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FROM INFLATION HEDGE TO TRADE FINANCE: STABLECOINS, TREASURY BILLS, AND THE DIGITAL DOLLAR ECONOMY

Gustavo S. Godoy ƚ

ABSTRACT

The cryptocurrency market is recent, with a technology that is still developing and has the potential to support innovative and, to some extent, revolutionary ideas. This movement draws on principles defended by economists such as Friedrich Hayek and reaches the libertarian project of Satoshi Nakamoto, who introduced the concept of Bitcoin in 2008 and whose structure remains operational to this today.

Among these principles, widely disseminated and defended, for example, by Antonopoulos, several stand out: protection against inflation in countries suffering from hyperinflation; an alternative investment possibility; easier access to international transfers of funds; and the creation, in blockchain environments, of financial products traditionally concentrated within financial institutions, with potential cost reduction and broader financial inclusion through expanded access to financial services.

This article explores the three topics mentioned above: the use of volatile Bitcoin as protection against inflation in Venezuela and as an investment in a country with high interest rate such as Brazil; the safety of using stablecoins, through an analysis of the peg and reserves held in Treasury bills by Tether and Circle; and the development of an export receivables assignment product using blockchain technology and stablecoins.

The results show that, despite Bitcoin's high volatility and several drawdowns, the asset may still work as protection during a hyperinflationary process. However, at certain moments, such as during crypto winters, holding the local currency may be more advantageous. From an investment perspective, when compared with a country such as Brazil, Bitcoin presents considerable risk relative to a traditional investment linked to the domestic interest rate.

The growing stablecoin market may facilitate foreign trade flows, mainly because stablecoins are much more stable than Bitcoin due to their fixed peg. However, events in 2022 and 2023 showed signs of depegging and raised concerns about the assets held in reserve by the companies responsible for managing those reserves. This article applies Granger-Wald causality tests and VAR impulse-response functions to assess whether flows in this market are inversely related to the 3-month T-bill yield. The results indicate that, for USDC, the expected relationship is observed, whereas for USDT it is not.

The development of traditional credit products in digital and tokenized formats is already a reality, with several financial instruments being issued on blockchain-based infrastructures. Export receivables assignment through FIDCs is a complex product, involving multiple institutions, foreign exchange settlement, documentation, credit analysis and hedge governance. As tokenized finance and blockchain-based credit structures gain scale, this type of transaction could potentially be adapted to an on-chain environment, despite the legal, operational, regulatory and credit-risk challenges inherent to export receivables financing.

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1. INTRODUCTION

Finance has undergone technological transformations over time. Processes are modernized, ideas for new products are developed, and economic concepts are reconsidered, modified, or improved.

Since the earliest stages of civilization, even before the development of writing itself, human beings had already developed counting systems to facilitate the exchange of goods, as explained by Antonopoulos (2017).

The concepts of money, securities, derivatives, credit operations, and payment methods were created and improved for several purposes and with different uses by hedgers, speculators, and arbitrageurs, whether for protection, investment, or speculation.

Some economic concepts developed in the early twentieth century, when economic thought gained relevance, were in some sense libertarian or unconventional, ranging, for example, from capitalist or socialist economic systems to ideas related to greater or lesser government regulation of the economy.

One of the main advocates of the denationalization of money and of private competition among currencies was Friedrich Hayek in Denationalization of Money, published in 1976. Although technologically unfeasible at the time, Hayek proposed private competition among currencies without direct government intervention. Regardless of the pros and cons of monetary control by a Central Bank or by the market, the idea itself would have been difficult to apply, despite the advance of computing from the 1980s onward and several proposals on how such decentralization could be implemented.

In 2008, with the publication of Nakamoto's (2008) white paper on Bitcoin, it became possible, through the concept of blockchain and a proof-of-work consensus mechanism based on mathematical validation, to develop the idea of peer-to-peer negotiation, in which the parties involved do not need to know each other to carry out a transaction.

Given Bitcoin's scarcity (total supply is 21 million units), an economic supply-and-demand perspective points to a situation in which the supply of money is scarce and predetermined. This differs from fiat money, whose supply can be controlled or managed through monetary policy by the Central Bank. For this reason, the instrument has been recommended for investors who wish to protect their capital from the loss of value of their country's fiat currency when there is a scenario of hyperinflation or strict government control over money and capital flows.

Antonopoulos (2017) explains the idea of deflationary money and the effects that inflation has on the value of individual's money. Inflation generates loss of value, functioning as a form of taxation that penalizes savers and favors debtors, causing currency degradation. On page 232, he argues that “deflation in Bitcoin is not caused by a collapse in demand, but by a predictable restricted supply... the deflationary aspect of the currency is a problem when it is not driven by rapid economic retraction, or an advantage because the protection from inflation and debasement **far outweighs** the risks of deflation.”

The first section of this study therefore seeks to examine whether Bitcoin, given its high volatility and periods of sharp decline (crypto winters), actually protects investors in an inflationary environment and what risks may be associated with this strategy, using the Venezuelan bolivar as the basis for analysis.

Rodrigues and Colombo (2024), when analyzing the inflation-hedging properties of cryptocurrencies, show evidence that Bitcoin may protect against unexpected inflation fluctuations. However, as Bitcoin returns became more correlated with returns on traditional assets, the hedging property itself declined. This leads to the conclusion that Bitcoin’s inflation-hedging role cannot yet be considered definitive, in contrast to more traditional hedge assets such as gold.

Regarding the use of Bitcoin as both an investment instrument and an inflation hedge in an economy with persistent inflation and high interest rates, such as Brazil, the question is whether it would outperform Brazilian interest rates despite its high volatility and provide protection against inflation.

Another possibility to reduce the risk arising from Bitcoin's high volatility would be the use of a stablecoin. According to Harvey et al. (2021), stablecoins are cryptocurrencies that maintain parity with an underlying asset, such as the dollar, the euro, or gold, with the peg maintained by fiat-collateral mechanisms (reserves external to the asset's chain), crypto collateral (backed by other cryptocurrencies), or no direct collateral (an algorithmic seigniorage model).

The use of stablecoins reduces cryptocurrency volatility by maintaining a 1:1 parity against the underlying asset. This type of asset would allow wallets to be used for payments and purchases.

In foreign trade, stablecoins could improve the international transfer system by reducing existing difficulties, especially those related to the time required to receive/send funds and to confirm execution (SWIFT). The stablecoin market operates 24/7, allows near-instant sending and receipt of funds, and provides confirmation shortly after execution.

As shown in Figure 1, the market value of the USDT and USDC stablecoins, issued by Tether and Circle, respectively, grew most strongly after 2024.

Fiat collateral represents the maintenance of the cryptocurrency's 1:1 parity with the base currency, mainly through reserves held in short-term U.S. government securities or similar instruments.

According to Harvey et al. (2021), although USDT (Tether) has the largest stablecoin volume, it is not audited, whereas USDC (Circle) is regularly audited.

The market capitalization of both stablecoins increased sharply and, as shown in Figure 1, reached a combined total of approximately USD 264 billion in early June 2026, according to CoinGecko data.

Because these stablecoins rely on fiat collateral, transparency about the volume and composition of the reserve assets required to maintain the 1:1 peg becomes particularly important.

Voshmgir (2020) discusses the centralization problem of asset-collateralized tokens, in which a single company is responsible for guaranteeing token coverage, thereby creating counterparty risk. Voshmgir states that “if there are serious doubts about the backing of Tether, the price system might collapse, and if it does, it might affect the BTC as well.” On March 24, 2026, Tether announced the hiring of one of the Big Four to audit its assets in order to improve internal control systems and risk management, including reserves and treasuries, according to Sandor (2026).

In this context, maintaining the 1:1 peg requires reserve assets with low credit risk and high liquidity. Short-term U.S. Treasuries, especially 3-month T-bills, therefore represent the core reserve instrument.

At certain moments, as shown in Figure 2, there was depeg relative to parity. These events may be related to COVID in early 2020, regulatory risks in 2020 and 2021, the Terra-Luna and FTX crashes in 2022, and the SVB case in 2023. Such episodes temporarily caused stablecoin prices to lose their 1:1 peg, which is a concern for investors and institutions that would like to use, for example, stablecoins to receive foreign-trade flows instead of relying on traditional channels through banks and SWIFT.

Figure 2 shows Bloomberg “Last Quote” prices and does not reflect the intraday market for stablecoins, which trade 24/7. Tobias et al. (2025) show that during the collapse of SVB (Silicon Valley Bank), USDC reached a depeg of 0.12 relative to the 1:1 target parity. Such a situation could generate significant financial losses in foreign trade transactions. For example, in a scenario in which an institution needs to receive dollars on D0 (assume USD 1 million, a relatively small FOREX volume) to avoid a delay in a loan, expecting the use of stablecoins to guarantee receipt, the institution could observe a USDC quote of 0.88:1, generating a financial impact of USD 120,000.00.

The second section of this article seeks to assess which of USDT and USDC would be more suitable for adoption in foreign trade as a substitute for receiving foreign currencies payments through traditional banking and SWIFT-based channels. The analysis considers the market capitalization of these stablecoins relative to Treasuries (3-month T-bills) held as reserve backing to guarantee the currency peg. This analysis was carried out through Granger causality tests and VAR models between market capitalization and Treasury return rates.

The State of Crypto 2025 report by AH Capital Management, LLC shows that stablecoins (Tether and Circle) are already among the 20 largest holders of U.S. Treasuries, ahead of countries such as Saudi Arabia, South Korea, Israel, and Germany.

Therefore, in addition to regulatory risk, compliance, and the technology itself, the adoption of stablecoins in foreign trade would require small or none peg deviations. As observed in Figure 2, depeg appears to be declining, possibly because of the stronger use of Treasury reserves, greater transparency, and the increasing relevance of this instrument, as reflected in the rise in market value shown in Figure 1.

Replacing a financial institution - or, more likely, the adoption of stablecoins by financial institutions themselves as a means of receiving and sending funds across countries - could reduce costs and increase the speed of receipt. This practice could replace or improve current business models that rely on financial institutions or investment funds, such as the receivables market.

The third section of the article explores a scenario in which, through the use of stablecoins and receivables tokenization, it would be possible to replicate the traditional export receivables assignment instrument initially developed by Grupo Multiplica in mid-2019.

The article is divided into the following sections: 1. Introduction, 2. Methodology, 3. Data, 4. Results, and 5. Conclusion.

2. METHODOLOGY

The article is divided into three analytical cases, moving from a broader context to a more specific one.

Case 1 - Analysis of Bitcoin as Protection Against Currency Depreciation

This section starts from an initial value of USD 100.00 allocated across three alternative strategies: holding USD 100.00 converted into bolivars (VES), holding USD 100.00 in stablecoins, and finally holding USD 100.00 in Bitcoin. Log returns were used to obtain the price variation of the underlying asset, as shown in equation (1).

$$r_t = \ln\left(\frac{P_t}{P_{t-1}}\right) (1)$$

where r_t is the log return, P_t is the price of the underlying asset, and P_{t-1} is the price in the previous period.

For the price variable, the first difference was used as in (2).

$$\Delta x_t = x_t - x_{t-1} (2)$$

where $x_t$is the index being analyzed.

Drawdown is a risk metric that measures, at each point in time, the percentage decline of a strategy's accumulated portfolio value relative to its previous peak, as calculated in equation (3).

$$DD_t^s = \frac{Value_t^s}{Max\left(Value_1^s, \ldots, Value_t^s\right)} - 1 (3)$$

where DD_t^s is the drawdown measure for strategy (*s*) in period (*t*), and $Value_t^s$ is the portfolio value of strategy (*s*) in period (*t*). In summary, drawdown, a portfolio risk metric, can be understood as the maximum loss an investor may incur over a given period.

Two scenarios were used for the Bitcoin purchase strategy. The first consists of buying the position and holding the converted USD 100.00 from early 2018 to 2026; the second uses rolling windows across different investment horizons (3, 6, 12, 24, and 36 months), with the 12-month period shown in the article as the base case.

The 12-month rolling-window equation is calculated as in (4), where $FR_{t,12}^s$ represents the 12-month forward return window for strategy (*s*), calculated from period (*t*), and $Value_{t+12}^s$ represents the portfolio value 12 months ahead.

$$FR^{s}_{t,12} = \frac{Value^{s}_{t+12}}{Value^{s}_{t}} - 1 \quad (4)$$

Case 1.1 - Investment Comparison Between Bitcoin, CDI, and Dollarized Assets

In this scenario, the investment starts from BRL 100.00 allocated to CDI, dollar stablecoins, and Bitcoin purchase strategies, both in nominal and real terms. Although Brazil has not experienced a hyperinflationary environment since the adoption of the Real Plan in 1994, it still presents persistent inflation when compared with similar emerging countries.

Accumulated CDI ($Value^{CDI}_{t}$) is calculated in (5), where $Initial\,BRL$ is the initial value of BRL 100.00 and CDI_j is the monthly CDI interest rate annualized on a 252-business-day basis in month (t). The product accumulates monthly CDI returns from the initial period $(j)=1$ up to month (t).

$$Value^{CDI}_{t} = Initial\,BRL \times \prod_{j=1}^{t} \left(1 + \frac{CDI_j}{100}\right) \quad (5)$$

For the stablecoin position, equation (6) calculates the initial dollar amount ($USD\ Amount$), which corresponds to the initial value ($Initial\,BRL$) divided by the initial average selling PTAX ($PTAX_0$).

$$USD\ Amount = \frac{Initial\,BRL}{PTAX_0} \quad (6)$$

Therefore, the BRL value of the stablecoin position $Value^{USD}_{t}$ is the total amount obtained in (6) multiplied by the average selling $PTAX_t$ in month (t).

$$Value^{USD}_{t} = USD\ Amount \times PTAX_t \quad (7)$$

For the Bitcoin position, equations (8) and (9) calculate the initial amount of Bitcoin and the value of the position in (t).

$$BTC\ Amount = \frac{Initial\,BRL}{PTAX_0} \quad (8)$$

$$Value^{BTC}_{t} = BTC\ Amount \times BTCUSD_t \times PTAX_t \quad (9)$$

where $BTC\ Amount$ is the initial amount of BRL 100.00 divided by $PTAX_0$, and the value of the Bitcoin position $Value^{BTC}_{t}$ is the amount of Bitcoin multiplied by the Bitcoin price ($BTCUSD_t$) and converted by $PTAX_t$at (t).

Finally, equations (10) and (11) define, for each of the above strategies, the real value deflated by the accumulated IPCA index in period t.

$$IPCAIndex_t = \prod_{j=1}^{t} \left(1 + \frac{IPCA_j}{100}\right) \quad (10)$$

$$Value^{s,real}_{t} = \frac{Value^{s,nominal}_{t}}{IPCAIndex_t} \quad (11)$$

where $IPCAIndex_t$ is the product of the $IPCA_j$ inflation index for each month (t), and the real value $Value^{s,real}_{t}$ of strategy (s) corresponds to the ratio between the nominal value of strategy (s) $Value^{s,nominal}_{t}$ and the accumulated inflation index defined in (10).

Case 2 - Analysis of Stablecoin Flows and Treasury Yields Using VAR

Section 2.2 of the article refers to the analysis of flows through the market capitalization of USDT and USDC stablecoins, compared with the movement of yields on 90-day U.S. Treasuries. Given that Tether and Circle are the two largest stablecoin issuers and that the 1:1 parity of these is guaranteed mainly through the purchase of short-term U.S. Treasury securities (T-bills), the relationship between maintaining parity and the quantity of securities becomes crucial for these companies.

This section uses Granger causality and VAR methodology to assess whether there is any relationship between movements in the market capitalization of the stablecoins, that is, the inflow and outflow of positions in both stablecoins, and movements in 90-day T-bill yields, given the significant securities positions held by these companies.

In this analysis, it is important to highlight the relationship with market securities positions in the following aspects:

a) Given that the peg is guaranteed by holding these securities, it becomes vital for investors and foreign-trade flows to understand whether the companies will maintain such parities, thereby avoiding scenarios such as those observed in Figure 2;

b) Interest-rate movements can lead to declines in securities prices, resulting in negative mark-to-market effects on these positions;

c) It is important to assess which companies show greater adherence between the securities linked to peg maintenance, in this case T-bills, by analyzing the movement between purchases and sales of securities and changes in yield.

Ahmed and Aldasoro (2025) analyze the relationship between stablecoin flows and U.S. Treasury yields and find that a two-standard-deviation inflow into stablecoins lowers 3-month Treasury bill yields by 2.5 to 3.5 basis points.

Given the size of the stablecoin market (more than USD 264 billion), flow movements become a driver that could affect yields in these markets. Therefore, this relationship may indicate whether these companies have the necessary positions and appropriate procedures to sell and buy securities as stablecoin outflows and inflows occur.

This section sought, using other methodologies, to verify whether the movements found by Ahmed and Aldasoro (2025) would also be observed, thereby corroborating their findings.

Similar to Ahmed and Aldasoro (2025), current market capitalization relative to five business days earlier was used as the market-flow parameter, that is,

$$Flow_t^{s,5d} = \frac{MCap_t^s - MCap_{t-5}^s}{10^9} \quad (12)$$

where $Flow_t^{s,5d}$ represents the flow of the current market value $MCap_t^s$ for stablecoin *(s)* relative to the value five business days earlier $MCap_{t-5}^s$, in billions of dollars.

The variation in 90-day T-bill rates and the variation in the VIX follow equation (2).

The VIX was included in the VAR model as a control variable for risk and risk aversion, given that volatility directly affects both stablecoin positions and bond yields.

The VAR, calculated following Sims (1980), uses a methodology in which the vector of endogenous variables y_t in model (13) includes the aggregate flow of USDT and USDC, or the stablecoins separately.

$$y_t = \begin{bmatrix} Flow_t^{s,5d} \\ \Delta TBill_t \\ \Delta VIX_t \end{bmatrix} \quad (13)$$

The reduced-form VAR model of order (p) is estimated in (14),

$$y_t = c + A_{1\,y_{t-1}} + A_{2\,y_{t-2}} + \cdots + A_{p\,y_{t-p}} + u_t \quad (14)$$

where (c) is the vector of constants, (A) are coefficient matrices associated with the system lags, and u_t is the vector of model innovations. The lag order (p) is selected based on the Schwarz Bayesian criterion (BIC).

Granger-Wald causality tests (15) were applied to verify whether the lags of one variable help explain another variable in the system. The main hypothesis tested is whether stablecoin flows statistically precede changes in the 3-month Treasury bill.

$$\Delta TBill_t = c_1 + \sum_{i=1}^{p} \alpha_i Flow_{t-i}^{s,5d} + \sum_{i=1}^{p} \beta_i \Delta TBill_{t-i} + \sum_{i=1}^{p} Y_i \Delta VIX_{t-i} + u_{1t} \qquad (15)$$

$$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_p = 0 \quad (16)$$

$$H_A: \exists i \in \{1, \ldots, p\}: \alpha_i \neq 0 \quad (17)$$

The null hypothesis of test (16) verifies whether past stablecoin flows do not help predict changes in T-bill yields, while rejection of the null hypothesis (17) indicates that lags of stablecoin flows help predict changes in the T-bill.

Finally, impulse-response functions (IRF) are calculated to assess the dynamic response of the 3-month T-bill change to a shock in stablecoin flows. The response at horizon (h) can be represented by:

$$IRF_h = \frac{\partial \Delta TBill_{t+h}}{\partial Flow_t^{s.5d}} \quad (18)$$

The response originally estimated in (18) corresponds to the effect of a USD 1 billion shock. However, following Ahmed and Aldasoro (2025), in which the researchers used a USD 3.5 billion flow as the benchmark, and for comparison purposes, the responses were rescaled to a USD 3.5 billion shock, as in (19).

$$IRF_h^{3.5bn} = 3.5 \times IRF_h^{1bn} \quad (19)$$

The IRFs were calculated over a 30-business-day horizon, with 95% confidence intervals obtained through 1,000 bootstrap simulations. In addition, ADF tests were used to assess stationarity, Portmanteau tests were applied to evaluate residual autocorrelation, and the stability of the VAR models was checked through the root stability condition.

Case 3 - Product Proposal: Tokenization of Export Receivables

Because this is a proposal for structuring a new product through receivables tokenization, no econometric estimation is performed.

3. DATA

The data used in the analysis of Case 1 cover the period from February 5, 2018 to June 3, 2026. Daily Bitcoin and VES (Venezuelan bolivar) quotations were obtained from the Bloomberg terminal. Regarding the Venezuelan bolivar, because the series suffered from monetary redenominations and scale changes, an adjustment procedure was applied to make the time series more continuous and free from abrupt jumps and value changes. The adjustment selects, for each observation, the scale that minimizes the variation relative to the adjusted value in the previous period, reducing artificial breaks associated with changes in the monetary unit.

For Case 1.1, monthly data from January 2018 to April 2026 were used for the Exchange Rate - Free Market - U.S. dollar (selling) - Period Average - Monthly (series code: 3698), the Broad National Consumer Price Index - IPCA (series code: 433), and the accumulated monthly CDI interest rate annualized on a 252-business-day basis (series code: 4392), obtained from the Central Bank of Brazil website. Bitcoin quotations were obtained from the Bloomberg terminal and converted into monthly averages based on daily prices.

For Case 2, the daily database covers the period from January 9, 2020 to June 11, 2026. USDC and USDT quotations were obtained from the Bloomberg terminal, and the CBOE Volatility Index - VIX (series code: VIXCLS) and the Market Yield on U.S. Treasury Securities at 3-Month Constant Maturity (series code: DGS3MO) were obtained from the Federal Reserve Bank of St. Louis (FRED). Daily market capitalization and total volume data for USDC and USDT were obtained from CoinGecko. Although CoinGecko provides flow data since 2015, volume movements became larger and more significant from 2020 onward; therefore, this year was adopted as the starting point of the analysis. Ahmed and Aldasoro (2025) began in 2021, but this article chose to use 2020 data, which already showed robust flow behavior.

The models were estimated using the R platform, with the *vars* package for the VAR, IRF, and stability tests; the Granger-Wald test was implemented using the VAR equation results from the *vars* package applied to the specific equation (15) through the *car* package; and the *urca* package was used for lag selection in the ADF tests.

4. RESULTS

Case 1 - Analysis of Bitcoin as Protection Against Currency Depreciation

The first case analyzed in the article sought to highlight one of the paradigms of Bitcoin's use: store of value through individual sovereignty. Unlike fiat money, which is subject to government control, potentially expandable supply, and possible inflationary loss of value, Bitcoin, based on the principle of sound money, without government control and with supply limited to 21 million units, would have the ability to preserve value, especially in economies facing severe inflation problems, such as countries in Latin America and Africa.

The study starts from the extreme case of Venezuela, where, due to hyperinflation, holding or saving resources in local currency would lead to a loss of purchasing-power parity. The study by Hanke and Bushnell (2016) showed that Venezuela entered the Hanke-Krus World Hyperinflation Table after exceeding the hyperinflation threshold, defined as an inflation rate equal to or above 50% for 30 consecutive days, with a peak monthly rate of 221%. By then, the study had identified 56 hyperinflationary episodes worldwide since World War I, showing the damage caused by currency destruction, with Brazil included in the list in 44th position.

Ammous (2018), in his detailed book on the role of monetary decentralization, discusses the role of government in controlling money and the resulting harms: “Government control of money has turned money from being the reward for producing value to the reward for obedience to government officials. Government can confiscate money from the banking monopolies it controls, inflate the currency to devalue holders’ wealth and reward it to the most loyal of its subjects, impose draconian taxes and punish those who avoid them, and even confiscate bills.”

For an economy such as Venezuela, achieving some form of stability in sound money, in which investors themselves have control without depending on the government and within a free market, would be extremely necessary. Bitcoin, as a form of global digital money through which transactions can be made without government intervention or permission, could provide Venezuelan citizens with greater control over their own savings, transactions and monetary decisions.

Antonopoulos (2019), in the lecture series later published as a book, states that populations in countries such as Argentina, Venezuela, Brazil, Turkey, and Ukraine, which suffer from inflationary environments and currency devaluation, may have an option that is not only a non-confiscable currency with easy international transferability, but also a way to “virtually exit the economy, transact in another currency, and create a parallel microeconomy in their community”.

Given the above arguments that Bitcoin could be a necessary exit for the population in a scenario of hyperinflation or high inflation, Case 1 of the article proposes to analyze, in the context of Venezuela's hyperinflation, what would be better for a resident of that country: to keep reserves in local currency, hold a stablecoin, or buy Bitcoin, despite the high price volatility of this market.

Another point is to assess whether a simple buy-and-hold Bitcoin strategy would be prudent in periods in which Bitcoin experienced high volatility or sharp declines, the so-called crypto winter.

Figure 3 shows the adjusted Venezuelan bolivar series, considering the adjustment required to correct several structural breaks in values over time (currency redenominations and changes in value), such as in 2021, when the sovereign bolivar was changed to the digital bolivar with six zeros removed. For example, if the quotation before October 1, 2021 was VES 1 million, on the day the digital bolivar was adopted it would become VES 1.00.

The adjustment made to the series to avoid breaks was to maintain the pre-redenomination parity (in the previous example, multiplying by 1 million). The logarithmic scale in Figure 3 shows the sharp depreciation of the currency more smoothly, from scales of 10^1 to 10^8 in approximately eight years.

Figure 4 shows the three strategies used, in which the investor could hold the currency in VES, suffering an almost total loss of the equivalent USD 100.00 converted; hold USD 100.00 in a stablecoin, preserving the USD 100.00 over time; or finally, buy the equivalent of USD 100.00 in Bitcoin in 2018, corresponding to 0.014083 unit. The initial amount of VES was converted at the rate of 1 USD:0.8056 VES = 80.56 VES.

The expected result in a buy-and-hold strategy was exactly as anticipated: the Venezuelan currency lost virtually all its value due to inflation, while Bitcoin appreciated by approximately 840% over the period, clearly becoming the best strategy. In this case, it would have been advisable for the Venezuelan population to buy Bitcoin instead of holding VES.

However, as expected, it is necessary to analyze the Bitcoin purchase from a risk perspective using the drawdown methodology (3), given that Bitcoin exhibits strong volatility and sharp price changes. In the Bloomberg daily price sample from February 5, 2018 to June 3, 2026, using (1) to obtain returns, Bitcoin's **daily volatility was 3.923%,** with a maximum percentage drop of **31.728%** on March 12, 2020, known as the Covid Crash, when Bitcoin lost around 50% in two days, according to Rooney (2020).

As shown in Figure 5, Bitcoin's drawdown reached levels in some periods that were as severe as the depreciation of the Venezuelan currency. Obviously, the currency followed a continuous path of value loss in one of the most severe recent hyperinflation episodes in the world (according to Hanke and Bushnell (2016), among 57 locations, in the post-2000 period only Zimbabwe in 2007, ranked 2nd, was ahead of Venezuela in 2016, ranked 23rd. All other episodes occurred before 2000).

The maximum drawdown in the sample was 76.80%, when the price of 221.5405 on November 9, 2022 was divided by the maximum of 953.8837 on November 9, 2021. However, several episodes of sharp declines followed by strong recoveries and increases can be observed. Depending on the magnitude of the monetary loss caused by inflation, a short-term Bitcoin strategy could even be riskier than holding the local currency.

Another possible scenario evaluation is to examine returns over short-, medium-, and long-term strategies. Bitcoin delivered exponential returns if an investor had bought and held the position for several years (the previously mentioned 840%). According to equation (4), returns were calculated for 3, 6, 12, 24, and 36 months, with Figure 6 highlighting the intermediate 12-month position.

Figure 6 shows a daily rolling window for an investor who buys USD 100.00 in Bitcoin at date (t) and holds it for 12 months ($t + 12m$); on the following day, at ($t+1$), the investor makes a new USD 100.00 Bitcoin purchase and holds it for another ($t + 12m$), and so on. Values above 0% represent positive returns (gains), while values below 0% represent negative returns (losses). In 2020, for example, the one-year forward return exceeded 1,000.00%; in other words, after one year the Venezuelan investor would have more than USD 1,000.00, whereas in the stablecoin strategy the value would remain fixed at

0% (the same USD 100.00). Regarding the local currency, as can be seen, holding VES for one year usually represents a negative return.

However, reinforcing that Venezuela represents a severe hyperinflationary scenario, between 2021 and 2022 the Bitcoin loss exceeded the loss from holding Venezuelan bolivars. This Bitcoin movement, probably associated with the 2022 crypto winter due to the Terra/Luna and FTX collapses, shows that investors must pay attention to timing.

Figure 7 analyzes the strategies using rolling windows of 3, 6, 12, 24, and 36 months, in which negative returns are verified across the periods. Probability is calculated as the number of negative returns in the period divided by the total number of sample returns. In this scenario, it becomes clearer that the short-term Bitcoin strategy (3 months) is much riskier than a longer purchase strategy with a 12-month or longer rolling period. In the quarterly rolled portfolio, the probability of loss in Bitcoin reached almost 50%.

Therefore, there is evidence that it would be better for a resident of a country with a severe inflation problem to buy and hold Bitcoin as a store of value. At the same time, the investor must pay attention to Bitcoin holding timing, given the high volatility and probability of loss associated with this cryptocurrency. Short-term strategies proved to be extremely volatile and associated with a high probability of loss. For example, if the investor wants to convert local currency into Bitcoin and use the cryptocurrency as a means of payment, this strategy would not be recommended because it could generate losses greater than the inflationary loss of the local currency itself.

Given the evidence regarding the use of Bitcoin as a store of value over longer horizons in inflationary countries, another question arises for investors or residents of a developing country with high inflation, high interest rates, and a medium-sized economy: would it be worthwhile to hold Bitcoin as an investment strategy, again from the perspective of risk, return, and portfolio holding horizon?

Brazil was chosen for this Case 1.1 analysis because it has these characteristics of high inflation and high interest rates. In the observed period from January 2018 to April 2026, Brazilian inflation measured by IPCA was 0.4368% per month (5.3694% per year), and the monthly CDI was 0.7144% (8.9178% per year). This period included the COVID pandemic, when Brazil's policy rate reached a historical low of 2.00% per year. The annual rate of 8.92% is historically low for the period of economic stability that began after the adoption of the Real Plan in 1994. The database was calculated according to equations (5) to (10).

Figures 8.A and 8.B show the investment returns for the local investor's initial BRL 100.00, in nominal and real terms. Accumulated IPCA inflation over the period was 54.50%. Bitcoin delivered the best return, at 806.7%, compared with 103.7% for CDI; however, this result includes the effect of exchange-rate variation. If a position in which the investor hedged against a fall in the dollar is considered, the return would be 478.4%. In real terms, applying equation (11), Bitcoin's return was 486.8%, compared with 31.8% for CDI. It is worth noting that if the exchange rate had appreciated, the result, despite the rise in the Bitcoin price, could have been significantly impaired.

Figure 9 shows the drawdown of the deflated strategies. Because the data are monthly, Bitcoin movements are somewhat smoother than in Figure 5, although similar. The maximum drawdown was 75.40% for Bitcoin, 9.2% for CDI, 35.10% for the local currency, and 37.6% for the stablecoin.

Figure 9 was deflated in order to show the investor the investment-return options when considering Brazil's high inflation. In this case, CDI appears as the most conservative option, although not the one with the best return, reflecting the investor's purchasing power. Bitcoin displays its well-known high-volatility characteristic, in which, depending on investment timing, losses of more than 75% relative to the previous maximum price are observed, but with returns much higher than CDI. The stablecoin absorbs exchange-rate risk, which is significant in Brazil, and also shows high volatility. Holding reais, although smoothed by the lower volatility of inflation, implies a constant loss of value.

Analyzing the rolling windows in Figure 10 and considering a 12-month holding position, Bitcoin stands out between 2018 and 2020, with returns above 800% in nominal terms. However, upon entering the crypto-winter period, the return falls, remains contained, and ends below all strategies at the end of the sample. Once again, also for the Brazilian investor, timing appears to be the best strategy, as in certain periods holding the investment for one year in Bitcoin would represent an opportunity for extraordinary gains, but with great caution.

Figure 11 presents the real probabilities of loss for the rolling-window strategies of 3, 6, 12, 24, and 36 months. The scenario differs from that previously observed in Figure 7 for Venezuela, where the strategy for that country is to dollarize or buy Bitcoin to avoid the loss of purchasing-power parity; in Brazil, despite high inflation, the scenario is to assess the best investment strategy for the investor.

Figure 11 shows that, in real terms, CDI presents higher probabilities of loss in the short and long term in periods in which accumulated inflation exceeds accumulated CDI, in addition to the interest-rate reduction between 2018 and 2020 (pandemic). Holding idle reais leads to a 100% probability of loss, given that the investor only loses purchasing power by keeping resources idle in an account due to inflation. In the case of Bitcoin, the probability decreases over the horizon, with the key point that, in longer horizons from two years onward, the probability of CDI loss due to inflation is higher than that of Bitcoin. Holding stablecoins is a risky strategy due to the combined loss arising from Brazilian inflation and exchange-rate exposure. Appendix 1 shows the complete table of results for the strategies in Figure 11.

The results of Cases 1 and 1.1 indicate that holding Bitcoin offers clear advantages for economies suffering some type of currency value loss due to inflation. However, there may be scenarios in which holding Bitcoin is even worse than holding the local currency; that is, it would not make sense for a citizen of such an economy to use Bitcoin as a short-term means of payment, but rather as long-term protection. The use of stablecoins preserves the citizen's resources by maintaining USD 100.00 as the base value.

When Bitcoin is used more as an investment than as protection in developing economies, it presents a probability of high returns and losses in the short term compared with the stability of investments in local interest rates. However, when real returns are considered, in an emerging economy with high inflation and interest rates, Bitcoin over longer horizons may even be a strategy with a lower probability of loss than investing in local interest rates, although still subject to negative impacts from inflation shocks (in the sample of 100 monthly observations, there were 29 months in which monthly IPCA exceeded monthly CDI).

Case 2 - Analysis of Stablecoin Flows and Treasury Yields Using VAR

Case 2 represents an additional analysis to that conducted by Ahmed and Aldasoro (2025). In addition to seeking to verify whether there is a contagion effect between stablecoin market capitalization and the 3-month Treasury Bills market, and vice versa, the article shows the cumulative effect for the two main stablecoins in the market, USDT and USDC, which have around USD 264 billion in market value, both in aggregate and separately. The main context is to evaluate whether, in relation to the leading stablecoin, Tether's USDT, which recently announced plans to improve market transparency for investors, this condition would be maintained.

For an investor holding both stablecoins, the choice between USDT and USDC may not be especially relevant in normal market conditions. In foreign trade, however, the choice becomes more important. As discussed in Case 3, export transactions may involve the receipt of payments from foreign companies, and a temporary depeg could generate financial losses at the moment of settlement. Therefore, identifying which stablecoin presents lower peg and reserve-management risk is relevant for mitigating potential losses, especially in periods of market stress such as those observed during the Terra/Luna and FTX episodes.

Figure 12 shows that USDT volume grew significantly between 2021 and 2022, probably in response to the post-COVID period and excess liquidity. After 2025, growth could be linked to a post-election rally following Donald Trump's election and to U.S. regulation through the GENIUS Act.

Figure 13 presents flows on a 5-day basis, according to equation (12). From 2021 onward, flows into stablecoins increased significantly. The chart also shows the 2022 events, which affected the flows of both stablecoins; however, in 2023 and 2025, opposite movements are observed, when there was migration from one to the other, in this case from USDC to USDT in 2023 and vice versa in 2025.

The VAR model in (13) and (14), in addition to using market capitalization and T-bill variables, also includes the VIX as a variable for analyzing investor risk sentiment.

Figure 14 shows the history of the 3-month T-bill rate and the VIX. It is possible to observe the increase in U.S. interest rates after the COVID pandemic, the VIX shock during the pandemic, and the Trump administration's tariff policy in 2025. The VIX is a market risk-sentiment variable, popularly known as the Fear Index, precisely because upward movements usually generate financial losses for investors.

Given the rapid growth of USDT and USDC from 2024 onward, as shown in Figures 1 and 12, and the concern with depeg shown in Figure 2, maintaining consistent reserves became essential. In this scenario, short-term U.S. Treasury securities are the best option, and Tether and Circle have come to hold significant volumes of securities in the market. According to the State of Crypto 2025 report, the stablecoin market is now among the 20 largest holders of Treasuries.

Unlike countries that hold foreign securities as part of central-bank foreign-reserve management, where buying and selling decisions tend to be more stable and consistent with the need to maintain strategic reserves, stablecoin companies may be affected by news that threatens the 1:1 peg. In a herd-effect scenario, it could be necessary to sell securities rapidly and on a large scale in order to maintain the peg, reduce volatility, and reassure investors.

In addition to this parity condition, which could also affect securities rates, as will be seen below, two other important implications arise from this new model of acquiring securities to back stablecoins.

Jointly, Tether and Circle, assuming that they hold mostly T-bills because these are considered among the lowest-risk securities in the global market, would receive interest income from those securities. In this case, an estimated revenue, for example, based on USD 264 billion at a 4% yield, would generate around USD 10 billion in annual interest simply by maintaining that reserve. At the same time, as shown in Figure 14, rates were close to 0.00% in 2020 and rose to more than 4%, generating a negative duration and MTM effect on these companies' portfolios, as shown in Table 2.

Therefore, stablecoin companies face a scenario in which they may sell securities with negative MTM in stressful moments when interest rates rise; when rates fall, because part of the reserves is held in short-term securities precisely to keep risk low, they lose revenue from holding securities that pay low interest.

Table 2 presents a reserve sensitivity scenario, showing that rates at 1% generate interest revenue of USD 2.6 billion, while rates at 5% generate approximately USD 13 billion. However, the increase in interest rates, based on the analysis of price-unit variation for each 1% increase, shows a loss of approximately USD 2.6 billion per percentage point. Considering only the increase from 1% to 5%, the accumulated annual loss on this position reaches USD 10 billion.

Finally, given that there is no record that both companies use derivatives to control risk in a rising-interest-rate scenario, it can be considered that there is **interest-rate exposure**. Even though the portfolio is short-term and composed of very safe securities, these positions are not immune to changes in U.S. interest rates (Fed Funds).

According to Equations 13 and 14, VAR models were estimated for three variables: stablecoin flows, changes in the 3-month T-bill, and changes in the VIX. The ADF stationarity tests for the series in levels and first differences, as well as the lag-selection criterion for the VAR model using BIC, are presented in Appendix 2. The series used in the model were stationary, and the BIC criterion selected 6 lags.

The complete VAR results for the three variables and the six lags are presented in Appendix 3, as are the multivariate Portmanteau tests, which reject the null hypothesis of no serial autocorrelation. In other words, the model residuals exhibit joint autocorrelation, requiring caution in the inference results of the VAR model, although this does not affect the interpretation of association among the variables. Because stablecoin flows, the T-bill, and the VIX may respond simultaneously to common shocks, both internal and external to the model, the results should be interpreted as reduced-form evidence of temporal association rather than as a fully identified causal effect.

Table 3 summarizes the Granger-Wald causality tests obtained from the VAR equations. There is statistical significance for Flow helping to explain changes in the T-bill in the USDC + USDT and USDC models. However, for the USDT model, the reverse flow was observed, in which changes in the T-bill would help explain USDT flows, which could reflect differences in the client base, the composition of securities, or liquidity management.

For the remaining parameters, in which T-bill movements would help explain the VIX and vice versa, the expected results were obtained given the interaction between these two indices. However, regarding VIX against Flow, statistical significance was found for USDC, which may suggest greater sensitivity of its flows to episodes of market volatility. This does not occur for USDT, perhaps because it has a more global client base, greater use on offshore exchanges, or a broader role as a liquidity instrument in the crypto market due to its larger market value.

Finally, using the data jointly makes the causality analysis more difficult, as the stablecoins apparently have distinct dynamics. Therefore, it would be more appropriate to analyze the two stablecoins separately rather than jointly, in order to capture these differences.

For a company or bank that intends to use stablecoins as a financial settlement mechanism for export receipts, USDC would apparently be the better choice because it presents the expected result in this simplified analysis, while also reflecting other known factors such as public audits of reserves, greater institutional transparency, and regulatory adherence.

Table 4 summarizes the VAR and Granger-Wald causality results. As presented in Table 3, the causality tests indicate that Flow Granger-causes T-bill for the USDT+USDC aggregate and for USDC at the 5% significance level, and that, for USDC, T-bill Granger-causes Flow at the 1% significance level. The number of VAR lags selected by BIC was 6, with the same number of observations. Adjusted R-squared results are around 8.8%, and the largest model root was below 1.00, reinforcing VAR model stability.

The complete results for all VAR equations for the three variables are presented in Appendix 3.

The last two columns show the impulse-response function results of the VAR model, in which a USD 3.5 billion shock to Flow would imply a minimum impact of -1.176 basis points for the aggregate and -1.918 basis points for USDC, therefore larger than the USDT impact of -0.751 basis points. Over the 30-day cumulative horizon, the results were -13.08, -18.403, and -8.61 basis points, respectively. The result is in line with Ahmed and Aldasoro (2025), who concluded that 'we find that 5-day stablecoin inflows of $3.5B, or 2 standard deviations, lower 3-month T-bill yields by about 2-2.5 basis points (bps) within 10 days'.

Figure 15 shows the impulse-response functions for USDT + USDC, USDT, and USDC for a USD 3.5 billion shock to flows, according to equations (18) and (19).

The results over the first 5 days are more volatile and differ across stablecoins. On the first day, while a USD 3.5 billion shock to USDT Flow generates an increase of 0.727 basis point, for USDC the opposite occurs, with a decline of 1.41 basis points. Given that the flow base represents the weekly variation according to equation (12), the short-term impact is most visible on this first day of the chart. Appendix 3 presents the impulse-response functions separately, including confidence intervals calculated by bootstrap with 1,000 repetitions.

The IRF results also support a preference for using USDC instead of USDT, for the same reasons already mentioned in the conclusion of the Granger tests.

Having completed this analysis, which identified through the Granger causality test and the IRF function that the expected movement of USDC purchase flow generates a negative impact on the 3-month T-bill yield, Case 3 uses this stablecoin as the basis for receiving export flows in the export receivables tokenization project.

Case 3 - Product Proposal: Tokenization of Export Receivables

Defining the creation of a product through an innovative technology involves assuming risks that developers often do not initially perceive.

There are examples of innovative solutions, such as Bitcoin and PIX, that brought new benefits as they developed and grew, but also introduced new risks.

Bitcoin, developed by Nakamoto (2008), enabled the first peer-to-peer system that is decentralized, 24/7, scarce, censorship-resistant, cryptographically secure, auditable on the blockchain network, mathematically secure against possible attacks, and capable of increasing efficiency and reducing costs.

Case 1 of this article shows precisely one of Bitcoin's main benefits as a way for citizens to protect themselves against the loss of value of their local currency when their country's economy faces hyperinflationary difficulties, without depending on any financial intermediary or government. This is exactly the peer-to-peer concept with which Nakamoto (2008) begins his white paper: "A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution".

However, as would be natural for any new and innovative product that has achieved great success, Bitcoin presented some risks possibly not measured by its creator, such as high volatility, which would limit precisely what Nakamoto discussed in the paragraph above about using Bitcoin as a peer-to-peer version of electronic cash (see Baur and Dimpfl (2021)); the increase in intermediaries in a transaction where they should not exist (see BIS (2023)); the incentive risk of miners acting in collusion (see Eyal and Sirer (2018)); or correlations between crypto-assets, corruption, and capital controls (Alnassa et al. (2022)).

In the case of PIX, created by the Brazilian Central Bank, the system made it possible to carry out instant bank transfers and payments 24/7, at no cost to citizens, with extremely simple and secure operation (users only need to register a personal key at the bank). However, the BCB recently had to improve the Special Refund Mechanism (MED), given the rise in scams (more sophisticated due to advances in AI), fake bank payment slips, and the need to limit PIX transfer amounts. The report by the Brazilian Forum on Public Security (2025) points precisely to the increase in scams via PIX or fake bank payment slips, from 10.80% in 2024 to 14.3% in 2025, with estimated financial losses of around BRL 28.8 billion and approximately 24 million people affected. In Chapter 7, 'The Professionalization of Fraud', the report addresses the use of fintechs and betting companies for money laundering by organized crime, involving PIX and cryptocurrencies.

Stablecoins were introduced to minimize Bitcoin's volatility risk by establishing a 1:1 peg to a currency, physical asset, or digital asset. As the market expanded, as shown in Figures 1 and 12, unexpected events, illustrated in Figure 2, contributed to the adoption of improved regulatory frameworks. The BIS (2023) report specifically discusses, in section 3.1.2, the search for a nominal anchor, stating that ".... they are subject to an inherent conflict of interest whereby issuers are incentivised to invest in risky assets. The robustness of stablecoin stabilisation mechanisms hence depends crucially on the quality and transparency of their reserve assets, which are often lacking.... In addition, they benefit neither from the regulatory requirements and protections of bank deposits and e-money, nor from ... central bank. Moreover, ... their exchange rate can fluctuate away from par."

Financial innovations usually emerge to solve a specific inefficiency, but their most relevant risks tend to appear only after adoption and scale are achieved. Bitcoin, for example, was conceived as a peer-to-peer electronic cash system, but its evolution revealed a risk that was not central to the original design: extreme price volatility, which brought it closer to a speculative asset than to a stable means of payment, in addition to the increase in intermediaries or the possibility of miners acting jointly. Similarly, PIX and tokenized financial products increase technological efficiency, reduce costs, structures, and inefficiencies, and democratize investment, but they do not eliminate later risks that were unidentified or only initially mitigated. Stablecoins, therefore, do not appear to be as stable as they promise.

The receivables-purchase product has been growing in the Brazilian market. ANBIMA recently developed a data platform for Credit Rights Investment Funds (FIDCs) in order to meet the growing demand for information on this product, which is expanding in the Brazilian market, as shown in Figure 16.

According to Bompan (2025), Grupo Multiplica carried out the first export receivables purchase transaction through a FIDC. The initial difficulty of this product was to transform an international transaction, with foreign-currency exposure (usually dollars), into a receivable transaction in reais with regulation and approval by CVM, the administrator, and the manager.

Export transactions at Grupo Multiplica began in 2019. The product was internally improved with the development of the Beyond system as the operational and settlement control pipeline.

Structuring an export receivables purchase transaction basically involves eight different institutions: the client (Cedente), the client's customer (the importer or Sacado), the financial consultancy (Grupo Multiplica), the fund manager (Multiplica Capital), the fund administrator, the digital-signature portal for the assignment agreement, a bank that acts as counterparty for the currency-exposure hedge, and another bank for settling the foreign currency paid by the Sacado.

The number of institutions involved in structuring the transaction already highlights the complexity required to carry out a structured receivables-anticipation transaction. Obviously, the costs incurred by the client tend to be high, as is generally the case in credit transactions in the Brazilian market, where the banking spread is elevated due to several factors, such as:

- default (credit risk),
- high tax burden,
- operational and administrative costs,
- funding cost (the base rate is the high CDI interest rate),
- legal cost (slow judicial proceedings and enforcement of guarantees),
- information asymmetry (risk of correctly assessing the borrower's credit),
- macroeconomic risks and Brazil risk (monetary policy, fiscal policy, Brazil's risk premium for investors),
- high banking concentration (less competition),
- political and legal risk,
- the spread itself (the institution's profit margin, in this case, the minimum percentage the fund must pay its investors).

The factors above are the main ones, but other factors may also indirectly affect the cost structure. In the specific case of investment funds, unlike financial institutions, the market is more competitive and less concentrated. In the specific case of credit funds, the analysis is even more complex because they present substantial risk. From the investor's point of view, the main metric considered is return versus risk (Sharpe, for example), and the manager establishes, according to the fund's bylaws, the expected return and how it will be achieved while seeking to reduce the fund's risk (PDD).

If the fund does not present good profitability or if it has risk above peers without a corresponding return, redemptions may occur. Therefore, initiatives that seek to reduce structure or operational costs are required by investors as well as by creditors and debtors.

If it is possible to tokenize export receivables in credit funds, given that traditional receivables have already been tokenized in FIDCs, some of the steps described above could be reduced, costs could be mitigated, and, finally, given the reach of blockchains, the client base for these transactions could be expanded, enabling access for smaller companies that unfortunately cannot currently obtain loans through a FIDC, either because the limit is too small to justify the transaction given its complexity or because the cost is too high.

Table 5 and Figure 17 summarize the main stages of the export receivables purchase transaction.

The analysis below represents a proposal for the tokenization of export receivables.

The legal, default, stablecoin-use, and hedge aspects are highlighted.

As in the traditional transaction flow, the stages are presented in detail, although not in table format, because more detailed explanations are required.

The product proposal below was prepared with AI assistance, according to the disclosure in Note 1.

- **Proposed structure**

The proposed product replaces the FIDC-centered structure with a tokenized credit structure in which the export receivable is represented by a digital token. The financial consultancy would remain responsible for origination, credit analysis, document validation, pricing, and operational monitoring. The tokenization platform and the smart contract would register the token terms, investor rights, covenants, payment waterfall, and default triggers. The product is designed as a conceptual structure, not as a legal opinion or ready-to-launch product.

- **Initial operational stages**

Origination and credit analysis

The Cedente / Exporter requests anticipation of an export receivable. The consultancy evaluates the export documents, the importer, the credit limit, eligibility criteria, pricing, and minimum return required by investors.

Compliance and wallet screening

Before token issuance, the participants and wallets are screened for KYC/KYB, AML/CFT, sanctions, illicit exposure, and source-of-funds risk. Chainalysis or an equivalent blockchain analytics provider could be used for address screening, transaction monitoring, and VASP/counterparty risk assessment.

Token setup

The tokenization platform creates the digital representation of the receivable. The smart contract stores the economic terms, investor allocation, maturity, expected yield, collateral, covenants, milestone rules, transfer restrictions, and default procedures.

Hedge execution

The NDF hedge remains with the hedge counterparty bank because a fully digital and regulated NDF infrastructure is not assumed. The hedge could be booked directly by the consultancy, rather than by the asset manager, but the hedge cash flows must be incorporated into the smart contract waterfall.

Funding and DvP disbursement

Whitelisted investors subscribe to the token. Funds are locked in escrow and released to the Cedente only when pre-defined conditions are met. The DvP logic reduces settlement risk because token delivery and cash disbursement are conditional on each other.

Export monitoring

Export milestones may be used to mitigate credit risk: goods placed at port, shipment confirmed, shipping documents validated, arrival confirmed, and payment due date reached. Disbursement can be full at D0 or released in tranches as milestones are met.

Settlement in stablecoin / FX rail

The importer pays the export amount through a stablecoin or equivalent digital settlement rail, with Braza Bank or another regulated partner acting as the stablecoin/FX settlement bank. The bank notifies the consultancy, which validates the receipt and documents.

Repayment waterfall

After settlement, proceeds are allocated according to the smart contract waterfall: hedge adjustment/reserve first, investor principal and yield second, fees and residual amounts third. If the NDF adjustment is positive, the hedge bank pays into the waterfall; if negative, the amount is paid from a pre-funded reserve.

Default handling

If the importer does not pay, the Cedente remains liable. The smart contract triggers default notices, freezes or restricts secondary transfers, activates guarantees, applies penalties, and starts collection and legal recovery procedures.

- **Treatment of the NDF hedge adjustment**

The most delicate cash-flow point is the settlement of the NDF hedge. In the current FIDC structure, the hedge adjustment is reconciled during final liquidation. In the tokenized structure, the same principle must be explicitly programmed into the waterfall. The proposed solution is to create a hedge reserve or a first-priority hedge settlement step before investor repayment. If the BRL depreciates and the hedge produces a positive adjustment, the amount is credited to the settlement account and increases the available cash to repay investors. If the hedge produces a negative adjustment, the payment to the hedge bank is deducted before investor distribution. This prevents a mismatch in which investors are paid before the FX risk is settled.

- **Is a custodian or administrator still necessary?**

The tokenized structure would not necessarily require a fund administrator in the same role as in a FIDC. However, a custody or fiduciary function remains advisable. The main reason is that the receivable, export documents, bank accounts, guarantees, and credit recovery rights remain partly off-chain. A smart contract can automate cash-flow allocation, but it cannot by itself prove the legal existence of the receivable, enforce claims in court, replace AML controls, or safeguard private keys. Therefore, a digital asset custodian, collateral agent, or trustee-like service provider should be included, even if the number of layers is smaller than in the traditional structure.

- **Legal and regulatory framing**

The product should be presented as a conceptual proposal subject to legal, tax, regulatory, and FX validation. The most relevant points are:

Tokens linked to receivables or fixed-income cash flows may be characterized as securities in Brazil, especially when offered publicly and when investor return depends on the effort of the issuer, structurer, cedent, or another third party.

CVM/SSE Circular Letter 4/2023 is directly relevant because it discusses receivables tokens and fixed-income tokens, and indicates that certain offers may fall under CVM Resolution 88/2022 or securitization rules.

If the token is offered publicly, the issuer, structurer, and platform must evaluate CVM rules on public offerings, crowdfunding, securitization, custody, bookkeeping, registration, settlement, and organized markets.

Law 14,478/2022 and Decree 11,563/2023 are relevant to virtual asset service providers and the Central Bank perimeter, but tokenized securities and tokenized credit rights may also remain under CVM jurisdiction depending on their economic substance.

Because the structure involves exports, foreign exchange, stablecoin settlement, and NDF hedging, BCB foreign-exchange rules must be analyzed separately. Current eFX and virtual-asset rules may limit or condition the use of stablecoins in regulated cross-border settlement flows.

Secondary market trading should be treated as a potential feature only. Transfers should be restricted to whitelisted investors, with KYC/AML, suitability, market-conduct controls, and smart-contract transfer restrictions.

- **Proposal-specific references**

ABcripto (2025), ANBIMA (2002), BCB Resolution No. 561/2026, Brazil. Law No. 14,478/2022, Brazil. Decree No. 11,563/2023, Chainalysis (2026), CVM (2023), CVM Resolution No. 88/2022, CVM Resolution No. 160/2022, OECD (2020).

The proposed tokenized structure seeks to transform export receivables financing into a programmable credit instrument. Instead of using a FIDC as the investment vehicle, the export receivable would be represented by tokens issued on blockchain infrastructure, with investor rights, eligibility criteria, payment waterfall, covenants, and default triggers embedded into smart contracts.

The financial consultancy would remain responsible for origination, credit analysis, pricing, documentation, and operational monitoring, while a tokenization platform would register and distribute the tokens to whitelisted investors.

A regulated stablecoin or FX settlement partner, such as Braza Bank or an equivalent institution, could be used to support the foreign-currency settlement leg, while the NDF hedge would remain with a traditional hedge counterparty bank until a regulated digital derivatives infrastructure becomes available.

In this design, tokenization does not eliminate the need for governance, custody, compliance, and legal enforcement; rather, it reduces selected operational layers and reallocates responsibilities toward smart contracts, digital custody, blockchain analytics, and regulated settlement providers.

The main expected benefits are lower operational friction, fractionalization, broader investor access, greater traceability, and faster settlement. The main risks are legal classification as a security, FX and stablecoin regulation, default by the cedent or importer, smart-contract vulnerabilities, custody of private keys, AML/CFT controls, and the enforceability of off-chain rights represented on-chain.

5. CONCLUSION

Since 2008, with the creation of Bitcoin, the world of finance has entered a new phase, with the constitution of digital money and decentralized blockchain infrastructure. This appears to be an enduring trend that presents a series of improvements over traditional finance.

Decentralization, value protection, expansion of the user base, greater security, digital auditability, and many other possibilities may be associated with DeFi.

Bitcoin as the pioneer cryptoasset, introduced a borderless form of digital money that allows individuals to transfer and store value without relying directly on government-controlled monetary systems. Countries facing fragile macroeconomic conditions, such as Venezuela in recent years, may therefore benefit from the use of Bitcoin as an alternative store of value. The empirical results suggest that buy-and-hold strategies may have supported capital preservation for Venezuelan citizens. However, short-term operations or the use of Bitcoin as a means of payment may expose users to significant volatility and, in some periods, to losses greater than those associated with simply holding the local currency.

The use of Bitcoin as an investment has been widely discussed, given the high volatility of this asset. Using Bitcoin as an investment in developing countries with high interest rates and inflation, such as Brazil, can lead to surprising gains. However, short-term operations are not recommended given the asset's volatility. Over longer horizons, when investments are evaluated in real terms, Bitcoin also proved to be an attractive alternative for investors, with a lower drawdown when inflation is considered.

Bitcoin's volatility discourages many risk-averse investors. Demand for more stable digital assets has driven robust growth in the stablecoin market in recent years. Stablecoins, as their name suggests, should be stable; however, events in 2022, such as the Luna/Terra and FTX crashes, showed that the 1:1 parity can suffer depeg, increasing concerns about reserve quality, liquidity and transparency.

These events reinforced the importance of understanding which assets are used as reserves by Tether and Circle, the companies responsible for maintaining and controlling reserves and parity. Based on Granger causality tests and VAR models, the results indicate that USDC presents stronger temporal alignment with 3-month T-bills. This suggests that USDC flows help explain movements in short-term Treasury yields, which is consistent with the role of T-bills as a core reserve asset due to their liquidity, low credit risk and low volatility.

The tokenization market for financial assets, like other crypto-assets, is also growing rapidly, with traditional-finance structures being migrated and tested in tokenized finance, on-chain finance, and, in some cases, DeFi environments. In Brazil, receivables tokenization has already been tested through several structures.

However, structuring export receivables in FIDCs remains complex, given the additional difficulty of involving foreign trade, international documentation, currency exposure, and receipt in foreign currency. As seen in other traditional assets, the use of technologies such as blockchain, smart contracts, DvP, and other instruments could serve this important market, which continues to require credit, capital and operational efficiency.

A conceptual pilot project for export receivables tokenization was analyzed, including the use of USDC as a means of receiving foreign currency and the tokenization of receivables on the blockchain, which would not rely on the FIDC vehicle itself. Although this is a conceptual project, challenges are substantial, especially regarding the use of USDC, regulation, settlement and mark-to-market adjustments related to the hedge, governance, investor protection and default scenarios involving the Cedente or the Sacado.

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Note 1: AI assistance disclosure: If disclosure is required, the following wording is suggested: The conceptual product design and initial flow were prepared with AI assistance, based on the author's operational description and the sources listed above. The final analysis, legal interpretation, and conclusions remain the responsibility of the author and should be validated by qualified legal, tax, regulatory, FX, and technology specialists.

Note2: The author also used ChatGPT as an auxiliary tool for language editing, grammatical revision, translation from Portuguese into English, and improvements in clarity and academic style. The tool was not used to replace the author's own analysis, interpretation or judgment. All data, empirical procedures, results, conclusions and final textual decisions remained under the sole responsibility of the author.

Appendix 1 – Real Forward Returns Summary

This appendix presents all rolling-window horizon results for the strategies in Case 1.1.

CDI shows negative results in real terms in scenarios in which accumulated inflation exceeded accumulated CDI returns. Holding idle reais reflects the loss of value through purchasing-power parity, since the BRL 100.00 are deflated by inflation. Bitcoin reflects precisely the volatility strategy, with short windows compensated by the long term, while the stablecoin reflects both risks: domestic inflation and exchange-rate variation, which amplify possible losses. In long windows, given the SELIC/CDI interest-rate reduction cycle and inflation, CDI presents a higher probability of loss than Bitcoin.

In the 36-month window, Bitcoin presented only five loss periods in 64 windows. However, in one of these windows, the maximum loss was 19.30%; that is, the investor who had held BTC for three years would have had a maximum loss of 19.30% (average of 10.08%), while for CDI the maximum was 6.10% (average of 2.87%).

Table A.1.1 - Brazil Real Forward Returns Summary by Investment Horizon

Brazil: Real Forward Return Summary

Rolling forward returns computed using IPCA-deflated portfolio values

	Windows	Probability of Loss	Mean Return	Median Return	Worst Return	Best Return
CDI						
3 months	97	28.9%	0.8%	1.0%	−2.6%	4.7%
6 months	94	23.4%	1.7%	2.1%	−4.1%	6.3%
12 months	88	25.0%	3.3%	3.5%	−6.6%	10.3%
24 months	76	31.6%	6.0%	4.8%	−8.7%	17.9%
36 months	64	42.2%	8.4%	3.7%	−6.1%	25.9%
Holding BRL						
3 months	97	94.8%	−1.3%	−1.2%	−3.6%	1.3%
6 months	94	100.0%	−2.6%	−2.2%	−5.9%	−0.1%
12 months	88	100.0%	−5.1%	−4.4%	−10.8%	−1.8%
24 months	76	100.0%	−10.3%	−9.0%	−17.5%	−5.3%
36 months	64	100.0%	−15.8%	−16.3%	−20.3%	−11.5%
Holding Bitcoin						
3 months	97	44.3%	13.8%	3.4%	−47.8%	171.9%
6 months	94	41.5%	34.2%	15.4%	−58.3%	411.2%
12 months	88	30.7%	86.4%	57.2%	−74.0%	764.8%
24 months	76	22.4%	244.8%	138.7%	−63.8%	1,775.4%
36 months	64	7.8%	323.4%	145.8%	−19.3%	1,539.3%
Holding USD Stablecoin						
3 months	97	55.7%	0.4%	−0.9%	−17.1%	30.8%
6 months	94	56.4%	0.6%	−1.2%	−19.0%	34.5%
12 months	88	58.0%	1.0%	−2.5%	−23.7%	38.4%
24 months	76	51.3%	2.7%	−0.3%	−27.3%	45.6%
36 months	64	57.8%	−2.0%	−6.4%	−29.6%	50.2%

Sources: BCB and Bloomberg. Returns are calculated in real BRL terms.

Appendix 2 - ADF Stationary Test Results and VAR Lag Selection

Table A.2.1 presents the ADF stationarity test results for the series used in the article. The null hypothesis is that the series is non-stationary. In this case, the market capitalization series in levels did not reject the null hypothesis, whereas the five-day variation data used in the VAR did reject it. Yield rates also did not reject H0 in levels, but the daily variation did; for the VIX, H0 was rejected both in levels and in differences.

Table A.2.1 - ADF Stationarity Test Results

ADF stationarity tests

Daily variables used in Case 2

Variable	ADF tau statistic	1% critical value	5% critical value	10% critical value	Reject at 5%
Total market cap level	0.734	−3.430	−2.860	−2.570	No
USDT market cap level	0.889	−3.430	−2.860	−2.570	No
USDC market cap level	−0.220	−3.430	−2.860	−2.570	No
Total 5-day flow	−8.890	−3.430	−2.860	−2.570	Yes
USDT 5-day flow	−8.906	−3.430	−2.860	−2.570	Yes
USDC 5-day flow	−10.889	−3.430	−2.860	−2.570	Yes
3M Treasury yield level	−0.513	−3.430	−2.860	−2.570	No
Daily change in 3M Treasury yield	−25.417	−3.430	−2.860	−2.570	Yes
VIX level	−4.780	−3.430	−2.860	−2.570	Yes
Daily change in VIX	−29.985	−3.430	−2.860	−2.570	Yes

Sources: CoinGecko and FRED. Notes: ADF tests estimated with drift and lag selection by AIC.

Table A.2.2 shows the lag-selection results for the AIC, HQ, SC/BIC, and FPE criteria, using the vars package (function: VARselect).

Table A.2.2 - VAR Lag Selection Results

VAR lag selection Daily VAR with stablecoin 5-day flows, Δ3M Treasury yield and ΔVIX				
Model	AIC	HQ	SC/BIC	FPE
USDT + USDC	10	6	6	10
USDT	10	8	6	10
USDC	10	6	6	10

Sources: CoinGecko and FRED. Notes: lag selection performed with VARselect, using a maximum of ten lags and a constant. The VAR estimations use the lag selected by the Schwarz/Bayesian information criterion.

Appendix 3 - VAR coefficients, Standard Errors, p-values and Portmanteau Test

Table A.3.1 - VAR Results for USDC + USDT: Flow Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	1.0246459	0.0226960	45.146	< 2e-16	***
ΔT-bill (-1)	-0.0024434	0.0039034	-0.626	0.531418	
ΔVIX (-1)	-0.0085363	0.0060612	-1.408	0.159224	
Flow (-2)	0.0491520	0.0323387	1.520	0.128733	
ΔT-bill (-2)	-0.0028494	0.0037879	-0.752	0.452031	
ΔVIX (-2)	-0.0074668	0.0061882	-1.207	0.227760	
Flow (-3)	-0.0581691	0.0323275	-1.799	0.072151	.
ΔT-bill (-3)	-0.0056911	0.0037653	-1.511	0.130868	
ΔVIX (-3)	-0.0046924	0.0061662	-0.761	0.446778	
Flow (-4)	-0.0593987	0.0323220	-1.838	0.066292	.
ΔT-bill (-4)	-0.0016528	0.0037738	-0.438	0.661474	
ΔVIX (-4)	-0.0101054	0.0061609	-1.640	0.101154	
Flow (-5)	-0.4556967	0.0324193	-14.056	< 2e-16	***
ΔT-bill (-5)	-0.0091909	0.0037859	-2.428	0.015307	*
ΔVIX (-5)	-0.0099600	0.0062147	-1.603	0.109209	
Flow (-6)	0.4352062	0.0226902	19.180	< 2e-16	***
ΔT-bill (-6)	0.0009807	0.0039014	0.251	0.801555	
ΔVIX (-6)	0.0108427	0.0060928	1.780	0.075335	.
Constant	0.0534989	0.0154392	3.465	0.000544	***

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.2 - VAR Results for USDC + USDT: T-bill Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	-0.0554065	0.1463855	-0.378	0.70511	
ΔT-bill (-1)	-0.0001232	0.0251760	-0.005	0.99610	
ΔVIX (-1)	-0.0071154	0.0390938	-0.182	0.85560	
Flow (-2)	-0.0278610	0.2085790	-0.134	0.89376	
ΔT-bill (-2)	0.0472612	0.0244316	1.934	0.05324	.
ΔVIX (-2)	-0.0569286	0.0399131	-1.426	0.15398	
Flow (-3)	-0.2160086	0.2085067	-1.036	0.30037	
ΔT-bill (-3)	0.0418984	0.0242855	1.725	0.08468	.
ΔVIX (-3)	-0.0668232	0.0397707	-1.680	0.09311	.
Flow (-4)	0.4582135	0.2084712	2.198	0.02810	*
ΔT-bill (-4)	0.0953660	0.0243407	3.918	9.31e-05	***
ΔVIX (-4)	-0.1096758	0.0397367	-2.760	0.00585	**
Flow (-5)	-0.4568606	0.2090991	-2.185	0.02904	*
ΔT-bill (-5)	0.2326973	0.0244183	9.530	< 2e-16	***
ΔVIX (-5)	-0.0483859	0.0400835	-1.207	0.22756	
Flow (-6)	0.1117823	0.1463476	0.764	0.44509	
ΔT-bill (-6)	-0.0367569	0.0251634	-1.461	0.14429	
ΔVIX (-6)	-0.0560883	0.0392975	-1.427	0.15370	
Constant	0.2385259	0.0995800	2.395	0.01672	*

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.3 - VAR Results for USDC + USDT: VIX Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	1.041691	0.022996	45.298	< 2e-16	***
ΔT-bill (-1)	-0.003635	0.002816	-1.291	0.196933	
ΔVIX (-1)	0.001712	0.004388	0.390	0.696481	
Flow (-2)	0.050498	0.032908	1.535	0.125104	
ΔT-bill (-2)	-0.001506	0.002736	-0.550	0.582147	
ΔVIX (-2)	-0.005304	0.004479	-1.184	0.236568	
Flow (-3)	-0.050051	0.032925	-1.520	0.128677	
ΔT-bill (-3)	-0.005876	0.002719	-2.161	0.030866	*
ΔVIX (-3)	-0.007240	0.004464	-1.622	0.105069	
Flow (-4)	-0.065805	0.032916	-1.999	0.045761	*
ΔT-bill (-4)	-0.002249	0.002727	-0.825	0.409715	
ΔVIX (-4)	-0.009367	0.004460	-2.100	0.035889	*
Flow (-5)	-0.450284	0.032997	-13.646	< 2e-16	***
ΔT-bill (-5)	-0.007260	0.002736	-2.653	0.008047	**
ΔVIX (-5)	-0.007796	0.004502	-1.732	0.083507	.
Flow (-6)	0.403610	0.022959	17.580	< 2e-16	***
ΔT-bill (-6)	0.002930	0.002821	1.039	0.299099	
ΔVIX (-6)	-0.002474	0.004412	-0.561	0.575085	
Constant	0.042122	0.011029	3.819	0.000139	***

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.4 - VAR Results for USDT: Flow Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	0.043532	0.094128	0.462	0.643803	
ΔT-bill (-1)	0.005041	0.016188	0.311	0.755526	
ΔVIX (-1)	-0.205182	0.025138	-8.162	6.65e-16	***
Flow (-2)	-0.116051	0.134119	-0.865	0.387015	
ΔT-bill (-2)	-0.008241	0.015710	-0.525	0.599930	
ΔVIX (-2)	0.040553	0.025665	1.580	0.114285	
Flow (-3)	0.013381	0.134072	0.100	0.920514	
ΔT-bill (-3)	-0.039429	0.015616	-2.525	0.011670	*
ΔVIX (-3)	0.020051	0.025573	0.784	0.433107	
Flow (-4)	-0.040118	0.134050	-0.299	0.764768	
ΔT-bill (-4)	-0.018333	0.015651	-1.171	0.241646	
ΔVIX (-4)	-0.096659	0.025551	-3.783	0.000161	***
Flow (-5)	0.106994	0.134453	0.796	0.426286	
ΔT-bill (-5)	-0.010469	0.015701	-0.667	0.505003	
ΔVIX (-5)	-0.017082	0.025774	-0.663	0.507573	
Flow (-6)	-0.030651	0.094103	-0.326	0.744681	
ΔT-bill (-6)	-0.036281	0.016180	-2.242	0.025083	*
ΔVIX (-6)	-0.030946	0.025269	-1.225	0.220874	
Constant	0.039567	0.064031	0.618	0.536713	

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.5 - VAR Results for USDT: T-bill Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	0.009040	0.131645	0.069	0.945264	
ΔT-bill (-1)	0.007874	0.016121	0.488	0.625301	
ΔVIX (-1)	-0.205765	0.025118	-8.192	5.25e-16	***
Flow (-2)	-0.211365	0.188389	-1.122	0.262049	
ΔT-bill (-2)	-0.008655	0.015662	-0.553	0.580610	
ΔVIX (-2)	0.040654	0.025642	1.585	0.113062	
Flow (-3)	0.080033	0.188485	0.425	0.671177	
ΔT-bill (-3)	-0.040807	0.015568	-2.621	0.008847	**
ΔVIX (-3)	0.019628	0.025557	0.768	0.442606	
Flow (-4)	0.162197	0.188434	0.861	0.389499	
ΔT-bill (-4)	-0.019271	0.015613	-1.234	0.217297	
ΔVIX (-4)	-0.095966	0.025534	-3.758	0.000177	***
Flow (-5)	-0.168380	0.188895	-0.891	0.372854	
ΔT-bill (-5)	-0.010606	0.015663	-0.677	0.498418	
ΔVIX (-5)	-0.017704	0.025770	-0.687	0.492188	
Flow (-6)	0.080767	0.131432	0.615	0.538963	
ΔT-bill (-6)	-0.039022	0.016149	-2.416	0.015789	*
ΔVIX (-6)	-0.031663	0.025257	-1.254	0.210173	
Constant	0.048733	0.063139	0.772	0.440330	

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.6 - VAR Results for USDT: VIX Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	0.207900	0.205323	1.013	0.31143	
ΔT-bill (-1)	0.001263	0.025144	0.050	0.95993	
ΔVIX (-1)	-0.004268	0.039176	-0.109	0.91326	
Flow (-2)	-0.333160	0.293825	-1.134	0.25702	
ΔT-bill (-2)	0.053090	0.024427	2.173	0.02990	*
ΔVIX (-2)	-0.054743	0.039993	-1.369	0.17125	
Flow (-3)	-0.106192	0.293975	-0.361	0.71798	
ΔT-bill (-3)	0.041861	0.024281	1.724	0.08490	.
ΔVIX (-3)	-0.062137	0.039861	-1.559	0.11924	
Flow (-4)	0.526563	0.293895	1.792	0.07338	.
ΔT-bill (-4)	0.102674	0.024352	4.216	2.62e-05	***
ΔVIX (-4)	-0.107709	0.039825	-2.705	0.00691	**
Flow (-5)	-0.475691	0.294614	-1.615	0.10659	
ΔT-bill (-5)	0.234855	0.024429	9.614	< 2e-16	***
ΔVIX (-5)	-0.044582	0.040193	-1.109	0.26751	
Flow (-6)	0.045021	0.204991	0.220	0.82619	
ΔT-bill (-6)	-0.032311	0.025187	-1.283	0.19973	
ΔVIX (-6)	-0.051941	0.039393	-1.319	0.18752	
Constant	0.162916	0.098476	1.654	0.09825	.

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.7 - VAR Results for USDC: Flow Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	-0.402629	0.216256	-1.862	0.06281	.
ΔT-bill (-1)	0.003244	0.025215	0.129	0.89764	
ΔVIX (-1)	-0.008246	0.039142	-0.211	0.83318	
Flow (-2)	0.408778	0.324857	1.258	0.20846	
ΔT-bill (-2)	0.046211	0.024461	1.889	0.05905	.
ΔVIX (-2)	-0.057808	0.039940	-1.447	0.14799	
Flow (-3)	-0.451567	0.325340	-1.388	0.16534	
ΔT-bill (-3)	0.045973	0.024309	1.891	0.05877	.
ΔVIX (-3)	-0.063998	0.039801	-1.608	0.10805	
Flow (-4)	0.526923	0.325452	1.619	0.10564	
ΔT-bill (-4)	0.097728	0.024341	4.015	6.22e-05	***
ΔVIX (-4)	-0.107520	0.039772	-2.703	0.00694	**
Flow (-5)	-0.550060	0.325399	-1.690	0.09115	.
ΔT-bill (-5)	0.235531	0.024411	9.649	< 2e-16	***
ΔVIX (-5)	-0.046782	0.040078	-1.167	0.24329	
Flow (-6)	0.198980	0.217114	0.916	0.35956	
ΔT-bill (-6)	-0.034222	0.025077	-1.365	0.17255	
ΔVIX (-6)	-0.055490	0.039269	-1.413	0.15783	
Constant	0.149082	0.087639	1.701	0.08912	.

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.8 - VAR Results for USDC: T-bill Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	1.1153070	0.0230117	48.467	< 2e-16	***
ΔT-bill (-1)	-0.0004339	0.0026832	-0.162	0.871565	
ΔVIX (-1)	-0.0091159	0.0041651	-2.189	0.028769	*
Flow (-2)	-0.0736595	0.0345679	-2.131	0.033255	*
ΔT-bill (-2)	-0.0015063	0.0026029	-0.579	0.562875	
ΔVIX (-2)	-0.0013705	0.0042500	-0.322	0.747145	
Flow (-3)	-0.0605411	0.0346194	-1.749	0.080526	.
ΔT-bill (-3)	0.0001043	0.0025867	0.040	0.967853	
ΔVIX (-3)	0.0023200	0.0042352	0.548	0.583918	
Flow (-4)	-0.0104420	0.0346313	-0.302	0.763059	
ΔT-bill (-4)	0.0002635	0.0025901	0.102	0.918983	
ΔVIX (-4)	-0.0013956	0.0042321	-0.330	0.741628	
Flow (-5)	-0.4559874	0.0346257	-13.169	< 2e-16	***
ΔT-bill (-5)	-0.0022161	0.0025975	-0.853	0.393710	
ΔVIX (-5)	-0.0017933	0.0042647	-0.420	0.674187	
Flow (-6)	0.4071188	0.0231031	17.622	< 2e-16	***
ΔT-bill (-6)	-0.0008346	0.0026684	-0.313	0.754511	
ΔVIX (-6)	0.0138547	0.0041786	3.316	0.000935	***
Constant	0.0185082	0.0093256	1.985	0.047355	*

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table A.3.9 - VAR Results for USDC: VIX Equation

Regressor	Coefficient	Std. Error	t-statistic	p-value	Signif.
Flow (-1)	0.085639	0.138856	0.617	0.537492	
ΔT-bill (-1)	0.004576	0.016191	0.283	0.777516	
ΔVIX (-1)	-0.203146	0.025133	-8.083	1.25e-15	***
Flow (-2)	-0.030716	0.208588	-0.147	0.882948	
ΔT-bill (-2)	-0.007893	0.015706	-0.503	0.615358	
ΔVIX (-2)	0.042711	0.025645	1.665	0.096018	.
Flow (-3)	-0.017290	0.208899	-0.083	0.934049	
ΔT-bill (-3)	-0.040231	0.015608	-2.578	0.010041	*
ΔVIX (-3)	0.021524	0.025556	0.842	0.399782	
Flow (-4)	-0.310880	0.208971	-1.488	0.137036	
ΔT-bill (-4)	-0.015344	0.015629	-0.982	0.326372	
ΔVIX (-4)	-0.097255	0.025537	-3.808	0.000145	***
Flow (-5)	0.472386	0.208936	2.261	0.023900	*
ΔT-bill (-5)	-0.010849	0.015674	-0.692	0.488951	
ΔVIX (-5)	-0.017226	0.025734	-0.669	0.503355	
Flow (-6)	-0.194058	0.139407	-1.392	0.164112	
ΔT-bill (-6)	-0.035371	0.016102	-2.197	0.028187	*
ΔVIX (-6)	-0.029233	0.025214	-1.159	0.246477	
Constant	0.019540	0.056272	0.347	0.728462	

Sources: Bloomberg and FRED. Notes: results are taken directly from the R VAR output. *, ** and *** denote significance at the 10%, 5% and 1% levels.

The residual autocorrelation tests were performed using the *vars* package, function *serial.test.*

Table A.3.10 - Portmanteau Test Results

Model	Endogenous variables	Lag selected by BIC/SC	Effective obs.	Log likelihood	Max root	VAR stability	Portmanteau χ^2	df	Portmanteau p-value
USDT + USDC	Flow, ΔT-bill, ΔVIX	6	1598	−8,877.118	0.954	Satisfied	300.990	90	< 2.2e-16
USDT	Flow, ΔT-bill, ΔVIX	6	1598	−8,367.022	0.940	Satisfied	311.250	90	< 2.2e-16
USDC	Flow, ΔT-bill, ΔVIX	6	1598	−8,272.864	0.933	Satisfied	314.110	90	< 2.2e-16

Sources: CoinGecko and FRED. Notes: the selected lag is inferred from the VAR specification estimated after BIC/SC lag selection. Stability requires all characteristic roots to lie inside the unit circle. The Portmanteau test reports the residual autocorrelation diagnostic.

Appendix 4 - IRF Charts and Confidence Intervals

Figure A.4.1 - IRF: USDT + USDC Flow Shock and 3-Month Treasury Yield

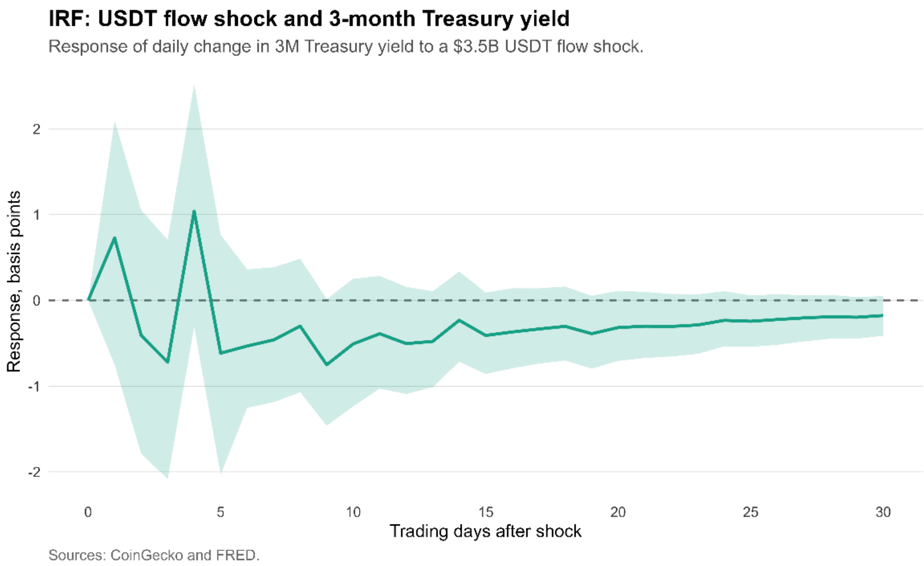


Figure A.4.2 - IRF: USDT Flow Shock and 3-Month Treasury Yield

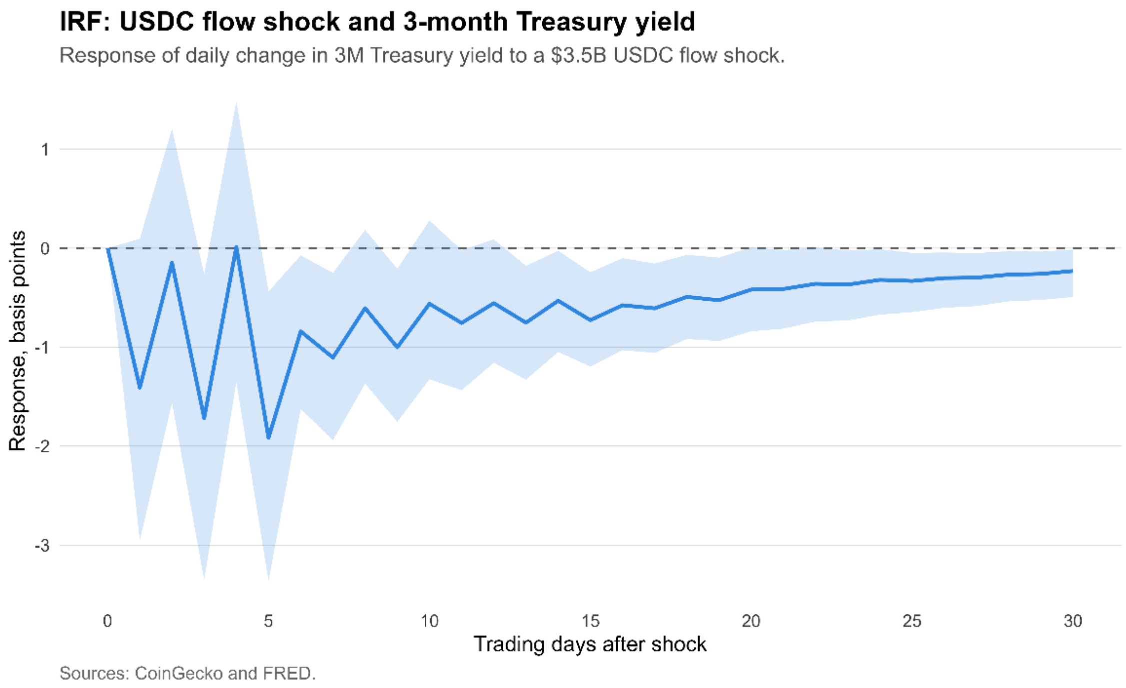


Figure A.4.3 - IRF: USDC Flow Shock and 3-Month Treasury Yield

TABLES

Table 1 - Investment Results by Application Type

Investment Results by Application Type Initial investment of BRL 100				
Application	**Initial Value**	**Final Value**	**Nominal Return**	**Real Return**
CDI	R$100.00	R$203.66	103.7%	31.8%
Stablecoin / USD	R$100.00	R$156.77	56.8%	1.5%
BTC Pure	**R$100.00**	**R$578.37**	**478.4%**	**274.3%**
BTC + FX	**R$100.00**	**R$906.69**	**806.7%**	**486.8%**
Source: BCB and Bloomberg.				

Table 2 - Interest Revenue and MTM Impact of Stablecoin Reserves

Interest Revenue and MTM Impact of Stablecoin Reserves

Approximation based on aggregate USDT and USDC reserves

Average Yield	Annual Interest Revenue	Quarterly Interest Revenue	Quarterly MTM Loss from +100 bp Yield Shock	Annualized Equivalent of Cumulative MTM Loss
1%	$2,639,888,015	$654,067,940	-	$0
2%	$5,299,618,174	$1,304,890,682	−$655,698,630	−$2,622,794,521
3%	$7,979,289,839	$1,952,492,318	−$655,698,630	−$5,245,589,041
4%	$10,679,002,617	$2,596,896,701	−$655,698,630	−$7,868,383,562
5%	$13,398,856,367	$3,238,127,452	−$655,698,630	−$10,491,178,082

Notes: Interest revenue is calculated on the aggregate USDT and USDC reserve base. MTM losses approximate the price impact of a +100 bp yield shock on a short-duration Treasury bill position. The cumulative MTM impact is expressed as an annualized equivalent.

Table 3 - Granger-Wald Causality Matrix

Granger-Wald causality matrix

Daily VAR with 5-day stablecoin flows, Δ3M Treasury yield and ΔVIX

Model	Flow → ΔT-bill	Flow → ΔVIX	ΔT-bill → Flow	ΔT-bill → ΔVIX	ΔVIX → Flow	ΔVIX → ΔT-bill
USDT + USDC	0.015**	0.861	0.093*	0.016**	0.063*	0.043**
USDT	0.203	0.612	0.008***	0.008***	0.140	0.061*
USDC	0.026**	0.453	0.966	0.017**	0.009***	0.049**

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels.

Table 4 - VAR and Granger-Wald Summary

VAR and Granger-Wald summary

Daily VAR with stablecoin 5-day flows, Δ3M Treasury yield and ΔVIX

Model	Lag	Obs.	Flow → ΔT-bill	ΔT-bill → Flow	Adj. R^2 ΔT-bill eq.	Max root	Min IRF bps	Cum. 30d IRF bps
USDT + USDC	6	1604	0.015**	0.093*	0.088	0.954	−1.176	−13.080
USDT	6	1604	0.203	0.008***	0.083	0.940	−0.751	−8.610
USDC	6	1604	0.026**	0.966	0.087	0.933	−1.918	−18.403

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels. IRFs are scaled to a US$3.5bn flow shock.

Table 5 - Operational Sequence for the Traditional Export Receivables Transaction		
Step	Stage	Description
1	Export relationship	The Cedente/Exporter sells goods or services to the foreign Sacado/Importer. The export transaction may be associated with an ACC or ACE structure.
2	Request for anticipation	The Cedente seeks the FIDC structure to anticipate the export receivable before the foreign payment is received.
3	Operational onboarding and credit analysis	The financial consultancy contacts the client, defines operational procedures and pricing, analyzes documentation and credit limits, and structures the transaction.
4	Pricing and hedge	After approval, the consultancy's FX and derivatives desk closes the purchase of the export receivable at a discount. The asset manager performs or approves the hedge of the FX exposure.
5	Manager approval	The fund manager approves the transaction according to the fund's mandate, risk limits, and expected return.
6	Contract and signature	The consultancy uploads the assignment agreement to the digital signature platform for execution by the Cedente, consultancy, and administrator.
7	Booking and D0 payment	Once the agreement is signed, the manager books the transaction and the administrator checks documentation, limits, and eligibility criteria. If approved, the administrator releases the D0 payment to the Cedente.
8	Foreign payment and FX settlement	After the export cycle, the FX settlement bank identifies the incoming foreign payment order and informs the consultancy. The consultancy validates the credit notice and documents.
9	Final liquidation	After validation, the consultancy coordinates with the settlement bank and the asset manager to liquidate the FX transaction and the hedge. The BRL proceeds and hedge adjustment are transferred to the FIDC.
10	Default risk[1]	If the foreign Sacado does not pay, or if the payment is delayed or disputed, the Cedente remains responsible for the obligation and becomes delinquent under the transaction documents. *Note: the default event cannot be treated as a simple technological issue. Even in a tokenized structure, credit risk remains linked to the Cedente, the foreign Sacado, the enforceability of the assignment agreement, the quality of documentation, FX settlement, hedge governance, and the rules for non-payment, restructuring, or collection.*

Table 6 - Tokenized Export Receivables: Advantages, Disadvantages and Key Risks

Advantages	Disadvantages	Key risks / mitigants
Lower operational friction; fewer manual reconciliations; potential reduction in intermediaries.	The legal structure is more complex and less tested than a FIDC.	Legal classification: treat public offerings of receivables tokens as potentially securities; validate with counsel and the CVM framework.
Fractionalization may broaden the investor base and allow smaller tickets.	Investor education burden is higher, especially if retail investors are targeted.	Investor protection: suitability, risk disclosure, transfer limits, and a clear whitepaper.
Smart contracts can automate payment waterfalls, covenants, and notifications.	Smart contracts do not replace legal enforcement or off-chain documentation.	Technology risk: code audit, multi-signature governance, contingency procedures, and cyber insurance.
Stablecoins or tokenized cash can support near-real-time settlement and DvP logic.	Stablecoin use in cross-border and FX settlement must follow current BCB rules.	FX / stablecoin regulatory risk: use only regulated partners and avoid assuming stablecoin settlement is automatically permitted.
On-chain records can increase traceability and auditability.	Confidentiality and data privacy must be managed carefully.	AML/CFT: wallet screening, transaction monitoring, sanctions screening, and Travel Rule readiness.
Secondary market trading may improve liquidity relative to traditional receivables structures.	Secondary liquidity is not guaranteed and may be restricted by regulation.	Liquidity risk: restrict trading to whitelisted investors and disclose that market-making is not assured.

FIGURES

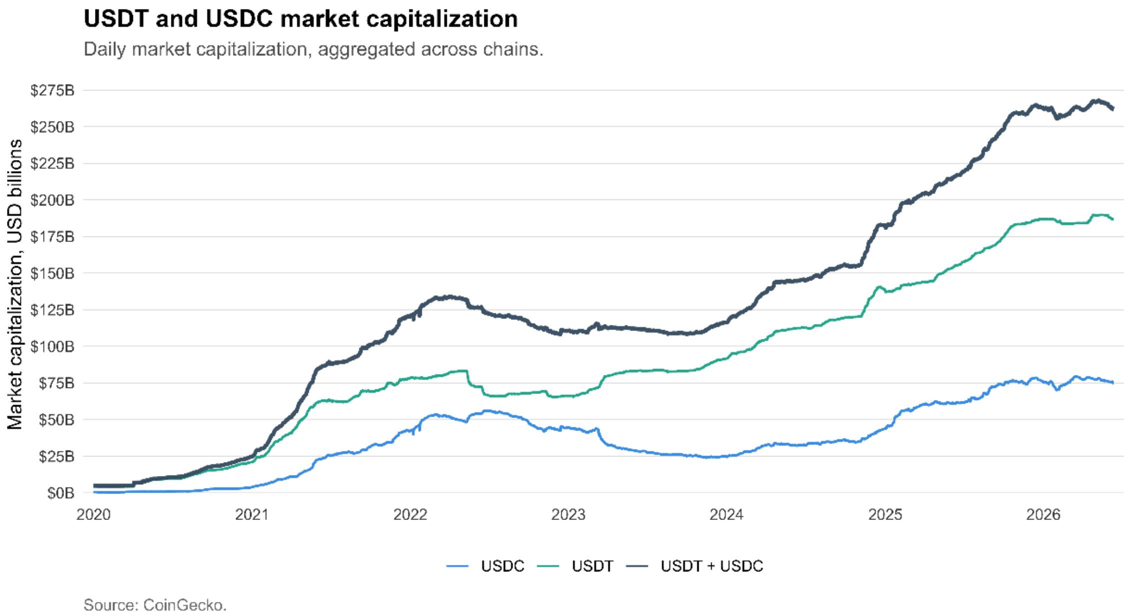


Figure 1 - USDT and USDC Market Capitalization

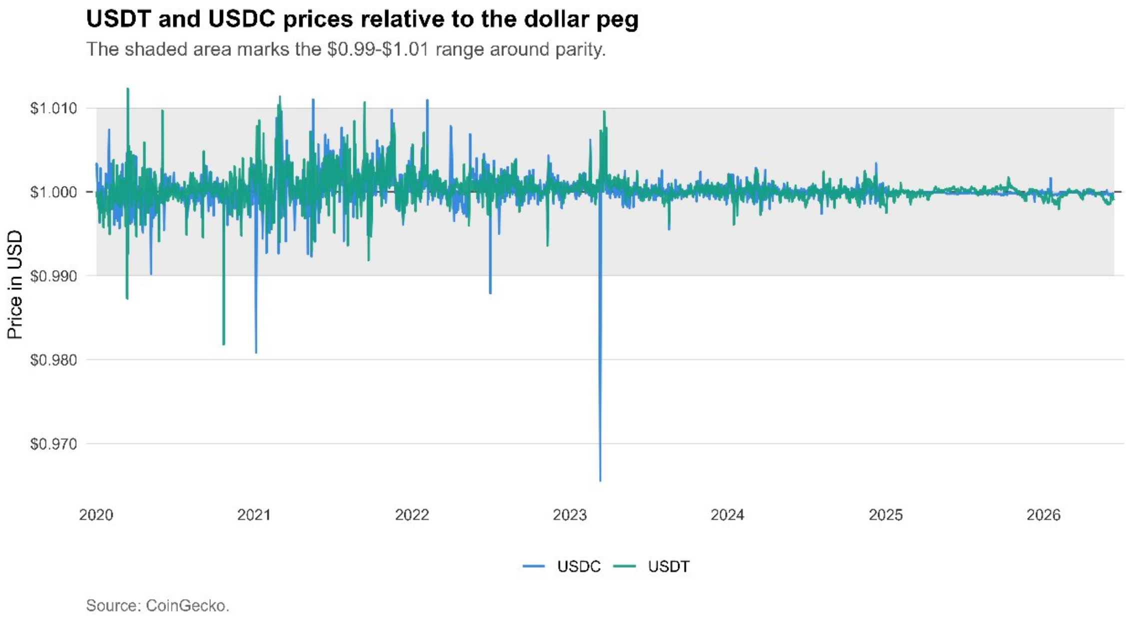


Figure 2 - USDT and USDC Prices Relative to the Dollar Peg

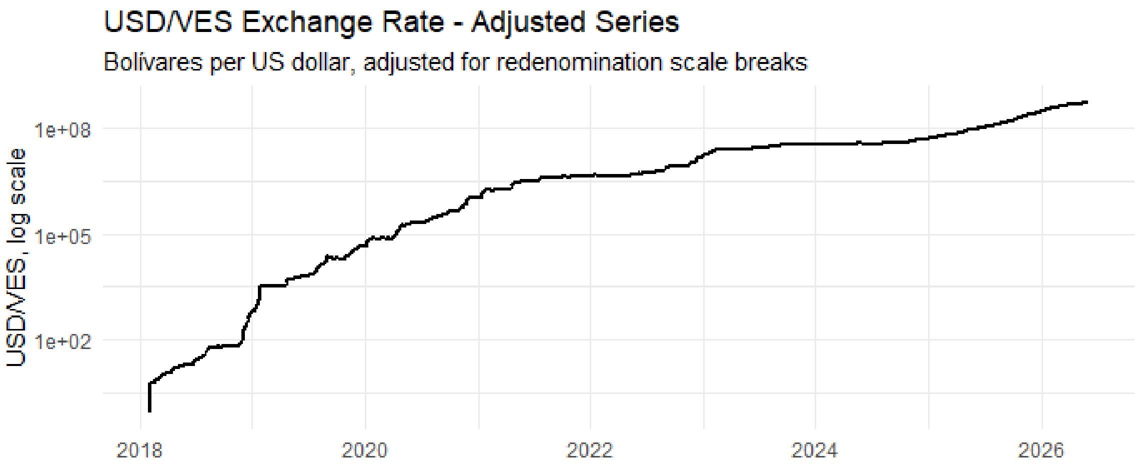


Figure 3 - Venezuela: Adjusted USD/VES Exchange Rate

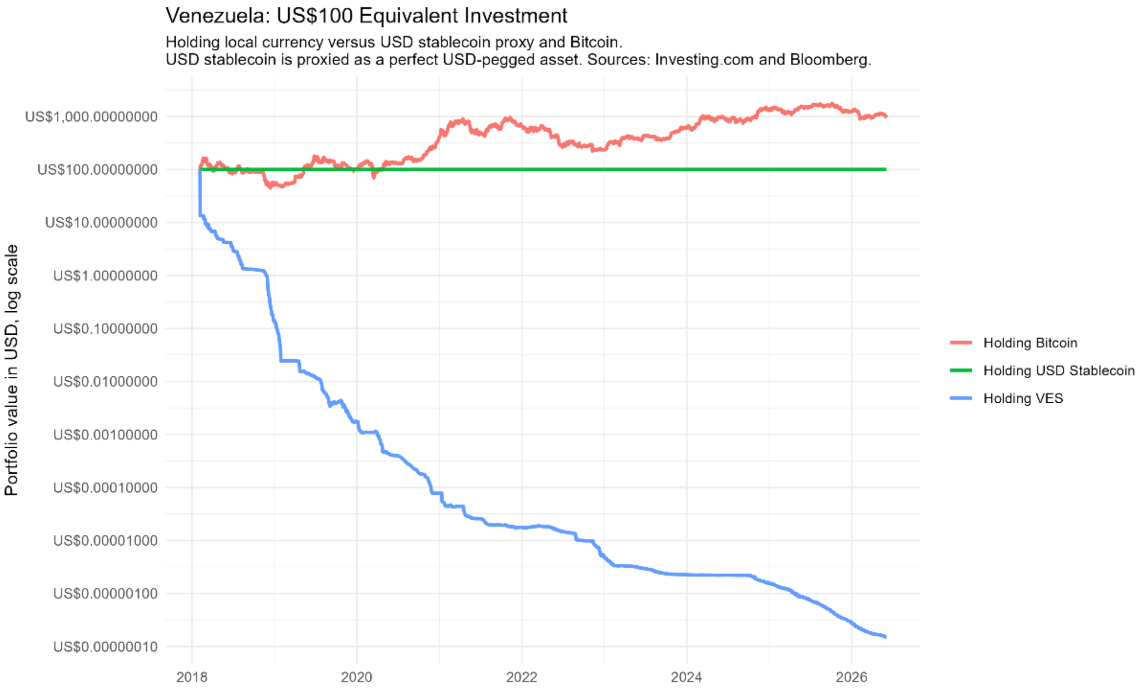


Figure 4 - Venezuela: US$100 Equivalent Investment by Strategy

Figure 5 - Venezuela: Drawdown by Strategy

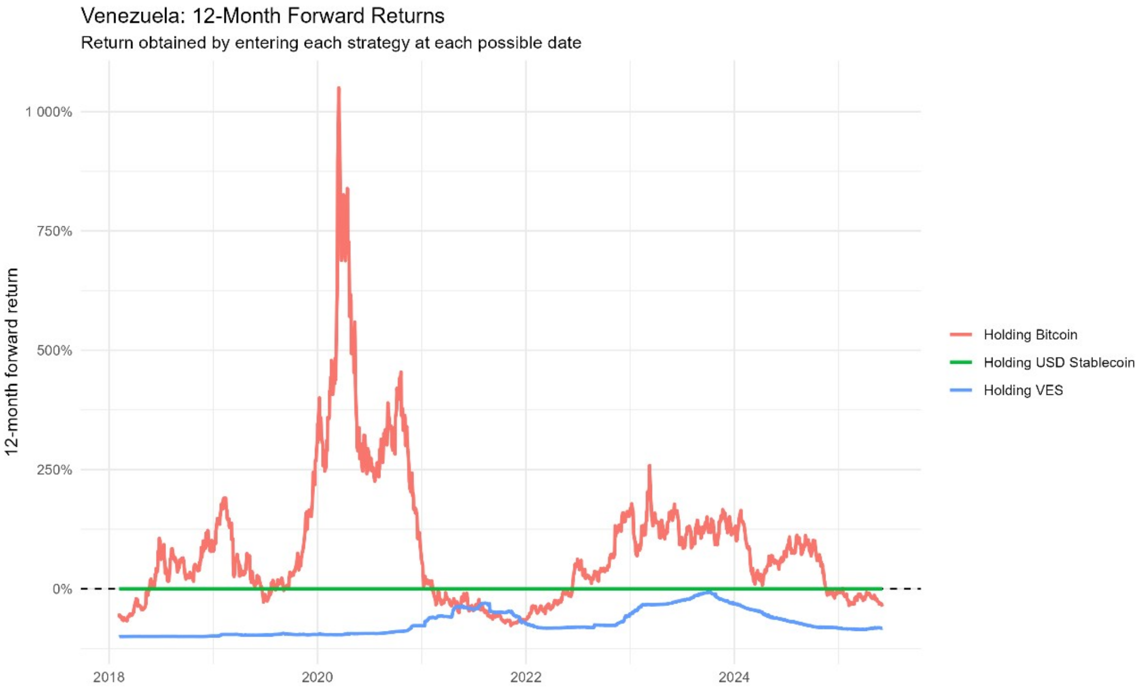


Figure 6 - Venezuela: 12-Month Forward Returns by Strategy

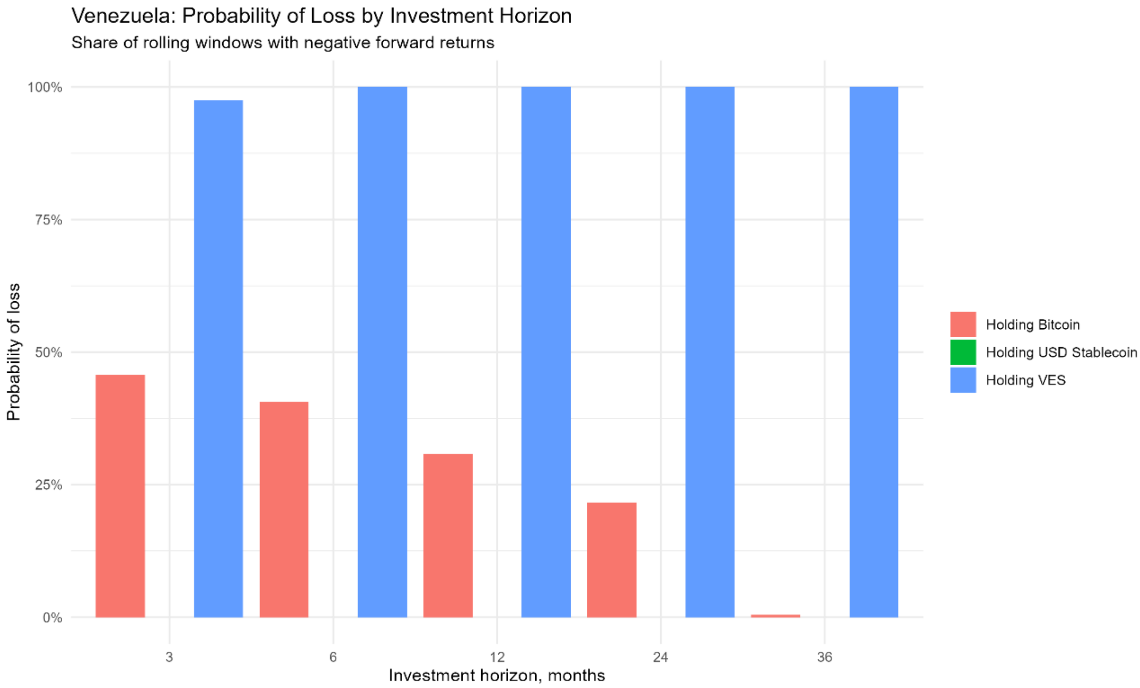


Figure 7 - Venezuela: Probability of Loss by Investment Horizon

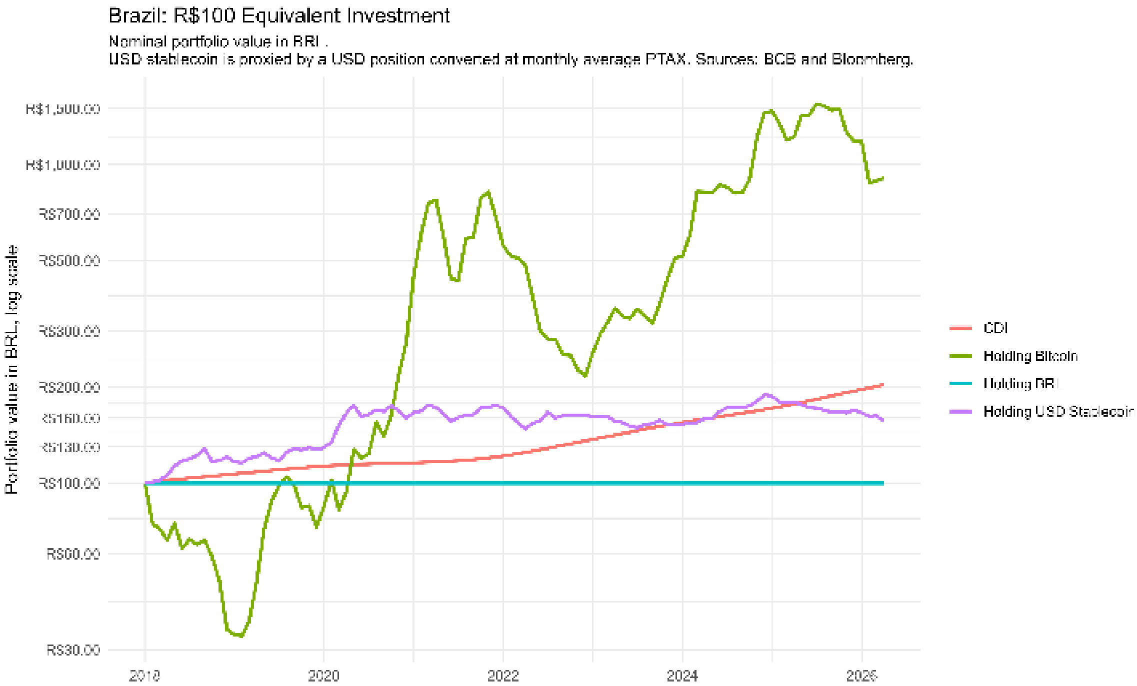


Figure 8.A - Brazil: Nominal Investment Results by Strategy

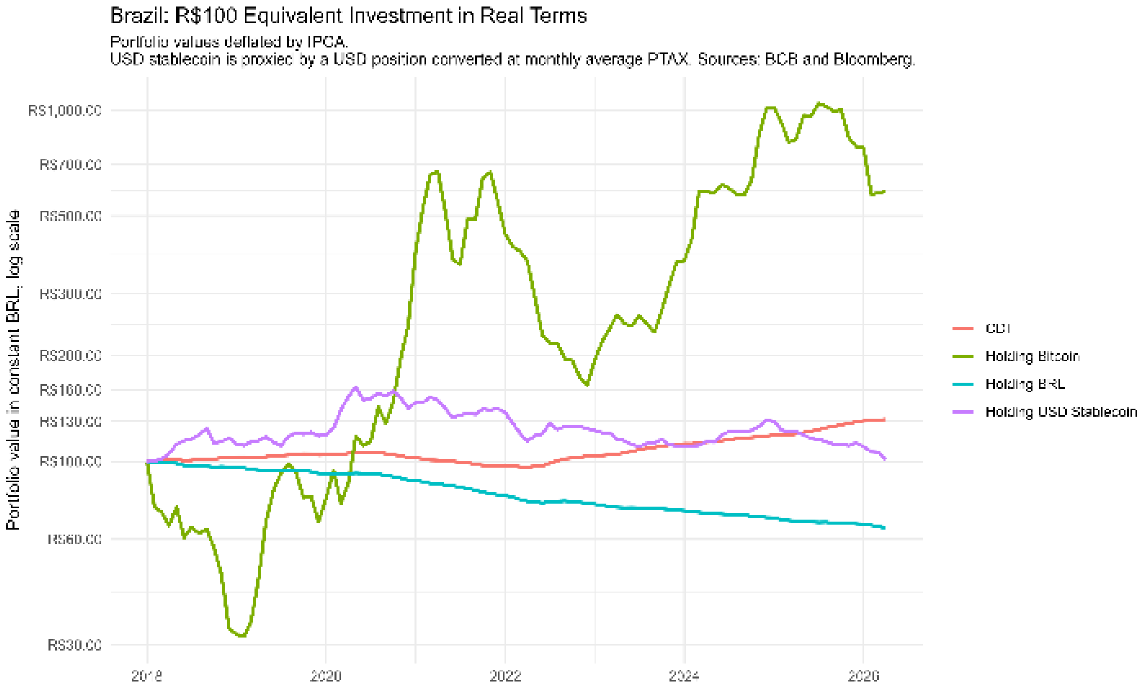


Figure 8.B - Brazil: Real Investment Results by Strategy

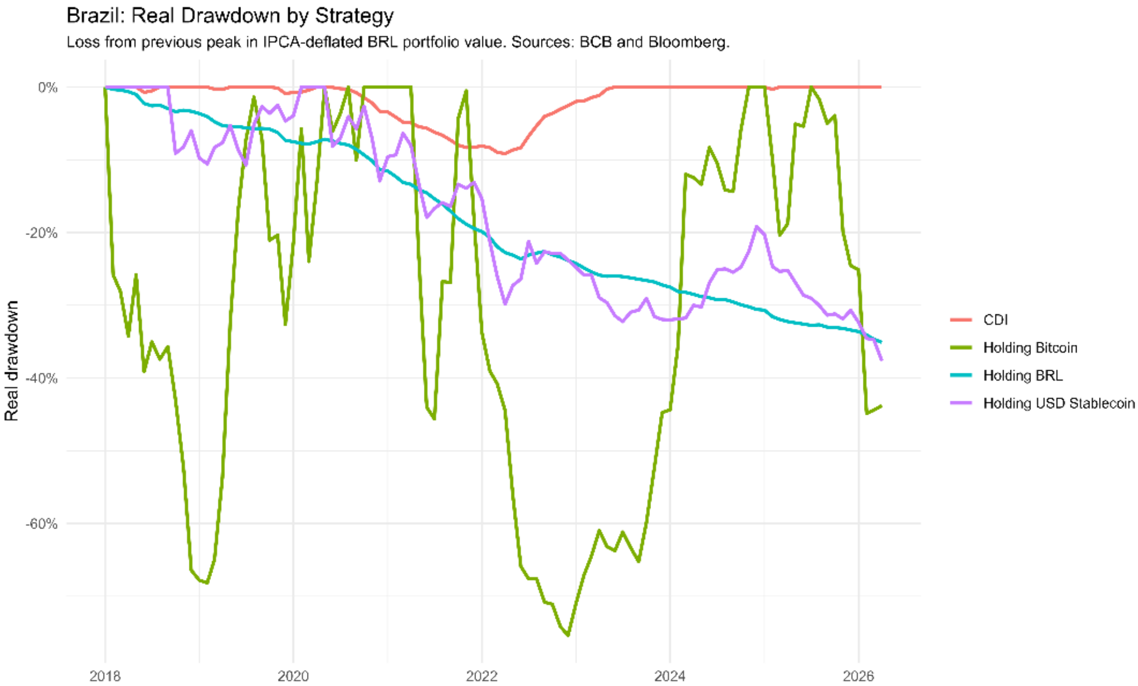


Figure 9 - Brazil: Real Drawdown by Strategy

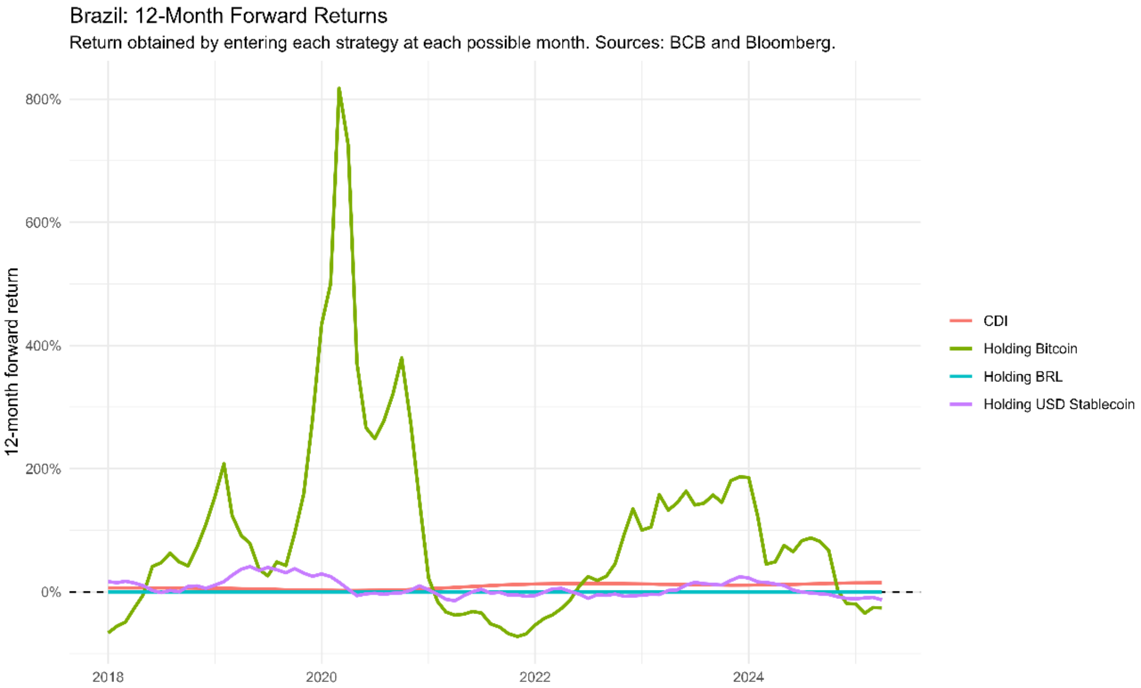


Figure 10 - Brazil: 12-Month Forward Returns by Strategy

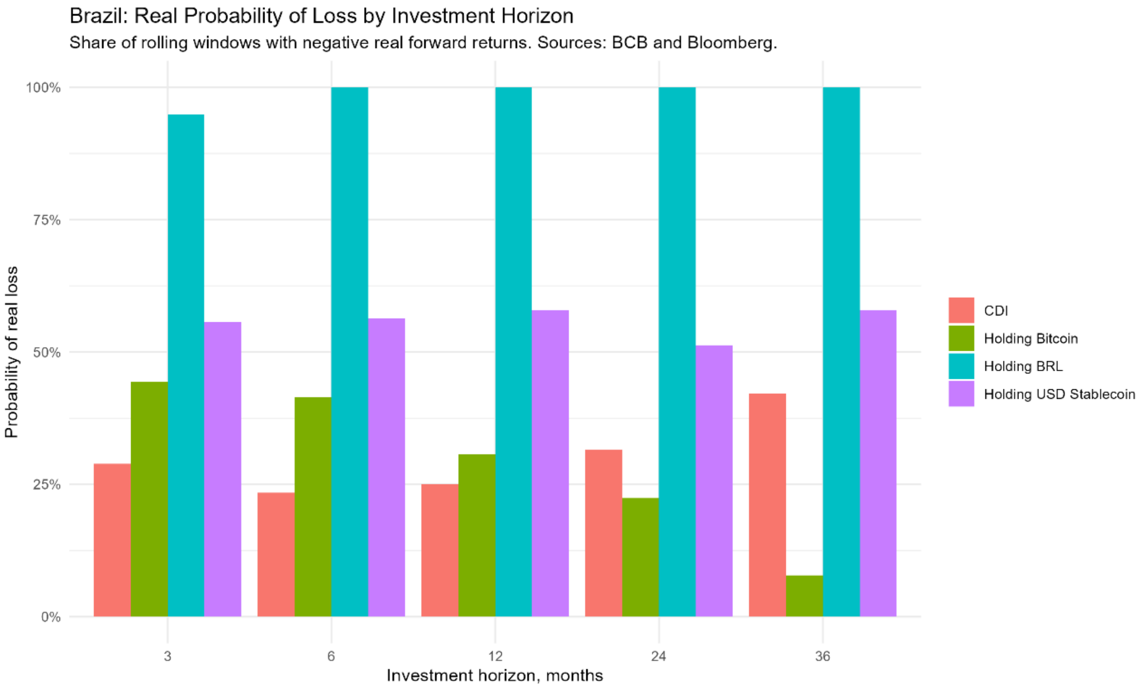


Figure 11 - Brazil: Real Probability of Loss by Investment Horizon

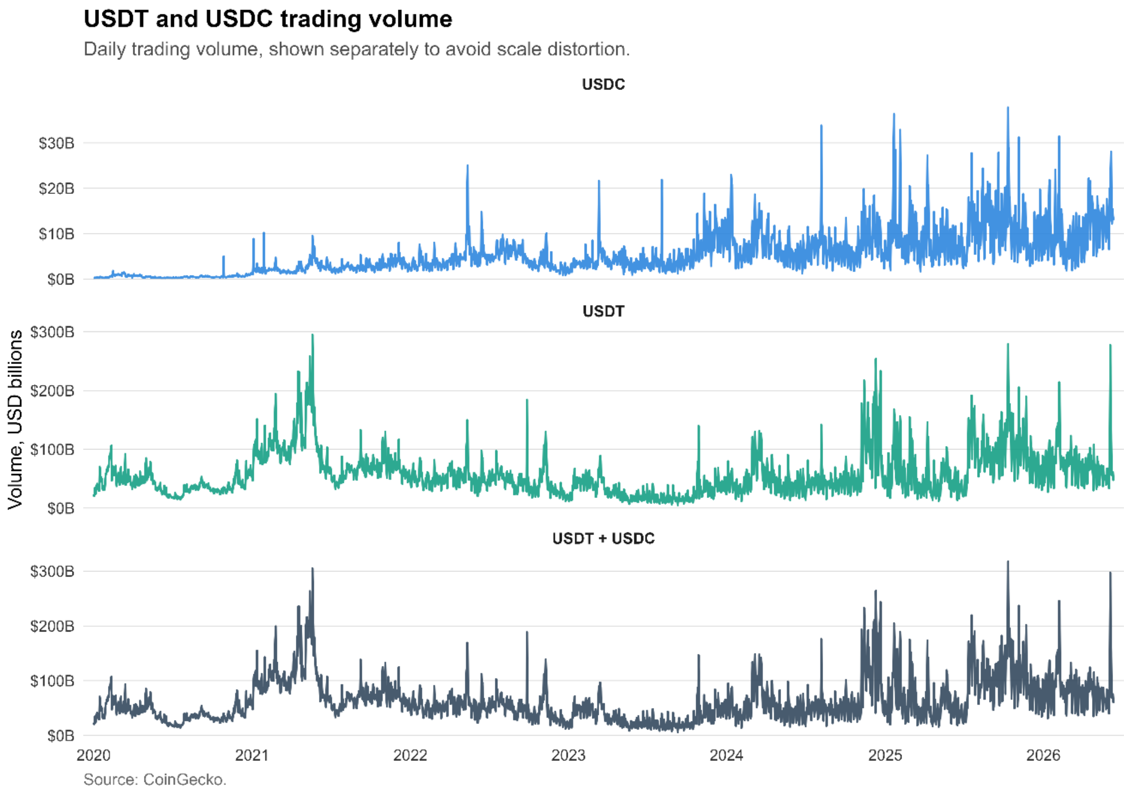


Figure 12 - USDT and USDC Trading Volume

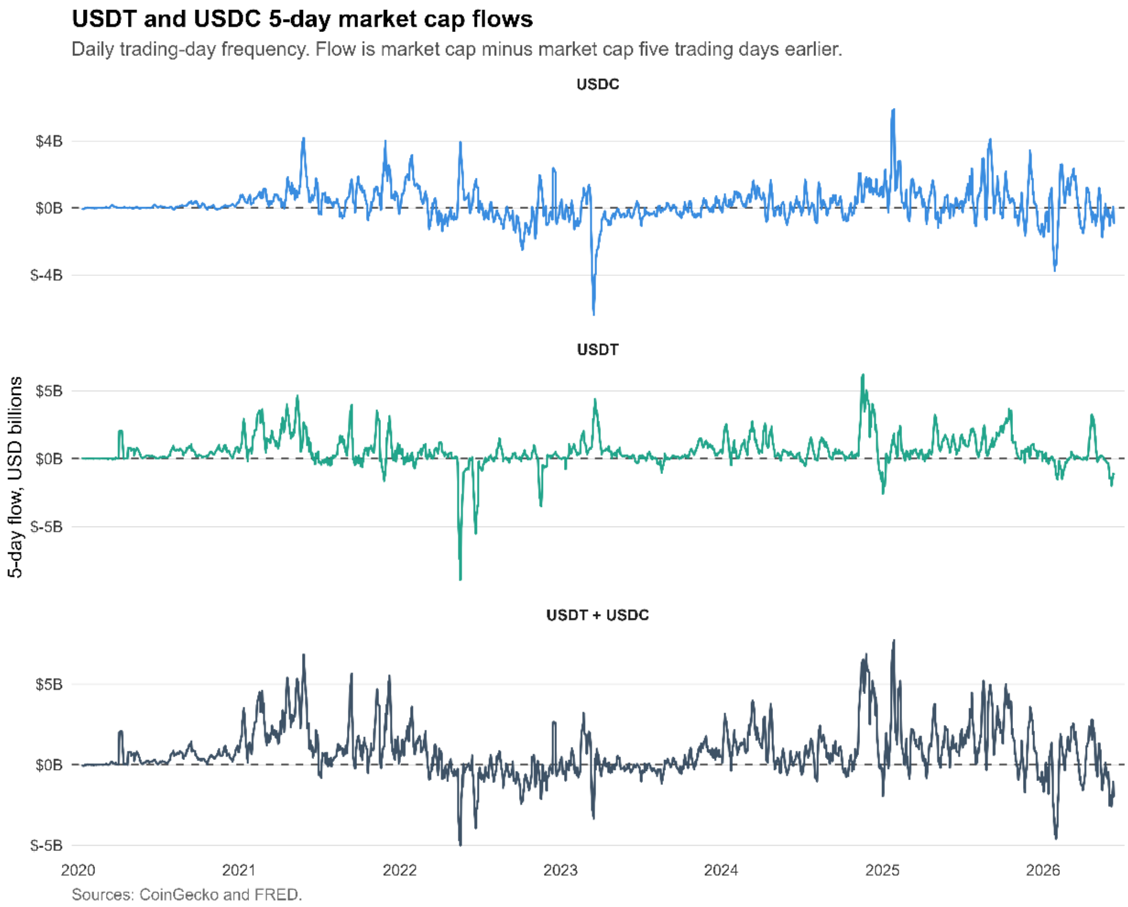


Figure 13 - USDT and USDC 5-Day Market Capitalization Flows

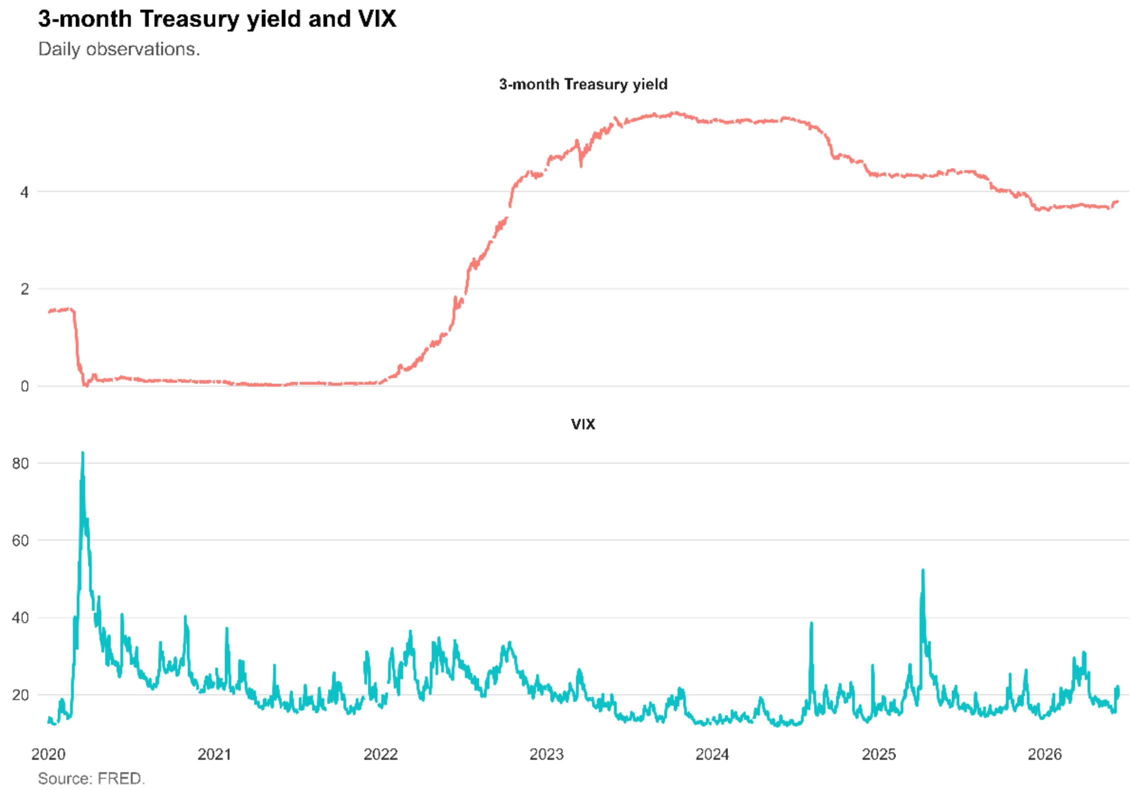


Figure 14 - 3-Month Treasury Yield and VIX

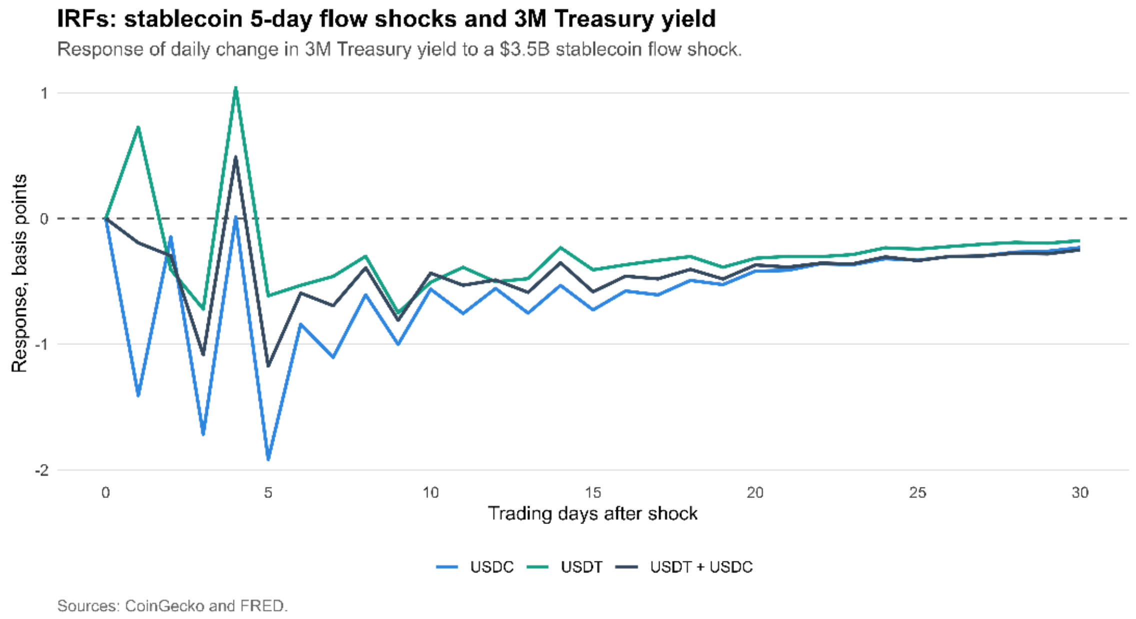


Figure 15 - IRF: Stablecoin Flow Shocks and 3-Month Treasury Yield

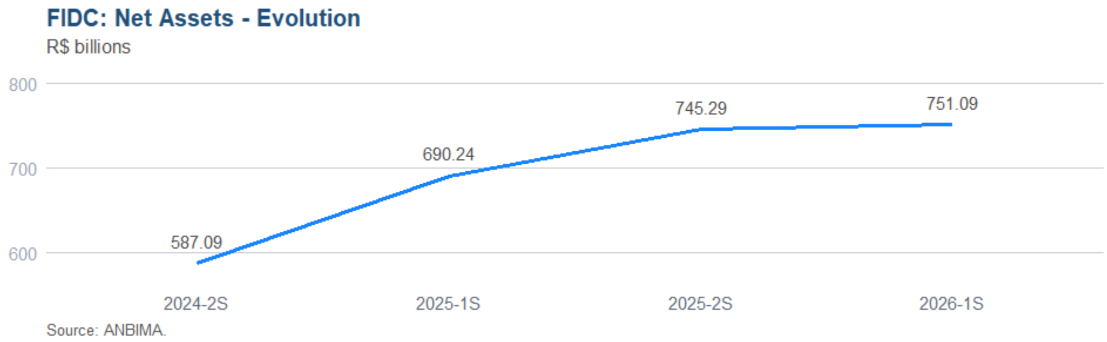


Figure 16 - FIDC Shareholders’ Equity Evolution

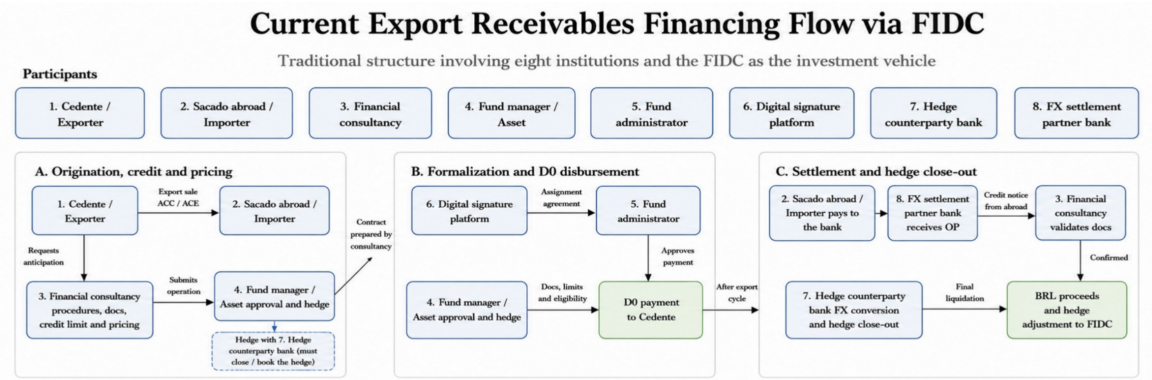


Figure 17 - Current Export Receivables Financing Flow via FIDC

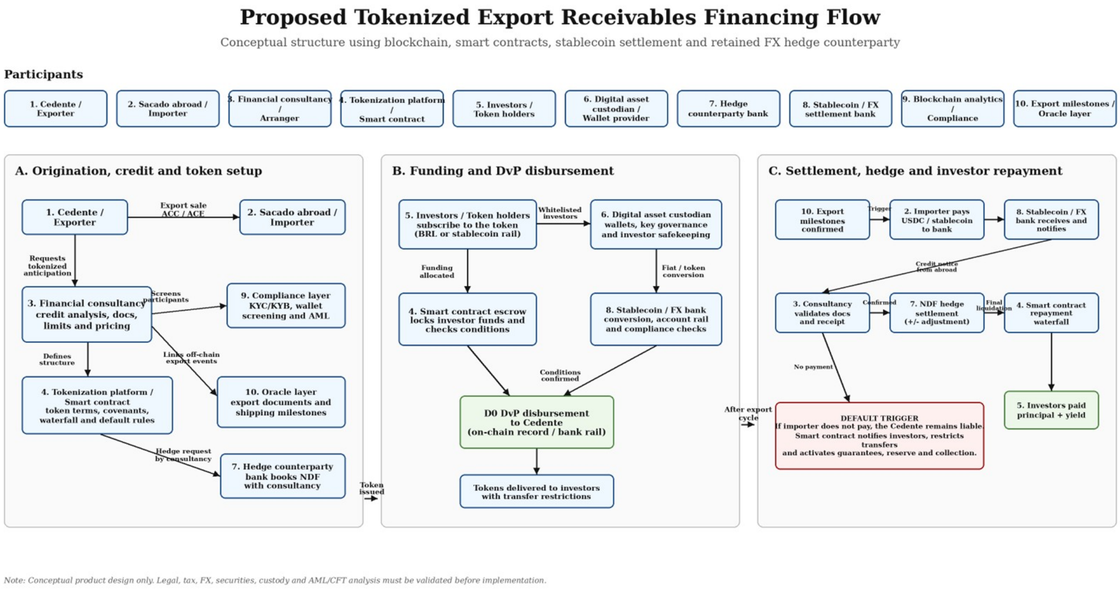
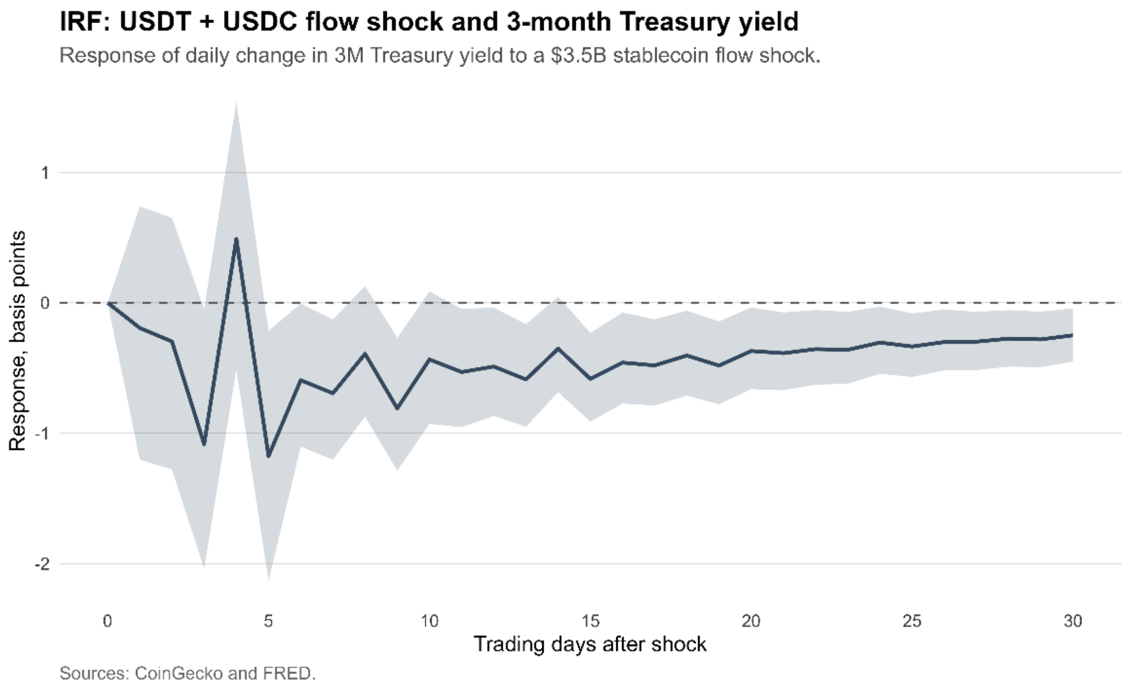


Figure 18 - Proposed Tokenized Export Receivables Financing Flow


IRF: USDT + USDC flow shock and 3-month Treasury yield
Response of daily change in 3M Treasury yield to a $3.5B stablecoin flow shock.
1
0
-1
-2
Response, basis points
0
5
10
15
20
25
30
Trading days after shock
Sources: CoinGecko and FRED.