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FINANCIAL SECTOR SUPERVISION IN DIGITAL AGE: CONCEPTUAL AND PRACTICAL ASPECT

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Abstract

The shape and instruments of financial sector supervision are undergoing deep changes during the current era of digitalisation. The development of digital technologies, and their application in supervisory processes, give us the chance for more effective and proactive monitoring of risk and compliance issues in the supervised institutions, and also provide space to a reduction in the costs of supervision for both the supervisory systems and the supervised institutions. The development of tools of supervision for the supervisory bodies is a logical consequence of the digitalisation of activities of the financial companies, and an inevitable outcome of the process. Their extensive use for supervisory purposes requires that a number of conditions be fulfilled, including ensuring data standardisation, as well as their high quality and completeness. It also requires building the appropriate competencies on the side of the supervisory bodies to avoid additional legal, operational and reputational risks.

1. Introduction

Supervision over the financial sector,or simply financial supervision, means the application by the state of the rules of administrative law to supervised financial institutions in order to ensure their compliance with the law. It may relate to various areas of their activity and be exercised by more or less numerous specialised entities.

The components of supervision include oversight over the supervised entities, and exerting influence on them to modify their activities, by means of applied supervisory instruments. Supervision, therefore, not only examines whether the facts of a case comply with the legal requirements, but it must also be able to take enforcement measures against the operations of the supervised entities.Supervisory activity is closely related to the regulation of financial markets and institutions. Regulations provide a framework for the activities of financial institutions. They determine their scope, functions and principles. They also influence, among

other things, the available product offer, business models, market behaviour and, finally, the organisational structure and legal form of those entities. The regulatory system must keep pace with emerging market innovations and respond to them appropriately.

For a long time, both these activities of the state, functioned together and they only began to move away from each other after the far-reaching liberalisation of the financial systems around the world that took place at the end of the 1970s. It was only then that the need arose to establish entities that would look after the safety of financial institutions released from the straitjacket of administrative restrictions (Masciandaro and Quintyn, 2013).

Towards the end of the twentieth century, these activities became clearly separated and were transferred to different government structures on account of their different characteristics. A somewhat symbolic moment marking this separation was the publication by the Basel Committee on Banking Supervision in 1996 of the Basel Core Principles for Effective Banking Supervision (BCP), where international rules for exercising prudential supervision over banks were adopted for the first time. A few years later, similar documents concerning insurance and the securities market were published. From then on, it can be concluded that supervision over the financial market had formally been born.

The shape and instruments of financial sector supervision are undergoing significant changes during the era of digitalisation. The development of digital technologies, and their application in supervisory processes, has enabled the more effective and proactive monitoring of risk and compliance issues in the supervised institutions, and also led to a reduction in the costs of supervision both for the supervisory systems and the supervised institutions (Toronto centre, 2017).

Their extensive use for supervisory purposes requires that a number of conditions be fulfilled, including ensuring data standardisation, as well as their high quality and completeness. It also requires building the appropriate competencies on the side of the supervisory bodies to avoid additional legal, operational and reputational risks (Zetzsche et al., 2019, p. 48).The purpose of this paper is to review the developments in the financial supervision under current digital transformation of the financial companies and assess their consequences for the financial system.We are doing it in three steps.First we discuss the generic impact of financial innovations on the regulatory and supervisory reality.Second we review innovations in the supervisory toolbox.Finally we assess changes taking place in supervisory reporting and analytical area.

2. Financial innovations:a growing challenge to the supervisory systems

Financial innovations are by their nature always difficult to regulate and supervise. It is even more so today because of the fact that dominant part of financial innovations is concurrently based on technology enabled solutions-fintechs.They are to a large extent applying digitalization, computers and internet in their complex combination(Torontocentre, 2017). European Commission claims that precisely the financial sector is concurrently a major user of digital technologies and a leading driver of digital transformation in the economy. The development of these two areas is mutually dependent and requires active coordination efforts of the State as well as direct cooperation of the financial sector with the rest of the economy(EU, March, 2019).

The difficult task of regulators and supervisors relates to their search how to fit these new technological solutions, into financial and legal framework.(FSB, June 2017).

Key technologies making up for fintech world include nowadays inter alia artificial intelligence(AI), machine learning(ML), internet of things (IoT), Big Data analytics, distributed ledger technology(DLT), smart contracts, cloud computing, cryptography and biometrics(IMF, 2016). Needless to say that this list is not final and we are constantly having new developments in this respect.

Current wave of financial innovations based on digitalization, internet and computer technology presents a number of opportunities, complexities and challenges (Brummer, Yadav, 2019).Generally speaking fintech could affect financial systems in four different ways (Torontocentre, 2017, pp. 6-7).

1. It could increase competition and thus enhance consumer options and provide more space for financial inclusion by introducing new actors into the financial markets and its growing disintermediation. Additionally it provides alternative lending mechanisms and alternative capital raising opportunities.

2. It could also increase efficiency of the systems due to infrastructural developments like new payment systems, development of public registries, application of client identification data, development of cashless solutions, enhancement of smart contracts and market platforms, application of telematics or exploitation of the potential provided by internet of things.

It could affect efficiency of the financial systems by introducing changes into back-office and front line of traditional financial operators by applying artificial intelligence, robo advice and big data analytics capacity.

3. It creates new investment opportunities for the established financial companies for acquiring fintech companies or sponsoring fintech incubators.

4. Finally fintech affect in many ways financial supervision. On one hand they generate new risks and challenges. It is particularly related to the growth in importance of the cyber security risk exposure and its systemic significance due to increased datafication and internet-based infrastructure(Brummer, Yadav, 2017). Equally important is the dramatic evolution in the speed of the risk transfer and migration in the financial systems due to growing automation, application of big data and digitalization. On the other hand it offers to financial supervision some interesting tools and possibilities. We will deliberate more on these issues in the next paragraph.

3. Innovations in the supervisory toolbox

Fundamental changes taking place in supervisory paradigm have been accompanied since the recent global financial crisis by the application of many new innovative supervisory tools, frequently described as supervisory instruments. They are supposed to enhance the effectiveness and efficiency of the supervision and to better reflect the new market reality. They are also a pragmatic reflection of the new tasks and powers allocated to the supervisory institutions. Interestingly enough they are not subject so far to comprehensive analysis and empirical evaluations. This is in spite of their frequently very repressive nature and deep influence on the material processes taking place in the financial markets.

Apart from this strand of impact which reflects the changing supervisory paradigm, supervisors are also experiencing a growing pressure from the technology enabled financial innovations, both directly, through their impact on the supervisory activities, and indirectly, via changes introduced into the financial markets and their participants.

Let us briefly elaborate on their spectrum. We will focus our special attention on suptech, which are the cornerstone of the new supervisory toolbox,apart from early supervisory powers and prompt corrective measures,mucroprudential oversight and stress tests.

Early supervisory powers have been initially applied in the banking supervision to accelerate the actions against banks where weaknesses have been identified, though no formal breach of law has taken place.Thereafter this instrument has been applied to other segments of the financial sector, insurance and securities in particular.

Historically this instrument was first applied in the United States, already back in 1991, in response to the financial crisis taking place at the end of 80’s in Savings and Loan Associations.This crisis led to the bankruptcy of around one thousand of the said associations

out of total over 3200 in existence and resulted in the public bail out costs in the value of over $130 billion. In result the Congress approved new regulations which effectively reinforced supervision of the banking institutions subject to federal oversight. It included inter alia annual supervisory reviews, auditing and risk evaluation as well as Prompt Corrective Actions-PCA.Thereafter this instrument has been popularized by the recommendation of the Basel Committee and became approved since 2014 in the supervisory practice of the EU(World Bank Group, 2017)

The essence of this tool lies in the possibility of undertaking supervisory actions either of corrective or liquidating nature vis a vis supervised entity before it falls into the state of formal insolvency. It effectively means allocating to the supervisory system the rights to act on the base of expert assessments and undertaking decisions in the administrative process.

Undertaking such measures means frequently the limitation of the ownership rights of the shareholders and boards of the institutions involved. In extreme cases it may mean effective transfer of the said rights to the supervisory institutions or other indicated bodies and de facto nationalization (BIS, 2018).

The major aim of the whole process becomes lowering the costs of bankruptcy process, protection of the critical functions of the institutions involved and financial stability and not the interests of individual claims holders, which was the case in the judicial insolvency process.

Similar justification provides macroprudential oversight.It is offering an additional possibility of forward looking interventions in the entire financial system or its substantial parts, to avoid systemic risk and financial instability.

Macroprudential regulations have long history dated back to the prewar time when it was actively used in US to control credit growth in aggregate or in some economic sectors such as housing (BIS, 2016) It has come to the center of regulatory reforms during the time of Global Financial Crisis.The G20 made macroprudential oversight one of its most important project Macroprudential measures became an important element of a global Basel III agreement as well as EU Solvency II regulations.

Macro-prudential supervision has a different manner of accomplishing its tasks than micro-prudential supervision does. It is fundamentally based on applying to the world of financial institutions new regulatory standards that address identified aspects of systemic risk. This may refer, for example, to new capital requirements towards the supervised institutions, the introduction of anti-cyclical buffers, new border levels of their debt, ceilings on leverage ratios, the introduction of LTV or DTI thresholds, etc. (Schoenmaker, Wierts, 2016).

Macro-prudential supervisory decisions assume thus, in principle, the form of new regulations introduced to the financial system. It is thus, contrary to micro-prudential supervision, directly related to regulatory rights that have a legislative character. Basically it is therefore a legislative-supervisorial hybrid. It must thus remain in close relation to entities from the legislative world, which practically means its strong institutional relationship with governmental institutions from the world of politics.

This supervision has no controlling or sanctioning instruments over the financial institutions which it supervises that is so typical of micro-prudential supervision. That is why, for its operational activity, it must remain in close cooperation with supervisory systems of a micro-prudential character, which perform the tasks of a direct enforcement type.

Stress tests encompass both the set of techniques of quantitative and qualitative nature. They are used to assess the degree of impact on a selected institution in a defined time horizon of unfavorable factors, in particular the change in its level of risk. It is a technique of an early measurement of the sensitivity of individual financial institutions, their groups or else the entire financial system vis a vis the events characterized by small probability of their appearance but having great importance once they come up (Borsuk, Klupa, 2016).

Stress tests are an extremely important part of forward looking supervision in the process of risk management process within financial institutions. It allows taking supervisory actions before negative scenarios are taking place. It is an important supervisory innovation which destroy the reactive supervisory model which essence lies in taking measures only post factum and hence the supervision is frequently in retard and thus less effective.

Stress tests have come into national regulations and supervisory practice after adoption of Basel III. US was the pacesetter, introducing this tool in the Dodd-Frank Act in 2010. EU followed with CRD IV(EBA, 2018).

4.Suptech:digitally enabled supervisory technology

Suptech could be considered supervisory answer to fintech developments on the regulatory side. It is technology driven.Suptech is simply speaking a reflection of fintech in the area of supervision.It is defined as the application of innovative technological solutions in financial supervision to digitalize supervisory reporting and implementation of other supervisory processes like monitoring, predictive analysis and use of robo advisors. (BIS, 2018).

Basically the aim of application of suptech is more effective and proactive monitoring of risk and compliance issues in the supervised entities. Its development is a natural consequence of the digitalization and computerization of the financial markets activities.

Principal area of suptech application are concurrently two supervisory areas-aggregation of data and its processing. In the first case new applications are widely utilized for supervisory reporting, management of data base and virtual assistance. An example is the utilization of supervisory data directly from the information systems of the financial institutions, their automatic validation and consolidation. It may lead to the situation in which reporting for supervisory purposes be abandoned and direct "sucking" of data in a continuous manner will take place. Thereafter they could be automatically validated and consolidated. Automatic validation could include the test of their completeness and consistency. It would thus allow supervisor to improve their performance and lower the costs, and focus more on analysis and assessments. Additionally suptech can be used to communication with the customers and processing of their claims, to better detect eventual irregularities and fraudulent activities of the supervised entities.

Through the system of reporting suptech allows creation of macrodata via aggregation of microdata level, thus providing information on interlinkages between the financial institutions and their exposure to risk.

Suptech enables aggregation of data coming from different sources, both structured data bases as well as unstructured ones.It could be also applied to their visualization for the supervisory purposes.Acting as virtual assistant suptech may be used for complaints handling and processing in order to detect potential irregularities in the activities of the supervised entities. Many supervisory agencies utilize already chatbox for automatic complaints handling and communication with the customers. It could be used also for consulting with the customers and checking their satisfaction. The same technology could be used in communicating with the supervised entities to answer automatically their simple daily questions related to supervision and compliance issues. It helps in better understanding of regulations and their interpretation.

In the second area-data analytics, suptech applications may be used for the monitoring of the processes taking place in the financial markets, detection of improper market conduct, utilization of the system of enhanced risk indicators or systems of early warning. Examples are detection of insider trading activities or identification of money laundering incidents. Finally it may find its direct application in micro and macro supervisory processes(FSI, August, 2019). For example British Financial Conduct Authority in its attempt of detecting insider trading receives daily over 20 million detailed information on transactions finalized on the equity market. These information are subsequently processed and analysed to reveal

potential market manipulation. Staff of FCA check the behavior of market participants trying to discover anomalies which may indicate existence of insider trading.

Suptech applications could be utilized for microprudential purposes. Thus for instance Bank of Italy uses currently suptech applications for diagnostic of companies' insolvencies and credit risk assessment of commercial banks. It is carried out via application of machine learning algorithms through connection of several data bases such as Central Registry of Credits, balance sheets data of nonfinancial corporations and other publicly available information.

Finally they could be applied for macroprudential supervision (FSB, 2017) For example Central Bank of Netherland (DNB)applies suptech solutions for the detection of risks emerging in the financial markets using vast information sources of the payment institutions. On the other hand both ECB and US Federal Reserve Board are applying natural language processing technology (NLP) as a form of artificial intelligence for the detection of threats to financial stability (ESMA, 2019)

Application of suptech by supervisory agencies may lead to substantial advantages in financial institutions. It may in particular provide a space for the lowering of their compliance costs as well as improve their risk management process. Cost advantages are particularly important. According to available research compliance costs both in US and UE of financial institutions represent as a rule several percentage points of their operational costs. In 2018 around 38% of the financial companies claimed their compliance costs to be at the level 1-5% of operational costs, 10% companies assessed their level at 6-10% and 4% claimed their level to be above 10% of operational costs(BIS, 2019, p. 6).

5. Financial supervision in the digital era:data challenge

The digitalisation of economic activity and the financial system has led, among other things, to a massive explosion in data. There are estimates that the volume of information is currently doubling every twelve hours (AIR, Regtech Manifesto, 2018). This means a serious practical challenge for the systems of financial supervision, a fact pointed out in a speech in 2019 by former Bank of England Governor Mark Carney. Justifying the use of artificial intelligence in the supervision process, he said: "The Bank now receives 65 billion data points each year of firm-related information. To put that into context, reviewing it all would be the equivalent of each supervisor reading the complete works of Shakespeare twice a week, every week of the

year." (AIR, Regtech Manifesto, 2018, p. 8). Handling such a tsunami is only possible with the use of automation processes.

The financial supervisory bodies not only have to deal with this rapidly growing amount of information, but also generally with its quality in the broadest sense. An additional problem is the validation and completeness of the data, and having the appropriate analysis tools and personnel with analytical skills.

It should also be noted that the data generated directly by financial firms in the supervisory process constitute, to an increasing extent, only a small part of the data generated about them and the environment in which they operate. These large datasets include information from online activities, social media, media publications, cameras, the Internet of Things and public datasets, etc. The availability of these data and the possibility of their quick processing as a result of the use of new solutions has enabled, among other things, new quality in the identification and assessment of risk and the time when it occurs.

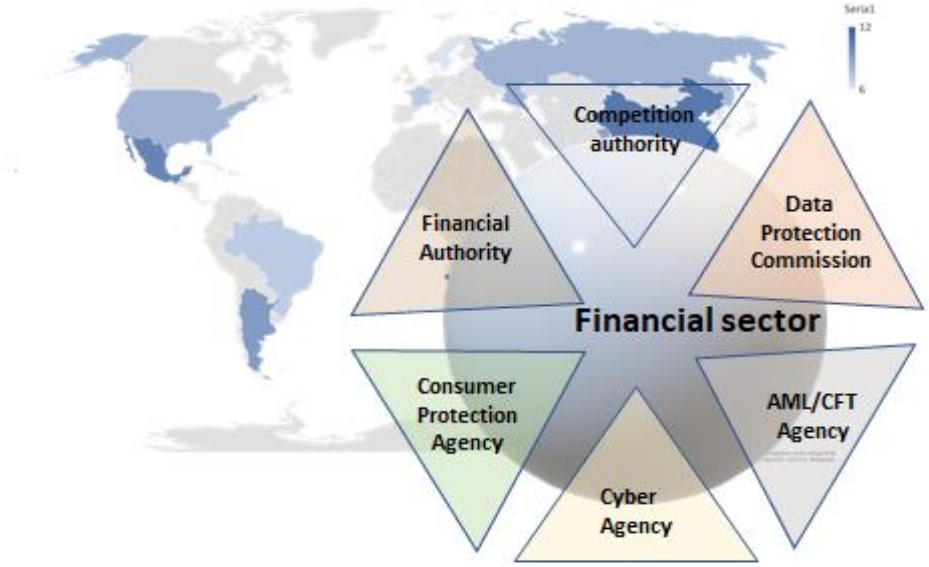
An additional element adding to the complexity of the new supervisory system of finance in the digital environment is the expansion of its scope, as well as the progressive growth of its trans-sectoral nature.

On the one hand, this is related to the fact that the digitalisation of the economy and finance, by leading to an explosion in the databases used in management processes, naturally creates an ever-stronger need for the privacy of the personal and non-personal data stored thereto be protected. This, in turn, leads to the emergence of institutions responsible for this protection, usually of a trans-sectoral nature. At the same time, the digitalisation of the economy and finance intensifies the processes of expanding the financial services consumer protection programmes initiated following the new regulatory paradigm resulting from the Global Financial Crisis. This paradigm identified the protection of financial services consumers as an important component of the financial stability of the network and made it the subject of international attention. The same applies to the development of macroprudential supervision, which has been functionally and often institutionally separated from the existing supervisory institutions and located in other bodies as a result of the Global Financial Crisis.

The digitalisation of the economy and finance has led to a huge increase in the role of cyber security and the expansion of monitoring and supervisory systems in this area, usually built on a trans-sectoral principle. Additionally, digitalisation has changed the nature and scale of

illegal activity in the financial area, a fact that is increasingly reflected in the development of specialised institutions supervising this part of finance. All in all, a new shape of the architecture of the supervisory system over the financial sector is emerging more and more strongly. It is a less sectoral and more horizontal architecture, less universal and more specialised.

Fig.1. Hexagon of contemporary financial sector supervision



Source: Own elaboration based on Crisanto et al. (2021)

The digitalisation of the economy and finance has led to a clear increase in the importance of operational risk related to the widespread use of new technologies such as artificial intelligence, cloud computing, large databases and data security, etc. This means, among other things, that there is a need to expand the supervisory field with new these issues and new risks.

6. The new nature of supervisory relationships with supervised entities

For many decades, the basis for exercising supervision over the financial sector has been the process of cyclical financial reporting by entities on the financial market, supplemented by on-site inspections. Due to the experience of the global crisis, however, this regular reporting

programme has recently been significantly expanded. For example, insurance companies in Poland currently submit twelve regular supervisory reports a year. These reports are intended to enable the supervisory body to obtain a correct picture of the supervised institution and its environment, as well as the actions it takes. The information collected is mainly of a statistical and supervisory nature. The former mainly includes balance sheet data which help the supervisory authority to see the broader context of the entity's operations. The latter, on the other hand, constitutes the vast majority of the information collected, and includes data on compliance with prudential requirements. It consists of data on the situation in terms of equity, reserves, liquidity, and the size of the risk, and its individual components, to which the entity is exposed. These data are primarily used to perform the micro and macroprudential tasks of supervision and its obligations related to crisis management (FSI, 2021).

The reporting process consists of a series of stages In the first stage, the reporting entity obtains operational data from the activity being conducted in order to prepare the data for supervision purposes. In the second step, based on the transformation rules, the data are transformed into the required supervisory information and then made available to the supervisory authorities. These, in turn, distribute them in the internal system and subject them to the appropriate analytical process.

In fact, the analogue reporting process was essentially done on paper. The transferred data was then entered into IT systems for further processing. Today, the reporting process is increasingly digitised and automated. The new solutions are used mainly for the needs of supervisory reporting, real-time monitoring, database management and virtual assistance. An example is the retrieval of data directly from the IT systems of financial institutions, the automation of data validation and consolidation, and the use of artificial intelligence to communicate with consumers and supervised entities.

The main areas of innovative activities resulting from the digitalisation of the financial system are primarily comprised of the standardisation activities required by the new technology. This concept includes standards regarding the properties, terminology, structure, organisation and format of the data (Gal and Rubinfeld, 2019). Data standardisation simplifies the retrieval of data by the reporting entities and improves the quality. Standardisation also makes it possible to facilitate the process of applying the transformation rules and formalising them. An important event in the development of reporting was the implementation of innovations in the reporting formats applied. The most fundamental change was related to the transition from paper reporting to reporting in digital format, in the form of Excel files. Currently, many

countries are moving towards more advanced reporting formats that can cover much larger datasets and enable more advanced analytics. As a result, they may also allow for the progressive granulation of the retrieved data. An important element in streamlining the reporting process is the restructuring of the transmission system, which aims at replacing emails with special internet portals set up by the supervisory institutions where the supervised entities can submit their reports. The use of machine-to-machine direct data transmission using API technology has also begun (FSI, 2020). The final part is the direct retrieval of data from the IT resources of the reporting entities. This may lead to reports from supervised institutions being abandoned in favour of direct and continuous data retrieval from their IT systems instead, and then their automatic validation and consolidation, and possibly visualisation. However, this requires many technological, legal and financial issues to be resolved. A pioneer in this regard is the National Bank of Rwanda, which has been implementing the idea of collecting supervisory data directly from supervised institutions since 2017. The collection process takes place automatically every 24 hours, and in some cases every 15 minutes. The supervisory body in the Philippines has intended to implement a similar project (FSI, 2018).

Obtaining the relevant data and reporting them for supervisory purposes is a complex and costly process, both for the supervised entity and the supervisory body.

An extensive study in this area by the European Commission in 2019, carried out among over 100 financial institutions from leading EU countries, shows that the average costs of reporting for supervisory purposes accounted for over 30% of the total compliance costs in the analysed institutions, and approximately 2% of the total operating costs. Particularly high shares of supervisory reporting costs in the compliance costs were recorded in the insurance sector and on the capital market (EU, 2019, p. 205). The breadth and complexity of reporting for supervisory purposes results, among other things, from the extensive tasks of these institutions and the lack of adequate internal coordination, as well as the use of ineffective methods of obtaining data. The high costs of acquiring these data may also result from their low quality. A 2018 study by the American consulting company BFA,conducted among supervisory bodies from ten countries from South America (Brazil, Peru), Central America (Mexico), Asia (Philippines) and Africa (Morocco, Egypt, Kenya, Ghana, Mozambique and Nigeria), shows that the key issues are delays in data delivery (as many as 92% of cases), incompleteness of the data provided (67% of cases), the low quality of the data (58% of cases), the incorrect interpretation of requirements (42% of cases) and data manipulation

(17% of cases) (BFA, 2018, p. 11). Other studies in the US and the EU have shown that the total compliance costs of financial institutions are generally a few percentage points of their operating costs. For 2018, over 35% of financial companies claimed that their compliance costs were 1-5% of operating costs, 10% of companies rated them at 6-10% and 4% of companies assessed them at over 10%. The same studies indicate that supervisory costs constitute a significant burden for the supervised entities. In 2018, the ECB estimated them for the EU at nearly USD 600 million, while the Federal Reserve System estimated these costs for the US at over USD 2 billion (Auer, 2019, p. 6).

7. Digitalisation of supervisory analytics:big data and artificial intelligence

The analytical activity of the supervision is based on the data and information collected. The whole process can be described in the digital environment through five basic stages: collection, organisation, analysis, storage and application (Gal and Rubinfeld, 2019, p. 737).
The collection stage includes finding data, saving them in a data lake and then aggregating them into a form that allows them to be subjected to data mining. The purpose of this process is to automatically discover statistical dependencies and connections in the collected data and then present them in the form of logical rules, decision trees or neural networks. Organising involves structuring the database, including synthesising certain records and entering explanatory notes. At the organising stage, therefore, data is transformed into information (Gal and Rubinfeld, 2019). The analysis stage involves the integration and processing of various data and it is at this stage that information is turned into knowledge. Data storage includes archiving data in a form that can be retrieved later. The stage of data application, on the other hand, comprises the use of the acquired knowledge to diagnose phenomena (diagnostic analysis), predict their development (predictive analysis) and undertake current supervisory activities (prescriptive analysis).

In the digital environment, supervisory bodies obtain information not only from the supervisory reports submitted to them by the regulated entities, as well astheir own findings made during inspections and ongoing interaction with the stakeholders, but also from many other sources. A natural source of information may be other public databases, e.g. from tax offices, statistical offices, labour offices, etc. Existing commercial data bases may also be an important source of information, as well as information available on the internet and obtained from market customers, e.g. through the use of chatbots. Big database technologies include

those used by the US Federal Reserve Board in a special oversight programme for financial entities of systemic importance to US financial stability. They are also used in a cyclical stress test as part of examining the capital situation of large banking organisations in the country. For this purpose, the Fed acquires monthly data relating to the individual loans granted by the surveyed banks in order to project the expected financial result from the conducted activity (Jagtiani et al., 2018). Digital solutions enable the use of many different data sources for the needs of analytical work, which may require both structured and descriptive data. For example, for the purposes of researching money laundering processes, the Bank of Italy uses both the reports of financial transactions concluded on the market and also press reviews. Analyses conducted with the use of large databases are often used to analyse phenomena occurring in financial markets. To detect insider trading, for example, the British Financial Conduct Authority (FCA) receives detailed information daily on over 20 million transactions taking place on the stock market. These data are analysed to detect signs of market manipulation. Appropriate FCA units analyse the behaviour of the sellers and detect deviations from the norm that may indicate the occurrence of insider trading.

Digital applications can also be used for the purposes of microprudential supervision. As an example, the Bank of Italy uses them to forecast bankruptcies and assess fluctuations in the credit risk of banks. This is done through the use of machine learning algorithms, by linking a number of databases such as the Central Credit Register, the balance sheet data of non-financial enterprises and other data on the business activities of companies. Finally, suptech applications can be used in the area of macroprudential supervision (FSB, 2017). For example, the Bank of Italy conducts systematic analyses of price forecasting in construction and inflation. The Central Bank of the Netherlands, on the other hand, uses suptech applications to detect risk signals appearing in the financial system, using for this purpose a huge information base from payment companies. In turn, the ECB and the Federal Reserve Board in the USA use natural language processing technology as a form of artificial intelligence to identify threats in terms of risks to financial stability (Esma, 2019).

8. Conclusion

Preceding debate indicates that supervision of the financial markets has become over recent twenty or so years an increasingly important element of the financial systems. It is progressively moving away from passive compliance check out towards an active influence of the financial markets reality. It is encompassing a growing range both of issues and entities

and is undertaking an ever deeper penetration into the material processes in the financial market and in the activities of the financial institutions. Its internal structure is becoming more and more complex and comprehensive.

All of this results in the enormous growth of importance of supervisory systems and its old and new institutions proliferating and of resources allocated to them.

Everything indicates that we are witnessing the birth of the second, after the central bank, public pillar of the financial system and a successive stage of the narrowing of economic freedom in the financial market.

Supervisory systems have to respond also to the increased changes in the material base of the financial markets and their growing datafication, digitalisation and computerisation. The financial innovations based currently predominantly on the application of fintech are increasingly changing the financial markets, their institution and their supervisory systems.

The analysis conducted shows that the shape and instruments of financial market supervision have been undergoing significant changes during the era of digitalisation. The development of digital technologies, and their application in the business processes of financial companies,has led to both the possibility and the need to reconstruct the existing supervisory system. The possibility for its reconstruction stems from the scale of availability of digital solutions for monitoring, analysing and using supervisory information for the purposes of achieving supervisory goals. The need for its reconstruction, on the other hand, is a result of the emergence of new challenges and risks in the financial system following changes to the type of products, services and business models used by financial institutions and their ecosystems. The application of digital technologies in supervisory processes has enabled the more effective and proactive monitoring of risk and compliance issues in supervised institutions, and also led to a reduction in the costs of supervision for both the supervisory systems and the supervised institutions. The development of tools of supervision for the supervisors is a logical consequence of the digitalisation of activities on the financial market, and an inevitable outcome of the process. Their extensive use for supervisory purposes requires that a number of conditions be fulfilled, including ensuring data standardisation, as well as their high quality and completeness. It also requires building the appropriate competencies on the side of the supervisory bodies to avoid additional legal, operational and reputational risks.

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International Centre for Digital Finance

Aims:

1. Developing activities promoting socially responsible digital finance
2. Initiating activities for better understanding and use of digital finance and financial innovations
3. Organising platforms for cooperation of digital finance stakeholders , its institutions, investors, consumers, public sector agencies and academic community .

Forms of activities:

- undertaking theoretical and applied research in the area of digital finance
- undertaking educational activities in the area of digital finance
- organising of seminars and conferences ,national and international
- supporting domestic and international cooperation in the area of digital finance
- monitoring of digital finance developments and its social and economic implications
- undertaking other actions and initiatives which relate to its aims

Strategic partners:

Fundation for the Promotion of Education,Chamber of Insurance and Risk Assessment, Interrisk.