Impacts of digitalisation on trading and post-trading

1. Key new technologies for the securities market

An industry representative observed that there is a great deal of variability in the way that technologies such as artificial intelligence (AI), cloud computing and those that underpin digital assets such as distributed ledger technology (DLT) and smart contracts are being used in the securities market. For all these technologies, however, there is still significant room for maturity and opportunities to take advantage of. The technology with most maturity in terms of implementation and with the greatest potential to be used in production for large scale applications in the securities space, at least in the short term, is cloud computing. This is followed by AI, which is already used for a number of smaller scale use cases, and blockchain, which has been extensively tested by the securities industry.

It is important to identify the added value of new technologies compared to existing ones, the industry representative stressed, and how they may better serve evolving client needs, e.g. in terms of product improvement, new product features and opportunities for compressing the value chain. The new generation of users coming into the market is also asking for new services and ways of consuming financial services that may change the value chain. One challenge is that the main users of market infrastructures are often relatively conservative and tend to focus on currents needs and challenges, rather than anticipating how these needs may evolve and what would be needed to support them in a more disruptive way. Possible future evolutions need considering when implementing new technologies.

An industry representative noted that the potential of new technologies has been explored for many years by different players operating in the securities value chain. Recent years have seen a major leap in technology offer and capacity in DLT, data analysis, AI and quantum computing and client expectations have grown in parallel. It is now time for financial institutions to roll out these technologies and deliver the expected benefits. Many companies operating in the securities market are however not large enough to manage all these developments in house, so partnerships have to be developed with tech companies in certain areas. Financial institutions should identify core services and focus in-house developments on the areas where they can build a competitive advantage or need to retain control when implementing these technologies. The speaker's organisation, a major asset servicer providing custody and fund administration services is focusing in-house developments on three main areas. DLT technology is such a potential game changer for the securities industry that it should be managed internally as far as possible, in close relationship with regulators and with participation in as many marketplace trials as possible. A second area is digital asset custody that also has significant potential. A third area is data analysis and reconciliation, which is at the heart of an asset servicing firms' value proposition and is a major differentiating factor. Sometimes data held with third parties is inaccessible, so it is preferable for asset servicing firms to perform data analysis internally, in order to retain the capacity to provide accurate and reliable information.

For technologies outside the asset servicing provider's core offer, or those requested by a low number of clients, such as AI applications to conduct predictive investor behaviour analysis or to obtain usable ESG data, it is necessary to find a cost-efficient way to implement them, the industry speaker stated. Rather than purchasing and integrating a solution as a white-labelled product, which may be costly, the best solution is for financial institutions to negotiate a cooperation agreement with a technology provider. The asset servicing provider should seek out solutions and provide the underlying data, while tech companies render the service based on cutting-edge technology products. Specialist staff with experience in the securities industry is also needed to ensure an effective implementation of those technologies.

2. Use cases of new technologies and lessons learned

The Chair noted that experiments with various technologies are being conducted across the value chain. There has also been a move from experiments to live use cases in production. Some use cases enable significant optimisation and efficiency gains and help to overcome difficulties experienced in the traditional world. These are also some challenges around maturity, scalability and operational resilience that need to be overcome. The Chair asked the panellists to illustrate how new technologies such as DLT, cloud and AI are used to enhance efficiency and resilience in the securities trading and post trading space and the related opportunities and benefits.

2.1 Cloud computing

An industry representative explained that cloud computing has been used for over a decade by securities market infrastructures and there are many live applications in the securities sector. These focus mainly on data management at present, but many opportunities exist around using data analytics in the cloud to drive better insights for clients and transferring applications to the cloud in order to drive further standardisation and efficiency. The speaker's organisation, a financial market

infrastructure, has over 50 non mission critical applications in the cloud, Progress is being made to ensure that applications can be implemented in the cloud with a level of resilience and performance and a capacity for recovery in line with regulatory requirements.

A second industry representative noted that some markets have started moving to the cloud. The speaker's organisation, a stock exchange, has moved one of its options trading markets to the cloud and work is ongoing in the US to move some equity derivative clearing activities of OCC to the cloud in 2025. There is significant interest from customers about moving central clearing systems into the cloud, but regulators must also be brought into the conversation. Many regulators are using cloud applications themselves. Cloud is also a prerequisite for using AI and machine learning applications effectively, as it enables the scale and elasticity of data without which using those technologies would be very challenging.

2.2 Artificial intelligence (AI)

An industry representative stated that currently AI has many interesting albeit relatively small scale use cases in the securities market. The challenge is the availability of sufficient standardised and quality data to train AI models, despite the data-driven nature of securities activities. Opportunities exist around the use of natural language processing (NLP) and optical character recognition (OCR) technologies for collecting and digitising unstructured data and for effectively processing the data by eliminating human error. These technologies can also be used to create better data insights for investors and issuers and support better trading and portfolio management decision-making. The new generation of generative AI should also allow a further enhancement of clients' and employees' experience, help to optimise software development and contribute to reducing friction in the value chain e.g. for transaction execution.

An industry representative noted that AI can be used to manage securities markets more efficiently. New dynamic order types can be created that use AI to determine the time period e.g. evaluate based on data whether an order should stay as a resting order or time out. AI-based approaches are also being used in the US for determining equity options strike prices.

2.3 Blockchain and tokenisation

An industry representative stated that blockchain, including DLT and smart contracts, is expected to significantly impact the securities industry in the coming years. The industry has been testing and evaluating the impact of this technology for some years and it is expected to reshape the securities value chain, even though it may not be adapted to all asset classes. Broad adoption has not yet been seen but many experiments have been conducted. There are 34 examples at the global level of bonds being issued on the blockchain by multiple parties and 13 examples of private equity being issued in a tokenised form. While these are not yet repeatable formats because the technology to allow this is not yet available, these experiments are helping the industry to understand

and validate various models for using blockchain in these areas.

However, every single one of those issuances has used a different protocol and different underlying technology, the industry speaker stressed, so currently there is fragmentation. Thinking is underway about the core capabilities that are needed in the securities space and how to establish the standards and frameworks that are needed. For custody and control activities, this requires defining roles and responsibilities in a blockchain environment and how clients and counterparties can secure agreements. It also means identifying the specificities of digital asset securities and how these can be managed in different use cases such as mutual funds or private equity funds. This seems feasible since the number of stakeholders and the level of interconnection is currently lower than in public equity or fixed income markets.

A second industry representative noted that blockchain and smart contracts are already being used in a number of markets and there are several examples in the Nordic region. The Nordic Sustainable Bond Network has been using smart contracts for two years. A project called Puro, trading carbon credits in tokenised form on a permissioned blockchain, is due to go live by the end of 2023. In the US, subject to regulatory approval, the speaker's firm is preparing the launch of a digital assets subsidiary that will provide crypto asset custody services on a public permissioned layer 1 DLT. Work is also underway with a South American CSD in conjunction with the central bank to tokenise government bonds. In this case the existing CSD technology will be used and the delivery versus payment (DvP) settlement will be processed in the CSD, with a digital layer on top of the traditional settlement layer. Customers around the world are indicating in the same way that they want to leverage their existing technology in the new digital environment in order to preserve existing legal protections and settlement finality. This is however challenging to achieve and is not only a question of technology.

DLT can be used to modernise securities markets and enhance their efficiency, the industry speaker observed, in a context where trading message traffic is exploding. Pre-pandemic there were about 50 billion messages a day in the US, it went to 120 billion during the pandemic and now a volume of 200 billion a day is being anticipated. Clients are also expecting 24/7 trading and the related liquidity. How new technologies such as DLT may support these evolutions is being assessed. Current use cases of DLT centre on executing transactions more efficiently and transparently, but they are not designed for handling intensive processing. Payment and securities transaction platforms must be able to run in a highly intensive and continuous way in the future, as these are the expectations for market infrastructures.

A third industry representative explained that their organisation, a multinational bank, has been working on tokenising trade finance, which is one of their core businesses. A project was conducted with the Hong Kong regulator and the BIS Innovation Hub to move to a more public blockchain with more participants. The objective is

to build a proof of concept for programmable payment tokens that can provide SMEs with supply chain finance. There is also on-going work with the Singapore regulator to develop that concept further and introduce a layer of securitisation. Underlying supply chain finance transactions would be pooled together and asset backed securities technique would be applied to this pool of receivables in order for it to be tokenised. This means not just tokenising the supply chain receivables, but also the securitisation layer. This introduces new questions and complexities, but would help to maximise the potential of the underlying technology. One of the key priorities for reaping the full benefits of DLT is to ensure that DLT systems are interoperable, to support the transition from a series of private blockchain transactions to a public chain and the interoperability between DLT platforms and existing technology.

An official explained that the Banque de France has adopted a learning by doing approach to the testing of new technologies such as blockchain. The aim is to explore how blockchain can optimise some market segments which are not yet sufficiently automated. Areas being explored include the use of blockchain technology for wholesale payments and DvP in domestic, cross border and cross-currency contexts[1]. Multiple DLT platforms are being tested, including public and private blockchains. The central bank is agnostic about these models, provided it can retain control over its CBDC. The current focus is on two major types of use cases: the settlement of tokenised assets and cross-border payments. Experiments showed that CBDCs can simplify reconciliation flows for tokenised assets and reduce trade to settlement processes, and that implementing digital cash on the ledger can maximise DLT benefits and optimise post-trade functions. Interoperable CBDC and multi-CBDC arrangements also have significant potential for improving cross border payments, especially remittances, notably by optimising correspondent banking models. Tests are also being conducted in other areas, such as automated market maker (AMM) applications[2] for optimising liquidity management. Several aspects remain to be further tested, notably the scalability and resilience of such solutions and the interoperability of DLT systems between them and between DLT and legacy systems[3].

A second official observed that temporary solutions have been proposed for combining existing payment systems with a DLT securities platform, to speed up the uptake of these solutions. A so called trigger solution has been tested by the Bundesbank to provide a technical bridge between DLT securities platforms and the existing payment systems in the euro area. Starting with this temporary solution for the settlement leg of transactions seems preferable as a first step for allowing faster progress, rather than trying to achieve a full implementation of a DLT system integrating wholesale CBDC settlement from the start. Settlement in central bank money should however remain the final target, to mitigate payment settlement risk.

3. Risks from the use of new technologies in the securities trading and post trading space

The Chair suggested that the use of new technologies in securities markets may create new challenges and pose risks that need to be clearly identified.

An official challenged the idea that risks may significantly diminish or disappear with the use of new technologies. They merely change form. For example, the use of atomic or instantaneous settlement with blockchain reduces settlement risk, eliminating replacement cost risk and principal risk in exchanging funds against securities. However, because this method requires pre funding almost by design, it might bring new risks in the form of reducing liquidity in the market, in particular in times of stress. If that is the case, this new technology might just be shifting risk from settlement to trading. Risks must therefore be thought of in a holistic way and a healthy dialogue between the industry and regulators about the potential risks as well as the benefits is necessary. There should be an iterative and dialectical process to identify the key issues and produce the best solution for tackling them.

There are four main potential risks from the use of new technologies for securities trading and post-trading processes, the official highlighted. First is the risk associated with settlement finality. There is an issue arising from probabilistic settlement in the use of DLT, and this is similar to issues associated with the use of DLT for stablecoins. The CPMI issued guidance on the application of the Principles for Financial Market Infrastructures (PFMI) international standards to stablecoins and on issues around settlement risk and finality in the use of DLT for payments. These discussions are also relevant to the use of DLT in securities settlement, because the decentralised structure might make it difficult to prevent or redress any mismatch between the technical and legal settlements. In many jurisdictions, systemically important payment systems or CSDs enjoy statutory protection of settlement finality in the event of a participant's failure. This same level of protection may not be available to DLT based solutions. This issue needs clarifying. Secondly, there is a risk associated with the safekeeping of underlying securities upon which tokens are created and circulated. The

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1. For example, in the Jura project, there was a DvP transaction involving the exchange of a Swiss franc central bank digital currency (CBDC) and a euro CBDC. This project was carried out by the Banque de France with the Swiss National Bank, the BIS Innovation Hub and Accenture. It showed that cross border and cross currency transactions could be optimised, especially where they involve long intermediation chains. This could imply changes to the role of intermediaries in future.
2. The Banque de France tested the AMM in a project with the Monetary Authority of Singapore (MAS) and the BIS Innovation Hub, and worked with the Swiss National Bank on Project Mariana.
3. An experiment is ongoing with SWIFT to interoperate DLTs with the Banque de France's real time gross settlement (RTGS) system.

underlying asset should be kept in custody and should not be used while related tokens are in circulation. Otherwise, there is a double duty and it would effectively lead to the unauthorised creation of securities, which is a violation of the very fundamental principle of custody of securities. Thirdly, there is a risk of a lack of transparency in the wider use of decentralised DLT solutions as opposed to centralised solutions, as quality data is more difficult to obtain in a decentralised environment. Fourthly, operational cyber resilience must be ensured. This is not unique to the use of DLT or tokenisation and decentralised structures may be more resilient against cyberattacks than centralised ones to a certain extent, but once a cyberattack happens, it may be more difficult to react to this situation in a decentralised manner.

A second official agreed on the importance of anticipating and tackling these risks in a context where technology is developing quickly, in order to avoid operational issues and the creation of new vulnerabilities.

4. Expected impacts and benefits from the DLT pilot regime

An official explained that the DLT pilot regime, which came into force in the EU at the end of March 2023, will facilitate the testing and benchmarking by market participants of new blockchain technologies and solutions. This should not solely be a prerogative of regulators and supervisors, and the private sector should also contribute. Experimentation and interaction between market participants and regulators in the DLT pilot regime will help to identify areas where regulation may need to evolve and regulatory barriers that may need alleviating. Fundamental policy objectives and principles should not change however and remain focused on avoiding market fragmentation, protecting investors and enhancing financial stability.

An industry representative explained that the DLT pilot regime is essential for increasing the market's comfort with using DLT platforms for exchanging tokenised financial instruments. The DLT pilot regime allows testing and learning around these platforms, which is vital for the uptake of the digital asset market. This will facilitate the involvement in these new projects of more traditional players, who were concerned by the initial objective of suppressing intermediaries with the implementation of blockchain. Their involvement is important because new technologies can strengthen existing traditional markets by improving the way securities are exchanged and custodied.

A second industry representative agreed that the learning by doing approach of the DLT pilot regime is relevant. Their organisation's DLT based Project Ion is a small use case but the technology was put into the production environment, which is highly regulated, and this allowed the consideration of performance, scalability and architecture issues, which are not possible to evaluate in an experimental environment.

A third industry representative added that it is necessary to consider how regulation should evolve to support a further dematerialisation and decentralisation of finance and the possible disappearance of certain intermediaries from the ecosystem. This could make it necessary to consider embedded regulation and how operational resilience can be achieved when there is no central entity to regulate or supervise.

A second official observed that, when thinking about the regulatory approach to the use of new technologies such as DLT and tokenisation, it is important to distinguish between their use by regulated and unregulated entities and also for retail and for wholesale activities. In addition, standards should be built recognising the different ways of achieving the same outcome, as with the PFMI principles, to remain applicable when technologies evolve or new technologies appear.

A third official welcomed the DLT pilot regime, which should allow the exploration of the conditions needed for the efficient implementation of DLT and of wholesale CBDC for effecting payments in central bank money on the blockchain. More activity is due to take place around wholesale CBDC at the Eurosystem level, in addition to the Digital Euro initiative focusing more on retail applications. Progress can only be made on these initiatives however if there is close cooperation between central banks and the private sector.