A Comparative Analysis of Market Reactions to Stablecoin Peg Deviations

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Abstract. Stablecoin have become a critical component in the digital financial ecosystem; it is a medium of exchange, a store of value, and a bridge between traditional finance and decentralized finance. However, its stability has been repeatedly challenged in real-world events. This article uses the event study method to explore how stablecoin de-pegging affects the market and how the market responds. This article selects representative de-pegging events of United States Stable Terra (UST), United States Dollar Coin (USDC), and United States Dollar Tether (USDT), and analyzes the reaction of related crypto assets before and after the events. The result of the research shows that, compared with fiat collateralized stablecoins, the algorithmic stablecoins are more likely to cause severe market volatility. Meanwhile, this study also observed significant cross-currency spillover effects, which indicate that stablecoin risks have systematic transmission characteristics. The results of this study emphasize the significant importance of enhancing the transparency of the reserve mechanism, strengthen the support of real assets, and the timeliness of regulatory intervention for maintaining the stability of digital finance.

Keywords: Stablecoin, Peg Deviations, Asset.

1 Introduction

Stablecoins are virtual assets designed to maintain a relatively stable value with certain assets (usually currencies), and are widely used in scenarios such as digital payments, cross-border settlements, and decentralized finance (DeFi) due to their flexibility and stability. It is worth noting that Cho argues that whether stablecoins are truly stable is still perplexing [1]. In addition to technical or political factors, the credibility of pegged currencies and resources is also uncertain.

Recent events have exposed vulnerabilities in the peg mechanisms of even the most widely used stablecoins, shaking investor confidence and triggering systemic market reactions [2]. Typical cases of stablecoin de-pegging include the large-scale collapse of United States Stable Terra (UST) in May 2022, UST de-pegged on a large scale in a very short period, and the sharp price drop led to the complete collapse of Terra ecosystem; In March 2023, USDC briefly de-pegged, the collapse of Silicon Valley Bank (SVB) affected some reserves of United States Dollar Coin (USDC), and the coming panic selling by investors pushed its price down to $0.87 [3]. The United States Dollar

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Tether (USDT) issued by Tether has experienced several minor de-pegging incidents during multiple market fluctuations, which has led to doubts abouts its reserve transparency, reflecting the unstable trust structure of USDT.

While a growing body of literature is focusing on analyzing the operational mechanism of stablecoins and the risks it brings. Few studies have offered a comparative review of market responses to multiple de-pegging events. This study takes several de-pegging events of three mainstream stablecoins (UST, USDC, and USDT) from 2022 to 2024 as samples, and uses the event research method to explore the market reactions of different types of stablecoins when they suffer from de-pegging and trust crises.

This study explores three questions. First, it sets an event window and tracks the price changes of three stablecoins before and after the de-pegging events. Second, it measures shifts in trading volume, market depth, and cross-currency spillovers that appear once a stablecoin loses its peg. Third, it compares algorithmic, fiat-backed, and hybrid designs, and asks which mechanism better preserves price stability and liquidity when market trust erodes.

2 Literature Review

Cryptocurrencies, due to their high volatility, make it difficult for investors to obtain definite returns, leading to the emergence of stablecoins, which can, to some extent, hedge the risks of cryptocurrencies. Broadly speaking, stablecoins are a stabilization mechanism achieved by controlling the exchange rate between traditional cryptocurrencies and fiat currencies, and pegging is an effective way to reduce asset volatility [4]. Stablecoins have become a key component of the digital asset ecosystem, providing price stability in highly volatile markets. Previous studies have classified stablecoins into algorithmic, legal collateralized, and crypto-backed types, each with a different risk profile [5]. Take classic events as an example: The collapse of Terusd (UST) was triggered by a loss of investor confidence, leading to large-scale divestment and selling. Its algorithmic mechanism relies on LUNA coinage to maintain the peg, entering a "death spiral" of hyperinflation and currency depreciation. The lack of actual asset support ultimately weakened the resilience of stablecoins under pressure [6].

Currently, stablecoins have become an important bridge connecting traditional finance with the crypto world. According to industry reports, the market capitalization of stablecoins has exceeded 250 billion US dollars by early 2025 [7], which indicates that it is playing a more and more important role in the digital asset ecosystem. However, the complex issuance mechanism and risk structure behind it have also drawn continuous attention from regulatory authorities and the academic community. Mathew Abraham points out that it is necessary to pay attention to the interrelationship between stablecoins and cryptocurrencies [8]. The Terra crash not only highlights the fragility of certain stablecoin designs but also exposes the risk of contagion between cryptocurrency assets, which deserves further research. At the same time, Perez Riaza indicates that stablecoins may become a source of market instability, emphasizing their potential disruptive effects. Wong concluded based on analysis of significant deanchoring events that the lack of actual asset support ultimately weakened the resilience of stablecoins under pressure.

Event study methodology, originally developed to assess the impact of firm-specific events on stock prices. Several studies have successfully applied this method to the field of cryptocurrencies. For instance, F Zhou described the application of this method in the analysis of cryptocurrency returns, and N Tomić measured the effects of Bitcoin forks on selected cryptocurrencies using this method [9]. Existing literature underscores the broader contagion effects triggered by de-pegging events, which this paper seeks to explore further in a comparative framework.

3 Analyze Stablecoin Price Dynamics Surrounding the De-pegging Event

The study chose the long-term daily price statistical indicators of fiat collateralized stablecoins USDT and USDC, and the daily price of algorithmic stablecoin UST during the de-pegging event in May 2022.

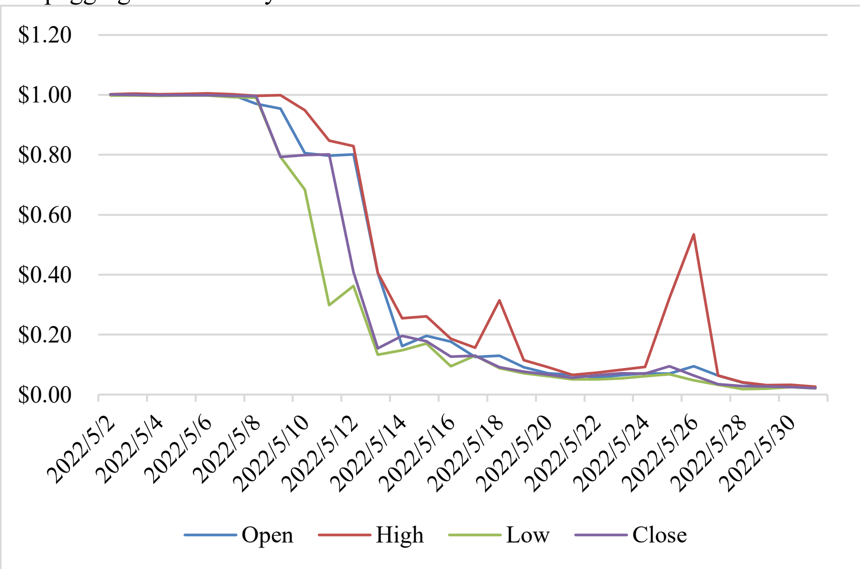

Fig. 1. UST daily price (May 2022) [10]

Figure 1 shows the price movement of UST from May 2, 2022 to May 31, 2022. The daily opening price, highest price, lowest price, and closing price data of UST are sourced from the CoinMarketCap website "TerraUSD (UST) Historical Price Data: May 2022", and the access data is July 18, 2025. To observe whether the market responds to the stablecoin de-pegging event, this study set the date on May 9, 2022, as the event day, which was when UST first significantly fell below its anchor price by $1. This study focused on observing the price changes of UST after its de-pegging on

May 9, 2022. By visualizing the price movement during this period, this study conducted a descriptive analysis to determine whether there was a continuous deviation in the market before and after the event day. Based on the performance, this study can preliminarily judge whether the market responded to the event.

Table 1. Descriptive statistics of stablecoin prices [11]

Name	Ticker	Startdate	Enddate	Mean	Median	Std.Dev	Max	Min
Tether	USDT	2018-02-17	2022-05-18	1.0016	1.0007	0.0052	1.0868	0.9485
USD Coin	USDC	2018-10-24	2022-05-18	1.0029	1.0004	0.0060	1.0565	0.9578

In Table 1, the data for USDT and USDC is from the Instability of Stablecoins (2023), which is published on Finance Research Letters by Duan and Urquhart. This research calculated the mean, median, standard deviation, maximum and minimum price based on the daily price of USDT (February 17, 2018 to May 18, 2022) and USDC (October 24, 2018 to May 18, 2022), which measured the price stability of fiat currency-backed stablecoins in a normal market.

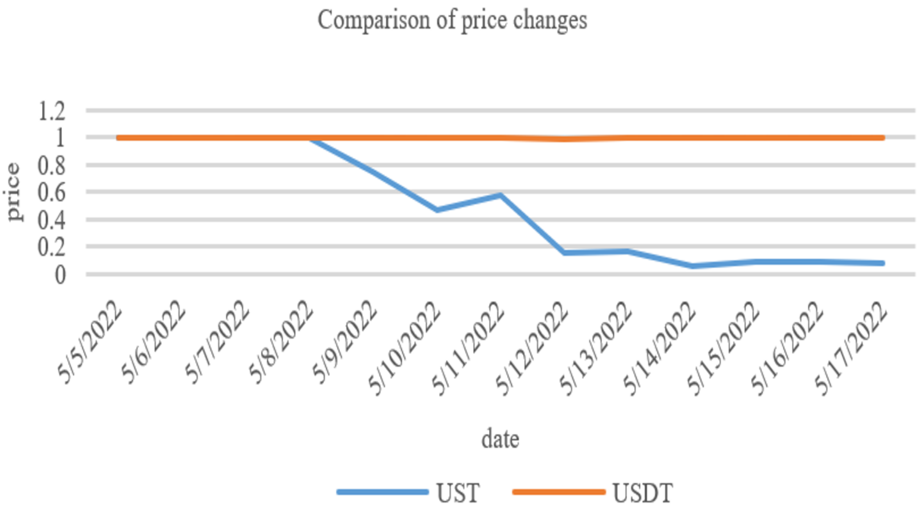

Fig. 2. UST and USDT price change comparison (Picture credit : Original).

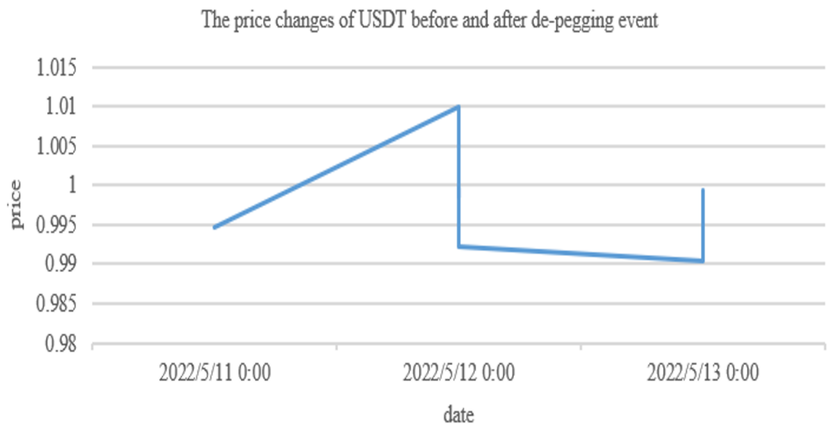

Fig. 3. The price changes of USDT (Picture credit : Original).

During the Terra ecosystem crash on May 12-13, 2022, algorithmic stablecoin UST and fiat collateralized stablecoin USDT exhibited essential differences in crisis transmission pathways and market resilience. As shown in Figure 2, UST launched a death spiral at noon UTC on May 11th, with prices collapsing in a stepwise manner from $0.8 to almost $0.4 within 6 hours, and completely returning to zero at 18:00 UTC on the 13th, showing an irreversible one-way collapse trajectory. The failure of this algorithm anchoring mechanism quickly triggered market panic, the shock was transmitted to USDT, causing it to briefly decouple to nearly $0.99, as shown in Figure 3[12]

At 8:00 UTC the next day, USDT fully recovered and anchored with the advantage of fiat currency reserves, while UST remained at 0.2 US dollars and continued to decline during the same period. This differentiated recovery model confirms the endogenous collapse risk of algorithmic stablecoins, while fiat currency collateralized stablecoins can suppress external shocks, providing key empirical evidence for regulatory focus.

4 Results Analysis

This study selected three representative stablecoin de-pegging events from 2020, 2022, and 2023, and compared and analyzed the performance differences of different mechanism types under market shocks. Horizontal comparisons show that algorithmic stablecoins(such as UST) often experience sharp price deviations when encountering confidence crises, take a long time to return to the anchor, or may even fail to recover to the target anchor level. Due to the lack of backing by physical assets, its price experienced a rapid decline and a slow recovery. Although fiat currency-backed stablecoins (such as USDC and USDT) may also experience short-term de-pegging due to market sentiment, benefiting from transparent reserve management and the support of real assets, they usually can complete price recovery within a relatively short period of time, demonstrating stronger market resilience and mechanism stability. This comparison result further proves that algorithmic stablecoins have shown more severe price drops and slower recovery speeds under different de-pegging shocks, while fiat-backed stablecoins have achieved a faster and milder regression path by relying on transparent reserves and real asset support.

5 Discussion and recommendation

This study, through empirical comparisons of multiple de-pegging events, clearly reveals that the mechanism type of stablecoins has a decisive impact on their market shock resilience. In addition, significant cross-currency spillover effects were observed in all three de-pegging events, during the peak of the de-pegging, stablecoins (USDC, USDT) that were not directly impacted also experienced brief negative excess returns and an increase in volatility, indicating that investors' panic can generate structural risk transmission throughout the stablecoin ecosystem through trading strategies and information transmission channels. This cross-currency linkage response reminds us that when regulators and investors assess the risk of a single stablecoin, they must take into account the chain reaction of the entire market.

Based on these findings, this study has the following suggestions:

Classification regulation. The algorithm type stable currency shall be issued to implement more stringent entry and regular stress tests, make sure its in extreme market conditions has sufficient liquidity insurance. For fiat currency-backed stablecoins, it is necessary to strengthen independent auditing of reserve assets and high-frequency information disclosure to enhance their transparency and credibility.

The crisis response mechanism of the public. It is recommended that stable currency issuers develop and open to the market a recovery plan, including a default redemption scheme or repurchase mechanism, to stabilize investor expectations ahead of time, and in the crisis, a rapid response process. For investors, it is important to recognize the characteristic that "stablecoins are not stable". It is advisable to give priority to choosing fiat currency-backed products with high reserve transparency and stable recovery paths to reduce potential systemic risk exposure.

6 Conclusion

This study, based on the event research method, systematically analyzed the market response characteristics of stablecoins under three typical mechanisms in three stablecoin de-pegging events. Firstly, single-event analysis reveals that algorithmic stablecoins experience more severe price drops and slower recovery during the de-pegging shocks, while fiat currency-backed stablecoins, supported by real assets and transparency, can quickly return to the anchoring level within an extremely short period. Secondly, through cross-event comparison, this study found that the above conclusion has a high degree of consistency in de-pegging events of different scales and backgrounds, further demonstrating the decisive influence of mechanism types on systemic risk tolerance. Thirdly, all three events demonstrated obvious cross-currency spillover effects:

even if they did not directly lose their anchor, other stablecoins would experience temporary negative excess returns and increased volatility due to market panic, indicating that the risks of stablecoins have a structural transmission path.

The research findings not only deepen the understanding of the relationship between the underlying mechanism of stablecoins and market resilience but also provide empirical evidence for regulators and market participants: algorithmic stablecoins require higher risk access and emergency response plans, while fiat currency-backed stablecoins need to enhance auditing and information disclosure. When making allocations, investors should comprehensively consider the type of mechanism, historical performance and recovery speed to reduce systemic risk exposure. Future research can further incorporate on-chain liquidity indicators or macro market fluctuation factors to enrich the multi-dimensional interpretation of stablecoin market behavior.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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