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Generation

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Technology Neutrality as a Guiding Principle in the Regulation of Crypto Assets

Argyrios Alexandros Lygeros*

This thesis examines the complex interpretation of the principle of technology neutrality with regards to crypto assets. It investigates the extent to which the existing legal framework can be applied to crypto assets under this principle. To assess whether crypto assets are functionally distinct from established legal concepts, special focus is placed on understanding the underlying technology. Finally, recent regulatory developments in the European Union and Switzerland are analyzed and evaluated.

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* Argyrios Alexandros Lygeros holds both a Bachelor and Master of Law degree from the University of Zurich. Throughout his studies, he gained practical experience working at several Swiss law firms. In November 2025, he began his legal traineeship (Substitut) at a leading Swiss business law firm in Zurich.
The author thanks BEE Spencer Tellini and BEE Nick Tuninga for their inputs regarding the technological workings of Distributed Ledger Systems. Many thanks also go out to B.A. Hannah LaBovick who held a presentation with the author on the topic of crypto asset regulation in the United States, the European Union and Switzerland.

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List of Abbreviations

AML	Anti-Money-Laundering
ART	asset-referenced token
art.	article
BaFin	Bundesanstalt für Finanzdienstleeistungsaufsicht
BankA	The Swiss Federal Act on Banks and Savings Banks (SR 952)
BankO	Ordninance on the Federal Act on Banks and Savings Banks (SR 952.02)
BBl	Swiss Federal Gazette
CAI	Crypto Asset Issuer
CASP	Crypto Asset Service Provider
cf.	confer
cit.	cited
CO	Federal Act on the Amendment of the Swiss Civil Code, Part Five: The Code of Obligations (SR 220)
Cst.	Federal Constitution of the Swiss Confederation of 18 April 1999 (SR 101)
DEBA	Swiss Debt Enforcement and Bankruptcy Law (SR 281.1)
DLT	Distributed Ledger Technology
DLT-act	Federal Act on the Adaptation of Federal Law to Developments in Distributed Electronic Register Technology (AS 2021 33)
DLT-PR	Regulation (EU) 2022/858 of the European Parliament and of the Council of 30 May 2022 on a Pilot Regime for market infrastructures based on distributed ledger technology, and amending Regulations (EU) No 600/2014 and (EU) No 909/2014 and Directive 2014/65/EU
ECB	European Central Bank

ed.	editor(s)
EF	Expert Focus, Schweizerische Zeitschrift für Wirtschaftsprüfung, Steuern, Rechnungswesen und Wirtschaftsberatung (Zürich)
e.g.	exempli gratia
EMT	E-Money token
ESMA	The European Securities and Markets Authority
et al.	et alia/alii
etc.	et cetera
et seq.	and the following pages
EU	European Union
FCA	Financial Conduct Authority of the United Kingdom
FINMA	Swiss Financial Market Supervisory Authority
FinMIA	Financial Market Infrastructure Act (SR 958.1)
FinSA	Federal Act on Financial Services (SR 950.1)
FISA	Federal Act on Intermediated Securities (SR 957.1)
GesKR	Zeitschrift für Gesellschafts- und Kapitalmarktrecht (Zürich)
ICO	Initial Coin Offering
let.	letter
MiCAR	Regulations (EU) 2023/1114 of the European Parliament and of The Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937
MiFID II	Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU
Nr.	Number
p.	page
para.	paragraph
sic!	Zeitschrift für Immaterialgüter-, Informations- und Wettbewerbsrecht (Basel)
SZW	Schweizerische Zeitschrift für Wirtschafts- und Finanzmarktrecht (Zürich)
TFEU	Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union, Official Journal C 326
vs.	versus

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A Introduction

Few financial inventions have challenged regulators as much as the emergence of crypto assets. A major challenge stems from the difficulty of upholding a technology neutral approach — a core legislative principle in both the EU and Switzerland.[1] The principle was first introduced in the EU in the context of the telecommunications Directive 2002/21/EC and was later adopted by Swiss regulators.[2] It holds that regulations should apply consistently based on the function and effect of an activity, regardless of the technology used, preventing regulators from favouring or discriminating among technologies.[3] New regulations should, therefore, focus on regulating the use and consequences of technology rather than the technology itself.[4] Thus, the principle of technology neutrality is essentially a concretization of the general precept of equality before the law (cf. art. 8 Cst.).[5]

A technology neutral approach helps regulations remain flexible, adaptive, and future-proof, avoiding antiquation as technologies evolve. However, the flexibility of a technology neutral approach comes with certain trade-offs, such as reduced legal certainty and ambiguity in application.[6]

Applying a technology neutral approach to the regulation of crypto assets has proven highly challenging, as crypto assets possess both substantial similarities and key differences with certain existing legal concepts, most notably financial instruments and currencies. Furthermore, creating new regulations applicable to crypto assets that do not expressly name the technology they aim to regulate proved difficult as well.[7] This essay aims to determine where crypto asset specific regulations are required and to what extent the existing legal framework is applicable to crypto assets considering the principle of technology neutrality. The analysis will be performed, by comparing the EU's and Switzerland's current regulation of crypto assets.

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1 cf. recital 9 MiCAR; FINMA, Regulation-Guidelines, p. 3; cf. FINMA, Stablecoin-Guidelines, p. 2; cf. Ojanen, p. 1 et seq.

2 Ojanen, p. 5.; cf. FINMA, Regulation-Guidelines, p. 3.

3 cf. FINMA, Stablecoin-Guidelines, p. 2; cf. Ojanen, p. 1; cf. European Commission, Common Assessment Method for Standards and Specifications (CAMSS), available at https://interoperable-europe.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/elap/technology-neutrality (last visited on 14 October 2025).

4 Swiss Federal Council, DLT-Report, p. 14; Ojanen, p. 3.

5 cf. Derungs, p. 118.

6 Ojanen, p. 3 et seq.; Derungs, p. 118.

7 cf. Swiss Federal Council, DLT-Explanations, p. 251.

B The Phenomenon "Crypto"

The exact technological workings of crypto assets are rarely discussed in legal doctrine. Most analyses rely on simplified – and at times inaccurate – analogies. Conclusions drawn on this basis are consequently unsubstantiated at best. A fundamental understanding of the technology behind crypto assets – even at a rudimentary level – is essential for developing a legal framework that does justice to their complexity, mitigates their inherent risks, and acknowledges their functional similarities with existing conceptual categories. This paper provides a concise, yet comprehensive, illustration of the technology underlying crypto assets. As cryptocurrencies were the first crypto asset to emerge – with the invention of Bitcoin in 2008 – the following section provides an overview of their history and their underlying technology.

I Cryptocurrencies

1 Centralized vs. Decentralized Financial Systems

Cryptocurrencies are the latest stage in the evolution of money. Unlike most traditional financial systems, cryptocurrency networks are entirely decentralized. This section first examines how traditional monetary systems operate and where their shortcomings lie. It then outlines how decentralized financial systems aim to address these shortcomings.

1.1 *The Shortcomings of Centralized Systems*

Coins are the oldest known means of exchange, serving as physical stores of value. Originally, coins derived their value from the precious materials they were made of.[8] Over time, coins were largely replaced by banknotes. Coins and banknotes (collectively referred to as "cash") constitute legal tender, meaning they must be accepted when offered in payment of a debt (cf. Art. 128 para. 1 TFEU). Unlike coins, banknotes have no intrinsic material value. Their worth is grounded in collective trust in the issuing authority. This was demonstrated in post-World-War I Germany, when hyperinflation rendered the German legal tender ("Papiermark") nearly worthless, prompting the creation of the "Rentenmark", as a replacement.[9] Coins and banknotes constitute decentralized means of payment in the sense that transactions can be carried out

8 cf. GREITENS, p. 55 et seq. and 99 et seq.
9 in more detail MONNERAT, p. 17.

directly between parties ("peer-to-peer") without the involvement of an intermediary. Payments are made through the physical transfer of cash, a process that is inefficient for distant or cross-border transactions.[10]

During the twentieth century, e-money became an increasingly common form of payment. E-Money constitutes a claim on the issuer that has monetary value. It is issued by authorized financial entities like banks (e.g. UBS) and payment service providers (e.g. PayPal). The value of the claim is denominated in a traditional currency (e.g. CHF, EUR). The monetary value of e-money is recorded on a centralized ledger which is held by the issuer. Therefore, its reliability is dependent on trusting this intermediary.[11] The 2008 financial crisis damaged public confidence in the banking system fuelling the desire for a peer-to-peer financial system that is also suitable for cross-border transactions.[12] This demand was met through the emergence of cryptocurrencies.

1.2 *Cryptocurrencies as Decentralized Systems*

Rather than relying on an intermediary, every participant of a cryptocurrency network maintains their own copy of the ledger. Accordingly, such systems are referred to as distributed ledger systems. Each copy of the ledger contains a complete record of all transactions made within the network (see Figure 1).

This raises a question: which version of the ledger should be trusted? The rule determining the valid version of the ledger is called the "consensus mechanism".[13] While different distributed ledger systems use different consensus mechanisms[14] – Bitcoin uses "proof of work",[15] Ether uses "proof of stake"[16] – they share a common goal: enabling participants to agree on the valid version of the ledger without needing to trust a central authority.[17]

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10 cf. European Comission, Crypto-assets, A comprehensive framework for crypto-assets and related services to ensure that the Union financial services are fit for the digital age, available at https://finance.ec.europa.eu/digital-finance/crypto-assets_en (last visited on 17 October 2025).

11 NAKAMOTO, p. 1; cf. MONNERAT, p. 6 et seq.

12 CORBET ET AL., p. 182; cf. NAKAMOTO, p. 1.

13 MONNERAT, p. 4; cf. NAKAMOTO, p. 3.

14 in more detail MEISSER, p. 12/21 et seq.; cf. MONNERAT, p. 10 et seq.

15 in detail section B.I.2.

16 in more detail MEISSER, p. 12/21 et seq.; cf. MONNERAT, p. 10 et seq.

17 MEISSER, p. 11; cf. MAUCHLE, p. 822.

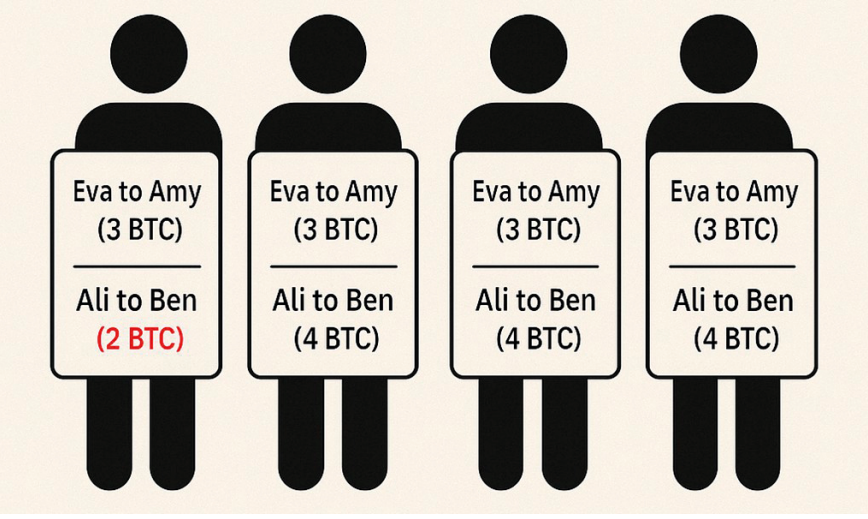

Figure 1: *Each of the four participants in this cryptocurrency network maintains their own copy of the ledger. The inconsistency in the first participant's ledger illustrates the fundamental issue that consensus mechanisms are designed to address.*

2 Archetype: The Bitcoin Protocol

This section focuses on the archetypal consensus mechanism used by Bitcoin – "proof of work". The Bitcoin protocol illustrates how a peer-to-peer financial system can operate without relying on trust. In this context, the term "protocol" refers to the set of rules that govern the functioning of the network.

2.1 *Blocks*

The bitcoin protocol dictates that the ledger must be validated after a certain number of transactions. The set of transactions recorded between validations is called a "block". A useful analogy is to think of a block as a sheet of paper: only a limited number of transactions can be written on a piece of paper before it is full. Before continuing the ledger on a new sheet, the full sheet must first be validated through a process called "proof of work".

2.2 *Proof of Work*

A block is validated by demonstrating that significant computational resources were used for its creation. The Bitcoin protocol requires each block to end

with a specific number known as "hash".[18] To explain why finding this number – and thus validating the block – requires extensive computational power, a brief explanation of cryptographic hash functions is necessary.

Cryptographic hash functions are mathematical algorithms that transform any input into a fixed-length output called the hash. The same input always produces the same output, but the process is designed to be one-way, meaning that is impossible to determine the original input from its hash.

In Bitcoin, a cryptographic hash function (called SHA-256) is applied to the block. The goal is to produce a hash that falls below a target value – for example, a hash that starts with a certain number of zeros. Because of the one-way nature of cryptographic hash functions, the only way to find a fitting hash is through a vast number of trial-and-error computations, requiring significant computational power.

2.3 *Blockchain*

Once a block is validated, the ledger is continued on a new block. The protocol dictates that each new block must include the hash of the previous block in its header. This ensures that altering any transaction in an earlier block would require recalculating the proof of work for that block and all that follow. Because blocks are "chained" together in this manner, the ledger is commonly referred to as "blockchain" (see Figure 2).[19]

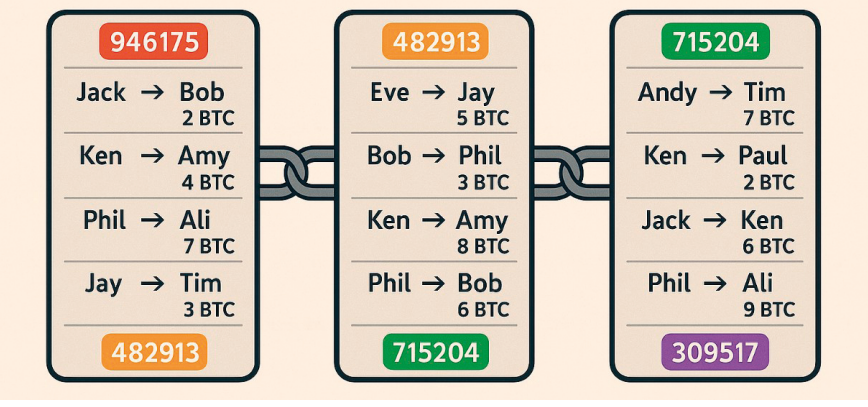

Figure 2: *The illustration depicts three blocks in a blockchain, where each block has the hash of the preceding block in its header.*

[18] Nakamoto, p. 3; Meisser, p. 16.
[19] cf. Weber, Herausforderung, para. 2.

2.4 *Miners and Digital Signatures*

The participants of the network performing the proof of work calculations are called miners. They collect unconfirmed transactions being broadcast to the network and assemble them into blocks. Miners then repeatedly input the block into the cryptographic hash function, attempting to produce a hash that meets the network's difficulty target. The first miner to succeed, broadcasts the newfound block to the network for the other participants to add that block to their version of the blockchain.[20]

Miners only consider transactions that have been verified by the debtor. Each transaction is digitally signed by the sender. The signature is created with the sender's "private key". The validity of the signature can be verified by using the corresponding "public key", ensuring that the transaction has been authorized by the rightful owner.[21] Thus, invalid or fraudulent transactions are excluded by miners in the block-building process (see Figure 3).

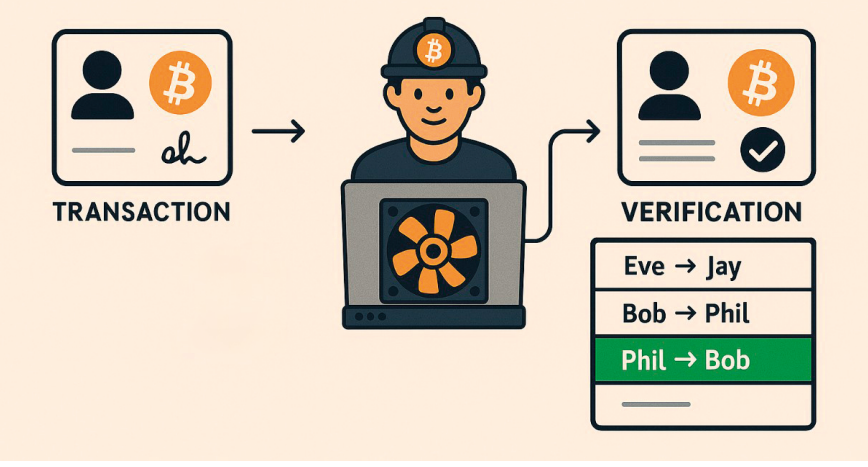

Figure 3: *When a miner receives a new transaction, they use the sender's public key to verify the validity of its digital signature. If the signature is valid, the miner includes the transaction in the block-building process.*

2.5 *Trusting the Longest Version of the Ledger*

Malicious actors could try to mine fraudulent blocks, creating an alternative chain containing fraudulent transactions. To prevent such fraudulent versions

20 NAKAMOTO, p. 3.

21 in detail MEISSER, p. 8 et seq.; cf. MONNERAT, p. 7 et seq.; Duc/Graf, p. 302.

of the blockchain from being trusted, the Bitcoin protocol dictates that participants always consider the valid chain to be the longest one.

If a malicious actor attempted to create a fraudulent version of the blockchain by generating blocks containing fraudulent transactions, they would need to find a valid hash for every block in their chain. For their version of the blockchain to be considered legitimate by the network, it would have to become the longest chain. Thus, the attacker would only succeed if they found a valid hash for all their blocks faster than the honest miners found valid hashes for the legitimate blocks.[22] Because finding a valid hash is a process that depends purely on trial and error – not skill – the likelihood of success depends entirely on the computational power one controls. As all honest miners collectively possess far more computational power than the malicious actor, the probability of a fraudulent chain surpassing the honest one over time is vanishingly small (Figure 4). This is why distributed ledger systems that employ the proof of work mechanism are effectively resistant to fraud.[23]

22 cf. PETRY/LOSER, p. 240 et seq.

23 in detail MEISSER, p. 13/16; cf. MONNERAT, p. 9; NAKAMOTO, p. 3 and 6 et seq.; WRONKA, p. 1.

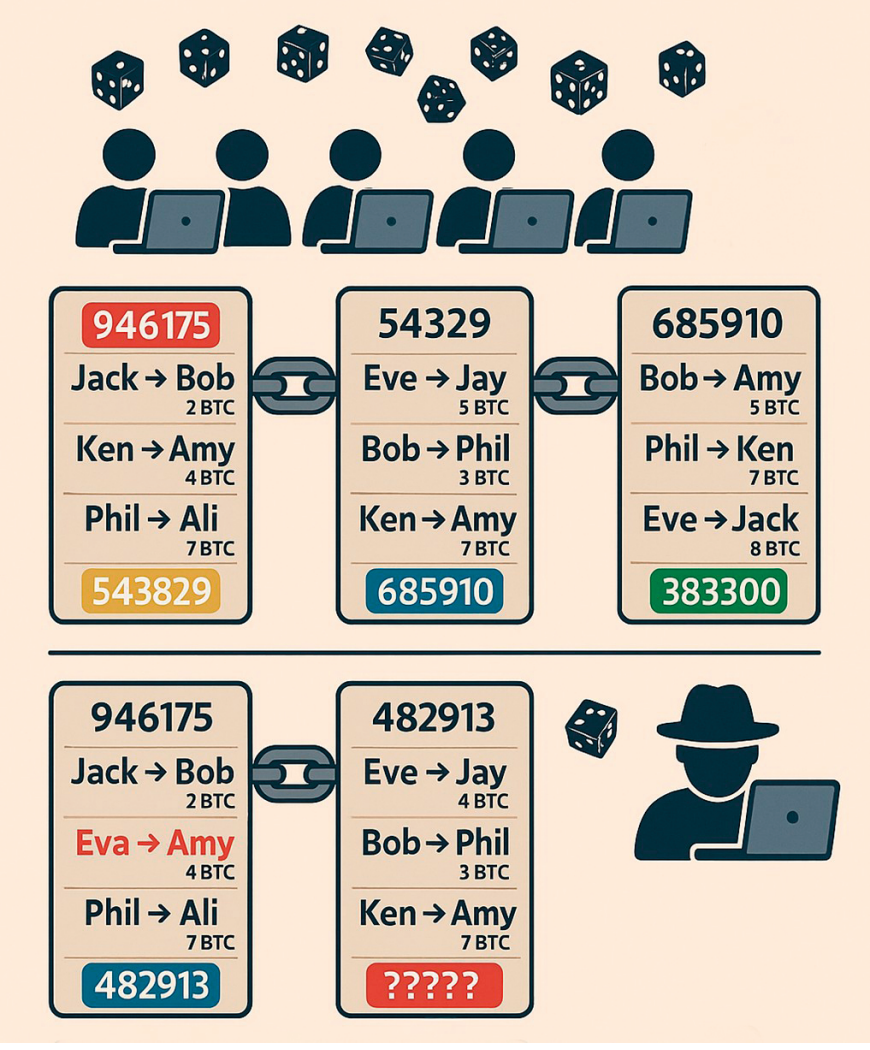

***Figure 4**: The malicious actor (bottom right) has inserted a fraudulent transaction into their version of the blockchain (shown in red). They eventually find a valid hash for the fraudulent block. Since they cannot rely on the honest network of miners, they must also compute the hash for each subsequent block on their own. Meanwhile, the honest network continues to validate legitimate transactions at a much faster rate, thanks to its vastly greater collective computational power.*

3 Other Cryptocurrency Protocols

The above demonstrates how the bitcoin protocol and its “proof of work”

mechanism create a fraud-resistant, peer-to-peer financial system that relies on the laws of probability, rather than trust. In practice, only a small number of distributed ledger systems rely on the "proof of work" consensus mechanism, due to its highly energy-intensive nature. Many have instead adopted the less energy-consuming "proof of stake" mechanism used on the Ethereum blockchain.

3.1 *Proof of Stake*

Instead of relying on the laws of probability, "proof of stake" uses the incentives of financial staking to its advantage. Validators stake ETH to have the right to validate blocks. The staked ETH serves as a security deposit. For the validation of each block, a validator is randomly chosen from the pool of validators who have staked their ETH. Subsequently, a group of other validators who have staked ETH are selected to vote on whether the proposed block is valid. Validators are incentivised to be honest as they earn rewards for proposing valid blocks and attesting to valid blocks. On the flip side, they face penalties (so called "slashing") for attesting to conflicting blocks and proposing invalid blocks. The penalty lies in losing the staked ETH.[24] Therefore, validators have a financial stake in acting honestly, thereby increasing network security. As there is no mining involved, "proof of stake" is considered much more energy-efficient. The trade-off is a lower level of network security as the incentive is mainly financial and not entirely mathematical (as is in "proof of work").[25]

3.2 *Proof of Authority*

Another consensus mechanism is "proof of authority" which is employed in the VeChain protocol. Thereunder, a pre-determined set of validators produce the blocks. "Proof of Authority" is, therefore, fast and energy-efficient. However, it is not decentralized, as trust is placed in the validating entities, meaning that the advantages of decentralized systems are lost.[26]

II Digital Value Forms based on DLT

The discussion above illustrated how DLT provides the foundation to create cryptocurrencies. However, DLT can also serve as the basis for other types of

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24 more in depth Crypto Valley, Paper on Staking Services, p. 3 et seq.; Petry/Loser, p. 242 et seq.

25 cf. for example Siegel, Kryptowährungen und Token, p. 94 et seq.

26 cf. Siegel, Kryptowährungen und Token, p. 95.

digital value. The remarks below aim to clarify the terminology distinguishing these DLT-based value forms.

1 Crypto Assets

Cryptocurrencies, tokenized assets, tokenized utilities, and non-fungible tokens all constitute subcategories of the broader term "crypto assets". Cryptocurrencies represent stores of value that function as means of payment. Stablecoins represent a subclass of cryptocurrencies designed to maintain a stable value, typically by being pegged to a fiat currency such as the U.S. Dollar (e.g., Tether [USDT], USD Coin [USDC]).[27]

Cryptographic tokens can also represent real-world assets, often referred to as tokenized assets. The specific asset a token represents depends on the shared understanding among its users (e.g., shares, bonds, or other rights).[28]

Cryptographic tokens that serve to provide access to specific products or services within a particular platform (such as supermarket coupons, airline miles, or cloud storage) are referred to as tokenized utilities. Unlike tokenized assets, tokenized utilities are not intended to function as investment instruments.

Non-fungible tokens represent ownership of unique digital assets recorded on a blockchain. The term "non-fungible" signifies that no two units on the blockchain are identical to another – unlike cryptocurrencies. NFTs may represent various digital items, including digital artworks and music.

2 Central Bank Digital Currencies

Not crypto assets in a technical sense are Central Bank Digital Currencies, which are digital versions of existing national currencies. They combine features of traditional central bank currencies (which are legal tender) with cryptocurrencies.[29] Essentially, a central bank issues digital units of its legal tender (e.g. EUR), which are stored on a blockchain that is managed by the central bank. Validation of transactions is performed by the central bank (cf. section B.I.3.2). CBDCs enable transactions without requiring commercial bank intermediaries. They are direct claims on the central bank and not on a commer-

27 FINMA, Stablecoin-Guidelines, p. 1; for details see HESS, Stablecoins, p. 938 et seq.
28 overview in MAUCHLE, p. 824 et seq.
29 cf. EGGEN, p. 147 et seq.

cial bank acting as an intermediary. An example for a CBDC is the "digital euro" project, proposed by the ECB.[30]

3 Tokenized Bank Money

Tokenized Bank Money is E-Money issued on a distributed ledger (e.g. JPMD[31]). Consequently, it represents claims against the bank that issued it. Unlike CBDCs it is created and issued by commercial banks, not central banks.

30 ECB, Report on a digital Euro, available at https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf (last visited on 22 September 2025).

31 cf. Kinexys Digital Payments, Fuel programmable, near real-time, multicurrency payments 24/7, available at https://www.jpmorgan.com/solutions/cib/news/jpmorgan-creates-digital-coin-for-payments (last visited on 14 October 2025).

C Technology Neutrality in Crypto Asset Regulation – EU vs. Switzerland

This section explores how Switzerland and the EU have applied the principle of technology neutrality to crypto asset regulation. To that end, it first outlines the financial instruments regulations that existed in each jurisdiction prior to the emergence of crypto assets. It then examines how each jurisdiction has integrated crypto assets into its respective regulatory framework.

I Implementation in Switzerland

1 Traditional Financial Instrument Regulations

Traditional financial instruments are regulated by various Swiss acts – most notably FinMIA and FinSA. The term financial instruments includes the following under Swiss law: equity securities (shares, participation certificates, etc.), debt securities (bonds, notes, etc.), derivatives, units in collective investment schemes, structured products and depository receipts. FinMIA regulates clearing and settlement obligations for derivatives and governs trading venues, central counterparties and trade repositories. FinSA regulates the offering of financial instruments and disclosure requirements (prospectus rules, etc.) and stipulates conduct rules for financial service providers.

2 Crypto Asset Regulations

2.1 *Crypto Asset Classification*

In Switzerland, FINMA is allowed to issue declaratory rulings to allow for an upfront clarification of the regulatory treatment of new financial phenomena. In 2018, FINMA issued a declaratory ruling referred to as "ICO-Guidelines", which sets out various subcategories of crypto assets and outlines their respective regulatory treatment.[32] Therein, FINMA distinguishes between three categories of tokens: payment tokens, security tokens and utility tokens. Although not an official token category, the term hybrid tokens refers to tokens that combine one or more of the aforementioned functions (payment, security or utility).[33] Several other jurisdictions have adopted similar categorizations.

32 cf. FINMA, ICO-Guidelines, p. 3.
33 FINMA, ICO-Guidelines, p. 3.

For instance, the United Kingdom distinguishes between exchange tokens, security tokens and utility tokens[34] while Germany distinguishes among payment tokens, security tokens and utility tokens.[35]

Payment tokens – i.e. cryptocurrencies[36] – serve as means of payment for acquiring goods and services. They do not grant claims against the issuer.[37]

Security tokens embody real-world assets or earning streams (equities, bonds, derivatives). Their economic function mirrors that of the traditional, underlying assets they represent. These tokens grant their holders claims against the issuer or membership rights in a corporation.[38] In essence, any securitizable asset can be tokenized. An example for a Swiss security token is SwssRealCoin (SRC). SRC represents a fractional ownership in a commercial real estate portfolio.[39]

Utility tokens can be used to redeem services, products or functionalities of a company, within a specific ecosystem. To qualify as a utility token, the underlying services must not be securitizable; otherwise, the token would be deemed a security token or payment token.[40] Due to their inherent similarity, distinguishing between security tokens and utility tokens can be difficult. A prominent example for a utility token is BAT of the Brave browser ecosystem. Within the Brave browser, ads and trackers are blocked by default. Users may choose to opt-in to ads and earn BAT tokens as compensation. The BAT tokens can then be used to redeem services.[41]

2.2 *Applicability of the Existing Legal Framework*

The extent to which crypto assets fall under existing laws depends on the classification of the specific token in question. In Switzerland, payment tokens are not classified as financial instruments within the meaning of art. 2 let. b FinMIA.[42] Under Section 3.6 of FINMA's ICO-guidelines i.c.w. art. 2 para. 3 let. b AMLA, the classification of a token as a payment token triggers the applicabil-

34 FCA, Crypto Guidance, p. 8.
35 BaFIN, Merkblatt ICOs, p. 5 et seq.
36 cf. Monnerat, p. 4.
37 FINMA, ICO-Guidelines, p. 3; cf. Monnerat, p. 4.
38 cf. Varmaz et al., Kryptowährungen und Token, p. 21.
39 SwissRealCoin, Switzerland's first real estate crypto token, available at https://www.swissrealcoin.io/ (last visited on 16 October 2025).
40 cf. Wronka, p. 420.
41 TAP network, Rewards Market for Brave Users, available at https://brave.tapnetwork.io/ (last visited on 16 October 2025).
42 FINMA, ICO-Guidelines, p. 4.

ity of the AMLA. Therefore, Swiss financial intermediaries holding or offering services to transfer cryptocurrencies are subject to the same AML-regulations as financial intermediaries offering these services for fiat money.

FINMA classifies security tokens as financial instruments within the meaning of art. 2 let. b FinMIA. Consequently, the existing legal framework governing traditional financial instruments applies equally to security tokens.[43] The specific rules applicable to a particular security token depend on the nature of the financial instrument it represents. For example, where a token is analogous to a bond or share, it is typically subject to the prospectus requirements under art. 35 et seq. FinSA.[44] Furthermore, certain activities involving security tokens may trigger licensing obligations.[45]

Pure utility tokens are not classified as financial instruments within the meaning of art. 2 let. b FinMIA, so long as they do not serve as investments.[46] Furthermore, the AMLA generally does not apply to pure utility tokens.[47] Pure utility tokens are therefore generally unregulated under Swiss financial market law.[48]

2.3 *The DLT Blanket Act*

Switzerland was among the first jurisdictions to adopt a comprehensive legal framework for crypto assets.[49] The federal government issued crypto-regulations in the DLT-act, which entered into force in stages beginning on 1 February 2021. Contrary to its name, the DLT-act is no standalone statute but rather a set of coordinated amendments to ten pre-existing federal acts.[50] The Swiss Federal Council expressly refrained from creating a technology-specific, standalone statute.[51]

The most consequential changes enacted by the DLT-act are the creation of "ledger-based securities" (art. 973d et seq. CO) and "DLT trading facilities" (art. 73 et seq. FinMIA).[52] Ledger-based securities are rights entered in a secu-

43 FINMA, ICO-Guidelines, p. 5.
44 FINMA, ICO-Guidelines, p. 6.
45 Spillmann/Akiki/Thoma/Peregrina, PwC Crypto Report, p. 77.
46 FINMA, ICO-Guidelines, p. 4.
47 FINMA, ICO-Guidelines, p. 7.
48 cf. Spillmann/Akiki/Thoma/Peregrina, PwC Crypto Report, p. 77.
49 Spillmann/Akiki/Thoma/Peregrina, PwC Crypto Report, p. 77.
50 cf. Kramer/Meier, p. 61; Dobbins, p. 484.
51 Swiss Federal Council, DLT-Report, p. 14; cf. Weber, Internationale Regulierungsansätze, p. 450 et seq.
52 Weber, Internationale Regulierungsansätze, p. 451.

rities ledger that can only be transferred via the securities ledger. The concept of ledger-based securities allows for the tokenization of shares, bonds and other traditional financial instruments, whilst providing clear rules for how these securities can be claimed, transferred, pledged and cancelled.[53] The new DLT trading facilities further permit the multilateral trading of ledger-based securities under a dedicated license regime.

Further significant changes concern bankruptcy law and banking law. Public deposits held in fiat currency cannot be segregated in bankruptcy proceedings under current Swiss legislation (art. 37a BankA i.c.w. art. 17-19 FISA).[54] Nevertheless, art. 242a DEBA and art. 16 para. 1bis BankA introduced a right of segregation for cryptocurrencies in bankruptcy proceedings, even if they are held in collective custody and can therefore not be individually assigned.[55] This leads to an unequal treatment of cryptocurrencies and fiat currencies in bankruptcy proceedings.[56] Moreover, art. 1a let. b and 1b para. 1 BankA stipulate, that custodial services for crypto assets may require a banking license.[57,58]

Lastly, it is important to note that – although Switzerland is not part of the EU – its crypto landscape will undoubtedly be impacted by the EU's adoption of MiCAR (further remarks in section C.II.2). As MiCAR does not provide a third-country regime, Swiss CASPs offering services in the EU will likely have to establish a licensed subsidiary in the EU to comply with MiCAR's provisions.[59]

II Implementation in the EU

1 Traditional Financial Instrument Regulations

In the EU, financial instruments are regulated by a series of regulations and directives, each addressing specific aspects of financial market regulation; to name a few: MiFIR, MiFID II, Prospectus Regulation, MAR and EMIR. MiFID II and MiFIR together form the core framework for investment services and trading venues. Annex I section C MiFID II defines the term "financial instruments" for EU law, which encompasses transferable securities (such as shares and bonds), money market instruments (such as treasury bills), units in col-

53 Spillmann/Akiki/Thoma/Peregrina, PwC Crypto Report, p. 78.
54 Monnerat, p. 26 et seq.
55 in depth Hess, Geltungsbereich BankA, p. 572 et seq.; cf. Monnerat, p. 29 et seq.
56 in depth Hess, Geltungsbereich BankA, p. 557 et seq.; cf. Dobbins, p. 492 et seq.
57 cf. art. 1b para. 1 i.c.w. art. 16 para. 1bis let. b BankA i.c.w. art. 5a para. 1 BankO; Monnerat, p. 44.
58 cf. Weber, Internationale Regulierungsansätze, p. 451.
59 Spillmann/Akiki/Thoma/Peregrina, PwC Crypto Report, p. 78.

lective investment undertakings and derivatives (options, futures, swaps and forwards). The Prospectus Regulation establishes requirements for issuers to publish a prospectus before offering securities to the public. MAR prohibits and sanctions insider trading and market manipulation for instruments admitted to trading on regulated markets, MTFs or OTFs. Finally, EMIR stipulates central clearing, reporting and risk mitigation obligations for OTC derivatives.

2 Crypto Asset Regulations

The EU has established a comprehensive regulatory framework for crypto assets in the realms of its Digital Finance Package, the initial components of which entered into force on 23 March 2023. The framework consists of MiCAR, the new AML-package[60] and the DLT-PR. Collectively, the new regulations establish a comprehensive regime that classifies crypto assets, regulates their issuance and trading, and integrates them into the existing financial market framework.[61]

MiCAR is the cornerstone of the EU's regulatory framework for crypto assets. It places a special focus on the regulation of stablecoins.[62] MiCAR establishes a comprehensive set of rules for crypto asset issuers (CAIs; Titles II-IV) and crypto asset service providers (CASPs; Title V). Key provisions include authorization requirements for CASPs, transparency and disclosure requirements for CAIs (duty to issue a crypto asset whitepaper), consumer protection measures (such as segregation requirements) as well as safeguards against market abuse (Title VI). Title VII delineates supervisory responsibilities among national competent authorities, EBA and ESMA.[63] Although MiCAR's regulations are extensive (particularly under Title V), its requirements are generally less stringent than those applicable to financial instruments under MiFID II.[64]

The EU's categorization of crypto assets is not derived from a specific legislative act but emerges from its broader crypto asset regulatory framework. In the EU, crypto assets can be grouped into three categories: (i) crypto assets that qualify as financial instruments and are therefore subject to traditional financial services laws; (ii) crypto assets that do not qualify as financial instru-

60 cf. European Council, Anti-money laundering: Council adopts package of rules, Press release, 30 May 2024, available at https://www.consilium.europa.eu/en/press/press-releases/2024/05/30/anti-money-laundering-council-adopts-package-of-rules/ (last visited on 17 October 2025).

61 Huertas/Devanand/Schmidt, PwC Crypto Report, p. 18.

62 cf. Hess, Stablecoins, p. 948; cf. Weber, Internationale Regulierungsansätze, p. 451.

63 detailed in Baisch, p. 244 et seq.; Baisch/Weber, p. 228 et seq.

64 Weber, Internationale Regulierungsansätze, p. 451; cf. Baisch, p. 250; cf. Dobbins/Reiser, p. 504.

ments but fall within MiCAR's scope of application; and (iii) crypto assets that do not qualify as financial instruments nor fall within MiCAR's scope.[65] MiCAR applies to three types of tokens: ARTs, EMTs and other crypto assets.[66] EMTs are stablecoins that are pegged to one single official currency (e.g. USDT), while ARTs are stablecoins that purport to maintain a stable value by referencing multiple assets (such as official currencies, commodities or other crypto assets). "Other crypto assets" encompass crypto tokens that are not classified as ARTs or EMTs and which are not excluded from MiCAR's scope of application. Notably, NFTs and CBDCs are expressly excluded from MiCAR's scope.

As a result, tokenized utility[67] generally falls inside MiCAR's scope of application, whereas tokenized assets typically qualify as financial instruments under art. 4 (1) no. 15 i.c.w. Annex 1 MiFID II and are therefore excluded from MiCAR's scope of application.[68,69] Since MiFID II predates the emergence of DLT,[70] applying its provisions to tokenized assets could hamper innovation. To address this, the DLT-PR establishes regulatory sandboxes for market infrastructures issuing, recording, transferring and settling tokenized assets (so-called "DLT financial instruments") allowing them to operate under temporary exemptions from certain provisions under MiFID II and MiFIR.[71] These exemptions are limited to low-risk environments to ensure investor protection.[72]

The question of the applicability of MiCAR to cryptocurrencies with no identifiable issuer (such as Bitcoin) has created some unwarranted uncertainty, with some claiming that MiCAR does not apply to these types of cryptocurrencies all together. Under recital 22 MiCAR, crypto assets that have no identifiable issuer are generally exempt from MiCAR's Titles II, III and IV. However, CASPs providing services relating to such crypto assets (like cryptocurrency exchanges) remain fully subject to MiCAR. The distinction under recital 22 MiCAR follows from the fact that Titles II-IV impose obligations on CAIs, which presuppose the existence of an identifiable issuer.[73]

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65 cf. Huertas/Devanand/Schmidt, PwC Crypto Report, p. 21 et seq.; cf. Bird & Bird, MiCAR Report, p. 10 et seq.

66 cf. Dobbins/Reiser, p. 503; Hess, Stablecoins, p. 948; dissenting opinion Raschauer/Kreisl, p. 117 et seq.

67 cf. art. 3 (1)(9) MiCAR.

68 for a comparison of MiCAR's and FINMA's crypto asset categorization see Dobbins, p. 503; Hess, Stablecoins, p. 948.

69 cf. ESMA, Qualification Crypto, p. 3; cf. Varmaz et al., Kryptowährungen und Token, p. 23 et seq.

70 MiFID II went into force on 15 May 2014.

71 Baisch/Weber, p. 222/228; Raschauer/Kreisl, p. 129 et seq.

72 cf. art. 3 DLT-PR; cf. Raschauer/Kreisl, p. 130.

73 Huertas, p. 1 et seq.; Bird & Bird, MiCAR Report, p. 11.

III Interim Conclusion

Both the EU and Switzerland have embraced a technology neutral approach toward regulating crypto assets.[74] In both jurisdictions, tokenized assets are generally regulated under pre-existing financial market law, as they are perceived to be functionally equal to existing financial instruments. Innovation is encouraged through supplementary crypto-specific measures (e.g., the EU's DLT-PR and Switzerland's ledger-based securities). In the EU, new regulations such as MiCAR and the new AML-package regulate cryptocurrency issuers and service providers. Switzerland, in comparison, has enacted fewer regulations expressly tailored to cryptocurrencies (most notably in bankruptcy and banking law). Parts of Switzerland's existing regulatory framework, particularly the AMLA, also extend to cryptocurrencies under the principle of technology neutrality. Whereas MiCAR also encompasses utility tokens, pure utility tokens remain unregulated under Swiss financial market law. Thus, while both jurisdictions adopt a technology neutral approach, they differ in how readily each considers crypto assets analogous enough to existing conceptual categories to apply the same regulatory regimes.

74 cf. recital 9 MiCAR; cf. FINMA, Stablecoin-Guidelines, p. 2.

D Challenges of Technology Neutrality in Crypto Asset Regulation

Adopting a technology neutral approach to the regulation of crypto assets presents notable challenges. Technology-specific features, risks and opportunities can justify regulations tailored to technology-specific attributes. Accordingly, this section examines the extent to which technology-specific regulations are necessary in the crypto asset space, highlighting key problem areas, and providing a critical assessment of how the EU and Switzerland have addressed these challenges.

I Decentralization of Cryptocurrencies Challenges Supervision

Because of their functional similarities to multiple existing conceptual categories, cryptocurrencies have proven to be the most difficult type of crypto asset to regulate.[75] Most challenges arise from their core feature: decentralization. Many cryptocurrencies lack an identifiable issuer or intermediary who could be subject to traditional forms of supervision.[76] Like traditional currencies, cryptocurrencies are intended to serve as means of payment. Unlike traditional currencies, cryptocurrencies are not issued by a central authority and are not legal tender (cf. A.I.).[77] In practice, cryptocurrencies are frequently used for speculative investment purposes – a feature typically associated with traditional financial instruments. Unlike financial instruments, they do not grant claims against an issuer or confer membership rights in a corporation, as no issuer exists.[78]

Maintaining a technology neutral approach becomes challenging when new assets combine both substantial functional similarities and differences with existing conceptual categories. Legislators therefore face a fundamental decision: subject such assets under the existing financial market regulatory framework and supplement those laws, where necessary, or create entirely new technology-specific rules. Switzerland has taken the view that cryptocurrencies possess sufficient similarities to existing conceptual categories, for parts of the traditional framework to apply. FINMA has expressly stated that the AMLA also applies to activities involving cryptocurrencies (Section 3.6 of FINMA's ICO-guidelines i.c.w.

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75 overview in WEBER, Herausforderung, para. 17 et seq.

76 cf. Recital 22 MiCAR; cf. WEBER, Herausforderung, para. 5 et seq.; cf. MOLO/BRUNONE, p. 300.

77 cf. VARMAZ ET AL., Kryptowährungen und Token, p. 26.

78 cf. DUC/GRAF, p. 310; MONNERAT, p. 13.

art. 2 para. 3 let. b AMLA). Thus, under anti-money laundering law, cryptocurrencies are treated in the same way as traditional currencies.[79] At the same time, Swiss legislators have introduced targeted adjustments, notably in bankruptcy law, where treating cryptocurrencies the same way as fiat currencies was deemed inadequate. In the realms of the DLT-act the DEBA was amended to permit the segregation of cryptocurrencies in the event of a custodian's insolvency (art. 242a DEBA and art. 16 para. 1bis BankA). This amendment leads to an unequal treatment of cryptocurrencies and fiat currencies in bankruptcy proceedings as public deposits taken in the form of fiat currencies cannot be segregated in bankruptcy under Swiss law (art. 37a BankA i.c.w. art. 17-19 FISA).[80]

By contrast, the EU has introduced a bespoke regulatory framework for cryptocurrencies – most notably MiCAR – which directly addresses cryptocurrency issuers and cryptocurrency service providers. Nonetheless, Titles II–IV MiCAR regulating CAIs do not apply to cryptocurrencies without an identifiable issuer, so the absence of a clear issuer remains a practical regulatory gap.

Both the EU's and Switzerland's regulatory frameworks present unique advantages but also entail certain trade-offs. The EU's choice to regulate CASPs in a dedicated act has enhanced legal certainty in the EU. By contrast, Switzerland has largely relied on the application of the existing financial market regulatory framework rather than issuing new, technology-specific laws. Integrating new technologies into the existing framework promotes stability and ensures that functionally equal phenomena are treated equally. The downside of this approach is that it requires continuous clarification by government authorities (notably FINMA) to determine which provisions of traditional financial market law apply to CASPs. As the traditional regulatory framework was designed without cryptocurrencies in mind, applying it to this new technology can be complex and therefore reduce legal certainty.

II Technology-specific Risks of Cryptocurrencies

Technology-specific risks may warrant the creation of technology-specific regulations. In recent years, the distinct risks of crypto assets in general – and cryptocurrencies in particular – have been the subject of widespread discussion. The value of cryptocurrencies depends entirely on belief (as illustrated in section B.I) and their creation is generally fast and simple.[81] Therefore, they

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79 cf. FINMA, ICO-Guidelines, p. 6 et seq.; cf. SPILLMANN/AKIKI/THOMA/PEREGRINA, PwC Crypto Report, p. 77.

80 in depth HESS, Geltungsbereich BankA, p. 572 et seq.; cf. MONNERAT, p. 29 et seq.

81 cf. KOFF, How to Create a Cryptocurrency, available at https://builtin.com/blockchain/how-to-create-a-cryptocurrency (last visited on 21 October 2025).

bear potential for exploitation, as the belief in their value comes down to the trust people have in their creator.[82] Some memecoins illustrate this. For example, the value of «$TRUMP»-coin surged hundreds of percent within hours of its launch.[83] The fact that value is largely dependent on belief has furthermore rendered the cryptocurrency market highly volatile,[84] posing significant risks for retail investors.[85] These risks differ from those found in traditional financial instruments, thus raising the question whether there is need for technology-specific regulations to mitigate them.

While both jurisdictions have recognized a need to address the risks associated with cryptocurrencies, neither has established regulations expressly targeting the above risks. In the EU, the new rules introduced for CASPs and CAIs are largely inspired by the existing financial market legislation (MiFID II, MiFIR, etc.) Thus, the EU has also relied on warnings to protect retail investors from the unique risks of the cryptocurrency space.[86] Switzerland has arguably done even less than the EU to mitigate the aforementioned risks. This liberal stance may ultimately not suffice to protect retail investors in the crypto space.

III Technology-specific Potential of DLT

The principle of technology neutrality can clash with the objective of promoting technological innovation. While the principle of equality before the law demands that functionally equivalent activities are treated equally, broader economic policy considerations may justify preferential treatment of certain technologies to encourage innovation in emerging technologies. This argument rests on the idea that incentivizing financial innovation can serve public interest, even if it departs from strict technology neutrality.

DLT has the potential to enhance the safety, efficiency and accessibility of securities markets. To harness this potential, both Switzerland and the EU have established regulations that incentivize innovation in this area. In the EU, tokenized assets generally qualify as financial instruments under Annex 1 Section C MiFID II and are therefore expressly excluded from MiCAR's scope of

82 Levine, p. 1 et seq.; cf. Girasa, p. 16.

83 The Economic Times, Donald Trump's $TRUMP coin dominates crypto scene with explosive .5 billion debut, available at https://economictimes.indiatimes.com/news/international/global-trends/trump-coin-dominates-crypto-scene-with-explosive-14-5-billion-debut/articleshow/117357561.cms (last visited on 17 October 2025).

84 cf. Girasa, p. 15.

85 cf. Molo/Brunone, p. 300; cf. Aiello et al., p. 1; cf. Friedrich et al., p. 102.

86 EBA, EU financial regulators warn consumers on the risks of crypto-assets, available at https://www.eba.europa.eu/publications-and-media/press-releases/eu-financial-regulators-warn-consumers-risks-crypto-assets?.com (last visited on 23 September 2025).

application. They remain subject to the existing financial markets framework. To encourage experimentation, the EU has adopted the DLT-PR which introduced regulatory sandboxes for market infrastructures experimenting with DLT. The regime establishes conditional regulatory exemptions from certain MiFID II and MiFIR provisions to test the use of DLT in trading and settlement. Similarly, Switzerland subjects tokenized assets (or «security tokens» by FINMA's classification) to the same regulatory framework as traditional securities. To encourage innovation, Swiss lawmakers introduced targeted, innovation-friendly amendments such as the creation of ledger-based securities (art. 973d et seq. CO) and the DLT trading facility (art. 73a et seq. FinMIA).

Early on, market participants both in the EU and Switzerland were hesitant to take up these new regulatory regimes. More recently, however, statistics show an upturn. On 18 March 2025 FINMA announced that it had granted its first license for a DLT trading facility (BX Digital AG).[87] On 25 June 2025 ESMA reported that, despite uptake being modest at first, the DLT-PR was seeing growing interest from potential applicants.[88] It remains too early to tell, whether DLT-based innovation will flourish in either jurisdiction. Given DLT's peer-to-peer nature and great fraud resilience (as discussed in section B.I), it is significant, however, that both the EU and Switzerland have encouraged innovation through technology-specific regulations.

87 FINMA, FINMA licenses first DLT trading facility, https://www.finma.ch/en/news/2025/03/20250318-mm-dlt-handelssystem/ (last visited on 14 October 2025).

88 ESMA, DLT-PR-Report, p. 7 et seq.

E Conclusion

Few financial inventions have challenged regulators as greatly as the emergence of crypto assets. The technology itself is highly complex, and, while many crypto assets possess far-reaching similarities to traditional legal concepts, they also differ from them in some crucial aspects. In an attempt to uphold the principle of technology neutrality, regulators around the world have sought to partially subject crypto assets to the existing financial market regulatory framework. This essay has illustrated that large parts of the traditional framework can indeed be extended to crypto assets. However, certain features such as decentralization, exploitability and the transformative potential of DLT make the application of a strictly technology neutral approach challenging. Designing an entirely new regulatory framework for crypto assets may be a way to avoid these regulatory challenges. However, resisting that impulse is crucial to ensure that functionally equivalent phenomena are treated equally. As crypto assets continue to evolve and new regulations are needed, the central question will remain: same same but blockchain?

Next Generation

This thesis examines the complex interpretation of the principle of technology neutrality with regards to crypto assets. It investigates the extent to which the existing legal framework can be applied to crypto assets under this principle. To assess whether crypto assets are functionally distinct from established legal concepts, special focus is placed on understanding the underlying technology. Finally, recent regulatory developments in the European Union and Switzerland are analyzed and evaluated.

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