Crypto tokens in payments and securities settlement

For some ten years now, it has been possible, using blockchain technology, to transfer digitally defined units of value, such as Bitcoin, as "crypto tokens" electronically within a network via a cryptographic process that leaves a distinct traceable record without the involvement of intermediaries. The financial sector believes that blockchain technology has the potential to carry out the entire process of settling financial transactions on the basis of digitised values. Existing units of value, such as gold or securities, could be represented by a digitally generated token and made digitally transferable (tokenisation).

Financial service providers and technology companies are currently stepping up their efforts to develop tokens for payment purposes that have a stable value. The effectiveness of most of the crypto tokens currently used for payments is primarily limited by the relatively large fluctuations in their value. However, with the progressive development and use of stablecoins, which are comparatively stable in value, crypto tokens demonstrate that they possess the potential for greater use in transactions. These also include the plans published recently by a consortium of large platform providers such as Facebook as well as international payment service providers under the name "Libra", according to which blockchain technology would be used to create globally available stablecoins. Whether and to what extent stablecoins will be used in the future as a means of payment remains to be seen. If stablecoin projects of this size were to quickly play a significant role in payment transactions, this could have a noticeable and lasting impact on the financial system and central banks. In light of this, policymakers and academics have been discussing from various angles whether central banks should issue digital central bank money to the general public. From today's perspective, however, the Bundesbank does not see a need for digital central bank money to be made available to non-banks.

In the area of securities settlement, the financial sector also assumes that the use of blockchain technology will enable transactions to be settled more efficiently. While German securities law currently does not permit the purely digital issuance or transfer of values, it is expected that the legal situation will be revised and that current settlement processes and structures will evolve further.

From the Bundesbank's perspective, efforts to tokenise assets using blockchain technology are to be welcomed in principle on account of the attendant impetus for innovation and efficiency. The Bundesbank will continue to monitor current developments closely. The guiding principle of its assessment will be to ensure that payment systems remain secure and efficient and that its other statutory objectives, primarily monetary and financial stability, are not compromised.

Tokens as catalysts of digitalisation

Digitalisation is changing processes and structures in settlement

Digitalisation impacts on payments and securities settlement in particular. The conversion of analogue processes, with their many manual operating steps and numerous system discontinuities, into digital, automated processes is especially important in high-volume payment transactions. Major advances have been achieved on this front since the 1980s thanks to the standardisation, harmonisation and automation of processes. In recent years, an entirely new dynamic has unfolded, driven, inter alia, by new technologies and the emergence of digital ecosystems, especially in the form of communication platforms and in e-commerce. This dynamic means that many of the IT systems used by financial service providers have to be overhauled.

Digital tokens enable electronic transfers within networks

For a number of years, the financial sector has been expecting digital tokens in conjunction with distributed ledger technology (DLT)[1] to transform processes and structures in payment and securities settlement systems. While the vast majority of payment transactions and securities settlement transactions are currently already cleared electronically, this nevertheless requires accounts or securities deposit accounts held at banks or other central intermediaries. If values are to be transferred, these central entities must be involved in order for a booking to be made on the corresponding accounts. The possibility of settling digital assets more and more decentrally in the form of tokens is intended to speed up the execution of many transactions, reduce the costs of the associated processes and open up new areas of business. The corresponding gains in efficiency will materialise particularly wherever a large number of participants in a network interact with each other and where there are frequent exchanges between the parties involved, such as in payment systems or on trading platforms. Tokens are digital units that are transferable and that can take on a great number of functions in a network. In order to transfer the tokens, the participants interact with each other directly via technical protocols in a peer-to-peer network. The Bitcoin network, for instance, functions as an independent payment system between connected computers. In the meantime, however, both blockchain technology and the concepts and business models behind digital tokens have seen noticeable progress.

Crypto tokens to enable secure and immediate transferability

Digital tokens can be generated and transferred both in public permissionless networks and in private, closed networks. Since the transfers or transactions within a network are carried out using a technical protocol based on cryptographic procedures, this type of token will be referred to below as "crypto tokens". The aim is to fully dematerialise means of payment and assets in order to transfer them between participants in the network securely and immediately.

Crypto tokens and their ecosystem

Publicly accessible crypto tokens remain a niche phenomenon

Crypto tokens were initially known as a substitute means of payment in public, decentralised networks on the internet. In recent years, they have increasingly been used as an object of speculation, giving rise to a large number of centralised and decentralised trading platforms. In the meantime, a number of traditional financial actors are now also offering products and services for publicly accessible crypto tokens. Owing to the use of unregulated crypto trading platforms and, in some cases, widely varying terminology, published statistics on the number, value and volume of existing crypto tokens should be interpreted with caution. The oft-cited source coinmarketcap.com lists over 2,000 different crypto tokens, with a market

1 The term "blockchain", or more generally "distributed ledger" (DL), is normally used to describe a database shared across a network which gives participants joint rights to write, read and store entries to the ledger. The most common DLT applications are based on blockchain technology, which has proven to be particularly useful for recording transaction histories; see also Deutsche Bundesbank (2017a).

capitalisation of around US$335 billion.[2] Bitcoin alone accounted for more than half of this figure. Most of the crypto tokens listed are of little importance in terms of their value, with several hundred of them reporting a daily turnover of less than US$10,000. Even the narrow monetary aggregate for the euro area, M1 (cash in circulation plus sight deposits of non-banks), is more than 25 times the value of all crypto tokens.[3]

Payment tokens, security tokens and utility tokens – distinction is often unclear

In the public debate, crypto tokens are generally divided into three categories for the sake of simplicity:[4]

- Payment tokens: These fulfil a payment function. Aside from this, they have little or no other function.
- Security tokens: Users have claims on assets arising from participation or contractual rights, similar to shares and bonds.
- Utility tokens: They can be used in the issuer's network to purchase goods and services.

In practice, it is often difficult to classify tokens distinctly into one of the three categories.

Development of the market environment

Crypto tokens originally arose as a substitute means of payment in public peer-to-peer networks and became known as an object of speculation

Crypto tokens arose and became known as privately generated digital tokens that can be transferred as a substitute mean of payment in publicly accessible peer-to-peer networks in a largely anonymous manner and without any intermediaries. On the whole, they are not used as means of payment predominantly due to their strong price fluctuations compared with legal tender as well as the lack of stability mechanisms on the part of an issuer or an anchoring in the real economy. At the turn of 2017-18, Bitcoin registered a multiplication of its value within a few weeks, as did many copycat coins. This boom was followed by a value adjustment that lasted several months. The value trajectory that was observed during this period strongly resembled the pattern of historical speculative bubbles[5] and provided an enormous boost to the prominence of crypto tokens, especially among speculative investors.[6]

Partial shift in focus from payment and speculation purposes to digital rights of use

In spring 2018, this development was followed by strong growth in the number of newly issued crypto tokens via "Initial Coin Offerings" (ICOs). These initiatives are a kind of crowdfunding where investors purchase newly issued crypto tokens for money or other crypto tokens in order to fund the development of products, typically software. This type of approach is especially interesting for newer start-up companies that are not readily able to cover their capital requirements via bank loans or the traditional capital market. The design of ICOs and particularly the rights and obligations associated with the issued crypto tokens vary considerably: in some cases, investors can use crypto tokens to purchase the rights of use to products that are often still in development, while in other cases they are looking at the prospect of real participation rights. Frequently, however, they are simply crypto tokens whose value could rise.

ICOs entail high risks

In the past, the rapidly growing ICO market, utilised as a form of direct finance, was structurally susceptible to abuse and fraud, however.[7] White papers that described the projects were sometimes formulated so vaguely that in many cases it was difficult to make a realistic assessment of the market opportunities.[8] Nevertheless, even these ICOs were in demand: blockchain or DLT were considered key future technologies that were expected to change many market structures. A large number of

2 See https://coinmarketcap.com.
3 See European Central Bank (2019), value for April 2019.
4 See Fußwinkel and Kreiterling (2018).
5 See Financial Stability Board (2018).
6 See Deutsche Bundesbank (2018a).
7 See Fußwinkel and Kreiterling (2018).
8 See Fußwinkel and Kreiterling (2018) and European Securities and Markets Authority (2017).

investors wished to have a share in the returns of seemingly promising developments.

In general, the issuers of the tokens placed on the market via ICOs determine themselves which information they disclose. Investors are not sufficiently able to verify this information. Since many of the ICOs initiated so far are initiatives that operate outside of the relevant regulatory provisions and jurisdictions, investors are not protected by consumer protection regulations.[9]

Centralised trading platforms

Market infrastructures have emerged for crypto tokens

The formation of a market for crypto tokens has entailed the increasing appearance of centralised and decentralised internet-based crypto trading platforms. Centralised trading platforms enable the purchase and sale of various crypto tokens against currencies issued by central banks. Similarly, most platforms allow different crypto tokens to be traded for one another. The most liquid crypto tokens on these trading platforms currently include Bitcoin, Ether and the Ripple token. Some trading platform operators additionally offer a significantly broader range of less liquid crypto tokens. The trading volume on the largest crypto trading platforms varies widely. Several studies in the past have also raised doubts regarding the reported trading volumes.[10] After some trading platforms pulled out of countries such as China due to stronger regulation, they are now chiefly located in Malta, South Korea, Singapore, Hong Kong and the United States. According to publicly available information, these include Binance (Malta, formerly China and Japan), OKEx (Malta), Coinbase (United States), HitBTC (Hong Kong), Huobi (Singapore, previously China, with additional locations in Hong Kong, South Korea, Japan and the United States), Upbit (South Korea) and Bitfinex (British Virgin Islands).[11]

Services and quality of centralised trading platforms vary considerably

The functioning, governance, transparency, scope and quality of services of the various centralised trading platforms can vary substantially. A key distinctive feature is the role of the platform operator in the trading of crypto tokens: while some providers merely provide the platform itself, on which customers can place their purchase and sales bids and carry them out against each other, other providers act as intermediaries by acting themselves as buyers or sellers to their customers. Moreover, the platforms can also play different roles regarding the custody of crypto tokens. Platform operators can therefore either custody the tokens on behalf of their customers ("custodial exchanges") or they can leave the custody of the token to the customer ("non-custodial exchanges").[12] Since crypto tokens exist purely in digital form, a private key is required to transfer crypto tokens. This key has a function similar to a password and is only known to the owner. If the platform assumes the custody of crypto tokens, it acts as a trustee. It then holds the private key, which entitles its owner to transfer the crypto tokens in the original peer-to-peer network, on behalf of the customer. In this respect, the situation is comparable to online banking or an online securities deposit account. On the other hand, if customers keep their private key themselves, they alone are able to transfer the crypto tokens and are solely responsible for safeguarding the key.

Not all operators of centralised trading platforms are subject to financial market regulation

Operators of centralised trading platforms are private companies that are sometimes not subject or only partially subject to financial regulation and supervisory regimes depending on the country of residence and business model. Therefore, in some cases, there are only very few or even no requirements for risk management, IT security and consumer protection. In addition, these platforms are typically relatively

9 See BaFin (2017).
10 See, for example, Bitwise Asset Management (2019), Presentation to the U.S. Securities and Exchange Commission (SEC), https://www.sec.gov/comments/sr-nysearca-2019-01/srnysearca201901-5164833-183434.pdf. This study was presented to the SEC at a meeting where a rule change was proposed to permit a Bitcoin ETF issued by Bitwise to be listed and traded.
11 For an overview, see https://www.bti.live/exchanges/
12 See Rauchs et al. (2018).

new enterprises or start-ups whose security policies are often still in their early stages of development and less tried-and-tested.[13] These trading platforms have experienced attacks by cybercriminals on several occasions due to insufficient security precautions.[14]

Security flaws and weak governance harbour high risk for customers of trading platforms

Besides cyber-attacks, cases of fraud and loss events owing to the operator's poor governance structures have frequently been observed in recent years. In some cases, it can be assumed that the market was targeted and manipulated in order to achieve profits illicitly.[15] Furthermore, some providers have been criticised for forgoing know-your-customer (KYC) checks required for banking business. Waiving the requirement to establish customers' identities opens the door to anonymous or pseudonymous participation in the network, meaning that illicit transactions such as money laundering and terrorist financing can be concealed. That said, there are indications in the sector of a trend towards the clear identification of customers, not least to build up trusting customer relationships and to achieve a broader customer base in the financial market.

Decentralised trading platforms

Decentralised trading platforms are only suitable for exchanging crypto tokens

Besides centralised trading platforms, an increasing number of decentralised trading platforms (also known as "decentralised exchanges") have been set up recently; on these trading platforms, users can exchange crypto tokens, in some cases entirely without intermediaries. The transaction takes place directly between the seller and the buyer and is cleared automatically by a program code (smart contract) developed specifically for that purpose.[16] However, only a very small number of decentralised exchanges operate exclusively on blockchain technology. As the matching of bids on the blockchain is very time-consuming and expensive, special websites are employed to match supply and demand via a trading book.

Traditional financial market actors increasingly integrating individual crypto tokens in their product range

In addition to the centralised or decentralised exchanges, the traditional financial sector is also gradually developing its own growing range of crypto token services, with some traditional actors offering custodial services for crypto tokens. Others are basing their index or derivative products on crypto tokens, enabling institutional and private investors to speculate on the prices of individual or multiple crypto tokens without having to hold them directly.

Crypto tokens such as Bitcoin do not fulfil functions of money owing to a lack of stable value

To sum up, although a diverse infrastructure for trading and storing crypto tokens has emerged in recent years, many of the crypto tokens that have been around for longer, such as Bitcoin, have, on the whole, not proven to be stable in terms of their value compared with currencies issued by central banks. As a result, they have not been able to establish themselves as a general means of payment, nor are they suited to being a store of value. Instead, they are a niche product used predominantly by speculative investors. Furthermore, the tokens and the infrastructure required for their trade and storage are often not subject to financial market regulation. There are also indications that crypto tokens are being used for illicit transactions.

Stablecoins

Stablecoins are crypto tokens designed to have a stable value …

In response to the sharp price volatility of many existing crypto tokens, there have been attempts for some time now to develop crypto tokens that are stable in value. Stablecoins are crypto tokens whose value is often pegged to an existing currency (or basket of currencies) and backed by matching collateral.[17] Stablecoins are therefore not payment tokens which have an inherently stable value.

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13 See Hileman and Rauchs (2017).
14 See Rauchs et al. (2018).
15 See Xu and Livshits (2018) and Li et al. (2018).
16 See Lin (2019).
17 As a general rule, there is no perfectly positive correlation between the stablecoin and its respective reference currency, as the price of a stablecoin is additionally determined by fluctuations in supply and demand on digital trading platforms.

… and could be used for settling payments in digital infrastructures

Stablecoins have been receiving a particularly large amount of attention over the past few weeks as a result of the plan by Facebook and other large global players (collectively in the Libra Association) to establish a global payment system with stablecoins. In these cases, the stablecoin is designed for settling payments in digital networks or infrastructures, such as messenger services. So far, stablecoins have been used mainly as a unit of account or a vehicle currency for trading between different crypto tokens, especially for arbitrage trading between different trading platforms.[18]

Settlement based on tokens encouraged by stable value

Tokens having a stable value encourages their use for payments. In the simplest case, the value of the token can be pegged to the value or price of an existing asset outside the network, such as a currency issued by a central bank or a security. What is crucial for their stability is how stable the value of the underlying collateral is and how legally binding any claim to convertibility is.[19]

Backing stablecoins with collateral

Fundamentally, there are two different approaches to maintaining the stability of the stablecoin's value: backing with off-chain or on-chain collateral and utilising algorithms to control the supply of tokens (see the chart on p. 45).

Backing with off-chain collateral

Off-chain collateral refers to values that are not stored on a blockchain in digital form, but stored in a traditional way. These mainly consist of claims in currencies issued by central banks, such as secured account balances at a bank or securities. However, off-chain collateral may also take the form of commodities, such as gold. Many initiatives, some of which have been launched by established companies, are aimed at a stablecoin backed by a local currency. The remarks below therefore mainly relate to this approach.

Often no right of redemption for the buyer

The stablecoin issuer assures the buyer that the issuer will hold the stablecoin's equivalent value in the respective collateral currency or in equivalent collateral assets. Redemption of the stablecoin in question in currency is often not guaranteed, however. The holder has no legally enforceable entitlement to reimbursement. In this respect, the situation is different from that concerning a bank deposit, which constitutes a legally enforceable claim against the bank in question (for example, payment in cash). However, it is also conceivable for the provider to hold the posted collateral as a trustee for the users. As a general rule, users of stablecoins incur credit risk if the provider is insolvent upon redemption. Liquidity risk may arise if, for example, the relevant collateral cannot be liquidated at short notice. It should also be noted that the nature of the assets used as collateral for individual stablecoins may vary widely.

Collateralistion with central bank money would reduce risk

If the collateral is in the form of liquid deposits held with commercial banks, there remains an inherent credit risk. Backing with central bank money would not have these disadvantages, but would not eliminate a priori the credit risk stemming from the collateralising entity. There would have to be specific legal arrangements for this, say, in the form of trusteeship agreements that would safeguard the collateralising character for the stablecoin in the event of the collateralising entity becoming insolvent.

Economic implications of stablecoins difficult to gauge from today's perspective

At the present stage, it is very difficult to gauge how widely and how quickly stablecoins will come into use in the future and what repercussions this would have for the economy and the financial system, particularly as the extent and speed both depend on the concrete implementation. In highly developed economic areas with efficient payment systems and stable currencies, the market potential of stablecoins as a

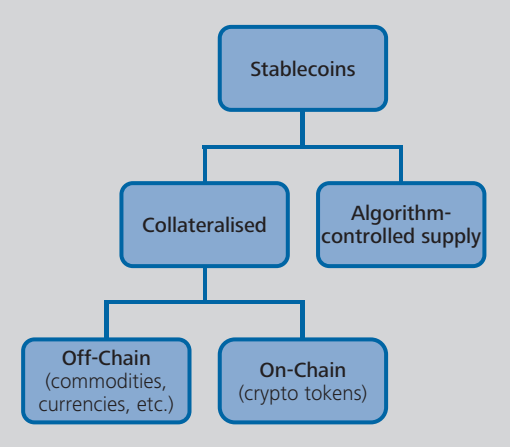
18 See Rauchs et al. (2018).
19 If the backing collateral is a currency basket, the holder always bears an additional exchange rate risk if the token is to be exchanged for US dollar or euro, for example. This risk essentially depends on the share of the respective currency in the overall basket.

means of payment is likely to be modest given the then uncertain additional benefit. However, globally functioning, low-cost settlement with a relatively stable token which is issued and credibly collateralised by a consortium of several large and solvent companies might have the potential to displace some currencies, especially those which are less stable in value, to a certain extent.

Stablecoins from solvent companies could have far-reaching implications

Stablecoins actually achieving large volumes and being backed by baskets of currencies might have a macroeconomic impact, say, owing to shifts in exchange rate relationships. This is conceivable, for example, if a currency were to have a larger share in the currency basket than warranted by its use in the international trade of goods and services or for the portfolio selection of international reserve currencies. In this scenario, far-reaching effects could also occur for the existing players in the respective financial system if stablecoins were to replace giro money as a means of payment, thus reducing banks' earnings in the field of payments. Although banks are already exposed to increased competition in payments from new providers, this has been concentrated so far on the "customer interface", while actual payment settlement still takes place on bank accounts. Banks' traditional business models would possibly come under pressure if sight deposits were to become less attractive compared with holding tokens, resulting in portfolio shifts into longer-term forms of investment. This might lead to a change in, for example, the refinancing conditions for lending and, indirectly, also in the transmission of monetary policy impulses.[20] In particular, if such shifts were to happen abruptly, effects on financial stability could not be ruled out. Over the longer term, once businesses and consumers have adjusted to it, it is likely that the financial system will have adapted to the more widespread use of stablecoins. Much the same applies to any monetary policy implications of the highlighted developments. As long as there is still a sufficient demand for central bank money, monetary policymakers will still be in a position to achieve their aims effectively. What also has to be taken into account in a financial system changed by stablecoins is that demand for tokens could become very volatile in the event of individual stablecoin issuers experiencing economic difficulties or threats to their reputation.

Types of stablecoins



Deutsche Bundesbank

Central banks' mandate must not be put at risk

Stablecoins also harbour opportunities in the form of aggregate welfare gains, say, if they lower the still very high fees for some cross-border transfers.[21] Particularly stablecoins that are broadly or even globally widely accepted could indeed have implications for some traditional tasks of the central bank, such as safeguarding the effective transmission of monetary policy, ensuring stable payments, and financial stability. The fulfilment of statutory central bank tasks must take priority over private sector business interests, however. If the sovereign fulfilment of the central banks' mandate were to be jeopardised by stablecoins in the future, the statutory and regulatory frameworks would have to be adapted accordingly. Owing to the potentially global dimension of tokenisation and its settlement infrastructures, close cooperation between regulators and central banks is indispensable for ensuring a stable financial

20 See Deutsche Bundesbank (2017b).
21 See pp. 46 ff.

system and similar competitive conditions internationally without the possibility of regulatory arbitrage.

Backing with on-chain collateral

Backing option with on-chain collateral, as a rule, less stable

A further option is to back stablecoins with on-chain collateral. In this system, collateral, such as existing crypto tokens, is deposited on a blockchain. As existing crypto tokens do not have an intrinsic stable value, additional stabilising measures are generally put in place. These include, inter alia, incentives for active management of the collateral as well as the over-collateralisation of the respective stablecoin. The stabilising mechanisms envisaged for this might act only with a time lag, however. Furthermore, liquidity shortages in the crypto token used as collateral as well as the generally very volatile market environment can lead to insufficient collateralisation. Price stability in relation to a reference currency can thus, in principle, be ensured only approximately in the case of crypto tokens with on-chain collateral. There is still the risk of a downward spiral given a fall in the price of the crypto token used as collateral.

Algorithm-controlled supply

Stabilisation through algorithmically controlled supply virtually non-existent and not functional, either

In contrast to the two variants that have already been described, stablecoins whose supply is algorithm-controlled are not backed by traditional or digital assets. Instead, the supply is intended to be controlled variably by the relevant blockchain protocol or an individual smart contract. The idea behind this is that of an algorithmic issuing agency that is supposed to manage the token supply automatically, so that a stable exchange rate to a selected benchmark (e.g. the US dollar or the euro) is ensured.[22] One of the unresolved issues here is how a fall in the price of the token could be prevented in the event of a speculative attack or a crisis. In practice, stablecoins with an algorithmically controlled supply have not been used on a notable scale so far.

Tokenisation in the settlement of payment transactions

Tokenisation as a catalyst for efficient settlement

Tokenisation allows for extensive digitalisation in the settlement of payment transactions so that, in several cases, confirmations and reconciliation processes can be carried out more quickly and some steps in the process chain can even be omitted entirely. As a result, benefits can be expected particularly for complex, labour-sharing processes. In the financial sector, this primarily affects securities settlement, but also cross-border payments.[23] By contrast, the national payment systems in many countries have already attained a high level of efficiency. In addition, there is a perceptible global trend towards introducing real-time retail payment systems, which make it possible to settle payments instantly and at any time via bank accounts.

Cross-border payments traditionally settled via correspondent banking

Until now, cross-border payments between banks have been settled via an international network of bilateral accounts (correspondent banking). In a number of cases, lines of credit are provided in order to settle payments; trust between the counterparties in correspondent banking therefore plays a key role. In some cases, there exist inefficiencies that can result from the long settlement chains and lack of standardisation, which are then reflected in relatively high fees and long processing times compared to national payments. In addition, some regions have seen a decline in correspondent banking relationships and tendencies towards consolidation in recent years.[24]

The use of tokens as vehicles for settlement provides the opportunity of leveraging poten-

22 See He (2018).
23 See Deutsche Bundesbank (2017a).
24 See Bank for International Settlements (2016).

Tokens could increase efficiency of cross-border payments

tial for optimisation in cross-border payments. Tokens can serve as a common medium of exchange within a network and thereby replace bilateral account management.[25] Through tokenisation, counterparties can exchange values and securities across countries and currency areas on a uniform basis.[26] The use of tokens in digital cross-border networks could enable those processes which, so far, have required manual intervention in some cases to be automated and carried out more efficiently. Furthermore, the use of tokens could be attractive for large, international providers if they integrate them into their cross-border platforms as a worldwide, user-friendly means of payment.

Trade finance could benefit from automated settlement

Trade finance also plays a major role in international payments. Alongside the use of digital tokens, an additional potential benefit is afforded by the use of smart contracts for simultaneously settling trading obligations. Using smart contracts, digitalised values are transferred on a blockchain – in a way that is verifiable and resistant to counterfeiting – depending on their documented progress in the process. This means that smart contracts act as technological trustees which automatically forward or return the funds entrusted to them upon the occurrence of certain events, such as the dispatch of goods. In a closed network with defined roles, the trade finance documentation, which often consists of several thousand pages nowadays, could be used in digitalised form.

Digital format templates must reflect contractual agreements

For this purpose, a number of prerequisites must be fulfilled: the contracts used must be standardised, such as in the form of digital format templates; the rights of the individual counterparties must be defined in a legally binding manner; and a common platform must be used. The platform could be operated jointly by all or several of the participants and would thereby avoid the problem of the participants needing to agree on a central, trustworthy intermediary, which can sometimes be a difficult issue in an international context. As smart contracts do not create contracts but settle them, the contractual basis for cooperation between the participants using a common technology in a process chain must be prepared initially. By using a common network with standardised contracts, risks can be reduced and processes that have so far been largely manual can be simplified and accelerated. Uniform data storage within the network may be expected to provide additional benefits.

Tokenisation could strengthen financial inclusion and lower costs for remittances

Improvements in cross-border payment transactions should also be seen as a way of increasing financial inclusion. These simplifications could allow for considerable welfare gains in some countries by facilitating people's access to payment services. In a considerable number of countries,[27] a significant portion of national income consists of transfers from emigrants back to their home country (remittances). In 2018, remittances to low and middle-income countries amounted to around US$529 billion[28] and are at times associated with high transaction costs. According to the World Bank, the costs were, on average, 7% of the transfer amount.[29] This means there is a high potential saving that could be leveraged through the use of new technologies. In order to make full use of this potential, it would also have to be possible to use tokens in the recipient country, which would avoid the cumbersome process of exchanging them for cash. At the same time, the stringent regulatory standards – for example, with regard to anti-money laundering and counter-terrorist financing measures – must be taken into account.

25 See, for example, Ripple, Solution Overview, https://ripple.com/files/ripple_solutions_guide.pdf.
26 See Clark-Jones et al. (2018).
27 In 2018, the highest share of remittances in terms of GDP were recorded in Tonga (35.2%), Kyrgyzstan (33.6%), Tajikistan (31%), Haiti (30.7%) and Nepal (28%) (World Bank, 2019).
28 See World Bank (2019).
29 These costs refer to the average costs of sending US$200 to a low or middle-income country.

Discussion about digital central bank money

Digital central bank money for non-banks currently promises little utility

Today, the vast majority of payment transactions between non-banks are settled in commercial bank money. Nevertheless, central bank money in the form of cash also continues to play an important role for payments in general. For this reason, following the emergence of crypto tokens, there was soon talk of issuing digital central bank money for non-banks – the "retail" variant – as a stable means of payment within DLT-based systems. However, such a connection is anything but compelling. As things stand today, this comprehensive variant of digital central bank money offers only minor perceptible benefits for payment settlement. Many use cases could be covered through the use of tokenised commercial bank money. If, for example, a token were to be issued by a commercial bank and could be exchanged for legal tender with that bank, this would constitute digital commercial bank money, known from a regulatory perspective as electronic money (e-money).[30] From the Bundesbank's perspective, there is therefore no need to introduce this comprehensive variant of digital central bank money at the current juncture. Nevertheless, some central banks have begun to systematically investigate the possibility of issuing digital central bank money. Differences result based on the scenarios analysed and the motive.[31]

Public accessibility as a motive for digital central bank money

One motive for introducing digital central bank money could be to ensure the accessibility of the financial system and central bank money to the general public. In some countries, the declining use of cash in payments has prompted a debate on whether households and enterprises need an electronic form of central bank money for payment settlement.[32] In addition, it is being discussed whether it could become necessary to issue digital central bank money if private payment structures with significant market power were to evolve. In this context, a payment system with digital central bank money should ensure competition and access to the payment system for all consumers as well as guarantee the security of payment transactions in crisis situations through a publicly provided service.

Digital central bank money for non-banks harbours certain risks

However, if digital central bank money were to be issued, far-reaching implications would have to be taken into consideration.[33] Digital central bank money that would also be available to non-banks could, for example, be used as a substitute for commercial bank money. The financing of commercial banks through (sight) deposits could be made more difficult or more expensive, which could also potentially have an impact on the credit supply.[34] Irrespective of this, bank deposits would likely be subject to greater volatility, particularly during times of crisis or economic strain in the financial markets.

Central bank money plays key role in banks' payment settlement

If digital central bank money were only to be used in a closed-loop system containing selected participants for a limited purpose – the "wholesale" variant – the consequences for monetary policy, bank stability and the financial system would be considerably less pronounced. The fact that commercial bank money harbours risks of insolvency and illiquidity plays a significant role in banks' payment settlement and in the cash settlement of financial market transactions. At present, private actors' access to accounts at the central bank, and thus the possibility of holding and transferring central bank funds, is largely confined to monetary financial institutions. The non-bank private sector generally only has access to central bank money in the form of cash. If these access criteria for central bank money were to remain unchanged,

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30 In simplified terms, e-money is an electronic representation of money that is issued in exchange for payment of an amount of money (prepaid), represents a claim against the issuer and is also accepted by parties other than the issuer.
31 See Barontini and Holden (2019).
32 See Sveriges Riksbank (2018).
33 For a detailed discussion of the issue, see, for example, Bank for International Settlements (2018).
34 Alternatively, banks would have to compensate for the loss of sight deposits, for example by attracting time deposits and savings or by issuing bank debt securities. However, these liabilities are regularly associated with higher funding costs.

structural effects in the financial sector would be expected only to a limited extent. The rationale behind establishing such a system would mainly be the expected gains in efficiency achieved through DLT-based settlement.

Collateralisation in central bank money envisaged

In this context, market participants are also discussing stablecoins, which would be used to settle very large-value financial market transactions. In order to minimise credit risks as far as possible, collateralisation in central bank money is under consideration in this regard. However, only a central bank's liabilities can be non-cash central bank money. As a result, tokens issued by commercial banks or a group of commercial banks backed by central bank money would not be considered central bank money.

"Trigger solution" conceivable

Settlement in central bank money could also be achieved by technically connecting DLT-based networks to existing payment systems. Existing payment systems, such as the TARGET2 real-time gross settlement system operated by the Eurosystem, would be used for the cash settlement of transactions carried out on DLT-based platforms. In this case, the DLT would act as a messaging platform that triggers payments. This "trigger solution" would require the development of a technical interface between DLT networks and payment systems, the creation of a legally binding, digitalised payment instruction, as well as the continuous provision of real-time settlement in RTGS systems by extending operating hours. However, the conditions for accessing the systems, and thus central bank money, would not need to be fundamentally changed.

Tokenisation may provide impetus for harmonisation

Ideas and initiatives with regard to tokenisation may, in conjunction with innovative technologies, provide impetus for increased harmonisation and standardisation. Heterogeneous rules and standards are often responsible for complex settlement structures. By establishing uniform standards, settlement can also be sped up within the existing structures and made more transparent. One example of this is the SWIFT Global Payments Innovation Initiative, which, under certain conditions, allows for same-business-day payments, payment tracking, and transparent processing fees in the field of international payments. In this regard, credit institutions are falling back on the existing infrastructure, but the potential for optimisation is being fully exhausted through the implementation of uniform rules and improved procedures.[35]

Tokens in securities settlement

Two types of tokenised securities

Alongside the use of tokens in payment transactions, there are especially high hopes for the use of tokenised securities. Conceptually, there is a distinction between digital representations of securities already issued through traditional channels, on the one hand, and securities that exist purely in digital form as tokens, on the other.

Tokenisation may enable significant efficiency gains in post-trade

A sizeable number of market participants believe that significant efficiency gains in post-trade could be achieved through tokenisation in the future. Post-trade comprises the settlement, custody and, optionally, clearing of securities. In this area, the processing of securities transactions should also be simplified and accelerated by the improved data quality and the omission of intermediaries. Ideally, it is expected that issuers and investors would be able to conclude transactions with each other directly without intermediation by other participants, such as central securities depositories (CSDs) or custody banks. The long custody chains that are typical in securities business at present could then be shortened considerably. The resulting leaner processes in post-trade would likely lead to efficiency gains and cost savings.[36] In addition, smart contracts are well suited to settling various corporate actions (e.g. coupon payments) in a more efficient way. Some steps in the process could be automated and the need for reconciliation as well as the

35 See Hofmann (2019).
36 See Bank for International Settlements (2017).

number of errors arising from the reconciliation process are likely to decrease as a result of common data storage.

Tokenised collateral baskets may significantly simplify mobilisation of collateral

One specific area that already features concrete use of tokens in the market is collateral management. Here, the focus is on what are known as "collateral baskets", i.e. baskets of collateral of predefined quality that are used to collateralise various transactions or to ensure compliance with regulatory requirements. As an initial step, these collateral baskets can be formed using tokens.[37] Employing DLT, these tokens can then be transferred between the counterparties involved virtually in real time. In particular, internationally active market participants whose securities are held at various locations could provide collateral in this way without the underlying individual securities having to be repeatedly moved along long custody chains. Utilising tokenised securities as collateral could allow residual frictions to be reduced. At the same time, the market is seeing strong demand for high-quality liquid assets (HQLA).[38] Tokenisation-based market solutions currently in development are approaching this problem by enabling easy mobilisation of these securities without the need for cumbersome physical transfer.

"Delivery-versus-payment" settlement not yet achieved

While only mutual exchange of securities or collateral baskets is envisaged at present, exchanging securities tokens for commercial bank money or central bank money (delivery versus payment, or DvP) is also already under consideration. DvP settlement links the transfer of securities resulting from their purchase or sale or from a repo transaction to the transfer of commercial bank money or central bank money. Here, securities are only delivered once the corresponding transfer of money has occurred, and vice versa. The idea behind such DvP settlement is to eliminate advance delivery risk; in existing settlement systems, it is standard procedure. Settlement with DLT and tokenised securities could either be done in connection with existing payment systems (as described above) or would require tokenised money on the blockchain. This could include representations of commercial bank money. However, due to its systemic importance, it is much more common, and also required by international standards, to settle such transactions in central bank money, for example on the TARGET2-Securities platform operated by the Eurosystem.

Operators already planning migration from existing market infrastructure to systems based on tokenisation

At present, a number of market infrastructure operators are looking into migrating some of their systems to DLT. For instance, the Australian stock exchange operator ASX is intending to replace its CHESS (Clearing House Electronic Subregister System) post-trade system, which has been in operation for more than 25 years, with a DLT-based solution.[39] The new system is based on a closed-loop network (permissioned distributed ledger). This means, for example, that, unlike well-known public blockchain systems such as Bitcoin or Ethereum, this new blockchain has an administrator (the stock exchange) and that transactions can only be carried out by participants approved by the exchange.

Entire process chain for securities could potentially be based on tokenisation in future

In future, it is conceivable that the entire value chain in the field of securities – from issuance through trade, clearing, and settlement to custody – could be processed using a single system based on tokenised securities and DLT. Until this is actually possible, however, a variety of technical, organisational, legal and regulatory issues will have to be resolved. In terms of technical issues, it must be guaranteed above all that tokens can be transferred in a way that is resistant to counterfeiting. The organisational side is concerned with integrating all participants into an effective framework of governance that also sets out clearly defined responsibilities and, if necessary, provides for interconnectivity with other blockchains. At least in Germany, there is currently no legal basis for

37 The underlying securities are ringfenced and temporarily blocked at a custodian so that they cannot be used for other purposes.
38 See Deutsche Bundesbank (2018b).
39 See ASX (2019).

BLOCKBASTER

In the BLOCKBASTER project (blockchain-based settlement technology research), Deutsche Börse and the Deutsche Bundesbank used a prototype to jointly research how the settlement of digitalised securities or digitalised units of value based on blockchain could work. This included building a blockchain prototype based on the implementation of the Hyperledger Fabric framework.[1] At the same time, the company Digital Asset was commissioned to develop an identical prototype to gain experience based on different implementations of DLT. Performance and load tests were subsequently carried out and analysed for both prototypes. The results of the tests undertaken in the spring of 2018 show that both prototypes are, in principle, suitable in terms of scalability for the live operation of financial market infrastructure and can serve as a basis for further developments.[2] At present, blockchain technology is still progressing rapidly, meaning that additional improvements with regard to productive use can be expected. With respect to the speed of the settlement of a single transaction, blockchain proved somewhat slower and somewhat more expensive (more time required, more resources consumed) than conventional central architecture.

This made it clear that, in the case of simple settlement tasks without significant follow-up processes (i.e. in large segments of payments), conventional central architecture may remain superior. However, in the case of more complex settlement procedures, such as in trade finance or securities, the advantages of using a common database could have a greater impact. The common database could allow follow-up processes, interim steps and reconciliation to be omitted or accelerated. Overall, only a comprehensive, more detailed cost-benefit analysis – including a comparison with traditional technologies over the full life cycle of a security – can provide a robust assessment of the advantages of the new technology. Furthermore, the research project made clear that the use of blockchain requires the close cooperation of all players in the settlements-as-a-network industry.

1 The Hyperledger Fabric framework is a special, open-source framework for the development of blockchain applications. The BLOCKBASTER prototype is based on version 1.0.5.
2 See Deutsche Bundesbank and Deutsche Börse AG (2018).

treating digital tokens like securities, which fall under German property law. In particular, the legal nature of the tokens and the statutory requirements in terms of custody (e.g. the role of the registrar) would need to be clarified.

Development of prototypes for a range of use cases

For many of the use cases currently under investigation, there are prototypes that have not yet been deployed in regular operations. In some cases, DLT-based settlement has been accompanied by parallel conventional settlement for legal reasons so that, except for not having legal force, the prototypes' full functionality can be demonstrated.[40]

Regulatory aspects

Innovations may require regulatory framework to be adapted

With the emergence of new technologies in the financial sector, the question arising time and again is whether they are adequately covered by the existing regulatory framework, or whether the framework needs to be adapted. In particular, the principle of "same business, same risks, same rules" should be taken into account. On the one hand, the protective function of the rules, e.g. regarding the stability of the financial system and consumer protection, as well as the general fulfilment of public sector mandates such as maintaining price stability or ensuring stable payment systems, must not be undermined. Yet on the other hand, regulation should be as technology-neutral as possible for the financial sector to make use of the benefits of innovation. The phenomenon of tokenisation and the establishment of new transaction infrastructures have raised numerous regulatory issues which are currently the subject of intense debate by the competent authorities at the national and international level.

Current classification of crypto tokens

There are many different types of crypto token. The uses and risks vary greatly depending on their features, which is why the regulatory classification of crypto tokens ultimately needs to be determined on a case-by-case basis. For example, the Federal Financial Supervisory Authority (BaFin) is looking into whether individual crypto tokens fall within the scope of already existing financial market regulation (e.g. on securities, financial instruments or investment), bearing in mind the principle of technological neutrality. The regulatory classification can imply far-reaching obligations for issuers, inter alia regarding due diligence with regard to anti-money laundering regulations and investor protection.

Regulatory classification on a case-by-case basis

Repeated warnings of loss risks associated with crypto tokens

Over the past few years, crypto tokens have increasingly been used as speculative financial assets. Given their high volatility, the European supervisory authorities, BaFin and the Bundesbank have in the past repeatedly warned investors of the associated risks. It would therefore be highly desirable to apply investor protection rules to securities-like crypto tokens as these usually represent early-stage investments in start-ups which can involve a particularly high risk of loss. Added to this is the fact that crypto tokens are traded on unregulated secondary markets, which correspondingly harbours additional risk.

Pure utility tokens could remain untouched by financial regulation, but are rare

As a general rule, pure utility tokens – even though they are occasionally used as a speculative form of investment – are generally unlikely to be governed by existing financial regulation. Therefore, neither the investor protection rules under financial market legislation nor anti-money laundering provisions would apply. However, it should be borne in mind that crypto tokens are mostly also used to make payments.

Need for further regulation yet to be assessed

A recent report by the European Securities and Markets Authority (ESMA) from January 2019[41] suggests that risk disclosure requirements vis-à-

40 See Fries and Kohl-Landgraf (2019) and Hirtschulz and Pehoviak (2019).
41 See European Securities and Markets Authority (2019).

Early integration of the first crypto tokens into the existing regulatory framework

As early as 2013, the Federal Financial Supervisory Authority (BaFin) stated publicly that – in their assessment – Bitcoins are units of account pursuant to section 1 (11) sentence 1 of the German Banking Act *(Kreditwesengesetz)* and are therefore financial instruments within the meaning of the Banking Act. This supervisory classification meant that authorisation is not required for the mining and mere use of Bitcoins and other crypto tokens classified as units of account. By contrast, financial services including the commercial purchase or sale of such crypto tokens – for example, by operating a crypto trading platform – require authorisation, and the operators of such financial services must comply with the requirements of the Money Laundering Act *(Geldwäschegesetz)*. This unambiguous approach by BaFin was an early response in Germany – unlike in many other countries – to potential risks posed by crypto tokens to the integrity of the financial system. At the same time, it provided clarity with respect to the supervisory classification of the crypto tokens which were most relevant at that time.

However, BaFin's administrative practice came in for criticism in a widely noted decision by the Berlin Court of Appeals *(Kammergericht Berlin)* in September 2018. In particular, it was stressed that BaFin had gone too far in its classification of Bitcoin and other crypto tokens as units of account, since it is not within the remit of the executive to intervene in matters of law-making.

Even though the existing administrative practice of BaFin is not immediately affected by this ruling in a criminal case and BaFin plans to adhere to its administrative practice, there have since been increasing calls for legislative initiatives to create legal certainty with regard to the supervisory treatment of crypto tokens[1] and the tokenisation of securities.

1 The draft law transposing the amending directive to the Fourth EU Anti-Money Laundering Directive *(Entwurf eines Gesetzes zur Umsetzung der Änderungsrichtlinie zur Vierten EU-Geldwäscherichtlinie)* defines the term "crypto value" and classifies it as a financial instrument, which is likely to lead to services akin to banking and financial services (such as investment or contract broking) being offered. Furthermore, "crypto custody business" is being introduced as a financial service.

vis investors be put in place. The European Banking Authority (EBA) also published a report at the beginning of 2019[42] in which it reaches the conclusion that the divergent treatment of crypto tokens by national authorities could lead to risks for consumers and possibly allow regulatory arbitrage on account of the unlevel playing field. Hence, the advice to the European Commission by ESMA and the EBA is to assess whether crypto tokens require additional regulation.

Can stablecoins be classified as e-money or deposit business or do they require their own set of rules?

Another question of particular interest is how payment tokens in the form of stablecoins are to be classified from a regulatory perspective, especially in the dominant variant of off-chain backing with a currency. Depending on the coins' form of issuance, use, remuneration and repayment claims, they could, for example, qualify as deposits, money market funds, investment funds or e-money. Given that individual stablecoins were potentially created to be used globally and that each jurisdiction has its own definition of what elements require regulation, it might become necessary to jointly enhance the regulatory framework.

Oversight of settlement infrastructures

Financial market infrastructures are held to high risk-mitigation standards

Besides the legal status of tokens, the underlying transaction infrastructure also plays a role. Where financial market infrastructures are involved, for instance, the bar has to be set high for those infrastructures which play an important role in the financial system, especially if they are systemically important. These requirements include risk provisioning in accordance with the Principles for Financial Market Infrastructures (PFMI) established by the CPSS and IOSCO.[43] Amongst other things, the principles stipulate that legal, liquidity and credit risk be mitigated. Operational risk – cyber risk in particular – should also be taken into account in the context of innovative technologies. In the event that DLT-based procedures become systemically important, the PFMI as well as other relevant rules for financial market infrastructures might become applicable under certain conditions. One particular challenge here is that the PFMI address the system operator, whereas DLT-based infrastructures generally exhibit highly decentralised elements.

Anti-money laundering and countering the financing of terrorism

Expansion of anti-money laundering legislation from 2020 onwards

If crypto tokens are used as a means of payment, they may also serve money laundering or terrorist financing purposes, especially where they allow anonymous or pseudonymous participation. The decentralised issuance of crypto tokens – without any natural persons or legal entities as an issuer or intermediary – raises the issue of how to best subject them to anti-money laundering provisions. The intention is therefore that implementing the amendments to the Fourth EU Anti-Money Laundering Directive will bring crypto trading platforms and commercial wallet providers, i.e. the interface between crypto token ecosystems and the traditional financial system,[44] into the general scope of anti-money laundering legislation. However, similar to cash transactions, purely decentralised transactions, which are carried out on a peer-to-peer basis, remain unaffected by this.

In view of the fact that crypto token networks often operate across borders, close international cooperation will be essential in order to prevent crypto tokens from being used for criminal purposes. The relevant guidelines of the Finan-

42 See European Banking Authority (2019).
43 See Bank for International Settlements (2012).
44 In order to facilitate the exchange between real currency and crypto tokens, crypto exchanges have no choice but to hold accounts in real currency. This is where anti-money laundering legislation comes into play because holding an account in the traditional financial system requires clear identification of the account holder, be they a natural person or legal entity. Commercial crypto token wallet providers are likewise rooted in the traditional financial system and therefore likewise open the door to anti-money laundering rules.

cial Action Task Force, as well as their rigorous international implementation and continued evolution, are thus particularly important.[45]

Efforts to modernise German law

Tokenisation may change legal nature of financial instruments

In order to make use of the potential offered by new technologies, the coalition agreement by the parties that constitute the Federal Government sets out plans to develop a blockchain strategy and create an appropriate regulatory framework for trading with crypto tokens. Using tokens in a comprehensive manner – something that is technically possible – may also change the legal nature of individual financial instruments. Tokenisation would lead to a greater standardisation of financial instruments, rendering them more easily transferable and fungible. Individual token-based investments may then assume securities-like properties within the meaning of the Securities Trading Act *(Wertpapierhandelsgesetz)*.[46] Given that, in the case of some financial instruments, interest in customisation outweighs the desire for fungibility, there will also be limits to tokenisation.[47]

Interim solution conceivable for utility tokens

In this context, the possibility of putting national transitional provisions into place for utility tokens is currently being reviewed; this would ensure legal certainty and investor protection at the national level and could function as a bridging solution until a common European regulatory framework for utility tokens is established.

Refinement of a technology-neutral securities law appears reasonable

As a further element of the blockchain strategy, it is being discussed whether German law should be opened up to the issuance of electronic securities, making physical certification no longer obligatory.[48] This should make it possible for securities[49] to be issued in line with the Federal Government Debt Management Act *(Bundesschuldenwesengesetz)* by entering them in a register. The register should be run by a government entity, or by a government-supervised entity, so as to rule out the possibility of manipulation. An exception to this register being managed or supervised by a government entity should be possible if manipulation can be ruled out by using certain technologies.[50] In such cases, it will be possible for issuers themselves or a designated third party to operate the register. Modernising German securities legislation by opening it up to technology-neutral electronic securities is something the Bundesbank would welcome, in principle.[51] Moreover, it would be desirable for a single regulatory framework to be established at the European level. In this way, cross-border settlement could be made more efficient, especially with regard to the capital markets union.

Outlook and further areas of action

Focus of financial sector on using DLT …

Irrespective of the volatile price spikes in publicly accessible crypto tokens, the financial sector is increasingly focusing on the application-oriented use of DLT. In order to apply the digital transfer of values effectively, the financial sector is aiming for tokenisation to become embedded in the regulatory framework.[52]

… within existing regulatory framework

The various technical solutions for implementing DLT are increasingly being tailored to the needs of the financial sector. The major initial problem of the blockchain procedure's lack of scalability has been resolved in that it no longer appears to be a significant obstacle in closed-loop applications for financial market infrastructures. In DLT prototypes pursued by financial service providers, the saved transaction his-

45 See Rolker and Strauß (2019); Read (2018); Klair (2018); as well as Financial Action Task Force (2019).
46 See Weiß (2019); in a similar vein, see also Koch (2018).
47 See Koch (2018).
48 See Federal Ministry of Finance and Federal Ministry of Justice and Consumer Protection (2019).
49 Initially limited to debt securities.
50 In this context, the key-issues paper uses the term blockchain technology. However, in the light of the paper's technology-neutral approach, we believe that the term can be understood as a pars pro toto.
51 See Deutsche Bundesbank (2019).
52 See Federal Reserve Bank of Boston (2019).

tory is no longer visible to all participants, addressing the legitimate need for confidentiality.

Closed-loop blockchains appear better suited for financial transactions

What is more, by displacing materially significant information, the sector is preventing the unauthorised disclosure of information resulting from possible future decryption through improved computing by, say, quantum computers. Financial service providers active in the field normally opt for a closed-loop, permissioned blockchain, where all parties involved need to be approved by the operator. This allows for transparent governance, avoids any anonymous and thus potentially illegal transactions and ensures that operators have a clear responsibility, including a competent contact person for issues regarding operational security. Open blockchains do not appear to be a suitable option for either financial transactions or any form of confirming personal data.

Insular solutions must become interoperable

The cooperation between various institutions has gradually produced functioning insular solutions for DLT-based settlement of individual transactions involving these institutions. For reasons of operational efficiency and in order not to split liquidity across individual markets, the aim should be to make these insular solutions used by individual consortia interoperable.

Digitalisation accelerated by combining DLT with tokenisation

Against this backdrop, the efforts of the financial industry to create technically secure as well as formal and legally binding tokens represent the next logical step. Through the process of tokenisation, DLT can accelerate the digitalisation of payment and securities settlements. Traditional crypto tokens in open permissionless networks are likely to play only a minor role. Stablecoins, ideally connected to stable currencies issued by central banks, or simply to commercial bank money, can help accelerate settlement and partially replace intermediaries. Digital central bank money, by contrast, is not required for this purpose.

A technically secure and efficient tokenisation of values is the prerequisite for a functioning decentralised settlement mechanism. In order for tokens to actually be used for financial transactions, as things now stand, the legal framework in Germany would need to be adapted to include a definition of the legal status of tokens in general and of crypto tokens in particular; in addition, DLT-based solutions as transfer and issuance channels would need to be legally recognised.

Challenge for tokenisation: technical functionality and definition of legal nature

Central bank mandates affected

Two recent developments may have a particularly great impact on the role of central banks. First, the call for the authorisation of stablecoins which are backed by central bank money, and, second, the creation of large consortia to develop stablecoins that can be used worldwide, e.g. Libra. In the first case, although no digital central bank money would formally be generated, market participants might associate stablecoins backed with central bank money with a high level of security, helping them to widely penetrate the market. Compared with clearing in commercial bank money only, this could make settlements in the field of innovate financial market infrastructure more secure, even without digital central bank money. However, payments would then take place outside the real-time payment systems operated and monitored by central banks (e.g. TARGET2), with potential implications for the role played by central banks and for market participants' liquidity management. Even more far-reaching implications would be conceivable in the latter case, where stablecoins are issued by international consortia. At present, important technical, organisational and regulatory questions concerning the approach of the Libra consortium remain open. Considering potential effects is therefore still speculative. Nevertheless, it seems appropriate that supervisory authorities and central banks are already carefully monitoring and assessing these developments. Innovations which are able to increase welfare and lower transaction costs should be facilitated. However, key objectives such as price stability, financial stability and the security of payments must not be compromised. Moreover, competition in the European payments

market should continue to be ensured. With all this in mind, it would seem advisable for the European banking industry to press ahead more resolutely than in the past with its efforts to modernise the payments landscape and find European solutions.

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