Crypto Compass

2023

Boerse Stuttgart Digital

Content

Preface

The capital markets are subject to constant change. Currently, the situation is particularly challenging due to interest rate turnarounds by the central banks and geopolitical upheaval. The market for digital assets is also characterised by fluctuating dynamics.

However, this is not just about price collapses in cryptocurrencies or crises affecting important players during the previous “crypto winter”. This pattern of market cycles, the consolidation of market players and ongoing development of market rules are also an indication that digital financial markets are maturing rapidly.

Digital assets are currently the most important application area for blockchain technology, which is achieving more widespread acceptance. It is an innovation that has the potential to fundamentally change many industries for the better. There are immense opportunities for blockchain and distributed ledger technology throughout the economy and especially in the financial sector.

There is persistent and steadily growing interest in crypto-assets from private investors, especially institutional players. That’s why all of us at Boerse Stuttgart Group and Boerse Stuttgart Digital welcome the fact that important political and regulatory strategies are being defined for crypto markets in Germany and the EU. These are key steps in the right direction towards sensible, comprehensive and far-sighted regulation that will set new standards.

When institutional players rely on digital assets, they need an experienced, reliable, forward-thinking infrastructure partner. As precisely such a partner, Boerse Stuttgart Digital provides customers with access to reliable trading and secure custody of digital assets. To give you an insight into what is already possible with blockchain technology today and what potential might be leveraged in the future, we have compiled the Boerse Stuttgart Digital Crypto Compass 2023.

I hope you enjoy reading it,

Dr. Matthias Voelkel
CEO Boerse Stuttgart Group

Summary

Innovations often have one thing in common: they are only recognised as such in hindsight. Whether it's the internet or the steam engine, innovations like these have changed our lives forever. In the 17th century, the introduction of the joint-stock company led to a transformation of the entire financial world, as is now recognised. Today, **blockchain technology** is equally revolutionary. It has the potential to change our world once again and to bring significant advancements in many sectors. What the internet is for communication, blockchain technology will be for transactions and participation.

It is impossible to imagine the capital market of the future without blockchain technology. It enables greater transparency and high security standards, while also ensuring a significant increase in processing efficiency across the entire value chain – from issue or securitisation to trading and settlement of traditional securities. The associated simplification and enhanced efficiency lead to cost reductions, which in turn benefit end customers and investors.

The market around blockchain[1] and crypto-assets has always seen strong growth. Global investment in blockchain technologies and cryptocurrencies has increased almost six-fold from 2020 to 2021 (Statista, 2023). While the following year 2022 featured a bitter "crypto winter", characterised by corrections and high volatility, since early 2023 the market now seems to be slowly recovering. The following figure shows the trend for total market capitalisation of all cryptocurrencies on the market since 2013 (CoinMarketCap, 2023).

Figure 1: Total market capitalisation of all cryptocurrencies

1 Blockchain technology is a type of distributed ledger technology.

With the European Union and Germany being regulatory pioneers in the digital capital market, the Boerse Stuttgart Group is sure that it is operating in a location of global innovation. It is the sixth largest exchange group in Europe, with a strategic foothold in capital markets as well as the digital and crypto business. In this context, Boerse Stuttgart Group regards itself as a bridge builder between the capital and crypto markets, with a duty to demonstrate the potential of blockchain technology for future capital markets and to offer suitable solutions as an experienced regulated player in the sector.

For the European Union (and thus also Germany) to remain competitive, it is crucial to create a regulatory approach that fosters innovation and is technology neutral. The first steps here have been taken at a European level with the Markets in Crypto-Assets Regulation and the DLT Pilot Regime, and in Germany with the Electronic Securities Act and Financing for the Future Act.

In the Boerse Stuttgart Digital Crypto Compass 2023, we examine what a modern capital market of the future might look like. We will show you its potential and introduce you to some general terminology and important facts and figures to help you understand the current state of the market for crypto-assets and crypto securities. We explain why blockchain technology has such great potential and describe what role will be played in this context by the high profile topic of sustainability. We also provide an assessment of current regulatory developments. Use the Crypto Compass as a comprehensive source of information to understand the wide range of topics surrounding modern capital markets and to make the most of this potential.

Blockchain as a game changer for modern capital markets

Transparency, security and efficiency: blockchain technology creates trust

Blockchain technology and cryptocurrencies are game changers for the capital markets of the future. **Trust** plays a major role here. Whether it's at a direct level between market participants or at a societal level as part of a thriving economy, a capital market is based on that trust. In the traditional financial world, central authorities such as stock exchanges, banks and other intermediaries usually stand between the market participants.

Blockchain technology now offers a new answer to the question of how trust can be created. Greater transparency, higher security standards and improved efficiency allow this technology to redefine trust at all levels. Blockchain technology can take on or assist the role of intermediaries in a system of mutually unknown trading participants. Trust in central authorities is often linked to market conditions and current industry trends. The blockchain has the potential to complement these authorities so that this relationship can be decoupled. What's more, the blockchain can reinforce basic trust in intermediaries thanks to its high transparency (IBM, 2023).

Trust-building mechanisms

Blockchain technology thus creates trust – among other things through two key attributes: its **consensus mechanism** and its **decentralised design**. Later in our Crypto Compass, we will explain these features in detail.

A blockchain is a chain of transaction data that is combined into blocks. These data blocks are cryptographically encrypted so that, on the one hand, the identity of the participants is not evident; however, the transaction itself is recorded in a way that is transparent and traceable for all participants in the network.[2] Transaction data is typically pseudonymised but not anonymised. These two features are vital elements in building trust.

Transactions that are registered on a blockchain can be viewed, which leads to increased transparency in the capital market. Transactions can be directly tracked, searched and reported, which significantly improves access to transaction data in the capital market. Currently, access is often difficult for individual market participants.

2 For technical background see: Silvia Palka, Wolker Wittpahl (2018): Vertrauen und Transparenz – Blockchain-Technologie als digitaler Vertrauenskatalysator. Working Paper of the Institute for Innovation and Technology, 2018/06, No. 39

The reason the blockchain can improve access here is thanks to publicly recorded transaction data.[3] Blockchain technology also provides many administrative advantages in the area of money laundering. This alone represents a specific application for the blockchain in capital markets as an innovative solution for current problems, such as unidentifiable and obfuscated transaction chains. Important: this only applies to public blockchains that are accessible to everyone.

Apart from greater transparency, the blockchain also offers high security standards. Since the data is stored on several computers in the network, it cannot easily be manipulated from a single point. This protects the integrity of each individual transaction. Decentralisation protects against vulnerable connection points that can become a target for hacking attacks. Technical failures are also much less likely because the network is maintained by a large number of nodes. Moreover, the immutability of the data creates additional trust in the market. This is particularly true in cases where central authorities engage in market manipulation. The blockchain prevents this thanks to its excellent data integrity and protection against forgery. For example, after a cyber-attack in 2007, Estonia decided to use blockchain to offer better protection for its digital administrative services against attacks (e-Estonia, 2023). In the Estonian public administration, 99 % of services are already digitised using blockchain technology (FINTECH Baltic, 2021).

There is also the potential for significant efficiency gains through a reduced number of intermediaries compared to today. **Smart contracts** enable transactions to take place automatically as soon as a certain contractual condition is met. The blockchain's validation mechanism is used to verify this. Smart contracts enable the automatic execution of transactions, thus reducing counterparty risks by allowing customers to interact directly with each other. Counterparty risks are a well-known problem, especially in settlement processes in the capital market because it is difficult to ensure the solvency of the counterparty. With smart contracts there is intrinsic trust between counterparties. Thanks to its decentralised organisation, blockchain technology is also global by design, enabling real-time transactions across international borders. The costs for individual transactions are reduced too, so customers can also benefit from efficiency gains.

3 Private blockchains, whose transaction history is not publicly visible, are excluded from this.

The European crypto ecosystem at a glance

Crypto-assets, stablecoins, tokens, crypto securities: dynamic industries such as blockchain and crypto develop new products and associated terms almost daily. It is important to build a knowledge base to ensure clarity and to offer investors adequate information about crypto products. In this section, we offer an insight into **distributed ledger technology** (DLT) and/or **blockchain technology** and digital assets.

At the heart of a digital financial ecosystem of the future is distributed ledger technology, which includes the more well-known blockchain technology. This chain of cryptographically encrypted data blocks is stored on different computers in a decentralised network. Decentralisation ensures that the chain of information cannot be manipulated by individual network participants.

The figure below shows a transaction process on the blockchain. After a transaction order is received, it is assigned to a block of data. This block is validated "by consensus" by network participants. The validated block is then attached to the chain, the transaction is executed and documented in the network in an immutable and – if this is a public blockchain – transparent manner.

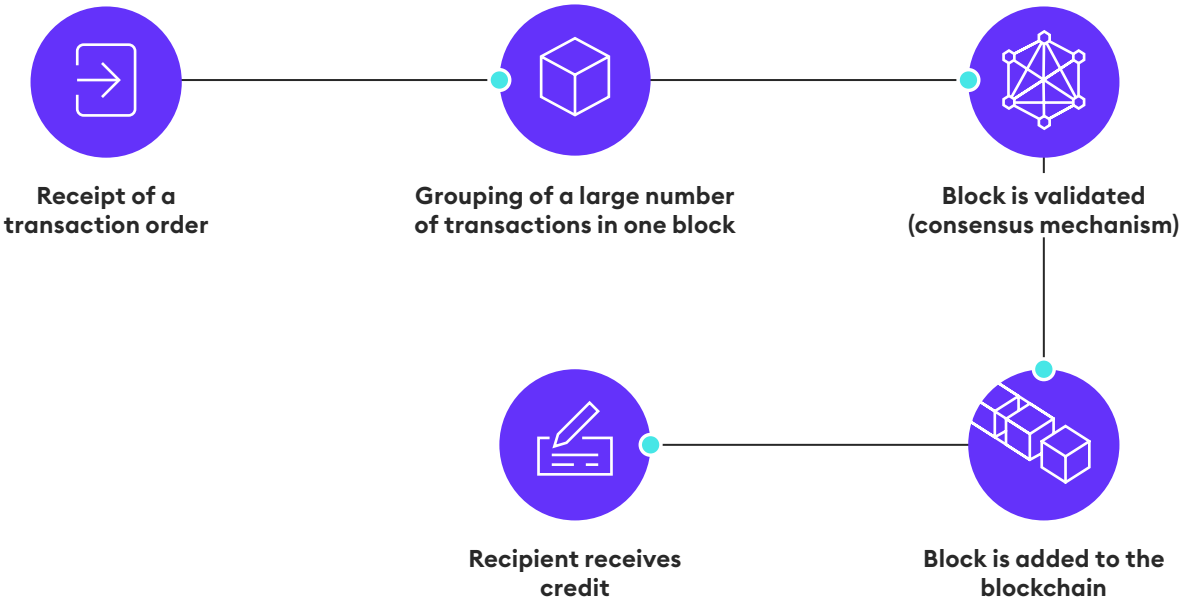


Figure 2: Flow of a transaction on the blockchain

The continuous validation and verification of data in the network is based on so-called **consensus mechanisms**. A consensus mechanism describes the way in which all participants in a decentralised network agree on the validity of transactions and secure the data in the blockchain. Figure 3 on the next page compares the two best-known consensus mechanisms.

The **proof of work** mechanism is characterised by competition between different network operators to guess hash values, which are created using cryptographic functions (BRAIINS, 2021). This validation process is also called mining. The network operators (miners), who provide their own computing power for the validation process, are remunerated in the form of newly created cryptocurrency. The more miners who participate in this process, the longer the mining process takes.

On the other hand, the **proof of stake** mechanism is designed around the investment ("stake") in cryptocurrencies in the network. Here, a network participant is randomly selected for validation from a pool of active shares belonging to different owners. The probability of being selected for validation depends on the extent of the stake in the network and is measured, for example, by the number of coins an owner has in the staking pool.

Staking means that crypto-assets are blocked for a certain period of time in a proof of stake blockchain. These are then used by network participants, called staking providers, to reach a consensus on a proof of stake blockchain. Network participants who contribute to the validation of blocks receive staking rewards for each confirmed transaction in the form of cryptocurrency generated via transaction fees. Individuals who make their coins available to network participants or staking providers receive a share of the revenue. Investors can thus "rent" their coins to network participants, so they have a sufficient stake in the network for the validation process.

These two consensus mechanisms (proof of work and proof of stake) differ according to their security characteristics. In principle, the integrity of a blockchain network can only be compromised via a so-called 51% attack. The idea of a decentralised network relies on having a large number of network participants who need to agree to and then validate any changes to the network. This protects the network from manipulation.

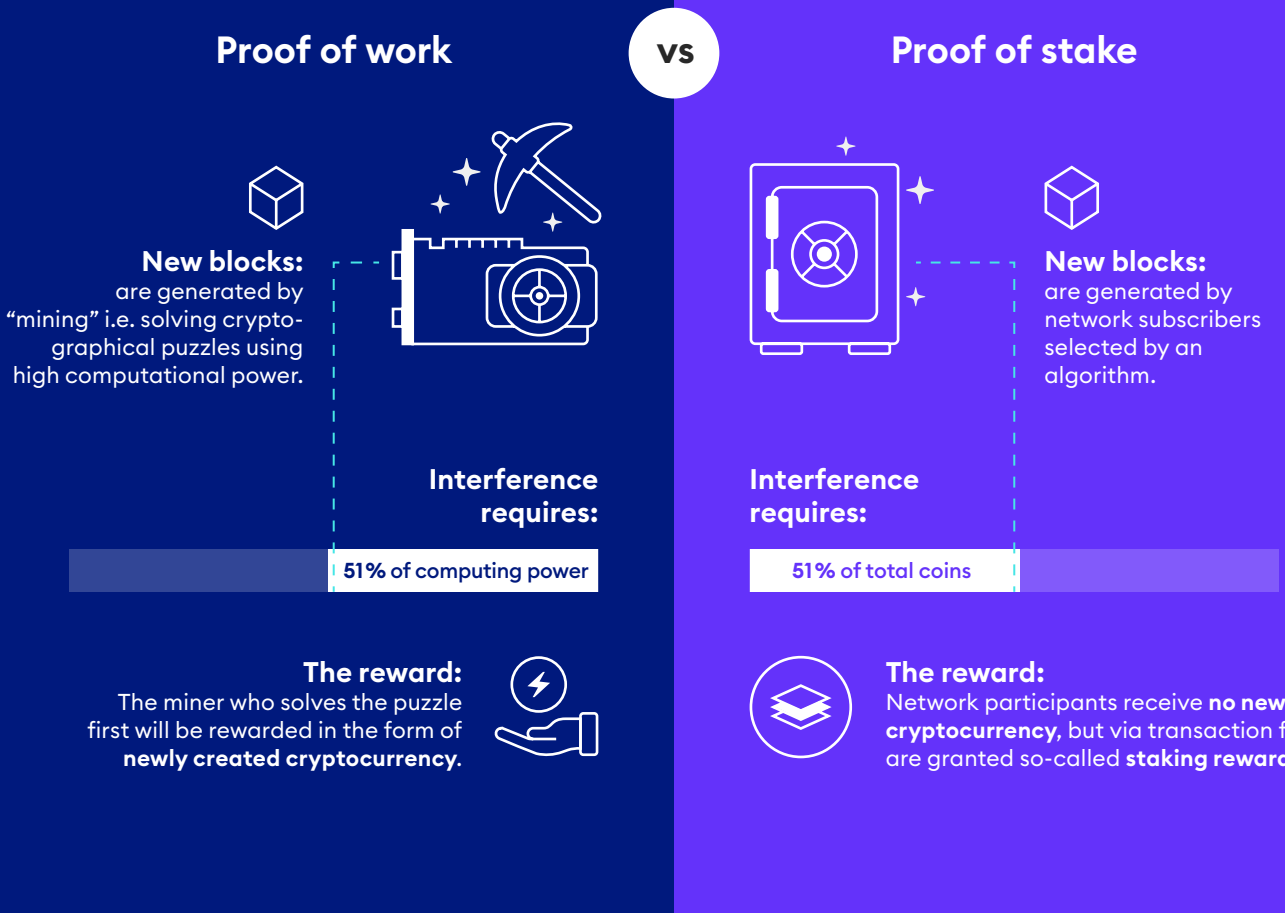


Figure 3: Comparison of the two consensus mechanisms: proof of work and proof of stake

For proof of work, this would mean that the network can only be manipulated if a single network participant controls at least 51 % of the total computing power. In the proof of stake system, a single entity would need access to at least 51 % of all coins to be able to manipulate the network. In the case of cryptocurrencies with a high market capitalisation, such attacks are difficult to implement as they often make no sense either economically or in terms of game theory.[4]

4 In general, smaller proof of work chains are at greater risk of a cyberattack because there is a higher likelihood of a single participant having control over 51 % of the network's total computing power.

Distributed ledger technology in the economy: crypto-assets and crypto securities

As a new underlying technology, distributed ledger technology is sector independent and thus an "enabler" for optimising existing application areas or for developing new ones.

Blockchain can be a fundamental building block in the real economy. It can be used in supply chain management to track the origin and transportation route of goods to prevent fraud or other risks. Another application area is the health sector. Here, blockchains can be used to enable decentralised management of health data (Hayes, 2023).

Distributed ledger technology has particularly great potential in the financial sector. Here, DLT is often used in tokenisation. Tokenisation generally refers to the process of mapping an asset onto the blockchain. As early as 2019, BaFin (the German Federal Financial Supervisory Authority) provided the following definition of tokenisation and the resulting tokens in a technical article (BaFin, Tokenisierung, 2019):

Token: A token refers to a digitised form of asset. It is attributed a certain function or value. A wide range of potential uses and manifestations are conceivable.

Tokenisation: This involves the digitised representation of an (asset) value, including the rights and obligations contained in this value, plus the transferability this enables.

The rights embodied in a token can lead to its classification either as a crypto-asset or a crypto security.

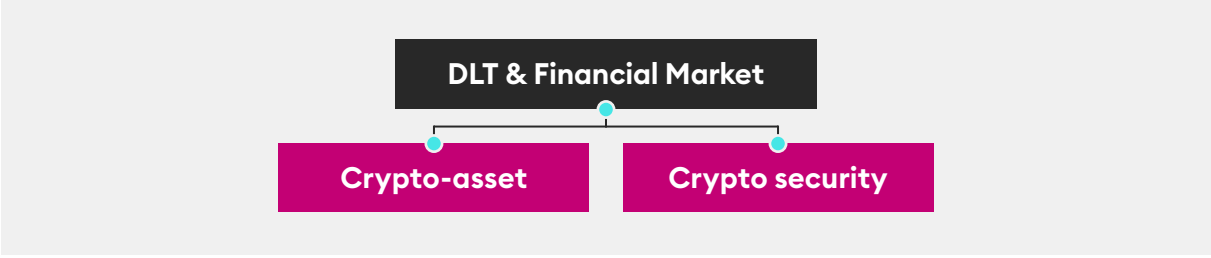


Figure 4: Classification of crypto-assets and crypto securities

Crypto-assets: digital assets of the future

When dealing with **crypto-assets**, it is important to bear in mind that Germany's definition differs from the new European "Markets in Crypto-Assets Regulation", or MiCAR (Regulation (EU) 2023/1114, 2023).

According to §1 para. 11 sentence 4 Kreditwesengesetz, abbreviated as KWG, (Federal Ministry of Justice, German Banking Act, 2023), crypto-assets are defined as

- digital representations of a value,
- which has not been issued or guaranteed by any central bank or public authority, and
- does not have the legal status of a currency or of money, but
- which natural or legal persons
  - accept as a means of exchange or payment
  - or use for investment purposes
  - on the basis of an agreement or de-facto practice, and which
- can be transmitted, stored and traded electronically.

MiCAR defines a crypto-asset as a digital representation of values or rights that can be electronically transmitted and stored using distributed ledger or similar technology (Art. 3(1)(2) MiCAR).

According to information from BaFin, the KWG definition will continue to apply until MiCAR becomes applicable law, which is expected to be in January 2025 (BaFin, Kryptotoken, 2022).

In addition to the umbrella term crypto-asset, MiCAR defines three specific sub-categories: "e-money tokens", "asset-referenced tokens" and "utility tokens". Specific legal consequences for market participants are attached to each category. Common cryptocurrencies such as Bitcoin and Ethereum are thus also covered by MiCAR (BaFin, European MiCAR Regulation, 2023).

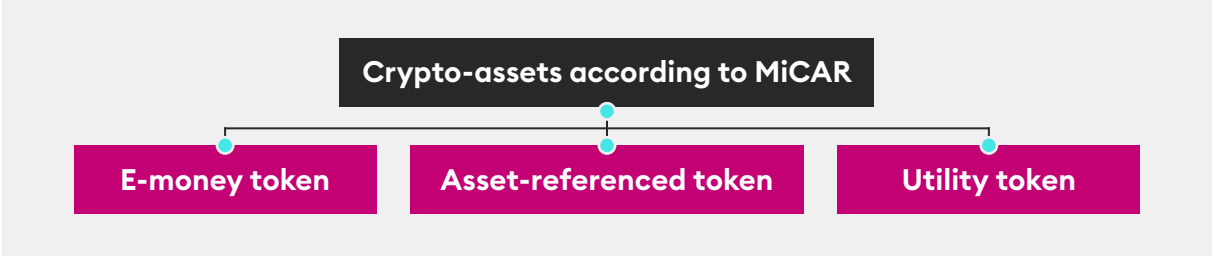


Figure 5: Classification of crypto-assets according to MiCAR

E-money tokens (electronic money tokens, "EMT") and **asset-referenced tokens** ("ART") are often colloquially referred to as "stablecoins". While electronic money tokens refer to a single currency (or a basket of currencies), asset-referenced tokens refer to other assets or combinations thereof.

Asset-referenced tokens created by non-governmental entities can link their performance to legal tender such as the euro or other assets such as commodities or even other crypto-assets and currencies. This link can be implemented in various ways, both synthetically and through actual securitisation. The aim of stablecoins is to achieve more stable pricing than for other cryptocurrencies, whereby market trends for the reference target are of course directly reflected in the stablecoin.

In recent years, as a counterpart to privately issued stablecoins, more and more central banks have also started issuing digital currencies, so-called **Central Bank Digital Currencies** (CBDCs). These involve digital central bank money, i.e. "digital cash". China and the Bahamas are pioneers in this regard and already issue CBDCs. But the European Central Bank (ECB) is also exploring the potential issue of a digital euro (ECB, 2021).

A **utility token** generally involves a type of use in which the holder of a token receives a right. This could be the right to obtain or access goods or services – usually in a limited ecosystem. Utility tokens can be complex in terms of the way they work and their regulatory classification, especially if they combine several different rights or "utilities".

Even if not explicitly mentioned by name, well-known cryptocurrencies such as Bitcoin are also covered by MiCAR. They mostly serve the purpose of an alternative means of payment in the ecosystem for the "issuer" (either exclusively or in combination with other utilities), whereby the issuer of the tokens is not a central bank or other public institution.

Crypto securities: decentralised securitisation creates new potential

In addition to the crypto-assets described above, which are explicitly not securities, DLT also offers a new possibility for "technical" securitisation of assets to create securities. Until the introduction of the German Electronic Securities Act, or eWpG for short (Federal Ministry of Justice, Gesetz über elektronische Wertpapiere, 2021), the securitisation process in Germany was still dependent on physical global certificates. Since then, electronic, "centralised" or "decentralised" securitisation has also been possible. In the case of decentralised securitisation, i.e. a DLT-based process, the eWpG speaks of crypto securities or DLT financial instruments at EU level. Generally, in the rest of the Boerse Stuttgart Digital Crypto Compass 2023, we use the term "tokenised securities" because the process of mapping the security on the DLT in a token is also referred to as tokenisation.

The term crypto security chosen in the eWpG does not represent a new type of security. Nor do the rights associated with the securities change. For example, a tokenised bond represents an interest-bearing security that grants the creditor the right to repayment as well as to payment of agreed interest, in exactly the same way as a "purely electronic" bond or a bond securitised using a global certificate. From a purely technical point of view, any type of security can be tokenised. The real question is what is permitted in regulatory terms (see the section "Roadmap to a modern capital market").

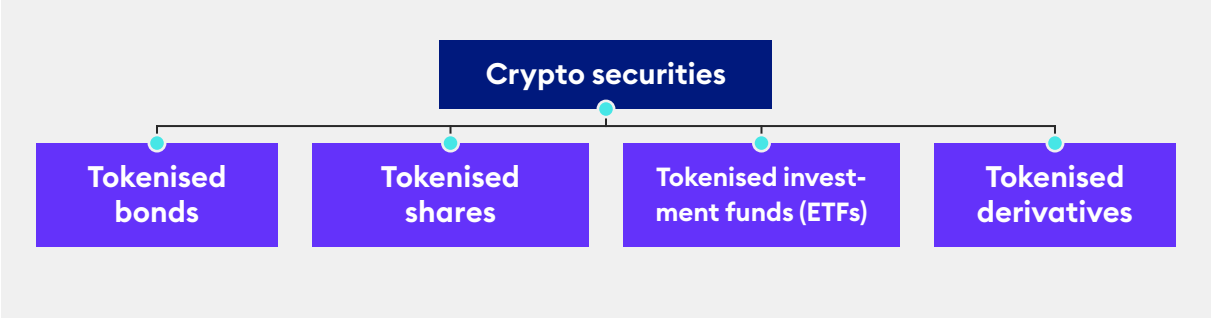


Figure 6: Types of securities that can be tokenised

Crypto-assets in future capital markets: harnessing innovation and securing digital sovereignty

As demonstrated by MiCAR, eWpG (German Electronic Securities Act) etc., when it comes to a new class of investment, barely any topic dominates **financial market policy discussions** as consistently as cryptocurrencies. From specific queries regarding taxation to fundamental questions about allocation to particular investment classes, the last few years have been dominated by cryptocurrencies in terms of regulation as well as financial policy.

Blockchain technology and the decentralised nature of the ecosystem can help overcome current hurdles in the financial system and enable enhanced transparency, security and efficiency.

One thing is clear: cryptocurrencies form the basis for blockchain technology functionality and are a central component of the ecosystem. Network participants who maintain the blockchain by validating transactions and providing computing capacity receive cryptocurrencies as remuneration. As the "fuel for the blockchain", they ensure the integrity of the system and create incentives for actors in the system to validate transactions. Miners are the engine here, with cryptocurrencies in the form of incentives functioning as the fuel.

Diversification: cryptocurrencies have established themselves as a serious tool for diversification, which is also becoming increasingly popular with institutional investors (Breinich-Schilly, 2021). Many private investors use cryptocurrencies as a long-term hedging instrument against inflation (Deutsche Bank). More and more investors are also turning to cryptocurrencies as a long-term investment (Bitkom e.V., 2021).

Future investment: an investment in cryptocurrency is also an investment in technology. This helps fund innovation and further develop the ecosystem. This also functions to enable services built on the blockchain. An example of this is the Polkadot project (Polkadot). Polkadot is a network structure that enables interoperability between different blockchain protocols. It allows the secure and reliable exchange of data blocks across different protocols. The project is also open-source and self-financing, in part through its own cryptocurrency DOT. Polkadot is just one of many examples where crypto-assets enable the financing of innovation.

The Boerse Stuttgart Group firmly believes that technology and innovation are important factors for the evolution of a contemporary capital market. Germany's current advantage here should not be slowed down but developed. That is why there is a need to create innovation-friendly, technology-neutral regulatory approaches.

Tokenised securities enable better securities settlement

Unlike crypto-assets, **tokenised securities** do not represent a new asset class but rather – as described above – a new (technical) form of securitisation. The aforementioned pioneering currency issue schemes show that an issuer may in future have outstanding securities that have been securitised in different ways, for example depending on the affinity of the issuer and the aim of the issue.

On the investor side, the use of DLT in securitisation is expected to result in only minor changes. The investor's account contains various securities and he or she may have no detailed knowledge as to how these are securitised or processed. This is true today and will presumably continue to be true in the future.

The use of DLT results in efficiency gains and cost benefits in the issuing process and then especially in the settlement process for transactions.

In fact, an interest in issuing tokenised securities is expected to be initiated by the banks. Whereas currently the settlement of securities transactions takes around two days, DLT-based settlement in real time (or thereabouts) could be a real game changer. As well as driving further automation, smart contracts could bundle product-specific, sometimes daily calculations into a kind of "golden source" – in contrast to the current scenario, where each party involved in the transaction performs these calculations.

A capital market for tokenised securities requires new infrastructure in some areas – there will be changes to value creation, as it has evolved historically, as well as to the distribution of tasks and roles. But even if the DLT takes over processing steps that currently operate in the back-end systems of the banks, the regulatory and legal responsibility for this will remain in the hands of regulated institutions.

Innovative blockchain solutions create new application domains

Blockchain technology is already being used in many areas today (Deloitte, 2017). Especially when it comes to automated documentation and process validation, the blockchain can unleash its potential. This also applies to capital markets.

Tokenisation: there are numerous applications in capital markets. The tokenisation previously described is required for the digital transfer of a commodity or a tangible asset such as a share. DLT thus enables digital securitisation of previously very illiquid asset classes. Large sections of the population thus gain access to asset classes that were previously reserved for a minority. Tokenisation can also, for example, enable individuals to make direct investments in specific projects. Digital securitisation thus enables the democratisation of capital investment and offers members of the public the opportunity to directly purchase assets that affect them.

Digital Euro: the blockchain could also be used to implement the digital euro (as mentioned previously), which brings numerous benefits. Among other things, it creates an alternative to familiar electronic payment methods, it can be used in Web 3.0 and IoT applications and can secure international competitiveness and the ability to innovate. However, for the digital euro to gain acceptance as a CBDC in broader society, a regulatory framework must be created that builds trust and achieves broad institutional penetration.

Currently, numerous central banks are working on the development of a digital currency. China is testing the digital yuan, and in the USA the Federal Reserve is exploring the concept of the digital US dollar. In Europe, the ECB is planning concrete measures for the digital euro. The EU Commission has now published a proposal for a regulation on the establishment of the digital euro (June 2023), thus laying the groundwork for legislation (European Union, Proposal for a Regulation on the Establishment of the Digital Euro, 2023). Among other things, this EU Commission proposal makes provisions for the digital euro to be recognised as a legal means of payment (with a few exceptions) and makes it subject to payment service regulations (e. g. PSD3) as well as requirements for the prevention of money laundering and terrorist financing (Walz, 2023).

On course for the future: enabling sustainability

Despite considerable potential, cryptocurrencies – especially Bitcoin – are often criticised for not being sustainable. **Sustainability issues** have also been impacting the financial sector for some years. In terms of pursuing the general goal of greater sustainability, cryptocurrencies as a modern asset class are just as important a part of the discussion as traditional investment products. As a rule, the assessment here is based on ESG criteria, i.e. environment, social and governance. While governance and social aspects can be described as having primarily positive effects in terms of sustainability, the discussion about environmental effects is much more controversial.

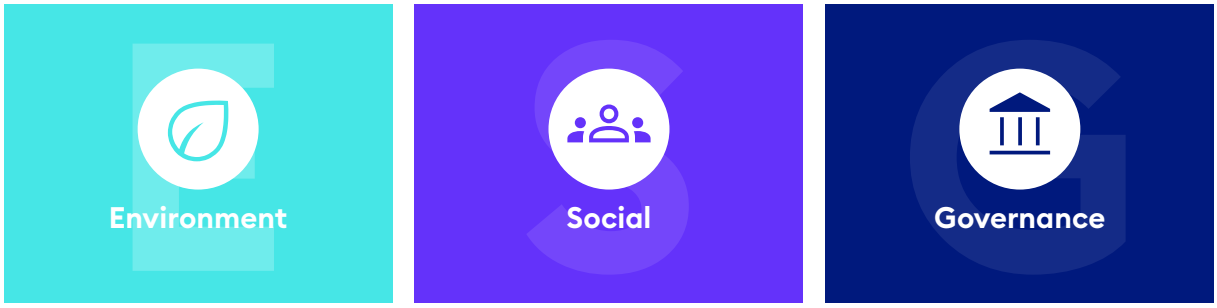


Figure 7: The ESG criteria at a glance

Governance: The governance perspective for cryptocurrencies and other blockchain-based assets is dominated by the idea of decentralisation. Decentralised peer-to-peer networks allow the secure transfer of assets without the possibility of subsequent manipulation or modification. Human errors due to manual input are also excluded.

Social: From a social perspective, blockchain solutions open up opportunities for the financial sector, especially with a view to democratising the financial system. Blockchain solutions avoid the need for intermediaries as there is no need for centralised institutions, such as banks, to carry out transactions. One of the benefits is that people living in less stable countries obtain more straightforward access to financial services. Moreover, thanks to tokenisation, blockchain technology enables small investors to make proportional investments in what would otherwise be too highly priced assets.

Environment: The sustainability discussion around Bitcoin and other cryptocurrencies often focuses on the high energy demands required to run the underlying network. The main reason for this is the proof of work consensus mechanism, which involves miners generating matching cryptographic hash values. There is much debate currently about the associated environmental impact. While critics often refer to the high energy consumption and associated greenhouse gas emissions, others see Bitcoin mining as a possible catalyst for a revolutionary approach to energy. In particular, Bitcoin mining can make a significant contribution to the development of renewable energy sources. For example, miners can capitalise on the overproduction of electricity that often occurs in sunny and windy weather by putting it to good use. In addition, as profit-driven entrepreneurs, miners have an incentive to use the lowest cost energy sources, often favouring renewables due to their low operating costs. By closely linking mining activities and renewable energies, a positive contribution can thus be made to promoting renewable energies and reducing the use of fossil fuels.

Another way to reduce the energy consumption associated with Bitcoin is the so-called **Lightning Network**. This protocol allows Bitcoin transactions to be executed off-chain and thus outside the main network. This significantly reduces the power consumption of Bitcoin transactions. In addition, transactions are carried out faster and more cost-effectively. The Lightning Network is thus a promising approach to increasing the energy efficiency of Bitcoin transactions while simultaneously scaling the network.

Proof of stake is a much-discussed alternative to the proof of work concept, and the former is used by Ethereum for example. In contrast to proof of work, proof of stake requires significantly less computing power and thus less energy. However, proof of stake also entails risks in terms of centralisation. Due to the fact that it requires a large number of cryptocurrencies to participate in the mechanism, it may be more difficult to achieve broader participation and thus decentralisation of the network. This can lead to a higher degree of centralisation and an adverse effect on the security of the network.

Overall, there are advantages and disadvantages to both consensus mechanisms. Proof of work is known to be energy-intensive. On the other hand, it has been shown to be a secure system that can specifically support the expansion of renewable energies. Proof of stake, on the other hand, promises a more efficient and less power-intensive method for validating transactions, but it also carries the risk of centralisation.

Facts at a glance: the crypto ecosystem in numbers

The crypto ecosystem is growing. It is particularly dynamic in Europe and Germany with the number of companies, investors and customers involved in the market continuing to rise. This is creating jobs and innovative services, while also contributing to the growth of the European and German economies.

The crypto market is a growth market, especially in the EU and Germany. Germany is currently a leader in many blockchain technology applications and has the human capital to become the next Silicon Valley.

Crypto industry & start-up market: growth across borders

Global: sixfold increase in one year

The **size of the global crypto market** is measured by the market capitalisation of all cryptocurrencies. As of February 2023, there were over 8,000 registered crypto-currencies (Statista, 2023), with Bitcoin alone having a market capitalisation of over $500 billion (CoinMarketCap, 2023). Investments in cryptocurrencies are also often seen as a substitute for investing in the further development of the blockchain ecosystem. But the blockchain sector is also recording record figures in terms of direct investments: in 2021, the volume of global investments (venture capital, public entities, mergers & acquisitions) in blockchain technologies and cryptocurrencies amounted to around $30.2 billion (see Figure 8) (Statista, 2023). By comparison, in the previous year, the global investment volume was still around 5.5 billion euros. This represents almost a six-fold increase within one year. According to the Crypto News platform, there will be roughly 25 million Bitcoin owners by the end of 2023 (Lielacher, 2022).

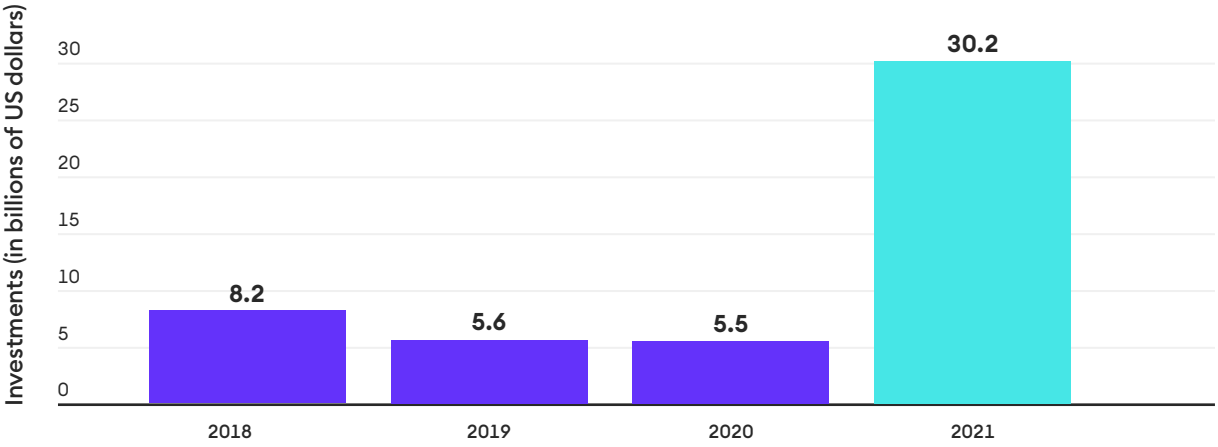


Figure 8: Volume of global investment in blockchain technologies and cryptocurrencies

European Union: leading the way in regulation

The industry around crypto-assets is also a **growth sector,** especially in the EU. In an international comparison, the EU is playing a pioneering role, and the creation of MiCAR represents the world's first all-encompassing crypto regulation. But the EU is also an important location for the blockchain and crypto world from an economic perspective when compared to Asia or the USA: the EU Blockchain Observatory and Forum lists over 600 initiatives and start-ups (EU Blockchain Observatory and Forum).

We explicitly welcome upcoming regulatory projects relating to crypto-assets – this is the only way the industry can overcome concerns and mature.

Germany: a driving force

Within the EU, Germany is a key driver: in 2021 alone, over 160 million euros were invested in crypto start-ups based in Germany (BISON). This means that almost as much capital was cumulatively raised this year as in all previous years. The German Economic Institute (Institut der Deutschen Wirtschaft) counts 275 blockchain companies in Germany, with 52 % belonging to the financial sector (IW, 2021).

Crypto-assets are enjoying rising popularity

The figures presented show that crypto-assets are enjoying rising popularity.
This applies not just to private investors but also to institutional investors.

There is growing interest in the crypto market from small investors and institutional investors alike. The industry is also evolving and becoming an innovative market segment in the EU.

Crypto fever is rising among German private investors

And it is not just blockchain applications that are popular, cryptocurrencies are also increasingly finding approval as an asset class among **private investors**.

On the one hand, 32 % of Germans regard cryptocurrencies as a suitable form of investment for wealth creation (BearingPoint, 2021). On the other hand, the proportion of people investing in cryptocurrencies was only 7 % in 2021 (Statista, 2023). A different survey showed that in 2022, 12 % of Germans had already invested in cryptocurrencies, 30 % could imagine making such an investment, but over half would still shy away from such an investment (see Figure 9) (Statista, 2022).

Furthermore, it can be seen that investors in crypto-assets come predominantly from younger age-groups: 18–39 year-olds currently make up 67 % of all German owners of crypto-assets (Coinbase, 2021).

The main reasons for this reluctance to invest are lack of knowledge and investment information combined with concerns about inadequate regulation (Coinbase, 2021). That is why Boerse Stuttgart Group explicitly supports upcoming regulatory projects around crypto-assets in order to provide investors with security and reliability.

Do you already use cryptocurrencies or can you imagine using them in the future?

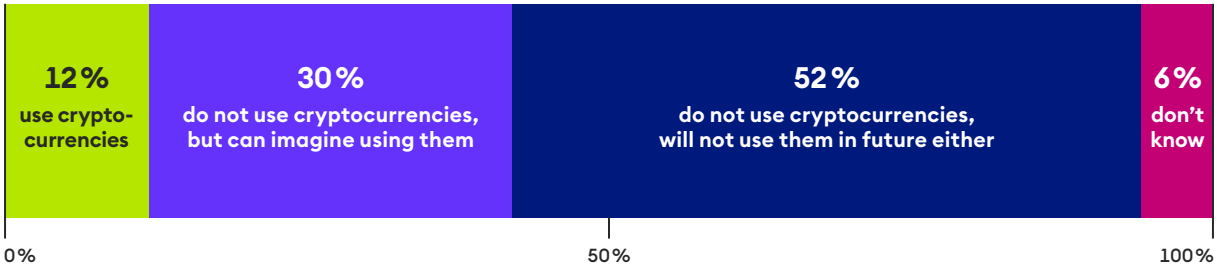


Figure 9: Survey results on the use of cryptocurrencies

Increasing institutional interest in crypto-assets

Institutional investors, like private investors, often previously justified their reluctance to invest by referencing a lack of regulation and the associated risks. However, we are now seeing increasing investments in crypto-assets by institutional investors. According to a survey of 55 institutional asset investors in the DACH region, 36 % already invest in crypto-related products such as cryptocurrencies, stablecoins and derivatives. Of those who have not yet invested, just under 40 % are planning investments (see Figure 10) (Cointelegraph, 2020).

Has your company invested in crypto-assets in the past? If not, does your company plan to invest in the future?

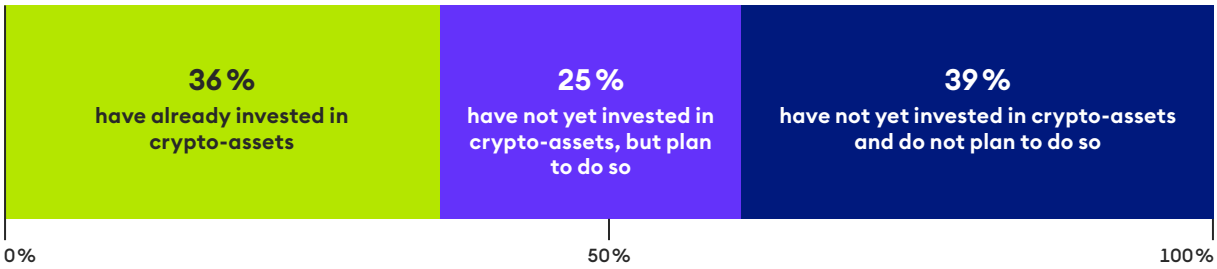


Figure 10: Investment in crypto-assets by institutional investors from the DACH region

In this context, it is welcome that Germany has shown itself to be receptive to market participants in the crypto sector who adhere to the set rules and practices of the capital market, as evidenced by its early regulation of crypto custodians and through the German Fund Jurisdiction Act (Fondsstandortgesetz). It is now possible, for example, for specialised funds to allocate certain quotas directly to crypto-assets, making a significant contribution to the professionalisation of the market and thus also to investor protection.

Tokenised securities still in their infancy

The tension between new technology and still very recent and evolving regulation has so far meant that **issuing activity has remained very manageable** – not just in Germany. As of late July 2023, 45 tokenised securities have been issued in Germany, all in the form of (bearer) bonds. The bond issued by the DAX-listed company Siemens in February 2023, amounting to 60 million euros, was unquestionably a trail-blazing initiative.

In Switzerland, where regulations already permit share tokenisation, two issuing schemes stand out: the SIX Bond with an issue value of CHF 250 million, and a bond from UBS totalling CHF 100 million.

At the European level, the European Investment Bank (EIB) has proven to be a pioneer and has now issued several bonds in tokenised form – either under French or Luxembourg law.

Predicting the future development of this recent type of tokenised securities is like looking into a crystal ball. However, further improvements with regard to regulation, an increasing number of financial institutions working seriously on the topic, as well as market forecasts and surveys all suggest that tokenised securities will be able to establish themselves as a form of securitisation.

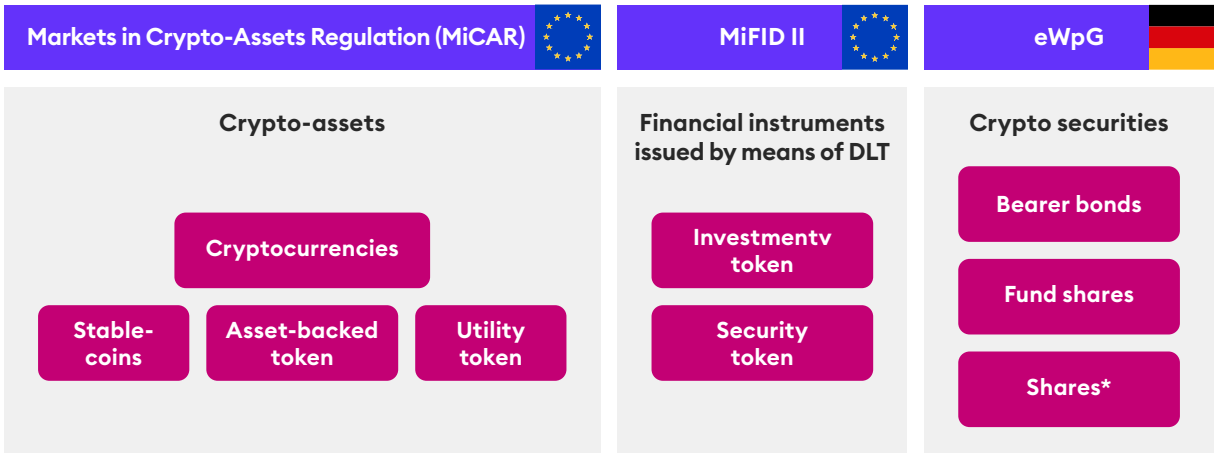
The path towards a modern capital market

The previous sections have made it clear that crypto-assets are just the start of a development towards a tokenised (financial) economy that is progressing inexorably at both national and European level.

Political decisions may either assist or hold up this development. We expressly welcome the creation of a regulatory framework that promotes the development of crypto markets. Ultimately, capital markets of the future require **forward-looking regulation** that is flexible and open to new technological developments, while also enabling innovation. Any prohibitions should be clearly rejected. At the same time, a level playing field should be created to maintain technological neutrality and ensure the same requirements apply to all service providers, regardless of whether they come from the traditional financial world or the crypto world.

Effective and proportionate regulation is the foundation for trust among market participants because it creates legal certainty and ensures adequate consumer and investor protection while guaranteeing financial stability.

With this in mind, European and national authorities have been dealing with the regulation of crypto-assets for some time. The European Commission's FinTech Action Plan published in 2018 (European Commission, FinTech Action Plan, 2018) may well be seen as a milestone for the creation of an EU-wide crypto market. Germany has also led the way with its Blockchain Strategy adopted in 2019 (Bundesministerium für Wirtschaft und Klimaschutz, Blockchain-Strategie, 2019) and the draft legislation published in April for the Financing for the Future Act (Bundesministerium der Finanzen und Bundesministerium der Justiz, Referentenentwurf Zukunftsfinanzierungsgesetz, 2023).



*announced, but not yet enshrined in law

Figure 11: Overview of different regulatory approaches

These initiatives have now given rise to a number of laws that provide a regulatory framework for the trading and custody of crypto-assets and also for tokenised securities. Figure 11 on the previous page gives an overview of the most important legislation. The Markets in Crypto-Assets Regulation (MiCAR), the DLT Pilot Regime – or DLT PR – (Regulation (EU) 2022/858, 2022), the German Electronic Securities Act (eWpG) and the tax arrangements are explained and discussed in more detail below.

Regulatory framework: innovative approaches for new technologies

Markets in Crypto-Assets Regulation: EU crypto regulation

After almost three years of sometimes tough political negotiations, MiCAR was published in the Official Journal of the EU in June 2023. The result is the first comprehensive regulatory framework around crypto-assets – and it applies throughout the EU single market, the world's largest trading bloc.

MiCAR sets standards for issuers and providers of crypto-assets, ensuring that they are subject to the same high standards as traditional financial institutions.

MiCAR is thus also often referred to as "MiFID light" for crypto-assets.

Indeed, there are many parallels to the well-known MiFID II regulatory regime (European Union, Directive 2014/65/EU, 2014). Figure 12 on the next page shows an overview of the essential components of MiCAR. First and foremost, MiCAR contains a typology of crypto securities and imposes requirements on their issuers. For example, stablecoins as asset-referenced tokens and e-money tokens are covered by MiCAR, as are well-known tokens such as Bitcoin and Ether. Insofar as tokens are accepted for trading , MiCAR obliges the service provider or issuer of the crypto-asset to prepare a white paper, which can be regarded as a (shortened) equivalent to a securities prospectus – a document that will be familiar to anyone with a knowledge of classic financial instruments.

MiCAR at a glance – one regulation for all cases

ASSET CLASSES	REQUIREMENTS FOR ISSUERS
Crypto-assets **Utility token**	White paper announcement + Information, liability, marketing requirements. Utility & small tokens are excluded.
Asset-referenced token (ART) **Significant ART**	White paper authorisation + subject to supervisory regulations and governance requirements. Higher requirements for significant ART.
E-money token (EMT) **Significant EMT**	Restricted to e-money or financial institutions. Subject to similar supervisory, governance and liquidity requirements as ART. Higher requirements for significant EMT.
Non-fungible token (NFT)	NFTs are not taken into account, but large NFT collections and series may be.
Authentication token (security token)	Not covered by MiCAR but by securities regulation.

CRYPTO-ASSET SERVICE PROVIDER (CASP) CATEGORIES	CASP REQUIREMENTS
Custody & administration **Operation of a trading platform** **Trading cryptocurrency <> crypto-currency or cryptocurrency <> fiat currency** **Allocation of crypto-assets** **Order acceptance and transfer on behalf of third parties** **Consulting and portfolio management** **Transfer services on behalf of third parties**	**All CASPs must meet minimum requirements regarding the following:** • Regulatory provisions (equity) • Governance • Custody of crypto-assets • Outsourcing • Complaint management • Disclosure obligations (incl. sustainability) • Settlement plans **In addition, each CASP must fulfil the following requirements, for example:** • Custody guidelines for depositaries • Market abuse detection systems for trading platforms • Best Execution Policy for trading venues • Aptitude and knowledge tests for consultants

Figure 12: MiCAR at a glance

MiCAR also establishes rules for financial services provided in relation to these crypto-assets. One example of this is the trading or custody of customer values. An important step here are the requirements for crypto custodians. These are designed to ensure that crypto-asset service providers (CASP) are liable for the loss of crypto-assets and that customer assets are segregated from the service provider's assets. This is particularly important against the background of recent scandals and company bankruptcies surrounding FTX and will strengthen investor confidence in the crypto markets. In addition, MiCAR places further obligations on crypto-asset service providers when it comes to investor protection, market abuse and client advice.

The geographical scope of MiCAR is equally significant. Thanks to the well-known EU passporting regime, the financial services covered by MiCAR can be offered either actively or passively in any EU member state.

MiCAR thus represents an important milestone in the adoption of crypto-assets. It creates uniform regulation across the EU, thus boosting confidence and enhancing market integrity, which increases investors' willingness to buy in to virtual forms of investment.

DLT Pilot Regime: a regulatory sandbox for applying DLT to classic financial instruments

As outlined above, MiCAR provides the regulatory framework for crypto-assets and related services. What MiCAR does not control, however, is the application of DLT in the area of financial instruments as we know them from the MiFID world, i.e. shares, debt securities, funds, derivatives and so on. As the previous explanations have shown, these financial instruments can in principle be represented as tokenised securities based on DLT. There is great potential for increasing efficiency and reducing costs, especially when it comes to the issuing and settlement of financial instruments.

EU legislators have recognised this potential and incorporated it within the framework of the FinTech Action Plan. Specifically, the **DLT Pilot Regime** (DLT PR) has been active since March 2023.

The DLT PR is a regulatory sandbox. Within this sandbox, market participants can apply DLT to the issuance, trading and settlement of financial instruments. At the heart of the DLT PR is the concept of the DLT market infrastructure. Securities firms, market operators, central securities depositories, and also new FinTechs can apply for a license as a

multilateral trading facility (DLT MTF[5]), a settlement system (DLT-SS[6]), or as a combined trading and settlement system (DLT TSS[7]). Market participants who opt for one of these licenses benefit from exemptions from existing regulations. For example, a DLT TSS provider may apply for an exemption from the obligation to book the financial instrument in the securities account of a central securities depository[8]. This makes it possible to map the entire value chain of issuance, trading and settlement under one roof using DLT.

The DLT PR has the potential to be a real game changer and break up existing structures in favour of competition. Nevertheless, there are certain limitations that stand in the way of realising this full potential, and these will subsequently need to be addressed by EU legislators as a matter of urgency.

Sufficiently high thresholds for the maximum possible issue volume on the DLT market infrastructures are required for the success of the DLT PR. But the reality looks different: low thresholds[9] already unnecessarily slow down application of the DLT PR in advance. Likewise, although the restriction of financial instruments is understandable from an investor protection perspective, discrimination against special financial instruments, such as structured securities, must be rejected. In particular, structured securities with a high level of issuing activity would offer enormous potential for efficiency gains. Last but not least, the question remains open as to what will happen to the pilot regime after the sandbox period of a maximum of six years. Since the establishment of a DLT market infrastructure requires considerable investment, market participants need legal certainty as early as possible to understand how their business model can continue subsequently.

Despite these limitations, the DLT PR is to be welcomed as it illustrates the EU's willingness to promote innovative solutions, as well as positioning it as a pioneer in the adoption of new technologies. The benefits resulting from the sandbox should then be available in the long term, so the potential of DLT in the capital market sector can be fully exploited.

5 MTF = Multilateral Trading Facility

6 SS = Settlement System

7 TSS = Trading and Settlement System

8 This requirement is laid down in Article 3 of the EU's Central Securities Depositories Regulation (CSDR) and ultimately means that exchange trading is only possible if the security is registered in the securities account of a central securities depository.

9 For shares, a market capitalisation of up to EUR 500 million, for bonds an issue volume of up to EUR 1 billion, and for funds a market value of up to EUR 500 million is possible. Particularly in the case of bonds, market experience suggests that this threshold is reached relatively quickly. This also applies to the total value threshold, according to which the total value of all DLT financial instruments admitted to trading on a DLT market infrastructure may not exceed EUR 6 billion at the time the new DLT financial instrument is admitted.

Germany sets out a roadmap for the issue of DLT-based securities

The DLT Pilot Regime regulates and enables the trading and settlement of financial instruments based on distributed ledger technology. The issue or creation of a DLT-based financial instrument, on the other hand, is not regulated under this regime.

Electronic Securities Act

In Germany, the Electronic Securities Act (eWpG) is designed for this purpose and came into force on 10 June 2021. The eWpG enables certain types of securities to be issued electronically.

Issuing these securities should be done by means of an entry in a newly created electronic securities register. Examples of this kind of register include the “central register” and the “crypto securities register”. Depending on the way in which the securities are issued, reference may then be made to a “central register security” or a “crypto security”.

This represents a significant innovation in securities issuance in Germany. In addition to the previous practice, where physical securitisation took the form of a certificate, it is now possible for the first time to issue securities based on a registration on the block-chain (Fechtner, 2023). As a result, Germany is taking a decisive step in the digitalisation of its capital market.

A look at the figures makes the full potential of the eWpG clear: 99.9 % of financial instruments that were newly issued in 2022 were in principle also under the scope of the eWpG and could be endorsed via these new channels as crypto securities or central register securities. Structured securities in particular stand out here, accounting for around 90 % of newly issued securities. Especially for these securities, where there is high issuing activity, a fast and efficient issue process is a real game changer.

Financing for the Future Act: extension of the eWpG to shares

The eWpG is limited to certain types of securities – these include debt securities (bonds, structured securities), covered bonds, and participation certificates in investment funds. However, it was announced relatively early on that the eWpG would also be opened up to shares in the future. This is currently underway in the form of a draft bill by the BMF and BMJ, the **Financing for the Future Act** (**Zukunftsfinanzierungsgesetz**: ZuFinG). Accordingly, in future it should also be possible for registered shares to be issued on the DLT or blockchain.

Currently, very few securities are issued as crypto securities. This is due to the remaining obstacles and constraints, which unnecessarily restrict the adoption of crypto securities and should thus be urgently addressed by legislators within the ZuFinG framework. There are two key obstacles here.

Firstly, as of September 2023, trading in crypto securities is only possible in the bilateral "Over the Counter" (OTC) area. This rules out transparent stock exchanges as trading venues. Furthermore, the obligation to pay a fee to announce issued crypto securities in the Federal Gazette makes issuance (for example of structured securities) via eWpG unnecessary and disproportionately expensive. Ultimately, it is not reasonable to open the eWpG to registered shares but not unregistered stock, and this unnecessarily restricts the scope of the eWpG.

The other obstacle is the lack of an option for fiat currency representation on the blockchain ("cash on ledger"). However, MiCAR and the potential introduction of digital central bank money should resolve this barrier in the future. Accordingly, MiCAR, DLT PR and the eWpG create good preconditions for a regulatory framework for trading in crypto-assets and for the DLT-based representation of securities trading with "classic" MiFID II financial instruments.

Money laundering and taxes: Germany creates early legal certainty

In general, German legislators have reacted promptly to the newly developing markets around crypto-assets when compared to other EU countries. For example, in the German Banking Act (Kreditwesengesetz: KWG) provision was made to introduce a financial service for custody of crypto-assets and an associated licensing requirement as a crypto custodian. Similarly, crypto-assets were defined as financial instruments within the terms of the KWG.

Germany has also led the way in terms of money laundering risks and terrorist financing when it comes to crypto trading. Through the **Crypto-Asset Transfer Ordinance** (Federal Ministry of Finance, Kryptowertetransferverordnung, 2021), Germany is already implementing the "Travel Rule" prescribed by the OECD in national legislation ahead of the EU. This means that when transferring crypto-assets, information about the persons involved in the transaction must be provided. These details include the name, address and account number (for example, public key of the customer wallet) of the originator and the name and public key of the beneficiary. The aim is the complete traceability of the individuals involved in a transaction for the purpose of preventing, detecting and investigating money laundering and terrorist financing. In June 2023, the EU passed the Travel Rule into EU law with the Transfer of Funds Regulation (ToFR).

In addition to money laundering, the **tax arrangements** for crypto-assets is an area where national legislators have provided clarity. On 10 May 2022, the Federal Ministry of Finance published a letter (Bundesministerium der Finanzen, Einzelfragen zur ertrag-steuerrechtlichen Behandlung, 2022) which provides legal certainty regarding the tax assessment of crypto securities. Accordingly, income tax must be paid on crypto-assets such as Bitcoin or Ether where any profits result from their sale. The capital gains are classified as private sales transactions in private assets. This means they are taxed according to the personal income tax rate if there is less than one year between the purchase and sale of the crypto-asset and/or the sum of all profits made in one year with such a private disposal transaction is more than 599 euros. The determination that profits from the sale of crypto securities are taxable and that a speculation period of one year is applicable was also confirmed by a ruling by the Federal Fiscal Court (BFH) on 14 February 2023. Thus, German legislators have created very investor-friendly regulation for the tax treatment of crypto-assets.

Closing words

It is now impossible to imagine the capital market of the future without **blockchain technology** because it offers greater transparency, high security standards and efficiency enhancements. This progress will enable the European Union to lead the global competition. The prerequisite is that we follow the right path now and push for change. To avoid missing the next wave of innovation, it is now necessary to create innovation-friendly, technology-neutral regulatory approaches. A sophisticated view of sustainability is required in this context – the entire industry is constantly working on solutions to promote the conservation of resources.

With the EU and Germany acting as regulatory pioneers in the crypto sector, we believe we are operating in a location of global innovation. At Boerse Stuttgart Group, we see ourselves as bridge builders between the capital and crypto markets, with a duty to offer clarity and demonstrate the potential of blockchain technology for future capital markets.

Our current concrete proposals – which we are very happy to discuss in detail – are as follows:

- Internationally consistent reporting standards
- Investor-friendly tax regulation
- Pragmatic and innovative approaches to money laundering regulation

We look forward to exploring different ideas in this area!

About Boerse Stuttgart Digital

Boerse Stuttgart Digital

Our vision

Europe's leading regulated infrastructure partner for digital and crypto solutions. Easy and reliable access for end customers. Safe and trusted partner for institutional customers.

Our product offering

As a true pioneer in digital finance, we provide reliable and fully regulated guidance along the entire value chain of crypto and digital assets.

As part of the Boerse Stuttgart Group – with a remarkable 160-year history in the capital market business – we have embarked on an exciting venture into the world of crypto-currencies. Boerse Stuttgart Digital unites seasoned experts from the traditional finance realm and visionary pioneers in financial innovation, fueling our collective drive for progress. With our exceptional team at your side, you will have a dedicated and trust-worthy partner throughout your digital financial journey, offering unwavering support at every step. Our integrated business solutions at a glance:

Boerse Stuttgart Digital Brokerage	Boerse Stuttgart Digital Exchange	Boerse Stuttgart Digital Custody
A well-proven infrastructure that enables bilateral trading (OTC) in digital assets for customized solutions.	Europe's first regulated exchange (MTF) for trading digital assets.	A fiduciary custody solution that provides the highest security standards for our partners.

In addition, one of the first secondary marketplaces for tokenised assets on the block-chain is currently being set up in Switzerland.

Entering the world of crypto and digital assets can feel like venturing into uncharted waters – that's where we come in. Boerse Stuttgart Digital, built through the Boerse Stuttgart Group, is the leading crypto and digital business among all exchange groups in Europe. We'll serve as your fully regulated, trustworthy compass as you embark on your journey into the new world of digital finance. Over 200 institutional clients, 17 cryptocurrencies, over one billion euros in crypto-assets under custody, five European locations and 700 international talents from over 30 countries around the world speak for themselves.

The Management Team

Our licences

Boerse Stuttgart Digital ensures full regulatory compliance and possesses all the necessary licenses for its business solutions. Our crypto custody solution is licensed by BaFin and provides extensive insurance coverage for the assets held in trust. Furthermore, our information security system is ISO 27001 certified, and the assets in our custody undergo regular audits conducted by independent third parties, with all findings promptly reported to regulators. This commitment to thorough oversight enables us to deliver high-quality services that benefit you.

By merging trust, innovation, and expertise, we deliver optimal results – tailored entirely to your individual needs. We work with you to find the right solution from our range of brokerage, exchange and custody service solutions for crypto and digital assets.

Powered by Boerse Stuttgart Group

Boerse Stuttgart Digital, powered by Boerse Stuttgart Group, is the trusted partner for integrated and tailored solutions along the entire value chain of crypto and digital assets across Europe. As a part of Boerse Stuttgart Group with +160 years of tradition and expertise in financial markets, Boerse Stuttgart Digital is committed to the highest safety, stability, and transparency levels and is fully regulated in Germany. As a one-stop-shop for B2B clients across Europe, Boerse Stuttgart Group bundles its business solutions: brokerage, trading and custody under the brand Boerse Stuttgart Digital to enable institutional partners to have easy and reliable access to the world of crypto & digital assets.

For more information about Boerse Stuttgart Digital, please visit bsdigital.com.

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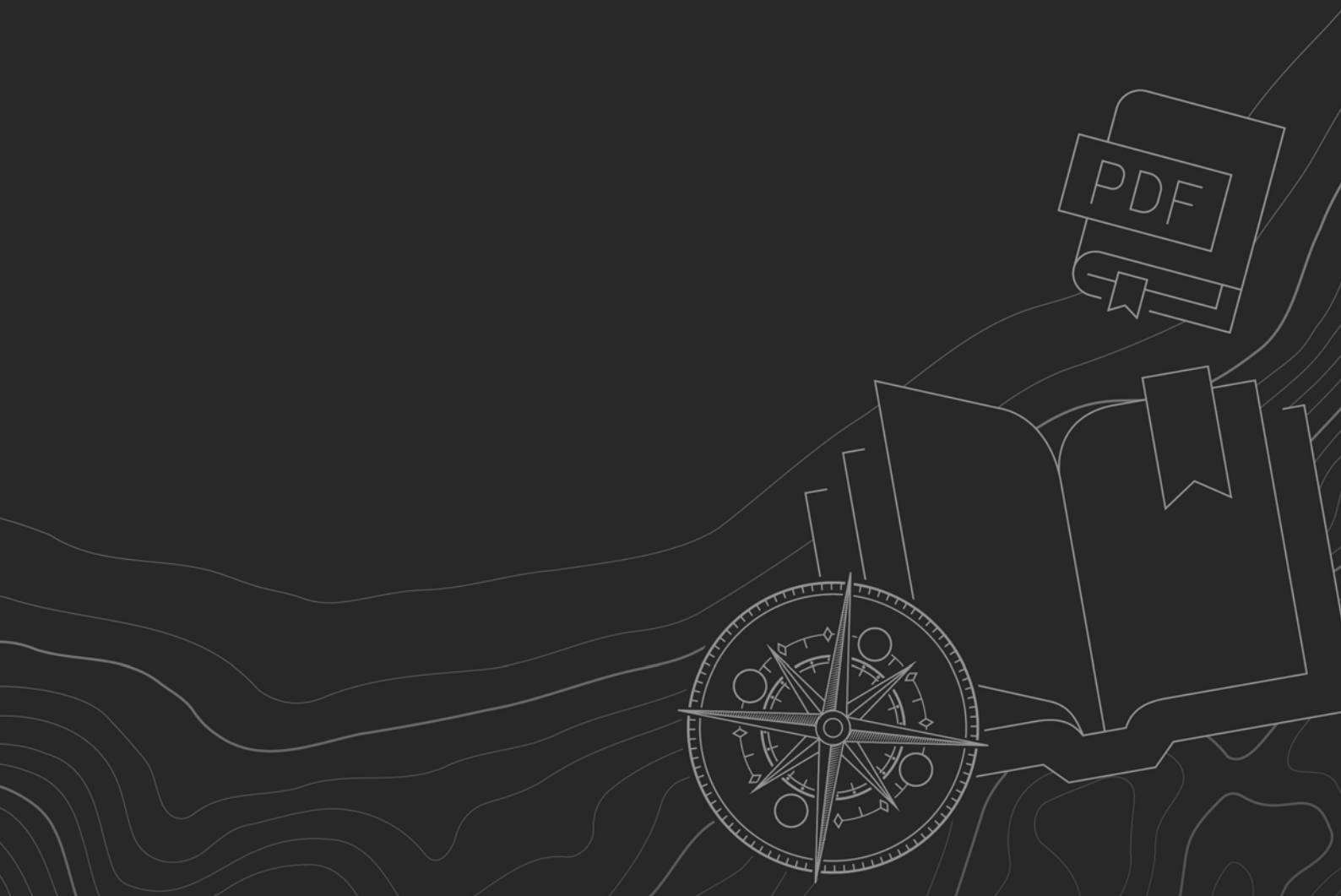

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List of figures

List of abbreviations

ART	Asset-Referenced Token
CASP	Crypto-Asset Service Provider
CBDC	Central Bank Digital Currencies
DLT	Distributed Ledger Technology
DLT PR	Distributed Ledger Technology Pilot Regime
EMT	Electronic Money Token
eWpG	Gesetz über elektronische Wertpapiere: Germany's Electronic Securities Act
ECB	European Central Bank
KWG	Kreditwesengesetz: German Banking Act
MiCAR	Markets in Crypto-Assets Regulation
MiFID	EU "Markets in Financial Instruments Directive"
ZuFinG	Zukunftsfinanzierungsgesetz: Germany's Financing for the Future Act

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