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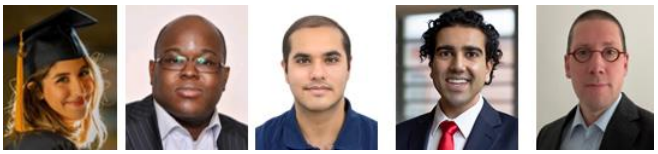
An econometric investigation on the stability of stablecoins: Are these coins stable or is their stability just a flip of the coin?



Lala AlAsadi | De Nederlandsche Bank
Oluwasegun Bewaji | Cognitive Macroeconomics
Aayush Gugnani | University of Ottawa
Tarush Gupta | University of Ottawa
Ronald Heijmans | De Nederlandsche Bank

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Abstract

This note analyzes the stability of major USD-backed stablecoins using econometric models and recent market data. While stablecoins generally maintain their pegs and absorb volatility under normal conditions, they can transmit financial stress during crises, becoming more interconnected with traditional markets. The study recommends integrating stablecoins into regulatory frameworks, tailoring oversight to coin design, enhancing monitoring, and strengthening global coordination to mitigate systemic risks and support financial stability.

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Introduction

Stablecoins are digital tokens designed to maintain a stable value, typically by pegging one-to-one to a fiat currency like the US dollar. They promise the speed and efficiency of cryptocurrencies while supposedly offering the reliability of traditional money. Since their emergence in the mid-2010s, stablecoins have grown rapidly in use, facilitating billions in daily transactions across crypto markets and even attracting interest from mainstream financial institutions. Unlike volatile cryptocurrencies such as Bitcoin, stablecoins aim to hold a constant price (usually $1). However, despite their name, stable- coins are neither inherently risk-free nor "stable" under all conditions. Their stability relies on the soundness of their underlying reserve assets and mechanisms. If those foundations waver, due to market stress, loss of confidence, or operational failures, a stablecoin can lose its peg, as dramatically illustrated by the collapse of TerraUSD in 2022.

This policy brief summarizes recent research that examines the stability of major USD- backed stablecoins and their connections to the broader financial system. Using advanced econometric models on data from 2020 to 2023, the analysis investigates how different stablecoins respond to economic shocks and whether they could transmit or amplify stress in the financial system. The focus is on four prominent stablecoins USD Tether (USDT), USD Coin (USDC), Dai (DAI), and TrueUSD (TUSD), which offer a mix of issuer types and reserve structures. The key questions are: How do these stablecoins behave when markets turn volatile or interest rates change, and what are the implications for financial stability and regulation?

Stability Under Stress: Heterogeneous Reactions to Shocks

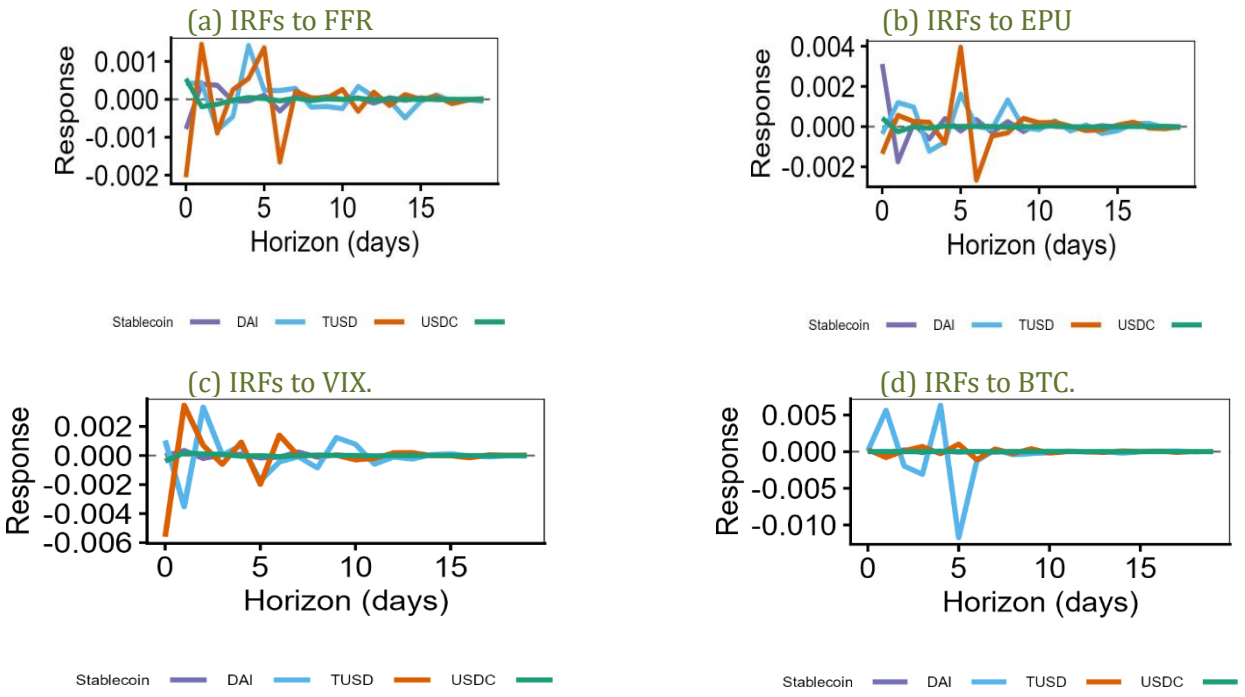
One way to test a stablecoin's robustness is to see how it reacts to sudden economic or financial shocks. In the study, we simulate the impact of various shocks, including a spike in market volatility, a jump in economic policy uncertainty, a sudden interest rate hike, and a broad cryptocurrency market drop on each stablecoin's price. The results reveal a clear heterogeneity in stablecoin responses. Two of the stablecoins, USDC and TUSD, exhibit noticeable but short-lived price movements following such shocks, whereas USDT remains essentially unfazed and DAI shows only modest, brief changes. In other words, a surprise event that causes turbulence in markets might make USDC or TUSD deviate slightly from their $1 peg for a short time, while USDT's price stays virtually flat.

Notably, even for USDC and TUSD, the disturbances are temporary, any deviation from the peg tends to correct within a few days. Figure 1 illustrates this pattern: following a shock, USDC and TUSD prices dip or spike momentarily (indicating sensitivity to the shock) before reverting to stability, whereas USDT's line on the graph is almost unchanged, reflecting a high degree of short-term resilience. DAI's reaction is mild, suggesting it absorbs shocks better than USDC/TUSD but not as steadfastly as USDT.

These differences likely stem from variations in market depth, reserve confidence, and redemption mechanisms. Larger stablecoins like USDT, which dominates in market vol- ume, may have more liquidity and trust to buffer shocks. In contrast, smaller or newer stablecoins such as TUSD can be more prone to jitter when faced with sudden market stress.

The findings imply that not all stablecoins are created equal in terms of stability. Importantly, however, none of the observed shocks led to a runaway destabilization: even the more sensitive coins (USDC, TUSD) regained their peg rather quickly. This indicates that, in normal shock scenarios, stablecoins primarily act as *volatility absorbers*, they experience the impact of broader market swings but do not themselves exacerbate the situation for long. In effect, they can provide short-term liquidity to traders as a safe haven, but this safe-haven quality is stronger in some stablecoins (like USDT) than others. The resiliency of the largest stablecoin, USDT, suggests that market participants may view it as a reliably sturdy token for parking funds during uncertainty, at least in the short run.

Figure 1. Impact of sudden macro-financial shocks on stablecoin prices (using GARCH model)



Note: Smaller stablecoins (USDC, TUSD) exhibit a brief deviation from their peg in response to a shock (e.g., a policy announcement or market volatility spike), before recovering, whereas the largest stablecoin USDT shows virtually no reaction. DAI's response is minor. Each line represents the estimated percentage change in price following a one-standard-deviation shock; the transient jumps for USDC and TUSD contrast with USDT's flat line.

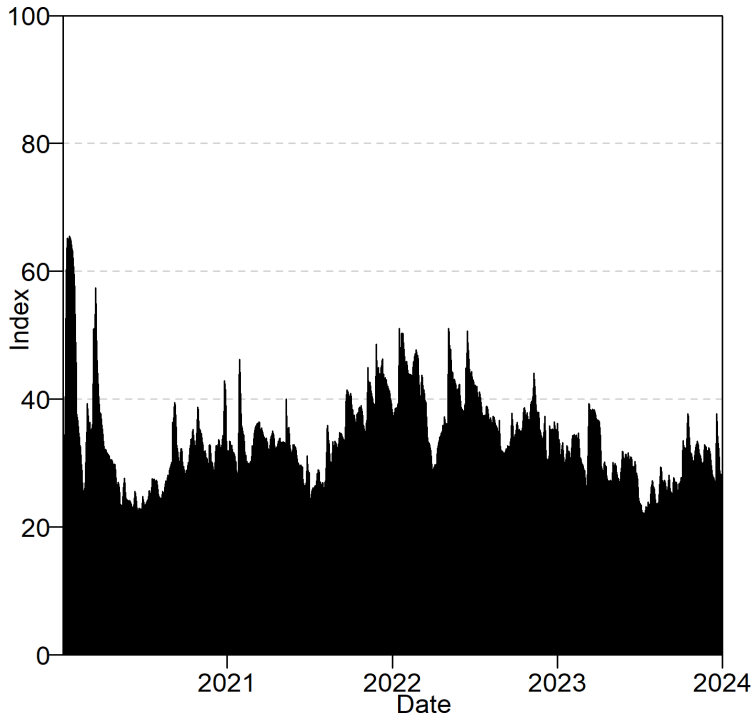
Systemic Connectivity: When Do Stablecoins Become a Risk?

Beyond individual price stability, a key concern for regulators is whether stablecoins could serve as channels for financial contagion. Do stablecoins merely react to crises, or can they amplify and transmit stress across the financial system? To answer this, the research examined how intertwined stablecoins are with traditional financial markets over time, essentially mapping their "connectedness" with other assets and risk indicators. The analysis tracked a metric called the total connectedness index, which rises when volatility shocks are spreading widely between stablecoins, cryptocurrencies, and conventional markets (like stocks or interest rates), and falls when markets are compartmentalized.

The evidence shows that during tranquil periods, stablecoins behave largely as islands: their price fluctuations are mostly independent, influenced by their own demand and supply, and they have little effect on external markets. In fact, in normal times stablecoins tend to absorb volatility coming from outside (for instance, if stock markets swing or Bitcoin's price gyrates, stablecoin prices might wiggle slightly in response, but they do not send significant shockwaves back into those markets). In technical terms, each stablecoin was a net "volatility receiver" rather than a sender under usual conditions. However, during major stress events, stablecoins become much more tightly linked with the rest of the financial system. In these moments, they can act as *conduits of stress* rather than just absorbers. Figure 2 shows how the connectedness index spiked sharply at the onset of the COVID-19 pandemic turmoil in March 2020 and again during the financial market turbulence of March 2023. In March 2020, a global dash for cash hit virtually all asset classes, and stablecoins were no exception: even though their prices mostly held, the panic led to surging trading volumes and strains in liquidity that linked stablecoin markets with traditional finance. Similarly, in March 2023, when a shock in the banking sector (the failure of a major tech-focused bank) caused one large stablecoin (USDC) to temporarily lose its dollar peg, it underscored how trouble in traditional banking could instantly reverberate into crypto markets, pulling stablecoins into the fray.

These episodes demonstrate that stablecoins, despite normally being stable in price, are not immune to systemic crises. In calm times, a stablecoin might seem like a separate, contained tool for crypto traders. But in a crisis, stablecoins are swept up in the tides of financial stress, they become another node in the network of contagion. The analysis finds that since 2021, stablecoins have grown more interconnected with mainstream finance, likely as more institutions and investors engage with them. While stablecoins did not appear to trigger any crisis on their own during the study period, they transmitted shocks when they themselves or their reserve backing came under pressure. In practical terms, if confidence in a popular stablecoin were to falter during a market crunch, it could add pressure to other markets (for example, forcing fire-sales of assets in reserve portfolios, or impacting funding markets if firms rely on that stablecoin for liquidity).

Figure 2. Systemic connectedness of stablecoins with broader financial markets, 2020– 2023



Note: The index (aggregate volatility spillover measure) remains low in normal periods, indicating little cross-market contagion, but jumps dramatically during crises. Notably, the COVID-19 market crash in March 2020 and the banking related stablecoin disturbance in March 2023 saw large spikes, meaning stablecoin and traditional market volatilities became strongly intertwined.

Conclusion and Policy Recommendations

Stablecoins have rapidly emerged as integral parts of the digital finance landscape. This study's findings highlight a dual nature: on one hand, stablecoins generally succeed in maintaining stability and even buffer shocks under typical market conditions; on the other hand, they can become entwined with system-wide risks during extreme events. Policymakers and financial authorities should take proactive steps to bolster stability and reduce potential systemic risks associated with stablecoins:

- **Integrate stablecoins into regulatory frameworks:** Regulators should incorporate stablecoins into existing prudential oversight (similar to how bank deposits or money market funds are regulated). This means applying standards for capital, liquidity, and risk management to any significant stablecoin issuer or the banks and institutions dealing heavily in stablecoins. Ensuring that issuers hold high quality liquid reserves and have clear redemption rules can reduce the chance of a destabilizing run on a stablecoin.

- **Tailor oversight to stablecoin design:** Not all stablecoins are alike, so a one- size-fits-all approach would be misguided. Supervisors should differentiate between fully asset-backed stablecoins, algorithmic or crypto-collateralized stablecoins, and those issued by regulated financial institutions. The more vulnerable a stablecoin's design (e.g., opaque reserves or dependence on risky assets), the more stringent the oversight required. Setting disclosure requirements for reserve composition and regular audits can improve transparency and trust.

- **Enhance monitoring and stress-testing:** Financial stability monitoring should explicitly track stablecoin markets. Real-time indicators (like the toolkit of connectedness measures used in the research) can serve as early-warning signals if a stablecoin is under stress. Regulators and central banks could simulate extreme scenarios, such as simultaneous bank and stablecoin runs or a large-scale crypto market crash, to test the resilience of stablecoins and their interconnected institutions. Results from these stress tests should inform contingency plans (for in- stance, how to provide emergency liquidity if a major stablecoin falters).

- **Strengthen global coordination and standards:** Stablecoin activity transcends borders and regulatory silos. International standard-setters, such as the Financial Stability Board and the Basel Committee, are already working on guidelines for crypto-assets and stablecoins. National authorities should align their rules with these evolving global standards to prevent regulatory arbitrage. Cross-border cooperation is crucial, for example, in sharing data and managing the fallout if a globally used stablecoin were to crash.

- **Prepare for integration with traditional finance:** As large financial institutions and payment systems explore issuing their own stablecoins or integrating existing ones, regulators should ensure that this innovation does not outpace risk management. For instance, if banks issue stablecoins, those coins should meet the same safety and soundness criteria as other bank liabilities. Central banks might also consider how stablecoins factor into monetary policy transmission and payment system oversight, given that a widely used stablecoin could influence money flows or even serve as an alternative form of deposit.

In conclusion, stablecoins hold promise for more efficient payments and financial inclusion, but they also carry familiar risks in new forms. Prudent, targeted regulation and vigilant monitoring can help harness the benefits of stablecoins, speed and global reach, while keeping their potential downsides in check. With appropriate safeguards in place, stablecoins can be part of a resilient financial system rather than a "flip of the coin" in times of stress.

About the author(s)

Lala AlAsadi holds a Master's degree in Econometrics and Operations Research from Erasmus University Rotterdam. During her thesis internship at the Dutch Central Bank (DNB), she applied econometric methods to analyze the volatility of emerging markets, focusing on stablecoins within the Market Infrastructure and In- novation department. Her research interests center on combining econometrics and machine learning for empirical analysis of policy-relevant economic issues. Lala currently works as a supervisor for the GSIB bank ING at DNB.

Oluwasegun Bewaj is an economist specialising in computational finance, systemic risk, and the design and analysis of financial market infrastructures. He holds a PhD in Computational Finance from the University of Essex and has over 15 years of research experience across central-banking, payments policy, and capital markets. His work combines agent-based modelling, artificial intelligence, machine learning, and econometric methods to study liquidity, network structures, cyber-resilience, and digital assets, alongside empirical research on crypto-assets and stablecoins. He also led economic and technology research for Project Jasper, Canada's wholesale CBDC prototype developed with the Bank of Canada and industry partners, and has presented his work internationally, including at the Bank for International Settlements and De Nederlandsche Bank.

Aayush Gugnani is a Senior Status LLB candidate at Queen Mary University of London and holds a Master's degree in Economics from the University of Ottawa. His research examines financial market infrastructures, systemic risk, and payment systems. He has previously contributed to projects at Payments Canada, focusing on cyber-risk, liquidity, and network analysis in high-value payment systems. His broader interests span fintech law and regulation, crypto-assets and stablecoins, and macroprudential policy.

Tarush Gupta holds a Master of Management Analytics from the University of Toronto's Rotman School of Management and an MA in Applied Economics from The George Washington University. He combines strong econometrics and machine-learning training with a deep interest in empirical analysis, applying these tools to study decision-making across domains such as payment systems and financial market infrastructures. His prior research spans behavioural responses to nudges in healthcare and education, determinants of risk-taking and time preference, and the impact of parental time-use on children's future outcomes.

Ronald Heijmans earned his PhD in Economics from the University of Groningen, with a thesis focused on large value payment systems. He previously obtained an MSc in astrophysics from Leiden University. He has over 19 years of experience at DNB, where he works for the Market Infrastructure and Innovation department as a senior policy advisor and data scientist. He has made significant contributions to the literature on payment systems and financial market infrastructure, covering topics such as machine learning, risk indicators, liquidity, network topology, and game theory on TARGET2, and crypto and stablecoin data.

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SUERF Secretariat
c/o OeNB, Otto-Wagner-Platz 3A-1090 Vienna, Austria
Phone: +43 1 40 420 7206
E-Mail: suerf@oenb.at
Website: https://www.suerf.org/