.2 Blockchain and Financial Inclusion

Blockchain has the power to foster financial inclusion. The mobile and blockchain are very promising solutions to provide financial services to billions of financially un-served people. Such technologies could generate banking revenues of about USD 380 billion in 2020 (of which USD 270 billion from covering SMEs financing needs and USD 110 billion from providing financial services to un-served individuals⁽⁴⁰⁾). Many DLT platforms have been designed with features that enable access to financial services by financially un-served people. These platforms decrease the cost of transferring and receiving money to a minimal level and support real-time transactions. They also provide crowdfunding and microfinance for small, medium and micro enterprises.

⁴⁰ Baruri P. "Blockchain Powered Financial Inclusion".

Chart (8)
What is the Total Market Opportunity from Unbanked Segments?



Source: World Bank Development Indicators, Financial Access Survey, Accenture, CGAP.

Specifically, DLT contains three features that could greatly help increase financial inclusion including the digital identity, Property registers, and smart contracts⁽⁴¹⁾. Some of the financially unserved people don't have a verifiable ID. DLT could help those people to have a digital biometrics identifier permitting them to remotely open accounts to receive financial services especially in rural and remote areas with little access to financial services. It could also be used to fulfill KYC requirements which could be integrated within credit bureau information systems.

On the other hand, financially unserved people face difficulties in getting access to finance without registered collaterals. Small properties of poor people such as lands, equipment, or vehicles, etc. could be formally

⁴¹ UN, International Telecom Union (2017). "Digital Financial Services Distributed Ledger Technologies and Financial Inclusion", ITU-T Focus Group.

registered via blockchain technology and use as collaterals. A work that is usually done in cooperation with the local governments, and gives the financial institutions appropriates guarantees to extend financial facilities to un-served segments. Additionally, a smart contract could provide insurance services to financially un-served people under certain conditions and circumstances (ex. smart contracts linked with climate applications could provide insurance services for the farmers against the drought conditions).

4.3 Using Blockchain in Providing Financial Services: Current Challenges

Although the interest in blockchain technology is growing rapidly, it is noticeable that the spread of this technology is still limited until now. This may be attributed to some general and particular challenges that hinder the widespread use of the DTL in the financial sector for the time being. A very significant challenge is that the financial industry in its nature is regulated by many legal, regulatory, and institutional frameworks and requirements, particularly after the financial crisis. These frameworks drive towards more transparency in terms of individual data and transactions details which is not always the case in some DTL applications that are based on the principle of anonymity and are not expected to meet the current legal and regulatory necessities⁽⁴²⁾.

There are also some other general issues and challenges that worthy of being mentioned including⁽⁴³⁾:

⁴² Teis S. (2017). "Blockchain: Challenges in financial sector use, Focus, the World Federation of Exchanges, Aug and IFC (2017). "Blockchain in Financial Services in Emerging Market: Part I Current Trends"; EMCompass, Aug.

⁴³ UN, International Telecom Union (2017). "Digital Financial Services Distributed Ledger Technologies and Financial Inclusion", ITU-T Focus Group.

- The nascent nature of these technologies which have not yet been properly tested or widely adopted.
- The uncertainty of the legal and regulatory status and their variabilities among different jurisdictions;
- The uncertainty of data protection and privacy;
- The need to ensure network security and resilience of the technology against cyber attacks.
- Cultural issues resulted from the need to convince people to trust in some cases anonymous counterparties;
- The difficulties in reaching the wide-scale use of technology compared to the current conventional methods.
- The potential difficulties of interoperability of various DLTs when needed.
- The high- initial capital costs.

Furthermore, there are some challenges associated with the using of DLT in some specific financial activities. For instance, one of the main challenges facing using DLT in payment systems is that its performance is affected by the network size and distance between nodes. There is a trade-off between network size and settlement performance. Increasing the number of nodes will lead to lengthening transactions execution time ⁽⁴⁴⁾.

Additionally, recent research conducted by the Bank for International Settlements (BIS) confirmed that despite that the future of using DLT in payments and settlements looks bright; the road is still far away. A lot of work is needed to ensure the sound legal framework, the robustness of the governance structure, and the ability of the technology to meet the industry needs and the regulatory requirements. Moreover, according to the BIS, the changes and related efficiency gains of using DLT in

⁴⁴ Bank of Japan (BOJ) and European Central Bank (ECB), (2017). “STELLA - a joint research project of the European Central Bank and the Bank of Japan Payment systems: liquidity saving mechanisms in a distributed ledger environment”, Sep.

payment, and settlement process seem to be incremental than revolutionary⁽⁴⁵⁾.

5. Blockchain: The Advances in Policy Making

Although the blockchain technology is evolving very fast, there is no global or comprehensive regulatory framework governs this technology. Conflicting policies at the national jurisdictions could impose risks hindering the technology advances. Now, there is only global guidance on how the regulators could deal with fintech development. As per the Basel Committee on Banking Supervision' Sound Practices on the implications of fintech developments for banks and bank supervisors, banking standards and supervisory expectations should be adaptive to innovations while maintaining appropriate prudential standards⁽⁴⁶⁾. The IMF and the World Bank "Bali Fintech Agenda" highlights key issues to be considered by policymakers when formulating their fintech policy approaches⁽⁴⁷⁾.

On the other hand, G20 is seeking guidance from international institutions to regulate crypto-assets in line with The Financial Action Task Force (on Money Laundering) (FATF) standards⁽⁴⁸⁾. Additionally, there are some other global efforts in this regard as follows:

⁴⁵ BIS, (2017). "Distributed ledger technology in payment, clearing and settlement an analytical framework, Committee on Payments and Market Infrastructures, Feb.

⁴⁶ BIS, (2018). "Sound Practices: implications of fintech developments for banks and bank supervisors", Feb.

⁴⁷ IMF, (2018). "The Bali Fintech Agenda", Oct.

⁴⁸ FSB report sets out framework to monitor crypto-asset <http://www.fsb.org/2018/07/fsb-report-sets-out-framework-to-monitor-crypto-asset-markets/>

Basel Committee on Banking Supervision working on:

- Assessing banks' direct and indirect exposures to cryptoassets.
- Clarifying the prudential treatment of such exposures.
- Monitoring the implications of cryptoassets for banks and supervisors.

Financial Stability Board working on:

- Formulating a framework, in collaboration with the Basel Committee Payments and

International Organization of Securities Commissions (IOSCO) working on:

- Establishing an initial coin offering (ICO) Consultation Network to discuss experiences and concerns.
- Developing a support framework to address domestic and cross-border issues stemming from ICOs that could impact investor protection.

FATF

- Informing the G20 on the potential risks of using crypto-assets in money laundering and terrorist financing activities.

Moreover, the advances in policy making in this area are expected to benefit from the current efforts towards blockchain standardization like for instance:

1. Efforts exerted by World Wide Web Consortium (W3C) which is one of the oldest bodies to focus on blockchain standardization.
2. The International Organization for Standardization (ISO) has launched efforts to issue a standard ISO307 for blockchain.
3. China: Electronics Standardization Institute plans to release three blockchain standards for smart contracts, privacy, and deposits.
4. Russia: National standards authority is working toward the standardization of blockchain and distributed ledger technologies.

Furthermore, several blockchain consortia have also evolved to support blockchain development and standardization as follows:

Enterprise Ethereum Alliance (EEA)

- The EEA is a group of more than 200 member-driven standards organization whose charter is to develop blockchain specifications that drive harmonization and interoperability for businesses and consumers worldwide. The alliance gathers leaders, adopters, innovators, developers, and businesses who collaborate to create an open, decentralized web for the benefit of everyone⁽⁴⁹⁾.

Hyperledger

- Open-source platform focusing more on scalability and the interoperability of different blockchains.

⁴⁹ EEA, (2019). <https://entethalliance.org/>, May.

R3

- A group of more than 100 members banks and financial institutions that have engaged in a consortium led by R3, and released a prototype of “Corda”, which raised a capital reached USD 150 billion to invest in blockchain financial applications.
- Corda works on issues of compliance such as KYC and Anti-Money Laundry (AML) and cross-border payment systems benefiting from blockchain technology.

B3i

- Blockchain Insurance Industry Initiative including 15 leading insurance companies working on blockchain opportunities in the insurance industry.

The Blockchain Alliance

- A public / private forum for dialogue between industry and governmental agencies in order to help fight criminal activities on blockchains

Global Blockchain Business Council

- Consists of members from over 30 countries to “advance global understanding of blockchain technology.”

On the national jurisdiction level, there three main policy approaches to deal with fintech and blockchain technology as follows:

1. Wait and See

Many regulators see that blockchain is a comprehensive new business model offering financial services without financial intermediaries. However, they prefer to gather data, monitor business models and to assess potential risks, then formulate the appropriate regulatory framework. The advantage of this approach is avoiding inaccurate regulation, while the disadvantage is lacking the regulatory clarity in addition to the risk of being exposed to the threats of unregulated business.

2. Establishing Regulatory Sandboxes to Explore the Opportunities

Some regulators strike a balance between encouraging industry development and ensuring financial stability by allowing blockchain platforms to operate within a controlled regulatory environment. The regulatory sandbox is a mutually beneficial approach for both sides and there are many examples like the UK, Canada, Australia, EU, Singapore, Switzerland, Luxembourg and many Arab countries.

3. New legislation and regulation

Despite the lack of a generally accepted terminology and standards, some national jurisdictions were keen to address this issue and enacted laws and regulations related to blockchain financial applications. Examples: Russia (ICO), France and Morocco (crowdfunding), USA (smart contract and digital signature).

6. Blockchain: Central Banking Approach

Blockchain technology will not revolutionize the financial services only, but it could also have significant implications for the central banks business model. The potential impact will result from two main developments; the uprising of cryptocurrencies (private encrypted currencies) and central bank digital currencies (CBDC). Both developments could under certain circumstances impact monetary policy, payment systems, and financial stability.

6.1 The Impact of cryptocurrencies

As it was mentioned earlier, cryptocurrency is a currency in which encryption regulates the generation and transfer of funds. The significant feature of these currencies is that unlike physical currencies they are not issued by central banks, nor backed by them. Cryptocurrencies don't have a tangible form, not backed by any tangible assets, and couldn't always be exchanged for other commodities, and are subject to little or no regulation, so they don't fulfill all the necessary elements required to be recognized as an acceptable currency to the public.

The current existence of cryptocurrencies currencies revived some of the old historical experiences and ideas about “the era of free banking” and “the Narrowing of the banking system”. As in the 1990s banks were able to issue their private currencies and the public chooses which currencies to deal with according to the trustworthiness and the credibility of the banks without a role for a central authority to issue money in what was called the “Era of Free Banking”⁽⁵⁰⁾. Since these currencies could be kept digitally in the blockchain, there will be no need for the individuals to keep their deposits with the commercial banks which may lead to the

⁵⁰ Stigler Center, “The Blockchain is Going to Revolutionize Central Banks and Monetary Policy”, University of Chicago

narrowing of the banking sector which is an old idea supported by the University of Chicago⁽⁵¹⁾. If this trend is fulfilled in a wide manner, it could affect the role of the deposit-taking institutions and will hinder the process of money creation which is based on (fractional) cash reserves. However, this is still unlikely to occur shortly.

Nevertheless, there are some potential implications that could arise from the wide use of blockchain technology particularly cryptocurrencies for monetary policy and financial stability. Central banks use monetary policy to manage the money supply and interest rates in a way that enables them to achieve monetary policy final goals most importantly price stability. Some central banks prefer to follow certain rules like Taylor rule⁽⁵²⁾ or McCallum rule⁽⁵³⁾ to define the required changes in money supply or interest rates to achieve price stability.

Cryptocurrencies creation and their wide use could impact the aggregate money supply in a way that could hinder the central banks' ability to achieve monetary policy goals. This impact will depend on two important factors firstly the rules adopted to govern cryptocurrencies money creation particularly whether it contradicts with the monetary policy final goals or not and secondly, the relative importance of cryptocurrencies within the monetary system compared to the conventional currencies.

⁵¹ Stigler Center, Ibid.

⁵² Taylor rule has become very popular starting from the 1990s. The rule represents an automatic response of the official monetary policy rate to any deviation of the inflation rate from the desired target value and to the output gap (deviation of real GDP from its potential). In essence, the rule involves changes in the ex-ante real interest rate, relative to its equilibrium value.

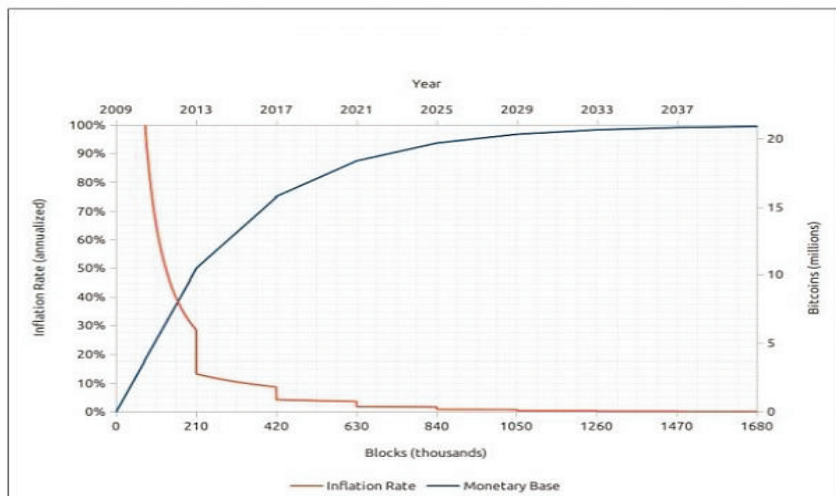
⁵³ McCallum Rule defines the needed money growth rate in relation to the targeted inflation taking into account the changes in the velocity of money and the changes in the real GDP growth rate.

Secondly, in a fully decentralized monetary system like cryptocurrencies, there is no central authority that regulates the money supply. Instead, the currency is created by the nodes of a peer-to-peer network. The system which is based on algorithm money creation defines in advance, how much money would be created and the growth rate of the money supply from this currency. Any currency that does not follow the rules will be rejected by the network and thus will be worthless.

Taking Bitcoin as an example, the growth rate of this currency is pre-programmed, and it follows a concave function which means that the increases in Bitcoin money supply will be decreased over time till certain point which is the year (2140) where the growth rate of Bitcoin money supply will be zero and then it will not be any creation of that currency afterwards.

This pattern (Algorithmic money creation) is similar to the rate at which commodities like gold are mined. Accordingly, the value of that currency will increase over time. The founder of the Bitcoin built a limited number of this coin (21 million units). Every 10 minutes, the miner who could create a chain get his reward in the form of new coins allowing the process of money creation. The reward is set to be halved (decreased by 50 percent) every four years. The reward stands at 12.5 coins now where it was 50 coins in 2009.

Chart (9)
Bitcoin Money Creation



Source: Bitcoin.org

According to this pattern, Cryptocurrencies money supply could not trigger inflationary pressures. Instead, it could be a source of deflationary pressures. So, if the central bank aims at curbing inflation, cryptocurrencies could support the monetary policy goals. Nonetheless, if the goal of monetary policy is to contain deflationary pressures, cryptocurrencies will make it difficult to achieve this objective.

On the second point, for cryptocurrencies to have a noteworthy impact on monetary policy, its money supply should reach a competitive level with the Fiat currency, and this is not the case now or even after ten years later. For instance, the USA dollar money supply is comprised of trillion of dollars, while all the global money supply of the Bitcoin reached USD 105 billion by the end of 2018. Therefore, under the current money supply scheme of cryptocurrencies and without any tangible technological advances, it is unlikely that they will have a significant

impact on the monetary policy unless it could lead to bank-runs hence affecting the composition of banks' funding.

On the contrary, the issuances of private decentralized cryptocurrencies by anonymous persons could entail many threats to financial stability as it could be used for financing ill-legal activities like money laundering and terrorist financing. Also, the volatile nature of these currencies and the potential increased risk of cybersecurity could disrupt financial stability. This why many central banks have warned against dealing in cryptocurrencies (as will be illustrated in the following section of this paper) due to its potentially disruptive impact on financial stability.

6.2 The Impact of Central Bank Digital Currency (CBDC) ⁽⁵⁴⁾

As defined by the Bank for International Settlements, CBDC is “a new form of digital central bank money that is different from reserves or settlement balances held by commercial banks at central banks. There are various design choices for a CBDC, including access (widely vs. restricted); the anonymity degree (whether it is complete or none); operational availability (Available throughout the day and seven days of the week or limited availability); and interest-bearing characteristics (yes or no)”.

The impact of CBDC on monetary policy, payment systems, and financial stability differs according to its type namely whether it is a wholesale or a general purpose one (public currency). Traditionally, the central banks restricted the access to (digital) account-based forms of central bank money (its liabilities) to limited actors (the banks and some other financial institutions), while the public physical central bank money is widely accessible to the public. This approach proved to serve

⁵⁴ BIS, (2018). “Central bank digital currencies”, Committee on Payments and Market Infrastructures, Markets Committee.

the financial system well. The CBDC could have some implications for monetary policy, payment system, and financial stability.

As for their impact on the **Payment System**, the wholesale CBDC is unlikely to have a great impact on the current payment system. Despite that, the wholesale CBDCs, combined with the use of distributed ledger technology, could enhance settlement efficiency for transactions involving securities and derivatives. However, the current CBDC technology for wholesale payments looks broadly like, and not clearly superior to the existing infrastructures. Even though future proof-of-concept of CBDC could be sounder and more efficient, central banks still need more experimentation and experience before the adaption of a wholesale CBDC according to the BIS.

Nevertheless, the issuance of a public CBDC could bring substantial benefits particularly in countries where the use of cash is diminishing continuously as it could serve as an alternative safe, robust, and convenient payment instrument. However, these gains could be attained if fast (even instant) and efficient private retail payment system are already in place or in development.

As for the implications of CBDC for **Monetary Policy**, the issuance of CBDC could support central banks' monetary policy tools by adding a new tool that can strengthen the transmission mechanisms of monetary policy to the market rates and enable central banks to address the issue of the zero lower bound or even lower interest rate. Yet, these gains could be obtained through other policy interventions without jeopardizing the current system with additional risks specifically financial risks. Also, if the flows into CBDC were to become large and not associated with offsetting declines in physical banknotes, some challenges could result from the need to broaden central bank's assets that could be held or taken as collateral).

The implications of wholesale CBDC could be more pronounced for monetary policy and the financial market if it became an attractive asset available to institutional investors competing with the other tradeable assets particularly short maturity government bills. As for the public CBDC it could compete with guaranteed bank deposits, hence having implications for the pricing and composition of banks' funding and commercial lenders might face a shortage of deposits.

On the other hand, the issuance of CBDC could pose some financial risks if it used to finance illegal activities, hence affecting **Financial Stability**. Therefore, the issuance of this currency should consider fulfilling of anti-money laundering and counter-terrorism financing (AML/CFT) requirements. It should also abide by the legal framework and built on a robust model especially if it will be designed to be used in settlement of cross-border transactions to ensure that it will not threaten financial stability.

As the anonymous general purpose CBDC could carry multiple threats to the financial stability, it is more recommendable for the central banks to consider a non-anonymous CBDC which could allow for digital records and traces, hence ensuring the application of rules of AML/CFT.

Likewise, the introduction of a public CBDC could lead to a flight towards the central bank assets in the period of stress. Accordingly, it could cause a higher instability of the commercial bank deposits, and it may result in a wider role of the central banks in the financial system that might adversely affect the efficiency of economic resources allocation.

7. Blockchain: Central Banks' Stances

Governments are taken diverse stances related to the development of blockchain ranging from the firmest stance in South Korea to the most welcoming in Dubai, which adopts a strategy for the development of blockchain. Blockchain technology encounters many opportunities and challenges for the financial sector. In this context, it was inevitable for the central banks to ignore blockchain technology. Many central banks are testing blockchain technology uses in different domains but with uneven stances.

Lately, many central banks are investigating using blockchain technology to test whether this technology could provide significant advantages to the financial services industry. Nevertheless, since this issue is very complex and requires much extensive research and thorough analysis for the possible broad implications, many central banks are engaged in joint projects with their peers, academics, industry groups, and pioneering blockchain companies to discover possible frontiers.

Bank of Japan (BOJ) and the European Central Bank (ECB) are cooperating starting from 2016 in a Project called “Stella”, research that has been launched to assess the applicability of adopting the distributed ledger technology in financial market infrastructures.

Similarly, the Monetary Authority of Singapore (MAS), is cooperating with the Association of Banks in Singapore (ABS), in developing a new set of distributed ledger prototypes that aim at testing how a digital version of the Singaporean dollar could be created to settle all forms of inter-bank payments. These software models will be among the first in the world to implement a secured decentralized netting of payments. Existing netting programs used in inter-bank payments depend on a single payment queue visible to the operator to find offsetting payments.

Decentralizing the queue, however, potentially exposes payment details to an unauthorized party. The latest models achieve a superior combination of decentralization and privacy⁽⁵⁵⁾.

South African Reserve Bank (SARB) has Taken a similar step in 2018 as it has launched a program that will trial Quorum blockchain potential in interbank clearing and settlement. The trial will allow the SARB and industry to assess the potential benefits and risks of DLTs jointly.

In the same context, Bank of England has started a financial technology accelerator last year based on blockchain and sees this technology as a great chance in enabling central banks to strengthen cybersecurity and improving payments system.

In the digital currency domain, central banks are more interested in the idea of the Central Bank Digital Currencies (CBDC) rather than decentralized cryptocurrencies (private currencies). The former kind of technology could reap the fruits of all the advances in blockchain technology without significantly jeopardizing the monetary policy management or financial stability.

The Bank for International Settlement has affirmed that policymakers can't overlook the evolution of cryptocurrencies and they need to decide whether there will be a need to issue digital currency at some point ⁽⁵⁶⁾.

Transformation to digital currencies could happen through the coming five or ten years according to some financial experts, or it could take longer time according to Kenneth Rogoff the famous Harvard professor

⁵⁵ Monetary Authority of Singapore (2017). "MAS and ABS lead consortium to harness blockchain technology for more efficient inter-bank payments".

⁵⁶ Committee on Payments and Market Infrastructures, Market Committee (2018). "Central bank digital currencies", Bank for International Settlements, Dec.

and a noble laureate who confirmed that governments might need first to fix some security and regulatory issues to enable this transformation.

Currently, some central banks like the Bank of England are working on having a better understanding of the implications of a central bank issuing a digital currency. This is mainly undertaken thorough deep research and collaboration between the central banks, academics, and all the interested parties. The Reserve Bank of India is studying now whether digital currencies backed by central banks can be used as legal tender, while both Bank of England and People Bank of China have indicated that they are far from creating digital currencies. On the contrary, some central banks still reluctant to move towards digital currencies like Bank of Japan as it sees issuing central bank digital currency to the public as if a central bank extends the access to its accounts to anyone.

While some central banks are addressing the idea of issuing central banks cryptocurrencies as indicated earlier, they are less interested and sometimes totally against the idea of private cryptocurrencies issuance. This explains why a number of these banks took a firm stand against decentralized cryptocurrencies, prohibit their trading, and even some central banks consider cryptocurrencies as an illegal activity.

According to the BIS, there might be a significant risk of bank runs, and commercial lenders might face a shortage of deposits due to dealing in such currencies. Privacy could also be a concern and severe price fluctuations deserve great caution.

The European Central bank has also warned about the danger of digital currencies on the financial system confirming that Bitcoin couldn't be considered as a currency, but a "tulip" alluding to the 17th-century bubble in the Netherlands. The People's Bank of China has taken

aggressive actions against private cryptocurrencies issuers, banning exchange trading of bitcoin and other cryptocurrencies.

Also, the Central Bank of France advice great caution concerning bitcoin because there is no public institution behind it to provide confidence. It warned that all examples of private currencies in history had ended badly confirming that it could entail significant cybersecurity risks.

In the same context, India's central bank has banned the use of cryptocurrencies as they could be used for money laundering and terrorist financing. The use of cryptocurrencies in India is considered a violation of foreign-exchange rules. Similarly, Russia's central bank has expressed concerns about potential risks from digital currencies and banned all forms of private money.

Additionally, more recently, the North American Securities Administrators Association has warned the investors from dealing in these currencies. In its press release, it has warned that investors should fully understand the risks associated with this type of investment. The association confirmed that the recent wild price fluctuations in cryptocurrency-related investments could attract speculative and suspicious activities⁽⁵⁷⁾.

8. Blockchain in Arab Countries and the Role of the Arab Monetary Fund ⁽⁵⁸⁾

Digital transformation is embedded within the future and strategic visions of many Arab countries as it is considered as a significant enabler

⁵⁷ the North American Securities Administrators Association (NASAA) (2018). "NASAA Reminds Investors to Approach Cryptocurrencies, Initial Coin Offerings and Other Cryptocurrency-Related Investment Products with Caution", Jan.

⁵⁸ Ali. H. (2019). "Blockchain Use Cases in the Arab Region: From Digital Identities to Cross-Border Transfers", GIZ.

to economic diversification and resilience. The Arab countries have paid growing attention to blockchain in the latest years. Blockchain market in the MENA region is expected to be doubled in 2018⁽⁵⁹⁾.

As a response to the financial technology (fintech) evolution, the Arab Monetary Fund (AMF) is exerting diversified efforts to monitor the evolution of fintech industry and its implication on the financial services and financial stability in the Arab region. As the AMF takes the responsibility of the Technical Secretariat for the Council of Governors of the Arab Central Banks and Monetary Authorities, blockchain evolution is being addressed in many technical committees and task forces emanating from this council.

Within this context, the Arab Committee for Banking Supervision and the Financial Stability task force discussed this issue in terms of its repercussions on financial stability and the role of central banks in the regulation of such activities, while the Regional Financial Inclusion Task Force tackles addresses the role of Fintech in enhancing financial inclusion by encouraging the use of digital financial services in the Arab countries. The Arab Committee for payment and settlement systems also addressed Fintech and its implications for the payment systems and how it could be used to reduce the cost of remittances and financial transactions. Furthermore, The Arab Credit Information Committee discussed several aspects related to using financial and big data technologies, including the role of these technologies in the exchange of credit information.

Additionally, the AMF has established a Regional Fintech Working Group in 2018 to formulate pertinent guidelines, policies and conduct proper activities aiming at enhancing digital finance in Arab countries

⁵⁹ First Blockchain Summit, (2018). “Dubai’s Future Blockchain Summit to Unlock Multi-Billion Dollar Opportunities”.

while ensuring financial stability. The group involves diversified expertise from all the Arab region and around the globe, which represents different segments, mainly regulators, private sector, fintech industry, international financial institutions (IFIs), regional and global associations...etc. The main mandates of the group include among others, supporting the regulatory framework and creating the appropriate ecosystem to properly develop Fintech industry in Arab countries, monitoring the evolution of DLT & Blockchain technologies, supporting fintech innovation through Business Accelerators and Incubators activities...etc.

Moreover, in December 2018, the Arab Monetary Fund (AMF) organized the first Arab #FinTex Symposium jointly with its strategic partners in the “Financial Inclusion for the Arab Region Initiative” (FIARI) including the GIZ, the Alliance for Financial Inclusion, and the World Bank. The Symposium attracted the attention of many policymakers, academia, and professionals who discussed regional and global developments in Blockchain technology and financial inclusion. The symposium included a session on DLT & Blockchain Global Policy Developments. The session highlighted some uses of blockchain in financial services in the Arab region which vary from digital identities to facilitating cross-border transfers.

Within this context, there are many initiatives to benefit from the evolution of using blockchain in financial services in Arab countries. In the UAE, Abu Dhabi Global Market (ADGM) has adopted a FinTech strategy to encourage meaningful applications of the blockchain. ADGM was the first in the MENA region to establish a dedicated and open FinTech regulatory framework. ADGM Regulatory Laboratory (RegLab) is one of the most active global FinTech regulatory sandboxes. In early 2018, ADGM announced the initiation and development of an (e-KYC) utility in close collaboration with the UAE’s largest financial

institutions using DLT⁽⁶⁰⁾. This platform will help increase the efficiency of financial services and support financial inclusion.

On digital currencies domain, the Saudi Arabian Monetary Authority (SAMA) and the Central Bank of the United Arab Emirates have recently launched a common digital currency project called "Aber". Aber will use DLT technology for financial settlements between the two countries. This project will also facilitate direct financial remittances between banks in both countries⁽⁶¹⁾. This is most likely the first time through which two monetary authorities have cooperation on this field.

On the other hand, Tunisia was one of the leading countries in the world to have a state-run electronic payment system based on blockchain technology⁽⁶²⁾. Tunisia decided in 2015 to boost its eDinar digital currency using the blockchain technology building on the previous achievements of the Tunisian Post which is a leader in financial and social inclusion by promoting the provision of digital services⁽⁶³⁾.

Most of the adults that have a bank account in Tunisia have an account with the Tunisian Post (90 percent), while there are still three million adults who don't have banking accounts. The official vision is to count

⁶⁰ ADGM launches e-kyc utility project with consortium of key <https://adgm.com/mediacentre/press-releases/adgm-launches-e-kyc-utility-project-with-consortium-of-key-uae-financial-institutions/>.

⁶¹ SAMA, (2019). "A Statement on Launching "Aber" Project, The Common Digital Currency Between Saudi Arabian Monetary Authority (Sama) And United Arab Emirates Central Bank (UAECB)", Jan.

⁶² It is considered according to some resources the first country in the world to have a state-run electronic payment system, while it considered according to some other resources the second after Ecuador.

⁶³ International Telecommunication Union, UN, (2017). "Blockchain in Tunisia: From Experimentations to a Challenging Commercial Launch", Workshop on "Security Aspects of Blockchain", Geneva, Switzerland, 21 March 2017

on blockchain to provide financial services to the financially unserved segments. Therefore, the government is cooperating with blockchain companies to deploy its first application for a full ecosystem of digital payments.

Smartphones could be used for instant mobile money transfers in Tunisia for online payments, sending remittance, paying salaries and bills, and managing official government transactions. DLT technology will enable financially unserved people shortly to access financial services through Tunisian Post, in association with the national government⁽⁶⁴⁾.

On the contrary, many Arab Central Banks and Monetary Authorities issued circulars that prohibiting the use of cryptocurrencies by banks and individuals and confirming that cryptocurrencies involve a high level of risk of price volatility and of being used in money laundry activities. In some Arab countries, traders of cryptocurrencies could be punished by anti-money laundry laws.

The use of blockchain technology in Arab countries is not limited to financial services. The Dubai Blockchain Strategy in the UAE aims at facilitating blockchain development. By 2020, Dubai will be the first blockchain powered government as 100 percent of the government services in Dubai will be provided through blockchain which is expected to mobilize saving of around USD 1.5 billion annually⁽⁶⁵⁾.

⁶⁴ Smart E. (2015). "Tunisia Becomes First Nation to Put Nation's Currency on a Blockchain", Dec.

⁶⁵ Smart Dubai, Dubai Blockchain Strategy.

9. Conclusion and Policy Implications.

Blockchain technology has evolved in the last twenty years from just a database to a full-fledged globally distributed cloud computing platform. Although blockchain was initiated to serve as an infrastructure for cryptocurrencies, it has invaluable potential uses in many industries like financial services, property registries, medical records, and government services.

There are many reasons behind the growing global interest in the blockchain technology as it is expected that the broader use of the blockchain would lead to global economic gains estimated at USD 3.1 trillion by 2030.

Blockchain networks have the power to revolutionize the financial sector. It could lead to massive cost reduction through shortening transactions time, streamlining procedures, lessening the regulatory burden, and eliminating unnecessary long processes. As a result, it will enhance financial efficiency and increase financial inclusion.

Despite the growing global interest in using blockchain in financial services, it is noticeable that till now, the spread of this technology is still limited. This may be attributed to some general and particular challenges that hinder the widespread use of the DTL in the financial sector for the time being.

These challenges are related to the nascent nature of these technologies which have not yet been properly tested or widely applied, the uncertainty of the legal and regulatory status and their variabilities among different jurisdictions; the uncertainty of data protection and privacy; the need to ensure the network security and resilience of the

technology against cyber attacks; cultural issues resulted from the need to convince people to trust in some case anonymous counterparties; the difficulties in reaching the wide-scale use of the technology compared to the conventional using methods; the possible interoperability difficulties of combining different DLTs when needed; and the high- initial capital costs.

The Arab countries have paid growing attention to blockchain technology in the latest years. The Fourth Industrial revolution is an opportunity and challenge for Arab countries. Digital transformation is embedded within the future and strategic vision of many Arab states, which can be considered as a significant enabler to economic diversification and resilience. The use of blockchain technology in the Arab countries is not limited to the scope of the financial services, but also to other areas, the most important of which is the provision of government services to support social and economic development.

Blockchain technology will not revolutionize the financial services only, but it could also have significant implications for the central banks business model. The potential impact will result from two main developments; the uprising of cryptocurrencies (private encrypted currencies) and central bank digital currencies (CBDC). Both developments could, under certain circumstances, impact monetary policy, payment systems, and financial stability.

Governments are taken different stances related to the development of blockchain ranging from the firmest stance in South Korea to the most welcoming in Dubai, which adopts a strategy for the development of blockchain.

Blockchain technology encounters many opportunities and challenges for the financial sector. In this context, it was inevitable for the central banks to ignore blockchain technology. Many central banks are testing blockchain technology uses in different financial domains but with cautious and uneven manner.

Since this issue is very complex and requires much extensive research and thorough analysis for the possible broad implications of these technologies, many central banks are engaged in joint projects with their peers, academics, industry groups, and pioneering blockchain companies to discover possible frontiers.

In this context, regulatory labs or sandboxes are considered very good opportunities to test the soundness of blockchain technology and other fintech projects/platforms and to formulate the proper legal regulatory and institutional frameworks to deal with them. This collaborative and participatory approach will enable the central banks to reap the fruits of this technology without jeopardizing the financial stability (box 3).

Box (3):

An Increasing Attention to Blockchain Opportunities in Financial Services within the Context of the Regulatory Sandboxes in Some Arab Countries ⁽⁶⁶⁾

Sandboxes offer very good opportunities to test the DLT and other fintech projects/platforms without jeopardizing the financial stability. Some Arab countries are increasingly interested in initiating regulatory labs or regulatory sandboxes to collaborate with the fintech industries in a way enabling the supervisory authorities to formulate the proper and sound legislative and regulatory needed to support the growth of the successful fintech project and ensure consumer protection.

A Regulatory Sandbox (Sandbox) is a framework and process that facilitates the development of the FinTech industry properly. It is defined as “a safe space in which businesses can test innovative products, services, business models and delivery mechanisms without immediately incurring all the normal regulatory and financial consequences of engaging in the activity in question.” Financial products/services based on new technologies, or new permutations of existing technologies, can be tested in the Sandbox without the burden of heavy regulations and licensing. Those that are successful (i.e. that meet the predefined experimentation criteria to the satisfaction of the regulator) can apply for the relevant license subsequently while others have to leave the Sandbox after a defined period.

⁶⁶ The Financial Services Regulatory Authority (FSRA) of Abu Dhabi Global Market (ADGM), and the Central Bank of Bahrain, Bahrain’s Fintec Bay.

The Financial Services Regulatory Authority (FSRA) of Abu Dhabi Global Market (ADGM), the International Financial Centre in Abu Dhabi, announced in early 2018 the initiation and development of an electronic-Know-Your-Customer (e-KYC) utility in close collaboration with a key team of the UAE's largest financial institutions. An industry consortium will cooperate with the ADGM, to develop a proof-of-concept to decide the governance framework and the functional requirements of the e-KYC utility. Distributed Ledger Technologies are being considered to underpin core functionality within the platform.

The immensely positive industry response reveals how seriously the region takes robust KYC and the material impact of 'RegTech' technologies in addressing industry challenges. Banks and financial institutions are seeking more ways to meet KYC and AML requirements and standards. With the increased deployment of technology, such as blockchain for KYC and the efficient management of digital identities, greater efficiency and cost-effectiveness can be achieved.

ADGM continues to introduce new capabilities and ideas to bolster Abu Dhabi and the UAE's position as a global hub for innovation. ADGM was the first to establish a dedicated and open FinTech regulatory framework for the MENA region in November 2016 to license FinTech stakeholders. It launched its Regulatory Laboratory (RegLab) – a regulatory sandbox – to provide a controlled environment for FinTech innovators to develop and test their products and services. ADGM RegLab is one of the most active global FinTech regulatory sandboxes with 16 FinTech firms with innovative solutions.

The Kingdom of Bahrain has launched the Fintech Bay initiative in 2018 to attract fintech companies from across the globe, including cryptocurrency-focused operations by providing them with world-class infrastructure. The Fintech Bay claims to be the largest co-working space in the region and offers opportunities for any global companies who want to set up operations in the country by assisting in starting up and helping them grow. Aside from providing infrastructure for digital currency-focused companies, the Bay provides a partnership between the private sector and the government as it also offers qualified workforce for cryptocurrency operations.

Additionally, the Central Bank of Bahrain has set up a regulatory sandbox in 2017 to investigate the credentials of interested companies and institutions that will open up operations in the country to take advantage of their offer. Bahrain is positioning itself to be the FinTech hub of the region as well, including Shari'ah compliant FinTech solutions. The CBB has made a conscious decision to initiate a Regulatory Sandbox in order to promote effective competition, embrace new technology, encourage financial inclusion and improve customer experience. This is being done in a manner that ensures the continuation of CBB policy safeguards on consumer protection, anti-money laundering and level playing field to all market players.

References

- Accenture (2015). “Blockchain Technology: Preparing for Change.”
- Accenture (2017). “Banking on Blockchain: A Value Analysis for Investment Banks.”
- African Business, (2017). “Senegal Creates Digital Currency History”, May.
- Al Mansoori M. (2017). “Opening Remarks of His Excellency, the Governor of the UAE’s Central Bank”, “the 13th High-level Meeting for the Arab Region: Global Banking Standards and Regulatory and Supervisory Priorities”, the Arab Monetary Fund, Dec.
- Arabian Business (2018). “Banking on bitcoin: Cryptocurrency’s growth in the Gulf.”
- Bank of Japan (BOJ) and the European Central Bank (ECB), (2017). “STELLA - a joint research project of the European Central Bank and the Bank of Japan Payment systems: liquidity saving mechanisms in a distributed ledger environment”, Sep.
- Baruri P. “Blockchain Powered Financial Inclusion”.
- BIS, (2017). “Distributed ledger technology in payment, clearing and settlement an analytical framework, Committee on Payments and Market Infrastructures, Feb
- BIS, (2018). “Central bank digital currencies”, Committee on Payments and Market Infrastructures, Markets Committee.
- BISsearch, “Blockchain Technology in Financial Services Market - Analysis and Forecast: 2017 to 2026 (Focus on Opportunity and Use Case Analysis)”.
- Charania N. and Naupari C. (2018). “Blockchain’s big potential in Africa”, April.

- Complexity labs, Evolution of Blockchain.
- Cryptoground, “Cryptocurrency Market Cap Predicted to hit \$1 Trillion Later This Year.”
- Deloitte, “5 blockchain technology use cases in financial services Powering innovation in the industry.”
- Dubai Government, Smart Dubai, Dubai Blockchain Strategy.
- First Blockchain Summit, (2018). “Dubai’s Future Blockchain Summit to Unlock Multi-Billion Dollar Opportunities”.
- Gartner Research Firm.
- IBM, (2017). “Streamline Transactions and Tap into New Revenue Sources with IBM Blockchain”
- IBM Institute for Business Value, (2017). “Bridging the divide: How CLS and IBM moved to blockchain,” October.
- IBM, “Build Customer Trust and Enhance the Banking Experience with IBM Blockchain.”
- IFC (2017). “Blockchain in Financial Services in Emerging Market: Part I Current Trends, EMCompass, Aug.
- Jo Lang, (2017). “Three uses for blockchain in banking,” IBM, October.
- Nakamoto S. (2008). “Bitcoin: A Peer-to-Peer Electronic Cash System.”
- Narayanan V, (2015). “A brief history in the evolution of blockchain technology platforms.”
- Manning J. (2018). “How Stock Exchanges Are Utilizing Blockchain Technology
- Medici, “Know More about Blockchain: Overview, Technology, Application Areas and Use Cases.”

- Menon R. (2017). "Economic Possibilities of Blockchain Technology", Keynote Address by the Managing Director, Monetary Authority of Singapore, at Global Blockchain Business Conference, October.
- Monetary Authority of Singapore (2017). "MAS and ABS lead consortium to harness blockchain technology for more efficient inter-bank payments".
- Pickering J. and Moore F. (2017). "These are the Major Roadblocks Stopping Bitcoin from Becoming a Mainstream Currency".
- Smart E. (2015). "Tunisia Becomes First Nation to Put Nation's Currency on a Blockchain", Dec.
- SME Finance, (2017). "World Bank Group", November.
- Stigler Center, "The Blockchain is Going to Revolutionize Central Banks and Monetary Policy", University of Chicago
- Teis S. (2017). "Blockchain: Challenges in financial sector use, Focus, the World Federation of Exchanges, Aug and IFC (2017). "Blockchain in Financial Services in Emerging Market: Part I Current Trends"; EMCompass, Aug.
- The BI Intelligence, (2017). "Bitcoin 101: Understanding Blockchain Technology, Bitcoins, and the Rise of Cryptocurrency", Dec.
- The Central Bank of Bahrain, Bahrain's Fintec Bay
- The Financial Services Regulatory Authority (FSRA) of Abu Dhabi Global Market (ADGM),
- The Origins of Blockchain: Pizzas, Spam, and Byzantine Generals.
- Transparency Market Research; World Economic Forum; Global Blockchain Council, Dubai Future Foundation.

- UN, International Telecom Union (2017). “Digital Financial Services Distributed Ledger Technologies and Financial Inclusion”, ITU-T Focus Group.
- UN, International Telecom Union (2017). “Blockchain in Tunisia: From Experimentations to a Challenging Commercial Launch”, Workshop on “Security Aspects of Blockchain”, Geneva, Switzerland, 21 March 2017
- World Bank Development Indicators, Financial Access Survey, Accenture, CGAP.
- United Nation Economic Commission for Africa (2017). “Blockchain Technology in Africa: Draft Report”, Nov.

صندوق النقد العربي

المكتبة والمطبوعات

سلسلة دراسات اقتصادية

الرقم	المؤلف / Author	عنوان الكتاب / Title	Year
1	جمال الدين زروق	تحرير التجارة الخارجية والتشغيل في الدول العربية	2007
2	جمال الدين زروق وعادل التيجاني	التنسيق الضريبي في إطار التجمعات الإقليمية: تجربة الدول العربية	2007
3	نبيل دحدح	أبعاد المبادرة متعددة الأطراف لإعفاء الديون	2007
4	محمد حامد الحاج	دراسة إنشاء تسهيل لدعم الإصلاح التجاري في الدول العربية	2007
5	مصطفى قاره وآخرون	دور الصندوق في مساعدة الدول الأعضاء المتأثرة بارتفاع أسعار النفط العالمية	2007
6	أحمد الصفتي	مسيرة الإصلاح الاقتصادي وتهيئة البيئة الاستثمارية في اليمن	2007
7	محمد حامد الحاج	دور إصلاحات المالية العامة في الدول العربية ودور صندوق النقد العربي في مساندتها	2008
8	أحمد الصفتي	Financial Sector Reforms in the Arab Countries	2007
9	ابراهيم عاكوم	أسواق الأوراق المالية العربية: انعكاسات وعبر من الأزمة المالية العالمية	2009
10	جمال الدين زروق وآخرون	تحويلات العاملين في الخارج وانعكاساتها التنموية على الاقتصادات العربية	2007
11	جمال الدين زروق وآخرون	أوضاع القطاع المصرفي في الدول العربية وتحديات الأزمة المالية العالمية	2009
12	أحمد بدوي	الحواجز المالية والنقدية في الدول العربية إبان الأزمة المالية العالمية وانعكاساتها على جهود الإصلاح المالي	2010
13	أحمد بدوي	القطاع الخاص والسياسة الاقتصادية في دولة الإمارات العربية المتحدة	2010
14	نبيل دحدح	تداعيات الأزمة المالية العالمية على أوضاع المالية العامة في الدول العربية المصدرة للنفط والغاز الطبيعي	2010
15	حازم الببلاوي	الاختلالات المالية الدولية: نظرة تاريخية تحليلية	2011
16	جمال زروق	التجارة الدولية والعربية وتمويلها وضمان ائتمان الصادرات في أعقاب الأزمة العالمية	2011
17	أحمد بدوي	مسارات التنمية الاقتصادية في الدول العربية ودور التعاون العربي - الياباني في تعزيزها	2011
18	أحمد بدوي	برامج إصلاح الموازنة العامة في الدول العربية	2011
19	جمال الدين زروق	الأزمة المالية العالمية وقنوات تأثيراتها على اقتصادات الدول العربية	2011
20	جمال الدين زروق	مقارنة بين السوق الخليجية المشتركة والسوق الأوروبية المشتركة	2011
21	هبة عبد المنعم	أداء الاقتصادات العربية خلال العقدتين الماضيتين: ملامح وسياسات الاستقرار	2012
22	جمال قاسم ومحمد اسماعيل	تنافسية الصادرات السلعية في الدول العربية	2012
23	أحمد بدوي	مفاهيم تقليدية ومعاصرة في إدارة المالية العامة	2011
24	ابراهيم الكراسنة	البنوك الإسلامية: الإطار المفاهيمي والتحديات	2013
25	هبة عبد المنعم	ديناميكية التضخم في الدول العربية (1980-2011)	2013
26	ابراهيم الكراسنة	الإطار المفاهيمي لإدارة الائتمان لدى البنوك	2013
27	أحمد شفيق الشاذلي	الإطار العام للاستقرار المالي ودور البنوك المركزية في تحقيقه	2014
28	أحمد بدوي	تداعيات ارتفاع أسعار الغذاء العالمية على اقتصادات الدول العربية	2013
29	مصطفى قارة وآخرون	الأزمة المالية العالمية وتحديات استعادة الاستقرار الاقتصادي وتحقيق النمو الشامل في الدول العربية	2013

Year	عنوان الكتاب / Title	المؤلف / Author	الرقم
2014	إصلاح دعم الطاقة في الدول العربية	محمد اسماعيل وهبة عبد المنعم	30
2014	طرق تكوين وإدارة الاحتياطات الأجنبية: تجارب بعض الدول العربية والأجنبية	أحمد شفيق الشاذلي	31
2015	بطالة الشباب في الدول العربية	محمد اسماعيل وهبة عبد المنعم	32
2015	النفط والغاز الصخريين وأثرهما على أسواق النفط العالمية	جمال قاسم	33
2015	Market Development Joint IFI Needs Assessment on Local Capital	European & AMF Bank	34
2016	انعكاسات تنامي صناعة الصيرفة الإسلامية	هبة عبد المنعم	35
2017	جاذبية البلدان العربية للاستثمار الأجنبي المباشر: دراسة تشخيصية	سفيان قعلول	36
2017	محددات الاستثمارات الأجنبية المباشرة في الدول العربية	محمد اسماعيل وجمال قاسم	37
2017	بيئة أعمال المشروعات الصغيرة والمتوسطة في الدول العربية: الوضع الراهن والتحديات	طارق إسماعيل	38
2017	قنوات انتقال أثر السياسة النقدية إلى الاقتصاد الحقيقي	أحمد شفيق الشاذلي	39
2017	النظم الضريبية وضريبة القيمة المضافة في الدول العربية	أحمد موعش وآخرين	40
2017	انعكاسات تضرر الفروض على أداء البنوك وعلى النشاط الاقتصادي	سومية لطفي	41
2017	قياس أثر تنافسية التجارة الخارجية على اقتصادات دول مجلس التعاون لدول الخليج العربية	جمال قاسم	42
2018	دور الإصلاحات الاقتصادية في دعم النمو في الدول العربية	هبة عبد المنعم ومحمد إسماعيل	43
2018	سياسات الدعم في الدول العربية	طارق إسماعيل	44
2018	احتساب مؤشر مركب للشمول المالي وتقدير العلاقة بين الشمول المالي والنتائج المحلي الإجمالي في الدول العربية	جلال الدين بن رجب	45
2018	Islamic vs Conventional Capital Markets Performance and Dynamics of Development	Youssef Nouran	46
2018	حدود الدين العام القابل للاستمرار والنمو الاقتصادي بين النظرية والواقع: إسقاطات على حالة الدول العربية	المصطفى بننور	47
2018	محددات مشاركة المرأة في القوى العاملة في الدول العربية	هبة عبد المنعم وسفيان قعلول	48
2018	تنبؤات الحسابات القومية السنوية باستخدام نموذج المدخلات والمخرجات	أحمد موعش	49
2018	قياس محددات التجارة الخارجية للدول العربية باستخدام نماذج الجاذبية	محمد اسماعيل وجمال قاسم	50
2019	اقتصاد المعرفة: ورقة إيطارية	هبة عبد المنعم وسفيان قعلول	51
2019	كفاءة التحصيل الضريبي في الدول العربية	طارق إسماعيل	52
2019	دور التقنيات المالية في تحسين إدارة المالية الحكومية	أحمد شفيق الشاذلي	53
2019	Using Blockchain in Financial Services	Heba Abdel Monem	54

Copies of publications issued by the Arab Monetary Fund
may be requested from:

Arab Monetary Fund

P.O. Box 2818

Abu Dhabi, U.A.E.

Tel. : (+9712) 6215000

Fax : (+9712) 6326454

E-mail: publications@amfad.org.ae

Available in PDF format at: www.amf.org.ae

<http://www.amf.org.ae>



صندوق النقد العربي
ARAB MONETARY FUND