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Financial Subordination Goes Digital

ASSESSING THE DRIVERS OF BRAZIL'S EXCHANGE RATE INSTABILITY

PEDRO PERFEITO DA SILVA AND MARINA ZUCKER-MARQUES*

ABSTRACT

This article examines the drivers of exchange rate instability in emerging markets, with a focus on "ForexTech"—a subset of the FinTech ecosystem composed of financial market actors who leverage technology to facilitate and mainstream access to crypto-assets and foreign currency–denominated accounts. Building on the concept of international financial subordination—the structural dependence of developing countries on global financial markets, which often constrains domestic economic policy—we argue that the proliferation of ForexTech accelerates capital outflows, heightens currency market pressures, weakens capital controls, and intensifies dollarization. These effects are not uniform, as domestic political dynamics and regulatory choices shape local outcomes. Brazil's 2024 currency devaluation pressure exemplifies this interaction: the increased use of crypto-assets and Forex-Tech-powered dollar accounts fueled capital flight, exacerbated by regulatory gaps and a post-2016 turn toward financial liberalization, including central bank independence, adherence to Organisation for Economic Co-operation and Development (OECD) standards, new International Monetary Fund (IMF) guidance, and diminishing support for capital controls. Our analysis indicates that hands-off regulatory approaches increase financial vulnerability and deepen financial subordination in emerging markets. We conclude that safeguarding monetary sovereignty requires proactive and adaptive regulation, even amid limited international coordination and substantial domestic challenges.

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INTRODUCTION

Since the crisis of the Bretton Woods order, capitalist economies have experienced a pervasive impulse to financialization, characterized by the growing importance of financial practices and motives alongside the dissemination of market reforms such as the removal of capital controls and the erosion of financial regulation (Epstein 2005). Beside the negative implications for growth and income distribution (Denk and Cournède 2015; Sahay et al. 2015), this process has led to recurrent episodes of financial instability, especially in emerging and developing economies that occupy a peripheral position in the global monetary hierarchy and struggle to borrow abroad in their domestic currency (Eichengreen et al. 2002; Fritz et al. 2018).

This long-term trend toward financialization is not exempt from discontinuities and critical junctures. For instance, the growth of the Eurodollar market in the 1960s and 1970s, the rise of over-the-counter derivatives in the 1990s and early 2000s, and the macroprudential turn after the global financial crisis brought important changes to global financial practices and policymaking (Baker 2013; Gabor 2020). Such transformations interacted with variegated self-insurance strategies at the domestic level, such as the accumulation of official reserves to cushion financial shocks and the targeted use of capital flow management to curb instability (Bortz and Kaltenbrunner 2018; de Paula et al. 2017).

Following a similar rationale, we take the rise of FinTech as another critical juncture in the financialization trend. Dating back to the 2000s, this process gained momentum after the COVID-19 pandemic, ranging from more conventional uses such as digital banking and payments to the dissemination of crypto-assets such as unbacked tokens (e.g., Bitcoin) and stablecoins (e.g., Tether). Even though these applications are far from homogeneous, they have motivated similar debates: optimistic perspectives have emphasized gains for financial inclusion, efficiency, and access to capital, while more pessimistic views have highlighted the deepening of financial instability, including the renewed currency pressures experienced by emerging economies (Appendino et al. 2023; IMF 2024b; Prasad 2023).

Against this background, this paper sheds light on how the rise of digital banking and crypto-assets is shaping financial subordination—defined as the structural and systemic relationships produced and maintained by global financial institutions, private actors, and local elites that constrain the domestic economic and policy autonomy of developing and emerging economies (Alami et al. 2023; Bonizzi and Kaltenbrunner 2024; Kaltenbrunner et al. 2024). We identify and focus on a particular subset of the FinTech ecosystem, which we refer to as "ForexTech." Rather than concentrating on specific actors in the financial markets, ForexTech describes the process of leveraging technology to facilitate and mainstream access to foreign currency–denominated assets and services.

We argue that a key distinction of ForexTech is that it empowers private actors to circumvent national financial regulations on cross-border payments, making emerging and developing economies even more vulnerable to exchange rate instability, capital outflows, and even dollarization. To highlight the repercussions of ForexTech for monetary sovereignty, we draw a parallel between this process and other forms of financial subordination, such as the original sin and the original sin redux, which respectively refer to the inability to borrow abroad in domestic currency and the currency mismatches that emerge from a surging share of non-resident investors in local currency-denominated assets (Bertaut et al. 2023; Eichengreen et al. 2002; de Paula et al. 2025). We propose the term "digital sin" to characterize the phenomenon of allowing—or even encouraging—resident capital outflows through ForexTech channels.

It is important to note, however, that the rise of ForexTech is far from uniform, varying across time and space as a result of interaction with local constellations of power (Bonizzi et al. 2022). To assess the drivers of this variation, we rely on the so-called international political economy (IPE) of policy space,[1] according to which the interplay of institutions, ideas, and interests shapes the ability of policymakers to curb currency pressures and regulate capital flows in emerging and developing economies (Gallagher 2015b). To assess this argument, we build an exploratory case study centered on the exchange rate pressures experienced by Brazil in 2024. Two factors underpin our case selection. First, we consider Brazil a crucial case in the set of emerging economies facing new vulnerabilities due to its record of liquid and innovative financial markets and active capital flow management (Cunha et al. 2020; Fritz and Prates 2018). Second, key IPE studies have discussed Brazil's policy choices from the 1990s to the mid-2010s regarding capital account regulations (Alami 2020; Gallagher 2015a, 2015b; Kaltenbrunner and Painceira 2018), therefore allowing for a within-case comparison.

Beside describing the role of ForexTech in Brazil's currency pressures in 2024, we also discuss why the country was not able to regulate ForexTech and minimize instability in the foreign exchange market. We contend that the repercussions of digital banking and crypto-assets and the ability to craft proper regulatory responses depend on a combination of institutions, ideas, and interests, such as the degree of central bank independence, the conditions set by trade and investment agreements, the interpretation of past crises, policymakers' economic views, government partisanship, and the demands of different social groups. Unlike Brazil's early experience with capital flow management in the 2010s, the aforementioned political underpinnings in 2024 were insufficient to support such regulation. Furthermore, the 2010s case centers around inflow regulation, but in the case of ForexTech, regulation would require comprehensive controls over outflows, which pose distinct and greater political challenges.

This article offers theoretical, empirical, and policy-relevant contributions. Theoretically, within the international financial subordination (IFS) agenda, it advances the mapping of domestic and international factors shaping financial subordination and its variations over time and space. It introduces the concepts of ForexTech and digital sin to clarify how the emerging FinTech ecosystem influences the global currency hierarchy, distinguishing inclusive domestic aspects from external dynamics that deepen financial subordination in developing and emerging economies. Empirically, the article provides an in-depth analysis of Brazil's ForexTech sector, detailing key actors and their roles in the foreign exchange market. Finally, on policy design, it highlights the structural drivers of financial instability and explores potential responses relevant to emerging and developing economies. Notably, the terms "ForexTech" and "digital sin" underscore that FinTech should be integrated into policy debates on exchange rate and capital flow management, moving beyond issues of domestic financial inclusion and efficiency.

The remainder of this article is organized as follows. The second section introduces the theoretical framework. The third section outlines the research design. The fourth section discusses the historical evolution of Brazil's capital flow management. The fifth section analyses the underpinnings of Brazil's exchange rate instability in 2024. The sixth section concludes.

THEORETICAL FRAMEWORK

This paper argues that domestic factors interact with the global impulse to FinTech in shaping the financial subordination of emerging and developing economies. However, before presenting our theoretical argument, we must first establish some basic definitions as well as identifying broader macroeconomic implications.

[1] The use of this term follows Alami (2018).

The rise of FinTech, here defined as technology-enabled innovation in financial services, paves the way for new business models, applications, processes, or products (FSB 2017). One of these is so-called digital banks or neobanks, which lack physical branches and offer a range of online banking services, such as opening accounts, providing credit, and performing FX operations (Basel Committee on Banking Supervision 2024; Ehrentraud et al. 2020). By increasing competition within the banking sector and achieving efficiency gains, the emergence of these new players is expected to lower interest rates and improve the quality of financial services, thereby fostering financial inclusion and reducing transaction costs for households and companies (Bejar et al. 2022; World Economic Forum 2024). However, these benefits are far from automatic, as entrants may emulate key aspects of incumbents' behavior, and the latter may embrace innovation to keep their market power (Buchak et al. 2018; Ylönen et al. 2024). Moreover, digital banking may introduce a series of risks, such as unfair competition due to segmented supervision and regulation, higher propensity for herd behavior, dissemination of precarious lending practices, and loss of effectiveness of monetary policy (Cevik 2023; Elekdag et al. 2024; Gou et al. 2024).

Another change associated with the FinTech landscape is the dissemination of crypto-assets, i.e., privately issued digital representations of value that are cryptographically secured and deployed using distributed ledger technology, encompassing both unbacked tokens such as Bitcoin, and stablecoins such as Tether that pledge to keep a stable price toward a reference asset (IMF 2023a; Enajero 2021). Beside a libertarian defense of market freedom and privacy, an optimist view on crypto-assets promises financial inclusion and efficiency gains due to the blockchain technology and the contestation of banks' market power (Triple-A 2024). On the other hand, a more pessimistic perspective emphasizes the connection to illicit flows, tax evasion, financial instability, and loss of effectiveness of monetary policy (Appendino et al. 2023; Ba and Șen 2024; Baer et al. 2023).

Drawing upon critical traditions such as dependency theory, post-Keynesian economics, and Marxism, the IFS research agenda offers a useful approach to understanding the implications of these changes at the capitalist periphery. According to Alami et al. (2023, p. 1363), the notion of IFS refers to "a relation that is both spatial and saturated with power, a relation of domination, inferiority and subjugation between different spaces across the world market, expressed in and through money and finance, which penalizes actors in developing and emerging economies disproportionately." This agenda assumes that social actors and policymakers in these countries face a disproportionate constraint on their agency. As an illustration, peripheral economies struggle with so-called original sin—the reduced ability to borrow abroad in their own currencies—and are therefore more exposed to exchange rate risk (Eichengreen et al. 2002).

On the other hand, the IFS programme also highlights that the form and nature of the subordination change over time is constantly reshaped by the interaction between global structures and the daily practices of local actors. For example, in response to the financial crises throughout the 1990s, middle-income, emerging economies accumulated official reserves, deepened their domestic financial markets, and decreased their percentage of government debt in foreign currency; however, the surging share of non-resident investors in local financial markets forged the so-called original sin redux—a new vulnerability rooted in the greater transmission of foreign shocks via sales of bonds and equities by foreign investors who carry the currency mismatches (Bertaut et al. 2023; Paula et al. 2025).

Moving back to our analytical focus, it makes sense to expect that the FinTech landscape will introduce new IFS channels, altering or even reinforcing the constraints faced by peripheral economies. For instance, digital banks have made it easier for companies and individuals to hold and transact foreign assets and currencies, fueling surges in capital outflows and exchange rate instability (Prasad 2023; Ylönen et al. 2024). By providing services through apps that allow frictionless decision-making, these players have also incorporated new segments of the population into foreign exchange markets, amplifying the repercussions of the financial cycle (Gou et al. 2024; Ioannou et al. 2024).[2] Moreover, the rise of digital banks may create opportunities for the penetration of foreign actors into countries that have kept some level of domestic control over their financial system (Gopalan et al. 2023; Ioannou and Wojcik 2022).

When it comes to crypto-assets, the repercussions for IFS are even clearer. For example, private actors can use crypto-assets to circumvent capital controls (He et al. 2022; IMF 2023a; Luckner et al. 2023; Prasad 2023). By further eroding the effectiveness of cross-border financial regulations, this process may result in a stronger version of the so-called capital mobility hypothesis, which ties the deepening of financial globalization to a permanent shrinking of the set of feasible economic policies (Andrews 1994). Additionally, the global dissemination of crypto-assets may reinforce currency hierarchy through two complementary channels, namely the role of dollar-pegged stablecoins as a new channel for US monetary power and the relationship between the price of crypto-assets and the Federal Reserve's monetary policy (Basel Committee on Banking Supervision 2024; Karau 2023; Reuter 2025).

Even though disruptive actors such as digital banks and crypto exchanges had a pivotal role in leveraging technology to facilitate foreign currency–denominated transactions, mainstream players, such as traditional banks, investment management firms, and foreign exchange companies, are expected to gradually embrace and consequently mainstream these practices. As stated in the introduction, we use the term "ForexTech" as an umbrella concept to explore this broader process rather than focusing on a specific group of actors. Moreover, we propose the notion of digital sin to highlight the implications of ForexTech for capital outflows.

It is also worth noting that an analytical axis of the IFS program is the attention to historical and geographical contexts to avoid uniformizing assumptions (Alami et al. 2023). As a result, the aforementioned structural constraints affect peripheral economies in different ways, leaving space for policy variegation as external forces interact with domestic factors (Bonizzi et al. 2022).

To shed light on the drivers of this variegation, this article relies on the so-called "IPE of policy space." Without denying the role of international factors, this strand of literature argues that domestic political conditions play a pivotal role in the ability of emerging and developing countries to regulate capital flows and manage their exchange rate.[3] While most of the studies affiliated with this perspective follow an inductive methodology centered on case-specific aspects, Gallagher (2015b) proposes a general framework around the interplay of three types of variables.

Regarding *institutions*, the focus lies on the regulatory tools available to policymakers and the control of elected officials over policy choices. This covers, for example, the degree of independence of the central bank, which may delegate key decisions to market-friendly technocrats, and the membership in international agreements, which can introduce formal and informal obstacles to financial regulation (Gallagher 2015a). Still on the institutional front, studies also highlight aspects such as the decision-making forum for capital flow management, the presence of strong state-owned banks, and access to non-market sources of external credit (Gallagher and Prates 2016; Steinberg 2016).

When it comes to *ideas*, the IPE of policy space pays attention to the motivations and economic views that guide policymakers on the issue of financial regulation. This may include factors such as

[2] By easing the transfer of money across borders, the rise of FinTech may also deepen the dependency of some developing economies on remittance flows (Drakopoulos et al. 2024).

[3] It is true that the IPE of policy space and the IFS research agenda disagree on the intensity of the external constraints and the progressiveness of capital flow management, but they are compatible for the goals of our paper, namely assessing how the FinTech landscape has shaped exchange rate instability in interaction with domestic factors.

the adoption of heterodox (or orthodox) economic ideas by policymakers, the prevalent interpretation about the causes of past crises, and the interaction with international organizations that shape the policy consensus around the theme (Grabel 2015; Naqvi 2021).

In terms of *interests*, the emphasis is on sociopolitical forces that demand or resist cross-border financial regulations. This encompasses the core constituency of the ruling party, the power distribution within the governing coalition, and contradictory pressures within each social group (Silva 2023; Silva and Bandeira 2021). For instance, beside cleavages around skills profile and unionization, workers face trade-offs around inflows and outflows, as the protection of purchasing power can come at the cost of job posts (Frieden 2015; Walter 2008). In the same vein, the position of manufacturing producers must balance opposing goals, such as cheap credit, importing capacity, export competitiveness, keeping exit options, and preventing a currency crisis (Pepinsky 2008). Even the domestic financial sector follows a similar pattern, also favoring access to cheap credit and exit options but seeking some protection against foreign competition (Pepinsky 2013).

Against this background, we contend that the rise of FinTech-related processes has introduced new transmission channels for IFS, fueling exchange rate instability, especially in financially integrated emerging economies. However, the operation of these channels can be further enabled or slowed down by domestic factors, which underpin the design and implementation of cross-border financial regulations.

As discussed in the following sections, this argument finds an echo in the case of Brazil. Different IPE studies have concluded that the country managed to translate institutions, ideas, and interests into policy space for reinforcing capital controls and mitigating currency appreciation in the aftermath of the 2007 global financial crisis (Alami 2020; Gallagher 2015a, 2015b; Gallagher and Prates 2016; Kaltenbrunner and Painceira 2018; Silva 2023). In this paper, we apply the same rationale to the mid-2010s onwards, contending that the change in domestic conditions, combined with the challenges posed by the FinTech landscape, have hurt Brazil's ability to regulate capital flows and contain exchange rate instability.

RESEARCH DESIGN

To assess this argument, we build an exploratory case study centered on Brazil's recent episode of exchange rate instability, which reached its peak in December 2024 (see Section 5). Specifically, our descriptive argument assumes two forms (see Bogliaccini and Madariaga 2024; Gerring 2012). First, it provides an account of how the rise of ForexTech has fed Brazil's financial subordination, enabling an increasing volume of capital outflows. Second, we suggest that there is a plausible relationship between the heightened capital mobility and the evolution in institutions, ideas, and interests from the mid-2010s onwards, which has eroded the intermediate capital account regime Brazil had built in the 1990s and consolidated after the 2007 crisis. While we do not suggest a causal relationship, we leave this open for future research.

We consider Brazil a crucial case for understanding the dynamics of financial subordination in emerging and developing economies. Beside displaying liquid and innovative financial markets, Brazil has maintained a long-term commitment to capital mobility while adopting different defensive strategies, such as the accumulation of official reserves and the deployment of market-friendly capital controls (Cunha et al. 2020; Fritz and Prates 2018).

From an empirical perspective, the existence of a relevant set of previous studies of Brazil's capital flow management and exchange rate dynamics also allows for within-case comparison (Alami 2020; Gallagher 2015a, 2015b; Gallagher and Prates 2016; Kaltenbrunner and Painceira 2018; Silva 2023). Moreover, the country has been praised for its progress in mapping capital flows related to the FinTech landscape, including monthly data, involved banks, and types of financial assets (FSB 2024; Cardozo et al. 2024).

In terms of supportive evidence, we consult the academic literature, publications by international organizations (including the International Monetary Fund (IMF) and the Bank of International Settlements), Brazil's laws and regulations, and relevant news published by Brazilian (including *Valor* and *Folha de São Paulo*) and international media (such as the *Financial Times* and Reuters). Additionally, we rely on public databases provided by the Central Bank of Brazil (regarding the balance of payments[4] and foreign exchange spot market[5]) and the Brazilian Ministry of Finance and National Treasury (on ownership of crypto-assets[6]). Finally, we rely on information from FinTech and financial institution websites, as well as corporate information available at LSEG (London Stock Exchange Group, a provider of financial market data).

HISTORICAL BACKGROUND

Before discussing the drivers and implications of Brazil's capital flows from the mid-2010s onwards, it is worth establishing what kind of capital account regime the country had built in the previous decades. Like many emerging and developing economies, Brazil implemented neoliberal reforms from the 1990s to the mid-2000s, seeking to attract foreign capital and ensure macroeconomic stabilization (Fritz and Prates 2018). This gradual process included the granting of access for foreign investors to all segments of the domestic financial market, the liberalization of capital outflows, regulatory harmonization with international standards, and a preference for market-friendly regulations rather than administrative restrictions (Cunha et al. 2020).

However, as it navigates the global financial cycle in a subordinate position, Brazil has adopted defensive measures—such as the overaccumulation of official reserves and the counter-cyclical deployment of capital controls—to safeguard the long-term commitment to capital mobility (Kaltenbrunner and Painceira 2018; Silva 2023). In his threefold typology, Klein (2012) classifies the country's capital account regime as an example of "gate," an intermediate arrangement that favors temporary and targeted regulations rather than encompassing and permanent restrictions, opening during tranquil periods to access international capital but closing toward destabilizing inflows.[7]

Two moments illustrate the functioning of Brazil's regime of capital flow management. In the 1990s, Brazil used an entry tax, called the Financial Operations Tax (Imposto sobre Operações Financeiras, IOF) and minimum maturity requirements to curb surges in short-term capital inflows, such as foreign loans and portfolio investments into the public bond secondary market (Peruffo et al. 2023). These regulations aimed to safeguard macroeconomic stability and were adjusted according to the capital flow cycle, being removed when Brazil experienced the 1999 currency crisis (Fritz and Prates 2018).

A similar pattern emerged in the aftermath of the global financial crisis, when advanced economies adopted unconventional monetary policies that fostered capital inflows to emerging markets (Grabel 2015). In response, Brazil once again imposed tax-based controls and macroprudential regulations on short-term capital inflows to mitigate currency appreciation and destabilizing financial practices (Gallagher and Prates 2016). Moreover, Brazil went beyond traditional capital controls, using the IOF

[4] We rely on the "Special series on the external sector." The "Historical series – BPM6" provides information on crypto-assets' debit and credit.

[5] Specifically, we rely on the information available at "Foreign exchange ranking by financial institutions" (in Portuguese, "Ranking por instituições financeiras") and "Semiannual rankings" ("Ranking semestrais").

[6] From the "Open data report and general information" ("Criptoativos: Relatório de dados abertos e informações gerais"), we use information from table 1 (volume of crypto-assets), table 2 (number of unique natural person and entity), and table 4 (type of crypto-asset and transaction volume).

[7] This arrangement is opposed to "wall" (fully closed) and open capital account regimes (Fernández et al. 2016; Klein 2012).

and reserve requirements to curb carry trade based on non-deliverable foreign exchange derivatives, which was a key channel for currency pressures (Prates and Fritz 2016).

Different studies have documented the conditions that enabled Brazil to regulate capital flows in the late 2000s and early 2010s. For instance, the country counted with *institutions* that ensured the power of elected officials over capital flow management, namely the finance ministry's jurisdiction over cross-border financial taxes, the legal need for consensus between the central bank and finance ministry in implementing exchange rate policies, and the relevance of state-owned banks in the credit supply (Gallagher and Prates 2016). Similarly, these initiatives benefited from an appropriate *ideational* setting, informed by the global macroprudential turn, the new IMF's position in favor of some types of capital controls, and the prevalence of heterodox and pragmatic economic views among Brazilian policymakers (Gallagher 2015b). Finally, the deployment of capital controls aligned with the *interests* of different sociopolitical groups, such as the governing left-wing party (the Workers' Party, PT) at the peak of its electoral strength as well as the convergence between labour unions and manufacturing producers around the concern with exchange rate competitiveness (Gallagher 2015a).

It is important to note, however, that these favorable conditions did not change the country's capital account regime, rooted in long-term commitment to capital mobility and the pursuit of credibility with global financial markets (Alami 2020). This means that policymakers avoided regulations that could harm Brazil's credibility with global financial markets, relying on currency swaps and incentives to foreign investments to manage surges in capital outflows (Fritz and Prates 2018). In line with this orientation, with the reversal of the cross-border financial cycle in 2013, Brazil removed inflow and FX derivatives regulations, but it did not consider imposing outflow restrictions (Prates and Fritz 2016). This regulatory asymmetry adds to other structural vulnerabilities, such as the preference for market-friendly tools that are far from challenging financial subordination, and the recurrent use of currency appreciation to achieve inflation targets, which may delay the adoption of counter-cyclical initiatives (Silva 2023).

THE POLITICAL ECONOMY OF BRAZIL'S CURRENCY PRESSURES

This section presents the case study centered on the exchange rate instability experienced by Brazil in 2024. Initially, we describe the currency pressures faced by the country as well as the role of ForexTech-related actors and processes as enablers of cross-border financial flows. After that, we shed light on how changing domestic conditions have eroded Brazil's regime of capital flow management, hurting the country's ability to curb the increase in outflows. Building upon this analysis, we reflect on the policy dilemma and the different scenarios that emerge from these digital channels for financial subordination.

THE EXCHANGE RATE DYNAMICS IN BRAZIL

To better understand the aforementioned currency pressures, it is worth outlining the political-economic context surrounding Brazilian policymakers. In 2013, still during the center-left government led by the PT,[8] the end of the commodity boom fueled a wave of protests due to a mix of corruption scandals, inflation, and economic stagnation, paving the way for the controversial impeachment of President Dilma Rousseff in 2016 (Alami 2020). As a result, Michel Temer, her vice-president, led a center-right administration that fostered market reforms (Saad-Filho 2020). Benefiting from the legitimacy crisis faced by mainstream parties, Jair Bolsonaro triumphed in the 2018 election, governing according to a right-wing populist platform with an even deeper commitment to neoliberalism (de Paula et al. 2023).

[8] The PT remained in office from 2003 to 2016, winning four consecutive presidential elections.

As Bolsonaro failed to overcome the economic malaise and manage the COVID-19 pandemic, Luis Inácio Lula da Silva and his PT once again won a close presidential election in 2022. However, compared with former PT governments, the administration that entered office in 2023 found a considerably more challenging context. For example, it must maintain a broader political coalition, facing a populist opposition that makes it difficult for center-right politicians to cooperate with progressive forces (Hunter and Power 2023). On the economic front, beside the absence of a commodities super-cycle, there is a need to resume growth without losing control over inflation and to gain fiscal space while keeping some degree of market credibility (Ferrari Filho and Terra 2023). Additionally, the domestic business community has maintained a negative attitude toward the PT, blocking the resurgence of the neo-corporatist bargain that rooted Lula's initiatives two decades ago (Silva and Bandeira 2021; Silverman and Gacek 2024). A set of conjunctural factors has also played a part in the evolution of Brazil's exchange rate. For example, the recovery of GDP growth under the new government has gradually put pressure on the balance of payments, especially when the country experienced a deterioration of the trade surplus between 2023 and 2024 (Banco Central do Brasil 2025). In the second half of the latter year, there was also an increase in global financial instability, motivating a flight to quality on the part of short-term investors (Adrian et al. 2024; Bank for International Settlements 2025).

Moreover, the new fiscal framework came into force in 2024.[9] Although the business community supported the establishment of an annual target for the primary budget surplus, it resisted any strategy that included tax increases (Desidério 2024; Folha de S. Paulo 2024). As a consequence, the government's attempt to close tax loopholes and redistribute income taxation from lower to top incomes ended up harming the economic team's credibility with the private sector, fueling the demand for foreign currency (IMF 2025).

Against this background, after a relative strengthening in the first half of 2023, the Brazilian real (BRL) gradually lost value compared with the US dollar (USD) in the second half of the year (see Figure 1). In 2024, the devaluation trend became even stronger, as Brazil experienced the highest volume of capital outflows since the pandemic which led to a record market intervention by the central bank of US$33.3 billion, around 10 percent of Brazil's foreign exchange reserves (Shinohara 2025).

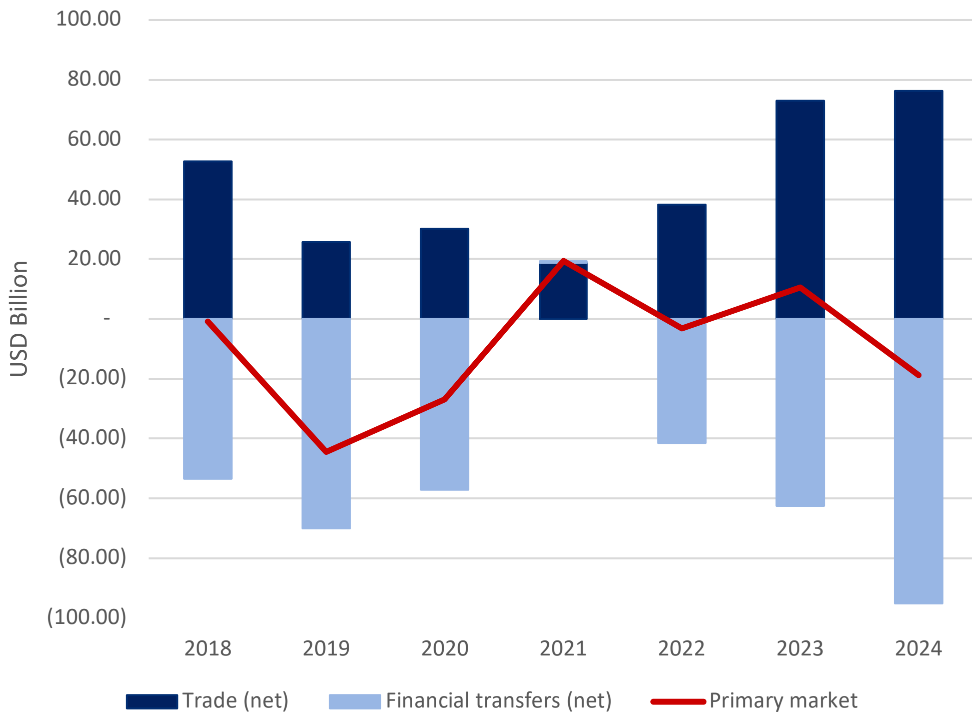
Figure 1: Daily Exchange Rate, USD to BRL, 30 December 2022 to 31 December 2024

Source: Central Bank of Brazil 2025c.

[9] The new fiscal rule restricts spending growth to below revenue growth to guide fiscal consolidation. The government's objective is to improve the federal primary balance from a deficit of 0.5 percent in 2023 to a surplus of 1 percent of GDP in 2026.

In Brazil, the foreign exchange derivatives markets play a key role in determining the spot exchange rate, given the country's specific institutional setting, including regulations on the convertibility of currency accounts (Prates 2015; Ventura and Garcia 2012). We do not dispute the significance of foreign exchange derivatives in the Brazilian case, but this paper sheds light on the growing participation of ForexTech in the spot market, i.e. digital sin, as a new factor exerting downward pressure on the Brazilian currency and increasing the vulnerability in the balance of payments.

Figure 2: Primary Foreign Exchange Market, Brazil, USD Billion, 2018-2024



Source: Central Bank of Brazil 2025c.
Note: Negative values indicate net outflows from Brazil; positive values indicate net inflows.

In this context, it is worth noting that net financial transfers abroad have been consistently growing since 2021 (see Figure 2), and this would have turned the primary foreign exchange market negative as early as 2023 if the increase in trade-related flows had not counterbalanced net outflows from financial transfers. In 2024, net financial transfers resulted in an outflow of US$95 billion, leading to net outflows in the primary market of nearly $19 billion. During a press conference in December 2024, the then Governor of Banco Central do Brazil, Roberto Campos Neto, said: "The financial flow throughout the year was quite negative—pointing to one of the worst years in history." Regarding the December data, the governor listed two main reasons: an above-average outflow of dividends (explained by high corporate profits in that year) and larger outflows from individuals, including, more recently, from platforms (Campos Neto 2024, minute 44).

THE RISE AND IMPLICATIONS OF FOREXTECH IN BRAZIL

Beyond playing a key role in the 2024 outflows as highlighted by Roberto Campos Neto, this paper contends that the FinTech landscape represents a structural change in the Brazilian foreign exchange market. To explore this relationship, we need first to provide a brief contextualization. In this context, as it was for other economic phenomena in the country, 2013 was a relevant turning point, as both legal and regulatory changes authorized the opening of digital banking accounts and the related payment arrangements and institutions (Marques et al. 2022). In the following years, a set of structural factors—such as the high level of internet penetration, the expansion of mobile phones, and the significant growth of micro-entrepreneurship in the wake of labour market deregulation—established Brazil as a regional and global leader in FinTech penetration (Bejar et al. 2022; Quatrochi et al. 2023).

In this changed landscape, digital banks such as Nubank, C6, and Inter managed to increase their client base and challenge traditional banks such as Itaú and Bradesco, becoming leading institutions in Brazil's financial system (Finsiders 2023). The pros and cons of this disruption are aligned with the international debate on the rise of FinTech: on one hand, the new actors eased access to banking services, improved daily communication with clients, and offered real-time decision-making; on the other hand, they did not alter the country's high interest rates despite initially benefiting from more hands-off regulation (IMF 2025; Veronese and Bertran 2023).

As mentioned in Section 2, the FinTech ecosystem is complex and encompasses numerous financial institutions offering a wide range of services, including payments, insurance, investments, and debt negotiation. In this paper, we focus on a specific subset of the FinTech ecosystem that we refer to as ForexTech.

Table 1 summarizes key information about the main financial institutions identified as part of the ForexTech sector in the case of Brazil. These institutions constitute a heterogeneous group in terms of size, origin, business model, client focus, and service offering. Some are digital banks that initially provided only local currency deposit accounts and services but have since expanded to include foreign currency accounts. Notable examples include Banco Inter and C6 Bank. As of 2024, Banco Inter served a client base of 36 million and held R$76 billion in total assets (approximately US$12.3 billion), while in the same year C6 Bank had 35 million clients and R$81 billion in total assets (approximately US$13.1 billion). Banco Inter provides more detailed information regarding its foreign currency accounts, which encompass 3.9 million clients and approximately US$1.2 billion in assets under custody. A similar unfolding case is Nubank, the largest FinTech in Brazil, which operates primarily in

Table 1: Overview of ForexTech, Brazil, 2024

Financial institution	Founding year	Operations (2024)	Additional notes	Corporate group
Banco Inter SA	1994 2015: digital account 2022: foreign currency account	**Overall**: R$76 billion in total assets (US$12.3 billion) 36 million clients **Global account**: US$1.2 billion in assets under custody, management, and deposits 3.9 million clients (Banco Inter 2025; C6 Bank 2025b; Inter&Co 2024, 2025)	Ninth-largest bank in Brazil by number of clients (IstoÉ Dinheiro 2025)	**Subsidiaries** **USA**: Inter&Co Payments Inc. **Cayman Islands**: Banco Inter SA (Cayman Islands Branch) (information from LSEG)
C6 Bank SA	2019	**Overall**: R$81 billion in total assets (US$13.1 billion) 35 million clients **Global account**: n/a (C6 Bank 2025a, 2025b)	First digital dollar-denominated account offered in Brazil Since 2021, J.P. Morgan has owned C6, with currently 46% ownership (Bautzer 2024) Services both corporate and natural persons Clients have access to J.P. Morgan investment services (C6 Bank 2025a)	**Subsidiaries** **USA**: C6 Holdings LLC **Cayman Islands:** Banco C6 SA (Cayman Islands Branch) (information from LSEG)

Financial institution	Founding year	Operations (2024)	Additional notes	Corporate group
Banco XP SA	2001 2022: foreign currency account (XP Inc. 2025a)	**Overall**: R$347 billion in total assets (US$56.1 billion) 4.7 million clients (XP Inc. 2025a, 2025b) **Global account**: 1 million clients eligible for foreign currency account (MoneyLab 2024)	Investment broker transitioning to digital international accounts	**Subsidiaries** **USA**: XP Advisory US Inc. **Cayman Islands**: Banco Modal (Cayman Islands Branch) **Portugal**: Chameleon Bravery Unipessoal Lda **United Kingdom**: XP Holding Uk Ltd (information from LSEG)
Wise	2011 (operating in Brazil since 2021)	**Overall**: two legal entities with combined total assets of around R$1.7 billion (US $0.27 billion) (Wise 2024a, 2024b) **Global account**: 2 million clients (foreign currency account) (Wise 2024c)	Focus on low-cost international money transfer and multi-currency account services In 2024, Wise made a partnership Nubank Invest to offer foreign currency accounts Nubank has a client base of over 100 million people	**Parent company** **UK**: Wise Payments Limited (Wise 2024b)
Avenue Holding Inc.	2018	**Overall**: R$416 million total assets (US$67.3 million) (Grant Thorson Auditores Independentes 2025) 1 million clients (Cilo 2025) **Global account**: possibly close to total clients as their advertising is mostly about facilitating USD transactions and investments	Investment platform with Itaú Unibanco as shareholder since 2022 (32% stake) (Araujo and Romani 2022) Provides international investment account services, using Ebury/Bexs foreign exchange bank as intermediary (Avenue 2024)	**Parent company** **Indirect owner, Cayman Islands**: Avenue Holding Cayman Ltd (FINRA 2025) **Direct owner, USA**: Avenue Delaware LLC **Affiliated companies** **USA**: Avenue Securities LLC (Avenue 2024; information from LSEG)
Banco Topázio SA	2005 2017: digital account (Banco Topázio 2025b) 2020: foreign currency account	**Overall:** R$2.4 billion total assets (US$0.39 billion) (Banco Topázio 2025a) Number of clients n/a **Global account**: n/a	Banking as a service (BaaS) provider—partners with non-bank FinTechs to allow them to access bank services Correspondent bank for remittance company Remessa Online (Valinor 2024) Partnered with Brazilian Association of Cryptocurrency (ABCripto) to support foreign exchange for crypto trading (Sciarretta 2023)	No evidence of foreign parent company/subsidiaries
Banco BS2 SA	1992 2020: digital account (Banco BS2 and PwC 2025)	**Overall:** R$12 billion total asset (US$1.94 billion) (Banco BS2 and PwC 2025) 122,000 corporate clients (Ryngelblum 2025) **Global Account**: n/a	Originally Banco Bonsucesso Shifted focus to online banking for corporate clients Offers foreign currency services to natural person, but focus is foreign currency accounts to entities (Banco BS2 and PwC 2025)	**Agency abroad** **Cayman Islands**: Banco BS2—Agência Cayman (Banco BS2 and PwC 2025)

Financial institution	Founding year	Operations (2024)	Additional notes	Corporate group
Banco Travelex SA	1976: British company founded 2010: Acquired Brazilian foreign exchange broker Grupo Confidence	**Overall**: R$841 million in total assets (US$136.0 million) (Banco Travelex 2025) Number of clients n/a **Global account**: n/a	Shifted focus from physical locations to online/app presence; since 2022, partnership with Ripple (cryptocurrency company) (Bomfim 2024) In 2024, launched its global account in partnership of Wise (Sayuri 2025)	**Parent company** **UK**: Travelex International Limited (Travelex International Ltd 2024)
Braza Bank SA	2013	**Overall:** R$1.14 billion in total assets (US$0.18 billion) 17 million clients, 7,000 companies, 50 foreign exchange banks (Braza Bank 2025a) **Global account**: n/a	Offers foreign currency account (Braza On) with option to purchase crypto-assets directly (Braza Bank 2025b) Platform to purchase stablecoin (USDT) using PIX (getBraza) Cross-border payment processing services to companies (Checkout, MassPayment)	**Affiliated companies** **UK**: Braza UK Ltd (Braza Bank 2025c)
Ebury	In 2023, Ebury purchased Brazilian bank Bexs, specialized in foreign exchange, and started operations in the country	**Overall:** R$27 million in total assets (US$4.4 million) 1,000 corporate clients (Ebury Banco de Câmbio 2025; Fernandes 2025)	Originally a UK-based FinTech Since 2020, Santander is the major shareholder (Fernandes 2025) Focus on cross-border payment processing services for companies	**Parent company** **UK**: Ebury Group (Ebury Banco de Câmbio 2025)
Ouribank	1979 (as Banco Our Invest) Digitalization process from 2022	**Overall:** R$5.4 billion in total assets (US$0.87 billion) 800,000 clients (Ouribank SA Banco Múltiplo 2025)	Pioneering bank in Brazil offering hedge solution in 1980s Foreign exchange is principal field of activity, with focus on corporate clients Recently changed focus to become BaaS provider—partners with non-bank FinTechs to allow them to access bank services Correspondent bank for Nomad, which offers foreign currency account to 3.5 million people (Nomad 2025)	No evidence of foreign parent company/subsidiaries

Source: Authors' elaboration based on information from companies' websites, annual reports, news, and LSEG.
Note: Exchange rate used is 6.19 BRL/USD as of December 31, 2024.

local currency with over 100 million clients but recently entered into a partnership with Wise to offer foreign currency accounts. These digital banks can serve as an important gateway for consumers to access foreign and digital currencies. According to a survey by the Brazilian Association of Financial and Capital Market Entities (ANBIMA, the Portuguese acronym), 56 percent of people investing in foreign currency do so through their bank's mobile application; the figure is 61 percent for those investing in digital currencies (ANBIMA 2025).

Other ForexTech companies, such as XP with R$347 billion (approximately US$56.1 billion) in total assets and 4.7 million clients, started as domestic investment brokers and later began offering foreign currency–denominated investments to their wealthier clients. Still others were conceived from inception as digital platforms for dollar investments. This is the case with Avenue (R$416 million, approximately US$67.3 million, in total assets and 1 million clients) and Nomad, a company with 3.5 million clients that is not a financial institution but relies on Ouribank to access foreign exchange markets.

This differs from the cases of Wise and Remessa Online (which relies on services from Banco Topázio), which initially focused on low-cost remittances but later evolved to offer multi-currency deposit accounts. Similarly, Travelex Confidence, traditionally a foreign exchange broker with a large physical presence catering to travelers, had to adapt to the digital landscape and has also started offering foreign currency deposit accounts.

Not all ForexTech companies focus on providing services to individual consumers: BS2, Ebury, Ouribank, and Braza Bank primarily offer foreign currency accounts to corporate clients. Some FinTech firms specialize in what is referred to as "Banking as a Service" (BaaS), which involves providing infrastructure and regulatory licenses to third-party companies, enabling them to offer banking products and services (such as accounts, payments, and loans) directly to their customers without becoming fully licensed banks themselves. This model is exemplified by the relationships between Nomad and Ouribank and between Remessa Online and Banco Topázio.

Although ForexTech institutions are diverse, they share some commonalities. Several have subsidiaries or are part of company groups based in the United States, United Kingdom, or the Cayman Islands, enabling Brazilians to schedule foreign exchange transactions, invest abroad, and speculate on exchange rate dynamics (Canônico 2023).

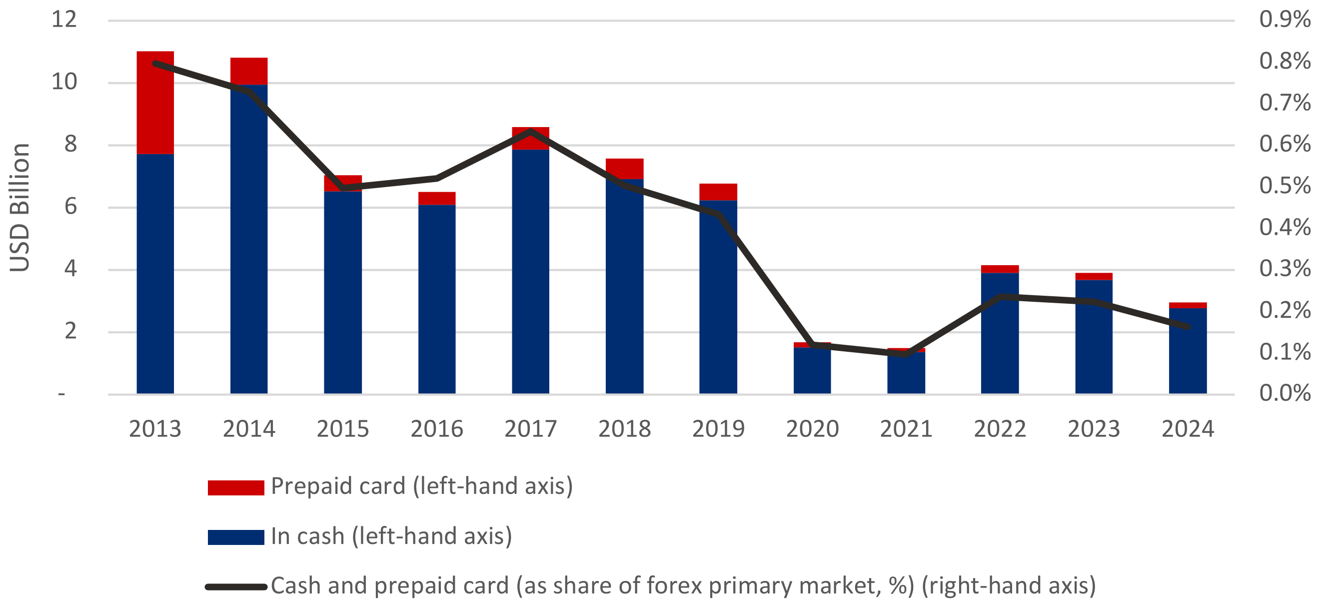
It is a misconception to assume that all players in ForexTech are new companies. Some have regional or less well-known banks as their roots, having been rebranded and expanded (e.g., Inter, B2B, Banco Braza). Others have large, traditional banks as shareholders—for example, C6, with 46 percent ownership by J.P. Morgan; Avenue being acquired by Itaú Unibanco; and Ebury with a major stake held by Santander. The increasing role of ForexTech is also pushing traditional banks to provide similar services (Lewgoy 2024; Rocco 2024; Larghi 2023).

Finally, ForexTech actors are increasingly intertwined with crypto-asset trading, offering crypto directly to clients (e.g., Inter, Nubank, Braza Bank via its app getBraza) or through funds, including exchange-traded funds (ETFs) (e.g., XP and C6). Banco Topázio has partnered with the Brazilian Association of Cryptocurrency (ABCripto), and Travelex has partnered with Ripple (the provider of the cryptocurrency XRP) to facilitate international transfers. Banco Braza has even launched stablecoins—one denominated in Brazilian real (BBRL) and another in US dollars (USD Balance, USDB).

To some extent, the emergence of FinTechs and their operations in foreign currency reflect shifting preferences among Brazilians travelling abroad. As shown in Figure 3, in 2013, US$11 billion—equivalent to 0.8 percent of Brazil's primary foreign exchange market—was delivered in the form of cash or prepaid cards. This share reduced to just 0.2 percent in 2024. The increased use of FinTech services over cash and prepaid cards is not only a matter of convenience but also reflects cost considerations, as the financial transaction tax imposed on FinTech transactions is lower than that applied to other forms (Elias 2021).

However, changes in payment preferences alone cannot explain the increasing role of ForexTech in Brazil. As Table 2 shows, between 2018 and 2024, the 11 largest ForexTech institutions (detailed in Table 1) increased their participation in the foreign exchange interbank market from 1 percent to 7.1 percent. In both 2023 and 2024, these institutions each facilitated the channeling of almost US$30 billion from Brazil on a net basis, excluding trade in goods and services. This amount was just $3.6 billion in 2018.

Figure 3: Primary Foreign Exchange Market: Delivery in Cash or Prepaid Card, Brazil, USD Billion and as Market Share (%), 2013–2024



Source: Central Bank of Brazil 2025b.

Table 2: Primary Foreign Exchange Market: Net Financial Transfers (Excluding Trade), Selected ForexTech institutions, Brazil, USD Billion, 2018–2024

ForexTech institution	2018	2019	2020	2021	2022	2023	2024
Topázio	(0.4)	(1.7)	(0.8)	(2.9)	(6.0)	(13.8)	(14.8)
Braza Bank	(0.6)	(0.5)	0.3	(0.1)	(0.0)	(0.4)	(3.3)
XP	(0.1)	(0.1)	0.0	0.3	(1.9)	(4.2)	(3.2)
Travelex	(0.3)	(0.6)	(1.3)	(3.6)	(4.0)	(3.0)	(2.5)
Ouribank	(0.5)	(0.3)	(0.2)	(0.2)	(1.6)	(4.4)	(2.5)
C6	0.0	0.0	(0.3)	(0.5)	(1.8)	(2.1)	(0.9)
Avenue	0.0	0.0	0.0	0.0	0.0	(0.2)	(0.9)
Ebury	(1.2)	(1.8)	(1.8)	(0.7)	(0.9)	(1.6)	(0.7)
Wise	0.0	0.0	0.0	(0.7)	(0.6)	(0.4)	(0.5)
BS2	(0.4)	(0.0)	0.2	0.4	0.4	0.0	(0.4)
Banco Inter	(0.1)	0.1	(0.0)	(0.0)	0.1	0.1	0.3
Total	(3.6)	(4.9)	(3.8)	(8.1)	(16.2)	(29.9)	(29.5)
Market share in interbank market (%)	**1.0%**	**1.3%**	**1.8%**	**2.9%**	**4.7%**	**7.0%**	**7.1%**

Source: Central Bank of Brazil 2025a.

Note: Red numbers in brackets represent net outflows; black numbers without brackets represent net inflows.

In 2024, traditional financial institutions (such as Citibank, Banco do Brasil, and J.P. Morgan) were also key channels for transfers abroad. As Table 3 shows, altogether the top 10 banks by volume of transfers abroad were responsible for US$76 billion in 2024—2.5 times greater than the group of ForexTech institutions (with almost $30 billion). However, these traditional financial institutions are much larger and account for the bulk of trading in the Brazilian foreign exchange interbank market. Together, these 10 traditional banks represent 65.7 percent of this market—almost 10 times the combined share of ForexTech.

Table 3: Primary Foreign Exchange Market: Net Financial Transfers (Excluding Trade), Selected Traditional Financial Institutions, Brazil, USD Billion, 2018-2024

Traditional bank	2018	2019	2020	2021	2022	2023	2024
Citibank	(2.4)	(5.6)	(9.3)	10.8	(0.7)	(12.1)	(18.3)
Banco do Brasil	(11.2)	(9.5)	(11.5)	(5.1)	(11.6)	(10.7)	(14.1)
J. P. Morgan	1.4	(9.8)	(0.1)	(3.2)	(6.0)	(6.7)	(11.0)
Itaú Unibanco	(2.4)	(11.8)	(4.3)	(10.5)	(4.8)	(7.5)	(9.2)
Bank of America	(4.1)	(2.1)	(8.7)	0.0	(5.4)	(4.9)	(8.2)
State Street	0.0	0.1	(0.0)	0.4	3.4	(1.5)	(5.5)
Banco Santander	(7.1)	(5.1)	(13.0)	2.5	(6.6)	(1.3)	(3.6)
Goldman Sachs	0.1	(1.8)	1.4	2.1	2.1	6.6	(3.1)
Societe Generale	(0.2)	(1.0)	(1.3)	(1.2)	(0.0)	(0.2)	(2.1)
Credit Suisse	(1.0)	0.1	(1.1)	(0.9)	(0.6)	(1.4)	(0.9)
Total	(26.9)	(46.4)	(47.9)	(5.1)	(30.2)	(39.7)	(76.0)
Market share in interbank market (%)	**65.3%**	**66.8%**	**66.7%**	**66.9%**	**68.0%**	**66.0%**	**65.7%**

Source: Central Bank of Brazil 2025a.
Note: Red numbers in brackets represent net outflows; black numbers without brackets represent net inflows.

The business model of ForexTech institutions, which focuses on providing foreign currency accounts and related services, inherently biases their operations toward being net buyers of US dollars in the interbank market. By facilitating easier access to foreign currency holdings for Brazilian clients, these institutions increase demand for the US dollar, thereby exerting downward pressure on the Brazilian real, amplifying exchange rate fluctuations, and influencing overall market behavior.

Beside providing a new channel for capital outflows, these actors have reinforced the country's financial subordination by continuously advertising foreign exchange operations as a risk diversification strategy available to large segments of the population, therefore amplifying external shocks and further constraining national policy space (Almeida 2024).[10] Table 4 shows the average volume of transfers abroad for the top ForexTech and traditional banks with the largest transfer volumes. This data reinforces the fact that ForexTech institutions serve a wide range of customers. The average transfer amounts for ForexTechs range from US$188,000 (for C6) to just US$300 (for Wise). In contrast, six traditional banks have average transfer volumes in the millions, ranging from US$11 million (Goldman Sachs) to US$75,000 (Banco do Brasil).

[10] For instance, C6 is one of the two digital banks backed by J. P. Morgan around the world (Bautzer 2024).

Table 4: Average Transfers Abroad by Selected Financial Institutions (ForexTech vs. Traditional Banks), Brazil, USD, 2024

ForexTech	Average transfers abroad (USD)	Traditional banks	Average transfers abroad (USD)
C6	188,000	Goldman Sachs	11.10 million
Travelex	102,300	State Street	4.96 million
Braza Bank	46,100	Bank of America	3.86 million
XP	31,200	Credit Suisse	2.81 million
BS2	30,100	J. P. Morgan	2.50 million
Topázio	19,000	Societe Generale	1.48 million
Ebury	8,800	Citibank	710,400
Ouribank	6,000	Itaú Unibanco	117,600
Avenue	1,400	Banco Santander	80,600
Inter	1,400	Banco do Brasil	75,800
Wise	300		

Source: Central Bank of Brazil 2025a.

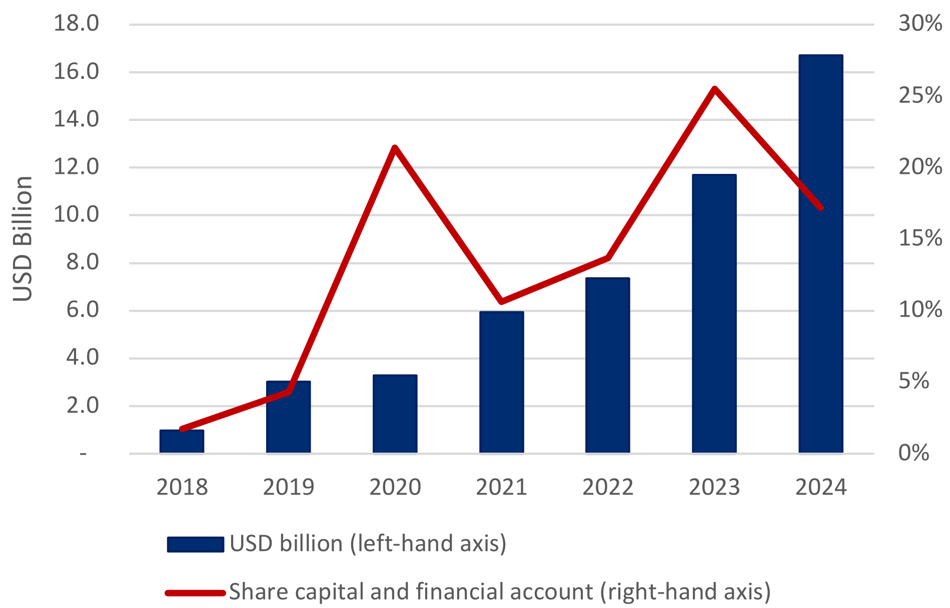
As mentioned earlier, the ForexTech and crypto ecosystems are intertwined and often overlap, although it is not possible—at least in this study—to assess the extent of this overlap. Still, in terms of foreign exchange pressures and balance-of-payments vulnerabilities, opening a foreign currency deposit account and purchasing crypto-assets from non-residents introduce similar effects in the balance of payments.[11]

As expected, the rise of crypto-asset transactions has had strong implications for cross-border capi-tal movements. For instance, from 2020 to 2024, capital outflows via the purchase of crypto-assets accounted for an average share of almost 20 percent of the sum of capital and financial accounts in Brazil's balance of payments (see Figure 4). In the latter year, the country also experienced a peak of net outflows associated with crypto-assets—almost US$17 billion, which amounted to roughly 25 percent of the country's trade balance of goods and matched the total trade balance of goods and services (Central Bank of Brazil 2025c).

According to some estimations, Brazil is the sixth country in the world in terms of cryptocurrency ownership rate, with 17 percent of the population owning some amount of crypto-asset in 2024, ahead even of the US with 15 percent (Triple-A 2024). Moreover, although international organiza-tions have praised the country for its progress with the measurement of crypto-flows, policymakers have adopted a cautious approach, which includes broad consultations with the sector, the grad-ual establishment of regulatory principles, and incentives for self-reporting (Baer et al. 2023; Brazil 2019, 2022, 2024; Cardozo et al. 2024). As Figure 5 shows, the number of people (including both legal entities and natural persons) holding crypto-assets in Brazil reached a peak of 9.2 million in November 2023. In terms of volume, holdings peaked in December 2024—when foreign exchange pressure in Brazil was at its highest—reaching the equivalent of US$8.5 billion. The volatility in the number of holders—for example, dropping to 3 million in November 2024 and then doubling to 6.2 million the following month—may indicate that for some people, crypto-assets serve as a channel for capital outflow rather than a long-term financial investment.

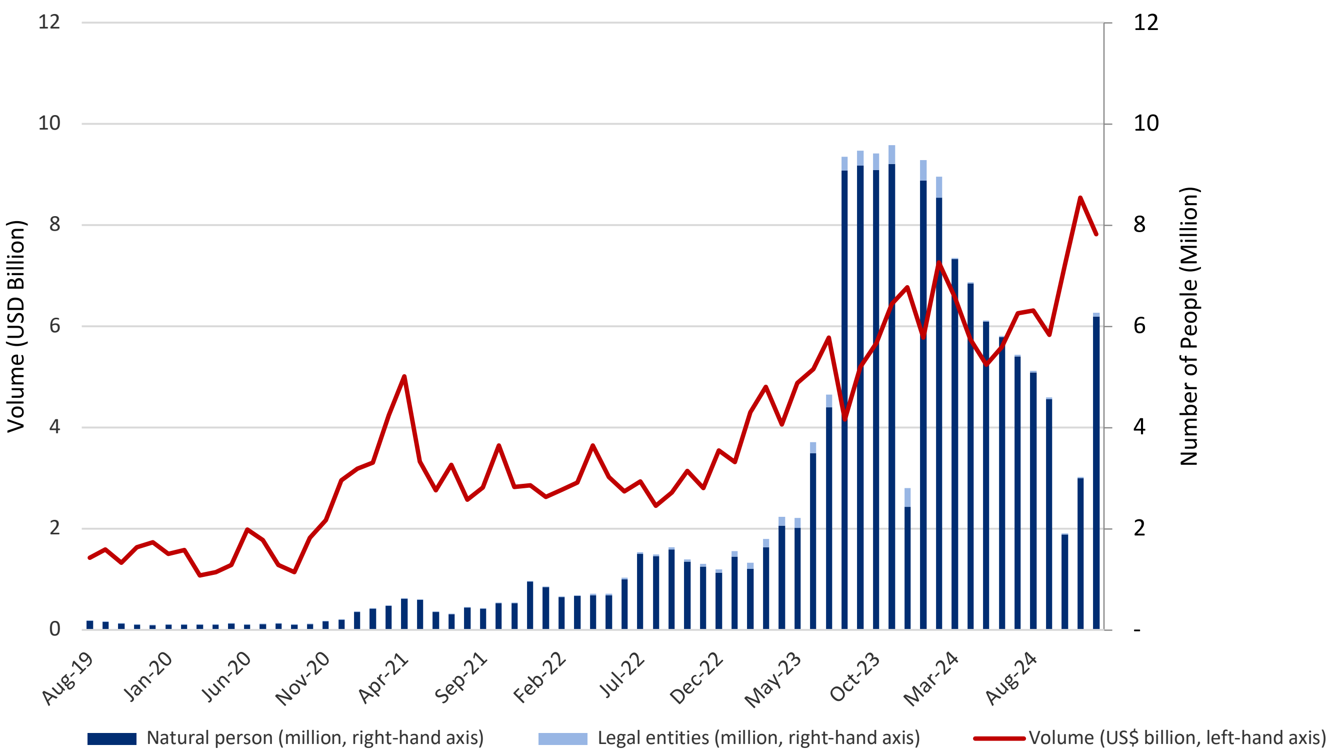
[11] If crypto-assets are exchanged among Brazilian residents, there will be no effect on the balance of payments.

Figure 4: Net Outflows via Purchase of Crypto-assets, Brazil, USD Billion and Share of Capital and Financial Account (%), 2018–2024



Source: Central Bank of Brazil 2025c.

Figure 5: Crypto-Asset Holdings by Brazilian Legal Entities and Natural Persons (Million) and Volume (Monthly), USD Billion, August 2019 – December 2024



Source: Brazilian Ministry of Finance and National Treasury 2025.

It is also important to note that stablecoins centered on the US dollar accounted for almost two-thirds of crypto-asset transactions between 2020 and 2024 (see Table 5), while real-denominated stablecoins accounted for just 3 percent. This supports the argument that crypto-assets provide a new channel for financial subordination, reinforcing US monetary power and further weakening the position of the Brazilian currency in the global hierarchy (Prasad 2023; Trebat 2023).[12] Hence, whether through the opening of foreign currency accounts or via crypto-assets, the result appears to be Brazilian residents purchasing various types of dollar-denominated products.

Table 5: Crypto-Asset Transactions, Accumulated Share, Brazil, August 2020–December 2024

Type	Share
USD stablecoin	65.1%
Non-backed crypto-assets	31.7%
Bitcoin	19.6%
Other non-backed crypto-assets	12.1%
BRL stablecoin	3.1%

Source: Brazil Ministry of Finance and National Treasury 2025.

THE POLITICAL UNDERPINNINGS OF THE OUTFLOW SURGE

Having established the contribution of the ForexTech ecosystem and digital sin to 2024 currency pressures, we can now move to our second objective, i.e., exploring the political underpinnings of this process. As previously mentioned, Brazil's regime of capital flow management has always prioritized inflow regulation, keeping a liberalizing orientation toward movements in the opposite direction (Fritz and Prates 2018). However, without denying this historical background, we show that changes in institutions, ideas, and interests have eroded the conditions that allowed policymakers to successfully curb capital flows in the late 2000s and early 2010s, preventing a similar strategy to contain the recent increase in the volume of outflows and related exchange rate instability (see Table 6).[13]

For instance, the institutional framework around Brazil's capital flow management has experienced an encompassing transformation. First, in 2021, the country approved the formal independence of the central bank (Ferrari Filho and Terra 2023). Beside weakening the control of the elected government over key aspects of capital flow management, this also introduced a four-year term for the central bank's board members, meaning that the first two years of Lula's monetary policy remained under the control of officials nominated by Bolsonaro.

Following this liberalizing rationale, in 2022, Brazil established a new exchange rate regime that expanded the set of transactions that can be conducted through foreign currency and made it easier for financial institutions (including digital banks) to move funds abroad (Naomeda 2023; Peruffo et

[12] Following this rationale, the Trump administration approved a regulatory framework for privately issued stablecoins, hoping to create a vehicle to dollar's global power, which will also imperil monetary sovereignty around the world (Stafford and Ardissino 2025; Wile 2025).

[13] The IOF hikes implemented in 2025 should not be interpreted as a sign that the government intended to restrict capital outflows. Rather, the measures were primarily driven by fiscal revenue motives, framed by the Lula administration as a necessary alternative to regressive spending cuts amid difficulties advancing broader tax reforms. Despite initial political backlash and temporary reversal by parliament, the government's subsequent persistence reflected concerns over fiscal credibility rather than efforts to curb currency pressures. Moreover, the administration maintained its commitment to an open capital account, quickly reversing any measure that could be interpreted as a capital control (Benevides and Haubert 2025; Brazil 2025; Cassela 2025; Folha de S. Paulo 2025).

Table 6: Domestic Politics of Capital Flow Management: Prevailing Factors

	Aftermath of the global financial crisis (2009–2013)	ForexTech-driven instability (2023–2024)
Institutions	Central Bank subordinate to finance ministry	Central bank independence
	Leading position of state-owned banks in the credit supply	Leading position of private banks in the credit supply
	No international agreements blocking capital controls	Pursuit of Organisation for Economic Co-operation and Development (OECD) membership
Interests	Joint capital-labour concern about exchange rate	Lack of a capital–labour consensus against outflows
	Left-wing party at the peak of electoral influence	Weaker electoral position of left-wing forces
		Middle classes and micro-entrepreneurs vocally against controls
Ideas	Developmentalist economic ministers	Economic ministers committed to capital account openness
	Central bank aligned with New Welfare Economics	Central bank under neoliberal leadership
	Increased IMF tolerance of inflow controls	Stricter IMF position on multiple currency practices
	Recent crises associated with excessive liberalization	Recent crisis associated with excessive interventionism

Source: Authors' elaboration; Gallagher (2015a, 2015b).

al. 2023). Moreover, it transferred key responsibilities for the regulation of foreign exchange operations from the National Monetary Council—composed of the ministers of finance and planning and the governor of the central bank—to the independent central bank (Brazil 2021; Ribeiro 2023).

In the same year, still during the presidency of Bolsonaro, Brazil formally became an accession candidate to the OECD, being requested to follow the institution's guidelines in different policy areas. In accord with the argument that international agreements may constrain the space for capital controls (Gallagher 2015a, 2015b), alignment with the OECD's Code of Liberalisation of Capital Movements appeared as one of the explanations for the publication of an executive decree committing to a gradual decrease in the tax on foreign exchange transactions, culminating in its abolishment in 2028 (InfoMoney 2022).

Another institutional feature that enabled Brazil's deployment of capital controls was the predominance of state-owned banks, which could partially replace external sources of funding (Gallagher and Prates 2016; Steinberg 2016). On this front, the current Lula administration found a transformed setting, as state-owned banks had lost participation in the country's credit supply, going from 56 percent in 2015, at the end of Rousseff's government, to 42 percent in 2022, the last year under Bolsonaro (Ribeiro and Campos 2024).

Alongside institutions, ideational changes have also eroded policymakers' ability to regulate cross-border financial movements. For instance, the IMF's ideas about capital flow management are not the same as in the late 2000s and early 2010s. Although maintaining formal support for the targeted and temporary adoption of capital controls, the IMF has supported controls over inflows in some circumstances but continues to show resistance to outflow measures (IMF 2023b). Since 2019, the Fund has also revised its policy on multiple currency practices, moving to advising against taxes on foreign exchange transactions such as the Brazilian IOF (IMF 2023c, 2025). Moreover, in various publications, the IMF has manifested distrust about the effectiveness of capital controls in regulating cross-border movements related to FinTech and crypto-assets, advising countries to prioritize the measurement of these flows while embracing macroeconomic orthodoxy to safeguard credibility with financial markets (Baer et al. 2023; IMF 2023a; Luckner et al. 2024).

At the domestic level, in comparison with the aftermath of the global financial crisis, the relative ideational consensus around capital controls has disappeared.[14] First, in 2023 and 2024, the chair of the independent central bank was Roberto Campos Neto, an orthodox economist who had made a career in the financial sector.[15] Moreover, even Lula's economic team do not favor heterodox policies, as the minister of planning, Simone Tebet, is a center-right politician from a region specialized in primary exports while the minister of finance, Fernando Haddad, follows a pluralistic orientation but remains strongly committed to obtaining credibility with the business community, explicitly discarding initiatives that could be interpreted as a change in Brazil's exchange rate regime (Taiar 2025).

Another obstacle to the deployment of capital controls by the current Lula administration lies in the absence of a supporting coalition of interests. In the electoral arena, for example, the PT does not have the same strength as it did in the late 2000s and early 2010s, having won the second round of the 2022 presidential election with a very small margin and lost influence over the parliament and local governments.[16] In the same vein, the emergence of a strong right-wing opposition has made it harder to build support for interventionist economic policies.

Regarding civil society, manufacturing producers and unionized workers—the main supporters of capital controls after the 2007 crisis (Alami 2020)—have become politically weaker due to factors such as deindustrialization and labour market deregulation (Silva and Bandeira 2021; Silverman and Gacek 2024). Moreover, the late 2000s inflow surge and the consequent currency appreciation aligned industrial capital and labour around the defense of external competitiveness (Gallagher 2015a, 2015b); the recent increase in capital outflows makes it hard to reproduce this alliance, as business leaders seek to maintain their ability to move funds abroad and even segments of the middle and working classes may be interested in purchasing foreign currency during periods of instability.

At the same time, middle classes and micro-entrepreneurs have become more vocal in their opposition to cross-border financial taxes, fearing that they could lose access to external assets or imported goods and services (Escardovelli 2025; Fraga and Rianelli 2024). In this sense, one could argue that there was an increase in the political repercussions of capital flow management, turning this policy area into an issue of mass politics (Steinberg and Nelson 2019).

[14] In the wake of the 2007 crisis, Guido Mantega, a heterodox economist, led the Ministry of Finance. The Ministry of Planning remained in the hands of PT members, first under Paulo Bernardo, a former labour union leader, and then under Miriam Melchior, a developmentalist technocrat. Regarding the central bank, in 2011, Alexandre Tombini, a civil servant with a pluralist mainstream training, replaced Henrique Meirelles, a right-wing MP with a career at BankBoston. For more information, see Gallagher (2015b).

[15] After concluding his term at the central bank, Campos Neto joined Nubank, Brazil's largest FinTech, as vice-chair and global head of public policy, leading the institution's strategy in the field of international regulation.

[16] For the sake of comparison, in 2002, the PT had its best performance in parliamentary elections, gaining 91 seats in the Chamber of Deputies. In 2022, the party won only 69 seats, which accounts for less than 15 percent of the lower house.

CONCLUSION

Developing and emerging economies' policy choices are structurally and systemically constrained by a combination of factors involving global financial institutions and markets, private actors, and local elites— a process known as financial subordination (Alami et al. 2023).This paper has examined how this condition is reinforced by the rise of a subset of the FinTech ecosystem, which we refer to as ForexTech, i.e., actors in the financial markets who leverage technology to facilitate and mainstream access to crypto-assets and foreign currency–denominated accounts. To highlight the structural constraints posed by this process, we propose the notion of digital sin to describe the phenomenon of allowing—or even encouraging—resident capital outflows through ForexTech channels. However, this does not mean a lack of variegation across time and space, as such a process interacts with domestic political dynamics and regulatory choices.

This paper provides an in-depth analysis of Brazil—a crucial case study in the set of emerging economies—showing how the rise of ForexTech contributed to the country's currency pressures in 2024. Unlike Brazil's early experience with capital flow management in the 2010s, the combination of institutions, ideas, and interests in 2024 was unable to sustain similar regulatory efforts. Additionally, while the 2010s focused primarily on regulating inflows, addressing ForexTech necessitates comprehensive control over outflows—an area that presents more complex and significant political challenges.

If left unregulated, the ForexTech sector could increase foreign exchange instability, worsen the balance of payments, and even fuel dollarization. Regulating ForexTech is a particularly challenging territory, but the difficulties are not insurmountable.

The most effective solution from a technical perspective would be global coordination to regulate digitally fueled capital flows. Some initiatives at the IMF and the G-20 indicate some space for cooperative efforts (FSB 2024). However, this degree of coordination—not even achieved in the wake of the 2007 global financial crisis—seems extremely unlikely, especially as the Trump administration has understood crypto-assets and FinTech as pathways to safeguarding US monetary power (Sandbu 2025; Stafford 2025). In July 2025, President Trump signed the GENIUS Act, mandating that stablecoin providers fully back their assets with liquid US dollars or short-term Treasuries. The law explicitly aims to secure US leadership in digital assets, increase demand for US assets, and preserve the dominance of the US dollar in the global currency hierarchy.

An alternative approach, echoing the views of international organizations such as the IMF (i.e IMF 2023a; Prasad 2025), suggests that in light of the limited ability to manage cross-border financial flows—especially given the disruptive impact of new ForexTech—policymakers should prioritize strengthening market credibility. According to this logic, adherence to macroeconomic orthodoxy and efforts to build credibility with global financial markets would make local currencies more attractive relative to foreign currency accounts or crypto-assets. However, such an approach not only comes with social costs but may never achieve the promised goals, for two important reasons. First, the monetary hierarchy in the international system means that even efforts to build domestic market credibility in developing countries can be undermined by the safe-haven status of key currencies. Second, the age of fake news, along with widespread opportunities to rapidly sell domestic currency, is a dangerous combination that may destabilize local economies.

Our analysis suggests that given the current political scenario, minimizing the risks posed by ForexTech requires a multifaceted policy approach to mitigate digital sin. First, the regulatory and tax treatment of ForexTech actors should be harmonized with that of the broader financial system to ensure consistency and reduce opportunities for arbitrage. Second, controls over capital outflows should be imposed, though such measures are often only partially effective and demand continuous innovation by central banks to keep pace with evolving financial technologies and cross-border dynamics. Third, accelerating the development and implementation of Central Bank Digital Currencies (CBDCs) is essential, to encourage issuers and financial firms to record and transact assets on a shared ledger as a means to restore central bank control and information on digital cross-border financial flows (IMF 2024b). Finally, it is important to regulate the advertising of crypto-exchanges and foreign currency–denominated account providers, extending media regulation beyond traditional channels (UNCTAD 2022) .

Brazil has many advantages in terms of its ability to minimize the costs of ForexTech and mitigate digital sin. Beside leveraging the country's institutional expertise in capital account regulation, this effort could build upon its demonstrated ability to measure capital flows associated with crypto-assets and FinTech. Drawing on the success of the country's instant payment platform (Pix), policymakers could accelerate the implementation of the digital Brazilian real (Drex). However, it is important to note that the ability to track these flows is not equivalent to the ability to restrict them, and technical effectiveness does not guarantee political feasibility. Achieving this would require rebuilding appropriate domestic political conditions and overcoming the international stigma attached to the use of outflow controls.

While regulating ForexTech presents considerable political and technical challenges, the cost of unregulated financial innovation can be even higher. Unchecked ForexTech expansion may increase exchange rate volatility, heighten balance-of-payments vulnerabilities, and, most concerningly, pave the way for dollarization in emerging markets. Ultimately, to minimize the risks of deepening financial subordination, policymakers in emerging economies must take an active role in regulatory oversight, despite the lack of support from large economies such as the United States. The stakes involved underline the importance of proactive regulation in safeguarding monetary sovereignty and financial stability, which are necessary conditions for the pursuit of inclusive models of development.

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