

Smart Contracts in Insurance

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The interlinkage between technology and insurance, commonly referred to as “InsurTech”, has clearly gained momentum, on the wake of a trend that has spread, more generally, throughout the entire financial services sector. In 2015, investments into technology-enabled insurance solutions came to \$2.7 billion, registering significant year-over-year increases since 2011, and the amount invested is expected to increase ever more as technology has the potential to bring innovation benefits in insurance. Smart contracts are among the major innovations taking place in the insurance sector. From a legal perspective, smart contracts refer to the possibility of representing a legal contract in programming code that gets automatically executed on a blockchain or other distributed ledger technology. In principle, the contract becomes self-executing, since once a pre-programmed condition is met, the relevant action is performed. The connection between automation – the hallmark of smart contracts – and insurance is intriguing for its possible impact particularly in terms of operational efficiencies and certainty in the implementation of transactions, but also as regards the legal challenges that it poses as smart contracts have the potential to transform how transactions are carried out. This paper investigates the scope for the application of smart contracts in insurance, and examines the legal and regulatory issues that they entail. Considering the global nature of the phenomenon, the analysis adopts a broad perspective. The focus is primarily on the European Union and the United States, also in light of their significance with respect to the investments in InsurTech. Clearly, the relevant laws and regulations at the national level are also considered, and in this context particular attention is given to the laws of the U.K. and major continental European civil law countries, namely Germany, France and Italy.

The paper rests on both practical and theoretical grounds. From a practical point of view, to consider the innovation potential inherent in the use of smart contracts in insurance is undoubtedly relevant. Smart contracts along with the underlying blockchain technology are viewed, in fact, as among the most important innovations since the Internet and they may have a significant impact in insurance by automating several processes, such as the underwriting of policies, claims handling, or payouts. The paper, however, is also grounded on a theoretical and more systematic perspective. The very idea of smart contracts needs to be confronted with the theory on the intrinsic incompleteness of contracts and the consequent necessity of standards to take into account the specific circumstances of a case. Automation traditionally hinges on rules, especially rules that can be expressed in a conditional logic, but rules can prove to be either too broad or narrow in scope, unlike standards. When combined with possible, future developments especially in machine learning and artificial intelligence, smart contracts, however, may challenge traditional views and change contracting behavior, reducing to code the entire contractual relationship of the parties. Moreover, to suggest another theoretical and systematic implication, it is worth noting that smart contracts bear on the essence of the insurance contract – the insurer’s promise to pay. By automating processes and ensuring the payment of claims once the relevant conditions are triggered, smart contracts can reinforce the insuring agreement and transform the relationship between the insurer and the insured.

In this framework, the paper is divided into four main parts. Part I discusses the phenomenon of smart contracts by exploring what they are and how they work. After situating smart contracts in the wider context of InsurTech, their technical functioning is explained. Any study of the implications of smart contracts in insurance and of their legal and regulatory impact, in fact, needs to build on an understanding of their nature from a technical point of view. The notion of smart contract is considered, highlighting the lack of a settled definition and also distinguishing between smart contracts *stricto sensu*– in computer science, basically, codes to be executed on a blockchain – and smart contracts in law – contract clauses represented in code, capable of being self-executing. This distinction is relevant to point out translation issues from the natural and legal language into the code operational semantic, and the possible limits on representing the entire contract in programming code. To clarify how smart contracts are implemented and operate, the underlying blockchain technology is also explained, and protocols such as Ethereum or Hyperledger are discussed as well as the interaction with oracles that can provide smart contracts with extrinsic information to automatically execute the contract.

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Part II considers the possible use cases and impact of smart contracts in insurance. It identifies the areas where smart contracts can play a role in insurance, also by discussing the projects that are currently being implemented in the industry, such as that piloted by Allianz Risk Transfer and Nephila aimed at automating contract management processes for catastrophe swaps and bonds, or the one developed by the start-up InsurETH that permits to automate the payout of claims for flight insurance. In particular, attention is given to the potential of smart contracts to automate underwriting and claim processing and payouts based on external data that can be provided by Internet of Things devices or third-party oracles, and even social networks as in the case of Dynamis, a start-up that has implemented a smart contract for peer-to-peer insurance that provides supplementary unemployment insurance by using data from LinkedIn to automate underwriting and claims handling. In addition, the use of smart contracts to determine rates, by relying on big data analytics and access, for example, to usage and demographic data is discussed, as well as their potential to increase availability of micro-insurance. Although current pilot projects are mainly focused on property and casualty insurance, the prospect of smart contracts in life insurance is also relevant as the insured event is capable of being represented into a binary data form. The potentials in reinsurance transactions are also covered, in light of the recent advances made by the B3i consortium that brings together (re)insurers and brokers from all over the world to develop common operational standards for the application of blockchain and smart contracts to the (re)insurance industry. The analysis considers the possible benefits of smart contracts in terms, for example of higher efficiency, reduction in costs and possible human errors, fraud detection, as well as the potential for disintermediation, as the contract would be executed on a distributed ledger and this may lead to direct underwriting in some cases. The need for adequate operational standards and convergence in the industry, however, is emphasized, also to prevent incidents that may pose threats to the security and reliability of the smart contract innovation, as in the recent implosion of one of the earliest decentralized autonomous organizations, The DAO, due to a flaw in the code.

Part III examines the legal and regulatory issues relating to the use of smart contracts in insurance, also from a policy standpoint. Clearly, the implementation of smart contracts would not take place in a legal vacuum, and a fundamental point is to consider whether enabling laws are needed to set the conditions for their legal validity and enforcement. In the absence of specific laws on the matter, the limits on smart contracts have to be addressed. In particular, on the understanding that the code cannot serve as a regulatory instrument in itself, unless recognized as such by the law or, possibly, the parties to the contract, it seems that at least in the initial stage the code may not be a substitute for a traditional contract written in natural, human language, but may only provide a supplemental mechanism for the automatic execution of some aspects of a legal contract, that are capable of being represented in conditional logic, like payouts. The problems posed by the extension of the role of smart contracts to replace all or part of a legal contract are also considered, such as the legal validity of the smart contract and the capability of the parties to understand the code and assent to the contract, the challenges for supervisors, the inherent difficulty for a code to embed complex contract clauses and unpredictable scenarios, and to represent legal standards. Although automation strives for eliminating possible disputes between the parties, considering dispute resolution seems still relevant, at the very least for errors in the code or in its execution, and issues concerning the interpretation of smart contracts in court or arbitration proceedings and the allocation of the liability for code errors or data breaches have to be examined. The distribution model for smart contracts is also considered as well as the effects that smart contracts may have on pre-contractual information. The other issues covered include privacy and data protection and the determination of the governing law where the relevant conflict of laws rules refer to the law of a State with the closest connection to the contract, as this determination may turn out to be complex given the nature of the underlying distributed ledger technology. The importance of proactive interactions between regulators and the industry in order to develop appropriate regulations for smart contracts in insurance is highlighted, to remove legal uncertainties and address the potential risks of the new technology. From a policy perspective, the analysis seeks to explore how to pursue a balance between the opportunities that smart contracts present and the regulation of the phenomenon, taking into account also the effects on competition, to both achieve the ultimate objective of ensuring policyholder protection and foster innovation in insurance. To this end, particular attention is given to regulatory sandboxes.

Finally, Part IV concludes, arguing for an incremental application of smart contracts in insurance, and distinguishing between short-term, more feasible applications and longer-term applications that would imply further technical developments and more substantial adjustments from a legal and regulatory point of view.