

International Financial Markets face to face with Artificial Intelligence and Digital Era

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Abstract. *Economic development is the process by which a nation improves the economic, political and social well-being of its people. The research paper starts from the reality that financial markets play an important role in each economy. The research find out that, the inequalities in the levels of development of the regions have arisen from two main reasons: economic and social conditions; and, the level of implementation of artificial intelligence and digital finance – FinTech. Nowadays, investments and financial markets are moving to a next stage: artificial intelligence and secured financial services and transfers using digital financial system, Blockchain. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance to create a more safety business and economic environment, reducing human error.*

Keywords: financial markets; financial intermediaries; financial instruments; artificial intelligence; digital finance; Blockchain.

JEL Classification: D53, E44, E58, F15, F18, F21, F3, F5, F65, G15, G2, O14, O33, Q55.

1. Introduction – features of financial markets

In a common understanding, *market* means a place where people and companies *exchange* different items. Financial market is that place (physically and virtually) financial instruments (securities). Financial markets have been around ever since mankind settled down to growing crops and trading them with others. The growth of exchange in goods and services and appearance of money, increase more the importance of financial markets. At the beginning, banks were those, which represented most financial markets places. People with excess of money needed to keep them safely and/or to receive an incentive for it, so they started to use the banks. Those in need of money approached the banks to borrow the money. So, we may say that this was the first form of financial market, the place when you can sell and buy *money*, in a shape of loans, or deposits, and later in more sophisticated financial securities. The first form of financial market, at local level, began with banks, who made grain loans to farmers and traders. This was around 2000 BC in India. Later, in ancient Greece, during Roman Empire, lenders (based in temples) made loans, accepting deposits in the same time, to perform the change of money. The first international financial market was noted in Europe, in Italy, were the leaders in the field and the first to start trading securities from other governments. They would carry slates with information on the various issues for sale and meet with clients, much as a broker (financial intermediary) does today (Beattie, 2018). In the present time, people and companies wanting to borrow money are brought together with those who have surplus of funds, in the *financial markets* (Brigham and Houston, 2016), though *financial intermediaries*.

Financial intermediaries appear as a middleman between borrowers and lenders. They bring together people with surplus of financial funds with those, which are in need of money. At the beginning, banks were those institutions, which use to facilitate, indirectly, the channeling between lenders and borrowers (Figure 1).

Figure 1. *Financial intermediary process (banks' operations example)*



Flow of funds transfers are usually conducted among people and companies through financial intermediaries. If at the beginning, there were only banks, as main intermediaries, once with the emergence and development of businesses, more types of financial intermediaries risen, depend on their types of activities. Mention this that, financial intermediaries base their activities on flow of money of people and companies. When funds are moving from lenders to borrowers through a financial intermediary, the process it is called *indirect finance*.

Financial intermediaries are financial institutions, which make the financial system and financial markets work. Without this financial institutions and financial markets it would be difficult to move funds from people who save to those which have productive investments.

Financial system include all actors, such: financial institutions, public authorities, which regulate and supervise financial institutions, people and businesses. Financial intermediaries include financial institutions like banks, savings and loans associations, pension funds, financial companies, and investment companies. All this institutions may be grouped in: depositary institutions; contractual saving institutions; and, investment intermediaries.

Financial intermediaries are working with financial instruments. *Financial instruments* are monetary contracts between parties. They are created, and can be modified, traded and settled. They can be subject of currency, evidence of a loan or ownership, or can be a contractual right to receive or pay cash (https://en.wikipedia.org/wiki/Financial_instrument). In other words, a financial instrument is a contract (document) that can be traded in a market, and it represents an asset to one party and a liability or equity to the other (<https://www.collinsdictionary.com/dictionary/english/financial-instrument>). Depends on their risk, and term, financial instruments may be grouped in: currency, deposits, municipality notes, or bills; treasury bills; money market mutual funds; treasury bonds; municipality bonds; corporate bonds; mortgages; stocks; commercial papers; loans; and, leases. All these above can be subject of exchange on financial markets.

People and investors wanting to borrow money are brought together with those, which have surplus of funds in the *financial markets*. Depend on type of financial instrument traded, there are public or private market; primary or secondary market; money and capital market; spot and future market; internal or international market; and, physical or virtual market.

Digital solutions and new technologies offer great potential to overcome massive development challenges and can contribute achieving the goal of universal access to financial services (Rizzo, 2014). Artificial intelligence and digital business promise a universe of applications and digitalized assets that are expected to work together to allow a rapid development of new capabilities that will give competitive advantage. One of these advantages will be the integration of many low- and middleclass income earners into the financial inclusion domain (Economic Corporate Network, 2016).

2. Research methodology

The present work paper is an exploratory research, based on investigative techniques. It is a fundamental and qualitative research, which aims to identify and encourage managing new financial methods through artificial intelligence and digital systems to achieve an efficient sustainable investments on financial markets. Author of the paper wants to promote innovative techniques for development financial systems, using Artificial Intelligence, Smart City, and Blending Facilities. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance to create a more safety business and economic environment, reducing human error.

3. Literature review - the internationalization of financial markets

At the beginning, financial intermediation was conducted only on internal financial markets. Once with the international trade development, foreign investments, international financial markets started to work almost automatically. Securities of large well-known companies started to be *listed* on international markets, first regionally; later globally. The extraordinary growth of foreign financial markets has been the result of both large increases in the pool of savings, in 1980s, and liberalization of movement of capital, and labor force. Investing the money inside the country, it is not enough. In the present time, financial markets, though electronic financial system it help movement of money from one party to the other, often across national boundaries. In their absence, companies would be greatly impeded in their ability to do business with each other, and economic growth would suffer (Greenbaum et al., 2016).

3.1. The impact of international financial markets on local economies

The internationalization of financial markets is having profound effects on all countries involved in foreign direct and indirect investments. Foreign investors and international bodies provide funds to corporations in certain countries, helping finance existing businesses, open new ones or helping the government (by investing in Treasury or municipality bonds). Without these foreign flows of funds, the economies would have grown far less rapidly in the past 20 years. The internationalization of financial markets is also leading the way to a more integrated world economy in which flows of goods and technology between countries are more commonplace (Greenbaum et al., 2016).

Positive impact of internationalization of financial markets. Internationalization of financial markets brought many benefit to investors and countries in the same time. Financial markets facilitates trade, risk management improvement, mobilizes resources, and acquires and processes information that helps in the allocation of capital.

An important service provided by financial market is helping individuals and businesses improve their management of various sorts of risks. This is important for economic growth because an increase in risk reduces investment. By facilitating improved risk management for both borrowers and savers, spurs long-run investments that fuel economic growth. On financial markets, financial intermediaries facilitate flows of financial resources. Investors can invest their money in productive opportunities, and businesses can access the needed capital to grow.

Financial markets obtains and processes information and facilitate capital allocation. Individual savers may not have the resources or expertise to evaluate firms, projects, and managers before deciding whether to invest in them. On the other hand, financial intermediaries may have a cost and expertise advantage in collecting and processing such information, and then helping the capital-allocation process based on that information. This, in turn, encourages investors to supply capital to these intermediaries, which channel the capital to businesses that make investments that fuel economic growth. Financial markets help to increase the flow of goods and services, increase the rate of physical capital accumulation, and increase the efficiency of combining capital and labor in production. As a result, there is more economic growth (Greenbaum et al., 2016).

Negative impact of internationalization of financial markets. The importance of the financial sector in all national economies that participate in the global financial markets has increased remarkably as well, illustrating that today domestic financial development and international financial linkages are typically complementary phenomena, rather than substitutes. Unfortunately, the scale and frequency of financial crises – especially banking crises – have increased as well (Calomiris and Neal, 2013). The value of markets has been for a long time understood to be dependent on information, leading to market asymmetry and to governance of those markets (Cerne, 2019). Informatization and computerization of society is one of the most important processes of present, everywhere around the world. Opportunities for new activities open up, while the information and technological environment as such contains the potential danger of deformations in the structure of personality and the ways of its social integration. In this regard, there is reason to assume that the development of information technologies in our modern age has both constructive and deconstructive consequences for a person or for a business (Lokova et al., 2018).

Financial crisis from 2007-2009 has propagated around the world through the international investment linkage. Back in time, the absence of a globally integrated financial framework, clear international regulations and interventions tools lead to a chain reaction from national to global.

3.2. Digital-Financial Markets – FinTech

The most valuable derivative of digitization is the rich pool of gathered data, which is growing very fast. Advanced computing capability has paved the way for *big data* analytics. Social media, mobile, analytics and cloud (SMAC) and application program interface (API) technologies have allowed different data streams to *talk* to each other in a highly efficient manner. This has led to the integration of multiple services into a single platform, thus creating a plethora of cases for digital financial services –fueling the *app economy* (Economic Corporate Network, 2016).

To remain competitive and achieve longevity in the market, financial services has to keep up with digital transformation. The survival of financial institutions is connected with the adoption of innovation, and embracing digital changes, to improve the efficiency and the performance within the organization (Scardovi, 2017). Digital transformation and new technology adoption have changed the way of doing business and channels that offer banking and financial products and services are more intuitive and trustworthy (Mohamed and Ali, 2019).

Digital systems are becoming more and more used, representing a much faster, cheaper and safer way when it comes to financial transactions. Access to modern telecommunications systems is a priority in all countries around the world, as in their evolution, financial and banking systems implement, use and encourage online services for domestic and international financial transfers. Digitization and digital transformation have become the most commonly used words in the last decade, but especially in recent years. There is an excess of definitions of this term, used to describe the offline-to-online migration of commercial operations and businesses, including those found in many published research works. Contemporaneous economists defined digitalization as *the realignment of, or new*

investment in, advanced technology and business models to more effectively engage digital customers at every touchpoint in the customer experience lifecycle (Solis et al., 2014).

Financial technology – *FinTech* refers to an emerging financial services sector that is becoming increasingly indispensable to financial institutions and has a steady impact on how technology supports or allows banking and financial services. Fintech, Financial Technology targets construction systems that model, value and process financial products, such as shares, bonds, money and contracts. Contemporary economists define Fintech as *a new financial industry that applies technology to improve financial activities* (Schueffel, 2016). Currently financial technologies are used by all types of business, from start-up to large corporations, in all economic sectors.

3.3. Artificial Intelligence

The digital revolution is changing the way of living, working and communicating. The transformation, that takes place within the telecommunications industry, it has a great impact on the surrounding world with the emergence and continued improvement of digital technologies (Zhao, 2018). Artificial Intelligence is one of them. It is a recent technological breakthrough, which, combined with industrial technology, it helps overcoming many human errors, exceeding human performance in different areas. IT programs are becoming more accurate, detecting and scaling objects better than human performance. Speech recognition systems can now identify the language of telephone calls and voice recordings with levels of accuracy that match human abilities. Translating from one language into another is now done in real time, using a simple application on the phone. Glasses can be connected directly to google map or other search program. All of these are already part of our lives. *Artificial Intelligence* solutions have the potential to transform such diverse and critical areas as education, research, healthcare, finance, accounting, auditing, transport and energy. It is not a single technology but a family of technologies. In addition, *Artificial Intelligence* solutions can help sustainable, rapid and viable regional development. The regional economic disparities that exist in different areas of the world can be diminished considerably. Therefore, *Artificial Intelligence* can help to successfully implement regional development policy objectives (Moșteanu, 2019), regardless the geographical area, the spoken language or the sectors of predominant activity. In many countries/regions public authorities require the application of the XBRL to enhance business operations and transparency, with the aim to advance their market's standing in the eyes of investors.

The history of *Artificial Intelligence* started around 100 years ago, in 1920, when Czech writer Karel Čapek published a science-fiction piece called Rossumovi Universal Robots, which introduced the word *robot*, a humanoid *machine* which work for people (Turing, 1950). In 1950, Alan Turing (mathematician, computer scientist, logician and cryptanalyst) asked himself (publically) *Can machines think?* (Koistinen, 2016), and from this question the *Artificial Intelligence* started its journey. Turing continued to develop three distinct strategies that might be considered capable of reaching a thinking machine: through programming; *ab initio* of machine learning (Koistinen, 2016); and, knowledge management (using logic, probabilities, learning skills). As a result of discoveries in neurology, information theory and cybernetics in the same time, researches, and with them Alan Turing, created the idea that it is possible to build an *electronic brain*. Turing

introduced his widely known Turing Test, which was an attempt to define machines' intelligence. The idea behind the test was to call machines (e.g. a computer) *intelligent*. If a machine (A) and a person (B) communicate through natural language and a second person (C), a so-called evaluator, cannot detect which communicator (A or B) is the machine (Schultebrucks, 2018). And the research continued. On 11 May 1997 IBM's chess computer defeated Garry Kasparov after six games. In the last two decades, *Artificial intelligence* has grown heavily. The *Artificial Intelligent* market (hardware and software) has reached \$9 billion in 2018 and the research firm IDC (International Data Corporation) predicts that the market will be \$47 billion by 2020. This all is possible through knowledge management to explore Big Data, and take advantage of faster computers and advancements in machine learning techniques (Schultebrucks, 2018).

3.4. eXtensible Business Reporting Language (XBRL)

eXtensible Business Reporting Language – XBRL – is a language used for electronic communication of business and financial data, which is revolutionizing business reporting around the world. XBRL enable business to generate their required reporting information directly from their financial data. It is a consistent tool also useful for comparability and overall business evaluation.

The birth of modern accounting had its origins in the Italian Renaissance where the favorable climate existed for double entry bookkeeping to be developed. In 1458, Luca Pacioli wrote his fifth book, *Summa de Arithmetica, Geometria, Proportioni et Proportionalita (Everything about Arithmetic, Geometry and Proportions)*. This was the first book on Algebra and it is the first systematic documented source of double entry bookkeeping method. Its basics are familiar and similar in the modern accounting system, but the rules of accounting have been developed over the years, especially in the last 40 years. Now the accounting rulebook has expanded to over 4,000 pages, and is perpetually changing to accommodate new business practices. The use of a standardized coding structure, such as XBRL would help to reduce these wage expenses by removing the replication of data-entry over many channels, and reducing lost data costs. In 2000, an accounting industry specific language was released, this was version 1.0 and it was renamed the eXtensible Business Reporting Language, what we called now XBRL (Kloeden, 2006). In 1999, the American Institute of Certified Public Accountants, six information technology companies, and experts reported that they had joined forces in an attempt to develop an XML-based Financial Reporting Language and extend XBRL internationally for use in business reporting. If the *father of accounting* is Luca Pacioli, the *fathers of XBRL* are Charles Hoffman and Wayne Harding (Hoffman and Strand, 2001). The American Institute of Certified Public Accountants was receptive to this idea and funded the creation of a prototype, once a plan was presented. When the prototype was finished, the AICPA created and promoted XBRL International. The group was formed as a not-for-profit global consortium of companies and agencies with one common goal, the development of XBRL and the widespread acceptance and use of the new global coding standardization process for financial information (Tie, 2005). Currently, XBRL is used by more than 100 regulators in over 60 countries (Europe, Middle East and Asia, North and South of America), supported by over 200 software packages and a growing number of

companies, to facilitate structured data reporting across millions of companies (Nitchman, 2016).

3.5. Blockchain

Blockchain is another newest technology, which enable businesses to generate their required reporting information directly from their financial data. Blockchain technology continues to grow and it is being used in more and more business sectors, finance, accounting and auditing has been identified as areas that could greatly benefit the distributed registry and other features of this one.

Blockchain is a new technology that was introduced a decade ago, after financial crisis of 2008 (Nakamoto, 2008), and there is still a long way to be accepted and adopted by everyone. Blockchain can be described as the chronological record of block transactions. To ensure transactions, the cryptography is used, based on a chain of digital signatures. Each block is a group of transactions that are added to the last block by reaching a consensus on its authenticity among users, which is then passed to each network user to update their database. The Blockchain system records all transactions ever made, shared by consensus distributed and shared among each participant's users, and it is very difficult to force it. Since every two-key sign-in and any transactions are cryptographed and simultaneously maintained in distributed ledgers of each Node, which make this almost impossible to be hacked. Nowadays double-entry bookkeeping it is not an absolute system but it is logically extendible to triple-bookkeeping by including a set of *force* in its third axis (Yuji, 1982; 1986). In the accounting industry, Blockchain helps the companies to write their transactions directly into a join bookkeeping, creating an interlocking system of enduring accounting records. Double entry accounting has been used for a very long time now. Triple entry accounting adds a level of clarity and honesty to bookkeeping that double-entry accounting cannot offer (Faccia and Moșteanu, 2019).

3.6. Cryptocurrencies

As digital finance and artificial intelligence occupy an increasingly important place in the financial services market over the last decade, cryptocurrencies appear too. *Cryptocurrencies* are virtual digital currencies and named as such because cryptographic techniques lie at the heart of their implementation (He, et.al, 2016). Historically, the idea and concept of storing important information by using cryptographic techniques is considered older, as the term crypto is taken from an ancient Greek word Kryptos, which means *hidden*. World Bank classified cryptocurrencies as a subset of digital currencies, which it defines as digital representations of value that are denominated in their own unit of account, distinct from e-money, which is simply a digital payment mechanism, representing and denominated in fiat money. In contrast to most other policy makers, the World Bank has also defined cryptocurrencies itself as digital currencies that rely on cryptographic techniques to achieve consensus. Today, the advent of cryptocurrencies is traced to the emergence of the first cryptocurrency, that is, *bitcoin* in 2009. After the emergence of bitcoin in 2009, the experiments in cryptocurrencies started happening in 2011 with the release of SolidCoin, iXcoin, Namecoin, and others. As of August 1, 2018, there are more than 1,737 different cryptocurrencies in the market. This number of

cryptocurrencies breaks down into 819 coins and 918 tokens. According to CoinMarketCap data, the combined market of overall cryptocurrencies to date is valued at \$269 billion (Mohamed and Ali, 2019).

Central banks have started to consider whether they might issue digital currencies of their own. Due to the advent of cryptocurrencies and blockchain technology, the central banks of major economies started to think and work on their own Central Bank's Digital Currency (CBDC) (Mohamed and Ali, 2019). A fundamental matter raised by CBDC issuance relates to the appropriate roles – in financial intermediation and the economy at large – of private financial market participants, governments and central banks. With CBDCs, there could be a larger role for central banks in financial intermediation. As the demand for CBDC grows, and if holdings of cash do not decline in lockstep, central banks might need to acquire (or accept as collateral) additional sovereign claims and, depending on size, private assets (e.g. securitized mortgages, exchange-traded funds and others). If demand becomes very large, central banks may need to hold less liquid and riskier securities, thereby influencing the prices of such securities and potentially affecting market functioning. Central banks may also need to provide substantial maturity, liquidity and credit risk transformation at times to both banks and markets. Since central banks could assume more important roles, they could have a larger impact on lending and financial conditions (Committee on Payments and Market Infrastructures, 2018).

4. Conclusion – necessity of Supervision of Financial Markets

The global financial and economic crisis has done a lot of harm to public trust and confidence in governing and financial institutions, as well as the principles and the concept itself of the market economy. It has also eroded a lot of public trust in corporations. The climate of global financial uneasiness can partly be attributed to the global meltdown of 2008 where governments and other regulatory agents failed in their responsibility to monitor and steer unrestrained speculative and damaging financial activities (Scardovi, 2017). Financial crises often lead to the emergence of new national and international institutions. Financial digitalization lead to new responsibilities of financial supervisor. The recent global financial crisis has provided a unique opportunity to go beyond economic data and to capture cross border financial data and other information that could assist international and national institutions (Moshirian, 2011), to measure and manage financial risk more effectively, and to prepare for challenges raised by *new financial technologies*. Only an internationally integrated financial system will make large banks global.

FinTech has revolutionized the entire financial services industry by using innovative and advanced technologies such as Blockchain, cryptocurrencies, XBRL, Artificial Intelligence and robot-advisors. These innovative financial technologies come to realign and reboot the efficiency and quality of financial services by cutting the human errors and time processing.

Central banks are the lead authority for macro prudential policy in most jurisdictions. Macro prudential responsibilities are more likely to be given to the central bank when the central bank is also the micro prudential supervisor for banking and financial institutions.

Dedicated committees are also responsible for macro prudential policy in a number of jurisdictions and typically include government representatives, central bankers and supervisory officials. More generally, most jurisdictions have strengthened their frameworks for monitoring financial stability (Calvo et al., 2018), typically by setting up public authorities.

The involvement of central banks is a key feature of any financial supervisory architecture. This is also a source of synergies and conflicts of interest. Synergies stem from the links between financial and economic stability and from the connection between monitoring the overall liquidity of the system – the role of central banks – and the oversight of financial system solvency, which is the role of the prudential supervisory function. On the other hand, conflicts of interest may emerge as monetary policy decisions concerning the setting of interest rates can affect banks' profitability and solvency. The assignment of prudential responsibilities to the central bank also raises concerns of a political economy nature including reputational risk and excessive concentration of authority. In the United States, different functions are typically assigned to several agencies at the federal or state level. In the European Union, member states and those on the accession process share a single prudential supervisory authority (the European Central Bank's Single Supervisory Mechanism) for significant banks (Calvo et al., 2018). However, Member States do keep responsibility for the prudential oversight of smaller institutions and for other supervisory functions, through their central banks or dedicated supervision public authorities (for other institutions than bank, such: insurance companies and private pension funds). Currently there are 268 financial supervisors (around the world) (List of financial regulatory authorities by country, 2019).

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