



Comitato Digital Finance Assogestioni



ASSOGESTIONI

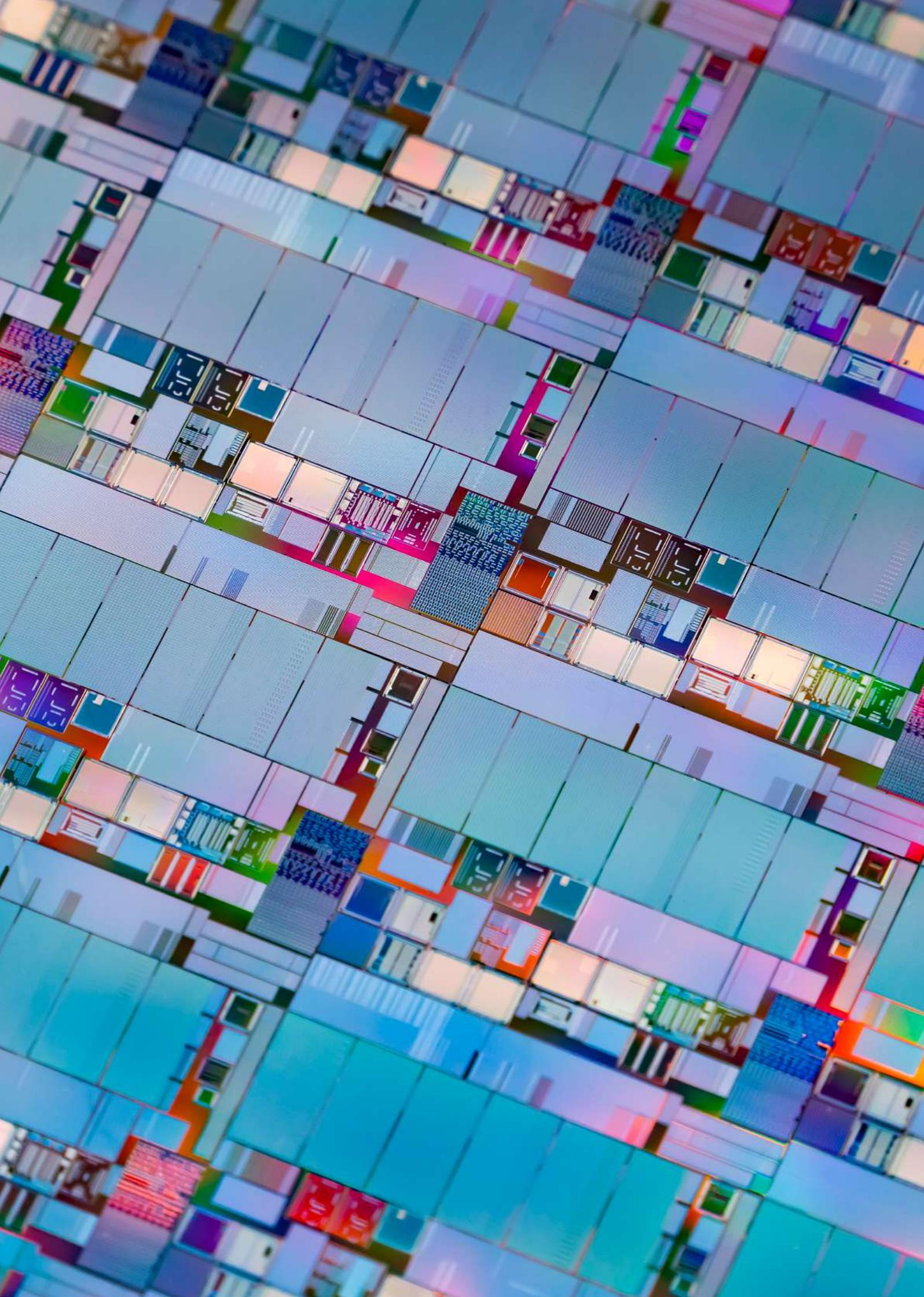
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BEYOND CRYPTOCURRENCIES

Distributed Ledger Technologies
for Asset Management

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Business Services Srl and Politecnico di Milano

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Introduction

Defining the scope of use of distributed ledger technologies (DLT) in the investment field is one of the main challenges for Asset Management and Assogestioni. Last March 2022, the Association's Digital Finance Committee set up two working groups with the aim of analyzing the potential impacts of the introduction of distributed ledger technology, on the one hand on the issuance, registration and circulation in digital form of fund units or shares and, on the other hand, on funds' investments in financial instruments or Digital Assets.

The two working groups involved key players in the value chain of the asset management industry (asset managers, custodian banks and distributor intermediaries) and players of the world of decentralized technologies (technology providers, platform managers), and aimed to identify possible evolutions of the role of traditional intermediaries through the use of 'decentralized' applications. The outcome of the groups highlighted the presence of obstacles, risks, but also opportunities and benefits for the industry as a whole and for savers.

The White Paper resulting from the analysis conducted as part of the Digital Finance Committee thus represents the first of a potential series of publications.

The realization of this White Paper was possible thanks, first and foremost, to the members of Assogestioni's Digital Finance Committee (ComDigit) and, in particular, to Giovanni Sandri (BlackRock), Chairman of ComDigit and Edoardo Maestri (Generali), Vice Chairman of ComDigit, who strongly desired and supported this initiative as well as to Roberta D'Apice (Assogestioni), Secretary of ComDigit, who coordinated the various contributions to the White Paper.

Special thanks are then due to those who made technical and scientific contributions to the drafting of the White Paper and, in particular, to Mauro Panebianco, Andrea Laurenti, Stefano Rossi, Alessia Maria Selenia Moia, Francesco Losso, Andrea Castellaneta and Giovanna Gialloredo (PwC Business Services) and, for the Politecnico di Milano, to Marco Giorgino, Laura Grassi, and Valeria Portale. Finally, many thanks are due to Marco Monaco (Consensusys) and Claudio Ritrovato (Allfunds Blockchain) for bringing innovative expertise to the ComDigit activity.

Crucial to the success of these initiatives was the participation in the ComDigit activity of ABI, ABI Lab, Amundi Sgr, Anima Sgr, Banca Generali, Banca Mediolanum, Banca Sella, BFF Bank, Metier Securities Services BNP Paribas SA – Succursale Italia, Caceis Investor Services, Credem Euromobiliare Private Banking, Credit Agricole Italia, Eurizon Capital Sgr, Euromobiliare Asset Management Sgr, Fideuram Intesa Sanpaolo Private Banking Asset Management Sgr, Generali Investments, Intesa Sanpaolo, Mediolanum Sgr, Sella Sgr, State Street Bank International, Societe Generale Securities Services.

Finally, I would like to thank the Offices of the Bank of Italy and Consob for their willingness to engage in discussion and, in particular, for the Bank of Italy, Carlo Gola, Elisabetta Leboroni Pierozzi and Luca Zucchelli, for Consob, Lorenza Pagnotto and Andrea Turi.

Fabio Galli, General Director, Assogestioni

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1. Executive Summary

The combination between digital technology and Asset Management has enormous potential. We did not make this discovery today. However, it is nowadays experiencing a phase of profound acceleration. Therefore, it is important to propose a series of analyses and identify areas for intervention so that the Italian asset management industry, central to the financial system and for the country as a whole, can pursue innovation paths which allow it to seize the full potential of this combination, while at the same time mitigating the risks.

This white paper has the primary objective of creating awareness of the importance of the topic, providing some preliminary knowledge bases and, in a concrete way, outlining some possible areas of improvement, on the basis of certain experiments that have been carried out.

The field of digital in Asset Management is extremely broad. This white paper focuses attention on the growing adoption of digital assets and examines two areas in particular: the issue, holding and circulation in digital form of units or shares of Undertakings for Collective Investment in Transferable Securities; (UCITS) investment in digital assets.

In particular, it is structured in a more definitional first part and in a more practical second part, focused on applications.

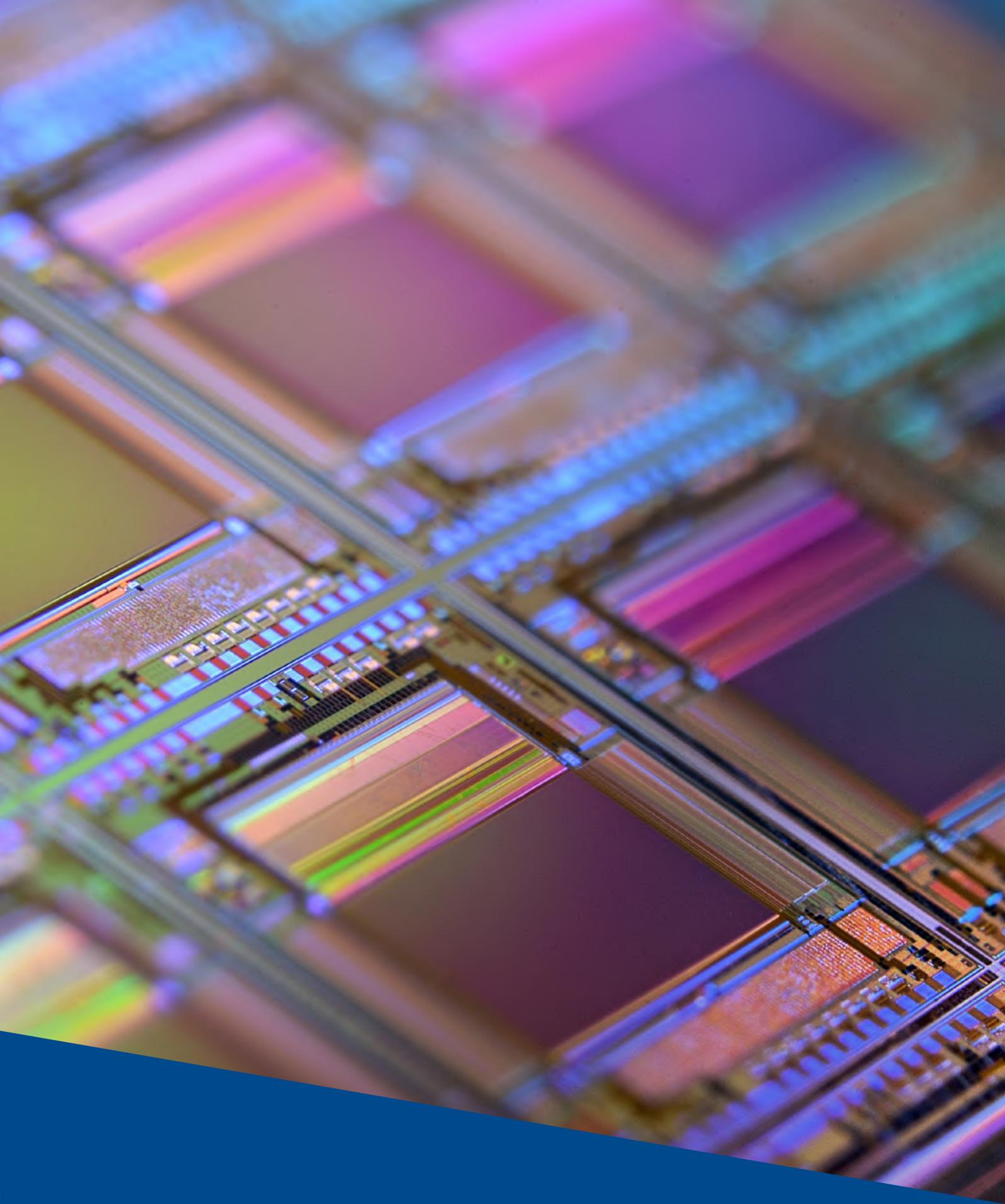
It is important, first of all, to share some basic notions, with particular reference to the meaning and functioning methods of the blockchain and its consensus algorithms, to the different types of Distributed Ledger Technologies (DLT) and to the different types of Tokens, highlighting their advantages and disadvantages, benefits and risks.

In such an evolving discipline, an initial orientation or primer is necessary in order to have a shared knowledge base on which to invest later and an international comparison is necessary to grasp some experiences that could be an inspiration for the needs of the Italian market. Furthermore, according to data from the Digital Innovation Observatories of the Politecnico di Milano, the phenomenon of using blockchain-based Tokens is growing steadily. From 2016 to 2021, 190 projects (25% of the total blockchain projects) that used fungible or non-fungible tokens were detected internationally, with 140% growth last year. 41% of the projects identified are located in the financial sector which has been experimenting with and using these tools for some time to represent securities and implement new management models. Particular attention in this area is dedicated to the world of security tokens.

In the practical part of this paper, focused on the issues of asset tokenization and investment in digital assets, an attempt was made to identify the various possible solutions where the potential benefits and specific critical issues were highlighted for each one. With regard to the former, the potential is evidently very significant in terms of simplification, security, interoperability, transparency and operational efficiency.

However, it is important to become aware as soon as possible that the speed of innovation is not always in line - and is often greater - than the speed of the decisions to be taken.

This white paper aims to help accelerate reflections on the trajectories to follow by speeding up the decision-making processes on the alternatives to be undertaken so that the competitiveness of the asset management industry always remains very high.



2. INITIATIVE DESCRIPTION

2. Initiative Description

In an increasingly interconnected and digitized world, blockchain technology and digital assets have become a subject of attention by many financial institutions.

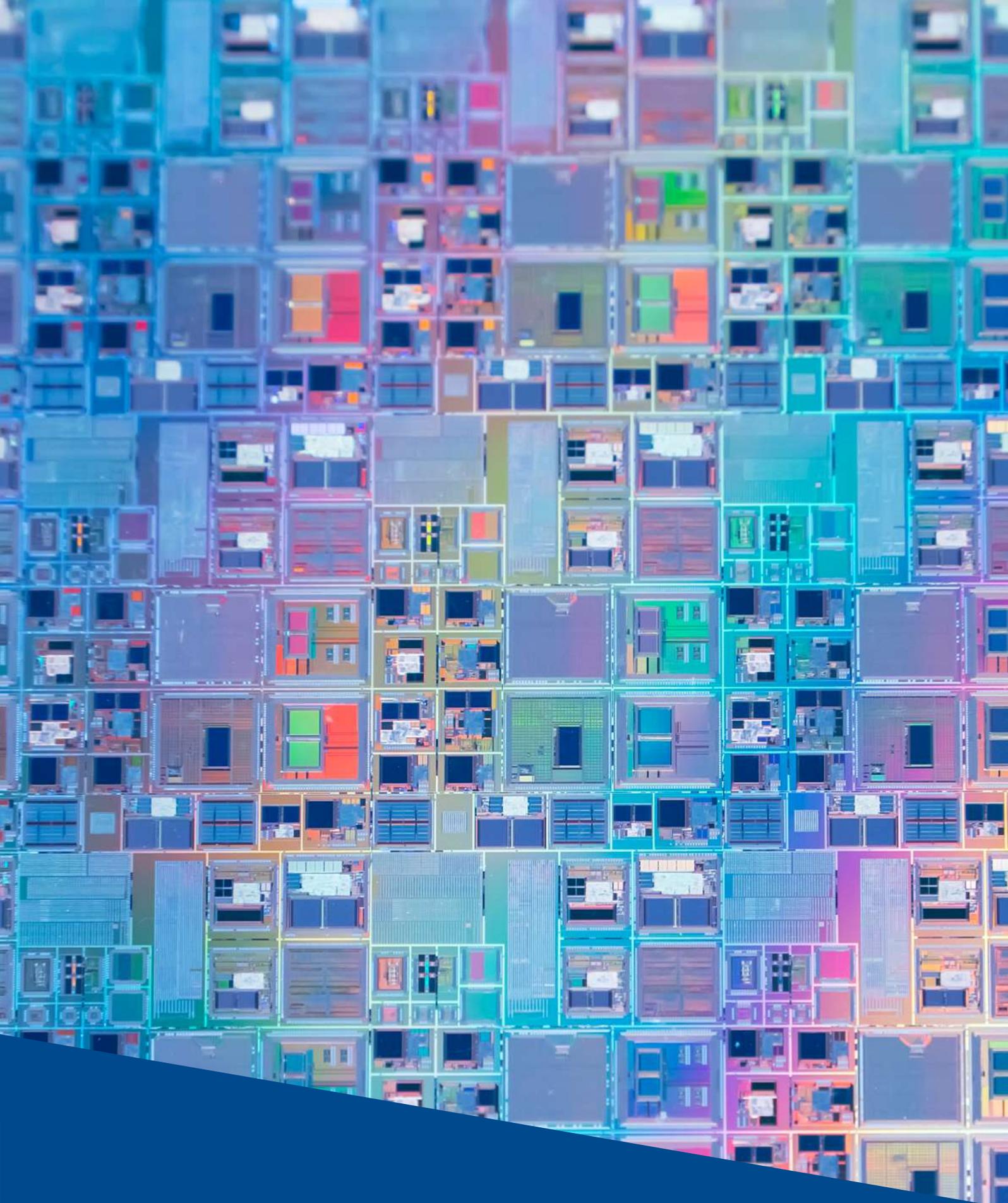
Distributed Ledger Technology (DLT) can bring numerous benefits to the Asset Management sector, in particular in two specific areas¹:

- **Technological evolution:** adoption of DLTs to improve current processes and information exchanges between the various stakeholders;
- **Asset tokenization:** conversion of financial instruments into digital assets natively transferable through DLT.

This paper was created with the aim of analyzing how the progressive adoption of digital assets can influence the Asset Management sector, define what are the opportunities for efficiency and development and how the use of instruments on DLT could support the evolution of the industry.

The Digital Finance Committee of Assogestioni has set up two working groups, made up of players from the blockchain world and the Asset & Wealth Management industry, which have set themselves the goal of analyzing the potential impacts, in terms of benefits and barriers, which could derive from the introduction of distributed ledger technology (DLT) with reference to two specific areas: the issue, holding and circulation in digital form of units or shares of UCITS; the investment of UCITS in digital assets.

1. http://www3.weforum.org/docs/WEF_Digital_Assets_Distributed_Ledger_Technology_2021.pdf



3. INTRODUCTION TO BLOCKCHAIN AND DIGITAL ASSETS

3. Introduction to blockchain and digital assets

3.1 Distributed ledger technology

The advent of blockchain and Distributed Ledger Technology (DLT) constitutes a paradigm shift towards distributed ledger systems, i.e. systems in which all the nodes of a network have the same copy of a ledger; the latter can be read by the single nodes and updated only by the validating nodes (e.g. by the “miners” in the Proof of Work) that participate in the network and verify the authenticity of the transactions.

What is DLT

Distributed ledger technology (DLT)² is a technology that has its foundations in a database (registry) distributed among a number of nodes.

Nodes are physical or virtual connection points where data and information can be created, sent and received (e.g., by a computer), and a copy of the registry is saved and replicated for each of them.

One of the main principles of a DLT is that the shared ledger is not administered by a central authority, but the data updates are recorded by the appointed nodes in a completely independent way.

To ensure the reliability and truthfulness of the updated data, which may concern different operations (e.g. the balance of a digital wallet after the movement of the assets held, a transfer of tokens, information added to a document), the participating nodes the DLT have the task of verifying the validity of each update, which will only be approved if most of them agree.

This voting and confirmation system is called a “consensus mechanism” and is made automatic by a “consensus algorithm”.

Once consensus has been reached among the participants, the updated version of the registry is saved for each node separately and data integrity is guaranteed by cryptographic functions.

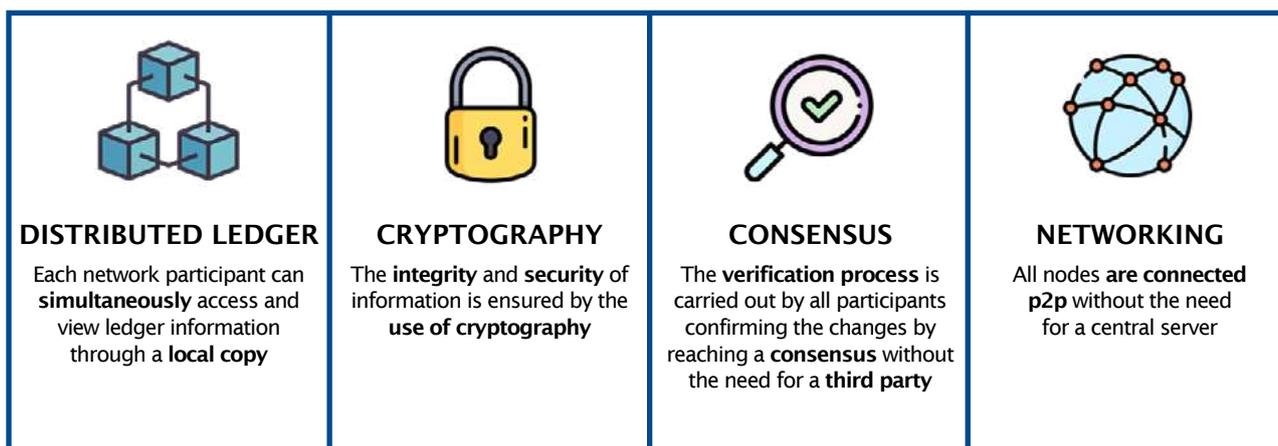


Fig. 1- DLT: Key Concepts

2. Sunyaev, A. (2020). Distributed ledger technology. In Internet Computing (pp. 265-299). Springer, Cham.

The consensus mechanisms may vary based on the type of Distributed Ledger Technology used: Permissionless, Permissioned and Hybrid.

- **DLT permissionless:** allows each node to perform the validator activity without the need to be authorized by a central authority.
- **DLT permissioned:** allows only nodes authorized by a central authority to perform the validator activity; this type of DLT is often used by small networks such as companies or organizations that need a more controlled and customizable environment.
- **DLT hybrid:** combines the essential elements of Permissionless and Permissioned DLTs; Transactions and records in a DLT Hybrid are generally not made public but can be verified when necessary, for example through a specific smart contract. Confidential information is kept within the network but is still verifiable. While a central authority can preside over a Hybrid DLT , it cannot alter its transactions.

Benefits of DLT

DLTs potentially have a number of advantages over traditional centralized databases . Some of the main benefits are listed below.

- Reduction of intermediaries necessary for the exchange of goods and information with consequent reduction of related costs, thanks to the use of smart contracts and the transparency and accessibility of data.
- Reduction of time for the transfer of assets (digital assets can typically be transferred in a few minutes through a DLT).
- High traceability of activities, as each data entered over time can be viewed within the distributed ledger. This principle can simplify, for example, the audit activity on specific operations.
- Greater security, as a DLT provides a structure in which, compared to a traditional database, the information is encrypted, distributed and entered into the ledger in an “append only” manner. In this way, the vulnerabilities of a Single-Point-Of-Failure are overcome and the information entered previously cannot be modified or eliminated.
- Reduce operational inefficiencies and fraud by eliminating manual processes replaced by automation enabled by smart contracts.

Distributed ledger technology presents itself as a new paradigm in the collection and transfer of assets and information, capable of reshaping the activities of retail investors, companies and government entities.

3. On the benefits to users from DLT technologies see Bank of Italy, Bank of Italy Communication on Decentralized Technologies and Crypto Assets, in bancaditalia.it, June 15, 2022, p. 6.; ESMA Report, The Distributed Ledger Technology Applied to Securities Markets, February 7, 2017, p. 6; EBA, FinTech Report on Prudential Risks and Opportunities Arising for Institutions from FinTech, July 3, 2017, p. 31. In doctrine, see E. SIRACUSA - G. ZACCARONI, Regulation of Crypto Assets in the EU and in the rest of the World: a Pluri-Focal Approach, in *Dir. Un. eur.*, 2021, 3-4, 583 ff.

3.2 Blockchain

A particular example or sub-type of the concept of DLT is the blockchain⁴, a decentralized register which provides that transactions are grouped and recorded within a “block”, each block is linked to the previous one forming a “chain”.

Each block has the hash⁵ of the previous block and a timestamp⁶ to understand the chronological order and the exact moment in which the individual blocks were created and validated. The hash related to the previous block is obtained using “SHA-256” encryption, thanks to which all the transactions contained in the block from which it was generated are “summarized”. Starting from a block of the blockchain and identifying the hash related to the previous block it is therefore possible to recompose the whole chain.

The three main characteristics of a blockchain are:

- Security (consensus and validation),
- Transparency (traceability),
- Immutability (inability to delete or modify already recorded information).

The security of a blockchain is closely related to the specific consensus mechanism used to validate only genuine transactions with certainty and insert them into the next block in the chain.

The blockchain therefore makes it possible to keep a register of all the data exchanges carried out, called a “ledger”, where each data exchange represents a “transaction”. Transactions must be verified through a distributed system, a so-called “peer-to-peer” network.

After the transaction has been verified, it is recorded on the blockchain and can no longer be altered. Transactions can contain any type of information, financial or otherwise. From this it follows that the area of application of blockchain technology turns out to be very large.

Obviously, in order for the data recorded in a blockchain to be truly immutable, the validating nodes, called “miners” in the blockchain Proof of Work (PoW), must be effectively discouraged from validating fraudulent transactions or tampering with the previous blockchain.

For this reason, the miners of the Bitcoin blockchain are remunerated through a reward issued in Bitcoin, as compensation for the “PoW” computing power offered, thus making an incorrect behavior inconvenient since it would lead to a reduction in their value.

In the case of other types of blockchain that have different consensus algorithms, it is always necessary to ensure that there is sufficient governance distribution and that the nodes cannot be corrupted and incentivized to validate non-genuine transactions, ensuring they maintain their impartiality.

4. Crypto Assets in the EU and in the rest of the World: a Pluri-Focal Approach, in Dir. Un. eur., 2021, 3-4, 583 ss. <https://towardsdatascience.com/the-difference-between-Blockchains-distributed-ledger-technology-42715a0fa92>.

5. Alphanumeric string result of the SHA-256 function. This function is used to map data of variable size, the result of which will always be a fixed size of 256 bits.

6. Timestamp, sequence of characters representing the date and time when the actual occurrence of a certain event took place.

Consensus algorithms

The consensus algorithm is the mechanism that allows you to create “permission-less” trust between nodes. In other words, this defines how to trust a proposed block to then add to the pre-existing chain. There are several consensus algorithms, the main ones are presented below:

- **Proof-of-work (PoW):** It is a form of cryptographic proof which is based on the demonstration of the offered computational effort. The network only considers blocks proposed by nodes that can demonstrate that they have put in a certain amount of work, thanks to a process called “mining”. The latter involves solving very complex mathematical problems using powerful hardware in order to get a reward for the work done. When this happens, a block is validated by the miners and added to the blockchain after a subsequent verification of accuracy by the nodes. PoW is still used today by the Bitcoin protocol.
Although the rewards for miners are quite conspicuous, the mining process requires the support of specific and expensive hardware, which requires constant updates to improve its performance. PoW hardware also consumes large amounts of electricity, which makes the process quite expensive. The difficulty in solving a block is directly related to the entire worldwide computing power of the network and is adjusted every 2016 blocks, in order to maintain the average time for creating a new block approximately every 10 minutes.
- **Proof-of-stake (PoS):** this validation method is not based on the computational capacity dedicated to solving a problem but on other parameters, including the number of tokens owned by the validating nodes. The validation of the new blocks takes place through the activity of the network participants themselves who deposit the native Crypto-Assets of that blockchain in a smart contract. These assets act as a guarantee and a disincentive for the validator not to behave dishonestly, as he would risk losing them forever. The validator is therefore responsible for checking that new blocks spread on the network are valid and, occasionally, for creating and spreading new blocks himself.
- **Burning proof:** this method provides that to carry out verification and validation of transactions it is necessary to “burn” coins. In order to enter a new transaction, it is necessary to send coins to blocked addresses, of which no one has control (there is no private key). The greater the amount of coins burned, the greater the mining power and consequently the probability to conquer the role of validator of the next block.
- **Capacity proof and storage proof:** method very similar to the PoW algorithms, it also exploits the hardware technical capacity of the node. This type of algorithm, using memory rather than computational power, is more efficient in terms of energy consumption.
- **Proof-of-authority:** a variant of the Proof of Stake algorithms, where participation in the network is no longer linked to the amount of assets owned, but to the identity of the node. Only the nodes whose authenticity has been verified can take part in the validation activity. This algorithm is typical of private networks, as the nodes are not anonymous and must be pre-authorized.

- **Reputation-based:** These consensus algorithms prioritize the nodes considered most trusted based on the number and intensity of interactions between them and the other nodes (the most active nodes).

Longest Proof-of-Work Chain

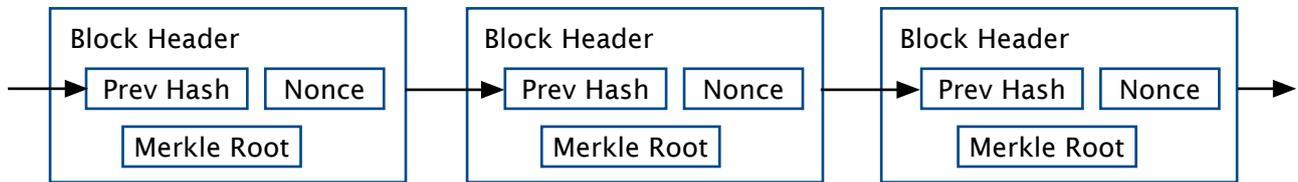


Fig. 2 – Proof-of-work⁷

Key management

A further basic concept of the blockchain infrastructure is represented by the cryptographic “keys”, or alphanumeric strings that allow to identify an address on a specific blockchain or to sign the transactions to be submitted to the validation of the nodes.

Specifically, through the public key and the private key, a unique identity is obtained.

The public key is the string through which it is possible to identify an address/Wallet; it is generated through mathematical calculations starting from your private key and follows the same principle as the current bank account number. It can be shared securely with anyone, since it is impossible to trace the private key from the public key, and it cryptographically identifies who carries out the transactions.

The private key, on the other hand, offers the power to digitally sign and authorize various actions in the name of the digital identity, provided that it is correctly used in combination with the respective public key.

This is generated through a “key ceremony” cryptographic process that provides a high level of security and follows the same principle as a PIN and password, representing a series of alphanumeric characters that allows you to access your Wallet and manage your digital assets.

7. Bitcoin white paper “Bitcoin: A Peer-to-Peer Electronic Cash System” Satoshi Nakamoto, 2008.

3.3 Smart contract

A “smart contract” is a program based on computer code that operates on compatible blockchains and which is executed upon the occurrence of a given triggering event. It is a collection of computer code (functions) and data (state) that reside in a specific address on the reference blockchain. Even if it is now considered an integral part of the blockchain and cryptocurrency world, the smart contract concept was formulated long before Satoshi Nakamoto’s 2008 white paper. The term smart contract first appeared in 1994 in an article written by the American computer scientist Nick Szabo and was subsequently elaborated and refined by the same author between 1996 and 1997. The first document defined the smart contract as a computer protocol that executes the terms of a contract, with the general goal of satisfying common contracts terms - such as payment terms, guarantees, privacy terms - minimizing the need to rely on intermediaries and at the same time reducing transaction costs and the risk of potential fraud.

In 2014, through an ICO (“Initial Coin Offering”), a method of raising capital that will be explored in the following chapters, the Ethereum blockchain was born. Ethereum is a Public blockchain known for its flexibility that allows you to create and run applications based on the native Solidity programming language and the smart contracts that can be configured on it. On the Ethereum blockchain, the native coin ETH is used to pay the transaction fees processed for the execution of smart contracts and Decentralized Applications (DApps⁸). The EVM, Ethereum Virtual Machine, represents the computing center thanks to which the programs codified by the smart contracts are executed.

Being a Permissionless blockchain, anyone can participate in the On-Chain activity. Ethereum integrates a standardized process for proposing, discussing and integrating updates to its protocol. At the heart of this process there is the Ethereum Improvement Proposal (EIP). In general terms, individuals or teams within the Ethereum developer community write EIPs and the wider community discusses their suitability. Proposals are modified, re-submitted and further discussed until a consensus is reached among the community participants. When the developers have completed the code needed to implement an EIP, an audit is performed and the update is tested on the Ethereum “testnet”. Finally, an update of one or more “Ethereum clients”⁹ is integrated into the public Ethereum code repository and all the node community has to choose whether to install and run the update. Only then can changes made by an EIP be considered part of Ethereum.

Since many stakeholders depend on the stability of Ethereum, there is a very high coordination threshold for major changes to ensure that every change to Ethereum is safe and widely supported by the community.

8. Jennifer Li and Mohamad Kassem. “Applications of distributed ledger technology (DLT) and Blockchain-enabled Smart Contracts in construction.” *Automation in Construction* 132 (2021): 103955

9. Software Ethereum.

The Ethereum blockchain contains the largest number of synthetic tokens on the market which, unlike “native” tokens, are issued by a centralized issuer. Furthermore, the aforementioned Tokens can be classified into three macro-categories based on their functionality:

- **Security tokens:** representative of financial instruments;
- **Payment tokens:** used to make payments;
- **Utility tokens:** goods or services are embedded to the token.

Smart contracts have the native ecosystem for their application in the blockchain. In fact, the blockchain has all the characteristics necessary for the implementation of smart contracts: from the simplest, such as digital currency exchange protocols, to the more complex, linked to DApps.

If we analyze Bitcoin, however, the platform can support complex transactions but is very limited for programming DApps, in terms of coding language. Only second-generation blockchains allow for the processing of a wider range of complex smart contracts. Not surprisingly, the Ethereum blockchain is the most used for their development, and the reason is that Ethereum has implemented a programming language that allows you to write and customize any type of smart contract, even the most advanced.

3.4 Digital asset

With the term “Digital Asset”, or “Crypto-Asset”, we mean the representation of an elementary unit of information that can be used in DLT-based systems. digital assets are hosted within a digital environment and stored on a blockchain platform that tracks their movements and changes of ownership.

These can represent assets of different nature, from a physical object to intangible assets, such as currency, patents, copyrights.

Below is a classification of the different types¹⁰ of digital assets:

- **Payment Tokens:** these are tokens designed and issued to serve as a means of exchange and/or unit of account. The goal is to make possible the payment of goods and/or services, in alternative to fiat currencies.
- **Utility Tokens:** these are tokens that provide the holder with a right to access and use a specific service. Utility Tokens can be redeemed for access to a specific product/feature provided by the token issuer, as well as used as a means of exchange.
- **Governance Tokens:** are tokens used to represent ownership and control of a decentralized platform or protocol. They can be used to vote on important decisions regarding platform development and management, such as major protocol changes.
- **Stablecoins:** are defined as Crypto-Assets designed to offer a stable currency (relative to another asset or calculation parameter) within the Digital Asset ecosystem. They are often pegged (which means they have a fixed exchange rate) or collateralized to a fiat currency, such as the dollar. To date, there are three different categories of stablecoins:
 - **Fiat-Collateralized Stablecoins:** work by holding fiat currency collateral (or more generally non-blockchain assets) as collateral to issue an adequate number of coins. Other forms of collateral may include precious metals such as gold or silver, as well as commodities such as oil, but the most widely adopted fiat-backed stablecoins today use cash or cash equivalent reserves.
 - **Crypto-Collateralized Stablecoins:** are backed by other crypto-assets (e.g. bitcoin, ether, etc.). As the Crypto-Asset in reserve may be subject to high volatility, these stablecoins are defined as over-collateralized as a greater value of the Crypto-Asset is kept as a reserve for the issuance of a smaller number of stablecoins in order to keep the latter stable even in the event of periods of stress of the market.
 - **Non-Collateralized (or Algorithmic) Stablecoin:** stablecoins that do not use any reserves but include algorithms that keep their price stable.
- **Central bank digital currencies (CBDC):** digital token representing the central bank currency which acts as a liability of the bank itself. CBDCs are a response to decentralized phenomena (such as the rise of cryptocurrencies, private tokens and the decline of cash) and express the need for an approach that supports regulation and financial stability, while promoting innovation.

10. While waiting for the publication of the MiCA Regulations, a widely accepted market classification was used:

1 “01/2022 IOSCO Decentralized Finance Report”; 2 “Binance Academy”; 3 “Bank of Italy Communication on Decentralized Technologies in Finance and Crypto Assets”; 4 “Initial Offerings and Crypto Assets Exchanges” - Consob; 5 “PwC Research”.

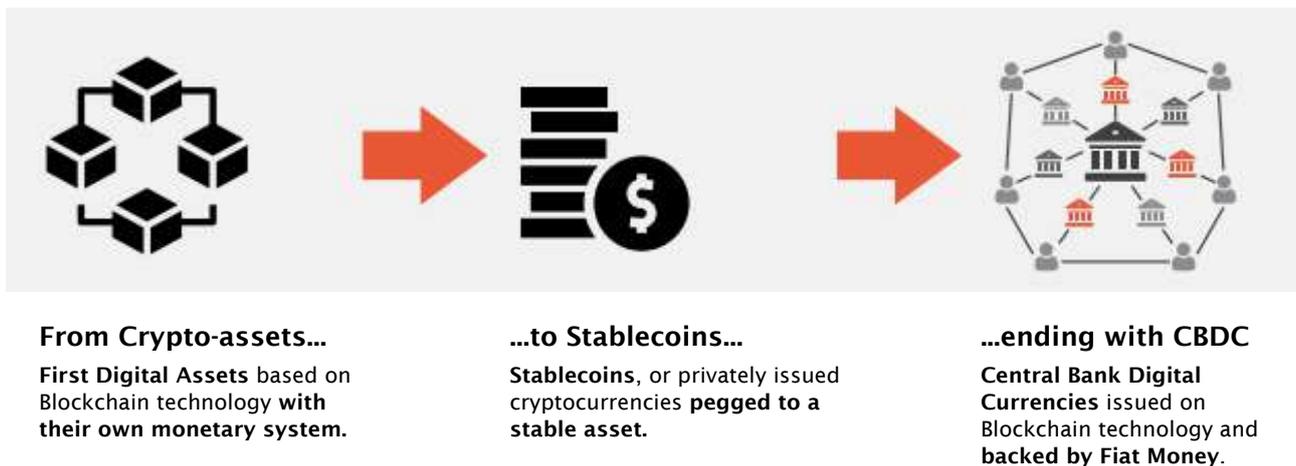
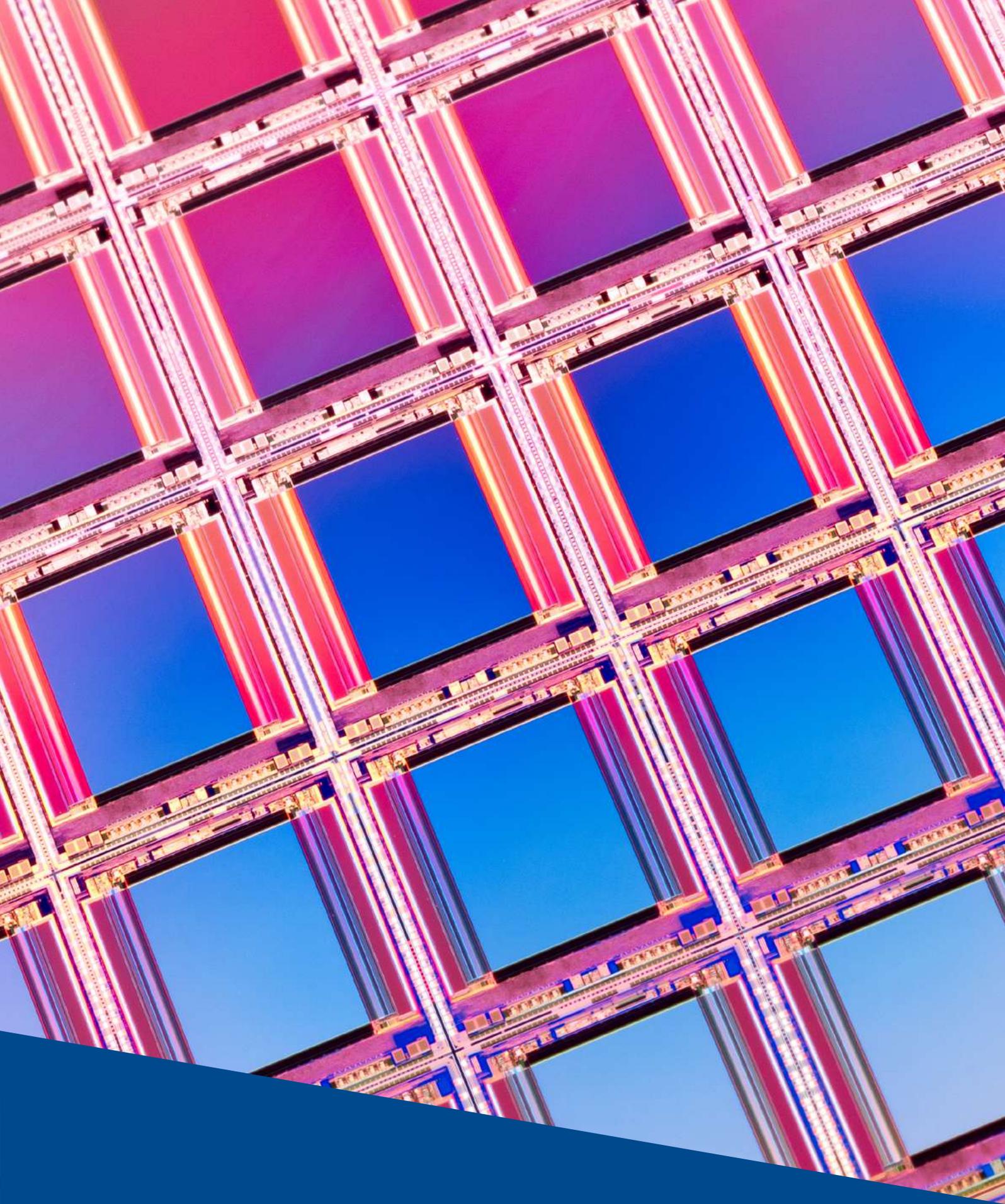


Fig. 3 – CBDC

- **Non-fungible token (NFT):** is a type of cryptographic token that represents the ownership of a unique asset (digital or physical).
What differentiates a “Non-Fungible” token from a “Fungible” one, such as cryptocurrencies, is that the latter can be exchanged with each other, are equal in value (one bitcoin is always equal to another bitcoin) and can be fractionated (a bitcoin can be divided into fractions of BTC called “satoshi”).

NFTs, on the other hand, have a digital signature that makes them unique, unambiguous and indivisible, therefore “Non-Fungible”.

- **Security tokens:** security tokens represent digital forms of financial instruments. They are liquid digital contracts that represent any financial asset within the blockchain (e.g. shares, bonds, derivatives). According to future MICAR directives, if a Digital Asset possesses the characteristics of a financial instrument pursuant to MiFID, even if it is digital, it must be treated in the same way as a peer fiat.



4. SECURITY TOKENS

4. Security tokens

4.1 The evolution from IPOs to ICOs, to the STOs

In the past, start-ups or small businesses had the opportunity to access funds by getting in touch with Venture Capital funds or Angel Investors, while for more structured businesses there was the possibility of opening up to the public through Initial Proposal Offerings (IPOs).

Specifically, IPOs constitute a tool through which a company allows the distribution of securities among the public, which is a necessary requirement for obtaining the listing of its securities on a regulated market.

However, these are an expensive and time-consuming tool for small businesses, which find themselves having to deal with intricate administrative and bureaucratic procedures in order to issue their securities on the market.

Over time, many IPOs have been canceled or postponed¹¹, due to procedural timing and onerous costs, at times when volatility and uncertainty in the markets were highest, making the expenses faced up to issue their financial instruments on the market vain.

In 2018, more than 40 IPOs were canceled in Europe due to the uncertainty caused by Brexit and, to date, the decline in the S&P and the Russian-Ukrainian conflict have led to record many cancellations globally.

A first attempt to overcome the barriers imposed by IPOs through the use of the blockchain was the Initial Coin Offering (ICO)¹², which can be generically described as a “decentralized” capital raising tool, through which fractions of ownership and certain rights of a project are transmitted by issuing and delivering tokens against payments in Cryptocurrencies. Despite the validity of the solution at a technological level, which has led to the birth of valid and still active projects today, ICOs have very often been associated with scams and frauds of various kinds, so much so that it is estimated that in 2017 approximately 80% of ICOs have been traced back to a scam (Satis Group, 2018¹³). Some of the main reasons for the proliferation of these frauds have been related to the lack of:

- Supporting regulation;
- Adequate know your customer (KYC) processes;
- Collateral that companies were supposed to provide as a backup for the issued tokens.

The problems described above have led to the development of a solution that would allow the benefits of ICOs to be exploited while at the same time discouraging the development of fraudulent projects, i.e. the security token Offering (STO).

STOs follow logics similar to those of ICOs; they are also fundraising tools but regulated according to the regulations of the relevant government body and characterized by the issue of security tokens, which can have real assets as underlying assets outside the blockchain, thus guaranteeing a much safer environment for investors.

11. <https://www.reuters.com/article/europe-ipo-cancellations/factbox-ipos-cancelled-in-europe-middle-east-and-africa-idUKL8N1SG7LB?edition-redirect=uk>
<https://www.afr.com/markets/equity-markets/companies-delay-ipos-cancel-raising-amid-market-chaos-20220314-p5a4cj>

12. From IPOs to ICOs: The Impact of Blockchain Technology on Financial Regulation 1, Alexis Collomb 2, Primavera de Filippi 3, Klara Sok

13. “On the basis of the above classification, as a percentage of the total number of ICOs, we found that approximately 78% of ICOs were Identified Scams, ~4% Failed, ~3% had Gone Dead, and ~15% went on to trade on an exchange.” https://research.bloomberg.com/pub/res/d28giW28tf6G7T_Wr77aU0gDgFQ

Here are some of the main advantages of STOs compared to other financing methods (IPOs, ICOs)¹⁴:

- The initial investment of the issuers is far lower than for an IPO as it is necessary to involve fewer intermediaries.
- Security tokens, as digital assets, allow investors to access a fractional ownership of assets usually considered illiquid and for which a high investment would have been necessary (e.g. Real Estate).
- STOs are a regulated instrument that ensures a high degree of security for investors and adequate anti money laundering (AML) and KYC processes.

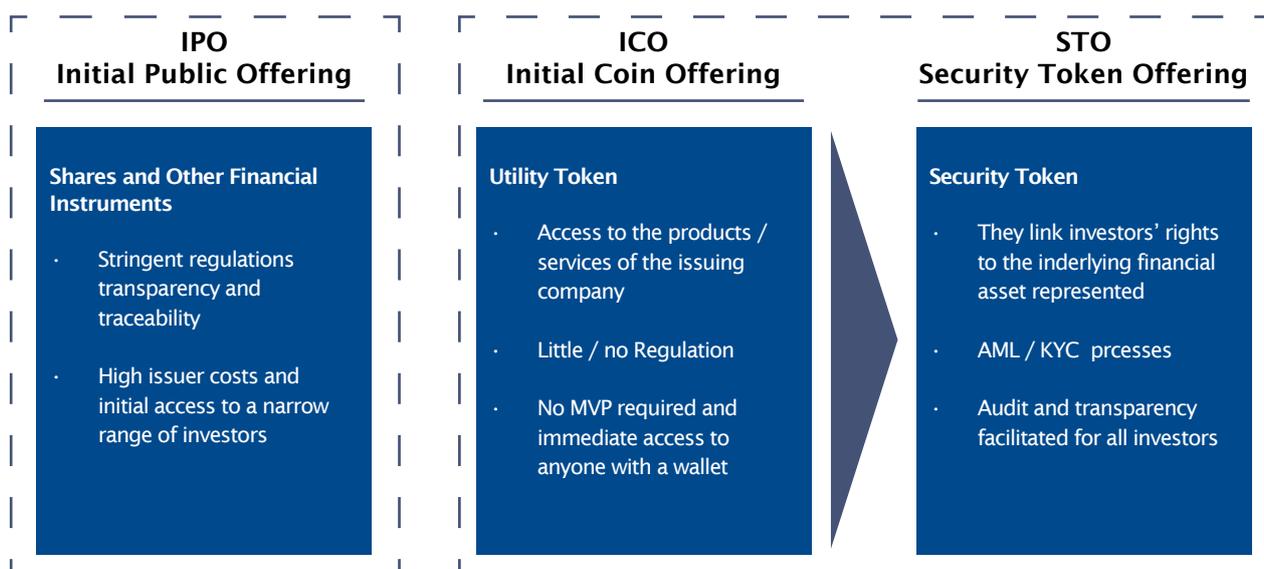


Fig. 4 - From IPOs to ICOs and STOs

14. <https://nickayton.medium.com/the-shift-from-ipo-to-sto-a-new-missed-opportunity-for-the-legal-profession-3ffb2e2fbf98>

4.2 Security Token Typologies

Security tokens represent tokenized securities, i.e. digital forms of financial instruments that live on a blockchain. These tokens can represent ownership of any financial asset and are issued according to a set of rules and parameters that can be programmed through smart contracts which allow for automatic execution. Among these parameters there are, as an example: the number of tokens issued, the amount of underlying asset that each token represents, the types of authorized investors, the permitted jurisdictions.

Security tokens can represent different types of underlying and consequently must comply with different regulatory requirements for each of them.

To date, the most used security tokens can be limited to three categories:

- **Equity security tokens:** they represent the ownership of a physical asset and the consequent rights, for example the right to a profit based on the percentage of ownership of the asset (e.g. shares).
- **Bond security tokens:** allow the owner to receive a predefined income in a certain period of time. An example is that of bonds or tokenized loans, in which the creditor is able to obtain the coupons and interest due to him over time in an automated manner.
- **Real Estate security tokens:** they represent ownership shares in a vehicle that owns a real estate asset, with the advantage of creating a more liquid ecosystem for investors and enabling crowdfunding mechanisms for Real Estate investments on the blockchain. Another possible approach is to consider them as debt management assets; in this way, through smart contracts it is possible to automate the receipt and distribution of rental income among investors.

The main players that make up the security token ecosystem are the following:

- **Issuance Platform:** technological platforms that enable the issuance of security tokens on different types of blockchain;
- **Infrastructures:** DLT/blockchain on which the Issuance Platforms work, which can be permissionless or permissioned;
- **Issuer:** actors who issue security tokens;
- **Key Custody Provider:** actors that facilitate the management of their customers' private keys;
- **Exchange:** enable the sale of security tokens in the secondary market.

4.3 Benefits and Challenges of security tokens

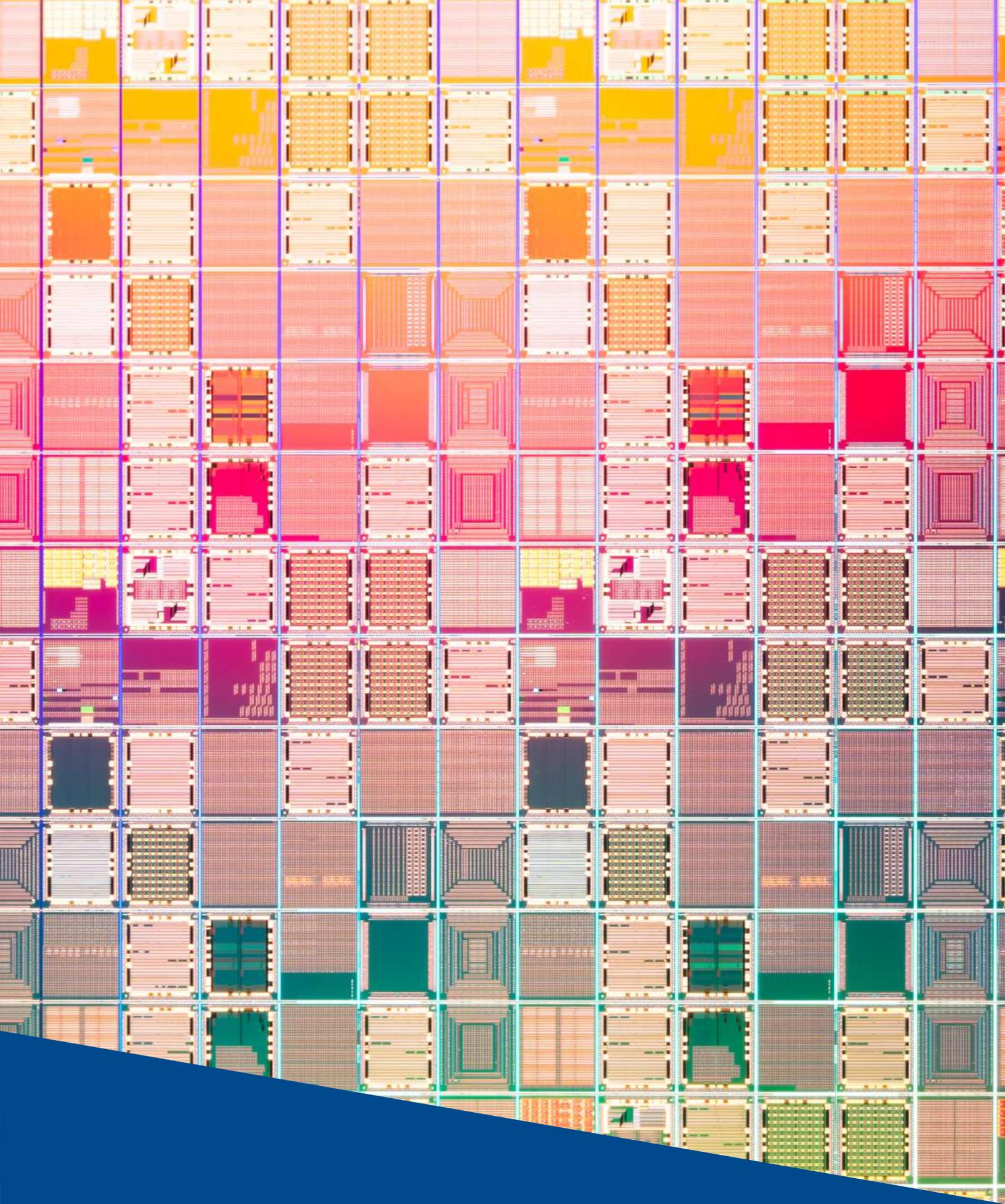
The adoption of security tokens can bring multiple benefits to institutions¹⁵ that aim to include digital assets among their financial instruments, specifically:

- **Potential high level of compliance:** An increasing number of government bodies globally are trying to understand how digital assets can be regulated through current legislation; security tokens give regulators the opportunity to create a set of new rules that drastically reduce compliance costs while streamlining the underlying processes. Blockchain and smart contracts would allow regulators to implement a series of regulatory logic directly inside the tokens, which would be applied automatically. An example would be to program security tokens to be bought or sold only by verified and qualified addresses.
- **Access of new investors:** in case the regulators of the different jurisdictions aim to support the implementation of the security tokens following a common standard at a global level, international opportunities would open up for the issuers, attracting potential investors from all over the world who could access the market with only the need for an internet connection.
- **Liquidity:** security tokens allow to split ownership of assets considered illiquid in the real world (e.g. Real Estate), thus making it possible for asset owners to sell their assets with fewer barriers for investors; the latter could buy fractions of an asset at an access price considerably lower than what is necessary for the whole asset in the real world, thus making the market more liquid and more accessible.
- **Efficiency of operations:** the use of blockchain technology makes it possible to streamline the processes currently adopted in the traditional financial system. By way of example: reduction of back-office work, simplification of accounting and auditing processes, elimination of intermediaries and real-time settlement in transactions, automation of KYC and AML processes, automatic payment of interest, coupons or dividends.
- **Transparency:** the blockchain allows you to verify all the activities carried out over time within the distributed ledger; moreover, the traced data are immutable and therefore cannot be altered. This system allows you to constantly verify the ownership of the security and avoid fraud and manipulation.

15. "The Key Distinctions between an IPO and STO", EDSX, European Digital Asset Exchange.

Despite the advantages that the blockchain and consequently the security tokens could bring by remodeling traditional processes, the obstacles to being able to reach a critical level of adoption today are many:

- **Identity verification:** the issue and transfer of security tokens requires an adequate identity recognition system, a challenging concept for public blockchains that make the principle of pseudonymity one of their strengths.
In fact, the register of transactions and activities on the blockchain does not show the direct identity of the person performing them, but only the address associated with the private key.
However, financial institutions are subject to regulations requiring them to trace the identity of anyone involved in a transaction; for this reason there is a need to structure adequate due diligence processes, in order to ensure that all the actors who carry out On-Chain activities are verified.
- **Privacy:** Actors within the Capital Markets ecosystem need to preserve privacy and confidentiality to safeguard their financial interests and to protect their clients' information.
In public blockchains, however, everyone can view the history of transactions and the ownership of an asset associated with the related wallet. There is, therefore, the need to identify solutions that safeguard the investor privacy.
- **Governance:** in order to allow security tokens to become a reliable tool within traditional processes, there is a need to define adequate governance models that comply with current regulations (e.g. voting rights).
- **Interoperability:** problems related to identity verification and privacy can be solved by adopting a private blockchain for the issuance and circulation of security tokens. The private blockchain can be customized based on the needs of the centralized body that has control over it, however at the expense of less interoperability and standardization.



5. OVERVIEW OF THE SECURITY TOKEN MARKET

5. Overview of the security token market

According to data from the Digital Innovation Observatories of the Milan Polytechnic, the phenomenon of using blockchain-based tokens is assuming growing importance in the projects of companies and public administrations all over the world.

In fact, taking into consideration the period from 2016 to 2021, 190 projects were detected (25% of the total blockchain projects) that used fungible or non-fungible tokens, with a growth of 140% recorded in the last year. 41% of the identified projects are developed in the financial sector which has been experimenting and using these instruments for some time to represent securities and implement new management models for them.

One of the most used types of tokens in the financial world are security tokens, whose use in the financial sector includes a variety of use cases.

In recent years, the main areas of interest of tokenization projects have concerned the stock market - specifically, the representation of shares and corporate shares of companies, both listed and unlisted - and the debt market, with a focus on the tokenization of government bonds and corporate bonds¹⁶.

Then there are other areas that could seize the potential offered by tokenization, but currently we see a smaller number of active projects on the market. For example, the collateralisation of guarantees in the credit market, the issuance and servicing of loans, factoring, the trading of non-performing loans, financial derivatives and structured products.

It is worth noting a significant difference in the type of assets that can be represented in the form of tokens on blockchain or distributed ledger platforms. In fact, tokens can be “native” instruments, i.e. they represent securities natively issued on blockchain or DLT and therefore do not exist outside these platforms, or instruments that represent financial instruments existing in the real world subsequently tokenized.

In cases of issuance of natively tokenized financial assets it is possible to fully exploit the potential of blockchain or DLT: in fact, when tokens represent natively digital financial securities, all information on the status of these assets is recorded (and therefore naturally available) On-Chain. This makes it possible to enable complex automations, for example through smart contracts that are automatically activated when predetermined conditions occur.

In the case of tokens representing real assets, on the other hand, the tokenized financial instruments are digital twins of securities that already exist in traditional forms. This places significant limitations on the possibilities of automating flows and processes through smart contracts.

In fact, a distributed ledger network is an isolated system, unable to access information about the outside world. Therefore, any data, information or status change concerning a tokenized asset must be performed through additional and dedicated systems, commonly called “oracles”. Beyond the possible ways in which it is possible to enter external data in a distributed ledger and the types of existing oracles (a topic that goes beyond the scope of this document), it is worth emphasizing how this step constitutes a delicate and potentially centralizing process.

16. On this topic, we note Consob’s Legal Notebook (n. 25) “Tokenizzazione di azioni e azioni tokens”, 2023, curated by P. Carrière, N. de Luca, M. de Mari, G. Gasparri, T.N. Poli.

5.1 Global Market

The Secondary Market of security tokens settles at around \$17.5 billion (STM¹⁷), however to obtain a measure of the total value it is also necessary to consider everything concerning the Primary Market.

According to industry estimates, it could even exceed \$50 billion in capitalization with ample room for growth, since the security token market is not only global, but includes a vast range of types of assets, tangible and intangible, liquid and illiquid.

Below some of the main assets that can be tokenized

Unic Items	Intangible Assets	Commodities	Currencies	Financial Instruments
Artworks	Patents	Gold	Dollar	Shares
Cars	Licenses	Silver	Euro	Real Estate
Electronic Devices	Royalties	Feedstock	Yen	Securities
	Trademark			Incomes

Fig. 5 - Types of Tokenizable Assets

Another factor to take into consideration to identify the huge market opportunity that could be generated by security tokens is the current value of the markets they have the possibility to penetrate:

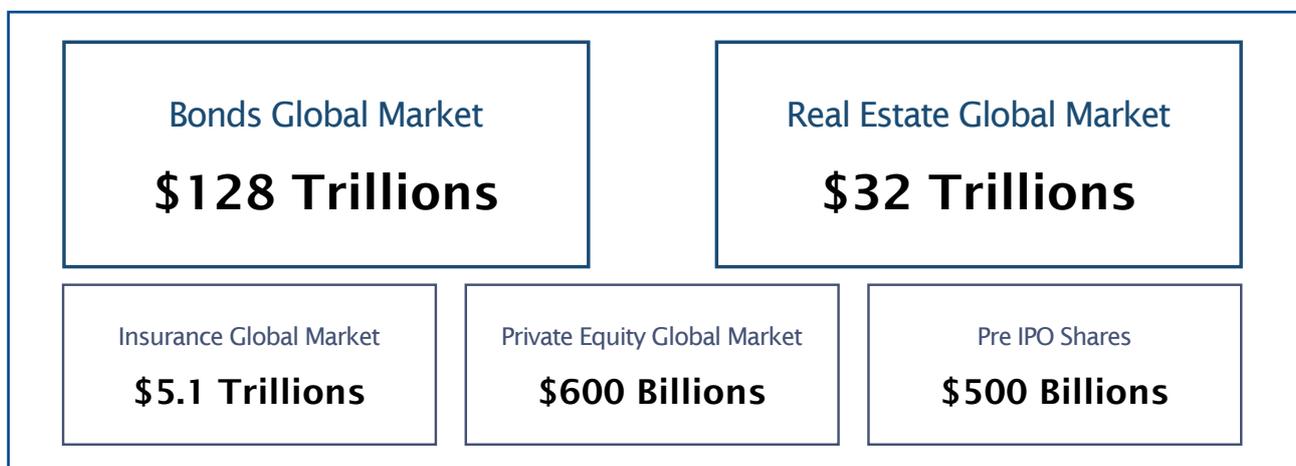


Fig. 6 - State of security token Market¹⁸

Looking at the activities of market players related to the use cases of tokenization on blockchain in the financial sector, with reference to the categorization proposed by the World Economic Forum¹⁹ It is possible to distinguish four main types of projects.

17. Given as of October 24, 2022 inclusive of security token and Tokenized Stock.

18. STO MARKET - The State of Security Tokens 2022, Security Token Advisors.

19. Digital Assets, Distributed Ledger Technology and the Future of Capital Markets, WEF, (2021).

Equity market

This category includes projects for the tokenization of company shares. The shares of companies listed on the stock exchange, or the shares of unlisted private companies can be represented on the blockchain. Examples of projects of this kind are the following.

- SIX Swiss Exchange has developed a fully regulated service called SIX Digital Exchange (SDX) for the listing, trading, settlement and custody of digital assets. The goal is to allow financial institutions to trade tokenized stocks and bonds through Corda's DLT technology. The SDX platform went live in November 2021, when the holding company SIX issued its own 150 million Swiss francs (\$162 million) bond in Digital Asset form, with Credit Suisse, UBS Investment Bank and Zürcher Kantonalbank as joint leads operation manager.
- In October 2018, the group that owns the St. Regis Aspen Resort in Colorado sold the 19.1% ownership of the hotel for \$18 million. The sale took place through the creation of Aspencoin, security tokens representing the fraction of ownership of the resort. The tokens were placed with investors through an STO initially promoted on the Indiegogo crowdfunding platform.

Debt market

This category includes projects involving the tokenization and/or use of blockchain and DLT for the issuance of bonds, and other debt instruments, whether they are issued on the market by private companies (corporate bonds) or by public administrations or governments (government bonds).

Here are some examples of this type of project.

- Goldman Sachs, Santander and Société Générale have partnered with the European Investment Bank (EIB) to issue €100 million bonds on the public Ethereum blockchain. In collaboration with Banque de France, the payment by subscribers to the EIB was represented on the blockchain in the form of CBDC. The second phase of the experiment could concern the secondary market of tokenized bonds.
- Société Générale-Forge has been active for some time with experiments and projects concerning the issuance of security token Bonds. Some relevant cases:
 - Issue of €100m of security token Bonds registered on the public Ethereum blockchain and fully subscribed intra-group (April 2019);
 - Issue of €40m security token Bond registered on public blockchain and fully subscribed by Société Générale (May 2020).
- In July 2022, the British energy company EDF issued a tokenized bond in partnership with BNP Paribas. The security, which was structured, tokenized and distributed by BNP Paribas, was natively issued in the form of a Digital Asset on the public Ethereum blockchain using AssetFoundryTM, the French bank's platform.

- In January 2022, the Luxembourg Stock Exchange (LuxSE) admitted financial instruments registered on a public DLT to the Securities Official List (LuxSE SOL) for the first time. Société Générale-Forge has issued and distributed digitally covered bonds (OFH Tokens) and natively tokenized structured products, respectively on the public Ethereum and Tezos blockchains. Security tokens are defined as financial instruments and debt securities under French law and comply with the CAST open-source securitization and interoperability framework.

Some examples of projects concerning the issuance of non-tokenized debt instruments through DLT or blockchain are the following.

- \$117 million of Corporate Loans issued by the Spanish banking group BBVA, called “Smart Bonds”. These bonds, taking advantage of solutions based on DLT technology, present various advantages especially compared to traditional report-keeping practices. Shared ledgers ensure consistency of market data, reduce complexity and opacity, while preserving sensitive information. The technology claims to combat the inherent drawbacks of conventional bond issues, which are considered time consuming, difficult and relatively unsafe.
- Figure Technologies has issued Asset-backed Securities for \$149 million through the Provenance blockchain. The underlying loans were issued by Figure, with Jefferies Group and Nomura Securities as underwriters. Figure says the overall benefit from reduced reporting costs over the loan lifecycle is 100 basis points. Provenance blockchain is a tokenization solution launched by Figure and, to date, has processed over 1.5 billion dollars in debt securities.
- In December 2019, the Bank of China, one of the country’s largest commercial banks, issued bonds worth 20 billion yuan, about \$2.8 billion at the exchange rate on the day of the announcement, with the aim of raising capital to finance small and medium-sized local businesses. The bank used a proprietary blockchain to issue digital certificates proving ownership, form groups of underwriters, and to document the proof of transactions.

Securitized Products/Collateralized assets

This type of projects concern the securitization processes of debt products and includes cases of tokenization of assets pledged as collateral for traditional financial loans. The representation in the form of tokens of the collateralized assets allows them to be exchanged on a blockchain or a Distributed Ledger platform.

A notable case is the project of JP Morgan Chase which, through its Onyx division, has developed a blockchain solution for the instantaneous transfer of collateralized assets for traditional financial loans. In May 2022, Onyx made its first transaction on the platform by tokenizing shares of the BlackRock money market fund and using them as collateral. Some examples of projects concerning the collateralization of non-tokenized assets are the following:

- \$15.6 billion of Centrotrenta Servicing assets . The company has launched HyperMast STS, an end-to-end credit securitization management platform based on IBM’s blockchain technology. The platform, based on DLT permissioned technology, aims to provide the financial market with a tool to connect the entire ecosystem involved in securitization transactions and allow the various players to interact in the various phases in a transparent, secure and traceable way.

- \$308 Million Saluda Grade HELOC on Figure's Provenance blockchain. Saluda Grade Asset Management ("SGAM"), a privately held alternative real estate investment firm, initiated a \$308 million securitization collateralized by Home Equity lines of credit ("HELOCs") issued by Figure Technologies. The transaction represented the largest securitization of HELOC since the 2008 housing crash.
- The Redwood Trust, Inc. based on a blockchain-based solution developed by Liquid Mortgage, Inc has completed a \$449 million tokenization, fully collateralized by "jumbo residential loans", real estate loans for the purchase of homes over \$650,000. The solution is able to provide end users with a more timely reporting, on a daily basis, of principal and interest payments on the underlying residential mortgages.
- \$1.3 billion of Residential Mortgage Backed Securities from the Bank of Communications²⁰ on the Jucai Chain, a permissioned blockchain solution owned by the BoCom bank itself.

Financial derivatives and structured products

This type of use case includes projects for the tokenization of derivative financial instruments or financial instruments that derive their value from an underlying, or structured products (Structured Investment Products or SIPs). Examples of projects of this type are as follows:

- In June 2021, DZ Bank and Bayern LB announced that they traded an over-the-counter (OTC) interest rate derivative using a smart contract on a distributed ledger (DLT) platform. The main benefits of the technology have been automation and reduction of counterparty risk.
- In April 2021 Société Générale issued security tokens representing structured products - Euro Medium Term Notes (EMTN), \$5 million - registered directly on the public Tezos blockchain and fully subscribed by Société Générale Assurances.

At the European level, according to a study conducted by the Frankfurt School of Finance and Management, Plutoneo and Tangan it is estimated that the security token market in Europe will reach a capitalization of \$918 billion by 2026.

The overall Digital Asset market will continue to grow at a rapid pace. Currently this market consists almost exclusively of Cryptocurrencies in terms of capitalization; however, the security token sector will grow strongly in the coming years. Progressive regulation in EU countries could lead Europe to become the world leader in the field of security tokens.

20. State-owned Chinese Bank

5.2 Market Overview – Luxembourg

In Luxembourg there is a very dynamic ecosystem with regard to digital assets, with over 50 operators active along the Value Chain which, with recent regulatory developments, will further evolve in the near future.

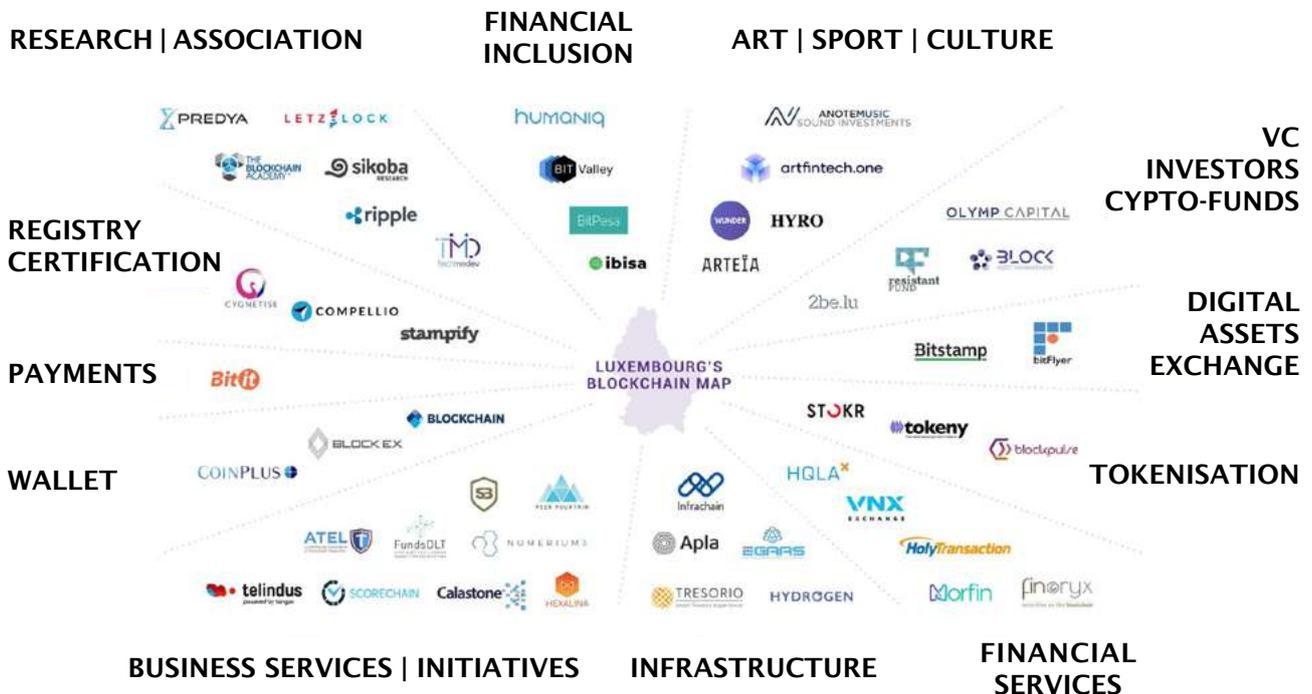


Fig. 8 – Luxembourg’s blockchain Map

As far as the Asset Management landscape in Luxembourg is concerned, it is essential to distinguish between Virtual Assets, or Crypto-Assets, and Virtual Assets that meet the definition of financial instrument, or security token. The ratio is analyzing both the nature of the asset itself and the type of investor it is aimed at (retail / non-retail / professional investor).

Currently, the Luxembourg Stock Exchange is making the issuance of security tokens available in the Security Official List (SOL) which gives visibility to the financial instruments issued on DLTs present on the market.

In terms of opportunities for the Luxembourg market:

- The rapid implementation of the EU Financial Digital Package in the Luxembourg legal framework has attracted the world’s second largest fund center to DLTs and Crypto-Assets;
- The VASP regime and the Dematerialized Securities Act ensure a smooth path for the implementation of the EU Pilot Regime.

Initiatives have also been active for some time to encourage the use of blockchain and DLT. For example, in 2016 - from the Luxembourg Stock Exchange and Fundsquare - the FundsDLT project was born, a decentralized platform that uses the private Quorum blockchain by Consensus. Today the platform is owned by Clearstream, Credit Suisse Asset Management, the Luxembourg Stock Exchange and Natixis Investment Manager.

FundsDLT has achieved several milestones over the years:

- In July 2017, the acquisition of real fund shares with real money on a blockchain-based platform was completed for the first time in the Asset Management industry.
- In January 2018, BNP Paribas Asset Management completed a test of a blockchain transaction on the platform that included every part of the fund trading process.
- In October 2021, in cooperation with UBS Asset Management, a Proof-of-Concept pilot was successfully concluded which aimed to explore a front-to-back fund distribution model based on blockchain. The project covered and simulated the entire distribution process, starting from investor onboarding, through transaction initiation, to settlement and transfer agency phases. On the FundsDLT platform, all parties involved had real-time transparency on the direct transaction.
- In May 2022 Beewise was officially launched, an Azimut Italia app based on FundsDLT which enables retail customers to make direct and digital investments.

Another service that deserves mention is that of Tokeny, a company that provides a compliance infrastructure for companies and financial institutions to issue, transfer and manage securities in a compliant manner using blockchain technology.

5.3 Market Overview – Spain

Spain has also been the site of an important market experimentation on the tokenization and custody of investment funds.

The project, led by Onyze, Allfunds, Renta 4 and IoBuilders was part of the choices of the first version of the “Sandbox” promoted by the Spanish regulators and was successfully completed in September 2022.

In this experimentation, Allfunds blockchain has provided the technologies necessary for the tokenization and management of investment funds, through its smart contract solution.

Renta 4 Banco was responsible for marketing these tokenized funds - managed by Renta 4 Gestora - to its investors. Onyze has provided the custody services necessary to safeguard these funds, while complying with the necessary regulatory requirements. Finally, IoBuilders collaborated as a technology partner specialized in blockchain technology, with experience in the issuance of digital assets.

5.4 Market Overview – UK

In the British landscape, the challenges for implementing an asset tokenization model are manifold. Unlike what has been done in Europe, there has been no in-depth work at the legislative level, partly due to Brexit. However, recent stances by lawmakers have made the United Kingdom perceived as a crypto-friendly nation.

5.5 Market Overview – France

In France, the regulation that regulates security tokens is the amendment of the French law on securities (Ordinance n° 2017-1674 of December 8, 2017 and Decree n°2018-1226 of December 24, 2018) which allows the full recognition of certain securities issued and transferred through DLT.

Security tokens mainly represent shares, debt securities, CIS shares and tokenized registered securities. While there has been limited use of security tokens to date, there have been some notable examples from Société Générale-Forge and the European Investment Bank (EIB).

As far as Asset Management is concerned, the market is moving towards a clear direction.

- In 2018 SETL launched IZNES, a pan-European platform registry enabled by SETL blockchain technology.
- Société Générale was the first operator to provide Asset Managers of AIF funds (specifically authorized to invest in cryptocurrencies) with a custodian bank service integrated, through record keeping, by a solution for investments in cryptocurrencies.

- La Française now offers its insurance partners the possibility of accessing its range of “Real Estate” vehicles by adopting a simplified process. All subscription and redemption operations can be carried out in real time on IZNES which offers a number of advantages to institutional investors of La Française:
 - Access to a complete database of products, with all the characteristics and documents related to the funds;
 - Ability to view subscriptions and redemptions in real time, with the closing times of the prospectuses;
 - Access to the blockchain registry updated in real time, which guarantees immutability and traceability and builds reference data shared between the investor and the management company.
- BNP Paribas Securities Services metier, in collaboration with Allfunds blockchain and with strategic asset manager clients in February 2021 created a first Proof-of-Concept on the tokenization of a UCITS fund. BNP Paribas Securities Services metier itself supports its institutional clients through two models:
 - When a blockchain Platform is a financial intermediary or distributor that uses blockchain technology, they collect orders from the blockchain channel in Luxembourg and handle them like orders from any other distribution channel, with the same level of service.
 - When certain equity liabilities are partially issued on a blockchain platform through their DLT integration service, they provide fund managers with an aggregate view that includes cash flow forecasts and other reports.

5.6 Market Overview – Germany

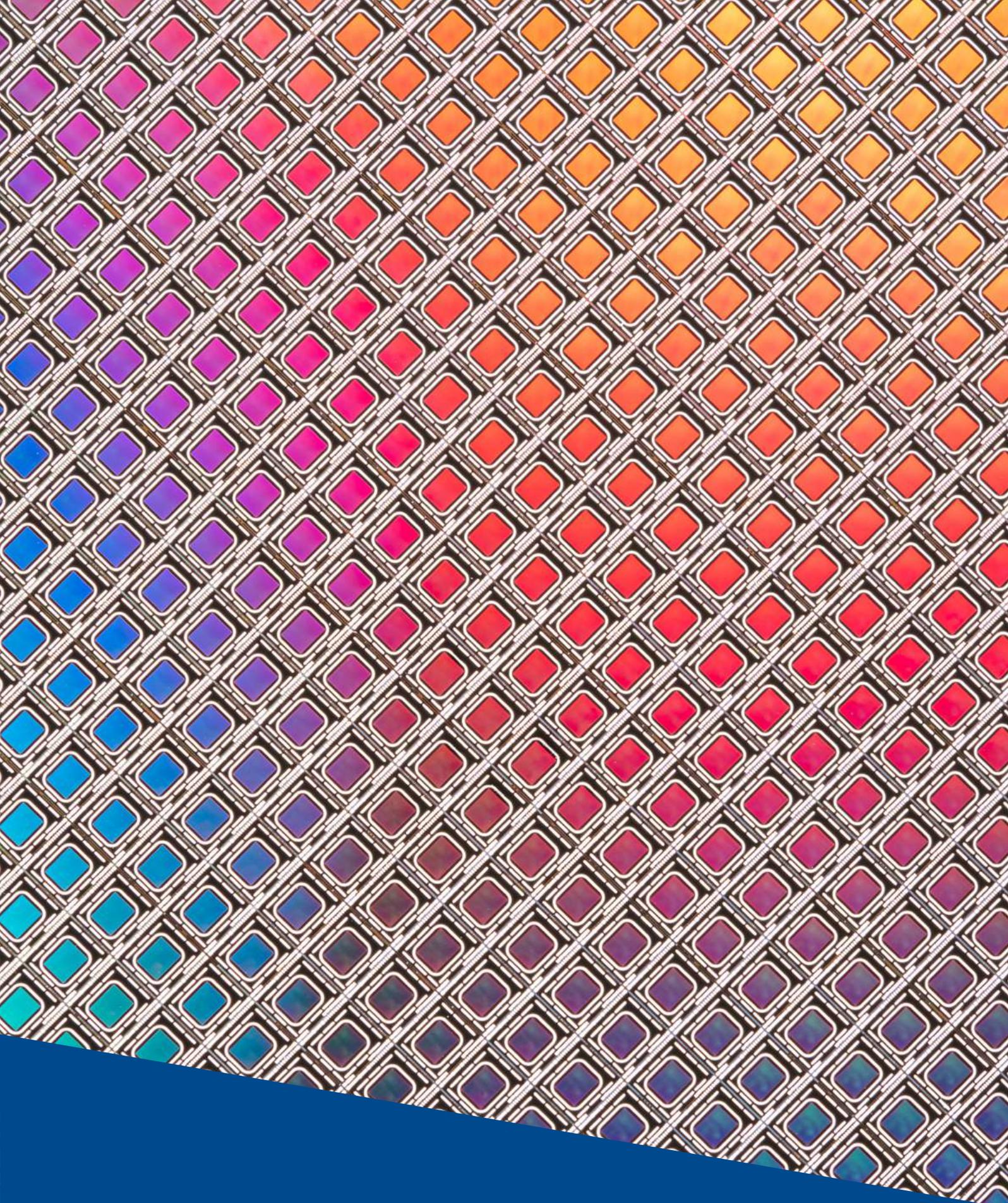
In Germany there are several noteworthy initiatives, including:

- Universal-Investment’s UI Enlyte, a platform that covers the entire Digital Asset investment process, from client onboarding to Digital Asset management and reporting. With this solution, fund promoters, asset managers, and investors can implement blockchain technology both end-to-end and as a white-label solution.
- BNP Paribas Securities Services metier conducted a technical Proof-of-Concept for mutual fund transactions on technology provider “Fundsonchain” settlement platform. The “Fundsonchain” platform allows you to automate the entire fund management process through the end-to-end processing of tokenized fund shares, based on the Distributed Ledger technology, in cooperation with the German financial service MEAG and the company ERGO, specialized in IT.
In this trial, BNP Paribas Securities Services metier acted as custodian of the Crypto Assets, MEAG acted in its role as management company, while ERGO acted as an institutional investor.

5.7 Market Overview – USA

The US market also has many interesting propositions, including the following:

- Franklin Templeton has launched the OnChain US Government Money Fund, a mutual fund that uses the blockchain to process transactions and record ownership of shares. Compared to traditional mutual funds, the main change is the way records are kept and transactions are made. The transition from paper records to cloud-stored spreadsheets had already been made; the use of blockchain technology represents a further step.
- Arcalabs in 2020 created the first blockchain Transferred Fund (BTF).
- Digital Funds has applied to launch a Tokenized S&P 500 EW Index Fund which will invest primarily in securities of issuers included in the S&P 500 Equal Weight Index. While the official register of ownership of the fund’s shares is maintained in accounting form, the shares will also be registered - as digital tokens - on the Algorand blockchain.



6. OVERVIEW OF THE REGULATORY CONTEXT

6. Overview of the regulatory context

6.1 Applicable Regulation to security tokens

The digital representation of financial instruments in distributed ledgers or the release of tokenized traditional asset classes to allow issuance, storage and transfer in a distributed ledger (the so-called tokenization process), will open up new opportunities in trading and post-trading in financial markets.

Security tokens are already ideally covered by the traditional regulation on financial instruments. The assumption assumed by the regulator is that the security token issuance phase does not require any specific discipline, but traditional regulation may be sufficient, thanks to some detailed changes and, of course, after expanding the definition of “financial instrument”, contained in directive 2014/65/EU of the European Parliament and of the Council related to the financial instruments market (“MiFID II”), with the new category of «instruments issued by means of distributed ledger technology».

In line with this orientation, MiCA Regulation (under definition) provides that the legislation of the European Union in the field of financial services must not favor a particular technology and that crypto-assets that can be assimilated to “financial instruments” as defined in Article 4, paragraph 1, point 15 (and more specifically in Annex I, section C) of MiFID II must therefore continue to be governed by current European legislation, regardless of the technology used for their issuance or transfer.

In addition, the Regulation (EU) 2022/858 of the European Parliament and of the Council (30 May 2022) relating to a pilot regime for market infrastructures based on distributed ledger technology (DLT Pilot Regime Regulation), specifies that crypto-assets falling under the definition of financial instruments pursuant to the MiFID II directive must fall within the scope of current European legislation on financial instruments.

MiCA delegates to ESMA the task of drafting the guidelines to define when a crypto-asset is considered a financial instrument.

To the extent that a crypto-asset falls within the definition of a financial instrument under MiFID II, a comprehensive Union financial law that includes:

- Regulation (EU) 2017/1129 of the European Parliament and of the Council (Regulation on the prospectus to be published when securities are offered to the public or admitted to trading on a regulated market),
- Directive 2013/50/EU of the European Parliament and of the Council (Transparency Directive),
- Regulation (EU) No. 596/2014 of the European Parliament and of the Council (regulation on market abuse),
- Regulation (EU) No. 236/2012 of the European Parliament and of the Council (regulation relating to short selling and specific aspects of derivative contracts concerning the coverage of the risk of default by the issuer - credit default swap),
- Regulation (EU) No. 909/2014 of the European Parliament and of the Council (regulation concerning the improvement of securities settlement in the European Union and central securities depositories),
- Directive 98/26/EC of the European Parliament and of the Council (directive concerning settlement in payment and securities settlement systems),

could apply to related issuers and companies carrying on related activities. Given, however, that current EU financial services legislation has not been designed with DLT in mind and therefore there are provisions that may preclude or limit the use of DLT in the issuance, trading and in the regulation of security tokens, the national legislator has published Decree-Law no. 25 of 17 March 2023 containing urgent provisions on the issuance and circulation of certain financial instruments in digital form and simplification and FinTech experimentation.

There are also obstacles and problems regarding the reliability and security of the protocols and smart contracts underlying crypto-assets that fall within the definition of financial instruments: the underlying technology could lead to new forms of risk associated with the custody of security tokens, the compliance with transparency and reporting requirements that are not adequately addressed by applicable laws and practices.

At the same time, the creation of financial market infrastructures for crypto-assets falling under the definition of financial instruments is currently constrained by some requirements contained in the Union legislation on financial services which is not fully adequate for crypto-assets which fall within the definition of financial instruments and for the use of DLT. For example, crypto-asset trading platforms usually give direct access to non-professional investors while traditional trading venues typically allow access through financial intermediaries.

In this context, The DLT Pilot Regime would allow some regulated institutions to develop and test a DLT-based infrastructure for trading, custody and settlement of securities.

Authorized investment firms and market operators can apply under the DLT Pilot Regime to manage a DLT Multilateral Trading Facility (MTF DLT); authorized central securities depositories (CSDs) may apply for authorization to manage a DLT Securities Settlement System (SS DLT).

The DLT Pilot Regime would allow operators to apply for exemptions from certain regulatory requirements that have previously been identified as barriers to the development of new DLTs.

The Regulation establishes the basic requirements for operation, which are similar to those for equivalent traditional market infrastructures. However, applicants can ask for exemptions from some technical requirements which cannot be met in view of the technology used.

The European Commission underlines that any regulatory approach towards DLTs must be pro-innovation, also allowing the creation of ecosystems to support innovation while respecting the principle of technological neutrality.

In October 2022, the Financial Stability Board (FSB) published a framework for the international regulation of crypto-asset activities. The main topics of this framework are:

- Recommendations to promote the homogeneity and comprehensiveness of regulatory, surveillance and control approaches to crypto-asset activities and markets and to strengthen international cooperation, coordination and information exchange.
- General recommendations for regulation, oversight and control of global stablecoin provisions to more effectively address financial stability risks.

6.2 Security Token Regulation – Switzerland

The Swiss legislator has adapted the current financial legislation considering technological developments and security tokens. On 1 August 2021, the federal law on the adaptation of federal law to developments in distributed ledger technology came into force, which adapted all current Swiss financial legislation on financial services to the new DLTs and security tokens. In particular, a new type of securities was introduced: the registered value right. Pursuant to the Swiss Code of Obligations (CO), a registered value right is a type of financial instrument registered in a DLT ledger which can only be exercised and transferred via this ledger.

The legislator has not regulated the type of DLT ledger necessary to issue a registered value right, however it has indicated the requirements that this ledger must have in order not to constrain the type of technology to be used.

6.3 Security Token Regulation – Germany

Germany has not implemented a specific regime for Crypto-Assets and instead takes a technology-neutral approach, regulating security tokens generally in the same way as other financial instruments.

Security tokens in Germany qualify as financial instruments under the German Banking Act (KWG). The German Federal Financial Supervisory Authority (BaFin) describes security tokens as granting the relevant holder rights to assets that are comparable to those of a shareholder or bondholder. In this respect, security tokens generally constitute securities (financial instruments) within the meaning of the German Securities Trading Act (WpHG) and the German Prospectus Act (WpPG).

As part of its blockchain strategy (blockchain - Strategie der Bundesregierung), the German government introduced the Electronic Securities Act (eWpG-E“) in Germany. The Electronic Securities Act creates an alternative to paper debt instruments, introducing the possibility of issuing certain categories of securities (bearer bonds, covered bonds) also through an electronic register and without the need for a corresponding physical certificate.

Germany recently further expanded the scope of its new regulatory regime for e-securities: On June 18, 2022, the German cryptocurrency shares regulation (Verordnung über Kryptofondsanteile – KryptoFAV) entered into force. The KryptoFAV introduces the possibility to issue mutual fund shares (Sondervermögen) via decentralized crypto-asset ledgers which are typically based on distributed ledger technology (DLT).

The KryptoFAV provides that the basic provisions of the eWpG for crypto securities registries and crypto securities apply, mutatis mutandis, to shares of crypto funds provided that:

- References to crypto stocks and bonds are understood to be references to crypto fund shares;
- References to terms and conditions are intended as references to the fund rules;
- References to the beneficiary are intended as references to the investor.

In derogation to the eWpG, only (i) the custodian (Verwahrstelle) of the investment fund or (ii) a custodian-appointed firm authorized for the registry of crypto securities under the KWG may act as registrar. In engaging such a firm, the depositary must ensure that it is able to fulfill its legal duties in its capacity as depositary of the investment fund.

6.4 Security Token Regulation – France

In France, in the current state of the legislation, only financial instruments that are not eligible for the operations of a central depository can be registered in a blockchain.

Security tokens qualify as financial instruments within the meaning of article L. 211-1 II of the French Monetary and Financial Code (CMF). French law allows financial instruments to take the form of tokens and be registered in a DLT ledger (dispositif d'enregistrement électronique partagé - DEEP) only if they are not registered in a centralized depository system (CSD).

In France, the blockchain Order has established a regulatory framework in French law that governs the representation and transmission of unlisted financial securities via DLT.

The blockchain Order makes it possible to issue and transfer security tokens in the form of units or shares of collective investment organizations not admitted to the operations of a central depository, negotiable debt securities and shares and bonds not traded on a trading venue pursuant to the MiFID II directive.

This law allowed for the extension of a previous law, introduced in 2016, which allowed the use of DLTs for the purpose of recording the issuance and sale of PMI mini-bonds.

With regard to Crypto Funds, the Loi Pacte provides that two types of alternative investment funds (AIFs) can invest in digital assets:

- Specialized professional investment funds (fonds professionnels spécialisés (FPS)), provided that they comply with the liquidity and valuation rules applicable to them;
- Professional private equity investment funds (fonds professionnels de capital investissement (FPCI)), with a limit of 20% of their assets.

The marketing of these funds is restricted to professional investors and high net worth individuals.

6.5 Security Token Regulation – Luxembourg

On 29 November 2021, the Commission de surveillance du Secteur Financier (the “CSSF”) published a Press Release entitled “CSSF Guide on Virtual Assets” as well as some FAQs on “Virtual Assets”, which were updated on 4 January 2022. These two initiatives follow up on a previous publication by the CSSF on “Financial Innovation: a challenge and an ambition for the CSSF”.

In its recent FAQ on the UCI Administrators Circular, the CSSF also clarified that any UCI administrator acting as a registrar can use the DLT to maintain the register of unit/shareholders. In this regard, the CSSF stated that it is necessary to have a “technological neutrality” and “maintain a flexible regulatory approach in order not to hinder new opportunities and remain open to innovation”.

6.6 Security Token Regulation – UK

With no clear legal framework in place, regulators are trying to regulate digital assets outside the existing legal framework, dividing what they consider security tokens and what they consider E-Money Tokens; the rest of the universe, on the other hand, is not yet the object of the activity of the regulators.

However, the regulator has launched some “crypto-sprint” initiatives to deeply analyze and address the issues arising from a regulatory point of view.

In February 2023, the FCA launched a consultation on “Updating and improving the UK regime for asset management.” Among the topics analyzed: Tokenization of fund shares (Fund tokenisation; investment of funds in tokenized portfolio assets and cryptoassets (Tokenised portfolio assets; Investment in crypto assets).

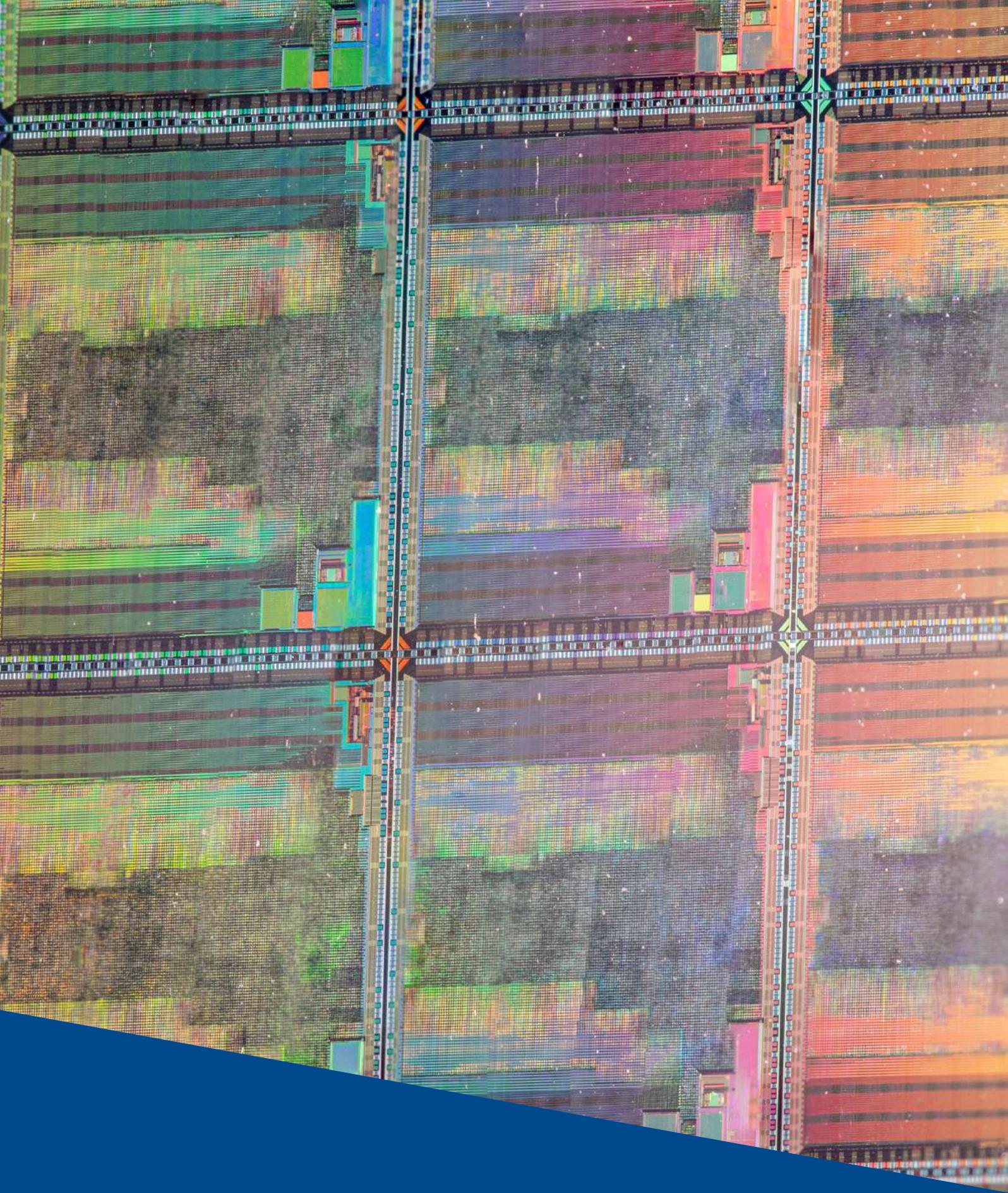
6.7 Security Token Regulation – Ireland

The CBI has recognized the possibility for two alternative investment funds reserved for qualified investors to obtain indirect exposure to cryptocurrencies. The two funds can now obtain a low level of exposure to cash-settled bitcoin futures traded on the Chicago Mercantile Exchange, a US-registered derivatives clearing organization. It is the first time that the CBI has approved a type of indirect crypto exposure for a QIAIF²¹, a type of fund available only to professional investors with a minimum subscription amount of €100,000.

6.8 Security Token Regulation – Italy

In Italy, Decree Law no. 25 of 17 March 2023 containing urgent provisions on the issuance and circulation of certain financial instruments in digital form has been published. The Decree Law implementing the DLT Pilot Regime Regulation was issued in consideration of the urgent need to introduce adequate regulations on emissions and circulation through distributed ledger technology (DLT), in order to prevent Italian operators from being at a competitive disadvantage compared to other operators established in Member States. The provisions apply to different categories of financial instruments, including shares or units of Italian collective investment undertakings.

21. “Qualifying Investor Alternative Investment Fund”



7. DEFINITION OF TEST ENVIRONMENT AND THE INVOLVED PLAYERS IN THE WORKING GROUPS

7. Definition of test environment and the involved players in the working groups

The world of tokenization requires the coexistence of traditional players and new players linked to Distributed Ledger Technologies, including some blockchain platforms. In order to determine how these platforms, the use of blockchain and security tokens can improve the processes currently in place in traditional systems, a test laboratory was organized. Through this laboratory, traditional actors had the opportunity to use the platforms, evaluate how they could be further developed in the future to obtain a higher level of operational efficiency and think about how the adoption of digital assets could solve the procedural pain points present today.

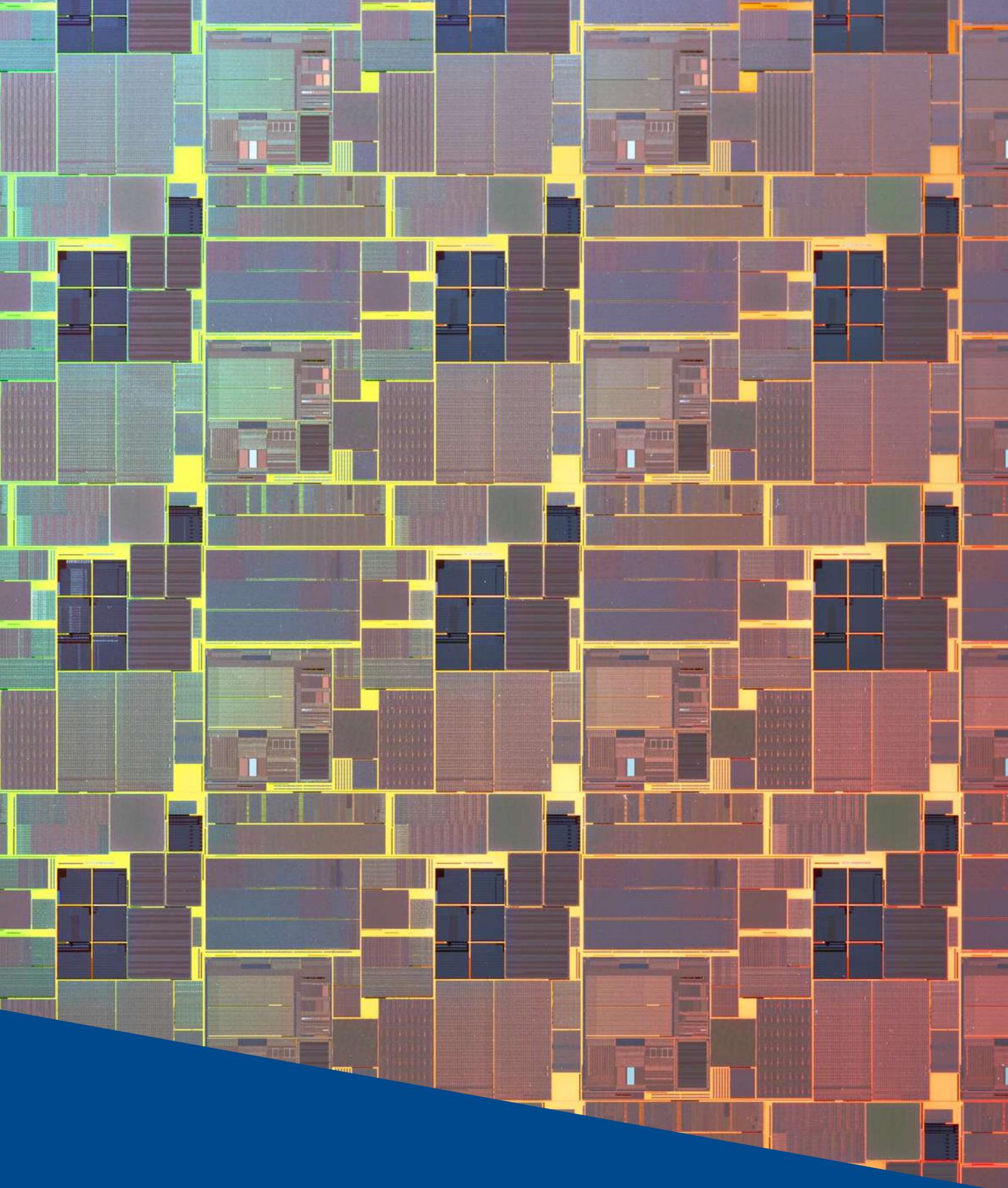
Six working groups took part in the laboratory, involving Asset Managers, Distributors and Custodians of the main financial groups active in Italy.



Fig. 9 - Working Groups



Fig. 10 - Test platforms



8. LABORATORIES

8. Laboratories

8.1 Tokenization of Fund Shares

The first use-case of the laboratory concerns the use of blockchain technology for the issuance of digital tokens representing units of transferable investment funds. Tokens allow the optimization of processes related to the issue and exchange of fund shares, and can also offer new opportunities for control and transparency.

In this context, the Issuing Platform plays a central role, as a junction point between all the players operating in the Asset and Wealth Management chain who have access to the management of operational flows linked to the management of fund share tokens.

8.1.a As Is Scenario

Traditional ways of subscribing, converting and redeeming fund shares:

Subscription

1. The Investor gives a subscription order to the Distributor;
2. The Distributor sends the order to the Asset Manager;
3. If the Investor uses the wire transfer as a mean of payment, the Distributor credits the fund account held by the Asset Manager with the Custodian for the corresponding amount;
4. If the Investor uses checks as a means of payment, the Asset Manager sends any checks received from the Intermediary to the Custodian Bank;
5. The Asset Manager calculates the number of shares to be assigned to the Investor based on the value of the relative NAV;
6. The Asset Manager produces the confirmation letter and sends it to the Investor;
7. The Asset Manager confirms the execution of the order resignation of the Investor to the Distributor;
8. Once the payment received from the Intermediary has been settled (see point 3 or 4), the Custodian Bank updates the fund's liquidity account;
9. The Custodian Bank validates the issue of the certificates (registered or bearer) or, if the Investor does not request physical delivery, updates the cumulative certificate.

Conversion

1. The Investor issues a conversion order to the Distributor;
2. The Intermediary sends the order to the Asset Manager;

3. The Asset Manager calculates the value of the shares of the outgoing fund and determines the number of shares to assign to the Investor in the incoming fund;
4. The Asset Manager produces the confirmation letter and sends it to the Investor;
5. The Asset Manager confirms the execution of the Investor's order to the Broker;
6. The Asset Manager communicates the operations performed to the Custodian Bank in order to allow the performance of the tasks assigned to it;
7. The Custodian updates the fund's cash account based on the conversion instruction;
8. The Custodian Bank verifies the accuracy of the updates and validates the issue of the certificates (registered or bearer) or, if the Investor does not request their physical delivery, updates the cumulative certificate. Based on the target funds chosen by the Investor, several Custodian Banks may be involved in the operational process.

Redemption

1. The Investor gives a redemption order to the Distributor or the Asset Manager;
2. The Intermediary sends the order to the Asset Manager or, in the case of direct assignment of the order to the Asset Manager, the latter, if necessary, requests confirmation of the execution of the order from the Intermediary;
3. The Asset Manager sends the payment instruction in favor of the Investor to the Custodian Bank;
4. The Asset Manager produces the confirmation letter and sends it to the Investor;
5. The Asset Manager confirms the execution of the Investor's order to the Distributor;
6. The Asset Manager communicates the operations performed to the Custodian Bank in order to allow the performance of the tasks assigned to it;
7. The Custodian Bank makes the payment to the Investor through bank transfers, checks or other means of payment chosen by the Investor in compliance with the provisions of the fund regulations;
8. The Custodian updates the fund's cash account based on the redemption instruction.

8.1.b Tokenized Funds Introduction

A tokenized fund, also known as a digital fund or BTF (blockchain-traded fund), is a fund in which the shares are represented digitally and can be traded and recorded on a distributed ledger. A tokenized fund uses code to mimic the functionality of a traditional fund and replaces shares with tokens. The differences between investing in a fund and owning the tokens that represent fund shares are not substantial, however, there can be important process rationalizations.

Tokenizing a fund does not change the way a fund is valued. A fund's valuation continues to be determined by its net asset value ("NAV").

The DLT registry keeps a record of the issued tokens and is updated as transactions occur on the network. There is no central register of subscribers and the distributed nature of the register allows participants to see their holdings in real time.

In the DLT network the parties in the fund ecosystem remain relatively unchanged, although the presence of a network operator is required and some roles of existing parties will evolve. For example, the asset management company will not have to maintain a central register of shareholders and the role of custodian could involve holding the private keys of investors, supervising and monitoring the transaction approval process and maintaining the register. The custodian, fund accountant and anyone else who reconciles their books and records with the subscriber register will no longer have to do so as they will have direct access to the DLT records via their network node. Investors will also have a node and this could be customized according to their needs/obligations; for example, retail investors may have slightly different needs/obligations than institutional investors. Even consultants could have insight into each of their clients via their own node.

Furthermore, each token can act as a database and therefore can store additional information that might not otherwise be available with a "traditional" fund share. For instance, a security token can indicate both legal ownership and rights, providing additional information such as ESG risks, AML and KYC and much more. This additional information can help measure the fund's performance in line with its objectives and constitutional documents, while also facilitating different forms of reporting.

8.1.c Results

Thanks to the use of the platform provided by Allfunds blockchain and the activities carried out by the working groups, relevant ideas emerged related to the benefits and obstacles deriving from the introduction of a tokenization solution for fund shares and its impact on the traditional model.

Impact on traditional processes

From the discussions that took place in the context of the laboratory, it emerged that a tokenization model of fund shares could have a strong impact on the traditional process and on the role of the players in the current Value Chain.

In particular, the following considerations were highlighted:

- **On-Chain and Off-Chain activities:** the transformation of the processes of the value chain depends on how many and which processes will be managed On-Chain and Off-Chain, also in consideration of a gradual migration process.

It is important to define which part of the process can be optimized through the blockchain, which activities will necessarily have to be managed Off-Chain and which will be the methods of integration between the blockchain and traditional Legacy systems, analyzing in particular KYC, AML, Taxation, Calculation Fees and Performance and Cash Management (essential to enable Delivery Versus Payment or DvP).

The methods of managing IT flows will also have to be analyzed, as the collection of information and the ways in which it is conveyed will change. A potential goal could be to gradually improve the efficiency of the value chain without removing current roles and players.

- **Notarization and smart contract:** blockchain technology can be used by focusing mainly on its notarization property or by exploiting its higher potential through smart contracts to automate processes (e.g. negotiation and transaction).

- Notarization: only exploit the timestamping / notarization / certification function. Timestamping on blockchain differs from “traditional” timestamps since there is no reference to a third-party certification body and the costs of the service could be reduced.

- Smart contracts: use smart contracts for the development of platforms to enable the issuance and movement of fund tokens between asset managers, distributors, and other actors involved in the process (custodian, TA, etc.).

It is possible to hypothesize a sequential approach of the two scenarios, with a first approach to the blockchain using its notarization and timestamping properties to then subsequently experiment with all the potential offered by the management of smart contracts.

- **Key custody provider:** it is a key role to be defined promptly since one of the most impacted activities of the Value Chain is the key custody. How wallet’s keys are held is a topic of fundamental importance: losing your private key means you no longer have access to your digital assets.

The key custody service requires specific regulations which define the specific requirements and obligations aimed at ensuring that it is carried out by regulated and supervised entities.

To obtain a greater degree of security, it would also be appropriate to adopt specific solutions for the management of private keys.

Barriers to adoption

Below are the main obstacles to the adoption of a tokenization solution for fund shares highlighted by the working tables.

- **Technological skills:** the implementation of an infrastructure for the issue and management of shares of tokenized funds in which legacy systems and blockchain interface needs the presence of highly specialized skills within an organization. The lack of user-friendly and easy-to-use applications means that access to the blockchain by operators today requires a complex technological approach and the need to internalize specific skills.
- **Risk and Cyber Risk:** the security level of permissionless blockchains is progressively increasing, however the technology can still be particularly exposed, particularly where the blockchain interfaces with legacy systems. Although encrypted, much information on the blockchain is public and can be consulted/used to carry out On-Chain analyses. The reputational, IT/operational and business risks associated with these aspects must therefore be properly managed.
- **Digital currency and fiat connection:** the introduction of a Trustless DvP system is linked to the use of Crypto/Stablecoins backed by physical cash and therefore to the availability of “digital” liquidity on the blockchain for the financial institution. While waiting for the availability of Central Bank Digital Currency (CBDC), a “scalable” solution could be represented by the use of stablecoins which, waiting for regulation, are recognized/authorized by a supervisory authority and / or national / supranational body. In the absence of a secure solution with these characteristics, it could be also considered using instruments such as E-Money Tokens. A hypothetical Stablecoin would presuppose a double liquidity to manage (both Stablecoins and fiat currency) with the related implications on the tax, accounting, risk management and liquidity management side.
- **Compliance:** one of the most complex processes concerns KYC/AML compliance. The On-Chain management of these processes may require a specific blockchain integration. The immutability of On-Chain data could hinder the possibility of eliminating data owned by the customer at his request, with consequent impacts in terms of GDPR and the need to follow “Data Pulverization” procedures.
- **Cross-border operations:** the fund subscription and redemption mechanism is a process that is not fully harmonized between the various European legislations. More analyses are needed to understand the impacts generated by the introduction of the blockchain in the process, for example on cross-border taxation and on the granting of authorizations for cross-border sales.

Benefits

Below, the main benefits highlighted by the participants.

- **Data Security and Governance:** the tokenization of fund shares can bring benefits in terms of data security and governance, particularly in cases where documentary certification is required (e.g. document set linked to an illiquid asset, KPI certifications ESG); the latter, in fact, can be included in the blockchain and connected to the data room of the underlying asset with timestamping certification. This system could lead to lower operating costs, lower operating risks, more transparency and less workload for the administrative functions of an asset management company.
- **Operating model evolution:** working on permissionless blockchain with wide geographical adoption enables a global product offer, connecting markets and distributors in more efficient ways. An example of a public blockchain that could become a common standard, considering its level of adoption and the possibility of managing smart contracts, is Ethereum, with possible uses of Layer 2 (Rollups) that could also solve problems related to the public sharing of information (Zero Knowledge Proof, ZKP). These benefits, in the case of a permissioned blockchain, would require interoperability between the various infrastructures or the availability of a widely used permissioned blockchain that becomes a market standard. On the other hand, this type of architecture, thanks to governance by a central authority and less exposure to potential external threats, could present an advantage in terms of control and security.
- **Transparency:** through the issuance of a security token it is possible to incorporate the rights and obligations of the token holder into the token, together with a unique and immutable ownership record (the account of the final investor is not visible on the blockchain anyway). These characteristics allow: the parties involved to understand each other's rights and obligations; to obtain information on the past ownership of the token and therefore to have a clear, transparent and definitive chain of ownership; to reduce information asymmetries and improve the price identification mechanism thanks to the availability of transactional data and punctual information relating to the issuer and the assets.
- **Operational Efficiency:**
 - Automating manual components: blockchain could improve the quality of time-consuming operational processes with a significant manual component (e.g. management of physical certificates, affixing of real guarantees and restrictions on the shares held).
 - Speed of Settlement: Depending on the asset classes contained in the fund, it is possible for a tokenized fund to facilitate T+0 settlement through DvP On-Chain, for both subscribing and redemption investors. The current operations of the funds typically envisage a settlement cycle of subscriptions and redemptions at T+2 / T+3. The NAV process for tokenized funds will not change.

- **Transferability:** given the intrinsic nature of tokens, the transfer of tokenized fund shares could be simplified by transforming fund shares into digital tokens, with the possibility of exchanging tokens more easily between industry players. This should therefore lead to greater “liquidity” of the tokens, a particularly interesting quality for funds characterized by a low degree of liquidity.

The same is also true for fund managers, who can better address potential illiquidity issues by trading tokens and thus expanding their investment portfolio.

8.2 Funds investing in digital assets

The second use-case of the Laboratory refers to funds that invest in security tokens or other digital assets (e.g. Crypto-Currencies, Stablecoins) issued by third parties or in a decentralized manner. As the tokenization trend progresses, the financial and real assets represented by digital assets will progressively increase. The focus was directed towards portfolio issues as well as everything concerning the Digital Asset Custody activity and the related control activities.

8.2.a Market context

Institutional Funds that invest in digital assets

The PwC Global Crypto Hedge Fund Report 2022²² offers a clear overview of the importance and growing scale of institutional investments in the international Digital Asset landscape. The latter shows that the total assets under management (AUM) of hedge funds operating on the crypto market rose to almost \$4.1 billion in 2021 from 3.8 billion the previous year, with an increase of \$300 million in only one year. The same report had indicated a total AUM value of 2 billion just 2 years ago. This data demonstrates the rapid growth of the market and the attention that institutional investors pay to this sector today.

There are currently over 300 cryptocurrency hedge funds, more than half of which were launched in the past 3 years. Most funds were launched during periods of rising BTC prices, with more moderate activity in less bullish years.

22. <https://www.pwc.com/gx/en/financial-services/pdf/4th-annual-global-crypto-hedge-fund-report-june-2022.pdf>

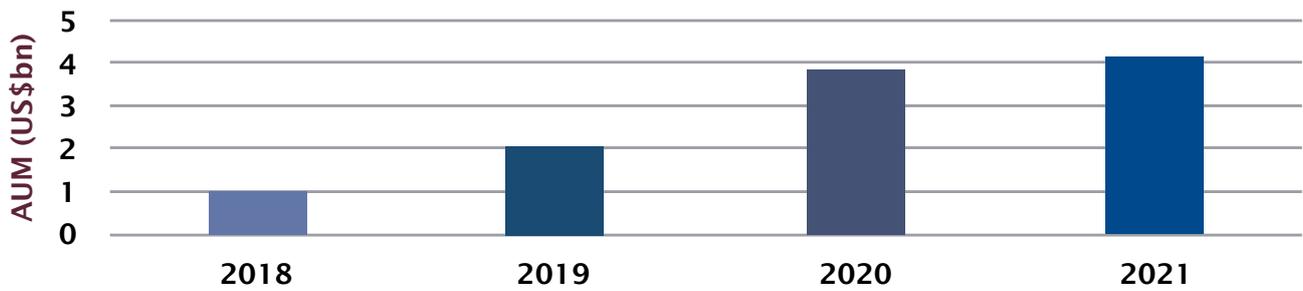


Fig. 11 - Crypto Hedge Funds Total AUM

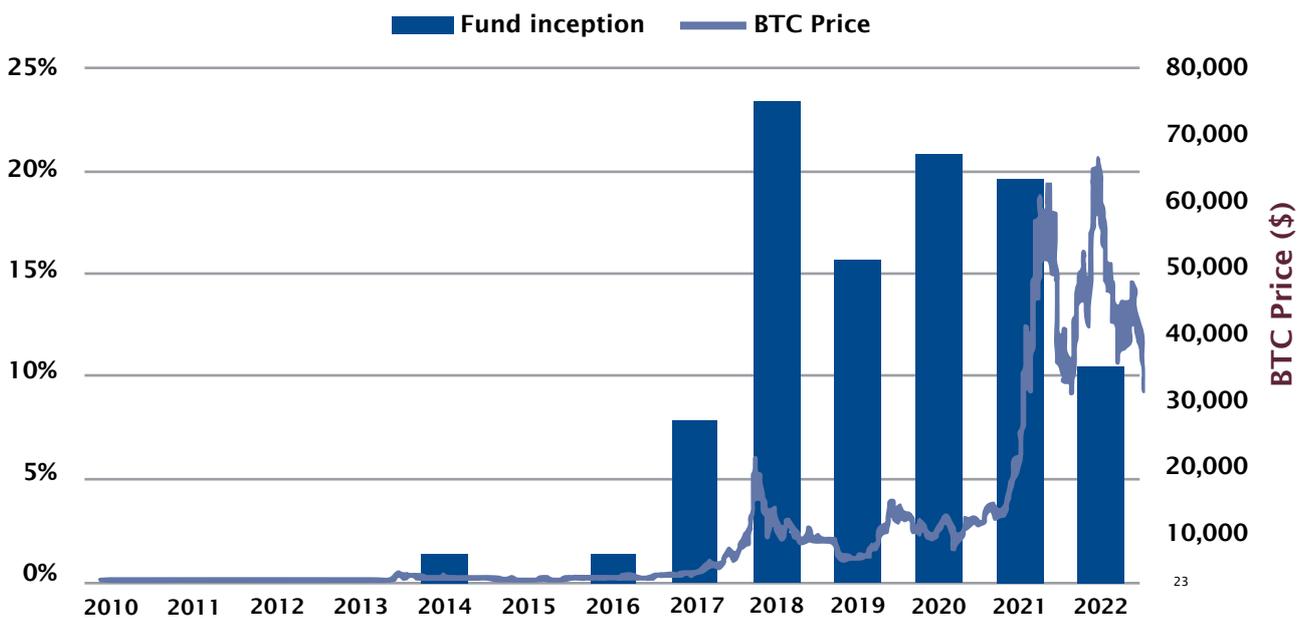


Fig. 12 - Fund inception vs BTC price

We had seen a similar trend in the distribution of traditional hedge funds in 2020, where a few large funds manage the majority of assets, with a long tail of smaller funds. At the end of 2021, however, there are fewer funds with low AUM levels, while a large growth is reported in the number of funds managing over \$20 millions. The cryptocurrency bull market in early 2021 has potentially boosted AUM growth and investor investment sizes leading to an increase in AUM of the sector as a whole.

23. PwC Global Crypto Hedge Fund Report 2022

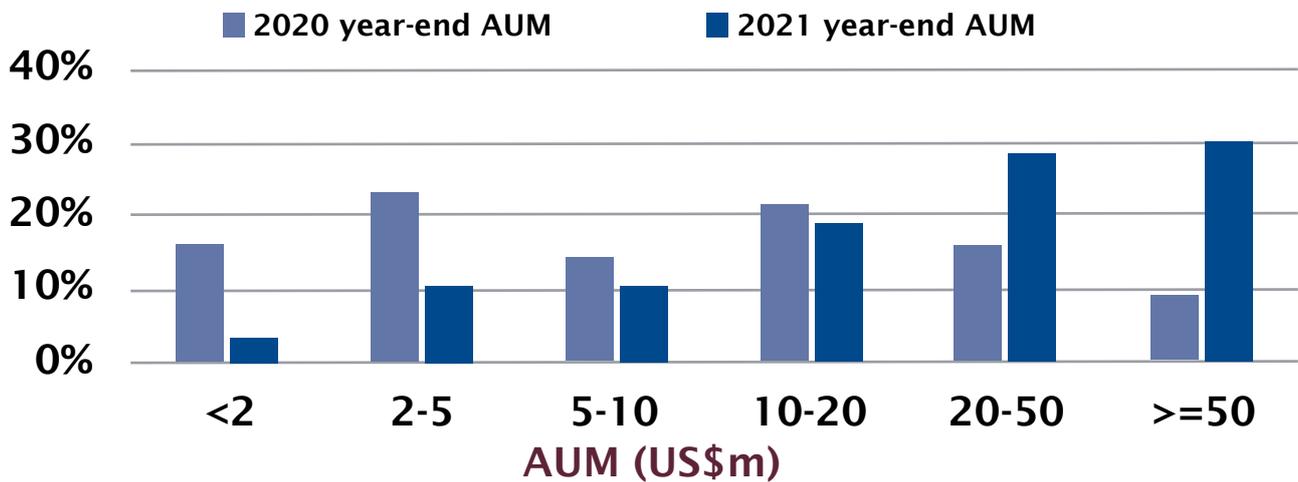


Fig. 13 – AUM Distribution

As for the most traded Crypto-Assets, over 80% of the funds trade bitcoin and ether, 51% Solana, 48% Polkadot, 42% Avalanche and 39% Uniswap.

Around one-third of hedge funds surveyed are currently investing in digital assets, up from one-fifth in 2020 (rising from 21% to 38%). These, on average, invest around 4% of their AUM in digital assets, compared to the 3% reported in the previous year’s survey. The most active funds in the sector, which have invested more than 5% of their AUM in digital assets, represent only 20% of the interviewees; the largest hedge funds (with \$5bn of AUM or more) all have less than 1% of their total AUM in digital assets.

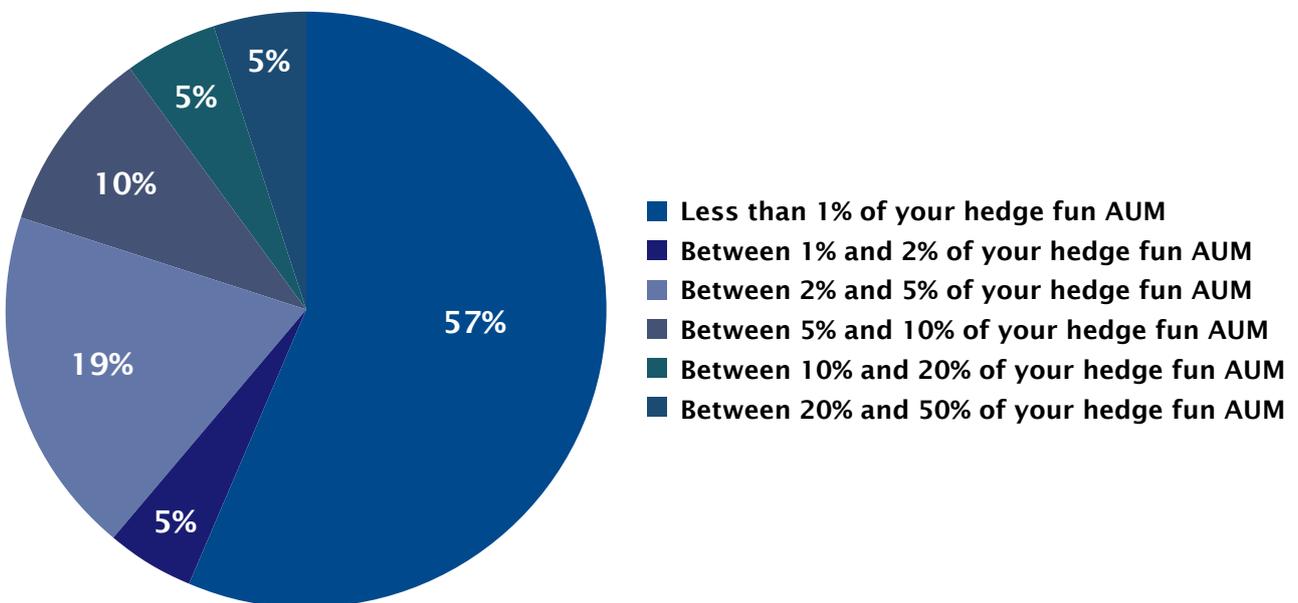


Fig. 14 – Share of the AUM invested on digital assets

Two-thirds of hedge funds (67%) that currently invest in digital assets intend to invest more capital in this asset class by the end of 2022, down from 86% last year. 29% of traditional hedge fund managers surveyed who are not yet investing in digital assets confirmed that they are planning or looking to invest at a late stage. About a third of them say that if key regulatory barriers were removed, they would actively accelerate their engagement/investment in digital assets (27%), up from 18% last year.

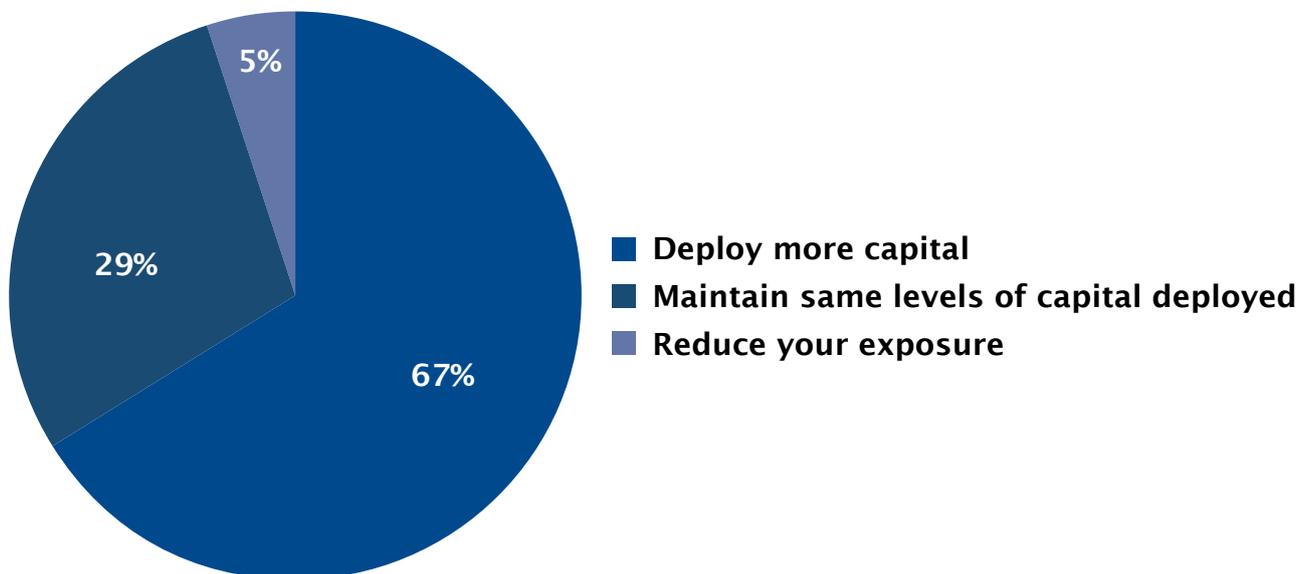


Fig. 15 - Level of Exposure

Funds that invest in digital assets internationally are growing rapidly and investment opportunities and strategies are constantly being developed and improved. In fact, the growth potential of institutional investments in Crypto-Assets is still very large and, as more and more investors are attracted by these new opportunities, their assets under management could continue to increase significantly.

Of particular interest is the news that Hauck & Aufhäuser Innovative Capital has launched a highly diversified crypto fund that invests directly in cryptocurrencies with a value chain fully subject to the German regulation, composed as follows:

- Smart contract Platforms 44% (ETH, SOL, BNB ...);
- Cryptocurrency 22% (BTC...);
- DeFi & Trading 12% (UNI, AAVE...);
- Metaverse & Web 3.0 10% (MANA, SAND...);
- Data & infrastructure 9%.

24. <https://www.hal-privatbank.com/haic-crypto-native-advanced-select>

The recent events observed in the world of cryptocurrencies (the FTX scandal is particularly relevant) have significantly cooled the enthusiasm of investors towards the world of crypto-assets. These events have highlighted the significant vulnerability of a market context with regulations in the definition phase and which do not yet provide for adequate controls. However, it should be emphasized that the current crisis has in no way called into question the validity and robustness of DLT technology and, therefore, the possibility of its profitable use in the world of investments. Recent events have only brought out once again the need for both effective regulation and the establishment of appropriate control/supervision measures to fully protect end investors.

8.2.b Results

Through the use of the test platform provided by ConsenSys and the discussions carried out by the participants, valuable insights emerged regarding the benefits and obstacles deriving from the inclusion of digital assets among investment asset classes managed by funds and the impact generated on traditional operating processes.

Impact on traditional processes

From the discussions between the groups it emerged that, for the use case of Investment in digital assets, the impacts at the value chain level are less than for the use case on the tokenization of fund shares, as all the distribution aspects remain potentially unchanged and the roles of the Asset Manager and Asset Servicer do not change.

On the other hand, the impacts at the operating process level are particularly significant, specifically:

- The Execution process, concerning the purchase and sale of financial instruments and their master data;
- The Pricing and Valuation phases of the share, above all in the event that funds also invest in digital assets that do not represent financial instruments;
- Cash management and risk management;
- Corporate Action and Income processes;
- The rules of Investment Compliance and regulatory compliance on reporting.
- Lastly, there are impacts on the custody aspects of digital assets and possible controls by the custodian, as it is crucial to monitor the management of keys, the consequent ability to control the assets, as well as the verification of ownership of the same.

For the majority of the participants, the security token pricing methods do not undergo substantial changes compared to the traditional methodologies applied for the underlying assets. Pricing is driven by the nature of these instruments.

Also in the case of alternative closed-end funds that invest in NFTs, as in the case of illiquid products from alternative investments, the pricing will be based on the rules and methodologies already used today to quote similar illiquid instruments, but with due further precautions. However, more doubts remain about which trading platforms will be authorized and regulated or which new info providers will communicate directly with the various solutions based on Distributed Ledger or again about the need for a specific reference authority for the pricing of some more innovative products.

Only a few participants believe that there could be a significant impact compared to the traditional pricing model.

Digital asset subject to investment

As regards the digital assets in scope for investment purposes, there are some clarifications to outline.

- **Cryptocurrency:** some participants have excluded them from the sphere of their interest for reasons of lack of transparency in the price setting mechanisms and in the information available to the market, as well as for reasons of high volatility and lack of a clear reference legislation (at least until adoption of the MiCAR).
- **Stablecoin:** an evolution of the specific legislation is deemed necessary, the issuer of the stablecoin must fulfill minimum information, security and transparency obligations.
- **NFT:** although particularly interesting, it is considered more appropriate that, at present, they remain only an object for additional analyses.
- **Security tokens:** compliant with the definition of financial instruments contained in MiFID, they are considered the most suitable category of digital assets for investment purposes.

Barriers to adoption

The main obstacles highlighted by the participants are the following:

- **Technological skills:** the lack of specific skills means that the approach to the blockchain and investment in digital assets by operators is highly cautious and requires an adequate technological approach.
- **Risk and Cyber Risk:** the level of security of the blockchain is progressively increasing. However, the technology can still be considered particularly exposed, in particular - for example - in the points where the blockchain interfaces with legacy systems. Although encrypted, much information on the blockchain is public and can be consulted/used to carry out On-Chain analyses. The reputational, IT/operational and business risks associated with these aspects must therefore be properly managed.
- **Digital currency and fiat connection:** the introduction of a Trustless DvP system is linked to the use of Crypto/Stablecoins covered by physical cash and therefore to the availability of “digital” liquidity on the blockchain for the financial institution. While waiting for the availability of Central Bank Digital Currency (CBDC), a “scalable” solution could be represented by the use of stablecoins which, waiting for regulation, are recognized/authorized by a supervisory authority and / or national / supranational body. In the absence of a secure solution with these characteristics, you can also

consider using instruments such as E-Money Tokens.

A hypothetical Stablecoin would presuppose a double liquidity to manage (both Stablecoins and fiat currency) with the related implications on the tax, accounting, risk management and liquidity management side.

- **Regulatory definition of digital assets:** absence of a complete and homogeneous regulatory framework at European level that can cover all types of digital assets and therefore facilitate their inclusion in investment portfolios.
- **Regulation of the Digital Asset Depository:** absence of legislation defining the obligations and responsibilities of the Digital Asset Depository. In this context, it should be noted that the role of the Depository and the presence of specific service providers are key elements for the development of investments in digital assets.
Another element of attention is that new subjects operating today, belonging to the digital ecosystem, can offer private key custody services even though they are not subject to a regulatory and supervisory regime comparable to that of traditional securities custodians. This has immediate negative effects on mechanisms and levels of transparency, security, protection and end investors safeguards compared to investments in traditional instruments.

Benefits

Below are the main benefits highlighted by the participants:

- **Industry Benefits:** Asset Managers can benefit from the extension to traditional investors of the possibility of accessing the Digital Asset market.
Enabling additional services (e.g. Staking) in a way with price points, fees, reduced operational complexity and greater security than what is present on the market, could generate new sources of revenue and allow penetration of a young and constantly growing market.
- **System benefits:** for some participants, the possibility of investing in digital assets through a transparent and regulated model such as Investment Funds would allow investors to access innovative asset classes in a more secure way, and the regulator itself to better monitor their streams²⁵. For other participants however, the investment in digital assets could constitute a risk as specific players who should play the role of Key Custody Provider are not subject to a regulatory and supervisory regime comparable to traditional securities custodians.
- **Operational benefits:** compared to the traditional operating model, some participants have highlighted that the method of investing in digital assets would bring a series of potential advantages including: reduction of manual activities, reduction of execution times, greater transparency and accessibility of information, reduction of counterparty risks, simplified access and greater liquidity for specific investments.

25. From this point of view, the Supervisory Authority would have the possibility of monitoring, in real time, the activity of the network in an aggregate manner without the need to have constant visibility on the counterparties carrying out the transactions. However, when there is a need to enter into the merits and carry out checks on the transactions of network participants, the authority, through its inspection powers, will be able to have access to all the detailed information to complete the check.

8.3 Focus on Use Cases' Key Topics

During the discussions between the participants, different topics that deserved a specific deep dive emerged, as they were considered particularly relevant.

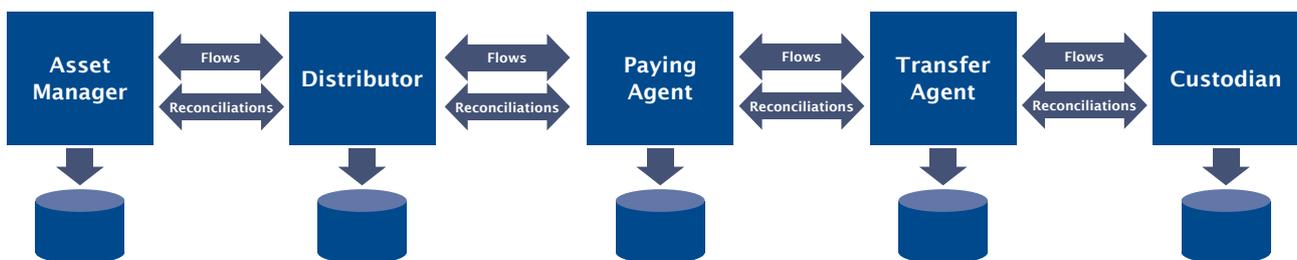
Delivery versus Payment enablement

Delivery versus Payment (DvP) is the clearing and settlement process that ensures that the delivery of an asset takes place only after the counter value has been paid. The tokenization of financial securities makes DvP even more relevant, since the two operations take place simultaneously and the process is automated, guaranteeing greater transparency, security and speed in trading the token.

The enabling of Delivery versus Payment (DvP) was one of the topics most discussed by the participants; it was pointed out that the enabler considered most appropriate in this sense is the introduction of a Central Bank Digital Currency (CBDC).

The current distribution processes involve the participation of several players: Asset Manager, Distributor, Paying Agent, Transfer Agent, Custodian Bank and others.

The Value Chain



- **Multiplication of flows and elaborations for each actor**
- **Operating costs**
- **Processing time**

Each actor part of the chain inevitably introduces the need for information flows, processing, controls and with them execution times and operational risk.

It is important to consider that the introduction of a Trustless DvP system is linked to the use of tokens representing cash or solutions integrated with traditional payment systems:

- **E-Money Token:** E-Money Tokens could be efficient for intra-bank transactions, while for a wider market they could be less scalable, as each financial institution could create its own E-money limiting decentralization and interoperability.
- **Stablecoins:** the digital assets closest to central bank currency are Stablecoins collateralised in “cash and cash equivalent” (e.g. USDC, EUROCC, USDT), although there are still doubts about their effective collateralisation. Another possibility to analyze is a possible tokenized commercial bank currency- **Commercial bank stablecoin** - which would offer more control with less scalability.

One of the most widely considered options is the use of stablecoins issued by a supervised and regulated counterparty. This possibility will be regulated by MiCAR which requires that this activity be provided by a “credit institution” or by an authorized Crypto-Asset Service Provider (CASP).

- **CBDC:** if founded on interoperability criteria with permissionless blockchains, the CBDC would act as a bridge between the traditional monetary world and the digital monetary world. The introduction of CBDCs is considered the method with the least implications on the tax, accounting, risk management and liquidity management side.

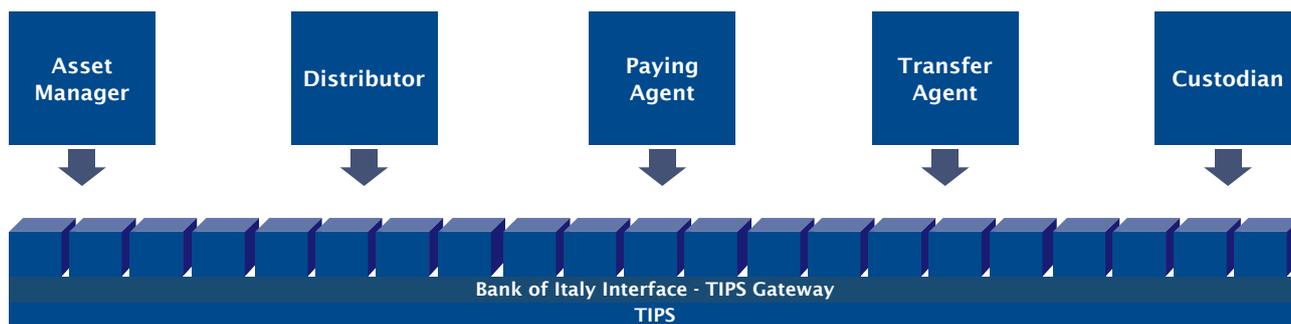
- **Integration with Payment System**²⁶

Another DvP regulation method, recently tested by the Bank of Italy, leverages central bank money and offers two different methods:

- **DvP with cash tokenization:** an approach that provides for the temporary tokenization of central bank money present in Target2 accounts by the Bank of Italy and the use of these tokens to enable the DvP, with their subsequent burning within a few seconds. This approach requires direct integration with a specific blockchain, but opens the door to possible extension to commercial banks (allowing settlement with commercial bank money).
- **DvP with Hash-Link Contract (HLC):** blockchain agnostic approach inspired by the Hash-Time Locked Contracts (HTLC) protocol which needs an active role by Banca D'Italia through TIPS Gateway. Also in this case the money used for the settlement is central bank money present in the reserve accounts of Target2.

26. Integrating DLTs with market infrastructures: analysis and proof-of-concept for secure DvP between TIPS and DLT platforms
- Banca d'Italia

The Value Chain with DLT DVP



- **Single technological backbone for all the Value Chain**
- **Minor costs flows and elaborations**
- **Same timing as an instant wire transfer**

A system like the one described above could constitute a “technological backbone” to which each participant in the value chain of the distribution process could look out to provide and receive data and in which:

- The information and control flows could be delegated to the DLT and known to the various participants according to established confidentiality criteria;
- The action of payment and allocation of shares could be collected, “logically”, in an atomic transaction.

Among the benefits that would be brought with the introduction of DvP mechanisms it is possible to hypothesize: a recovery of efficiency in terms of management costs beneficial for the investors, the reduction of order execution times through the immediate allocation of shares to the subscriber’s securities dossier and with a consequent improvement in the investment experience, an increase in the transparency of the process increasing trust in the banking system and the asset management industry.

However, some non-marginal aspects still need to be solved, such as:

- Definition of the share value to be used in case of instant transaction;
- Definition of appropriate programmable rules within the security token, which ensure the correct management of subscriptions avoiding “trading” practices.

Blockchain Permissioned and Permissionless

The issue of choosing between Permissioned or Permissionless “solutions” for enabling activities on tokenized fund shares is a relevant subject of debate in the market, whose players continue to wonder about the trade-off between costs, risks and benefits in using the different options.

Permissioned Solutions. From the discussions of the participants it emerged that the use of permissioned solutions brings greater control over transactions, greater customization and fewer implications on the compliance and taxation side since it would be possible to operate in a “closed” mode, where the regulator himself could actively participate and check the data needed for monitoring.

In the event that it is chosen to opt for the use of a solution based on a Permissioned infrastructure, it would be advisable to structure a consortium-type organization and operate with a hierarchical access to information.

It is also crucial to identify the infrastructure governance model that best suits the project needs.

Permissionless solution. Permissionless blockchains can bring numerous benefits given by greater interoperability and distribution, with a consequent increase in security and a reduction in costs given by the possibility of taking advantage of a pre-existing infrastructure. The interoperability of solutions that operate on Permissionless blockchains therefore represents a particularly relevant aspect as it allows for easier integration, high data and information exchange capacity between all the different applications developed on the same blockchain. This is due to their nature and above all to the presence of a global community that uses the same technological infrastructure and the same programming language.

The use of a Permissionless solution, such as Ethereum, allows the user to take advantage of pre-established rules and conditions, such as the consensus algorithm, the validating nodes, the native coin for the settlement of the On-Chain transactions.

Permissionless blockchains can thus facilitate collaboration between systems through their shared architecture and the presence of common standards.

However, Permissionless blockchains are also characterized by some critical issues which have limited their institutional adoption in the past. Among these there is certainly the risk linked to the governance model of the technological infrastructure itself and on which the applications can then be developed. This risk has been highlighted again by the recent cases of the blockchain Terra²⁷ and the blockchain Solana crisis²⁸.

These events have demonstrated the vulnerabilities of the two technological infrastructures since they were too dependent on the token in one case and on a concentration of validating nodes in the other. Crises resulting from similar events or even changes to the parameters of a blockchain can have serious consequences on all the solutions that depend on it. If an application is developed on a blockchain that is compromised or abandoned, the platform could be forced to migrate its code to another compatible one or to develop the solution again, incurring huge economic losses.

Some of these critical issues are managed through the following technological measures:

- **Permissionless solution with access restrictions:** some market players are testing the use of permissionless solutions with specific restrictions (DeFi for Institution), with models for which platforms are developed to guarantee access only to a selected number of investors identified through KYC, limiting the risk associated with total openness to the market while maintaining the benefits that a public blockchain can bring compared to a private one.

27. The case is related to the collapse of the Terra-luna token, the UST algorithmic stablecoin and the Anchor protocol.

28. The case is related to the bankruptcy of FTX and Alameda Research.

- **Layer 2:** a possibility to exploit the advantages of a Permissionless blockchain but with additional protection mechanisms and limitations is to use an Ethereum Layer 2, faster, scalable and customizable infrastructures based on Ethereum. Even more interesting could be the use of a Layer 2 based on Zero Knowledge Proof (ZKRollup), which provides the same benefits while including additional privacy features.
- **Standard security token (this is also valid for permissioned ones):** it is important to bear in mind that specific security token standards (e.g. ERC 3643, ERC 1400) despite being issued on a Permissionless blockchain provide greater control, bringing the advantages that would be obtained through a permissioned blockchain. Whoever has the keys of the relative contract manages the token and can apply customizable logics of exclusive access for selected stakeholders, KYC, validation, blocking and recovery.
- **Data encryption:** Finally, to overcome the requirements of transparency and respect for privacy, although the transaction ledger is sometimes public, it is possible to use encrypted versions (alphanumeric strings, “hash”) of data and confidential information kept in clear text only Off-Chain.
Regardless of the concept of public and private, it is inevitable to first define the trade-off between privacy, security, transparency and scalability. there is the need to understand the focus and priorities of the specific need to use the most appropriate form of Distributed Ledger Technology accordingly.

Transparency and confidentiality

The issue of transparency and confidentiality, in the management of customer relations or the operational activity of asset managers, have been the subject of in-depth debates.

Executing the fund’s investment orders on the blockchain would allow other participants partial visibility into the day-by-day tactical asset allocation, although in encrypted form. The issue extends to strategic asset allocation in the case of reserved funds.

The main risks that follow require a detailed assessment considering that the asset allocation represents the know-how of the Asset Manager, if not exactly the qualifying and distinctive element in the case of active management.

Key custody providers

For the custody of digital assets, a clear distinction must be made between ownership verification and asset management. Since blockchain is a Distributed Ledger Technology, ownership information is available to network participants. The ability to sign a transaction and dispose of digital assets is determined by the possession of the specific private key; the custody of this key, consequently, appears to be strictly connected to the availability of the asset itself.

The complex role of Key Custody Provider is believed to be performed by a regulated and supervised entity on the basis of a specific discipline which will define its requirements and obligations.

It is of fundamental importance that the custody of the keys is entrusted to entities that meet the same requirements and the same supervision that the entities that offer traditional asset custody services respond to today. The possession of the keys corresponds to the actual access and management of the digital assets.

As far as wallets are concerned, in determining the preference of one type over another, it is necessary to consider the trade-off between availability/access times to the asset and security:

- **Hot Wallets:** connected to the network, with a higher speed in the operational execution of transactions, but with a lower level of security due to several additional risk factors.
- **Cold Wallet:** not connected to the network and therefore considered more secure at the expense of ease of use and accessibility to carry out transactions.

To obtain a greater degree of security, it would be appropriate to exploit specific solutions for the management of private keys (eg multisig, MPC), or rather services which allow the execution of an irrevocable transaction to be linked to the authorization by several regulated actors.

Blockchain and Energy Consumption

When choosing the blockchain platform to adopt, it is also advisable to take into account the ESG impact of the various solutions considered, in particular with reference to CO2 emissions.

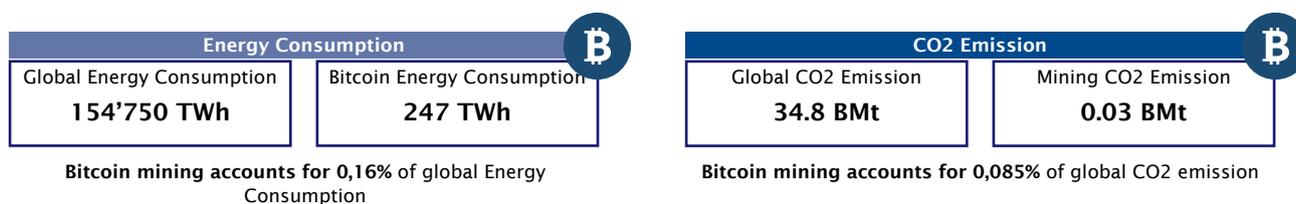
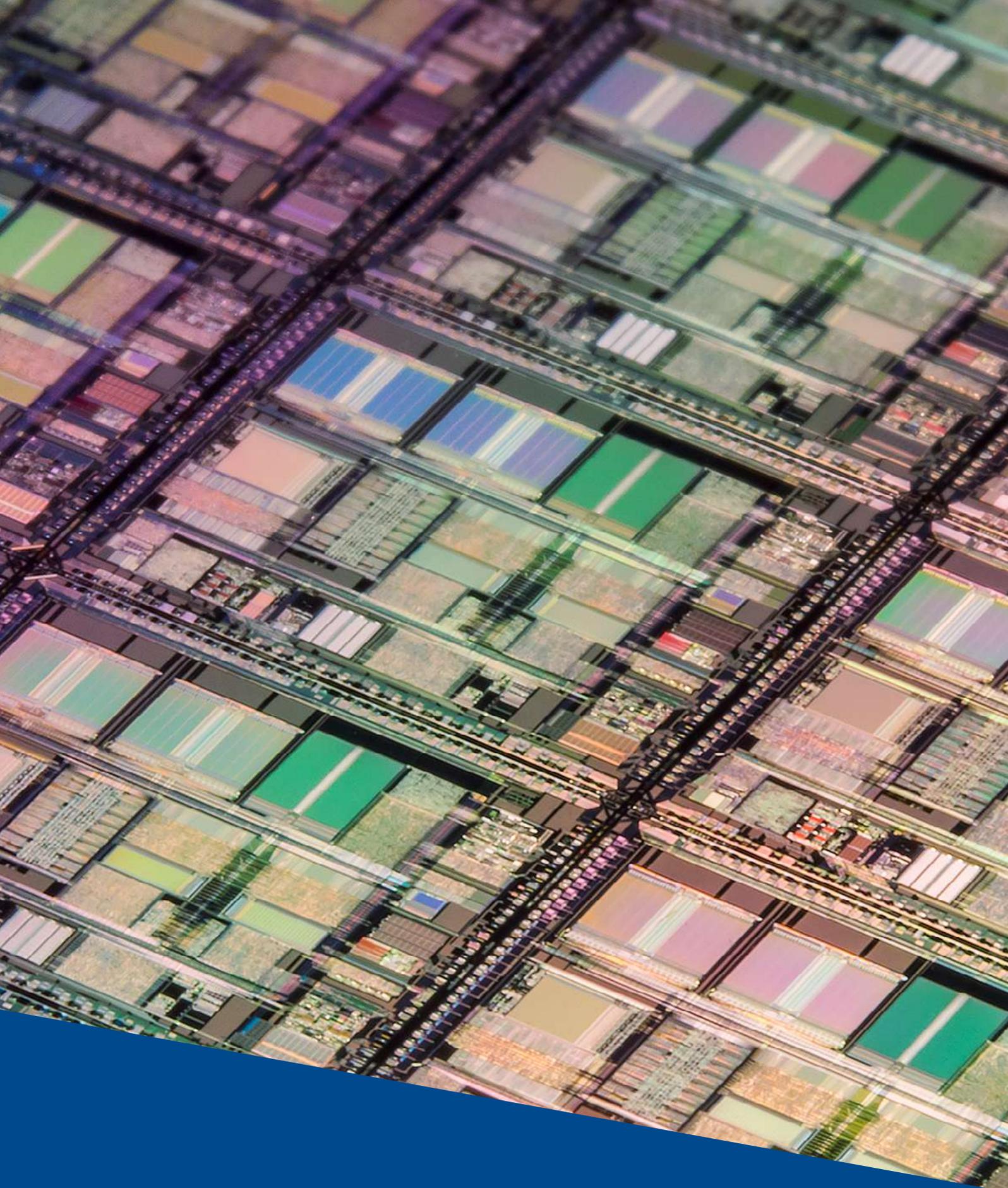


Fig. 16 – BTC Mining Energy Consumption

Almost all of the security tokens are issued on blockchains that are based on the Proof of Stake consensus mechanism, which is characterized by a significantly lower energy consumption than the Proof of Work mechanism and therefore on mining. For example, it is estimated that the transition of Ethereum (the blockchain that supports most of the security tokens issued on the Permissionless blockchain) from PoW to PoS leads to a reduction of about 99.95% of its total energy consumption²⁹.

29. Ethereum Foundation Blog



9. CONCLUSIONS

9. Conclusions

Distributed Ledger Technology combines different technologies and can be developed with different functionalities, depending on the needs of the project that relies on it. Each DLT has its own characteristics and specific features and for this reason it can be a complex technology to understand.

The benefits it could bring to the world of Financial Services become increasingly clear over time, and precisely in this regard it becomes necessary to carry out a correct assessment of the risks associated with its development, implementation and use.

The analysis of impacts, benefits, and barriers to adoption described in this white paper are by no means exhaustive and may not align perfectly with every business type and scope of blockchain.

The aim was to identify the issues that currently require further study, thus directing the work of professionals and Supervisory Authorities towards issues considered relevant by the market.

Below is a collection of the primary areas of study identified:

- **Issuance, registration and circulation of financial instruments in digital form:** also taking into account the requests represented by Assogestioni, Decree Law no. 25 of 17 March 2023 was published on 17 March 2023 containing urgent provisions on the issuance and circulation of certain financial instruments in digital form. The Decree Law implementing the DLT pilot was issued in consideration of the urgent need to introduce adequate regulations on emissions and circulation through distributed ledger technology (DLT), in order to prevent Italian operators from being at a competitive disadvantage compared to other operators established in Member States. The provisions apply to different categories of financial instruments, including shares or units of Italian collective investment undertakings.
- **Digital assets and Obligations of the UCI Depository:** with reference to the investment of UCIs in security tokens, it is necessary to clarify, for the purposes of identifying the obligations and responsibilities of UCI custodians: (i) whether the security tokens must qualify as «financial instruments that can be held in custody» (in the same way as dematerialized financial instruments) or that must be classified as “other assets” and therefore subject to the Depository’s obligation to verify ownership by the UCI; (ii) how the other duties of the Depository should be fulfilled in a system for the circulation of financial instruments in digital form, including the surveillance obligations as well as the functions related to the execution of the operator’s instructions.
- **Key Custody Provider:** the role and responsibilities of the Key Custody Provider must be clearly defined, especially with reference to liability issues in the event of loss of keys, insurance coverage, certifications, outsourcing rules and domiciliation of servers and infrastructures. A regulatory system capable of guaranteeing at least the same level of security envisaged by the current legislation as regards the custody and safeguarding of the assets held by a UCI should be evaluated.

To obtain a greater level of security, it would also be appropriate to exploit specific solutions for the management of private keys (e.g. multisig, MPC), or rather services that allow the execution of an irrevocable transaction to be linked to authorization by multiple regulated actors.

- **Evaluation of digital assets and Pricing:** it is necessary to clarify the methods of evaluation and pricing to be adopted in the case of investment of UCITS in digital assets, especially where these assets are different from security tokens.
- **Other Technology Providers:** the implementation of solutions based on DLT introduces the need to interact with new technology providers for which a legislation that is consistent with that in place for traditional solutions (e.g. regulatory requirements: SOC I, SOC II, vulnerability testing, intrusion detection/protection and DDoS; audit/approval/certifications eg ISO2700x, pci) should be provided . The legislation will have to ensure high standards of protection for investors, savers and robustness of the economic and financial market. The definition of dedicated guidelines should be envisaged, taking into account other European legislation (see Bank of Italy Communication on decentralized technologies in finance and crypto-assets).
- **Permissionless solutions with “restrictions”:** the choice to use a DLT technology for the tokenization of fund shares and/or for the investment in digital assets is above all a strategic business decision that must be evaluated also taking into account the risks and costs associated with it.
Many participants showed particular interest in the possible use of a Permissionless solution (with appropriate arrangements at the smart contract level) in order to make the most of the potential and interoperability offered by the latter; otherwise, others have emphasized the security and high degree of control afforded by a permissioned architecture.
- **Definition of a system smart contract for UCITS:** the work carried out in the laboratories has shown that the process of issuing and managing tokenized fund shares is possible at a technological level through suitable platforms. The results that emerged provided ideas for determining the essential elements to be taken into consideration for the definition of Guidelines containing the minimum set of data and rules for a smart contract to “control” tokens representing UCI units (“Smart Rule”) in compliance with current legislation and the peculiarities of the national asset management market (for example taxation, establishment of restrictions on shares, etc.).
- **Enabling Delivery-versus-Payment:** During the laboratories it emerged that the possibility of carrying out the DvP On-Chain, between tokenized fund shares and legal tender currency - through the most appropriate type of payment token in terms of efficiency and security - it is essential to be able to appreciate the benefits of tokenization. According to the provisions of the DLT Pilot Regime Regulation: the settlement of payments can be made using central bank money, where possible and available, or, where it is not possible or available, using commercial bank money, also in the form of tokens or in electronic money token (cf. art.5 par.8).
- **Suitability of DLT to guarantee the essential safeguards - KYC/AML On-Chain:** ensure the suitability of DLT to guarantee the essential safeguards envisaged by current legislation, overcoming the duplications and inefficiencies as well as identifying the

minimum DLT infrastructure requirements that create an equivalent situation of “control” on the chain. In this perspective, it is considered necessary to evaluate the possibility of being able to create customer “digital identities” (in line with European regulations) to verify the KYC/AML status in real time and process the investor’s transaction, avoiding duplication of collection effort and verification of data from intermediaries.

From the analyzes reported in this white paper it is evident that tokenization can bring numerous benefits to fund managers, simplifying the operational underwriting processes, bringing advantages in terms of security, interoperability, transparency and operational efficiency, accelerating the digitization of their offers and extending the range of investable assets they manage.

There are many hurdles to overcome before these benefits can materialize. The biggest obstacle of all is time. The transition of a global industry into the future cannot be accomplished in a single leap. The danger is that the inevitable duration of the transition to the new model becomes a brake on innovation. It is therefore of primary importance to build solid foundations today for what will be built tomorrow.

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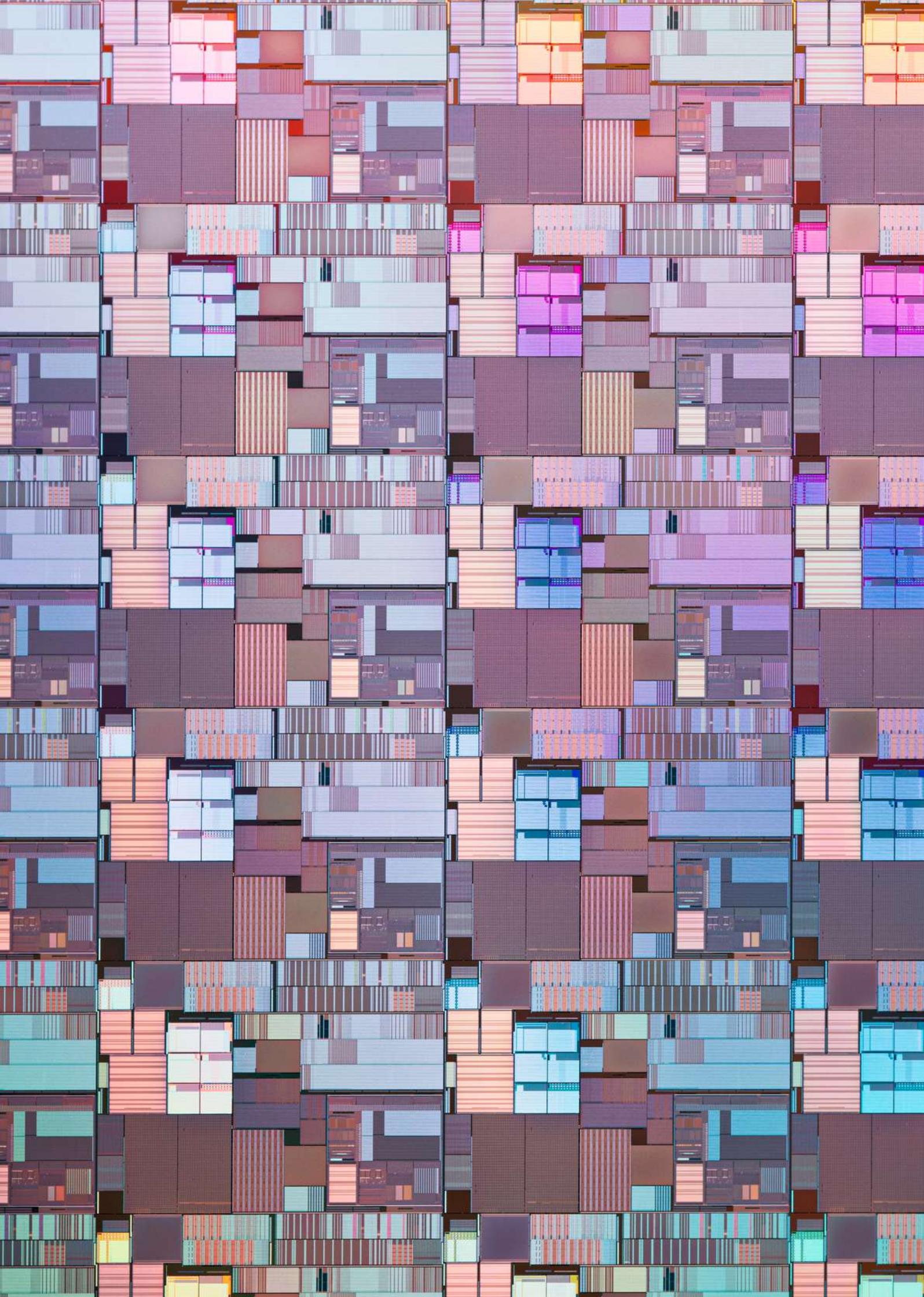
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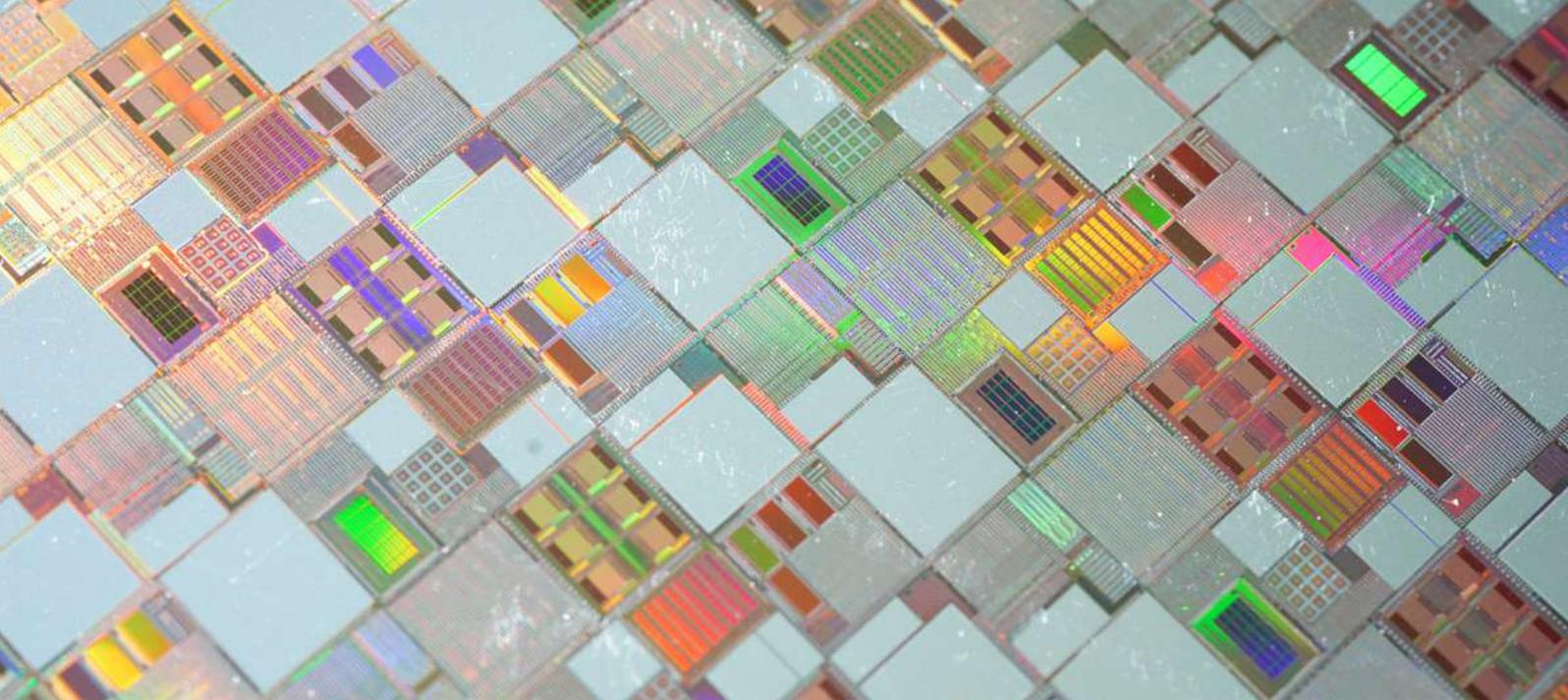
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10. Who is Assogestioni

Assogestioni is the representative association of the Italian investment management industry. It represents most of the Italian and foreign investment management companies operating in Italy, as well as banks and insurance companies involved in investment management, including pension schemes.

The association's main purpose is to foster the investment management industry in Italy through the establishment of a regulatory and market environment in Italy which is conducive to growth. To achieve these goals, Assogestioni offers to its members advice and technical support on legal, fiscal and operational matters. It also encourages its members, financial and public institutions to debate on themes involving savings, investments, sound corporate governance and regulatory and operational improvements.





ASSOGESTIONI

associazione del risparmio gestito