

Managing risk and novelty in nascent markets: an overview of the regulation of digital assets, smart contracting, tokenisation and legaltech in Brazil

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Abstract: Blockchain technology has become a transformative force in the global digital economy, redefining transactional architecture through decentralisation, immutability and transparency. In Brazil, this innovation has progressed beyond niche adoption to influence institutional frameworks, regulatory strategies and contractual practices. Central to this evolution are tokenisation and smart contracts, which introduce new possibilities for fractional ownership, liquidity and automated performance. Brazil's regulatory approach is technology-neutral and functional, ensuring that the legal nature of an underlying asset determines applicable rules. Tokens representing securities fall under the Securities and Exchange Commission's oversight, while non-security virtual assets are governed by Law No. 14,478/2022 and forthcoming Central Bank resolutions, which impose stringent operational as well as anti-money laundering and combatting the financing of terrorism (AML/CFT) requirements on virtual asset service providers. The Central Bank of Brazil's Drex project, a tokenised version of the Brazilian Real, exemplifies this commitment to modernising financial infrastructure. Smart contracts, recognised under the *Civil Code's*

principle of freedom of form, promise efficiency and certainty but raise complex questions regarding their enforceability and the need for judicial intervention. Tokenisation of real-world assets such as real estate and commodities remains subject to substantive private law and official registration systems. This article highlights how Brazil reconciles cutting-edge automation with established legal doctrines, positioning itself as a leader in the global digital asset ecosystem.

Keywords: *automation, digital assets, DLT, regulatory governance, smart contracts, tokenisation*

1. Introduction: blockchain, tokenisation and smart contracts in Brazil

Blockchain technology has emerged as a transformative force in the global digital economy, redefining the architecture of transactions through decentralisation, immutability and transparency. Its foundational attributes, including distributed consensus, cryptographic security and resistance to tampering, have created a trusted environment for advanced financial and legal applications. In Brazil, this innovation has moved beyond niche adoption to influence institutional frameworks, regulatory strategies and contractual practices, positioning the country as a key player in the evolution of digital assets.

Central to this transformation are two pivotal developments: tokenisation and smart contracts (SCs). Tokenisation, the process of converting rights in an asset into a digital representation recorded on distributed ledger technology (DLT), introduces unprecedented opportunities for fractional ownership, enhanced liquidity and secure, auditable transfers. In Brazil, these mechanisms are being integrated into financial market infrastructure under the supervision of the Securities and Exchange Commission (CVM) and the Central Bank of Brazil (BCB). Regulatory initiatives such as the CVM's guidance on asset-backed tokens and the BCB's flagship project Drex, a tokenised version of the Brazilian real, illustrate the country's commitment to modernising its financial ecosystem while maintaining robust oversight.

Parallel to this, SCs, which are self-executing agreements encoded in computer code (Szabo, 1996), promise efficiency and certainty in contractual

performance by automating obligations without intermediaries. While Brazilian law lacks a dedicated statute for smart contracts, their recognition under the *Civil Code's* (CC) principle of 'freedom of form' enables their integration into existing legal frameworks. This alignment, however, raises complex questions regarding enforceability and judicial intervention.

By examining these developments, this article explores how Brazil is reconciling cutting-edge automation with established doctrines of private law and financial regulation. In doing so, it highlights the country's role at the forefront of legal and technological innovation in the era of crypto-assets.

2. Legal and regulatory treatment of crypto-assets and tokenisation in Brazil

Brazil's legal and regulatory treatment of crypto-assets rests on a technology-neutral premise: digital representations may be subject to distinct regimes depending on their economic function, legal structure, and distribution mechanics. There is a bifurcated approach anchored in statutory definitions and functional oversight: for crypto-assets that are not securities, Law No. 14,478/2022 governs market conduct and the licensing of virtual asset service providers (VASPs), with the Brazilian Central Bank as the regulatory authority; for assets or tokens that are deemed securities under the Brazilian capital markets law (Law No. 6,385/1976), the Brazilian Securities Commission regulations apply (Law No. 14,478/2022; Law No. 6,385/1976).

In keeping with this understanding, Brazil has not enacted a single, comprehensive statute for tokenisation; rather, it channels tokenised instruments through existing sectoral rules. Tokenisation is generally treated as an added technological layer that does not alter the legal nature of the underlying asset: a tokenised share remains a security; a tokenised receivable remains a credit right and legal and regulatory consequences apply accordingly. The CVM has clarified the regulatory perimeter for 'tokens' by focusing on substance over form. A token will be treated as a security if it: (i) legally represents any instrument enumerated in the securities statute; (ii) falls within securitisation instruments governed by specific legislation or (iii) qualifies as a collective investment contract within the open-ended definition of a security, assessed through a multifactor analysis adapted from comparative law. The CVM has underscored that if tokens are publicly offered as securities, all ordinary market infrastructures—intermediation,

bookkeeping, central deposit, registration, clearing and settlement—remain applicable, irrespective of the use of DLT (Law No. 6,385/1976).

The BCB has been designated the competent authority to regulate the virtual asset (VA) market and has moved from consultations to issuing binding rules, which entered into force on 2 February 2026. The rules are set out in Resolutions BCB 519, 520, and 521: Resolution BCB 519 regulates licensing (authorisation) procedures with the BCB, applicable to both VASPs and other BCB-regulated entities that will be allowed to provide virtual asset services. Resolution BCB 520 addresses the constitution and licensing of VASPs and the provision of virtual asset services by such other institutions. Resolution BCB 521 governs the interface with foreign exchange and cross-border regulations (BCB, 2025a; 2025b; 2025c).

These acts adopt definitions relevant to VASP operations, including specific treatment for fiat-referenced virtual assets and key custodial concepts, while deliberately omitting a statutory definition of tokenisation in the operative text to avoid prejudging the private-law characterisations of underlying instruments (BCB, 2025b). The functional taxonomy that matters in practice remains aligned with market distinctions among payment tokens, utility tokens and asset-backed tokens, while recognising hybrids and maintaining the primacy of the underlying legal regime.

Brazil has moved from a period of market-led experimentation to a structured two-pillar framework. Non-security crypto-assets and their service providers are governed by Law No. 14,478/2022 and the BCB regulations that entered into force on 2 February 2026. Security-like tokens fall within the CVM's remit, guided by technology-neutral principles articulated in 2022 and supplemented by circular guidance addressing tokenised receivables and public offerings (Law No. 14,478/2022; Law No. 6,385/1976).

2.1 Legal status of crypto-assets

Law No. 14,478/2022 is the foundational statute of virtual assets (VAs) in Brazil, which regulates VASPs and, crucially, defines 'virtual assets'. Accordingly, a VA is a digital representation of value that can be traded or transferred electronically and used for payments or investment. The concept expressly excludes: (i) legal tender (domestic or foreign currency); (ii) electronic currency (*moeda eletrônica*) as regulated under Brazil's payments law (Law No. 12,865/2013); (iii) instruments granting access to specific products or services or associated benefits (e.g., loyalty points)

and (iv) representations of assets whose issuance, bookkeeping, trading or settlement are governed by other specific laws or regulations, such as financial assets and securities (Law No. 14,478/2022). As mentioned, VAs that qualify as securities are outside the scope of Law No. 14,478/2022 and fall under the jurisdiction of the CVM (Law No. 14,478/2022).

Specifically on the regulations that entered into force in 2026, Resolution BCB 520 establishes three licensing categories for *sociedades prestadoras de serviços de ativos virtuais* (the local name for VASPs): intermediaries, custodians and brokers (combining intermediation and custody). The scope of permitted activities includes underwriting issuances of VAs, buying, selling and exchanging VAs, administering portfolios composed of VAs and other financial instruments subject to applicable rules, acting as trustees, providing staking services and offering advisory and structuring services connected with distributed-ledger environments where permitted. Custodians are dedicated to the safekeeping and control of the instruments that enable the exercise of rights over VAs, with detailed contractual and operational stipulations, while brokers combine both intermediation and custody and, therefore, must comply with additional risk mitigants for the integrated activity set (BCB, 2025b; 2025e).

Resolution BCB 519 consolidates authorisation processes and applies them to VASPs alongside traditional intermediaries (e.g., banks, broker-dealers, etc.), requiring, among other elements, governance compatible with business complexity, suitable IT infrastructure, the capacity and reputation of controlling shareholders and members of management and an exclusive-use head office address with no reliance on co-working or virtual offices as the registered seat (BCB, 2025a; 2025d). It also structures the transitional process for entities active by the entry-into-force date: those in legitimate operation on 2 February 2026 must request authorisation between 2 February and 29 October 2026 and may continue to operate while their applications are processed; newcomers require prior authorisation (BCB, 2025a; 2025d).

Regarding foreign entities, those already serving Brazilian clients must migrate their operations and users within 270 days from 2 February 2026 to a locally authorised VASP or to an eligible institution and then discontinue direct operations, subject to continuity and data-protection safeguards. Banks, broker-dealers and other BCB-authorised institutions intending to begin VA activities after the entry-into-force date must file prior communication meeting technical certification requirements, and institutions already active must file a formal communication with independent certification within the same transitional window (BCB, 2025b; 2025e).

The prudential and conduct architecture is detailed in Resolution BCB 520. VASPs must segregate client VAs and financial funds from proprietary assets through operational and bookkeeping mechanisms, adopt proof of reserves and related controls, undergo periodic independent audits with reasonable assurance on both proprietary and client positions, and maintain robust cyber resilience, internal controls and risk management for market, credit (where applicable), operational and liquidity risks. The rule explicitly prohibits mechanisms that obstruct supervisory action or law enforcement or that unduly conceal transactional provenance, such as mixers, tumblers or obfuscation bots, and it bars facilitating operations with unlicensed VA entities that are not authorised to operate in Brazil. It also sets guardrails on balance sheet leverage and client credit, limiting funding and lending relationships with regulated financial institutions to business-necessary purposes and prohibiting the extension of credit to clients and users. To support orderly markets and client protection, intermediaries must maintain transparent listing, suspension and delisting policies, implemented through technical committees and published to clients, and they must provide clear *ex ante* disclosures for request-for-quote modalities, including pricing, sizes, time windows, settlement terms and counterparty and settlement risk (BCB, 2025b; 2025e).

AML and CFT requirements are both general and specific. VASPs must implement KYC and counterparty diligence, partner and outsourced-provider risk assessments and monitoring consistent with the BCB's AML/CFT framework (BCB, 2025b; 2025e). Additionally, the regime operationalises a travel-rule-type obligation, requiring originator and beneficiary information to accompany transfers of VAs, including account identifiers and wallet addresses. The framework staggers implementation in two steps: first, a domestic inter-VASP information-transfer capability within 365 days from entry into force; second, an international information-transfer capability within a further 365 days, with full compliance across authorised VASPs required by 2 February 2028 (BCB, 2025b). This timeline reflects the technical demands of interoperability and the policy aim of aligning with evolving international standards (BCB, 2025e).

On outsourcing and foreign custody, VASPs may contract relevant services such as technology, liquidity provision, market making, issuance of electronic currency (*moeda eletrônica*) and payment or deposit accounts, subject to extensive diligence, transparency and Banking-as-a-Service rules for relationships with other licensed institutions. When contracting a foreign VA custodian, the VASP must ensure that the custodian is authorised and

supervised in its home jurisdiction, that the legal and regulatory regime is compatible with Brazilian standards, that there is a local representative and either local attachable assets or promptly enforceable financial guarantees, and that the contract gives the VASP and the BCB access to all data and records necessary for oversight (BCB, 2025b; 2025e). Custody contracts must specify methods of storage, wallet types, client communications and authentication, service fees, applicable law, internal controls and independent audits, staking roles and responsibilities, transfer-of-custody procedures, order timelines and risk disclosures, including explicit client decisions, where multiple custody architectures are offered (BCB, 2025b).

Foreign exchange and cross-border capital activities have been integrated under Resolution BCB 521, which includes in the foreign exchange market several VASP activities: international payments or transfers with VAs; transfers of VAs to or from a client to satisfy obligations arising from international cards or other electronic means of payment; transfers to or from self-custodied wallets that do not themselves constitute an international payment and the purchase, sale or exchange of fiat-referenced VAs. For these activities, VASPs must obtain or rely on appropriate foreign exchange authorisations, must not buy or sell VAs with payment or receipt in foreign currency and must observe limits and conditions that differ by institutional type and counterparty. Institutions already authorised to operate in foreign exchange apply their existing client limits to virtual-asset-mediated international payments and transfers, while VASPs that are not foreign-exchange institutions face a US\$ 100,000 cap per transaction when the counterparty is not a foreign-exchange-authorised institution (BCB, 2025c; 2025f). Monthly reporting of foreign-exchange-related VASP activity to the BCB begins in May 2026, and cross-border credit in fiat-referenced VAs and foreign direct investment contributed to VAs is expressly brought within capital reporting disciplines (BCB, 2025c; 2025f).

As mentioned previously, the CVM has articulated that token issuance and distribution do not displace the ordinary public offering rules or market infrastructures. In that sense, the regulator has moved to update the crowdfunding regime to accommodate tokenised fixed-income offerings, with an expressly technology-neutral stance.

From a private-law perspective, token transfers do not supersede the formalities required to transfer title to underlying assets. For credit instruments, endorsement requirements for ‘to order’ instruments and civil assignment for other receivables remain critical. Failure to respect off-chain

formalities may impair the chain of title, enforceability and endorser co-obligations. Transaction documentation should expressly link on-chain transfers to the corresponding legal assignments or endorsements and provide for prompt reconciliation between on-chain and off-chain records.

Moreover, Brazil's tax authority has imposed monthly reporting obligations on domestic exchanges and, above certain thresholds, on individuals and legal entities transacting outside domestic platforms. The authority consulted on a new reporting framework aligned with international standards, expanding the scope of information to asset-backed crypto-assets, decentralised finance (DeFi) and fractionalised non-fungible tokens (NFTs), and recently issued a new rule regulating such reporting (Normative Ruling No. 2,291/2025).

3. CBDCs, stablecoins and government-issued tokens impacting the broader crypto ecosystem

The BCB has a dual role as prudential and conduct regulator for non-security VA services, and this has been reinforced in the recently enacted framework. The final BCB regulations expressly define a 'fiat-referenced VA (stablecoin)' as a VA backed by reserve assets and created to maintain its value linked to a reference fiat currency (Resolution BCB 520, Article 2, II; BCB, 2025b), with reserve assets limited to the reference fiat currency itself and government securities issued by the same sovereign.

In addition, VASPs operating in Brazil are barred from offering or listing fiat-referenced VAs whose reserve-control mechanisms are performed by algorithms. By imposing pre-listing eligibility assessments and continuous disclosures on VASPs, the framework indirectly disciplines stablecoin issuers whose tokens seek distribution through regulated platforms serving Brazilian clients. The ability of the BCB to mandate suspensions of admissions to trading, where use is inconsistent with regulation, complements this ex-ante vetting with an ex-post supervisory tool.

While CBDC remains outside the four corners of the VASP rules, the architecture of segregation, operational resilience, outsourcing transparency and inter-VASP information transfer is consistent with a broader policy trajectory favouring interoperability and auditability across tokenised liabilities and legacy rails. The clarification of stablecoin status within the VA perimeter—and not as legal tender or electronic currency

(*moeda eletrônica*)—has a stabilising effect for business models built on fiat-referenced tokens by reducing legal uncertainty while insisting on disciplined risk management at the VASP layer. Cross-border use cases that had been piloted or contemplated during the consultation period are normalised within the foreign exchange market through specific activity definitions, prohibitions on settlement in foreign currency and granular reporting obligations, which together should improve observability and reduce compliance frictions.

In the securities markets, government engagement has indirectly supported tokenised fixed-income and receivables initiatives by emphasising technology neutrality and by maintaining that public offers of securities must pass through the established infrastructures regardless of ledger technology. The boundary between stablecoins, tokenised deposits and securities-like tokens remains functional: when a token embodies rights that are securities or securitisation instruments or otherwise meets the open-ended collective investment contract concept, the CVM's supervisory perimeter applies with its investor-protection apparatus. The net impact is to encourage on-chain product development under clear perimeters, subject to heightened governance, anti-money laundering and know-your-customer (AML/KYC) and reconciliation discipline.

4. Tokenisation of RWAs

Building on the concept of NFTs, the broader trend of tokenisation has extended beyond digital art and collectibles to encompass real-world assets (RWAs). In the crypto market, RWA tokenisation refers to the process of bringing tangible and intangible assets that exist in the physical world onto the blockchain (ABToken, 2025). Tokenised RWAs therefore cover the conversion of tangible or intangible assets, such as real estate, debt securities, private credit, commodities, equity stakes, works of art and intellectual property, into tradable digital assets. This transformation introduces new opportunities for fractional ownership, liquidity and global accessibility and reflects the growing issuance of on-chain capital market products, where digital securities are tokenised and offered to retail clients.

Real-world assets highlight the breadth of this trend, including government bonds, treasury bills, corporate bonds, equities, precious metals like gold and silver, luxury goods such as watches and jewellery and carbon credits.

Tokenisation of these assets enables fractional ownership and faster transactions, lowering entry barriers and improving liquidity compared to traditional markets.

Real estate tokenisation is one of the most prominent applications of RWA tokenisation. In Brazil, special purpose entities (SPEs) or silent partnerships (SCPs) can be tokenised to incorporate real estate developments. However, legal certainty remains a challenge, particularly regarding token classification and the adaptation of notarial and property registry systems (Rocha and Rocha, 2025).

Similarly, the agricultural sector has embraced tokenisation to finance production and provide guarantees. Assets such as grains (soybeans, maize, wheat) are tokenised, with each token representing a guaranteed stored quantity. These tokens can be exchanged for inputs, sold or used as collateral for financing, facilitating access to credit at competitive rates and promoting financial inclusion (ABToken, 2025). The Agrotoken project (Argentina–Brazil) exemplifies this model by tokenising grains and partnering with major players to enable exchanges and collateral use. Examples include livestock tokens representing cattle or other livestock, coffee and sugar tokens for trade and financing, and agricultural carbon credits linked to sustainable farming practices and carbon offset initiatives.

Tokenisation also reshapes the management of intellectual property rights. NFTs have introduced new ways to authenticate and trade digital works; however, their legal implications remain complex. Under Brazilian *Copyright Law* (Law No. 9,610/1998, Article 49, II), the full and definitive transfer of copyright belongs exclusively to the rights holder and must be formalised through a written contract. Purchasing an NFT does not automatically confer copyright; rather, it provides a certificate of authenticity confirming ownership of the token via an SC on the blockchain. Importantly, the NFT and the underlying work are distinct entities governed by separate legal frameworks. While SCs are recognised under Brazilian law and produce legal effects if statutory requirements are met, any assignment or licensing of copyright—such as through Creative Commons—must be expressly stated. Similarly, the resale right under Article 38 applies to the resale of works, not tokens. Although NFT creators often receive royalties upon resale, this practice is contractual rather than statutory, leaving its compatibility with Brazilian copyright law open to debate. These nuances highlight the evolving intersection of technology and law, reinforcing the broader significance of tokenisation across diverse asset classes.

Considering these, it must be highlighted that Brazilian private law treats tokenisation as a representational layer that does not alter the legal nature of the underlying right or asset. Accordingly, the enforceability of ownership and transfers—and the availability of remedies—continue to turn on the substantive law governing the underlying. This has three practical consequences.

First, formalities matter. If a token represents a credit instrument subject to endorsement, the endorsement must satisfy statutory form requirements, which traditionally require written declaration on the instrument itself; for credits not ‘to order’, civil assignment via a bilateral instrument remains the operative mechanism. Token transfers should be contractually drafted to trigger, contemporaneously and automatically, the corresponding off-chain legal transfer, with procedures to reconcile on-chain and off-chain positions and to suspend token transfers upon discrepancies. For assets governed by registration systems (e.g., certain securities or receivables recorded with authorised registrars; real estate in property registries), the official registration or deposit remains the authoritative anchor of title and enforceability. DLT records do not substitute for mandatory registration acts.

Second, the documentation and custodial architecture must be adapted. Transaction suites should acknowledge the digital representation, specify chain-of-title mechanics and hardwire reconciliation between the registrar/custodian records and on-chain positions, including controls for liens, encumbrances and events affecting the asset. Where tokens are publicly distributed as securities, the full securities market infrastructure applies in addition to private law formalities. For investment funds that acquire tokenised credit rights, governance documents should define eligibility, verification of backing, independence among the manager, registrar and custodian, and detailed operational manuals for reconciliation and incident handling. Engagements with tokenisation service providers should address key management, SC change governance, interoperability with registries, auditability of backing and business continuity.

Third, remedies remain grounded in the underlying regime. For credit rights, the holder’s enforcement against the debtor depends on proper assignment/endorsement and evidentiary documentation, not merely possession of a token. Disputes over chain of title will be resolved by reference to registral/custodial records and validity of transfer instruments. Where a token functions as a security, investor remedies follow securities law, including

disclosure-based claims and the supervision of market infrastructures. Consumer and civil liability frameworks apply to service providers outside the securities perimeter, while AML/CFT obligations and record-keeping duties frame supervisory remedies.

These structural features generate several operational challenges. Ensuring continuous equivalence between on-chain and off-chain records is non-trivial and requires rigour in sampling, reconciliation and incident reporting. The strict formalism of endorsement makes it difficult to natively harmonise certain negotiable instruments with token transfers without bespoke legal engineering. Custody and segregation of client assets introduce dependencies on third-party infrastructures and cross-jurisdictional considerations when foreign custodians are involved. Finally, risk disclosures must address technological vectors such as protocol changes, forks, cyber incidents and token burns, while maintaining clarity that token lifecycle events do not displace the settlement or delivery obligations under the underlying asset's legal framework.

In sum, Brazil's private-law approach is pragmatic and layered. Tokenisation unlocks fractionalisation and operational efficiencies, but ownership, transfer and remedies continue to be determined by the substantive law of the underlying asset, the applicable registration or custody regime, and—where relevant—the securities law overlay for public offers. Robust documentation, formal compliance with transfer rules and disciplined reconciliation are indispensable to preserve enforceability and investor protection across tokenised RWA structures.

5. Legal precedents involving crypto-assets

Brazilian case-law concerning crypto-assets has evolved across several dimensions, including criminal jurisdiction, banking relations, civil liability and the institutional recognition of blockchain technology. The Superior Court of Justice (STJ) has played a pivotal role in defining jurisdictional boundaries for crimes involving cryptocurrencies. In STJ Ruling 673 (STJ, 2020b), the Court held that pyramid schemes based on crypto-assets fall under State jurisdiction. The Court reasoned that, without evidence of foreign-exchange evasion or money laundering harmful to federal interests, the conduct amounted to a crime against the popular economy, which is traditionally adjudicated by state courts. By contrast, in STJ Ruling 667,

the STJ (2020a) held that the unauthorised public offering of collective investment contracts involving cryptocurrencies is equivalent to trading securities without registration, which constitutes an offence against the National Financial System and therefore falls within federal jurisdiction. These decisions illustrate the Court's approach to classifying crypto-related offenses within existing legal frameworks rather than creating *sui generis* categories.

At the constitutional level, the Federal Supreme Court (STF) has acknowledged the technological relevance of blockchain. ADPF 681 (STF, 2021) highlighted the security features of blockchain in the context of public safety, noting its potential for tracking weapons and ammunition through immutable records and QR codes. Although the use of blockchain as judicial evidence remains under discussion, this recognition signals institutional openness to leveraging distributed ledger technology for official registries (Souza Junior and Souza, 2024).

In the commercial sphere, the STJ has addressed the tension between traditional financial institutions and crypto exchanges. In STJ Ruling 636 (STJ, 2018), the Court upheld the legality of terminating current accounts used for cryptocurrency trading, provided prior notice is given. The decision rejected claims of abusive commercial practices, affirming that banks retain discretion to manage operational risks associated with crypto transactions.

Recent case-law has also focused on enforcement and consumer protection in the digital environment. In REsp 2.067.133/SP, the STJ (2025) explicitly recognised the possibility of seizing crypto-assets, consolidating the view that such assets possess economic value, form part of the debtor's estate and are suitable for satisfying judicial obligations, provided they can be identified and located.

This has been followed by state courts. For example, the Court of Appeal of São Paulo (2021; 2022; 2023a; 2023b; 2024a; 2024b) has consistently established that VA custodians, such as cryptocurrency exchanges, must be formally notified when a judicial order seeks to seize cryptocurrencies. This requirement arises because the Central Bank's *Sisbajud* system—the electronic platform used by courts to search, block and seize financial assets—does not encompass VAs. *Sisbajud* is designed to interact with regulated financial institutions and fintechs, enabling the freezing of bank accounts and other monetary resources denominated in Brazilian reais. However, cryptocurrencies fall outside its scope due to their legal classification: they

are considered *digital assets*, which are digital representations of value that can be traded or transferred electronically and used for payments or investment purposes. They are fundamentally different from *electronic money*, which refers to funds in Brazilian reais stored in electronic systems, such as prepaid cards or mobile payment platforms, and are regulated under Law No. 12.865/2013. Electronic money is linked to the official currency and supervised by the Central Bank, whereas VAs are neither issued, guaranteed nor regulated by any governmental authority. Given this distinction, the court recognised that the *Sisbajud* system cannot retrieve information or enforce measures against cryptocurrencies. Consequently, the issuance of an official notice to entities managing VAs is necessary to ensure compliance with judicial orders for asset seizure.

Regarding liability, in REsp 2.104.122/MG, the Fourth Panel of the STJ (2025) imposed strict liability on cryptocurrency trading platforms for fraudulent transactions, applying the risk theory in line with STJ Precedent 479. The Court held that exchanges are responsible for undue transfers of bitcoins executed through the user's credentials and two-factor authentication unless they can prove exclusive fault of the consumer or a third party. By contrast, in REsp 1.885.201/SP, the STJ (2021) dismissed claims against an email service provider for damages resulting from hacking, finding no causal link between email invasion and access to private keys, thereby limiting liability in cases where the technological breach does not directly enable asset misappropriation.

There have also been relevant decisions on the state tribunals. Regarding fraudulent conduct by breach of contract, the Court of Appeal of Paraíba (2024) has declared a contract for the purchase of cryptocurrency null and void through trading in what was identified as a pyramid scheme. The decision noted that the promised returns were never paid, and the company retained the invested amounts. The court ordered restitution of the sums invested but denied claims for moral damages, emphasising that mere frustration of profit expectation does not constitute extra-contractual harm (Court of Appeal of Paraíba, 2024). The Court of Appeal of São Paulo also upheld a decision in a case involving a contract for the purchase and sale of cryptocurrency (bitcoins). The plaintiff sought rescission of the contract and recovery of funds after being unable to withdraw bitcoins from their wallet. The court recognised a consumer relationship and joint liability among companies in the same economic group, citing failure in service provision, and ordered payment of the amounts owed but denied the appeal, maintaining the original decision.

There has also been litigation regarding the liability of different parties within the cryptocurrency supply chain. The Court of Appeal of São Paulo recently decided two notable cases. In the first, it overturned a judgment against the Trust Wallet platform, finding no defect in the provision of services where the wallet was non-custodial and decentralised, leaving full control of operations to the user. The court concluded that the alleged fraud occurred externally and that the claimant failed to prove any causal link between the platform and the loss, thereby excluding liability (Court of Appeal of São Paulo, 2025b). On the other hand, in another case, the Court of Appeal of São Paulo addressed a dispute involving the virtual game Mafagafo, which allowed users to purchase NFTs and in-game tokens convertible into other assets. The claimant alleged that the game's operators launched a public offer to repurchase rare NFTs but failed to honour this promise. The defendants included the entity behind the game (registered in the British Virgin Islands but operating in Brazil) and its partners: a well-known investment firm, a technology company and two individuals who publicly promoted and endorsed the project. Evidence showed that these parties actively participated in marketing, investment and public announcements to attract users, thereby creating legitimate expectations of compliance with the repurchase offer. Applying consumer protection principles under the Brazilian *Consumer Defence Code*, the court imposed joint and several liability on all defendants for the breach, ordering them to fulfil the repurchase obligation. However, it rejected claims for moral damages, finding no proof of extra-contractual harm (Court of Appeal of São Paulo, 2025a).

6. Legal and regulatory approach to SCs and automated contracting

In Brazil, SCs are understood not as substitutes for traditional agreements but as complementary tools that automate specific clauses to reduce bureaucracy, enhance efficiency and mitigate fraud. Although not expressly regulated, they may satisfy the Brazilian *Civil Code*'s (Law No. 10,406/2002) validity requirements provided they are correctly coded by qualified professionals (Rodrigues, 2025).

Brazilian contract law defines a contract as a legal act resulting from the agreement of wills aimed at creating, modifying, transferring or

extinguishing rights. This conceptualisation emphasises the primacy of consent as the constitutive element of contractual obligations. Within this normative structure, the CC enshrines the principle of freedom of form, under which the validity of a contract does not depend on a specific formal instrument unless expressly required by law. Article 107 of the CC makes it clear that a written document serves primarily as evidentiary support rather than as a constitutive requirement.

The automation of performance does not displace the normative structure of contract law. SCs must comply with the essential elements of a contract, irrespective of their digital or cryptographic form. Within this context, two principal configurations emerge. The first is the hybrid SC, which combines natural-language agreements with automated execution mechanisms. In this model, the underlying contract remains the primary source of obligations, while the code functions as an instrument of performance for specific clauses. The second configuration is the pure SC, in which the code itself constitutes the contractual instrument. This modality is permissible under the principle of freedom of form, provided that the object does not require a legally prescribed format, such as real estate transactions or other formal acts.

This classification underscores that SCs are not a distinct legal category but rather a technological modality of contractual expression. Their validity derives from compliance with the general principles of contract law, not from their computational nature. The legal system thus retains its conceptual integrity while accommodating technological innovation.

Within this context, automation in contractual performance is not a novel phenomenon. Mechanisms such as direct debit and standing payment orders have long facilitated the execution of obligations without continuous human intervention. However, these traditional systems exhibit structural limitations: they depend on trusted intermediaries, such as financial institutions, and remain susceptible to unilateral cancellation or operational errors.

This principle of formal freedom is particularly significant for technological innovations such as SCs, as it permits contractual arrangements to be expressed through unconventional formats, including executable code. Consequently, the Brazilian legal system does not impose an inherent barrier to the adoption of SCs, provided that the essential elements of a legal act—capacity, lawful object and consent—are preserved. This flexibility operates

as the regulatory gateway for integrating automated contracting into the existing legal order, allowing the legal system to accommodate technological determinism without abandoning foundational principles.

6.1 Evidence of consent

The CC regulates contractual formation through the principle that consensus arises upon acceptance of an offer, as provided in Article 428. In blockchain environments, this normative structure is adapted to the technological context. The deployment of SC code on a DLT is analogous to a public offer under Article 429, as it manifests the proposer's intent to be bound under specified conditions. Acceptance occurs when the counterparty activates the SC functions via a transaction, thereby triggering the programmed obligations.

The evidentiary dimension of SCs is supported by existing frameworks for electronic documents, notably Provisional Measure No. 2.200-2/2001, which recognises the legal validity of digital signatures and electronic records, as discussed below. Nevertheless, best practice dictates the inclusion of complementary documentation in natural language to facilitate interpretation, dispute resolution and evidentiary robustness. This dual approach—code as an operative instrument and text as interpretative safeguard—reflects the need for legal certainty in an environment characterised by technical complexity.

Moreover, a significant challenge lies in reconciling legal language with the binary logic of code. Engelmann, Cantali and Simões (2023), for example, advocate for 'terms of use' and user interfaces that align party intent with automated execution. Automation must not undermine principles such as objective good faith and the social function of contracts, demanding transparency and accountability in programming obligations.

6.2 Enforceability

SCs introduce a paradigmatic transformation by eliminating intermediaries and implementing deterministic, self-executing logic based on conditional programming: 'if X, then Y'. This architecture promises enhanced certainty, reduced transaction costs and mitigation of opportunistic behaviour. Yet this technological determinism generates normative tension: the problem of self-regulation or private self-help. The first concern relates to illicit objects: how should the legal system respond when obligations executed automatically

involve unlawful objects? The absence of ex-ante judicial control amplifies the risk of irreparable harm.

The second concern relates to judicial remedies. Given the impossibility of preventive intervention once execution is triggered, judicial protection tends to be restitutory or compensatory rather than specific. The principle of *solve et repeat* often applies, requiring execution prior to judicial review. Importantly, self-enforcement affects only performance, not validity, which remains subject to jurisdictional control.

Future regulatory strategies should prioritise mechanisms—such as kill switches—to attenuate execution irreversibility and enable preventive judicial intervention without undermining efficiency. Additional risks include technical vulnerabilities, such as bugs and exploits, and the Oracle Problem, whereby reliance on external data sources introduces systemic fragility and potential inaccuracies affecting contractual performance. These challenges underscore the need for a risk-based regulatory approach that balances technological innovation with constitutional guarantees, ensuring that efficiency does not eclipse legality.

6.3 Legislative developments: Bill of Law (*Projeto de Lei*) No. 4 of September 2025

In August 2023, the Brazilian Senate established a Commission of Legal Scholars tasked with drafting a comprehensive proposal to update the CC (Bill of Law No. 4 of September 2025) under the presidency of Justice Luis Felipe Salomão (Superior Court of Justice). Amongst other efforts, the new text aims to modernise civil law to meet the demands of a digital society.

Within this broader reform, Chapter VIII, ‘On the formation of contracts by digital means’ introduces a groundbreaking provision on SCs. The draft defines SCs as agreements in which some or all contractual obligations are defined or executed automatically by computer programs using sequences of electronic data records that guarantee integrity and chronological accuracy. This conceptualisation aligns with the Ricardian contract methodology, which treats code as a mechanism for translating natural-language agreements into executable logic.

The detailed requirements for providers or intermediaries implementing SCs include: (i) robustness and access control to prevent functional errors and manipulation; (ii) safe termination and interruption (a ‘kill switch’) to

stop execution and avoid accidental future transactions; (iii) auditability and data archiving to preserve transactional records, logic and code; (iv) governance-level access control for strict security and (v) consistency with the terms of the underlying agreement.

The chapter also recognises the validity and enforceability of contracts concluded through digital applications, provided they meet the CC's legal requirements. A digital application is defined as any platform, software or electronic system enabling the conclusion, management and execution of contracts involving non-fungible or immaterial assets.

This legislative initiative reflects an emerging consensus that SCs cannot be governed solely by traditional contract law principles. Instead, they require specific safeguards to reconcile technological determinism with fundamental principles of private law and constitutional guarantees, including informed consent and liability for technical failures. The proposal is now formally in the legislative process under bicameral review and currently in the stage of submission of amendments, pursuant to Article 374, III of the Senate Internal Rules (RISF).

6.4 Legal precedents involving SCs

Brazilian case-law involving SCs is still nascent. There have been only two precedents rendered by higher courts, which have a greater binding force—although not equivalent to law—as detailed below. Lower courts have also begun to address disputes involving automated contractual execution.

In 2024, the Court of Appeal of Minas Gerais (2024) dismissed an appeal filed by Banco Mercantil do Brasil S/A in a consumer claim, ruling that a screenshot of an alleged electronic loan agreement was not sufficient evidence to establish the existence and validity of the contract. The judgment stressed that although technology enables diverse forms of contracting, including SCs, this does not eliminate the need to verify the essential elements of legal transactions (existence, validity and effectiveness). The Court recognised the legal validity of electronic and SCs in principle, but held that, in this case, the screenshot lacked transparency and failed to demonstrate secure identification of the contracting party.

More recently, the Court of Appeal of Pernambuco (2025) also addressed issues related to electronic transactions and SCs. The case involved an unauthorised withdrawal of monies from a consumer's account. The Court

rejected the bank's argument that the transaction was regular because it was executed with the original card and PIN, applying consumer protection principles and the inversion of the burden of proof. Significantly, the judgment acknowledged that electronic transactions fall within the realm of SCs and highlighted their defining features (traceability and transparency), citing the ability to audit executions recorded on DLT. The Court stressed that these characteristics should reduce disputes, but in the absence of clear evidence of consent, the consumer cannot be left vulnerable to opaque systems.

Even more recently, on 25 November 2025, the Court of Appeal of Paraíba (2025) took a different approach to the one showcased above in a case involving the loss of BRL 121,215 in crypto-assets from a non-custodial wallet linked to the Binance ecosystem. While recognising Binance's legitimacy as part of the consumer supply chain, the Court concluded that the platform was not liable because the wallet was non-custodial, meaning the user retained exclusive control of private keys. The judgment found that the loss resulted from a fraudulent SC approved by the consumer following a social engineering scam, characterising the event as *fortuito externo* ('external fortuity', similar to *force majeure*) under the *Consumer Defence Code*. This broke the causal link and excluded liability, reinforcing that responsibility in decentralised environments depends on the degree of control exercised by the service provider.

Finally, lower court decisions have also recently addressed SCs, indirectly or directly acknowledging their validity and enforceability. As an illustration, the São Paulo Small Claims Court recently judged a case involving the unauthorised transfer of crypto-assets from a consumer's digital wallet (Special Civil Court of São Paulo, 2025). While the defendant argued that the consumer had interacted with SCs and that these automated mechanisms triggered the disputed transactions, the Court clarified that such interaction does not exempt service providers from liability. Although the judgment did not expressly discuss the legal nature of SCs, it indirectly recognised their existence by considering the defendant's argument that automated SC interactions triggered the disputed transactions. The Court held that such mechanisms do not exempt service providers from liability or from proving authorisation and held the exchange responsible for failing to prevent fraud and ordered restitution (Special Civil Court of São Paulo, 2025).

These precedents confirm that Brazilian courts are slowly adapting to and applying existing norms to new digital realities. Tribunals seem to be

converging on two key principles: technological innovation does not eliminate traditional legal requirements such as consent, transparency and security, and liability in decentralised environments depends on the degree of control exercised by service providers and the nature of the relationship between the parties (i.e., commercial or consumerist).

7. Regulatory sandboxes or experimental frameworks

Brazil's approach to innovation has included regulatory sandbox initiatives and supervised experimentation that predate and inform the final VASP framework. The CVM's sandbox, launched in the early 2020s under technology-neutral principles, selected projects for limited-scope and time-bound testing under enhanced supervisory oversight. These included initiatives involving the tokenisation of receivables and the adaptation of distribution channels to on-chain assets, with the aim of reconciling investor protection with emerging issuance and trading models. The BCB pursued parallel innovation channels through supervised testing environments and structured programs aimed at modernising financial market infrastructures and evaluating digital asset use cases, which provided empirical inputs to the rules finalised in 2025.

As of 2025, these sandbox cycles have transitioned from exploratory cohorts to a regulatory consolidation phase. The BCB's recent issuance of Resolutions 519, 520 and 521 operationalises governance, authorisation and market-conduct lessons learned and introduces foreign exchange and capital-flow reporting tailored to virtual-asset-mediated operations. On the securities side, the CVM's technology-neutral guidance and adjustments to offering channels reflect uptake of tokenised asset pilots and an emphasis on applying existing infrastructures to new technological implementations. The principal results of these initiatives include clearer perimeters between banking, payments and securities activities when delivered through DLT; more granular expectations on custody, segregation and outsourcing and a shift from *ad hoc* exemptions toward codified rules.

At the same time, the limitations typical of sandboxes—short timeframes, restricted scope and the difficulty of scaling beyond the test environment—remain evident, which explains the policy preference for embedding durable standards into sectoral regimes and supervisory toolkits rather than perpetuating sandbox exceptions.

Looking ahead, the policy emphasis has moved to implementation, supervision and inter-agency coordination rather than new sandbox cohorts. The integration of travel-rule obligations, foreign exchange classifications for virtual-asset activities and cross-border capital reporting demonstrates that the innovation agenda is now pursued through mainstream regulatory instruments. For market participants, this means that pilots and proofs of concept (PoCs) should be designed with an eye to rapid graduation into the definitive regimes now in force or scheduled, including the staged travel-rule timeline and the transitional windows for authorisation and foreign-exchange reporting.

8. Recognition and regulation of on-chain legal infrastructure

Brazil recognises and regulates digital signatures and electronic documents through a public key infrastructure and notarial digitisation tools that secure authenticity, integrity and legal validity, providing a bridge between on-chain automation and off-chain formalities. The Brazilian public key infrastructure, ICP-Brasil, established by Provisional Measure No. 2.200-2/2001, creates a chain of trust under which qualified digital certificates identify signatories and enable signatures that carry a presumption of authenticity.

Documents signed with ICP-Brasil certificates are legally valid and benefit from evidentiary presumptions that mirror or, in practice, obviate the need for certain forms of notarisation demanded for handwritten signatures because the certificate binds identity to the cryptographic act within a state-supervised trust hierarchy. This presumption does not eliminate mandatory public-deed requirements or registry acts where the substantive law demands them, but it elevates digitally signed private instruments to a level of enforceability and evidentiary weight compatible with modern, remote-first contracting.

Moreover, there is a nationwide platform operated under the coordination of Brazilian notaries—the e-Notariado—which provides a complementary digital notarial layer that leverages ICP-Brasil and notarial identity verification to deliver remote notarisation, authenticated signatures and electronic notarial acts. Notarial executed digital acts carry the same public faith as their analogue counterparts, including, where applicable, effects equivalent to *firma reconhecida* by virtue of the notary's attestation

of identity and will in the digital environment. In transactional practice, that means parties can achieve, fully online, the same legal assurance historically associated with in-person recognised signatures, provided they route execution through e-Notariado workflows or employ qualified digital certificates with the appropriate notarial overlays.

These infrastructures are directly relevant to tokenised operations and SCs. When an SC automates transfers or conditional performance, the enforceability of the transaction continues to depend on the validity of the underlying legal act and the satisfaction of any form requirements that govern the asset or right in question. Embedding ICP-Brasil-qualified signatures into the off-chain master agreements and annexes that govern token issuance, transfer, collateralisation or assignment, and, where appropriate, using e-Notariado for notarial deeds or recognised signatures, ensures that automated on-chain state changes correspond to off-chain legal acts that are formally valid and probative.

For example, platforms for tokenised receivables often combine on-chain transfer records with digitally executed assignment instruments that satisfy applicable civil-law formalities and use higher-assurance digital signatures when registries or counterparties require a certified or otherwise formally validated form of execution. Similarly, key management and SC change governance should be structured so that administrative actions with legal effect are gated by ICP-Brasil-validated approvals, enabling ex-post verification of authority and consent.

In short, while on-chain records enhance transparency and operational integrity, Brazil's public key infrastructure and digital notarial systems supply the legally recognised signatures and attestation needed to satisfy formalities, allocate responsibility and ground judicial enforcement.

9. Legaltech and regtech innovations in Brazil's crypto ecosystem

The rapid growth of VAs in Brazil has introduced complex compliance and governance challenges, prompting the rise of legaltech and regtech solutions across the financial ecosystem. Following the enactment of the *Virtual Assets Act* (Law No. 14.478/2022) and related BCB regulations, VASPs are subject to stringent AML/CFT obligations, with the Central Bank of

Brazil designated as the primary regulator, as previously detailed. To meet these requirements, technology-driven tools have become indispensable for operationalising compliance and enhancing regulatory oversight.

At the operational level, legaltech platforms enable advanced KYC procedures, real-time transaction monitoring (KYT) and automated compliance workflows. Brazilian KYC processes involve rigorous identity verification, leveraging secure API integrations with official government databases such as the *Cadastro de Pessoas Físicas* (CPF). Providers like Didit (2024)¹ combine document validation, liveness detection and facial biometrics with cross-referencing against *Receita Federal* and electoral records. These measures support differentiated due diligence—simplified, standard and enhanced—based on customer risk profiles, sources of funds and transactional behaviour, mitigating risks such as synthetic identities and deepfake technologies during onboarding.

Post-onboarding, KYT protocols and blockchain analytics platforms such as Chainalysis, TRM Labs and Elliptic monitor crypto transactions, trace asset provenance and flag high-risk patterns linked to sanctioned entities, darknet markets, mixers and politically exposed persons (PEPs). Automated alerts generated by these systems underpin mandatory suspicious activity reports (SARs) to Brazil's national Financial Intelligence Unit—*Conselho de Controle de Atividades Financeiras* (COAF)—within 24 hours, ensuring compliance with Brazil's financial intelligence framework. Complementing these measures, integrated case management systems consolidate KYC and KYT data, maintain audit trails and enforce record-keeping requirements for at least five years (ten years for BCB-supervised entities, according to Circular BCB No. 3,978/2020), streamlining reporting and governance.

Beyond compliance, legaltech is shaping Brazil's regulatory and market landscape through AI and blockchain innovation. The BCB's Center of Excellence for Data Science and Artificial Intelligence promotes AI adoption in monitoring systemic risks, analysing international debates and developing frameworks for emerging topics such as stablecoins and tokenisation. AI tools are also being explored in Brazil's CBDC project (Drex; BCB, no date) and asset tokenisation initiatives, supporting alignment with regulatory standards. At the market level, VASPs increasingly deploy AI-powered regtech solutions for KYC and AML/CFT, using machine learning to detect suspicious patterns and automate reporting.

¹ Didit (2024) offers modular ID verification (document checks, liveness/facial recognition) and connects to government databases, helping companies comply with Brazil's KYC/AML rules.

An example of blockchain-driven governance is Trustt,² the world's first platform to digitise and operate shares of S/As with real-time regulatory compliance. By embedding blockchain into corporate governance, Trustt demonstrates how legaltech extends beyond transactional monitoring to equity operations, ensuring transparency, security and adherence to regulatory standards.

Together, these innovations signal a convergence of legaltech, regtech and supervisory technologies, positioning Brazil at the forefront of technology-enabled compliance and governance in the crypto economy.

10. Conclusion

The regulatory trajectory of digital assets in Brazil reflects an increasingly coherent but deliberately modular framework: technology-neutral in its premises, sector-specific in its execution and pragmatically attentive to market realities. The coexistence of a structured dual-pillar regime—CVM oversight for security-like tokens and BCB supervision for non-security VAs—has reduced (and is expected to continue reducing) conceptual uncertainty while reinforcing traditional legal anchors.

The Brazilian experience also demonstrates that tokenisation, despite its operational efficiency, does not displace the legal nature of underlying rights. The persistent primacy of private-law formalities reveals a structural lesson: digital representation is valuable only to the extent that it remains tethered to enforceable legal title. This design choice seems to safeguard market integrity and reduce systemic fragility.

SCs, in turn, expose a deeper normative tension. Their promise of determinism and automated enforcement challenges the constitutional allocation of adjudicatory authority and strains traditional doctrines of consent, defect and judicial relief. The emerging consensus in Brazilian legislative and academic circles—embodied in ongoing proposals for statutory clarification—signals that automation requires explicit safeguards such as interruptability, enhanced disclosure and accountable governance. Without such measures, technological efficiency risks sliding into unreviewable private ordering.

² The first platform promoting tokenisation of a Brazilian corporation's shares, using blockchain to maintain a digital share registry compliant with corporate law—touted as the world's first regulated S/A digital equity platform. This allows 24/7, secure management of shares with legal validity, exemplifying legaltech in corporate finance (Trustt, no date).

Judicial practice, though incipient, reveals a pragmatic willingness to absorb crypto-related disputes into existing doctrinal categories. Courts have relied on established principles of consumer protection, civil liability and evidentiary standards, resisting pressures to create *sui generis* legal constructs. This trajectory suggests that institutional stability, rather than disruptive innovation, will continue to guide adjudicatory adaptation.

Taken together, these suggest that Brazil's emerging crypto-legal architecture is characterised not by deregulatory enthusiasm but by calibrated integration: innovation is permitted, sometimes encouraged, yet firmly constrained by legal form, institutional hierarchy and constitutional principles. This balance, although naturally imperfect as in any legal system, offers a viable template for jurisdictions seeking to reconcile technological novelty with regulatory and doctrinal coherence.

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