

Blockchain and Insurance: Disproportionate Hope or New Era?

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Abstract In this article, we examine the importance of the blockchain on the insurance industry. Then, we show that there are strengths of the blockchain for the case of the insurance market that are, the security it brings, the speed of transaction it offers and the fact of being able to exist without intermediaries. Given these contributions, the blockchain presents economic and ecological difficulties, human difficulties and societal difficulties. In addition, the blockchain has cultural, technical and safety limits of the so-called blockchain technology.

Keywords: *blockchain, cryptocurrency, bitcoin, insurance*

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1. Introduction

The blockchain could profoundly change the insurance business. The role of trusted third party insurer is in the hot seat. And the losses could be settled without human intervention.

In 2008, the banking and financial crisis of large scale induces a crisis of confidence in "trusted third parties" which results in the first "bank runs" for centuries. At the same time, starting in 2009, so-called "blockchain" technology enables the creation of a cryptocurrency, the bitcoin, an experimental system for transferring and verifying property based on a peer-to-peer network with no central authority. It is therefore a virtual value, without borders, which does not belong to any government or enterprise, and whose operation is totally freed from any third party of confidence. At the end of 2015, the media is interested in bitcoin and blockchain: in six months, more than 5000 articles have been published in several newspapers.

The purpose of the "blockchain" is to register and validate transactions or transactions (possibly expressed in bitcoin) with greater reliability than those given by traditional players, bypassing trusted third parties, ie banks or insurers. The insurer could therefore be stripped of its role as a fundraiser, while the development of smart contracts (indexers) deprives it of its status as trusted third party. This plan to automate the terms and conditions of the contract so that the settlement of the incident occurs without human intervention [1,2,3].

Starting in 2016, insurers are organizing to understand blockchain technology. New forms of blockchain are created under the impulse of all the actors of insurance, traditional companies or start-ups of Assur Tech. They create "private blockchains" or "consortiums" that are different from the original blockchain that wants to be open and therefore public. This technology is "under control" and is no longer a libertarian bypass threat, but presents many opportunities for insurance [4].

The question is no longer whether the blockchain will be part of our economy, but what application the profession of insurer can make. It may be that we move from a trust-based world to an evidence-based world, where risks are better controlled, and where the insurer becomes an oracle (in the language of smart contracts) that put an end to the compensation avoidance strategy which remains central to his behavior.

The rest of this paper is structured as follow. Section 2 shows the chain of blocks of a changing world. In section 3, we present the application of blockchain technology to the world of insurance. Finally, section 4 concludes and remarks.

2. The Chain of Blocks of a Changing World

2.1. Blockchain Technology

The technology aims to transfer a multitude of values between two actors A and B, in complete safety, without the intervention of a third party. It is similar to the Internet

network technology, which borrows its characteristic of "open" architecture. It is based on several techniques [5,6]:

- The "mining": it is a question of validating the blocks of transactions one after another so as to make them unfalsifiable, intangible and connected to each other. The "mining" can be artisanal (one or two machines) which, important in the initial phase of the creation of blockchain / bitcoin, is more rare because little profitable for "minors" who "rent" their machine. It becomes the fact of "pools of mining" (pooling of machines and higher production) and especially of industrials with very powerful computers (China-Silicon Valley);
- Encryption (or "hashing"), which creates an electronic signature. There is a single "hash" for each transaction, a series of numbers and letters that represent an algorithm. The electronic signature makes it possible to generate a system of double key: the public key which makes it possible to prove the transaction to the whole network, and the private key which makes it possible to possess the value and to prove that it belongs to the holder of the key.

2.2. Complex Data Structures

The chain of blocks is a multitude of strings of data blocks linked together, incorporating the "hash" of the previous block. Each modification of a block causes a modification on all the blocks of the chain. This makes the technology almost inviolable because, to alter a block, it is necessary to modify each block, thus having access to each private key of the chain. This assembly of cryptographic techniques makes it possible to securely transfer the value, without a central entity.

The challenges to be met are still numerous and important:

- "Scalability": it is a matter of moving quickly from a "craft project" to industrial processes to produce economies of scale. Blockchain technology is potentially scalable, but the reality is that bitcoin remains too volatile for scalability to be asserted;
- The user experience is still weak. The purchase of bitcoins is difficult. In 2015-2016, we had to go through the Darknet's "gray market". In 2017, legal platforms for exchanges have developed, but registration is laborious, security takes over anonymity, and the levy of a commission in fact removes disintermediation. There are also physical places (the house of bitcoin in Paris) which are counters for the purchase and sale of bitcoins and Ethereum. And more and more merchants accept the payment in bitcoins (smartphone application).

2.3. The Basics of Technology

Bitcoin is a new currency created in virtual form by a process that removes the trusted third party needed for the exchange of fiduciary money. Bitcoin is a non-perishable and divisible currency; it is a means of exchange since it is recognized as a method of payment by economic actors; it is a unit of account which makes it possible to express the price of goods; it may be a store of value, even if its

current volatility compromises the proper performance of this function.

The first uses of bitcoin were of a criminal nature, especially money laundering. A scam took place in 2014 (use of bitcoin in a "Ponzi Pyramid" type operation), and in August 2016, a first piracy ended the theory of the inviolability of bitcoin. Despite this, the value of bitcoin exceeds that of gold in March 2017 and the total value of the outstanding amount reaches 20 billion dollars. For some experts, bitcoin could become a safe haven and is far from reaching its peak.

The value of bitcoin is driven by its programmed scarcity: by 2140, the number of bitcoins is expected to be 21 million, at the rate of the increase in computer speed and the number of "minors". It also results from the confidence of investors who are interested in its incorruptible character, but also to the anonymity of transactions.

Other currencies have developed since the beginning of the decade. "Ether", the currency used by the Ethereum blockchain, an internal exchange for a developer community for creating applications, is still in the process of being implemented. NXT, created in 2013, seeks to solve the problems of "mining" bitcoin and the risk of loss or theft of personal keys.

In 1996 appears the smart contract, which automates the triggering of the effects of a contract, whatever it is, if all the conditions of its application are met. Insurers are naturally interested in this decentralization of the trusted third party which could be exercised to their detriment.

The fact remains that the given order of the signature of the "delivery note" of the contract (compensation / payment in the case of the insurance contract) must be entered in the blockchain. This is where the Oracle comes in, who is responsible for entering the data essential to the execution of the contract. This function queries the creators of the blockchain: is it not the reconstitution of a trusted third party? Who can be entrusted with the role of "oracle"? What responsibility for error should be sought? Various solutions are being studied: notion of "proof of honesty" of the oracle using cryptographic methods, multiplication of "oracles" responsible for validating the same information, use of artificial intelligence to create an "oracle automated", Use connected objects to determine if the trigger conditions of the smart contract are met.

Blockchain technology can therefore create an insurance system without trusted third parties that could revolutionize the distribution and management of contracts, provided that trust is built around the technology itself.

2.4. Trust Requires Proof

Insurance allows the company to progress by putting the risks of progress to the trusted third party that is the insurer. But this confidence has been eroded, because of the ignorance by the insured of the contents of the contracts and the principles of mutualisation. Algorithms could restore this confidence. Blockchain technology should help:

- It is transparent and allows the insured to check all actions performed by the entire network. It gives the insured proof of the action, which replaces the trust in the action of third parties (banks, insurers, intermediaries);

- It is secure;
- It is distributed and relies on communities, where each user of the blockchain is a possible vector of information equally to each of the other users, each representing a node of the network;
- It is disintermediated, which is major with regard to the financial activity of the insurer, and no doubt, thanks to the artificial intelligence, it will protect it by personalized contracts and adapted to its needs.

2.5. The Blockchain Evolves

The blockchain "public" is open and autonomous: it is underlying the development of cryptocurrencies, including bitcoin. The blockchain hybrid or consortium is developed, since 2016 by insurers, to pool and streamline information. By reintroducing "trusted third parties", to the detriment of "minors", we can pool the entire claims history, for example, to prevent the risk of fraud. The "private" blockchain puts the "trusted third party" at the center of the system, which is similar to a database management mode that uses the algorithmic power of technology to streamline exchanges. These technologies are obviously called upon to coexist.

2.6. The Difficulties of the Blockchain

The first difficulty related to the blockchain is economic and ecological. The blockchain induces considerable IT costs and energy costs. From some works, we show that bitcoin's electricity consumption was equal to that of Ireland. The demand for bitcoin electricity could reach thousands of gigawatts [7].

The second is of a human nature, with the replacement of men by machines. But also, the technology requires the deployment of considerable training and recruitment of specialists: the "mining" almost artisanal, linked to the provision of machines running 24 hours a day, with reduced maintenance, leaves room for real business in the management of companies.

The third is societal. Technology can be used for community initiatives. The "Deep Web" is the hidden face of a totally out-of-control network dealing with trade with untraceable and anonymous currencies. We see the risks of drifting from these practices. It also excludes any dispute resolution in the event of a dispute, because it ignores the "right to be forgotten" and the confidentiality of the information given. This is why hybrid systems (IBM-blockchain as a Service, Microsoft-BaaS) are developing to "safeguard the confidentiality of certain information and allow the trusted third party to fully play its role in conflict management".

3. The Application of Blockchain Technology to the World of Insurance

3.1. The Threats of Disruption of the Profession

Blockchain technology has enabled the emergence of smart contracts. These "threaten" the insurance index or

parametric used in all activities "sensitive weather", "insurance on demand", reinsurance or even asset management life insurance.

Index insurance essentially covers the loss of income of farmers (drought "thresholds" whose operation causes a flat-rate compensation, for example), or the operating losses of gas producers (low temperatures compromising extraction), or transportation and tour operators. The blockchain can allow the creation of index insurance without trusted third party: an "oracle" can calculate the risk and define the contribution of a community of insured. The insured members adhere to a smart contract, the blockchain manages the contract, and the "oracle" triggers compensation when the thresholds are reached. The obstacles obviously stem from the investment of funds and the solvency rules of the "insurer" (non-existent, since there is no trusted third party).

Peer to Peer (P2P) insurance connects members of a community sharing the same risk. The system is based on the idea that policyholders are supportive and therefore accountable, and that benefits, if any, are redistributed to community members. An insurer intervenes to "reinsure" part of the risk and to face the catastrophic risk. The blockchain can replace the insurer to achieve by consensus a calculation of the price of risk. She can manage the underwriting, manage the contract and manage the disaster, under the control of the community. The system, however, has technical limitations, but insurers could develop "private blockchains" to improve fluidity of product management and meet demand for P2P products.

The insurance "on demand" covers the products according to their use (automobile: Pay how you drive) or products used intermittently (smartphone, bicycles, etc.). The model can be used for health insurance, which rewards the health of life measured by connected objects. These insurances raise various questions related to the confidentiality of personal data, the lack of advice from the insurance salesman, and even possible fraud.

The blockchain calculates the exact risk, certifies the information given indelibly, and detects the fraud in the declaration of the incident (the connected objects acting as "oracles"). While blockchain technology does not bring a real break, and raises questions of compliance, but it may interest distributors such as Amazon or Apple to better control the operational risk.

For asset management in life insurance, the falsifiable, decentralized and autonomous register is totally adapted. The "fundchain" blockchain consortium in Luxembourg, ensures the authenticity of transactions and nullify the margin of error, economies of scale on the "back offices", simplify compliance, and to obtain safer yield calculations. The blockchain also allows the acquisition of cryptocurrency assets mainly in presence of the subjects of regulation, taxation and the volatility of cryptocurrencies.

In the reinsurance sector, the blockchain makes it possible to develop new modes of intervention. Insurers tend to develop captive reinsurance entities, in particular to manage their subsidiaries around the world, optimize the use of equity and benefit from favorable tax locations. A registry based on a private blockchain technology would have multiple benefits of simplification, reduced costs, auditability, speed and confidentiality. Smart contracts could allow, through internal experts designated

as oracles, to validate transactions in a smooth and fast manner. This approach has been tested by SCOR.

The creation of a public blockchain is possible. As of May 5, 2017, there are 16.3 million bitcoins in circulation, which means a financial capacity of 25.4 billion euros during the course of the day (163 billion dollars at the end of 2017). It is therefore conceivable to create a consortium of public blockchains to replace all or part of the reinsurance. Obviously, this type of approach would come up against regulatory obstacles and confidence in the solvency of the system.

A. The lowering of the risk of fraud

The trend of insurance fraud is growing, 25 billion in 2014 and three times more fraud cases in ten years. Or the detection of fraud is still subject to manual processing: the subscription (with the sanction of proportional reduction in case of disaster), when changing the contract, or in the management of the disaster. The blockchain could protect the insurer against misrepresentation (connected objects), fraud against stolen precious objects and against fraud during a disaster by automating the payment of the claim. It is likely, however, that it will impose the use of human "oracles" to assess damage beyond certain gravity.

B. Automation of the administrative management of contracts

Despite the efforts of the market (conventions) and companies (electronic document management), administrative management remains expensive in terms of personnel and management of paper documents, while the regulation of the right of insured persons increases the management of contracts and claims. Litigation is also expensive and more frequent. Current solutions are still performing poorly in terms of their cost: dematerialization of archives through electronic document management, data exchange platforms between insurers and damage repairers. The use of "Big Data" solutions involves spending considerable amounts of money on IT investments. The blockchain could provide solutions in three areas:

- Smart contracts used to guarantee and manage frequent and low-intensity claims (breakage of ice, water damage), which would be subcontracted to an "oracle" - authorized repairer.
- Other smart contracts for natural disasters, which automate the validation process by noting the perimeter of the natural disaster, listing information on claims in the area and defining compensation.
- For serial disasters, the blockchain would provide through the existence of secure registry traceability in the management of the globalization clause which sets the ceiling for compensation for all victims.

C. The revolution of customer knowledge

The regulation imposes client advisory standards and transaction monitoring requirements, which translate into Know Your Customer approaches. Tracfin's money laundering / financing of terrorism control requirements force bank and insurance employees to undergo complex controls. Customer Relationship Management (CRM) and the presence on social networks of the insurer, allow fine analysis of data to more effectively meet the needs of customers.

The blockchain consortium could tomorrow simplify the maintenance of information on the client registered in the central and autonomous registry open to players in

insurance consulting of the same company (multichannel distribution). It will also facilitate the "traceability" of information and the conduct of internal control, compliance audit and internal audit. It will finally provide the customer with a digital identity (sort of single passport) to secure the theft of data, to change intermediary or insurer, and to know (for the insurer) the loss experience of the customer or prospect. It remains obviously to allow feasibility by installing a favorable regulatory environment.

D. Insurance of an adapted contract

The customization of insurance products has become the answer to the risks of commoditization of products and the reduction of competition in the debate over the price of substitutable products. Insurers are developing new product concepts tailored to the needs of individuals, and new modes of consumption: P2P insurance, "on demand" insurance. Assistance and compensation for damages replace the compensation.

The blockchain has all the qualities to develop the customization of products and manage the intervention of a provider. It makes it possible to develop a "niche" product to test it in a small market, without spending excessive costs on experimentation. It should facilitate price customization through connected objects and smart contracts. Finally, its use by the assistants / convenience stores would ensure the automation of the intervention, and provide useful information to design prevention solutions based on fault analysis.

E. Blockchain and international activity

The development of insurance in emerging markets in Africa and Asia provides a growth driver for French insurers. However, they encounter real implementation difficulties, investment costs. Blockchain technology (experienced in Ghana) would allow to subscribe smart contracts, of an index nature, thanks to the use of a smartphone, which avoids any random manipulation of paper contracts.

3.2. The Current Limits of Blockchain Deployment

A. The cultural limits

The blockchain works only on the proof, and not on the trust, at least for the public blockchain, which breaks with our societal practices. It postpones the question of trust on a technology "dehumanized" in the operation of which the user shows his confidence. The rules are set by a majority of users in case of conflict, with the risk of the default decision. It will therefore probably be necessary to add decentralized governance to each blockchain system.

The poor understanding of blockchain mechanisms limits its development today. Contrary to the media notoriety of the volatility of bitcoin, which is not favorable for the rest, the blockchain remains little known: the public and political sphere speaks little.

B. The technical limits

The number of transactions per second (limited to 7 at the origin of bitcoin) is much lower than that of bank card transactions (2,000 transactions per second for Visa net).

The costs of integrating blockchain technology into information systems are considerable, and operating costs (energy consumption) may be prohibitive.

Technological relevance is discussed: the directors of the information services of insurance companies feel that they do not need this very expensive technology, except in the intra-company field. The autonomous and reliable calculation of the cost of risks without a trusted third party is still distant.

C. The safety limits of blockchain technology

The flaws of the trading platforms exist - they do not concern the information entered in the register, but the exchange of currencies (dollar or euro) against bitcoin. Bitcoin flights on MtGox and Ether on the DAO project show that platform security is not immune to hackers. The storage of "private keys" also raises questions: their piracy is still possible. The idea is to develop their physical storage, a secure key that works offline; but one remains exposed to a risk of loss or destruction of the physical key.

The regulatory limits are obviously important. The blockchain is not in a legal vacuum, it is subject to common law until the creation of a special "special" right. The regulation could, however, make it possible to develop the use of the blockchain. Thus, the state could formalize the use of bitcoin in the payments of individuals. Conversely, the general opening of the register, without borders, contravenes the French data protection rules: the blockchain must therefore "take care" to avoid the illegal exploitation of this data (but is it possible?). The responsibility in case of litigation due to the blockchain today has no clear solution: the Man is responsible according to the Civil Code, but not the algorithm.

Regulation is therefore ultimately necessary for the "libertarian dream" of the blockchain for its development. Attempts are multiple. The "sandbox" of the United States, Switzerland, the United Kingdom and France consists of defining a framework and then observing the results on a small scale. China includes the development of blockchain in a perspective of deregulation and investment in ethically questionable areas (Quantum Genomics). The United States is encouraging companies to take hold of the subject without imposing any restraint on them. France is experimenting with this technology. The United Kingdom seems to be moving forward on the subject of governance, while emphasizing (Government office for science) that technology can improve the overall functioning of public services.

3.3. Insurance in a Controlled World of Algorithms

The blockchain could encourage the concentration of the market, already largely achieved, since the 1990s. But it also promotes the development of new entrants (start-ups named AssurTechs).

Today, it justifies massive investments in start-ups; nearly 700 million in 2016 worldwide. It is possible that this race for innovation goes beyond the reality of needs on the one hand and the limits on its application on the other. The blockchain remains unknown to the majority of the insured, poorly understood, and therefore cannot attract their trust.

The blockchain brings about a major break in the insurance business model. It supposes indeed the programmed destruction of the mutualization, thanks to the information sharing collected by the connected objects. This makes it possible both to improve prevention (to

make the risk insurable at a reasonable price), and to accurately price the individual risk, which ensures the "killing" of the pooling of risks. It is true that the insured, faced with rising insurance prices (especially after natural disasters), does not understand why he must "pay for others". We would then enter the era of personalization of premiums, with a prevention of negligence by the premium increase that forces the insured to the responsibility, and the risk of seeing weak insured left behind.

Will the insurer be "oracle" or "Big Brother"? In the first case, the insurer is a real expert who adds the confidence that the insured expects in the automatic system. He is a paid counselor for his wisdom (conflict management) and his knowledge (definition of the value of risk). The role is not satisfactory, however. Receiving premiums, investing them, managing assets is a major factor in the solvency / liquidity of the system. The distribution supposes the advice to the customer: the robotics is still far from satisfying it.

The insurer could be a benevolent big brother. Admittedly, he uses our personal data to the best of our safety on the road, our health, our survival, our heritage. It acts at best of prevention.

4. Conclusion

This article has been devoted to the study of knowing what the blockchain is an opportunity or threat to the insurance industry. Then, we find that there are strengths of the blockchain for the case of the insurance market that are, the security it brings, the speed of transaction it offers and the fact of being able to exist without intermediaries. Given these contributions, the blockchain presents economic and ecological difficulties, human difficulties and societal difficulties. Additionally, the blockchain has cultural, technical and safety limits of the so-called blockchain technology.

Thus, blockchain could threaten overall employment, but especially certain types of jobs in insurance. The blockchain could thus replace actuaries' pricing activity, distribution and, above all, sales advice for many products, claims management, accounting management, etc. On the other hand, it could develop new businesses, including within the traditional trades: the marketing of smart contracts, the prevention and internal control of the insurance company. It promises of course new jobs for Data Scientist and the in-depth reform of information systems and their management.

The blockchain will transform the world's insurance, if only because it creates a business world without trusted third parties, replaced by the notion of proof. But at the same time, it creates a more equitable collaborative society with the insurer as the expert or "oracle".

In the so-called "Hype" cycle of Gartner, the blockchain is at peak of inflated expectations, an excessive enthusiasm for innovation, followed by the "fall of disillusion" in the model. It could therefore be that the blockchain is rejected, even before having found its concrete application in insurance.

Insurance could suffer both the annihilation, the disappearance or buy-back of laggards, the capture of

market shares by new entrants, and the apprehension of opportunities by those who will be proactive and cautious in their investments. Nevertheless, the blockchain will upset the business models of insurers, change the principles of pooling and change the functions and skills of thousands of employees. Also, we provide that the regulation allows it (or even facilitates) and that the governance of the system allows protecting the interests of customers without hindering its development.

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