Regulatory Approaches to the Tokenisation of Assets

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Foreword

Blockchain and distributed ledger technology's (DLT) applications in finance have proliferated in recent years. The technology is now a significant feature of the fast-evolving FinTech landscape, from payments with central bank digital currencies and fiat-backed stablecoins, to post-trade with DLT-based clearing and settlement systems, from unregulated crypto-asset markets such as bitcoin, to the tokenisation of assets, with the latter now among the most prominent emerging uses for the technology.

Asset tokenisation, mostly theoretical just a few years ago, is now a reality with successful pilot projects around the globe. Early uses were largely centred around Initial Coin Offerings, associated with non-compliant financial instruments, unfulfilled promises to investors and outright scams. But in the years since, tokenisation has found a place in mainstream finance with use-cases in tokenised equities, bonds and commodities. The launch of the SDX platform for digital assets by the Swiss Stock Exchange gives a good indication of where we are headed.

Regulatory approaches to the tokenisation of assets documents and analyses the range of policy responses to emerging issues in this nascent market. Most regulators dealing with active tokenised markets have adopted a technology-neutral approach to policies and risks, applying existing financial regulations to tokenised assets. Some are introducing new, tailored frameworks for tokenised assets and DLT-based markets, others are defining new roles for new actors participating in such markets, while elsewhere existing regulation is being adjusted to address specific characteristics and risks unique to decentralised networks and systems.

DLT-based applications in finance are being developed and adopted in pursuit of benefits like speed, efficiency and transparency – but there are also risks to market participants. Examples abound in the early stage of development of tokenised asset markets, the high volatility of some of the products, and their possible operation in a non-compliant manner. This report identifies key regulatory issues in tokenised assets and markets that may warrant further attention from policy makers, in order to ensure that those tokenised assets that do fall under the purview of financial market regulators comply with regulatory requirements and are consistent with financial stability, financial consumer and investor protection, market integrity, and competition considerations.

Blockchain and other DLTs are set to become a fixture in financial markets in the years ahead, and may eventually lead to structural changes to market processes or even the market itself. This report is the OECD's latest contribution to help market participants and regulators understand how these technologies are used in financial markets; it aids in the assessment of implications and issues these emerging technologies present; and it puts forward a policy toolkit for asset tokenisation to inform regulatory responses. This is part of the OECD's ongoing commitment to promote international cooperation and collaboration, ensuring this technology develops in a way that supports fair and efficient financial markets and, by extension, better lives.

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Tokenisation of assets involving the digital representation of real (physical) assets on distributed ledgers, or the issuance of traditional asset classes in tokenised form[1] came to the forefront with the emergence of *mostly non-compliant* initial coin offerings in the period 2017-18. Today, tokenisation of assets, which is *mostly regulated*, is one of the most prominent use-cases of DLTs in financial markets, with implications for the functioning of the markets and for their participants.

Tokenised assets that fall under the purview of financial market regulators should comply with regulatory requirements that promote financial stability, financial consumer and investor protection, and market integrity while promoting competition (OECD, 2020[1]). The early stage of development of tokenised asset markets, the high volatility of some of the products and their possible operation in a non-compliant manner exacerbate the risks for market participants.

Policy makers in different jurisdictions have approached tokenisation in different ways, either by *applying existing financial regulations to tokenised assets; by introducing new tailor-made regulatory frameworks or by adapting existing rules to accommodate* the application of DLTs in tokenisation. Policy maker approaches to tokenised assets differ amongst jurisdictions, depending on the level of development of the market for tokenised assets and its pace of evolution; corresponding risks identified in the market; the overall financial architecture; the number of policy makers involved and their respective mandates, and the overall strategy vis-à-vis FinTech adopted in each jurisdiction.

Regulators in most jurisdictions with active tokenised markets have adopted a *technology-neutral approach* to policies around tokenised assets and their markets, with the same rules applying to the same types of activities and risks, irrespective of the technological medium through which the product/service or activity is provided. As such, the use of DLTs or other technology does not affect the way these regulators assess whether or not the ensuing financial product/service or activity falls within the regulatory perimeter, and by consequence, whether it is regulated or unregulated.

Still, market participants may not fully and correctly understand whether and how their activities fall within the scope of the regulators' remit. To address potential ambiguity, policy makers have been providing *guidance and clarifications* around the (pre-existing) regulatory and supervisory frameworks applied to tokenised assets and markets, protecting financial consumers, investors, and other market participants, while promoting market integrity. The provision of clarity at the early stages of development of this market focused on frameworks to explain how a token or digital asset is regulated or unregulated (e.g. the US SEC FinHub staff framework on digital assets, the UK FCA's policy statement on crypto-assets), but has since evolved to include other activities/ participants in such markets, such as custodians.

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[1] Each of the two categories of asset tokenisation may be treated very differently in particular jurisdictions. This report focuses, by and large, on Blockchain-based tokenised assets that qualify as financial instruments, and on regulated tokens issued directly on the blockchain (e.g. compliant ICO tokens).

Policy makers in a number of jurisdictions have opted for bespoke, *tailor-made rules for (parts of) tokenised asset markets*, sometimes in spite of a general technology-neutral approach to financial regulation, as they recognise that the combination of technologies such as DLTs with finance could give rise to the potential for new types of risks. Such policies either adapt existing schemes or introduce holistic frameworks or 'Blockchain Acts' covering DLT activity in markets (e.g. France; Luxembourg; Switzerland; and proposed legislation of the European Commission). The draft Electronic Securities Act or 'eWpG-E' in Germany is a notable example of tailor-made regulation for tokenised assets, creating an electronic alternative to paper-based debt securities without the need for a corresponding physical certificate.

In some cases, new regulations are introduced to cover *new actors and roles* of participants in asset tokenisation markets, such as the 'digital asset providers' in France, 'decentralised crypto security registers' in Germany, or 'verifying authorities' in Liechtenstein. Such verifying authorities are physical validators who ensure the existence and enforcement of contractual enforcement of rights to property represented in tokens on-chain, in the case of 'digital twin' tokenisation.

The innovative nature of DLTs and the novelty of their inherent characteristics give rise to unique issues and risks associated with asset tokenisation, which may necessitate further attention by financial authorities as part of their ongoing supervisory/ regulatory work. As tokenisation activities and risks continue to evolve and expand across borders, regulators may determine that their regulatory regimes and rules may need to further adjust to mitigate potential emerging risks from the deployment of DLTs in the provision of financial products/services.

Although a large part of the purported value creation in asset tokenisation is, in theory, expected to be captured by enhanced efficiencies reaped at the *post-trade (clearing and settlement) moment*, in practice, the use of DLTs for clearing and settlement faces legal, regulatory and implementation difficulties in a number of jurisdictions. In some jurisdictions (e.g. EU MiFID and CSDR rules), current legal and regulatory frameworks impose the need for intermediaries/operators to act as the securities settlement system, which may exclude the use of decentralised networks/public blockchains. In addition, whether and how platforms for tokenised assets will be allowed to link to the central bank payment infrastructure (e.g. through a tokenised form of central bank currency or CBDC) or be allowed to rely on private-initiative stablecoins is a policy decision that will affect settlement with delivery versus payment. A related issue concerns the absence of netting of trading in DLT-based atomic settlement and the potential need for prefunding of the account for the trade to occur.

Custodianship in DLT-based networks of tokenised assets is conceptually and operationally different than in traditional financial security markets, and application of existing financial security policies may be challenging in many jurisdictions. Indicatively, custodians of tokenised assets do not physically hold the asset itself cannot prove exclusive ownership and may find it difficult to evidence the existence of the tokenised security for the purposes of their regulatory books and records. A number of legal and regulatory challenges also arise relative to property rights and ownership (e.g. restitution of ownership, forced transfers). Asset segregation policies may need to be considered in the DLT-based environment.

Policymaking with respect to asset tokenisation faces a number of *additional challenges*, mostly related to the innovative nature of DLTs, and many of challenges remain unresolved as markets and products continue to evolve. Examples include: the probabilistic nature and uncertainty of *settlement finality* in decentralised networks; issues of location of the asset for tokens representing physical assets; *enforceability of regulation* on participants in decentralised DLTs; *governance and accountability* issues stemming from the disintermediation and related to the absence of a single established central authority in public DLT networks; *data protection and privacy,* particularly when it comes to the use of digital IDs; and *operational issues* such as cyber-risk and hacking. The *lack of*

shared understanding of terminologies is still a challenge when it comes to policymaking, especially given the global nature of tokenised assets.

Importantly, some of the challenges identified do not appear in all types of DLT networks and are very much *dependent on the characteristics of the DLT used*. To that end, regulators may find a need to distinguish between public permissionless and permissioned types of DLTs when discussing such challenges.

As decentralised finance and markets for tokenised and crypto-assets develop and grow in size and importance, policies, regulations, supervision and enforcement will remain important to ensure that the safeguards present in traditional financial markets will equally apply in DLT-based systems and networks with a view to protecting investors and financial consumers and safeguarding financial stability. Given the global, cross-border nature of DLT-based transactions and securities, further policy dialogue and international collaboration efforts are warranted.

1 Asset tokenisation as part of crypto-asset policymaking

The concept of tokens came to the forefront with the emergence of (*mostly non-compliant*) initial coin offerings (ICOs) and the issuance of DLT-based, cryptography- enabled digital tokens used by start-ups and SMEs for capital raising purposes in the period 2017-18 (OECD, 2019[2]). Today, tokenisation of assets (mostly regulated) is becoming one of the most explored use-cases of DLTs in financial markets, even though most applications to date are pilots or at experimental stage, with possible implications (currently at theoretical level) for the functioning of the markets and for its participants. Ensuing tokenised assets can include securities (e.g. stocks and bonds), but also commodities (e.g. gold) and other non-financial assets (e.g. real estate).

Box 1.1. Asset tokenisation in a nutshell

Tokenisation of assets involves the process of digital representation of real (physical) assets on distributed ledgers, or the issuance of traditional asset classes in tokenised form.

In the first case, the economic value and rights derived from pre-existing real assets is linked or embedded by convention to DLT-based tokens, acting as a store of value. Tokens issued exist on the chain ('digital twin'), while the real assets on the back of which the tokens are issued continue to exist in the "off-chain" world.

In the second case, asset tokenisation involves the creation of a trading instrument through a blockchain and the issuance of tokens that are 'native'* to the Blockchain, built directly on-chain and living exclusively on the distributed ledger.

Figure 1.1. Stylised representation of asset tokenisation
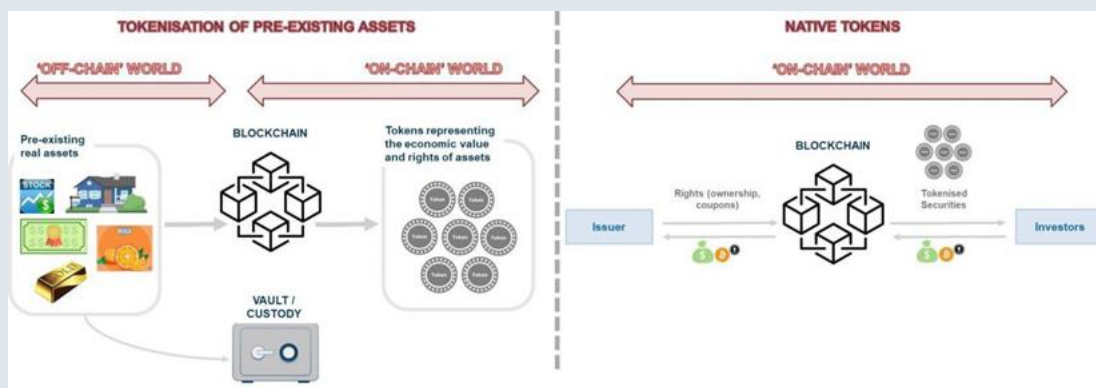
Note: * The term "native" is used here in the sense of residing on the blockchain (e.g. tokens built on ERC20). *Source*: (OECD, 2020[1]).

This policy note focuses on tokenised assets that are financial market products and therefore within the purview of financial policy makers, and does not look into 'utility' tokens or other similar token forms, depending on the definitions of each jurisdiction. The note does not discuss regulatory approaches to central bank digital currencies or other forms of 'stablecoins', given their implications for central banks and monetary policy.

Tokenised markets should comply with regulatory requirements that promote financial stability, financial consumer protection, investor protection, and market integrity while, in some jurisdictions, promoting competition (OECD, 2020[1]). The early stage of development of the market for tokenised assets, the high volatility of some of the products and the limited oversight by policy makers in some jurisdictions in parts of those markets exacerbate the risks for investors and other market participants.

Policy makers in different jurisdictions have approached tokenisation in different ways, either by applying existing rules to tokenised assets, or by introducing new tailor- made regulatory frameworks to accommodate the application of DLTs in financial services and provide regulatory clarity for specific processes/products or actors involved in asset tokenisation. The approach used by policy makers differs to a great degree amongst different jurisdictions, which could be explained by the different stage of the market for tokenised assets and its pace of evolution and corresponding risks identified in the market; the financial architecture, number of authorities involved and their respective mandates, and the overall strategy vis-à-vis FinTechs adopted in each jurisdiction. For example, some blockchain-based products may be sitting at the intersection of payments, regulated securities markets and FMIs and may require coordination by authorities involved at the national level. Similarly, competition issues are not necessarily included in the mandate of the financial regulator in many jurisdictions, so cooperation at the national level is required. Importantly, given the global nature of the markets for tokenised assets, collaboration at the international level is of essence.

It should be highlighted that the approaches taken by different jurisdictions, some of which are presented in the next section, are not mutually exclusive; regulators may combine various elements of different policies approaches in the way they address asset tokenisation, participants of tokenised markets and risks arising in these markets. Therefore, the following sections do not intend to classify approaches into categories, but rather to describe elements and characteristics of jurisdictional approaches to asset tokenisation and which can co-exist in a number of cases.

Box 1.2. Potential benefits and risks of asset tokenisation

The application of DLTs and smart contracts[2] in asset tokenisation has the potential to deliver a number of benefits, including efficiency gains driven by automation and disintermediation; transparency; improved liquidity potential and tradability of assets with near-absent liquidity by adding liquidity to currently illiquid assets; and, faster and potentially more efficient clearing and settlement.

Asset tokenisation could provide an additional way to achieve fractional ownership of assets which, in turn, could further lower barriers to investment and promote more inclusive access by retail investors to some previously mostly unaffordable or insufficiently divisive asset classes in some jurisdictions. The

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[2] Smart contracts are distributed applications created and run over the blockchain, which consist of self-executing contracts written as code on DLT ledgers, automatically executed upon reaching pre-defined trigger events written in the code (OECD, 2019[3]).

flow of private financing from capital owners to SMEs could be eased and facilitated, enhancing access to financing for SMEs.

At the same time, the application of DLTs in tokenised markets may give rise to important risks and challenges stemming from the novel nature of some of the business models and processes involved in tokenisation, and the innovative character of the technology itself. Operational vulnerabilities related to the technology deployed include scalability (given the significant throughput that would be required for the scale of global financial markets); potential uncertainty over settlement finality (i.e. final and irrevocable settlement of payment instructions with deterministic finality); interoperability between different networks that will allow for connectivity of different infrastructures, as well as interoperability of DLT-based infrastructure with traditional one; network stability, market infrastructure robustness and cyber-threats, risks similar to other network-based applications in finance, but exacerbated given the rapid advances in the field of quantum computing and cryptography.

Governance risks, particularly relevant to fully decentralised ledgers, relate to the difficulty in identifying a sole owner or node accountable for the full network. The absence of a single accountable point is a very important challenge to regulating DLT networks and assigning responsibility for a failure in the network. The legal status of smart contracts still remains to be defined in many jurisdictions, and potential lack of enforceability of such contracts gives rise to important financial consumer protection concerns. The auditability of the code of smart contracts and relevant permissions to change the code are other areas of concern. Questions arise also around data protection and privacy (including relative to digital IDs), storage of data and regulation applicable to the usage, sharing and storage of data and other investor and consumer protection issues and market integrity issues. Risks related to AML/CFT are prominent in DLT-based systems and are particularly high in tokenised markets that are based on public permissionless networks.

Source: (OECD, 2020[1]).

2 A technology-neutral approach to tokenisation policies: 'substance over form'

Most jurisdictions with active tokenised markets adopt a *technology-neutral* approach to regulation for financial services, which they also apply to tokenised assets and their markets (e.g. European Commission, FCA, US regulators). Under a technology-neutral principle, the regulatory perimeter and the subsequent treatment of financial products/services and activities are not influenced by the technological medium through which the product/service or activity is provided. As such, the use of DLTs or other technology does not affect the way these regulators assess whether or not the ensuing financial product/service or activity falls within the regulatory perimeter or not, and by consequence, whether it is regulated or unregulated.

DLT allows the creation of native tokenised securities and the tokenisation of existing securities.[3] In some jurisdictions, tokenised securities could be described as a form of cryptography- enabled dematerialised securities that are based and recorded on a decentralised ledgers powered by DLTs, instead of electronic book-entries in securities registries of central securities depositories (OECD, 2020[1]). Tokenisation in these jurisdictions could therefore be seen as merely replacing one digital technology with another where requirements are set without having any specific technology in mind.

Box 2.1. EU Approach to Crypto-Assets and DLTs

In 2019, the European Banking Authority (EBA) and the European Securities Market Authority (ESMA) published a Report (EBA, 2019[3]) and Advice (ESMA, 2019[4]) to the European Parliament, Council and Commission.

The ESMA Advice represents a comprehensive assessment of the applicability of the EU financial securities rules to crypto-assets. The Advice clarifies the circumstances under which a given crypto-asset may qualify as a MiFID financial instrument, using a set of practical examples. In particular it highlights that some crypto-assets, such as those with attached profit rights, are likely to qualify as MiFID financial instruments, in which case they, and the firms undertaking activities involving these instruments, need to comply with the full set of EU financial securities rules. Others, which represent a large portion of those crypto-assets outstanding, are likely to fall outside of the regulated space.

In addition, the Advice calls on the EU policy makers to address the gaps that exist in the current rules when applied to crypto-assets. These gaps are mainly twofold. First, where crypto-assets qualify as MiFID financial instruments, some clarifications and/or adaptations are needed to allow for an effective application of the existing rules and these clarifications/adaptations mainly concern settlement and custody rules. Second, where crypto-assets do not qualify as MiFID financial instruments (or e-money for what concerns EBA), there are important risks to consumer protection that need to be addressed.

The European Commission used the EBA and ESMA Report and Advice to introduce in September 2020 a draft legislative package that addresses the risks and issues posed by crypto-assets, including stablecoins (see Box 2.5).

Source: Anne Chone, ESMA (2020).

Indeed, by way of an example, the UK Financial Conduct Authority (FCA) has an explicit policy of technological neutrality and has adopted this approach in its policymaking around crypto-assets (FCA, 2019[5]). The Swiss Financial Market Supervisory Authority (FINMA) has technological neutrality as one of its three fundamental principles when it comes to regulating FinTech, including asset tokenisation activity[4] (FINMA, 2016[6]). Similarly, the Polish FSA, in its draft supervisory position, published for public consultation in July 2020, has adopted an approach to regulating crypto-assets in Poland based on the "substance over form" principle.

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[3] The distinction between the two types of tokenised assets is important when it comes to the potential for the efficiencies promised by the application of DLTs to be materialised. The creation of native security tokens on-chain, without a corresponding paper certificate, as in the case of the proposed eWpG-E draft bill in Germany, goes beyond dematerialisation and could open up a number of opportunities for further efficiencies (e.g. larger scope for disintermediation, cross-border activity), while at the same time possibly exposing investors to increased risks, including fraud.

[4] The other two principles are legal certainty and principle-based regulation.

A similar approach is adopted by the European Commission; tech-neutrality, expressed as 'the same activity is subject to the same regulation, irrespective of the way the service is delivered' was one of the three core principles when setting the area's policy on Fintech regulation (European Commission, 2017[7]).[5] Such principle is applied to the EC's policies around markets for crypto-assets, including tokenisation markets (see Box 2.3).

Similarly, the European Securities Markets Authority (ESMA) considers it important to take a technology-neutral approach, to ensure that similar activities and assets are subject to the same or very similar standards regardless of their form (ESMA, 2020).

2.1. Still, guidance and clarifications are increasingly valuable to market participants

Industry participants, investors and financial consumers have argued that greater clarity around the regulatory and supervisory frameworks applied to tokenised assets and markets would assist the development of fair and sound markets for such instruments, even in the case of technology-neutral approach to policymaking, where the same rules will apply to the same types of risk. Market participants may not fully and correctly understand whether and how tokenised assets fall within the regulatory perimeter, or have intentionally attempted to avoid compliance with existing laws, thereby exposing themselves to risks, potentially engaging in illegal activities, and undermining the smooth functioning of such marketplaces.

As with all financial instruments, guidance and clarifications on the regulatory perimeter and applicable regulations can help protect financial consumers and other market participants, while promoting market integrity. This was particularly the case at the early stages of development of tokenisation activity through ICOs, when guidance, positions, warnings and clarifications were issued by a vast number of jurisdictions (see Annex B of (OECD, 2019[2]), in many cases reminding participants that their activities were (or could potentially be) subject to the pre-existing regulatory regime.

Regulators across the world continue to issue guidance addressing perceived ambiguity by some market participants around the way tokenised asset activity is regulated and supervised in some jurisdictions. For example, through its policy statement on crypto-assets, the FCA clarified to participants where and how their activities fall within the scope of the regulators' remit and for which an authorisation is required (FCA, 2019[5]) (for more details, see Annex A).

The Federal Financial Supervisory Authority of Germany (BaFin) has issued clarification around tokens, explaining that certain types of assets represent a security class of their own (sui generis) because they converted traditional not tradeable investments into MiFID securities which can be traded on the financial markets through tokenisation, and these must therefore be classified as securities (BaFin, 2019[8]).

In the same vein, the French Market Authority (AMF) has launched, in February 2020, a review and analysis of the application of existing financial regulations to security tokens (AMF, 2020[9]). Such analysis verified the conditions under which the existing regulatory framework could apply to security tokens.

In 2019, staff of the FinHub at the US Securities and Exchange Commission (SEC) published an instructive framework to assist market participants in determining whether a

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[5] The other two principles are proportionality and market integrity.

particular digital asset is an investment contract and therefore a security. The term 'digital asset', as used in said framework and subsequent SEC statements, refers to an asset that is issued and/or transferred using DLTs, including, but not limited to so-called virtual currencies, coins, or tokens (SEC, 2020[1]).

3 Adoption of dedicated, tailored-made frameworks for tokenised assets

Policy makers in a number of jurisdictions have opted for specific, tailor-made rules for (parts of) tokenised asset markets, sometimes in spite of a general technology-neutral approach to financial regulation. Examples include France, Luxembourg, Malta, Switzerland, as well as Germany relative to the issuance of electronic (and DLT-based) securities (see Box 2.4).

3.1. New frameworks for tokenised securities and DLT-enabled markets

The framework introduced for the issuance of native tokenised assets in France is a notable example of novel policies specifically tailored to the use of DLTs and the issuance of native tokenised assets, and was adopted very early on in the development of tokenised markets. The Blockchain Order of 2017 established in French law a regulatory framework governing the representation and transmission of unlisted financial securities via DLTs (French Parliament, 2017[11]). This law allowed for the extension of a previous law, introduced in 2016, allowing the use of DLTs for the purpose of recording the issuance and sale of SME mini-bonds (Code monétaire et financier, 2016[12]). It extended to other securities (mainly unlisted equity and debt securities) the possibility of using distributed ledgers for the issuance, registration and transfer of such securities, instead of traditional securities accounts.

Box 3.1. The German draft Electronic Securities Act

As part of its Blockchain strategy, the German Government presented the first draft of the Electronic Securities Act or 'eWpG-E' (Federal Ministry of Justice and Consumer Protection, 2020[13]) which was amended on 16 December 2021 (Bundesministerium der Finanzen, 2020[2]). The draft bill creates an alternative to paper-based debt securities, by introducing the option of issuing debt securities electronically through an electronic register and without the need for a corresponding physical certificate.

The amended draft bill also introduces certain investment fund shares, though electronic investment fund shares can only be registered in central registers, and not in crypto securities registers.

The eWpG-E effectively allows the registration of securities in electronic registers as equal substitute for the conventional deed required for the creation of bonds until today (DWF, n.d.[14]). The regulatory treatment of bearer bonds (regarding prospectuses, trading etc.) remains intact.

In addition to central registers maintained by central securities depositories (CSDs) in electronic form, the eWpG-E introduces a second type of electronic securities registers, the decentralised *crypto securities register* that may be based on DLTs[4]. Interestingly, crypto- registers can be run by entities which are not CSDs, provided that these are registered according to the financial services license (DWF, n.d.[14]). Based on the amended draft bill, the operation of central electronic registries is no longer restricted to CSDs, and it is now also possible for custodians to run a central electronic registry as long as the securities are not traded at a trading venue.

Electronic securities issued in a crypto securities register are defined as 'crypto securities' while securities on a central register are referred to as 'central register securities' (Freshfields, 2020[15]).

Importantly, despite the fact that no global (paper) certificate will be necessary for their issuance (Globalurkunde), securities issued under the new draft legislation will be explicitly deemed movables. Therefore, property law will apply for the transfer of such securities, allowing for a bona fide purchase, which is crucial for investor protection and for safe and secure capital markets (Bundesbank, 2020).

The bill covered bearer bonds (Inhaberschuldverschreibungen) in the first instance, and certain centrally registered investment fund shares, and it foresees that equity instruments (e.g. stock company shares), other types of debt instruments may be introduced at a later stage.

In March 2019, Luxembourg enacted a law similar to the Blockchain Order in France, recognising that token transfers via the blockchain were equivalent to transfers between securities accounts (Parliament of Luxembourg, n.d.[16]). This allows the possibility of dematerialisation of securities other than bonds, as even shares could be issued in native tokenised security form, without the need for a corresponding certificate to be issued. Issuance of tokenised bonds, as bearer securities, does not necessarily require the issuance of a corresponding certificate for each bond anyway, as possession accords ownership. In addition, a new draft bill of law[6] which shall allow central account keepers and settlement organisations in Luxembourg to have legal certainty concerning the use of blockchain or DLT for the issuing and circulation of dematerialised securities. It will however not be possible for entities (such as issuers) to issue tokens on their own, it is mandatory to use the services of a central account keeper or settlement organisations (see Annex).

Liechtenstein is another prominent case of a jurisdiction with a comprehensive regulatory framework for a tokenised economy, through its Law on Tokens and TT Service Providers, also known as the Liechtenstein Blockchain Act, which came into force on 1 January 2020 (Government of Liechtenstein, 2019[17]). Interestingly, policy makers in this case introduced the term *Trustworthy Technologies* (TT) to describe DLT or other technologies that do not require trusted central parties as a basis for trust. Different types of professional TT service providers and their functions are introduced in the Liechtenstein Blockchain Act, a number of which intend to cover for the new actors involved in asset tokenisation and

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[4] Interestingly, based on the current draft bill, crypto-security registries and crypto-securities maintain a technology-neutral principle and it would therefore be possible to use other technologies besides DLTs.

[6] N° 7637 proposing to amend the Law of 5 April 1993 on the financial sector as well as the Law of 6 April 2013 on dematerialised securities.

who may not be covered by existing regulation as they reflect innovative aspects of DLT-based processes. A notable example is the role of the 'physical validator' (see Section 2.3.1).

On 24 September 2020, the European Commission announced a comprehensive package of legislative proposals for the regulation of crypto-assets, updating certain financial rules for crypto-assets, and creating a legal framework for a pilot regime for the use of DLTs in trading and settlement of securities (European Commission, 2020[18]) (European Commission, 2020[18])(see Box 2.5). The proposed Markets in Crypto-assets Regulation (MiCA), intends to replace national rules covering the issuance, trading and storing of such crypto-assets and covers issuers, service providers, wallet operators and crypto-exchanges. The driving force for this comprehensive proposal was the importance of legal certainty and clarity of regulatory regime in areas pertaining to blockchain-based applications. The Commission aims to avoid fragmentation with the EU; increase investments, including for the financing of SMEs; and ensure consumer and investor protection.

Box 3.2. Tokenised equity and debt under the EC legislative proposals for a legal and regulatory framework for blockchain

The Commission's legislative proposal reiterated that tokenised equities and bonds are already subject to EU securities market legislation, as they qualify as financial instruments under the Markets in Financial Instruments Directive (MiFID).

Nevertheless, recognising that MiFID predated the emergence of crypto-assets and DLT, and on the basis of advice that the EC has received from ESMA and the EBA, the EC proposed a pilot regime for market infrastructures involved in the trade and settlement of transactions involving financial instruments in crypto-asset form (pilot regime for DLTs). Similar to sandboxes, the pilot regime will allow for exemptions from existing rules, allowing both regulators and private sector participants to test DLT-enabled products.

When it comes to crypto-assets that do not qualify as financial instruments under MiFID and to persons engaged in the issuance or service provision related to crypto-assets in the EU, the EC proposed a new regulatory framework, the Markets in Crypto-assets Regulation (MiCA) that will replace all EU and national rules covering the issuance, trading and storing of such crypto-assets. The proposed regulation covers issuers, service providers, wallet operators and crypto-exchanges.

The proposed framework provides three categories of crypto-asset issuers: (i) issuers of asset-referenced tokens (cryptoassets that purport to maintain a stable value by referring to the value of fiat currencies/commodities/or a combination of such assets, e.g. stablecoins); (ii) issuers of e-money tokens (cryptoassets to be used as a means of exchange and that purport to maintain a stable value by referring to the value of a fiat currency that is legal tender); and (iii) issuers of crypto-assets that do not fall under the above categories (e.g. utility tokens).

MiCA introduces a substantive list of prudential, conduct of business, and governance requirements for issuers, including requirements relating to the maintenance and custody of reserve assets for asset-reference tokens, and the drafting of a white paper in advance of an offer. It also introduces prohibitions

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and requirements to prevent market abuse involving cryptoassets, including prohibitions on insider dealing, unlawful disclosure of inside information and market manipulation.

EBA has the power to classify asset-referenced and e-money tokens as 'significant' and subject them to enhanced regulation through a supervisory college, so as to address possible financial stability risks inherent in significant stablecoins/e-money tokens.

As MiCA was designed with the principle of proportionality, a range of public offer exemptions apply that exempt issuers of cryptoassets from the authorisation and conduct requirements of MiCA provided that the public offer complies with certain conditions. MiCA aims to support innovation while protecting consumers and the integrity of crypto-currency exchanges and increasing legal certainty in the area of cryptoassets.

Source: (European Commission, 2020[19]), (European Commission, 2020[18]).

3.2. Introducing new roles for new actors in asset tokenisation

It can sometimes be difficult to know with certainty whether tokenisation is fully captured by the regulatory perimeter, especially given the novel nature of some new business models and processes involved (OECD, 2020[1]). Potential gaps in the regulatory treatment of tokenisation may give rise to regulatory arbitrage opportunities and/or give rise to novel risks that may arise from the application of innovative technologies, such as DLTs. It is therefore important to identify whether existing regulation may need to apply to new actors present in tokenised assets markets and/or whether new requirements may be needed to be added to existing policies.

3.2.1. Digital asset service providers in France

French regulators introduced a bespoke framework governing the activities of secondary market crypto-asset intermediaries, called *Digital Asset Providers or DASPs* (Loi PACTE enacted in May 2019) (French Parliament, 2019[20]) (AMF, n.d.[21]). The framework sets up an optional license for DASPs issued by the French Markets Authority (AMF). Such license becomes mandatory if the intermediary provides digital asset custody services and/or buying or selling digital assets for legal tender services in France. In these cases, DASPs are required to register with the AMF, with the Autorité de Contrôle Prudentiel et de Résolution (ACPR)'s assent.

DASPs have obligations around cybersecurity, capital requirements and insurance, as well as obligations specific to the provision of custodial services (e.g. to restore control of digital assets held in custody), and they need to abide by AML/CFT regulations. Importantly, this framework improves access to banking services for approved DASP (among others, such as issuers of ICOs granted an optional visa by the AMF). Intermediaries can appeal with the ACPR in case of unjustified refusal of access to banking services (French Government, 2019[22]).

3.2.2. Decentralised crypto securities registers in the German draft electronic securities bill

As part of the draft bill introducing electronic securities that the German Ministry of Finance and the German Ministry of Justice and Consumer Protection published in August 2020 (see Box 2.6), crypto securities registers are being introduced as an alternative to paper certificates alongside central registers, and require a licensed register administrator to ensure responsibility as the entity providing register management services.

The crypto security register must be maintained on a decentralised, forgery-proof recording system in which data are recorded in time sequence received and stored in a manner protected against unauthorised removal and subsequent modification (Bundesbank, 2020). The licensed register administrator maintains the register and is supposed to be the only one to alter the content of the register based on instructions of the beneficial owners or a depositary. Whether this can be ensured when using a decentralised infrastructure remains to be tested in practice.

Based on the latest draft of the Electronic Securities Act (16 December 2020), the operation of central electronic registries is no longer restricted to CSDs. It is now also possible for custodians to run a central electronic registry as long as the securities are not traded at a trading venue. Registry administrators for *crypto securities registers* require a newly introduced license under the German Banking Act (KWG). Crypto-securities registers are required to have initial capital of EUR125,000 (same as for crypto-depository services).

Importantly, acting as registry administrator does not necessarily constitute custody business (in the meaning of the KWG). Since electronic securities are treated as paper-based securities, providing custody services for those securities qualifies as regular custody business rather than the novel 'crypto custody business'. Depending on the type of services provided, both custody licensing regimes may apply (Freshfields, 2020[15]).

Finally, it is not yet clear whether the security issuer requires a license. The draft law does not state an exemption for issuers.

3.2.3. Trusted Technology Verifying Authorities in Liechtenstein

Despite its potential for disintermediation at many levels, tokenisation of physical assets has been argued to ultimately depend on the existence of a trusted and credible central authority that will guarantee the backing of tokens issued by the real assets, making the connection of the off-chain world to the distributed ledger environment (OECD, 2020[1]). Such third party may also be safeguarding the asset and/or guarantee the uniqueness of each asset backing each token, ensuring that the same asset is not being represented by multiple tokens in multiple platforms.

The Liechtenstein Blockchain Act introduced such a trusted third party intermediary, called the Physical Validator, recognising the need to bridge the gap between the offline and the online world, and to provide assurance that the underlying right embodied by the token truly exists (Naegele, 2019[23]). The new framework describes as physical validator a professional whose function is to ensure the existence and enforcement of contractual enforcement of rights to property represented in tokens on TT systems as defined by property law (Naegele, 2019[23]). In other words, the validator ensures that the party tokenising the right to something represented online is indeed the party who possesses that right offline, allowing for a valid transfer on a TT system such as the blockchain.

The physical validator must also ensure that the principal of the token issuer instructing them to tokenize the rights to an object can, at any time, lawfully dispose of the tokenized right so as to avoid a collision of rights in case of a tokenisation of rights to the same object (Nagele and Bont, 2019[24]). Finally, the physical validator can also keep the asset in his custody so as to ensure that the transferee of a token representing the right to own a certain asset will be able to obtain the underlying physical object.

3.3. Selectively adjusting existing laws: the Swiss proposal on DLTs

Some jurisdictions, like Japan or Switzerland, have chosen to address specific issues related to tokenised markets through the selective adjustment of existing laws instead of introducing bespoke regulation applied to such products/services.

In 2019, the Swiss Federal Council adopted the dispatch (Swiss Confederation, 2019[25])on federal legislation to adapt federal law to developments in DLT. The proposal (Swiss Confederation, 2020[26]) is aimed at increasing legal certainty, removing barriers for applications based on DLTs and reducing the risk of abuse. In September 2020, the Swiss parliament has adopted the DLT law, which is expected to come into force in 2021.

One of the key areas of the Swiss proposal is the amendment of securities law to provide a secure legal basis for the trading of rights through electronic registers. Furthermore, the segregation of crypto-based assets in the event of bankruptcy is to be clarified by law. Finally, it plans the establishment of a new authorisation category for DLT trading systems in financial market infrastructure law, thereby creating a flexible legal framework for new forms of financial market infrastructure.

4 Policies around other risks stemming from the innovative nature of DLTs

The innovative nature of DLTs and the novelty of their inherent characteristics give rise to unique issues and risks associated with asset tokenisation and may necessitate the attention of policy makers as part of their ongoing supervisory and/or regulatory work, whether to address such new risks and/or to consider, within their own regulatory frameworks, alternative approaches they believe are appropriate. Some of these issues are examined in this Section.

4.1. Regulatory implications around the payment leg of clearing and settlement

Current regulatory and legal frameworks in some jurisdictions (e.g. EU MiFID and CSDR rules) impose the need for intermediaries/operators to act as the securities settlement system in post-trade processes, which may exclude the use of decentralised networks/public blockchains. In addition, whether and how platforms for tokenised assets will be allowed to link to the central bank payment infrastructure (tokenised form of central bank currency or CBDC) or rely on private-initiative stablecoins is a policy decision that will affect settlement with Delivery versus Payment (or DvP). A related issue concerns the absence of

netting of trading in DLT-based atomic settlement and the potential need for prefunding of the account for the trade to occur.[7]

For settlement to be achieved at near real-time and for delivery to be certain in securities transactions (DvP), the securities transacted and the corresponding payments need to switch ownership simultaneously. For the payment to be exchanged without potentially lengthy processing times or costly fees involving intermediaries off- the-chain, pilot clearing and settlement systems and market participants are using a tokenised form of central bank money on the blockchain or stablecoins for the payment leg of the transaction (OECD, 2020[1]).

In practice, sandbox-based and proof-of-concept projects of tokenised security settlement by the official sector (e.g. Project Ubin, Project Jasper) have used tokenised forms of central bank money, while private sector initiatives use stablecoins for the payment leg of security settlement in DLT networks. A notable example is Project Helvetia by the Swiss National Bank (SNB), the BIS Innovation Hub and SIX. In two proofs-of-concept the integration of tokenised assets and central bank money for DvP settlement is explored. In the first proof-of-concept, the SNB issued a wholesale CBDC, while in the second proof-of-concept, a link to the Swiss RTGS was established. This project is interesting in that, contrary to other NCBs looking at wholesale CBDCs in anticipation of future applications, Project Helvetia was initiated and driven by a practical application of a market for tokenised securities, the SIX Digital Exchange (SDX). SDX aims to launch a fully integrated trading, settlement and custody infrastructure for digital assets in 2021 (BIS Innovation Hub, 2020[29]) (see Box 2.6).

In May 2020, the French Central Bank and Societe Generale SFH issued EUR40m of covered bonds (obligations de financement de l'habitat or OFH) as security tokens directly registered on a public blockchain, using a digital form of euros issued by Banque de France through a blockchain platform (Banque de France, 2020[27]) (Société Générale, 2020[28]). This transaction proved the feasibility of settlement with DvP through the use of a wholesale CBDC. This transaction followed an initial issuance of EUR100 million in security tokens by Societe Generale SFH in April 2019, settled in the traditional manner in fiat currency.

4.1.1. Settlement of tokenised assets in central bank money and stablecoins

As a large part of the purported value creation in asset tokenisation markets may be seen in enhanced efficiencies reaped at post-trade through automation and DLT application, considerations regarding clearing and settlement, including through the potential use of CBDCs or other forms of tokenised cash, is an important issue as these markets continue to develop.

The use of wholesale CBDCs for the payment leg of tokenised asset clearing and settlement may present some perceived advantages compared to stablecoins, as access to the central bank payment infrastructure would reduce credit risk as well as liquidity risk related to the funds required to be held with the commercial bank that would act as the intermediary in a different case.

In addition to settling tokenised assets with a wholesale CBDC or a stablecoin, another option would be to make the DLT infrastructures interoperable with existing payments systems, to allow for the settling of tokenised assets in today's payment infrastructure. Project Helvetia investigated DvP settlement of tokenised assets using a wholesale CBDC (proof-of-concept 1) and a link to the Swiss RTGS (proof-of-concept 2). Using a wholesale

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[7] These also apply in case of T+0 settlement without the use of DLTs.

CBDC opens up functionalities possible with tokenisation, while at the same time giving rise to operational challenges, as well as governance and policy questions. In contrast, an RTGS-link would entail fewer such challenges as today's payment infrastructure is used, but it would also omit potential benefits of a complete integration. (BIS, Swiss National Bank, SIX Group consortium) (BIS Innovation Hub, 2020[29]) (see Box 2.6).

Box 4.1. Project Helvetia: Settling tokenised assets in central bank money

Project Helvetia is a joint experiment by the BIS Innovation Hub (BISIH) Swiss Centre, SIX Group AG (SIX) and the Swiss National Bank (SNB), exploring the integration of tokenised assets and central bank money on SIX's SDX platform. Two proofs of concept (PoCs) for settling tokenised assets were conducted: (i) issuing a novel wholesale central bank digital currency (w-CBDC) and (ii) building a link between the new securities settlement platform of SDX and the existing central bank payment system.

Project Helvetia published the results of the first two proofs of concepts in December 2020, announcing that the experiments confirmed both PoCs as realistically possible. Specifically, both PoCs used the testing environments of live or near-live systems, and transfers were shown to be legally robust.

In particular, the experiment consisted of the SNB issuing a Swiss franc w-CBDC onto a near-live DLT test platform and, together with SIX, building a link from the Swiss RTGS test system to the same platform. Detailed analysis showed that settlement in both approaches is legally feasible and robust.

Project Helvetia's next steps will be to seek a deeper understanding of the practical complexities and policy implications of issuing w-CBDC, by introducing even more realism into the project and exploring in more detail the different trade-offs that different design choices yield. Progressing with this work is neither a signal nor a commitment by the SNB to issue wholesale CBDC.

Source: (BIS Innovation Hub, 2020[29])

The use of private sector stablecoins could introduce risks to the network, and in particular counterparty risk related to the issuer of the stablecoin. Private initiatives may lack proper audit and assurance over the availability of the funds backing the stablecoin, and users are exposed to all kinds of operational or other risks derived from the counterparty. The regulatory treatment of stablecoins also differs, affecting the willingness of (bank-)participants to hold the stablecoin overnight and thus book it into their balance sheet.

Box 4.2. Pre-funding of positions and atomic swaps

A related issue concerns the absence of netting of trading in DLT-based atomic[8] settlement and the potential need for prefunding of an account for the trade to occur, irrespective of how the payment leg will be facilitated (stablecoin or CBDC).

Contrary to traditional markets, where trades are often netted as part of the clearing, in tokenised markets there is the possibility ability to conduct 'atomic swaps', i.e. wallet-to-wallet exchange of two digital assets simultaneously in a single operation within a blockchain or across different blockchains without going through any centralised intermediary (OECD, 2020[1]). Atomic swaps may significantly reduce, if not eliminate, certain the replacement cost risk, although they could give rise to additional risks. In

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[8] Wallet-to-wallet exchange of two digital assets simultaneously in a single operation; technically two bilateral transfers on different chains which are confirmed by both sides within a certain time period, using hash technology.

addition, atomic swaps are, in most cases, performed on a gross basis and can only happen when both assets are locked-on in the position of the buy and sell-side prior to the execution of the trade. By consequence, the positions trading parties need to be pre-funded for each transaction for the trades to occur. This, in turn, translates into (i) assets being tied-up, potentially reducing liquidity; and (ii) increase in the demand for the traded assets.

At the same time, it should be noted that in atomic swaps, the stablecoin/CBDC used for payment is not tied up for hours/days while clearing and settlement is performed, as the process is instantaneous. This, in turn, helps reduce the amount of capital assets/funds that is tied up and makes the tokens and corresponding funds available immediately for other transactions.[9]

4.2. Approaches to regulating the role of custodianship in asset tokenisation

Policies will need to consider the unique challenges that custodianship in DLT-based networks of tokenised assets raises, as it is conceptually and operationally different than in traditional financial security markets, and application of existing financial security policies may be challenging in some jurisdictions. For example, custodians of tokenised assets do not physically hold the asset itself, cannot prove exclusive ownership and may find it difficult to evidence the existence of the tokenised security for the purposes of their regulatory books and records. A number of legal and regulatory challenges also arise relative to property rights and ownership (e.g. restitution of ownership, forced transfers). Asset segregation policies may need to be considered in the DLT-based environment.

Clearing and settlement has arguably the most potential for efficiencies through the application of DLTs (see Box 2.8). DLT-enabled systems and the use of smart contracts, cryptographic processes and notary node functionalities for clearing and settlement of tokenised assets may have the ability to verify ownership, confirm trade matching and record transactions in an automated, immutable, transparent and near-immediate way (OECD, 2020[1]).

The distributed ledger could potentially act as a decentralised registry of data on transactions, and a "counterparty" to all transacting parties, reaping efficiency gains at post-trade and reducing counterparty risk of participants.10 In theory, record-keeping, such as changes in ownership, security holder records, issuing and cancellation of certificates, as well as distribution of dividends, could all be performed by the distributed ledger, with the platform effectively replacing the registrar or transfer agent (or the CSD in case there is no transfer agent involved, depending on the jurisdiction). Such platform may be subject to regulatory requirements applying to registrars/transfer agents and could exist as a separate platform, disconnected from the custodianship function.[11]

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[9] It should be noted, however, that were transactions are not immediately recorded on a blockchain (e.g. internal trading activities at trading platforms where they use an omnibus wallet) there is a time delay in the transaction if it is to be recorded on the blockchain.

[10] The term counterparty is used to conceptually represent the scheme, however, transactions on DLTs would occur on a P2P basis.

[11] It should be recognised, however, that this scenario does not apply where trades - and therefore ownership - is not reflected on the blockchain but is only recognised on the internal records of the trading platform. In the particular case of securities, and depending on the jurisdiction, these could potentially apply in case the securities are held directly by the beneficial owners, and not through a trading platform/exchange/clearing agency.

It should be noted, however, that the above benefits remain to be proven through the large-scale application of DLT technology in post-trade processes. At the same time, the use of DLTs may give rise to new risks stemming from the novel nature of the technology (e.g. market integrity, investor and consumer protection, operational, security, governance, legal risks and other). Financial consumers and investors involved in such trades can be exposed to important risks, including manipulation, fraud and other bad acts and, as such, regulatory oversight and supervision are key in protecting investors and other market participants.

The role of custodians in tokenised markets differs from traditional securities markets, and these are expected to provide custody of private keys12 instead of traditional asset keeping. They thereby assist in reducing the risk of loss of private keys, which corresponds to loss of ownership. *Non-custodial wallets* without access to the private keys.[13] They simply assist clients by providing a solution for the storing of their own keys, allowing for self-custody by the clients. Although it provides benefits of exclusive ownership of private keys and reduces the risk of hacking, this type of custodian is not necessarily appropriate for investors who lack the necessary expertise and equipment to safekeep their private keys, or for institutional investors with increased need for access to the keys (ESMA, 2019[4]).

Alternatively, custodians can be *'full' custodial wallets*, such as exchanges, with direct access and control over the private keys held in custody, and by consequence over the asset itself. Custodial wallet providers are responsible for the custody of the assets regulations. When storing tokens that fall within the regulatory perimeter, custodians may be required to obtain relevant permissions depending on the jurisdiction. For example, in the UK they are required to obtain permission to the management of investments, as well as safeguarding and administering of investments (FCA, 2019[5]). A special regime for crypto-registrars is introduced in the German draft legislation, with crypto-registrars allowed to be run by entities not being central securities depositories (CSDs) (see Section 2.4.2).

Custodians of tokenised assets do not physically hold the asset itself and may find it difficult to evidence the existence of the tokenised security for the purposes of their regulatory books and records. At the same time, custody of digital assets gives rise to a number of new risks compared to custody of traditional securities. For example, there are greater risks that a custodian could be subject to fraud or theft, lose a private key necessary to transfer a client's digital asset securities, or could transfer a client's digital asset securities to an unknown or unintended address without the ability to reverse a fraudulent or mistaken transaction (SEC, 2020[1]).

Questions around custody of tokenised assets become even more pressing given the divergence of approaches taken by courts to determine property rights of investors in crypto-assets more generally, and the legal risks involved. Such risks are most evident in legal cases of insolvency of the custodian (Haentjens, de Graaf and Kokorin, 2020[30]).

Box 4.3. Post-trade efficiencies through the use of DLTs

In some traditional financial markets, central clearing houses act as central counterparties (CCPs) to both sides of a trade, ensuring that the trade is matched and is executed even in case of default of one of the parties, thereby reducing counterparty risk. Clearing houses confirm trade data and use central securities depositories (CSD) and/or transfer agents depending on the jurisdiction, to record

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12 A private key is a form of cryptography that allows a user to access their cryptoasset.

13 Online and offline/cold versions of non-custodial wallets exist.

transactions. Custodians holding investor assets work with CSD to ensure the safe delivery/transfer of assets and funds to each of the respective transacting parties and handle the settlement of transactions.

The application of DLTs on FMIs could change the current setup: particularly due to atomic swaps, the clearing layer would disappear. The asset- and cash-settlement happens on a DLT-based CSD, enabling smart business logic. Indicatively, the layers of the current FMI structure could be described as trading; clearing, settlement, asset servicing and custody, while the layers of a DLT-based FMI would be simplified to include atomic trading and settlement, and asset servicing and custody (BIS Innovation Hub, 2020[2]).

Figure 4.1. Simplified scheme of DLT-based post-trade
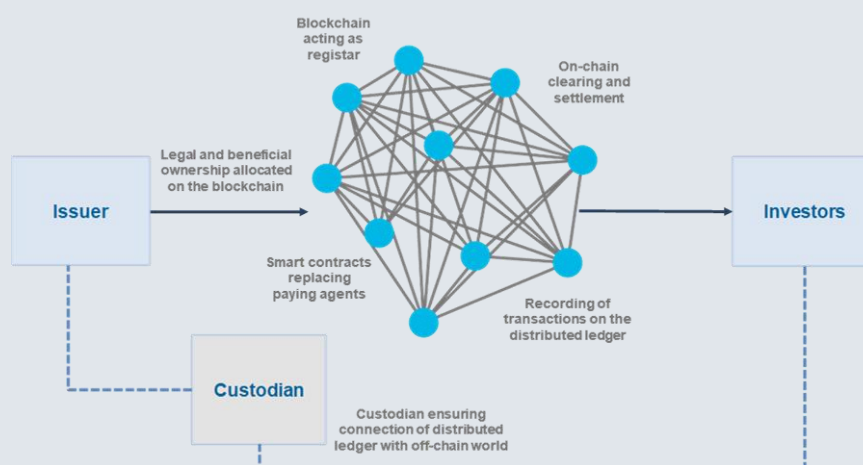
Source: (OECD, 2020[1]), (BIS Innovation Hub, 2020[2]).

4.2.1. Ownership

One of the thorny issues is the absence of obligation of restitution of the ownership of the tokenised security by custodians when the security is recorded on the distributed ledger, and has been identified in the EU. This occurs because there is no recognition of the right of ownership if the tokenised securities are registered in an account with the central depository (here DLT) and not with a custodian account keeper. In other words, the custodian account-keeper has no obligation of restitution of the financial securities recorded in a distributed ledger and not in securities accounts in the keepers' books (AMF, 2020[9]). This raises important investor protection risks, as investors do not have total control over their assets. Such concerns are not present in case of non-registered (i.e. bearer) securities, the holding of which constitutes ownership.

Another risk that arises in custody of tokenised assets held by custodial wallets relates to hard forks, possible in permissionless networks. Forks create a chain split, and when the old chain is abandoned are referred to as network upgrades.[14] In case of a hard fork occurring on a DLT, clients are entitled to get the benefit from the fork but getting assets at both branches of the chain (AMF, 2020[9]). Due to lack of regulation in certain jurisdictions, certain custodians refuse to give the assets of one branch to the clients, causing unfair treatment and harm to the owners of the asset. Some jurisdictions, such as France, have addressed this risk with the introduction of ad hoc regulation (article 722-1,

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[14] It should be noted that hard forks and their implications depend largely on the type of DLT used.

4° of AMF General Regulation). Importantly, hard forks introduce questions around taxation, for example through the creation of extra tokens for free as a result of a hard fork, which could be considered taxable income for the users.

Segregation of assets held by custodians on behalf of clients can also raise risks for asset owners, where such segregation is inadequate or completely non-existent. This issue is, however, equivalent to the issue faced by custodians of non-DLT based securities. In omnibus account models containing accounts of undisclosed customers on a commingled basis in sub-accounting systems, and where there is no segregation, intermediaries aggregate and often net customers' purchase and sale transactions as it places trade orders through one or more omnibus positions maintained at the transfer agent. Given that assets in omnibus or 'nominee' accounts are held in the name of the intermediary as opposed to named accounts of the beneficial owners, the investor runs the risks of the custodian, which materialise upon insolvency of the custodian.

Regulators are increasingly considering aspects of custody of tokenised assets and other cryptoassets. In 2019, staff of the US SEC Division of Trading and Markets and the Office of the General Counsel of the Financial Industry Regulatory Authority (FINRA) issued a joint statement regarding the broker-dealer custody issue of digital assets (SEC and FINRA joint staff's statement, 2019[32]), followed by a no action letter issued on 25 September 2020 that clarifies the statement (SEC Staff, 2020[31]). On December 23, 2020, the SEC issued a statement and a request for comment regarding the custody of digital asset securities by broker-dealers (SEC, 2020[1]) (see Box 2.9).

Box 4.4. SEC Statement and Request for Comment Regarding the Custody of Digital Asset Securities by Special Purpose Broker-Dealers

On December 23, 2020, the SEC issued a statement and request for comment regarding the custody of digital asset securities by broker-dealers in order to encourage innovation around the application of the U.S. federal securities law broker-dealer "customer protection rule" to digital asset securities.

The statement sets forth the Commission's position that, for a period of five years, a broker-dealer operating under the circumstances set forth in the statement will not be subject to a Commission enforcement action on the basis that the broker-dealer deems itself to have obtained and maintained physical possession or control of customer fully paid and excess margin digital asset securities for the purposes of paragraph (b)(1) of Rule 15c3-3 under the Securities Exchange Act of 1934. These circumstances, among other things, include that the broker-dealer:

- limits its business to digital asset securities;

- establishes, maintains, and enforces reasonably designed written policies and procedures on whether a digital asset is a security offered and sold pursuant to an effective registration statement or an available exemption from registration, and whether the broker-dealer has complied with the federal securities laws for effecting transactions in that digital asset security, before undertaking to effect transactions in and maintain custody of such asset;

- establishes, maintains, and enforces reasonably designed written policies and procedures to assess the characteristics of a digital asset security's distributed ledger technology and

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> associated network prior to undertaking to maintain custody of the digital asset security and at reasonable intervals thereafter;
>
> - establishes, maintains, and enforces reasonably designed written policies, procedures, and controls for safekeeping and demonstrating the broker-dealer has exclusive possession or control over digital asset securities that are consistent with industry best practices;
>
> - establishes, maintains, and enforces reasonably designed written policies, procedures, and arrangements to: (i) identify steps it intends to take on the occurrence of certain events that could affect the firm's custody of the digital asset securities, (ii) allow the broker-dealer to comply with a court-ordered freeze or seizure, and (iii) allow the transfer of the digital asset securities held by the broker-dealer, in the event the broker-dealer can no longer continue as a going concern and self-liquidates or is subject to a formal bankruptcy, receivership, liquidation, or similar proceeding;
>
> - provides customers with certain disclosures regarding the risks of engaging in transactions involving digital asset securities; and
>
> - enters into a written agreement with each customer that sets forth the terms and conditions with respect to receiving, purchasing, holding, safekeeping, selling, transferring, exchanging, custodying, liquidating, and otherwise transacting in digital asset securities on behalf of the customer.
>
> In addition, the Commission requested comment to provide the Commission and its staff with an opportunity to gain additional insight into the evolving standards and best practices with respect to custody of digital asset securities.
>
> *Source:* (SEC, 2020[1])

4.2.2. Delivery versus Payment (DvP) in tokenised securities

Some market participants believe that the application of DLTs can enhance efficiency in the settlement process, reducing complexity and shortening the settlement cycle to near real-time (T+0) compared to T+3 or T+2 settlement periods currently being applied. DLT-enabled 'atomic swaps', i.e. the wallet-to-wallet exchange of two digital assets simultaneously in a single operation, eliminate the need for collateral management and clearing.

Germany and Liechtenstein have introduced the requirement for both counterparties involved in a trade to approve the transaction before it can be settled. This allows regulators to ensure explicit approval from both counterparties, although, according to the industry, there is still uncertainty around the ability for all assets to support that kind of approvals.

In Europe, current regulations (European Regulation on Central Securities Depositories (CSDR), Settlement Finality Directive, account-keeping and custody obligations) do not allow for full settlement and delivery on the Blockchain (AMF, 2020[30]). In addition to the need for a CBDC/Stablecoin for the payment leg of the transaction, and the difficulty in proving ownership at the level of the custody account keepers, mentioned above, the AMF identifies another two difficulties, namely: (i) the need to identify an intermediary acting as the securities settlement system, which is incompatible with the very essence of decentralised networks/ public blockchains; and (ii) the obligation of intermediation by a credit institution or an investment firm so that individuals may obtain access to the settlement and delivery system, which does not seem compatible with the current functioning of crypto-asset platforms by direct access.

As such, and at least in the European space, DLT platforms listing security tokens need to either become CSDs themselves, or use a third party intermediary approved as a central depository. DLT platform operators could become licensed CSD, however, the costs entailed may be prohibitive and the process of creating intermediaries counter to the very nature of DLT-based systems.

4.2.3. Forced transfers and imposed restrictions in tokenised asset trading

The extent to which a regulatory restriction could be practically implemented on a platform's operations, such as the imposition of trading suspension, remains largely untested at a practical level, despite clarity regarding the extent of the regulator's powers to suspend trading. This issue is particularly challenging in markets based on public permissionless networks.

Similarly, in some jurisdictions there is legal and technical uncertainty over the ability of a court of law to order and implement changes to the ledger, when nodes are unwilling to effect those changes. Forced transfers, such as forced separations of assets following a court decision on a divorce are such examples.

Technical solutions are being developed by the industry to address the technical uncertainty, for example through the introduction of 'controllers' defined by issuers in a capability built into ERC1400[15] (Polymath, 2020). Such 'controller' can be the issuer himself or their delegate (registrar/transfer agent) and can move the holdings of an individual investor from one wallet to another without the need for their approval. This solution allows transfer agents to recover assets in the event of the loss of a private key or to enforce legal actions.

The correction of erroneous transfers would be another example of a forced transfer. However, allowing the possibility of such corrections would open the door for reversal of transactions, adding another hurdle in the ambiguous settlement finality of on- chain trades.

4.2.4. Introduction of crypto-registries in Germany

As seen in the above cases, the requirement for the issuance of certificates for tokenised securities introduces some hurdles to the smooth operation of tokenised markets, impeding the full capturing of efficiencies provided by DLTs at post-trade level. In some cases, reliance on off-chain paper certificates while the asset itself is represented on-chain may cause arbitrage opportunities and risks of on-chain/off-chain dislocations when assets are transferred or moved.

As part of the proposed bill for electronic securities, which creates an alternative to paper-based securities, the German regulators have proposed the introduction of *crypto-electronic registers*. The crypto-register must be maintained on a decentralised, forgery-proof recording system in which data are recorded in the time sequence and stored in a manner protected against unauthorised removal and subsequent modification. The registrar of the crypto security has to maintain the register and is supposed to be the only one to alter the content of the register based on instructions of the beneficial owners or a depositary. This is different to the existing central electronic register, where the registrar has to be a CSD.

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[15] ERC1400 is a programming standard developed through an industry-led initiative and providing a standardised framework for the tokenisation of securities. The standard is programmed to automatically enforce specific conditions that relate to legal and regulatory requirements applicable to securities in different jurisdictions and allows for automated compliance of the tokenised asset with pre-defined requirements built in the code.

Industry participants issuing tokenised securities continue to issue paper certificates and work with qualified registered custodians for such paper certificates as well as for the issued tokenised securities representing the rights to these securities. Some issuers have resolved into innovative applications of DLTs and smart contracts to propose new technological solutions for the exercising of rights directly by the owner of the tokenised asset, even when such asset is held in a custodial wallet. For example, some industry participants have separated permission levels of tokens, allowing for the exercising of voting rights by the token holder, even when the token is held by the custodian (see Box 2.10).

Box 4.5. Ownership vs. Custodianship and ERC-1400: an industry perspective

Security tokens could provide a transparent, timestamped record of ownership. Under the ERC- 1400 standard, as with its ERC-20 predecessor, ownership is linked to a balance associated with a specific Ethereum address, which represents the asset owner. This may not be sufficient in some use-cases which require differentiation between the different levels of ownership, and in particular between beneficial asset ownership and custodial ownership.

The introduction of ERC 2258 standard could allegedly provide the possibility for the token owner to remain the beneficial owner of the security with regards to capital distribution and governance, while the custodian has exclusive rights over the beneficial owner.

The new standard aims to standardise an approach towards the custodial ownership of assets represented through security tokens, differentiating between custodial and beneficial ownership.

Note: These protocols may contain bugs or vulnerabilities not addressed in this box.

Source: (Dossa, 2019[32]), (Dossa, 2019[33]).

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5 Other potential challenges to policymaking around asset tokenisation

Policymaking around asset tokenisation may face a number of potential challenges, some of which are outlined below. These may include lack of common language around tokens; the probabilistic nature of settlement finality in decentralised networks; issues of location of the asset for tokens representing physical assets; enforceability of regulation on participants in decentralised DLTs; legal considerations, including around the enforceability of smart contracts; governance and accountability issues related to the absence of a single established central authority in public DLT networks; vulnerabilities around data protection and privacy particularly, including in the use of digital IDs; as well as operational issues (cyber-risk, hacking).

These challenges are considered by the industry as potential stumbling blocks for the development and growth of tokenised markets overall, and could impede or decelerate the large-scale adoption of asset tokenisation (OECD, 2020[1]). Policy analysis, international dialogue, direct experimentation, pilots, forums with operators and other national and international authorities are all tools used to face the challenges rising in tokenised markets, as well as across the board in relation to digitisation in finance.

5.1. A common understanding of terminology and international cooperation

Despite a plethora of literature and regulatory action on DLT-based assets, it appears that there is not a shared understanding of terminologies among jurisdictions.[16] According to a recent cross-country review of FinTech policies by the Financial Stability Institute of the BIS, '*the lack of a common categorisation of cryptoassets is one of the most important challenges when considering a regulatory approach*' (Ehrentraud et al., 2020[34]).

The terms used by policy makers evolve in parallel with the development of technologies and the rapidly changing business models. As with other financial products, and in order to maintain the technology-neutral approach to regulation, the majority of definitions used by regulators do not explicitly mention the underlying technology that enables the creation of a new type of asset, but rather focus on the underlying economic function (e.g. payment vs. security tokens), in order to appropriately evaluate the financial instrument and digital asset from their regulatory standpoint. Nevertheless, having a somehow common understanding of terminology might at some point prove useful given the global, cross-border nature of DLT-based markets, not least so as to help limit potential regulatory arbitrage (OECD, 2020[1]).

5.2. Settlement finality still probabilistic[17]

Final settlement is defined as the irrevocable and unconditional transfer of an asset or financial instrument, or the discharge of an obligation by the FMI or its participants in accordance with the terms of the underlying contract (CPSS-IOSCO, 2012[35]). According to the CPSS-IOSCO FMI principle 8, *"An FMI should provide clear and certain final settlement, at a minimum by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intraday or in real time."*

Settlement finality, i.e. guarantees that transfer orders which enter into such systems are also finally settled, regardless of whether the sending participant has become insolvent or transfer orders have been revoked in the meantime , is crucial for financial market transactions, as it is essential for payments or transfer of assets to have guaranteed settlement in short time. The notion of finality is only probabilistic in decentralised systems, and cannot be guaranteed although it can be secured within certain economic bounds, or not at all, depending on the type of the DLT used (public vs. private permissioned) and the design of their model (Buterin, 2016[36]).

The issue of finality, as others described above (e.g. hard forks) is very much dependent on the type of DLT used. Public blockchains cannot by default guarantee settlement finality,

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[16] The lack of shared understanding of terminologies is evident throughout this note in the discussion of different regulatory frameworks on tokens.

[17] In other words, the settlement of a transaction is not guaranteed and the chances of finalisation are described as a probability, depending on the number of blocks confirmed.

given the possibility of network-driven hard forks, which questions the reliability of such networks for the clearing and settlement of financial instruments. The 51% attack on the Ethereum classic is a notable example of the vulnerability of the model (Forbes, 2019[37]). At the same time, the public blockchain's economic incentives and the cost of mining power required to reach that 51% could be considered as an inherent safety mechanism, discouraging possible attackers.

Technically speaking, a proof-of-work blockchain never guarantees that a transaction is 'finalised'; for any given block, there is always the possibility that someone will create a longer chain that starts from a block before that block and does not include that block (Buterin, 2016[36]). Practically speaking, however, a transaction is considered sufficiently close to being final after a number of blocks have been confirmed (six block confirmations for Bitcoin transactions, for instance). More confirmations increase certainty (e.g. after 13 confirmations there is a one-in-a-million chance of an attacker succeeding).

Even in permission-based DLT networks, where it is arguably easier to have confidence over finality, operational glitches or coding errors may cause revocation of a transaction. Nevertheless, given the fundamental differences between permissionless and permissioned DLTs from the policy makers' perspective, some regulators (e.g. ESMA) highlight the need to distinguish between the two models, particularly when it comes to issues such as finality (ESMA, 2019[4]).

5.3. Geographic location of the asset and regulatory/supervisory enforcement on trading activities

It may be challenging to enforce legal and regulatory requirements on trading activities to nodes of a tokenisation platform or intermediary facilitating the issuance or the operation of the chain, when such parties are based in jurisdictions that do not have cooperation agreements with the home regulator/supervisor. What happens when a participating party (e.g. node) is beyond the reach of the regulator?[18]

In addition, it may be difficult to define the jurisdiction of a public permissionless Blockchain, as the decentralisation inherent in the model, as well as the subsequent disintermediation, make it difficult to point to an identifiable party that performs the regulated activity. This adds an extra layer of complexity for policy makers relative to the enforceability of regulation/supervision.

Another area of legal complexity relates to the issue of territoriality applicable in certain jurisdictions on physical assets in particular, when the law applies depending on where the property is situated.19 Given the global nature of tokenised assets, this becomes an issue, and in most cases, participants need to define their choice of law. The enforceability of such agreements to nodes outside the chosen governing law location/jurisdiction remains ambiguous.

Many jurisdictions impose a regulatory requirement for the asset to be physically 'on soil', which is contrary to the very essence of the decentralised nature of DLT-enabled tokenised assets. The issues raised in this section relating to the location of the assets apply to

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[18] It should be noted that, in the case of the US, if offers and sales are made in the US, including through trading platforms and the internet, then US laws apply, regardless of the location of the issuer of the tokenised asset.

[19] This is not a US issue from a securities regulatory jurisdiction standpoint: Offers and sales into the US are subject to US securities laws.

tokenisation involving the representation of a physical asset existing off-chain, rather than the issuance of native tokenised securities.

5.4. Legal considerations: legal nature of smart contracts and property law

Perceived uncertainty around the legal status of crypto-assets and the enforceability of smart contracts under private law may inhibit the wider use and trading of such assets as investors are not confident that their legal rights are appropriately protected. In particular, there is perceived uncertainty around whether crypto-assets qualify as property under private law, and whether smart contracts written in code give rise to binding legal obligations (UKJT, 2019[38]). According to some legal practitioners, a contract between two parties who cannot identify each other cannot be legally binding. This adds to the complexity of the smart contract law enforcement issue.

If a smart contract does not give rise to binding legal obligations, the rights of transacting parties cannot be enforceable in the event of a technology glitch. Who is responsible and accountable for a coding error of a self-executed smart contract (software developer; user; operator of the Blockchain)? Under which circumstances can the code underlying a smart contract be amended if circumstances change, and who has this privilege and responsibility?

There is currently no consensus with respect to the enforceability of smart contracts under private law. Increased clarity around the treatment of smart contracts relative to their content/code, security, auditability and reliability, as well as assignment of responsibility on their content and functioning are still open questions in many jurisdictions. Until it is clarified whether contract law applies to smart contracts, enforceability and financial protection issues will persist (OECD, 2020[1]). This issue becomes even more complex when considering cross-border applications of tokenisation and multiple jurisdictions involved.

The auditability of the code of such smart contracts will require additional resources from authorities who may wish to supervise activity or from law enforcement agents wishing to confirm the basis on which such smart contracts are executed.

Similarly, the question of whether tokenised assets are recognised as property under private law is unclear in many jurisdictions. By way of an example, under Japanese Civil Code, property rights exist only on 'things', where 'things' are tangible objects that may be subject to exclusive control (Morishita, 2020). It may therefore be difficult to determine with certainty the legal claim investors can have over the tokenised asset (FSB, 2019[39]); how tokens can be subject to enforcement; what their position is in a bankruptcy proceeding from a legal standpoint or whether the holder of an asset will get access to the tokenised asset in case of default of the custodian, to name a few (see also section 2.4.2).

5.5. Governance and accountability

Governance issues, particularly relevant to fully decentralised ledgers, relate to the difficulty in identifying a sole owner or node accountable for the full network. The absence of a single accountable point is a problem that also arises when regulating DLT networks, or when responsibility for a failure in the network needs to be assigned. Network participants can perform '51% attacks' if the majority of the network decides to make changes that are not in line with the initial plan or can 'fork' if they disagree with the original protocol and decide to deviate and develop a separate network by adjusting the basic code (for permissionless DLTs) (OECD, 2020[1]).

Perhaps the most pressing governance challenge from the policy makers' standpoint relate to the absence of a single established centralised authority where the supervisory and enforcement activity can be applied. Lack of accountability is exacerbated in completely decentralised networks (i.e. public permissionless networks).

5.6. Digital ID, data protection and privacy, disclosures

Wider issues around identity and the management of digital identity at scale will have to be addressed in the context of tokenised assets as well as in other DLT-based applications in financial markets. Currently, there are no clear mechanisms in place to prevent, for example, 'wash trading' and other market manipulation techniques. As trading expands from within an exchange to across exchanges and across jurisdictions, that risk is expected to drastically increase. Such risks can be addressed by using strong AML/KYC checks and the use of regulatory-compliant platforms (OECD, 2020[1]).

Questions arise also around data protection and privacy but also around storage of data and regulation applicable to the usage, sharing and storage of data. This is particularly pertinent in jurisdictions with data privacy regimes such as GDPR in Europe, requiring watertight consent management processes in place, effective data rights management systems to be in place, which can be somehow addressed in permissioned blockchains (OECD, 2020[1]).

Regulations around data protection, such as the GDPR in Europe, contain clauses that provide clients with the 'right to be forgotten' or 'right to erasure'. Such clauses are the total antithesis of the immutability of the blockchain and will be harder to address for information that is written on the chain. By way of example, is the public key used as the digital representation of a node in a public network considered as personal identifiable information? If so, how can platform operators grant nodes the right to be forgotten? Such issues may raise liabilities for platform operators and data controllers.

Some believe that the uniqueness of the digital ID may also be important, especially when restrictions apply as to the maximum level of investment each investor can hold. Auditability and consolidation of all investments held by the same ID will also need to be possible, while complying with regulations around data protection at the same time.

Nevertheless, it has been proven that privacy of transactions can be achieved in tokenised environments, where only relevant parties have visibility to transaction detail (e.g. Monetary Authority of Singapore Project Ubin, Phase 2; EY's zero-knowledge proof (ZKP) private transaction protocol of Project Nightfall[20] ((n.a.), 2019[40]).

Some level of privacy around data will also need to be ensured. At the same time, from a supervisory perspective, supervision and enforcement actions (e.g. trading restrictions) cannot apply at a confidential basis. Moreover, there is the possibility for policy makers to have direct visibility over trades performed on DLT-based platforms, as participating nodes in the network.

5.7. Operational issues

From a policy makers' viewpoint, operational issues still present in DLT-based systems give rise to new risks for participants and are therefore within their scope. Network stability, cyber-risk exposure and risk of hacking are not new concepts, however, the innovative

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[20] For more, see https://github.com/EYBlockchain/nightfall

nature of DLTs make them more complex to address. Such issues link back to the policy challenges raised above, too; for example, in case of a hack of a wallet provider, how can a claim to tokens stolen (or lost) be enforced? New requirements may also designed to cover the interoperability between DLTs or the interaction or gateways linking the on-chain and off-chain environments (OECD, 2020[1]).

The European Commission Digital Operational Resilience regulatory proposal is a very interesting example of comprehensive regulatory activity that aims to mitigate operational risks of financial services firms in the digital space (European Commission, 2020[41]) (see Box 2.11).

Box 5.1. The EC Digital Operational Resilience Regulation Proposal (DORA)

As part of the Digital Financial Strategy and legislative proposal package that the European Commission proposed on 24 September 2020, the Commission formulated a legislative proposal that focuses on digital operational resilience in financial services (the Digital Operational Resilience Proposal or DORA) (European Commission, 2020[41]).

The proposal builds on existing information and communications technology (ICT) risk management requirements already developed by other EU institutions and formulates new common rules mitigating digital operational risks.

The DORA proposal aims to establish a clear foundation for EU financial regulators and supervisors to be able to go beyond financial resilience and focus on strengthening their operational resilience, too.

The proposal looks into harmonising local rules across the EU, sets EU-wide standards for testing of operational resilience; ICT risk management rules across financial services sectors; and ICT incident classification and reporting.

Importantly, the proposed rules bring 'critical ICT third party providers' (CTPPs) (e.g. cloud service providers) within the regulatory perimeter, to be supervised by one of the European Supervisory Authorities (ESAs), who would have the power to request information, conduct off-site and on-site inspections, issue recommendations and requests, and impose fines in certain circumstances.

The proposed framework is an important step forward for the strengthening of the operational resilience of financial sector firms, not least against cyberthreats, cyberincidents and other ICT operational disruptions.

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6 What next for tokenised assets?

A lot of ground has been covered in the past few years in the development of markets for tokenised assets, both in terms of regulatory and policy frameworks, as well as in projects undertaken by the industry. In terms of practical applications, a number of ongoing pilot or commercial use cases aim to examine to what extent the efficiencies expected by the deployment of DLTs in financial markets can be achieved. In terms of policymaking activity, greater regulatory clarity is being provided around tokenised markets, new rules

are devised for blockchain-based finance and regulations are adapted to cater for new risks arising in DLT-based financial products and services. Importantly, an open and engaging dialogue is increasingly taking place between policy makers, the blockchain industry and the finance industry.

Real life experience through pilot projects and industrial applications have helped identify shortcomings and risks emerging in DLT-based financial products, as well as areas of further potential innovation. Some of the challenges that policy makers should be aware of have been outlined in this report and include, inter alia, privacy issues; governance risks and operational issues.

As decentralised finance and markets for tokenised and crypto-assets develop and grow in size and importance, policies, regulations, supervision and enforcement will remain important to ensure that the safeguards present in traditional financial markets will equally apply in DLT-based systems and networks with a view to protect investors and financial consumers and safeguard financial stability.

Importantly, international collaboration efforts and dialogue will be important given the global, cross-border nature of DLT-based transactions and securities. In addition, a common understanding of terminologies might help limit regulatory arbitrage.

Annex A. Selection of regulatory approaches to tokenisation initiatives

Clarity on the regulatory perimeter and guidance on the way tokenised securities are regulated

The US framework on digital assets

The SEC has engaged in a large number of enforcement actions[21], indicatively notable cases against Ripple[22], Telegram[23] and Kik[24], and the SEC report on The DAO[25].

In 2019, the SEC FinHub Staff published an instructive framework to assist market participants in determining whether a particular digital asset is an investment contract and therefore a security under the US federal security laws. The term 'digital asset', as used in said framework and subsequent statements, refers to an asset that is issued and/or transferred using DLTs, including, but not limited to so-called virtual currencies, coins, or tokens (SEC, 2019[42]) (SEC, 2020[1]).

In 2019 alone, at State jurisdiction level, 28 States have introduced legislation relating to Blockchain; 27 bills and resolutions have been enacted or adopted (NCSL, 2020[43]). Some notable examples include South Carolina's SB 4351, enacting the South Carolina Blockchain Industry Empowerment Act of 2019 and establishing an opt-in framework for banks to provide custodial services for digital asset property as custodians, while specifying standards and procedures for custodial services; Wyoming's HB 185, authorizing corporations to issue certificate tokens in lieu of stock certificates as specified; Arkansas' HB 1944 which provides that smart contracts are considered commercial contracts; and Delaware allowed companies to use DLTs to and transfer financial securities (NCSL, 2020[43]). It should be noted, however, that actions in particular States have, in most cases, no effect on treatment of digital assets in other states and have no effect on the applicability of the federal securities laws to the digital asset, regardless of what the State law says (see FinHub Staff letter dated January 27, 2020, available at https://www.sec.gov/files/staff-comments-to%20nysdfs-1-27-20.pdf; and Staff statement dated November 9, 2020, available at https://www.sec.gov/news/public-statement/statement-im-finhub-wyoming-nal-custody-digital-assets).

On December 23, 2020, the SEC issued a statement and a request for comment regarding the custody of digital asset securities by special purpose broker-dealers (see Box 2.9). The

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[21] https://www.sec.gov/spotlight/cybersecurity-enforcement-actions

[22] https://sec.gov/news/press-release/2020-338

[23]23 https://www.sec.gov/news/press-release/2019-212

[24] https://www.sec.gov/news/press-release/2019-87

[25] https://www.sec.gov/litigation/investreport/34-81207.pdf

statement sets forth the SEC's position that, for a period of five years, a broker-dealer operating under the circumstances set forth in the statement will not be subject to an SEC enforcement action on the basis that the broker-dealer deems itself to have obtained and maintained physical possession or control of customer fully paid and excess margin digital asset securities for the purposes of paragraph (b)(1) of Rule 15c3-3 under the Securities Exchange Act of 1934. These circumstances, among other things, include that the broker-dealer limits its business to digital asset securities, establishes and implements policies and procedures reasonably designed to mitigate the risks associated with conducting a business in digital asset securities, and provides customers with certain disclosures regarding the risks of engaging in transactions involving digital asset securities.

In March 2020, the Commodity Futures Trading Commission (CFTC) published interpretive guidance explaining what constitutes the "actual delivery" of a digital asset in the context of a retail commodity transaction.[26] In July 2020, the CFTC announced plans to develop a holistic framework to promote responsible innovation in digital assets as part of its strategic plan for 2020-2024.[27] In October 2020, the CFTC issued an advisory providing guidance to futures commission merchants (FCMs) on how to hold and report certain deposited virtual currency from customers in connection with physically-delivered futures contracts or swaps.[28] The advisory also provides guidance that FCMs should follow when designing and maintaining risk management programs concerning the acceptance of virtual currencies as customer funds.[29]

In July 2020, the Office of the Comptroller of the Currency (OCC) published a letter clarifying that national banks and federal savings associations can provide cryptocurrency custody services to their customers (OCC, 2020[44]).[30] In September 2020, the OCC allowed national banks to provide permissible banking services to any lawful business they choose, including cryptocurrency businesses, so long as they effectively manage the risks and comply with applicable law, including those relating to the BSA and AML (OCC, 2020[45]). This includes reserves backing stablecoins, provided that the stablecoins are kept in a hosted wallet (i.e. wallets controlled by a trusted third party, contrary to unhosted wallets controlled by the user who is also the owner of the assets stored). The SEC staff issued a statement issued at the same time as the OCC letter regarding the continued applicability of the federal securities laws, depending on the facts and circumstances.

On December 23, 2020, the US President's Working Group (PWG) on Financial Markets released a statement on key regulatory and supervisory issues relevant to certain stablecoin arrangements with a US nexus and that are primarily used for retail payments. The members encouraged further dialogue as US authorities continue to assess the evolving technological and market landscape and US regulatory framework with respect to stablecoins (President's Working Group on Financial Markets, 2020[2]). The statement reflects a commitment to both promote the benefits of innovation and to achieve critical objectives relating to national security and financial stability. The statement emphasizes that digital payments systems, including stablecoin arrangements, should be designed and operated in a responsible matter that effectively manages risk and maintains the stability of

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[26] https://www.cftc.gov/PressRoom/PressReleases/8139-20

[27] https://www.cftc.gov/PressRoom/PressReleases/8196-20

[28] https://www.cftc.gov/PressRoom/PressReleases/8291-20

[29] *Id.*

[30] It should be noted that that does not apply to the digital asset itself, only to the fiat currency backing the particular digital asset.

the US domestic and international financial and monetary systems. Where adopted at a significant scale, the associated risks may require additional safeguards noted in the statement. The PWG includes the Secretary of the Treasury, the Chairman of the Board of Governors of the Federal Reserve System, the Chairman of the SEC and the Chairman of the CFTC. The Acting Comptroller of the Currency (OCC) was also consulted.

The FCA policy statement on crypto-assets

In its policy statement on crypto-assets, the FCA effectively classifies tokens in regulated (securities or e-money) and unregulated ones ('utility' tokens). Security tokens are tokens with specific characteristics that mean they provide right and obligations akin to specified investments, like a share or a debt instrument as set out in the Regulated Activities Order (RAO) and possibly also a Financial Instrument under MiFID II, excluding e-money (FCA, 2019[5]). The FCA considers a security to refer broadly to an instrument (i.e. a record, whether written or not) which indicates an ownership position in an entity, a creditor relationship with an entity, or other rights to ownership or profit. As such, security tokens are securities because they grant certain rights associated with traditional securities.

The guidance goes beyond native tokenised assets, highlighting some of the requirements and permissions that participants such as custodian wallet providers, and exchanges and trading platforms need to consider when carrying on regulated activities. Security Token Offerings and clear distinction between tokenised securities and 'utility' tokens

Draft supervisory position of the Financial Services Authority of Poland

The Polish FSA published in July 2020 a draft supervisory position on crypto assets. According to this draft position, issuers of tokens that have the economic functions of regulated financial products / instruments (e.g. bonds, shares, investment fund units, derivative products) should fulfil the same conditions that are obligatory for issuers of these products in traditional form. The draft position includes examples of hypothetical tokens with commentary on their probable regulatory treatment. Regulatory clarity is also provided by the Polish FSA through its Innovation Hub programme. In addition, in cooperation with the Central Bank, the Polish FSA is raising consumer awareness of risks related to investing on the crypto-asset market, as well as of frauds, through statements and public awareness campaigns.

The Case of Japan: STO-issued tokenised securities

The Financial Services Agency of Japan introduced a number of changes in policies related to crypto-assets (Okamoto and Takeuchi, 2020[46]). As part of the reform, it was clarified that tokens issued to investors in exchange of funds (fiat or crypto) through Security Token Offerings (STOs), and which offer the possibility to receive dividends, will be regulated under the Financial Instruments and Exchange Act. The reform also introduced regulations on conduct of business targeting brokers of security tokens, including solicitation and management of tokens.

In particular, shares, corporate bonds or other securities considered as high liquid[31] and are referred to as 'Type I Securities', remain Type I Securities when tokenised and are subject to the corresponding regulations.

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[31] As prescribed by Article 2, paragraph 1 of the Financial Instruments and Exchange Act.

When it comes to interests in collective investment schemes or other securities that are considered as low liquid[32] and are referred to as 'Type II Securities', these are defined as electronically recorded transferable rights (ERTRs) when tokenised. As their liquidity increases through tokenisation, these become subject to the regulations applying to Type I Securities.

Tokenized Type II Securities that are considered to have relatively low liquidity when held by a limited number of investors (accredited investor category[33]), are excluded from ERTRs and continue to be subject to regulations applying on Type II Securities, while giving due consideration to balance between user protection and innovation. Under the Financial Instruments and Exchange Act, Type II Securities are subject to a less strict framework than Type I Securities when it comes to the duty of disclosure on issuers and regulations on businesses engaging in transactions.

Table A A.1. Categorisation of STO-issued tokenised securities in Japan

	Type Ⅰ Securities				Type Ⅱ Securities
	(1)Shares, public and corporate bonds, etc.	Tokenised securities			(5)Collective investments schemes, etc.
		(2) Shares, public and corporate bonds, etc.	(3)Electronically Recorded Transferable Rights (ERTRs) such as Collective investments schemes, etc.	(4)Tokenized Type Ⅱ securities excluded from ERTRs	
Disclosure of issuers	When soliciting 50 or more general investors and issuing securities exceeding 100 million yen	When soliciting 50 or more general investors and issuing tokens exceeding 100 million yen		When soliciting 500 or more investors, issuing tokens exceeding 100 million yen, and investing 50% or more of capital contributions in securities	When soliciting 500 or more investors, issuing securities exceeding 100 million yen, and investing 50% or more of capital contributions in securities
Service providers	Type Ⅰ financial instruments business (Stated capital not less than 50 million yen)			Type Ⅱ financial instruments business (Stated capital not less than 10 million yen)	

Source: JFSA.

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[32] As prescribed by Article 2, paragraph 1 of the Financial Instruments and Exchange Act.

[33] Includes qualified institutional investors, corporations whose stated capital is not less than 50 million yen, and individuals who opened a security account one year ago or earlier and whose total balance of investment-type assets and crypto-assets is not less than 100 million yen.

Adapting existing frameworks

Germany: security tokens

Traditional non-tradeable capital investments (within the meaning of the German Capital Investment Act/ VermAnlG) as not usually considered as MiFID securities (within the meaning of the EU Securities Prospectus Act/ WpPG or the German Securities Trading Act/ WpHG), as they do not fulfil the essential characteristic of standardisation, negotiability and transferability in (capital) markets, as well as incorporation of rights comparable to securities.

In its 2019 clarification, BaFin advised that as the result of the use of DLTs, financial instruments that could be structured or described as capital investments, once tokenised, is not a capital investment within the meaning of the VermAnlG, but a MiFID security within the meaning of the WpPG and WpHG. This is at least the case if rights are attached to the financial instrument that are similar to shares or membership rights or a property right of a contractual nature and if the financial instrument is freely transferable (BaFin, 2019[8]). This administrative practice applies in particular to instruments which grant participation in the profits of a company or which constitute participation rights and registered bonds.

Despite this treatment of tokenised assets, issues around property and trading protection remained, related to the difficulty in applying civil law provisions on these securities given to the absence of physical certificate. The draft new bill on electronic securities eWpG – see below) seeks to remedy this through granting the same property and trading protection to electronic and paper-based securities alike (Jünemann and Wirtz, 2020[47]).

The introduction of electronic bearer bonds under the draft Electronic Securities Act (eWpG-E)

Under the newly introduced draft Electronic Securities Act, electronic bearer bonds are treated the same as paper-based debt securities. The framework mirrors the existing regulation of German government bonds, which are issued as dematerialised securities by an entry in the federal debt register and treated as legal objects under the German Federal Public Debt Management Act (Freshfields, 2020[15]).

The draft bill explicitly takes into account the existence of distributed ledger based security tokens and registries and permits crypto registers to be run by entities not being central securities depositories (CSDs) (DWF, n.d.[14]).

The draft bill allows the exchange between already issued paper-based securities into electronic securities and vice versa, while it also permits split issuances (partly paper- based and electronic). It does not only allow for integrating the new electronic securities into the existing paper-based securities' issuance, trading and clearing infrastructure but also a fluent exchange between the legacy and new systems (DWF, n.d.[14]).

Electronic debt securities are fictionally declared to be a legal object so that German property law applies, along with its advantages in insolvency proceedings or bona-fide acquisitions (Freshfields, 2020[15]).

Luxembourg: Draft bill of law N° 7637 proposing to amend the Law of 5 April 1993 on the financial sector as well as the Law of 6 April 2013 on dematerialised securities

The draft bill of law No 7637 which proposes to amend the Law of 5 April 1993 on the financial sector as well as the Law of 6 April 2013 on dematerialised securities will

explicitly allow the use of a secure electronic registration mechanism including distributed registers or databases (hereafter "blockchain or DLT") for the issuing of all dematerialised securities defined in the Law of 6 April 2013. In particular, the use of blockchain or DLT will be allowed for the registration of dematerisalised securities in an issuance account.

It is important to note that an issuance account is not a securities account because the objective of these accounts is different. The issuance account will permit to verify the number of dematerisalised securities in circulation compared to their number at issuance.

The Law of 1 March 2019 already permitted the use of blockchain or DLT for the registration of a previously issued security in a securities account as well as the transfers between securities accounts. As a result, once the draft bill of law has become a law, central account keepers and settlement organisations in Luxembourg will have legal certainty concerning the use of blockchain or DLT for the issuing and circulation of dematerialised securities. It will however not be possible for entities (such as issuers) to issue tokens on their own, it is mandatory to use the services of a central account keeper or settlement organisations.

In addition, the draft bill of law further proposes that investment firms and credit institutions can provide the activity of central account keeping for a specific set of dematerialised securities, namely the non-listed debt securities. Accordingly, investment firms and credit institutions will be able to provide a larger set of services around non-listed debt securities and their issuers will have a larger choice for selecting the central account keeper.

Swiss initiatives on tokenised securities and DLT developments

In September 2020, the Swiss parliament has adopted the DLT law, expected to come into force in 2021 (Swiss Confederation, 2020[3]). The law aims at increasing legal certainty, removing barriers for applications based on DLTs and reducing the risk of abuse.

FINMA published ICO guidelines in 2018 (FINMA, 2018[52]) and its supplement regarding stablecoins in 2019 (FINMA, 2019[50]).

Identifying and filling the gaps

European Union: ESMA's case by case approach on crypto-assets[34]

EU regulators have been actively monitoring the development of DLT and crypto- assets for several years already. Back in 2017, ESMA published a report on DLT highlighting the potential benefits of the technology but also the challenges that it needed to address to be successfully deployed in financial markets. Later in 2017 and 2018, ESMA published two Statements on Initial Coin Offerings (ICOs) (ESMA, 2017[53]), (ESMA, 2017[54]) and the three ESAs published a joint-Warning on Virtual Currencies (VCs), as we were concerned about the speculation around these instruments (ESMA, 2018[55]).

ESMA considers that a 'case by case' approach is needed when legally qualifying crypto-assets. Some crypto-assets, e.g., those with attached profit rights, are likely to qualify as MiFID financial instruments. Others, which represent a large portion of those CAs outstanding, are likely to fall outside of the regulated space in the EU.

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[34] Sub-section provided by Anne Choe, ESMA (2020).

Where crypto-assets qualify as transferable securities or other types of MiFID financial instruments, a full set of EU financial rules, including the Prospectus Directive, the Transparency Directive, MiFID II, the Market Abuse Directive, the Short Selling Regulation, the Central Securities Depositories Regulation and the Settlement Finality Directive, are likely to apply to their issuer and/or firms providing investment services/activities to those instruments.

However, ESMA has identified a number of gaps and issues in the existing regulatory framework when applied to crypto-assets. In particular, some of the risks that are specific to their underlying technology may be left unaddressed. Meanwhile certain existing requirements may not be easily applied or may not be entirely relevant in a DLT framework.

Where crypto-assets do not qualify as financial instruments (or where they do not fall within the scope of other EU rules applicable to non-financial instruments such as the e-money directive as identified in the EBA's report and advice on crypto-assets), the absence of applicable financial rules leaves consumers exposed to substantial risks.

Some Member States have or are considering some bespoke rules at the national level for all or a subset of those crypto-assets that do not qualify as MiFID financial instruments. While ESMA understands the intention to bring to the topic both a protective and supportive approach, ESMA is concerned that this does not provide for a level playing field across the EU. ESMA believes that an EU-wide approach is relevant, also considering the cross-border nature of crypto-assets.

France: The Financial Market Authority (AMF)'s consultation on security tokens

In February 2020, the French Market Authority (AMF) has launched, in February 2020, a review and analysis of the application of existing financial regulations to security tokens (AMF, 2020[56]). Such analysis verified the conditions under which the existing regulatory framework could apply to security tokens.

Introducing new policies for tokenised assets

European Commission: Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto Assets, and amending Directive (EU) 2019/1937 (MiCA) and Pilot regime for market infrastructures based on DLT

In September 2020, the European Commission adopted a comprehensive package of legislative proposals for the regulation of crypto-assets, updating certain financial market rules for unregulated crypto-assets (markets in crypto assets or 'MiCA'), and creating a legal framework for a pilot regime for using DLT in the trading and post trading of securities (the 'pilot regime'). MiCA replaces all national rules currently governing the issuance, trading and storing of those crypto-assets which do not already fall under existing financial market regulation in the EU. The pilot regime allows for exemptions from existing rules and allows regulators and supervised institutions to test innovative solutions utilising DLTs (European Commission, 2020[4]), (European Commission, 2020[5]).

The draft Markets in Cryptoassets Regulation (MiCA) and pilot regime were designed to support innovation while protecting consumers and the integrity of crypto-currency exchanges (no insider trading, front running etc) and increasing legal certainty in the area of cryptoassets.

The proposed regulation covers not only entities issuing crypto-assets but also firms providing services around these crypto-assets such as and firms operating digital wallets, as well as cryptocurrency exchanges. It creates a new EU-wide licensing regime for cryptoasset issuers and service providers along with substantive conduct of business and consumer protection requirements. MiCA also introduces a new EU-wide passport that is available to market participants who become licensed under the MiCA regime in their home member state.

The proposed bill regulates issuers of asset-referenced tokens (cryptoassets that purport to maintain a stable value by referring to the value of several fiat currencies that are legal tender, one or several commodities or one of several cryptoassets, or a combination of such assets) and issuers of e-money tokens (cryptoassets used as a means of exchange and that purport to maintain a stable value by referring to the value of a fiat currency that is legal tender).

MiCA introduces requirements for the issuance of tokens not falling under one of the above categories (including utility tokens), including indicatively the issuance of a white paper and marketing communication complying with a set of requirements. Crypto-asset service providers are subject to a number of requirements depending on the type of crypto-assets involved (e.g. authorisation; prudential; business conduct; governance).

The proposal addresses also potential risks for financial stability and monetary policy risks related to global stablecoins, as according to the proposed bill, the European Banking Authority can classify asset referenced tokens and e-money tokens as significant at its own initiative or at the request of the issuer, which translates into stricter requirements.

Figure A A.1. The proposed taxonomy of crypto-assets in MiCA

Crypto-asset	Asset-referenced tokens and e-money tokens (general and significant*)	Crypto-assets qualifying as financial instruments
- utility tokens	- asset-referenced tokens - e-money tokens (includes e-money)	Financial instruments (MiFiD)
'crypto-asset' means a digital representation of value or rights which may be transferred and stored electronically, using distributed ledger technology or similar technology	*'asset-referenced token'* means a type of crypto-asset that purports to maintain a stable value by referring to the value of several fiat currencies that are legal tender, one or several commodities or one or several crypto-assets, or a combination of such assets	'crypto-assets that qualify as: (a) financial instruments as defined in Article 4(1), point (15), of Directive 2014/65/EU;
	'electronic money token' or 'e-money token' means a type of crypto-asset the main purpose of which is to be used as a means of exchange and that purports to maintain a stable value by referring to the value of a fiat currency that is legal tender	
• 'Catch-all' definition – in line with the FATF recommendations • Not attempting exhaustive list or a full taxonomy • Future-proof	*'Asset-referenced token'* A token referring to gold A token referring to several currencies A token referring to other crypto-assets	• Promote consistent application across EU (Commission interpretative communication) • DLT pilot
➡ covered by MiCA	➡ covered by MiCA	➡ not covered by MiCA

Source: European Commission staff presentation, October 2020.

France's bespoke framework for tokens

The Blockchain Order of 2017 established in French law a regulatory framework governing the representation and transmission of unlisted financial securities via DLTs (French Parliament, 2017[11]). It extended to other securities (mainly unlisted equity and debt

securities) the possibility of using distributed ledgers for the issuance, registration and transfer of such securities, instead of traditional securities accounts.

France established an innovative framework for token offerings via the PACTE Action Plan for Business Growth and Transformation bill (published on 24 May 2019). The loi PACTE set out an optional framework for tokens that cannot be assimilated to financial instruments, both on the primary market of initial coin offerings (ICOs), as well as on the secondary market, spanning custody, fiat-crypto and crypto-crypto exchange

The Italian framework defining DLTs and smart contracts

Although it does not address directly tokenised asset markets, Decree-Law No. 135 of 14 December 2018, converted into law by Law No. 12 of 11 February 2019, provides a definition of distributed ledger technologies (DLTs) and a definition of smart contracts. Furthermore, it clarifies that the electronic time stamps produced by a DLT have legal effects as per Art. 41 of European Regulation No. 910/2014. According to said law, the Agency for Digital Italy should publish technical standards for DLTs to produce the abovementioned legal effects and for smart contracts to comply with the written form (the Agency does not seem to have published such standards yet).

In addition, in June 2020 the Italian Government (namely, the Ministry of Economic Development) has released a document, the "Proposte per la Strategia italiana in materia di tecnologie basate su registri condivisi e Blockchain" ("Proposals for the Italian Strategy in the field of technologies based on distributed ledgers and Blockchain"), hereinafter referred to as "Italian Strategy", subject to a public consultation from 18 June to 20 July 2020. This document, issued prior to the publication of the Digital Finance Strategy by the European Commission in September, contains some recommendations, including one relating to digital tokens managed through a distributed ledger, in particular, with reference to Initial crypto-asset offerings (ICO / STO).

Russian Federation: 'utility' tokens vs. 'digital financial assets'

In July 2020, the Russian Duma adopted the Law on Digital Financial Assets, effective from 1 January 2021. Among other things, the new Law separates utility (or 'product') tokens, providing legal claims on services/goods/IP, from 'digital financial assets', akin to tokenised securities. According to the text of the law, digital financial assets provide monetary claims and other rights (e.g. rights of equity securities, such as the right to participate in the capital of a non-public joint-stock company, as well as the right to exercise the transfer of equity securities).

The new law clarifies the regulatory regime applicable to each of the two categories of tokens. On the one hand, utility or 'product' tokens are allowed to be issued through initial coin offerings (ICOs), under an approach similar to the French visa system. On the other hand, tokenised securities or 'digital financial assets' fall under the existing financial securities regulation and its requirements.

In the case of ICO issuances, the law introduces detailed requirements including the provision of a whitepaper, disclosure requirements to investors and an obligation for a dedicated information system that should be included in the register of the Central Bank and which should encompass access to assets functionality; continuity of operations; integrity and reliability of the information on the register, among other things. Participants are subject to business reputation and qualifications criteria, and are required to maintain internal control and security systems.

Amendment of the Companies Code in Poland and dematerialisation of shares in new Simple Joint-Stock Company (Prosta Spółka Akcyjna - P.S.A.)

In March 2021, a new law amending the Commercial Companies Code will come into force in Poland, making it possible to register shares of a new type of company using blockchain. The provisions will introduce a new type of capital companies to the legal market - Simple Joint-Stock Company (Prosta Spółka Akcyjna - P.S.A.). The adopted provisions create a simplified procedure for dematerialisation of PSA's shares. All Simple Joint-Stock Company shares will be registered in the register of shareholders kept in electronic form by one of the authorized entities, e.g. the National Depository for Securities, custodian banks, banks conducting brokerage activities or notary offices. The shareholders register may only be in electronic form and may be in the form of tokens in a decentralized and distributed database. Entities keeping registers of Simple Joint-Stock Company shareholders will be required to ensure that the number of shares registered in the register is consistent with the number of shares issued and to make entries of changes to the data in the register.

### *Singapore issues first digital corporate bond pilot in Asia*

In September 2020, SGX, in collaboration with HSBC and Temasek, completed the first pilot digital syndicated corporate bond in Asia (SDX, 2020[57]). SGX's digital asset issuance, depository and servicing platform was used to launch and settle in parallel a S$400 million 5.5-year public bond issue and a follow-on S$100 million tap of the same issue by Olam International.

SGX utilised DAML, the smart contract language created by Digital Asset, to model the bond and its distributed workflows for issuance and asset servicing over the bond's lifecycle. SGX's solution used smart contracts to capture the rights and obligations of parties involved in issuance and asset servicing, such as arrangers, depository agents, legal counsel and custodians.

The digital bond used HSBC's on-chain payments solution, which reportedly allowed for seamless settlement in multiple currencies to facilitate transfer of proceeds between the issuer, arranger and investor custodian.

Key efficiencies that were reported to have been observed within the pilot include timely ISIN (identifier) generation, elimination of settlement risk (for issuer, arranger and investors), reduction in primary issuance settlement (from 5 days to 2 days) as well as automation of coupon and redemption payments and registrar functionality (SDX, 2020[57]).

Figure A A.2. SGX Digital Asset Issuance Platform
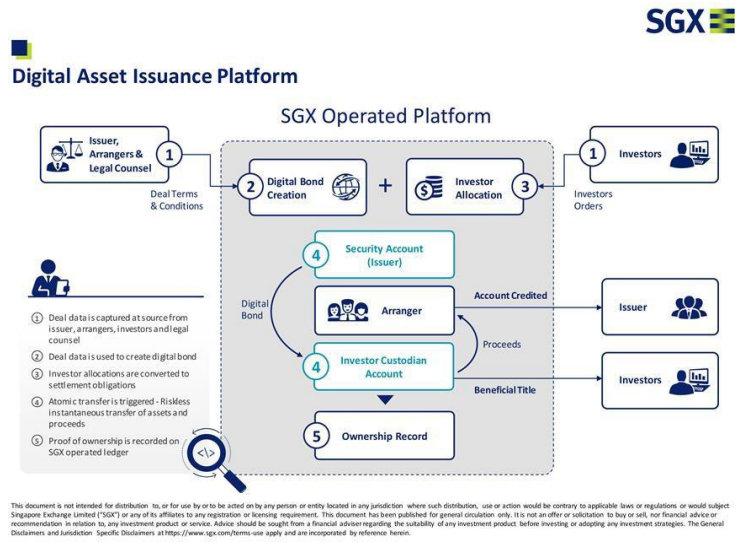
Source: SGX.

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