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FERNANDO GRECO

Smart contracts in the financial sector

SOMMARIO: 1. The digital age and the potential of blockchain. – 2. Market rules and digital dynamism. – 3. The coexistence between traditional regulation and technological innovation. – 4. The partiality of approaches and their temporal scanning of the regulatory phenomenon. – 5. Banking/financial contracts at the test of digitalization. – 6. Regulatory initiatives of the European Union. – 7. Smart contractsfeatures. – 8. The language of smart contracts: the codification of contract clauses. – 9. The critical issues underlying the use of smart contracts. – 10. Disintermediation, financial inclusion, robo-advice, stock options, and derivatives. – 11. Smart contracts in banking services. – 12. Fintech in insurance: automated claims management. – 13. Concluding remarks.

1. *The digital age and the potential of blockchain*

The digital era is having a significant and disruptive impact on contract law, such as to accentuate the process of progressive distancing (if not, indeed, abandonment) from the single paradigm of the contract, already initiated with the crisis of classical liberal thought. The structural differentiation between markets, which depends on the specificity of the good and/or service provided, is leading to a parallel stratification of contractual models, which, in adapting to specific sectoral needs, tend to take on increasingly atomistic features[1].

The banking and financial sector seems to be the segment in which the significant potential offered by the so-called distributed ledger technologies (DLT) is best represented, among which the best known is the blockchain[2], with its three main functional characteristics, namely: a) immodifiability of the data entered; b) transparency and accessibility of the information recorded; c) traceability of operations. The blockchain contributes to enrich the category of digital contracts, notably imposing an assessment of compatibility between this

[1] In that respect, M. MAUGERI, *Smart Contracts e disciplina dei contratti*, Bologna, 2021.

[2] See, P. L. RIET, *Blockchain-Based Smart Contracts for beginners*, in *Rivista di Diritto del Risparmio*, fasc. 2, 2020.

innovative form of negotiation "not in presence" and the traditional schemes. In other words, the profound economic changes connected to the creation and affirmation of telematics, as a function not only economic, but also dialogical of modernity, have implied the start of a profound rethinkingof some legal concepts and interpretations, in the attempt of the conjugation between innovation and tradition. A reconsideration of the overall discipline of contracts[3], including those that "make themselves" (so-called "self-driving contracts")[4] is, thus, requested. Mass bargaining (and, therefore, contractual standardization), which was initially relegated to an ancillary role, hasprogressively established itself as a rule and has ledto the transition from the centrality of the individual to that of the market.

As the financial sector is the main user of digital technologies, as well as an important driver of the digital transformation of the economy and society, it represents the cornerstone between financial services and the singledigital market (as stated by the European Commission in its «Financial Technologies Action Plan: Towards a more competitive and innovative European financial sector»). In that respect, we can thinkat the automation and simplification of various types of operations, from trading and payment to risk management, with a considerable compression of processing and execution times, associated with an ever-increasing reliance on security measures to protect individual market users. In this context, the banking sector proves to be an excellent hub for the collection of proposals and the development of the best and most promising innovations brought by smart contracts.

2. *Market rules and digital dynamism*

The relationship between rules and innovation is usually seen in terms of conflict, since, on the one hand, we experience the slowness, lack of understanding and receptiveness of the regulator towards the new phenomena; on the other, instead, we do experience the speed and disruptive force of technological and market innovations. In the field of

[3] V. D. FAUCEGLIA, *Il problema dell'integrazione dello smart contract*, in *Contratti*, 2020, 5, 591.

[4] In that respect, C. AMATO, *La 'computerizzazione' del contratto (Smart, data oriented, computable e self-drivingcontracts. Una panoramica)*, in *Europa e diritto privato*, 2020, fasc. 4, 1259.

physics, the situation described would be defined as a parallax error, which is an error of reading and evaluation dictated by the adoption of an unsuitable perspective of analysis.The conflict develops exclusively on an apparent plane, just as it would be the displacement of the object in the physical projection: the force of regulation is indeed considered in a single-dimensional vision, which intends the rules as a defensive instrument for the purpose of a contingency of the risks of abuse and criminal phenomena[5].

The regulatory framework must also be appreciated from a more constructive point of view, in the same way as the equivalence (to remain again in the mathematical field) of normative propositions equal to paternalism. The rules, in fact, aim also at giving a sense of orientation to final consumer; but they alsooffer solutions that are oriented at greater security, sustainability and virtuosity, and, at the same time, they aim atdiscouraging distortive conducts of the competitive dynamics[6].

Against this background, there is an inherent complexity in first creating, and then implementing, a stable, effective and efficient regulatory architecture that is immediately understandable to all classes of recipients (across the board) and, last but not least, that can be sufficiently coordinated with the rapid and (most often) unpredictable and fragmented financial technological innovation.

Technological and digital evolution cannot be stopped, but,in order to make the change of gear as comfortable as possible,the clutch shall be activated. The need for greater and more punctual attention towards the entry of digital technology into market, commercial and financial dynamics, has even contributed to an adjustment of public institutions themselves, which have created special departments dedicated to digital transition.

[5] See, A. PERRAZZELLI, *Le iniziative regolamentari per il Fintech: a che punto siamo?*, 4 maggio 2021.

[6] See, A. PERRAZZELLI, *op. cit*.

3. *The coexistence between traditional regulation and technological innovation*

One of the classical issues in dealing with financial technologies is the adjustment of classical regulatory models, that find their roots in civil law, to the new technological and digital needs. Pre-digital market rules reveal to be inadequate to regulate phenomena which did not exist at the moment of their formalization; in other words, in the legal sector of Fintech, we find ourselves before a lack of regulation, which we have tried to fill through the elaboration of some supplementary regulatory approaches, thanks to the widespread diffusion of an innovative financial phenomena, such as, above all, crowdfunding and virtual currencies: phenomena that have transversally involved the market and its protagonists, including regulations.

Authoritative scholars[7] have identified a categorization of the approaches adopted so far, which can divided into three types, depending on the attitude towards digitization; specifically:

- *wait-and-see*[8] approach; the guideline is: do not intervene (with the introduction of new rules) until there is a current and pressing need. In other words, it is advisable to let the "new" financial services and/or products coexist with the "old" ones, in a process of sustainable integration, at least until the actual foreseeability of a risk of system failure, as conceived. In other words, heterodirection would represent the residual remedy.The approach in question should not, however, be merely relegated to a choice of passivity, since it is more akin to a ghostly regulation, silent but present, which is expressed in warnings and communications, aimed at making the market aware of the risks of deregulation and which remains, in any case, prodromal to the subsequent introduction of sectoral legislation.
- An "*osmotic*" approach, based on the principle of "*same business, same risk, same rules*". Although the activities may appear, *prima facie*, to be different, they underpin the same economic function. Despite being digitized, the new market frontiers lead to the same risks as

[7] Reference is to M. AMSTAD, *Regulating Fintech: Objectives, Principles and Practices*, ADBI Working Paper Series, No. 1016, Asian Development Bank Institute (ADBI), Tokyo, 2019.

[8] AA.VV., *La digitalizzazione della consulenza in materia di investimenti finanziari*, in *Quaderno FinTech n. 3*, gennaio 2019.

already regulated activities. In essence, this is an extensive approach (in this sense, osmotic), which disregards the concrete implementation of the process and, therefore, the choice of individual means used, to focus on the substance and content. Technology, almost, fades away and is relegated to an accessory circumstance.

A "*futuristic*" approach, which is, in a certain sense, in open discontinuity with previous approaches. New technologies can only correspond to new rules ("*new functionality, new rules*"): the "*novelty*" can realistically imply risks that are already known, as well as problems that are still unknown and, consequently, not covered by effective and efficient protection mechanisms. Hence the need for a legislative interventionism, aimed at filling, in a precise and specific way, the new market dynamics.

4. *The partiality of approaches and their temporal scanning of the regulatory phenomenon*

The three definitions above, do not imply alterity, but, on the contrary, complementarity. We have already had the opportunity to point out, in fact, as each of the three approaches present criticalities, which would compromise theier use in atomistic key.

The "*wait-and-see*" approach has the advantage of guaranteeing the public institutions a more than adequate period of time for the adaptation process (*rectius*, of transition), with the possibility of better investigating the phenomena and intervening, therefore, in a more focused manner; however, the counterisk is evident: delaying the intervention in front of a phenomena that is already faster in itself could be equivalent to increasing (rather than contracting) the intervening delay. The *wait-and-see* phase of the study can just be viable only in the preliminary moment of the development of a service and/or product,

Similarly, the second way of dealing with fintech, rightly defined as "*osmotic*", reveals its fallacy in the possible underestimation of the differences between two different ways of conducting the same economic function. Although it is the most widespread approach and the most convenient (at least in the short term), the application of uniform conditions to "new" and "old" types of contracting, to "new" and "old" operators, contributes to frustrate the innovativeness underlying the technological component itself.Indeed, evading new

risks do not help to defuse them; artificial intelligence, as well as blockchain, are particularly incisive on the executive phase of contractual relationships, introducing new service risks, which, by physiognomy, require new analyses and new regulatory measures.

Lastly, there is the third approach, the one defined as "*futurist*", also in consideration of its complete referability to the final phase of the regulatory process. Being completely detached from the first two, the identification and development of new rules is the natural conclusion of the process: a phase, in substance, executive, which is the most natural outcome of those of study and implementation.

The effective contextual and coexistence of the three different regulatory approaches has already been sufficiently proven by the experience of the so-called crypto-assets[9], which started out as a phenomenon of little importance and were the subject of a phase of study and in-depth analysis by national and supranational authorities; they expanded rapidly (in view of the large number of requests on the market) and gradually came into conflict with the regulations in force; finally, they were incorporated into an *ad hoc* legislative and regulatory apparatus, which was able to detail the innovativeness without, at the same time, thwarting the traditional financial discipline[10].

5. *Banking/financial contracts at the test of digitalization*

MiFID II, as is well known, has introduced, in the overall work of strengthening the protection of the investor, a sort of regulatory paternalism, by means of reinforced contractual transparency which require the execution of a contract, that shall necessarily be in written form.This translates, for the purposes of the valid conclusion of the contract, into the inadequacy of the information technology solutions, mainly used (such as, for example, flags to be ticked, pop-ups, icons to be selected), because they are not sufficient to guarantee compliance with the civil law requirements, in terms of form *ad substantiam* and

[9] V. M. DE MARI, *Prime ipotesi per una disciplina italiana delle Initial Token Offerings (ITOs): token crowdfunding e sistemi di scambio di crypto-asset*, in *Rivista ODC*, 2019, facs. 2.

[10] See, A. PERRAZZELLI, *op. cit*.

signature, provided for by the civil code (ex art. 1350 and 2702 Italian Civil Code) and by the sectoral regulations (art. 23 TUF)[11].

Digital bargaining does not require the contextual physical presence of the contracting parties, it pursues a fast realization of the effect of the contract and it uses techniques of communication at a distance, to reach a finalization of the agreement; it appears as there are not the margins for a formalization in writing and a traditional collection of the signature of the customer.It seems far away from the re-propositions of civil law stereotypes of contract conclusion, such as the exchange of proposal and acceptance through correspondence: this would certainly be a solution of immediate realization, but which would be outside the scope of smart contracts. The computerization of the contract would, on the other hand, be implemented with recourse to electronic signature, using the tools provided by the Digital Administration Code (CAD)[12]: a perspective already adopted in payments through internet banking, with the production of a temporary identification code (so-called OTP).

6. *Regulatory initiatives of the European Union*

Starting from an analogical approach that included some "futuristic" vision, the European Commission has launched several initiatives aimed primarily at clarifying the application of existing regulations to new financial activities and, at the same time, at reinforcing the system of complementary controls. In this sense, the Digital Finance Strategy and the Retail Payment Strategy represent two true cornerstones. More specifically:

- the Digital Finance Strategy aims to make the digital transition easier, in the continuous search for solutions that can, effectively, contribute to adapt the pre-existing regulatory framework to the new technologies. The two main areas of intervention have been crypto markets (so-called "MiCAR")[13] and digital operational resilience (so-

[11] V. AA.VV., *La digitalizzazione della consulenza in materia di investimenti finanziari*, in *Quaderno FinTech n. 3*, gennaio 2019.

[12] V. G. FINOCCHIARO, *Il contratto nell'era dell'intelligenza artificiale*, in *Riv. trim. dir. proc. civ.*, 2018, fasc. 2, 441.

[13] MiCAR is aimed at the harmonization of the Community (rectius, Union) of the regulatory framework relating to the issuance of crypto-assets, with an expansion of the subjects and activities supervised and the management of trading platforms. See,

called "DORA") [14].The significance of this ambitious projectis to be found in the mixture of two of the three approaches mentioned above: the *leitmotif* of the Union's work is, in fact, the search for a balance between the application of existing rules to activities that are operationally new (although functionally "old") and the proposal of new rules for phenomena that cannot be effectively subsumed within the group of those already known (and regulated). This complex balance is, in good substance, an excellent metaphor for the state of the art in the field of Fintech and smart contracts.The activity of methodical innovation, based on the principles of proportionality, adequacy and, as far as possible, standardization, is clearly affected by the difficulties of definition and perimeter of activities and phenomena now widespread, but susceptible to sudden developments, changes and reversals methodological and operational: there is, in essence, a step-by-step update, with phases of study and settlement, interspersed with the clearance of new proposals.

- The Retail payments strategy is based, on the other hand, on a different factual observation, namely that payments methods are a driving sector in the digital evolution. In a nutshell, the strategy focuses on four different areas of development (i.e., increasingly digital and instant payment solutions with pan-European reach; innovative and competitive retail payments markets; efficient and interoperable retail payment systems and other supporting infrastructure; and efficient international payments, including remittances).The adoption of increasingly instantaneous payment solutions, which disregard any legacy of materiality, fully describes the competitive and innovative vocation, as well as the promotion of new and different market dynamics. The PSD2 Directive, although very recent, is already beginning to show some symptomatic traits of anachronism compared to the quick developments in the macro-area of payment services, requiring revisionist adjustments with reference to the regulation of instant payments and crypto-activities.This is an unequivocal sign of

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F. ANNUNZIATA, *Verso una disciplina europea delle cripto-attività. Riflessioni a margine della recente proposta della Commissione UE.*, in *Diritto Bancario*, Approfondimenti, ottobre 2020.

[14] DORA aims to introduce uniform, cross-cutting ICT security standards for financial sector players, with the provision of a European regime of direct oversight of service providers.

the profound difference in speed, already pointed out in the introduction, between the times of standardization and those of innovation.

From the national perspective, the recent interventions aimed at introducing a regulatory sandbox and the simultaneous simplification of the onboarding processes for bank customers are certainly worth on mention. The reference is, in particular, to art. 36 of Law Decree no. 34/2019 (the so-called "Growth Decree"), as amended by conversion law no. 58/2019, which introduced the "sandbox", i.e. a space for the experimentation of innovative technological applications in the credit, financial and insurance sectors[15].

Lastly, as part of the so-called emergency legislation, Law Decree no. 76/2020 (the so-called "Simplification Decree") introduced specific simplification measures, mainly aimed at facilitating the widespread use of advanced electronic signatures and forms of digital identity (such as, for example, the SPID or the CIE) for access to banking services.

7. *Smart contractsfeatures*

Smart contracts[16], originally conceived as computer protocols aimed at implementing an automation of the executive phase of some standardized, univocal, measurable, contractual clauses[17], can be defined as self-enforceable software[18] implemented on a blockchain

[15] This is a favorable authorization regime, pursuant to the textual provisions of art. 36-bis, paragraph 2-bis, «*experimentation relating to techno-finance activities (FinTech) aimed at pursuing, by means of new technologies such as artificial intelligence and distributed registers, the innovation of services and products in the financial, credit, insurance and regulated markets sectors*». V. E. BATTELLI, *Le nuove frontiere dell'automatizzazione contrattuale tra codici algoritmici e* big data*: gli smart contracts in ambito assicurativo, bancario e assicurativo*, in *Giust. civ.*, 2020, fasc. 4, 681 ss.

[16] See, L. CASALINI, *Blockchain and smart contracts*, in *Rivista di Diritto del Risparmio*, 2019, n. 9.

[17] The original definition was the work of Nick Szabo, during the 1990s. According to the Author, «[...] the basic idea of smart contracts is that many types of contract clauses (such as liens, encumbrances, property rights delineation, etc.) can be built into the hardware and software we are dealing with, in such a way as to make breach of contract costly (if desired, sometimes prohibitively expensive) for the violator».

[18] In that sensesee, C. AMATO, *op. cit.*, 1259.

platform. In other words, they pair certain outcomes with certain conditions: they perform specific actions, pre-set by the parties, upon the verification of certain events, by means of an algorithmic code. The predetermination of conditions, in fact, leads to the realization of the contractual *synallagma*[19]; the formula is (almost) algebraic: if this, then that.

This method of contracting and/orexecuting the contract[20] eliminates any possibility of non-fulfillment[21], making it logically, even before being legally, impossible. In fact, the smart contract, once programmed and started, executes itself automatically, according to the commands indicated in its code (according to the principle elaborated by Lawrence Lessing "code is law"): once the agreement between the parties is reached, through a process of cryptographic identification[22], the contract is concluded and, moreover, unchangeable.For the sake of completeness, we cannot fail to mention how this last reading lends itself to being an alternative to another specular one, according to the basic choice of understanding (or not) smart contracts as alternatives to contract law[23]. In fact, to Lessing's approach, one could knowingly reply with the empirical consideration for which the correct execution of the "code" is not always superimposable on the correct execution of the contract, since there could well remain an area, however limited, of "non-fulfilment" (also in accordance with art. 1374 Italian Civil Code), the evaluation of which would be referred, however, to the enforcement of the judging authority (which, however contingent, however, would persist)[24].

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[19] They may, however, also concern only one or more phases of the contract.

[20] The issue is conceptually debated in doctrine and is exacerbated in the banking-financial sector. As will be discussed in more detail in the course of the discussion, the automatic transfer of funds, which is one of the main applications of smart contracts, represents, rather than a contract, a mere act of execution of a contract (the current account contract, in this case).

[21] In such respect, D. DI SABATO, *Gli smart contracts: robot che gestiscono il rischio contrattuale*, in *Contr. Impr.*, 2017, 2, 378; P. CUCCURU, *Blockchain ed automazione contrattuale. Riflessioni sugli smart contract*, in *Nuova giur. comm.*, 2017, 1, 107.

[22] See, G. FINOCCHIARO, *op. cit.*, 441.

[23] V. D. FAUCEGLIA, *Il problema dell'integrazione dello smart contract*, in *Contratti*, 2020, 5, 591.

[24] See, M. MAUGERI, *op. cit*.

The regime of absolute immodifiability (which, however, seems to become a less and less intangible canon)[25] and indissolubility implies the emergence of specific problems relating to the eventuality of contractual contingencies[26], which, in a certain sense, represent an source of risk of each economic operation, especially where there is a large time lapse between the conclusion of the contractual agreement and its execution. In this sense, it has been argued by a part of the doctrine that smart contracts could even allow a better management of contractual contingencies, being able to rely on the ability of the algorithmic program to consider an almost infinite series of variables; however, the mathematical rigidity of the code seems to make the forecasting of the potential risks of a duration contract more complex, because the contracting parties should, in any case, not only know and hypothesize them, but also translate them into binary code[27].

Referring to smart contracts, it is necessary to make a systematic distinction between software, which governs the negotiation circumstances, and the reality of things, which, complementarily, characterize (or can characterize) the economic environment that serves as a framework for the contractual transaction. Digitization can minimize the occurrence of unforeseen risks by managing them in a preventive way, with the choice of the contractual scheme to be used and, therefore, of an optimal risk allocation model; at the same time, it

[25] It is opportune to point out, at least incidentally, how the development of the blockchain is progressively orienting itself towards functional solutions to achieve a dissolution of the contract or, alternatively, its ineffectiveness ab origine. In this way, one can include the possibility of resorting to an instrument for the removal of the smart contract, which would satisfy any requirement linked to the invalidity of the contract, as well as the specific permissive functions of a modification of the computer codes, capable of resolving other flaws (such as the error of a contracting party) or allowing the reduction to equity, the termination for excessive onerousness and rescission. For an in-depth study of the institutions in question.F. CARNELUTTI, *Preclusione dell'offerta di riduzione ad equità*, in *Riv. dir. priv.*, 1953, II, 108; A. DALMARTELLO, *Lesione, riduzione del contratto all'equità e svalutazione monetaria*, in *Temi*, 1948, 37; E. REDENTI, *L'offerta di riduzione ad equità*, in *Riv. trim. dir. proc. civ.*, 1947, 576.

[26] See, F. CALISAI, *Rischio contrattuale e allocazione tra i contraenti*, Napoli, 2016, 21.

[27] See, M. GIACCAGLIA, *Gli Smart Contracts. Vecchi e nuovi(?) paradigmi contrattuali nella prospettiva della protezione dei consumator*, in *Diritto mercato e tecnologia*, 2020.

can define *ex ante* the conditions relating to the effectiveness of the contract (or, alternatively, of its individual parts) upon the occurrence of an event[28]. The recourse to the condition is a sort of *passepartout*, which, for the contracting parties, opens the way to: *iusvariandi* (with an indirect flexibility of the smart contract, before the occurrence of circumstances not foreseen and not determinable at the time of stipulation) and right of withdrawal (with the characterization as a merely potestative resolutive condition, admissible by art. 1355 Italian Civil Code)[29].

Ultimately, an algorithmic punctuation of preventive risk management can aspire to be an effective counterbalance to the immodifiability and irretractability inherent in the protocol[30]; everything that persists outside or beyond the algorithm can no longer have any autonomous relevance.

From a legislative point of view, in the Italian legal panorama, a definition is contained in art. 8ter D. L. Semplificazioni 14 December 2018, no. 135, converted with l. 11 February 2019, no. 12 (headed «Technologies based on distributed registers and smart contracts»); pursuant to the aforementioned provision, «technologies based on distributed registers» can be defined as «IT technologies and protocols that use a shared, distributed, replicable, simultaneously accessible, architecturally decentralized register on a cryptographic basis, such as to allow the recording, validation, updating and storage of both plaintext and further cryptographically protected data verifiable by each participant, not alterable and not modifiable. [...]». It is, moreover, provided that «the storage of a computer document through the use of technologies based on distributed registers produces the legal effects of

[28] V. G. CASTELLANI, *Smart contracts e profili di diritto civile*, in *Comparazione e diritto civile*, aprile 2019.

[29] Cfr. S. PAGLIANTINI, *voce Modificazione unilaterale del contratto (diritto civile)*, in *Enc. dir.*, Annali, VI, 2013, 527 s.; A. BARENGHI, *Determinabilità e determinazione unilaterale del contratto*, Napoli, 2006; G. IORIO, *Le clausole attributive dello ius variandi*, Milano, 2008; P. GAGGERO, *La modificazione unilaterale nei contratti bancari*, Padova, 1999; A. A. DOLMETTA, *Linee evolutive di un ius variandi*, Milano, 2012; A. SCARPELLO, *La modifica unilaterale del contratto*, Padova, 2010; D. BARBERO, *voce Condizione (diritto civile)*, in *Novissimo Dig.*, III, Torino, 1959, 1101; S. MAIORCA, *voce Condizione*, in *Digesto/civ.*, Torino, 1998, vol. III, 281.

[30] See, M. BESSONE, *Adempimento e rischio contrattuale*, Milano, 1969.

electronic time validation referred to in Article 41 of Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014. Within ninety days of the date on which the law converting this decree comes into force, the Digital Italy Agency shall identify the technical standards that technologies based on distributed registers must possess for the purposes of producing the effects referred to in paragraph 3.» This is a qualifying attempt that does not erase all definitional problems, since, as accurately observed by attentive doctrine, it can lend itself to contrasting interpretative readings: if from a more strictly literal point of view, the informative execution of the code would seem to bind the parties (without, as highlighted, the possibility of a subsequent modifying intervention), with a coincidence between the conclusion of the contract and the execution of the algorithm, quite antithetically, a different interpretation could lead to consider the algorithmic protocol side by side with the contractual regulation[31].

On a comparative basis, in Arizona, a different legislative definition was given, whereby «Blockchain technology means distributed ledger technology that uses a distributed, decentralized, shared and replicated ledger, which may be public or private, permissioned or permissionless, or driven by tokenized crypto economics or tokenless. The data on the ledger is protected with cryptography, is immutable and auditable and provides an uncensored truth». This last concept is interesting because it implies a distinction between: a) the so-called "permissionless blockchain", i.e. those in which anyone can participate in the process of validation of transactions and anyone can become a node of the network[32]; b) the so-called "permissioned blockchain", i.e. those in which anyone can become a node of the network. "blockchain permissioned", characterized, on the other hand, by an access to the network restricted to some authorized participants and by a validation process delegated to a restricted group of actors (with important inferences also on the identifiability of the parties)[33]; c) finally, some hybrid solutions (such as Ripple), in which anyone can participate in the network, but only some can deal with the validation of transactions.

[31] V. E. BATTELLI, *op. cit.*, 681 ss.

[32] Among the most popular permissionless blockchains are the cryptographic mounts Bitcoin and Ethereum.

[33] These include Rope and Hyperledger.

If we want to draw the lines of what has been described up to this point, the smart contract is a contract without human intermediation (confined to the initial phase of negotiations), endowed with a "life of its own", given that the contractual program is codified through computer algorithms in which the execution of the contractual conditions occurs automatically. The algorithm absorbs the risk of non-performance, governs the contract and takes care of its execution, without requiring any external intervention and/or any maintenance heterodirection.

In the case of the banking-financial sector, these same characteristics do not constitute limits but, on the contrary, make the management of exchanges more effective, giving the sector an almost precursor status. Smart contracts are particularly suitable for "executing" standardized and unambiguous contractual clauses, measurable and automatically executable by a program, i.e. they reflect all the typical characteristics of the financial sector, where they tend to refer to unambiguously defined mathematical parameters, without leaving significant room for discretion or uncertainty. Similarly, there is another condition of compatibility, namely the use of registers and complex accounting systems, easily implemented through blockchain.

By way of example, in a sense of the benefits of digitalization, reference can be made to the so-called "Nasdaq Linq", the platform that allows the exchange of shares of unlisted companies, in a closed market, at drastically reduced costs. The Australian stock exchange (ASX) has decided to focus on a post-trading system based on blockchain to replace the current clearing system; SWIFT, likewise, has invested in blockchain to improve the reconciliation of its overseas correspondent current accounts, in real time, with the ultimate aim of optimizing liquidity management. The reduction in the time required for each securities settlement transaction would be accompanied by the automation of back-office processes, resulting in a minimization of the risk of errors and litigation.

8. *The language of smart contracts: the codification of contract clauses*

It is evident that the drafting of the smart contract must imply a "compromising" choice in terms of the language of the contractual

conditions. The so-called coding of the lines of code containing the instructions for the functioning of the software requires particular attention, given that, once the execution has begun, there will be no possibility of modifying the contract, northe possibility of revocation by the parties. The lexical choice must certainly be oriented by the pursued automation of the contractual execution: the predetermined clauses must be computerized and, therefore, translated into a language immediately comprehensible to the protocol algorithms. It follows that all the stylistic and content formulas that may, due to their too broad or too ambiguous conformation, give rise to interpretative and operational misunderstandings, are excluded "upstream". The denial of non-fulfillment, therefore, suffers from a first structural limit: the related lack of flexibility of the contractual text[34], with a necessary opening towards a more marked negotiation approximation.

9. *The critical issues underlying the use of smart contracts*

The use of blockchain and smart contracts would imply an increase in the subjective requirements for access to negotiation and, consequently, a worsening (at least, in an abstract way) of the position of the consumer, who could see his information-knowledge gap widen, in the face of the need to learn and manage a specific technical-computational language. For structural and functional characteristics, smart contracts would seem, *prima facie*, to assume almost "anti-democratic" connotations, in order to be better suited to "b*usiness to business*" relationships (so-called "B2B"), i.e. between professional contracting parties, possessing the necessary technical and professional capacity to understand and, above all, govern the cryptographic format[35]. On the other hand, the automation of the executive phase requires the availability of a considerable quantity of data, to be managed in terms of its custody and archiving. In this respect, the use of blockchain and smart contracts does not neutralize the typical risks of financial markets, but could, paradoxically, be functional to their exacerbation.

[34] See, J.M. SKLAROFF, *Smart contract and the cost of inflexibility*, in *University of Pennsylvania Law Review*, vol. CLXVI.

[35] Cfr. M. DUROVIC E F. LECH, *The Enforceability of Smart Contracts*, in *Italian Law Journal*, 2019, 2, 509 ss.

The centrality (and accessibility) of personal data is undoubted, given the preordained need for prediction and personalization of the proposal, first, and of the contractual *synallagma*, later. Although, as pointed out, the blockchain can boast an extremely reliable architecture, from the point of view of computer security, it cannot be a priori excluded that an instrumental use of technological evolution can lead to a fraudulent forcing of the cryptographic algorithms, at the basis of the blockchain. Similarly, the programming, "upstream", of the smart contract, remaining a process substantially entrusted to human activity, remains fallible, with the possibility that one or more errors may occur, generating operational risks, with a domino effect. If the outcome of the adoption of a smart contract is the simplification of the procedureof formation of the contractual agreement and of its effective implementation, nevertheless, the principle is represented, by particularly sophisticated technologies, the management and monitoring of which require specialist skills (not yet fully diffused) and not negligible resources.

10. *Disintermediation, financial inclusion, robo-advice, stock options, and derivatives*

A mixture of the wait-and-see approach, with recourse to soft regulation and forward-looking supervision, based on technological neutrality and proportionality with respect to potential risks[36], can be found in automated advice (so-called "robo-advice"). "Robo-advice", which is often indicated as a phenomenon potentially able to fill the so-called "advice gap", or rather, to be able to reveal an effective instrument of financial inclusion, being able to reach an audience of recipients including those "excluded" from traditional intermediation. More specifically, this refers to the wide range of so-called "underserved" investors, who are unable to access the financial service in its standard version, since they do not have the necessary requisites: holding adequate assets; having sufficient funds compared to the price at which the product and/or service is offered. Robo-advice breaks down all preclusions, providing access to capital thresholds and costs

[36] V. AA.VV., *La digitalizzazione della consulenza in materia di investimenti finanziari*, in *Quaderno FinTech n. 3*, gennaio 2019.

that are lower than those of traditional advice and, as a result, are more attractive for investors, willing to (re)enter the market dynamics, through a digital platform. In the financial sector, digitization becomes almost a wild card, metaphorically inviting those who would otherwise have been excluded to participate.

The counterbalance to this wide-ranging, inclusive vocation can be intuitively found in the pricing of the value of financial consultancy, to be understood as the right compromise between the human component and automation, to be tested on three different levels (attitudinal, emotional, and rational)[37]:

- under the first profile, curiosity and openness towards innovation and its discoveries play a role of primary importance;

- from the emotional point of view, there is a tendency to weaken the digital service, which, due to its conformation, lends itself to the lack of a human reference point that is stable over time, which, in turn, implies having to take decisions in complete autonomy, without a fixed point of reference or support. This leads to the fear of losing control of one's own portfolio, as well as apprehension about computer security and the handling of personal and sensitive data.

- The rational aspect intervenes, instead, as a buttress, for its proven objectivity, as well as for the capacity, also in this case for conformation, of not being able to replicate eventual negative previous experiences. The merits of robo-advice are, therefore, to be found in the objectivity of the recommendations, in the continuity of the (automated) monitoring of the portfolio, in the accessibility to the market (in terms of minimum asset thresholds and related costs), and in the autonomous decision-making management.

Automated consultancy, in addition to being more "democratic", offers an "aseptic" service. The objectivity of the algorithm and the direct accessibility through the platform represent, from this point of view, qualities of primary level.

Now, the preference seems to be for a compromise solution, that is, the recourse to a "hybrid" model, which can combine aprevalent automated part with another residual part which is still human: the

[37] Sul punto, M. CARATELLI, C. GIANNOTTI, N. LINCIANO e P. SOCCORSO, *Valore della consulenza finanziaria e* roboadvice*nella percezione degli investitori. Evidenze da un'analisi qualitativa*, in *Quaderno FinTech n. 6*, dicembre 2019.

digital channel still coexists with physical supervision, which, in its assisting and guiding function, acts as a collector between innovation and tradition. This solution seems preferable, also in view of the central role of financial education, which is necessary for a better understanding of financial dynamics and their possible realization through new technologies. One cannot knowingly believe that one can effectively bridge the social, cognitive, informational, and economic gap only with free access to the new market, without adequate (and, above all, pre-arranged) theoretical and pragmatic preparation, which allows for a correct planning of one's financial plan. Still today, the silent presence of the consultant must be, therefore, understood also in an assistential key, just in favour of the subjects holding less informative and cognitive power, which are, as highlighted, the main referents and recipients of the automation processes. Ultimately, unlike electronic payments (see below), we are witnessing a "new" intermediation, rather than a true disintermediation, with cascading consequences also on the regulatory level (which, as seen previously, is, at times, still characterized by opacity).

As a manifestation of fintech in the strictly financial field, the robo-advice can be placed side by side with two typical dynamics, the stock options, and the derivatives, which have elements such as to adapt perfectly to the predetermination exasperated by the smart contracts. In fact, the former, as known, give the right to purchase shares (or, however, securities representing risk capital), in a given time frame, at a given price: three predefined and circumstantiated elements, from the initial phase of granting the right, to the final phase of its possible exercise, passing through the intermediate phase of the offer. In a not dissimilar way, derivative contracts lend themselves very well to automation, being privileged by the high documentary standardization and by the easy transposability in computer code[38]; more specifically, the value of the instruments *de quibus* depends on the variations of the so-called underlying; in the case of the so-called commodity futures, a party is committed to purchase certain goods, within a certain term, at a certain price: also in this case, three predefined and circumstantial elements.

[38] V. D. AQUARO, *Smart contract: cosa sono (e come funzionano) le clausole su blockchain*, in *IlSole24Ore*, 24 giugno 2019.

Lastly, the management of company dividends could be more immediately subsumed within the smart contract framework, with an automated crediting operation, subject to the realization of the conditions set in the algorithmic protocol.

11. *Smart contracts in banking services*

The advent of smart contracts in banking services has induced a process of "banking decentralization", which, in turn, develops on two fronts, interconnected between them: the one of the traceability of operations, in the first place; the one of transparency, in the second place. The fact that smart contracts are, by conformation, dependent on the simultaneous management of a considerable volume of data (personal and sensitive) is an aspect that has already been highlighted; the adoption of the digital tool contributes to facilitating the traceability of information relating to the various economic transactions and, consequently, the profiling of individual users.

The response of the banking sector has been the creation of what could be defined as "Open Banking", a definition that aims to summarize the innovations that have affected the system and that have, in fact, imposed a coexistence between old and new operators (among the latter, the so-called "*Third Party Providers*"[39]).

The so-called "*mobile payment*" represents the cornerstone of the application of smart contracts in banking services. The possibility, simplified and immediate, of being able to make agreements concerning money transfers between two subjects, is the best example of banking digitalization and which best responds to the new contractual executive mode: the amount is mathematically defined; inserted and processed in an algorithm code; blocked, until the realization of the suspensive condition defined by the contracting parties. The disintermediation (which represents, therefore, a sort of *fil rouge* of the discussion) of the so-called "*instant payment*" is flanked by bank guarantees and the deposit. With specific reference to the accessory guarantee contracts, the interested parties would insert all the conditions in the algorithm,

[39] Third Party Providers can be divided into two categories: a) the so-called "Payment Initiation Service Providers", which offer services for the provision of payment orders; b) the so-called "Account Information Service Providers", which, conversely, make available information services on current accounts.

on the occurrence of which the executive mechanism would be activated (and the guarantee enforced, linked to the current accounts of the parties involved). Likewise, in the deposit, the sum would be deposited virtually, with subsequent (re)transfer to the current account of the party identified by the IT protocol. The immediacy and simplification of the operations presuppose, however, a parallel reinforcement of the standards of protection (which should guarantee a level equivalent to that foreseen by the traditional contractual form, of the written form)[40] and an implementation of the controls (especially in consideration of the potential *vulnus* connected to the computer security).

Incidentally, it should be noted that creditworthiness (i.e., the assessment of creditworthiness) also represents a particularly profitable sector segment. The European Commission has taken steps to achieve the introduction of uniform rules on the introduction on the market and the subsequent use of artificial intelligence systems, imposing risk-based assessment procedures and forms of certification for artificial intelligence (AI) applications considered to be the most risky; among those with the highest risk, mechanisms for assessing the creditworthiness of individuals should be included. Algorithmic evaluation of creditworthiness is already widely adopted in lending marketplace activities, which take the form of a wide range of services, from direct management of cash flows, matching of applications, diversification of investments according to investment objectives, category and risk appetite, duration of the investment and sector of activity (which can be summarized in the definition of "account management financial services"), to co-lending and preparation of secondary markets[41].

[40] See S.L. FURNARI, *Validità e caratteristiche degli smart contracts e possibili usi nel settore bancario finanziario*, in E. CORAPI e R. LENER (a cura di), *I diversi settori del Fintech*, Padova, 2019, 106.

[41] See E. MACCHIAVELLO e A. SCIARRONE ALIBRANDI, *L'inquadramento giuridico delle attività svolte dai lending marketplace. Linee di fondo*, in *Quaderni FinTech n. 5*, Kuly 2019.

12. *Fintech in insurance: automated claims management*

At the end of the discussion, the insurance sector, which smart-contracts'cornerstone is in the equivalence between the profiling ofthe insurance customers and the flexibility of the offer. The opportunity to profile each individual user in detail, on the basis of the data collected, and to activate specific predictive algorithms, on the basis of the results obtained, allows a more precise definition, differentiation and stratification of the policy offer, with an optimization both of the quantification of insurance premiums (more customizable and modifiable over time), and of the management of risks. In other words, the insurance sector is the one (perhaps) most devoted to a "*client-centrism*", a user-friendly model, which is best suited to individual personal insurance needs.

However, the technological breakthrough demonstrates all its potential risks, which can be found, in particular: a) in the possible distorting dynamics of the offer; b) in the violation of the principle of mutuality; c) in the emergence of variously discriminatory profiles (through the packaging of algorithms); d) in the conflict with the principle of compulsoriness of some policies; e) in the erosion of the physiological insurance risk. The automatic activation of insurance cover against damage caused, for example, by a road accident or the automatic crediting of compensation in the event of flight cancellation[42] are prospects (in part already achieved) which must still be compared with inescapable problems of privacy protection, underlying every process of automation and simplification in the management, depersonalized, of policies.

13. *Concluding remarks*

The systemic framework is evidently inherent in a certain, complex, fragmentary nature, physiological in the context of a process (that of digitization) which is still in progress, and which creates conflicts with the traditional regulation and civil law architecture. As already

[42] In this case, the smart contract could query an "application programming interface" (API) to obtain information on departure times and, consequently, in the event of a flight delay guaranteed by the policy, execute the contract and indemnify individual insured.

mentioned in the first paragraphs, a fundamental choice must be made, consciously: adopt smart contracts or refuse to do so. Pretending to be able to discipline a new phenomenon with anachronistic interpretations seems to have all the characteristics of an operation which, in the long run, will be fruitless.

The smart contract is a contract of data, self-managed, with a mathematical outcome; it is not a contract of people, progressive and fluctuating, with an uncertain outcome[43]. Perhaps, even the same canonical definition of contract, of codicil matrix, turns out to be inadequate, where it generates contrasts on the identification of the parties (attributed to electronic certifications), on the object of the contract (preferably to be translated into data), on the finalization of the agreement (with a contraction of executive times), on the form (which loses its sacredness of *vestimentum*, sacrificed to immediacy). As already hypothesized by many, a more atomistic approach should be preferred, a sort of contract law. It would be a vain claim to lead technology and its findings back to something that is structurally and functionally incapable of recognizing and regulating it. What is needed, in essence, is a new idea of contract, just as, as we have seen, a new idea of intermediation was needed. Consequently, some related concepts should also be abandoned, for example that of "contingencies": Indeed, once the contractual terms and conditions have been predefined, there is no margin to make *ex post* modifications to the codified agreement, precisely because of its self-enforceable nature, and, therefore, for an effective management of the events that have occurred, which the algorithm does not know, does not detect and does not codify; but even in the event that the contingencies were foreseeable and foreseen, they would obviously no longer be such, in the codified sense, having to be classified as mere conditions.

In a composite systemic panorama, it is undeniable how the Supervisory Authorities must play a central role, legitimized also by their privileged perspective position. In fact, in consideration of their institutional role, they can fulfil a precursor function, of "lookout", having the possibility to intercept, with suitable advance, the innovative phenomena and, at the same time, for their task of mediators between

[43] See, F. DI CIOMMO, *Smart contract e (non-)diritto. Il caso dei mercati finanziari*, in *Nuovo diritto civile*, 2019, n. 1.

opposing instances, they have the possibility to search, in an open, dialogic and constructive way, the best compromise solutions, to support and/or tame the transformations of the market. In their being crossroads, the Authorities become (at least abstractly) the best candidates for the implementation of the so-called "*facilitators of innovation*"[44]. Similarly, Authorities are requested to play an active role in the transition process, to guarantee sustainable digital development, under the banner of democracy, which can even out disparities (aiming at the inclusion of the weaker and less intercepted by traditional mechanisms), instead of exacerbating the information, knowledge and, also, application gap between the different categories of market players (with a fundamental role, therefore, also in terms of financial literacy and potentially of sectoral knowledge and skills). They must, moreover, channel the use of new technological advances towards improving the financial world.

[44] A. PERRAZZELLI, *op. cit*.