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Crypto Lending and Stablecoin De-Pegging: Key Risks and Challenges

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Abstract

This study investigated the de-pegging effect of stable coins in the crypto market considering the increased growth in crypto lending using DeFi (Decentralized Finance). Employing an event study method and using the trading data of a select sample of stable coins and cryptocurrencies in more than two-year post-pandemic sample period (01 January 2021-30 March 2024), the study examined whether there was a spillover effect of stable coin crisis into the cryptocurrency market. The event study results showed that prior to the de-pegging event, there was a sharp decline in abnormal returns of both stable coins and cryptocurrencies. The univariate, event study and logistic regression estimations support the study predictions that the de-pegging event of USDC affected the crypto market adversely including the cryptocurrencies. Despite the claim of maintaining a pegged value, the stable coins were found to be prone to volatility mainly due to their involvement in DeFi lending. Although both USDC and DAI recovered fast and reached their pegged values of US$1, probably due to the immediate intervention of the FED in the March 2023 banking crisis, the recovery was short-lived. This is a lesson for crypto investors who patronize DeFi lending platforms in pursuit of yield farming and staking that stable coins are no longer stable as they claim to be, and they can be as volatile as cryptocurrencies.

Keywords: *Stable coins, Cryptocurrencies, De-pegging, Event study*

1. Introduction

Once considered a safe harbour for crypto investors to park their assets, stablecoins are no longer perceived to be stable as they claim to be. This is evident from an analysis carried out by DAM (Moody's Analytics' Digital Asset Monitor) (Moody's Analytics, 2023), tracking the prices of 25 stablecoins including Tether, USDC, and PayPal Coin. Defining price change by more than three percent in a day against the fiat currency peg, DAM found that as of September 2023, 1,914 de-pegs occurred, and out of which 609 were from stablecoins Tether, USDC and PayPal Coin. Tether, a fiat-collateralized stablecoin lost its value below its U.S.$1 peg in 2017, followed by DAI, a crypto-collateralized stable coin. DAI's de-pegging was due to the loss of value of Ether

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(ETH), the main collateral for DAI. And NuBits, an algorithmic stablecoin, lost its value owing to a 2016 sharp decline in demand. Such massive de-pegging has been attributed to DeFi stable coin lending activities, where crypto speculators indulge in yield farming and staking[1] to earn superior returns. The most recent de-pegging event occurred in March 2023, when, USDC de-pegged its value below US$1 by 13%. DAI's value also declined because USDC holdings represented more than half of the collateral reserves of DAI. The immediate reason for USDC's collapse was attributed to the failure of three US banks (Silicon Valley Bank (SVB), Signature Bank and Silver-gate Bank). This was because Circle, the issuer of USDC, confirmed that $3.3 billion of cash reserves backing USDC were held at SVB. The present study examines the impact of the 2023 USDC de-pegging on the returns of a select sample of cryptocurrencies.

1.1. Background Information

Stable coins emerged as a fiat-currency substitute with cryptocurrency properties with the introduction of Tether in 2014, initially named as Real Coin and later rebranded as USDT. Pegged to the US$, USDT today supports bitcoin's omni and liquid protocols and other blockchains (Ethereum, Avalanche, Kava, Polka, TRON, EOS, Algorand, and Solana). Besides the U.S. dollar, currently USDT issues tokens pegged to the euro, the offshore Chinese yuan, the Mexican peso, and gold. A major reason for USDT's initial success was due to its features of allowing cryptocurrency users to transfer USDT between exchanges and circumventing the need to keep U.S. dollar funds on exchanges. Later other stable coins (USDC and BUSD) entered the market, and they are pegged not only to the U.S. dollar but also other fiat currencies or gold. The success of stable coins, however, sparked heated debates about their underlying collateral, the risks of centralized management and the question of whether they could be used to manipulate the prices of cryptocurrencies such as bitcoin.

1.2. Types of Stable Coins

Stable coins come in three forms, fiat-collateralized, crypto-collateralized, and algorithmic stablecoins, and each of them employs a distinct protocol to maintain parity with its pegged asset. In fiat-collateralized stablecoins (e.g., USDT, USDC), for each unit in circulation, there is an equal amount of the fiat currency held in reserve by the issuing entity, providing redeemability at face value. The crypto-collateralized stablecoins (e.g., DAI) are backed by reserves of other cryptocurrencies. These stablecoins are often over-collateralized (the value of the collateral exceeds the value of the stable coins in circulation) to mitigate the potential volatility of the collateral. A system of smart contracts[2] manages the collateralization, selling or buying back stablecoins to maintain their peg. Algorithmic stablecoins (e.g., BASIS CASH) employ automated algorithms to adjust the supply to changes in demand. They do not depend on collateral but use economic incentives to attract market participants to expand or contract the supply to maintain the peg.

Despite the guarantee of pegging the value to the U.S. dollar or other assets, maintaining the stability of stablecoins has been a challenge. While fiat-collateralized stablecoins are based on trust in the issuer's promise of redemption and the accuracy of their reserves, crypto-collateralized stablecoins have the risk of their collateral losing value. The algorithmic stablecoins face market upheavals that disrupt their stability.

1.3. Stable Coins and Money Properties

A debatable question is whether stable coins are money substitutes. Stable coins are generally run on blockchain, and their 24/7 accessibility to transactions and redeemability to their fiat currencies make them an efficient means of payment. Furthermore, they are guaranteed by a proof of the reserves of the issuer, such as Tether for USDT and Circle for USDC. From a business perspective, there is a distinction between functional currency (the currency traders do business in) and reporting currency (the currency in which financial statements are published). Stable coins have benefited from the simplicity to account for it in a unit that is commonly used. The fiat-backed stable coin is also an IOU (I owe you), where users transfer fiat currency to a centralized institution and get stable coins as digital receipts. This acts as a store of value. These stable coins are claims on the corresponding fiat deposits held by the institution, effectively tokenizing the fiat currency. However, there

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1 Yield farming or liquidity mining in Defi refer to the attempt of crypto investors to use DeFi protocols to earn profits that exceed the normal price appreciation. Similarly, DeFi staking is the practice of locking up cryptocurrencies in a smart contract thereby creating scarcity, leading to price appreciation of crypto assets.

2 Smart contracts on a blockchain execute transactions when pre-determined criteria are met.

is a counterparty risk, as the issuance of stable coins is controlled by a centralized institution. It is likely that the issuer may create excessive stable coins or run away with the underlying bank deposit. The third-party risk can also arise from the potential default of banks (e.g., USDC case in March 2023). Additionally, users collateralize their crypto assets in a smart contract, which creates stable coins (crypto fiat loans) against the collateralized assets.[3] Despite the money properties of stable coins, the current financial and accounting systems have a long way to go in managing stable coin payments.

1.4. Research Motivation

The motivation for this research is threefold. First, peer-to-peer (P2P) lending received a boost with the introduction of DeFi[4] Bazarbash and Beaton (2020) stated that in the UK alone, the P2P lending in consumer markets increased from 0.79 billion USD in 2014 to 2.5 billion USD in 2017. The data on P2P lending during the 2012-2015 period showed that the P2P lending registered a sharp growth from 1.2 billion USD in 2012 to 64 billion USD in 2015. It is expected to reach 1,000 billion USD in 2025 (Statista, 2024). Despite the impressive growth, the biggest challenge of P2P lending including DeFi lending is the high risk for investors due to moral hazards and adverse selection.[5] For instance, the default rate at Prosper.com, a leading P2P lending platform in the United States, was reported to be 2.6% for A-grade loans and 11.5% for D-grade loans as of May 2017, in contrast to only 1.84% for consumer loans at commercial banks (Dore and Mach, 2020). Unlike crypto mining, stablecoin lending (crypto lending) is attractive to investors as it offers high interest rates. Considering that a major cause of de-pegging is DeFi lending, the study examines the inherent features of DeFi that trigger the de-pegging of stable coins.

Second, prior studies such as Klages-Mundt and Minca (2021) and Uhlig (2022) endorsed the contention that some stable coins are prone to de-pegging due to their designs. It was also observed that the stablecoins with a larger amount of high-quality (low-volatility) reserve assets and more restrictive lending requirements faced less redemption pressure during the DeFi crises. Another trigger for de-pegging was the prominence of non-fiat-backed stablecoins in the DeFi lending system. Thus, the present study investigates the design features of stable coins that can shed light on the degree of run pressure they face during crises. Such an investigation is relevant in a post-covid situation, when investors pursue yield farming and staking opportunities for better returns.

Third, there is a need to focus on the interconnection between stable coins and cryptocurrencies. The main shock receivers of the Terra crash were the crypto collateralised stablecoins. Other stablecoins with no direct exposure to Terra USD, such as Tether, also suffered from heavy redemptions breaking their US $1 peg. The crash not only highlighted the fragility of certain stablecoin designs, but also exposed the risk of contagion among crypto-assets warranting further investigation.

The rest of this paper is organised as follows. Section two discusses some stylized facts in stablecoin / DeFi lending. Section three explains de-pegging of stable coins. Section four reviews the related literature and forms a set of hypotheses. Section five presents the data sources and research methods, with the key results presented in Section six. Section seven concludes.

2. Stylized Facts in Stablecoin Lending

2.1. Centralized and Decentralized Lending (CeFi v/s DeFi)

Stablecoin lending refers to loans made with stablecoins, like USDC, DAI, BUSD, or USDT (Tether). Unlike cryptocurrencies, the stablecoin values are not expected to be highly volatile due to their peg. CeFi[6] and DeFi

[3] Given the volatility of crypto collateral, stable coins are overcollateralized to mitigate potential price swings. Unlike fiat-backed stable coins, crypto-backed stable coins are locked in the smart contract, and crypto users are allowed to withdraw them within seconds.

[4] Peer-to-peer (P2P) lending is direct lending of money to individuals or businesses through online platforms. DeFi (decentralized finance) is a term used for financial services on blockchain.

[5] Adverse selection is the result of asymmetric information between buyers and sellers, leading to market failure. Moral hazard is a situation where a borrower has an incentive to increase his / her exposure to risk because he / she does not bear the full costs of that risk.

[6] Unlike DeFi which does not have a central point of control, CeFi refers to financial services that are centrally controlled.

are the popular lending platforms, with the former requiring customer verification and the latter needing no customer identity verification. There are multiple lending platforms in CeFi (BlockFi, Gemini, and Nexo), giving the lender access to crypto collateral lending with stablecoins. The interest rates on CeFi can vary between 7% to 10% depending on the token and exchange. On CeFi, the lender offers his / her tokens to the exchange for lending, and the tokens are locked for certain period (between a few days and a few months), and receive in the interest payments. However, in DeFi, the lender can log on, with the wallet and swap, borrow, or lend the tokens. DeFi options include Maker DAO (Oasis), Aave, and Compound, all of which offer different interest rates on lending. Maker DOA (Oasis) allows crypto users to lend out their tokens to generate DAI, which is a stablecoin pegged to the U.S. dollar. Lending on DeFi can take place directly among crypto users or take part in a liquidity pool that combines users' tokens, allowing borrowers to use them. The interest rates on Oasis range from 0% to 8.75%, and the interest rate on Aave can be between 1% to 3%. Interest payments are received daily, weekly, or monthly, depending on your lending platform.

2.2. Main Players, Regulation, and Taxes

The participants in the lending process include three parties, the stablecoin lenders seeking to make money, individuals, or entrepreneurs (borrowers) looking for funds, and the crypto exchanges responsible for connecting lenders and borrowers, holding digital assets, and setting the interest rates on their loans. Stablecoin loans are sometimes used as capital by institutional traders to buy cryptocurrencies, and the crypto payment processors seek stablecoin loans to help them quickly reimburse lenders.

Despite having good security systems, there are often instances of hacking and security breaches. Coincheck was hacked in 2018 and lost over $500 million worth of crypto. However, most lending platforms these days are insured against loss of your digital assets. Most stablecoin platforms are usually regulated with established rules governing borrowers, lenders, and interest rates. However, there are still instances of hacking, and Crypto.com was recently hacked, and about $15 million of Ether was stolen.

In many countries, including the United States, stablecoin interest is taxable. The interest earned is considered taxable income and needs to be reported on your tax return. According to the IRS (US), stablecoins are listed as "property" under Notice 2014-21, and the interest earned is considered as income for income tax purpose. Furthermore, if you receive stablecoins as payment for goods or services or as wages for a job, they will be taxed as ordinary income. Similarly, changing BTC to UDSC or any other stablecoin is also a taxable event.

2.3. DeFi Lending and Crypto Crisis

DeFi system operates in a decentralized finance system characterized by the anonymity of borrowers, over collateralisation and procyclicality.[7] In DeFi, the collateral values and hence risk-taking capacity rise in booms and decline in busts, producing procyclicality in lending volumes and prices. Borrowers use DeFi to gain leveraged exposure to crypto assets or adjust portfolios, while lenders are attracted by high interest rates. Assessment of borrower's risk through screening or relying on reputation becomes difficult in DeFi since borrowers are anonymous. Moreover, the DeFi loan is disbursed in stablecoins, while the collateral consists of riskier unbacked crypto assets. The minimum collateral borrowers must pledge to receive a loan of a given amount is determined by smart contracts. The smart contracts are programmed, and in booms high prices raise collateral values, leading to a fall in collateralisation ratios. In turn, borrowing constraints relax and loan volumes expand, feeding into further price rise and boosting volumes. In busts, however, loans are liquidated as prices and hence collateral values decline sharply, lowering lending activity. The situation gets worse when borrowed crypto assets are used as collateral for additional loans (like rehypothecation), giving rise to collateral chains. The procyclicality feature of DeFi is prone to de-pegging.

Yield farming or liquidity mining is rampant in DeFi. Investment in ETH is not yield-farming, however, lending out ETH on Aave (DeFi lending platform) to earn a return exceeding ETH price rise is yield farming. Besides Aave, Compound is another DeFi platform used by investors for yield farming. Aave offers stable interest rate which tends to be higher than that offered in Compound.

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[7] Procyclicality is the act of overestimating future risk in times of crisis and underestimating it in normal times.

2.4. DeFi Lending and Yield Farming or Liquidity Mining

DeFi investors often use yield farming technique to earn variable or fixed interest on their investments. Investing in a crypto coin such as ETH is not yield-farming, however, lending out ETH on a DeFi platform (e.g., Aave) for earning a return exceeding ETH price appreciation is yield-farming. Yield farming in DeFi platforms can be profitable only if you have large amount of money to lend since there is competition among investors and the "gas"[8] prices are high. Besides Aave, Compound is another DeFi platform investors use for yield farming. Compared to Compound, Aave offers stable interest rate which tends to be higher than that offered in Compound, however, Compound introduced new incentives for investors through the issuance of its native token COMP, which can be utilized to earn extra rewards. Liquidity pool is another innovation where users add their funds to pools that are then used to generate yield, facilitating liquidity mining or yield farming. There are liquidity pools[9] like Uniswap and Balancer in DeFi which offer fees for adding crypto assets to a pool. In a centralized exchange (CEX) matching engine (system that matches orders with each other) and order book are essential. However, DeFi trading involves executing trades without a centralized party holding the funds. This creates a problem when it comes to order books. Liquidity pool circumvents this difficulty by executing the trade against the liquidity in the liquidity pool instead of a counter party.

3. De-Pegging of Sable Coins

De-pegging occurs when the value of a stablecoin falls below the pegged value. For instance, a stablecoin pegged at a ratio of 1.1 to the US$ may have a market price of $0.80. Stablecoins maintain their stable prices based on asset collateralization including gold and other cryptocurrencies. Stable coin prices tend to move up and down with their dollar pegs within a predefined range of movement. However, maintaining a fixed peg is a difficult task as stablecoins can de-peg and potentially collapse at hyper speed, as they are traded 24/7 on hundreds of crypto exchanges. Additionally, some collateral is less liquid, and valuations of stated collateral may change based on the price of the underlying assets and the costs of converting them to cash.

Although stable coins are vulnerable to de-pegging, however, they are still popular with traders for working capital or as a safe investment option for investors. The stablecoins pegged to the value of an asset, an algorithm or a fiat currency are in great demand, and along with their growth, the third-party audits verifying the proof of collateral has also become important. For instance, USDT's collateral includes secured loans (8.7%) and other investments (4%), and USDT lists corporate bonds and precious metals (5.1%) in its audited reports.

The procyclicality feature of DeFi lending is considered the main cause of de-pegging, and the evidence from the recent de-pegging events points towards it. The recent events related to Terra (May 2022) and Celsius (July 2022) (collapse of Anchor on the Terra blockchain and Celsius' restrictions on withdrawals), were attributed to the institutional features of DeFi lending. Terra USD (UST) was pegged to the US $ and was convertible into one dollar's worth of LUNA, and vice versa. Anchor, the lending protocol of DeFi, had a deposit rate of around 20% on UST and new crypto users bought LUNA to mint UST, leading to an increase in the value of LUNA. However, as UST fell below its peg, users removed their UST out of the Anchor protocol to burn them and mint $1 worth of new LUNA with the expectation of selling LUNA and making a profit. However, the newly minted LUNA coins had no takers in the crypto market and the LUNA price crashed. This resulted a decline in the values of collateral falling below their liquidation ratios, and fearing that the collateral could become impaired, depositors withdrew their funds. The result was a run-on Terra and the panic spread to other cryptocurrencies.

From late 2022 to early 2023, there was an increase in stablecoin redemptions, mainly in BUSD. Large scale redemptions imply less liquidity for stablecoins. The current cash-on-hand ratios for USDC and BUSD are 20% and 6% respectively. However, the current cash-on-hand ratio for USDT is unknown. Furthermore, the fiat-collateralized stable coins have up to 80% of the collateral held in 30-day fixed-maturity Treasury bills, with only 20% held in liquid cash deposits. In many instances, the volume of stablecoin redemptions may be larger than the cash on hand for instant redemptions. For instance, in December 2022, BINANCE paused over $1.6 billion in USDC withdrawals, as the exchange did not have the USDC on hand to fund the withdrawals.

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[8] Gas is the fee required to conduct a transaction on the Ethereum blockchain platform.

[9] A liquidity pool is a collection of funds locked in a smart contract, and they are used for decentralized lending.

The delay was around eight hours; however, these redemption delays have the potential to temporarily de-peg a stablecoin. De-pegging can also arise due to supply shortage or smart contract failure.

Table 1 provides a set of data related to stable coins, crypto lending and staking. Panel (A) shows that the three dollar-denominated fiat-collateralized stablecoins (USDT, USDC and BUSD) dominate the stable coin market. Considering their importance, any crisis related to these stable coins will have a contagion effect in the crypto market. Panel (B) shows that USDT, BUSD, and USDC top the chart in terms of cumulative trade volume

Table 1: Data on Stable Coins, Crypto Lending, and Staking

Panel (A): Stablecoins by Value and Percentage*

Stable Coin	USD Value	% of Stable Coin
USDT	68,278,906,241	49.63
USDC	41,550,334,529	30.2
BUSD	16,176,383,346	11.76
Total	126,005,624,116	91.59
All other Stable Coins	11,579,888,676	8.42
Grand Total	137,585,512,793	100

Panel (B): Cumulative Stable Coin Trade Volume (USD) in 2023**

USDT	2.2 trillion	
BUSD	560 billion	
USDC	250 billion	
TUSD	166 billion	
DAI	20 billion	

Panel (C): Stable Coin Yields (2023)***

Name	Total Value Locked (TVL) (USD)	Yield (APY-Annual % Yield)
Compound	142.11 million	2.9. This yield is split into a base APY of 2.10% and a reward APY of 0.80%
AAVE V2	107 million	2.59
Morpho Aave	72.66 million	2.96
Dai Savings Rate		3.49.
Yearn Finance	107.57 million	5.45
Conic Finance	34.58 million	11.61%, with a base APY of 0.62% and a reward APY of 10.99
Ondo Finance	160.31 million	7.1

Panel (D): Crypto Lending and Staking Platforms, and Popular Yield Earning Cryptos (April 5, 2023)****

Top lending platforms	Top Decentralized Platforms for Staking	Popular Yield earning cryptos
Nexo, Huobi, Binance, Compound, You Holder	Kyber Network, Bisq, IDEX, Honey Swap, Binance DEX	Ethereum (ETH), Polygon (MATIC), Bitcoin (BTC), Solana (SOL), Cardano (ADA), Tether (USDT), Finance Coin (BNB), MultiversX (EGLD)

Note: *The market for stablecoins as of Feb. 10, 2023. Source: Coin Gecko. **Kaiko Asset Metrics. ***Data from DeFiLlama, a leading DeFi TVL aggregator. ****https://www.cryptowisser.com/guides/earning-crypto-yields/

with $ 2.2 trillion, $560 billion and 250 billion respectively. In the post Terra event, yields across stable coin platforms have been within the 3-5% range and this is shown in Panel (C). The popular crypto lending and staking platforms are displayed in Panel (D). The figures in Panel (C) highlight the low-yield environment in stablecoin market. However, the figures also show the diversity and potential opportunities in the stable coin market depending on the level of smart contract risk.

4. Related Literature and Hypothesis Development

4.1. Related Literature

Prior studies including Klages-Mundt and Minca (2021); Uhlig (2022); Platias and DiMaggio (2019) and Gudgeon *et al.* (2020) focussed on the stability of stable coins and observed that stable coin designs are prone to de-pegging. While Klages-Mundt and Minca (2021), investigated the deleveraging of DAI using a market microstructure approach, Uhlig (2022) employed a run model to explain Terra-Luna dynamics. Platias and DiMaggio (2019) and Gudgeon *et al.* (2020) tested the stability of Terra USD and DAI. Evans (2019) work on the credit risk of DAI, and Darlin *et al.* (2022) study on fund flows of DeFi lending protocols also addressed the issue of stability. The evidence from these studies showed that the response of stable coins to de-pegging events was varied, with some facing acute redemption pressure, while others were not affected by the crisis. The crypto-collateralized stable coins faced the worst situation due to de-pegging occurrence. The other studies that examined the relationship between stability and stable coin design include Clements (2021), Catalini and de Gortari (2021), Briola *et al.* (2022), and De Blasis *et al.* (2022). Jarno and Kolodziejczyk (2021) found that the stability on stable coins differed based on the underlying design, and Jeger *et al.* (2020) reviewed the stability mechanisms under the Covid-19 related financial crisis. Zhao *et al.* (2021) examined the BASIS Cash's design and stability, while Baur and Hoang and (2021) used high-frequency data of six major stablecoins to study their returns, volatility, and volume and concluded that they are not stable.

The studies that examined the interconnectedness between stable coins and other markets include Pernice (2021), Thanh *et al.* (2022), Nguyen *et al.* (2022), Yousaf and Yarovaya (2022) and Bojaj *et al.* (2022). Pernice (2021) demonstrated how the prices of fully collateralized stablecoins change due to traders' behaviours, and Nguyen *et al.* (2022) employed fixed effects models to determine the effect of the United States federal funds rate and the Chinese interbank rate on stablecoins. Thanh *et al.* (2022) argued that the instabilities of major stablecoins, such as USDT and USDC, affected the pricing of other stablecoins. Yousaf and Yarovaya (2022) observed varying return and volatility spillovers between gold-backed stablecoins and equities in pre-COVID and COVID periods. Bojaj *et al.* (2022) investigated the potential impact on cryptocurrency and found various types of stable coin shocks resulted in an unpredictable volatility of Bitcoin.

Although these studies were recent and examined the stability of stable coins, generalization of their findings may not be apt. First, most of these studies were conducted during the pandemic period, which is not a normal situation. Not only the crypto market, but all the other financial markets including equity and fiat currency markets were also affected by the pandemic. Given the interconnected of these markets, it is very likely that there could be confounding effects so that the real relationships may not get fully reflected. Second, these studies employed varied methods for analysis and therefore an aggregation of their findings may not be accurate. Third, except a couple of studies, none of the other studies have focussed primarily on the spillover effect of stable coin de-pegging on cryptocurrency values. This is important because most of the stable coins including the crypto collateralized coins have cryptocurrency reserves. The presence of simultaneity between de-pegging effect and cryptocurrency values can not be ruled out. The present study focused on these research gaps, and specifically estimated the impact of de-pegging on a select sample of cryptocurrency values using the event study method.

4.2. Objectives of the Study and Hypothesis Development

The de-pegging events have shaken the confidence of both the traders who patronized the DeFi lending platforms for funds and the crypto investors who used the crypto exchanges for better returns. While reviewing the current state of empirical literature on stable coins, it is clear, that faulty coin designs and vulnerable algorithms have contributed to the instabilities of major stablecoins, leading to de-pegging events. A related

issue is the change in value of fully collateralized stablecoins due to traders' behaviours. Based on these insights from prior studies and taking a cue from Bojaj *et al.* (2022), who examined the effect of stablecoin instability on other cryptocurrency prices including Bitcoin, the present study has the following twin objectives:

- Examination of whether there are any abnormal returns of stablecoins around the de-pegging event date.
- Investigation of whether there are any abnormal returns of crypto currencies around the de-pegging event date.

Examining the fragility of stablecoins, Clements (2021) and Catalini and de Gortari (2021) connected the fragility with the volatility of reserve assets and risk exposure of stablecoins. Instability being the main cause of de-pegging, it is therefore hypothesized, that the stablecoin market is adversely affected by de-pegging events. The first hypothesis in alternative form is:

H_1: *The Cumulative Average Abnormal Returns (CAARs) of stablecoins in the sample will be less than zero over the de-pegging event window -5 to +5.*

In DeFi lending platforms, collateral values decline sharply, reducing lending activity during busts. The problem gets magnified when borrowed crypto assets are used as collateral for additional loans (rehypothecation), giving rise to collateral chains. Besides procyclicality, the DeFi loan is disbursed in stablecoins, while the collateral consists of riskier unbacked cryptocurrencies. It is, therefore, hypothesized that the abnormal returns of the sampled cryptocurrencies around the de-pegging event dates are negative. The second hypothesis in alternative form is:

H_2: *The Cumulative Average Abnormal Returns (CAARs) of cryptocurrencies in the sample will be less than zero over the de-pegging event window -5 to +5.*

5. Data, Sample, and Research Methodology

The data for the study includes the daily adjusted close prices of a select sample of stable coins and cryptocurrencies chosen based on market capitalization and the availability of data for the full sample period from 2 March 2021 to 2 March 2024. The sample period includes only the post-pandemic period and the covid period was omitted with the intention of avoiding the confounding bias. The crypto market trading data including the daily adjusted close prices and trading volumes were collected from sources such as CoinGeco.com, Coincodex.com and Coinmarketcap.com. Table 2 shows the list of stable coins and cryptocurrencies included in the sample. The sample was determined based on market capitalization and availability of data for the entire sample period.

The research methods employed in the study include event study and logistic regression. The event study was used to examine the return behaviours of a select sample of both stablecoins and cryptocurrencies experiencing a common event (de-pegging of USDC during the weekend of March 10-13, 2023). The failure of three US banks namely Silicon Valley Bank (SVB), Signature Bank and Silvergate Bank caused both USDC and DAI to de-peg in March 2023. USDC is a centralized, collateralized stablecoin, implying that each token is backed by $1 in reserve assets, and its reserves were held exclusively in US banks as cash and short-term US Treasuries. The issuer of USDC, Circle, confirmed that it held $3.3 billion of cash reserves, backing USDC, at SVB resulting in a de-peg of 13% below $1. DAI was also forced to de-peg because USDC holdings constituted over half of the collateral reserves backing DAI. However, both USDC and DAI recovered to their peg levels after the Federal Reserve confirmed that it would support the banks' creditors. Not all stable coins were affected by the event, and Tether, having no exposure to SVB increased its value above $1 as crypto investors exited from the affected stablecoins.

The date on which the event (de-pegging of USDC in March 2023) occurred was taken as the event date (t = 0). Although it is difficult to pin point the exact date of de-pegging event as it occurred during the 10-15 March, 2023 period, for the event study analysis, the date 15 March 2023 was taken as the event day. This was done since the de-pegging process reached its culmination on 15th and the intervention of the FED in the banking crisis made both USDC and DAI to recover fast and reach their pegged values. The eleven days enclosing the events (i.e., t = –5…., 0…., +5) were labelled as the event window. The days before the event period

Table 2: Stable Coins and Cryptocurrencies in the Sample

S. No	Stable Coin (Symbol)	Cryptocurrency (Symbol)
1	ALCH	CARDANO
2	BNB	AVAX
3	CELO	BCH
4	CRV	BNB
5	DAI	BTC
6	DGX	DASH
7	FEI	DOGE
8	FLEX	ETH
9	GUSD	FIL
10	LQTY	LINK
11	PAXG	MATIC
12	SPA	STX
13	SUSD	TRX
14	TOR	XLM
15	USDC	XPM
16	USDK	XPR
17	USDP	
18	USDT (Tether)	
19	USTC	

(i.e., –50…-5) were labelled as the estimation period. The abnormal returns (AR) of the tokens for the event window were computed around the announcement date (15 March 2023).

After estimating the expected returns for the window period (ER) by employing the mean adjusted returns, the abnormal returns (AR) were computed by deducting the actual returns (AR) from the expected returns (ER). The mean adjusted returns model was preferred instead of the market model because of the difficulty of identifying a market index which represent both stable coins and cryptocurrencies. Finally, the CAR (Cumulative Abnormal Returns) for the 10 days was estimated, and the CAR is calculated by adding the daily AR for the entire event window of 11 days. The student t-test was computed to assess the statistically significant difference in the mean returns before and after the events. The return series is calculated as the natural log of the first difference of the daily adjusted closing price.

$$Rt = \ln Pt / (Pt - 1) \quad \ldots(1)$$

Where Rt is the logarithmic daily returns for time t, Pt is the closing price at time t, and $Pt-1$ is the closing price at $t-1$ period. Under the mean adjusted returns, $[ARjt = Rjt - E(Rj)]$ where $ARjt$ is the abnormal return on the token (stable coin / cryptocurrency) j in time t, Rjt is the observed return on the token j in time t and $E(Rj)$ is the expected or average return for the token j over a given sample period. Parametric and non-parametric tests were conducted to ascertain the impact of the events on the returns of the sample tokens.[10]

[10] An event study investigates if the cross-sectional distribution of returns at the time of an event is abnormal (systematically different from predicted). In the event study literature, the focus is on the mean of the distribution of abnormal returns. The null hypothesis is whether the mean abnormal return (the average residual, AR) at time t is equal to zero.

For robustness test, the study used a logistic model. The estimation of logistic regression,[11] was done by dividing both the stable coin and crypto currency samples into two sub-samples of pre and post USDC de-pegging event periods. The dependent variable is a dummy, with 1 representing observations in the post-USDC de-pegging event period and 0 otherwise. The logistic model is employed here to make a prediction about the dependent categorical variable (1 or 0) and the independent variables of stable coins and cryptocurrency returns. In logistic model, exponentiating the beta estimates is done to change the results into an odds ratio (OR), with the OR showing the outcome will occur given a particular event, compared to the odds of the outcome occurring in the absence of that event.

The logistic model used in the study takes the following form:

De-pegging Dummy = $\beta 0 + \beta 1$ Stable Coin Returns + $\beta 2$ Cryptocurrency Returns + $\beta 3$ Stable Coin AR + $\beta 4$ Cryptocurrency $AR + \mu$ ....(2).

Where, the De-pegging Dummy takes a value of 1 for observations in the post-USDC de-pegging event period and 0 otherwise. μ is the residual term.

6. Results and Discussion

6.1. Data Characteristics

Prior to conducting the univariate analysis, histograms and normal probability plots were drawn to examine the characteristics of the data used in the analysis. Figures 1 to 4 display the characteristics of stable coin and cryptocurrency returns and average ARs using histograms. The histograms were drawn to understand the data distributions and look for outliers. Additionally, the histograms help to discover the underlying frequency distribution (shape) of the data (the returns and abnormal returns of stable coins and cryptocurrencies) used in the study. An inspection of the histograms (see Figures 1 to 4) shows that except the cryptocurrency average abnormal returns in Figure 4, all the other histograms do not show any serious issue of outliers and skewness.

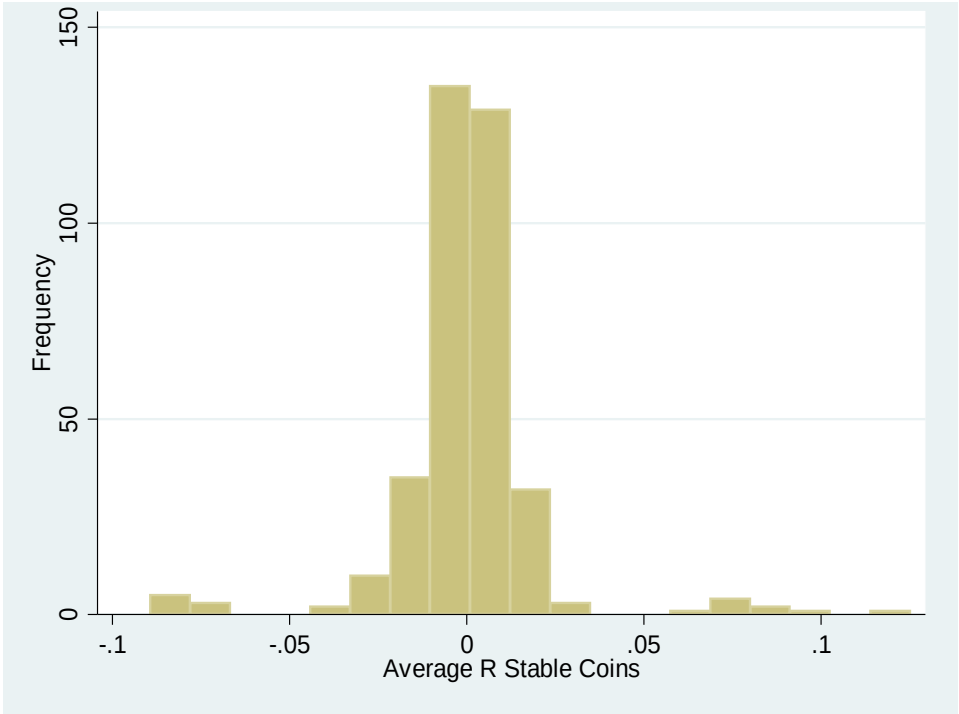

Figure 1: Histogram of Stable Coin Returns

[11] For details on logistic regression refer Chao-Ying Joanne Peng, Kuk Lida Lee and Gary M. Ingersoll (2022). An Introduction to Logistic Regression Analysis and Reporting. *The Journal of Education Research*, Vol. 96, No. 1, Oct., pp. 3-14.

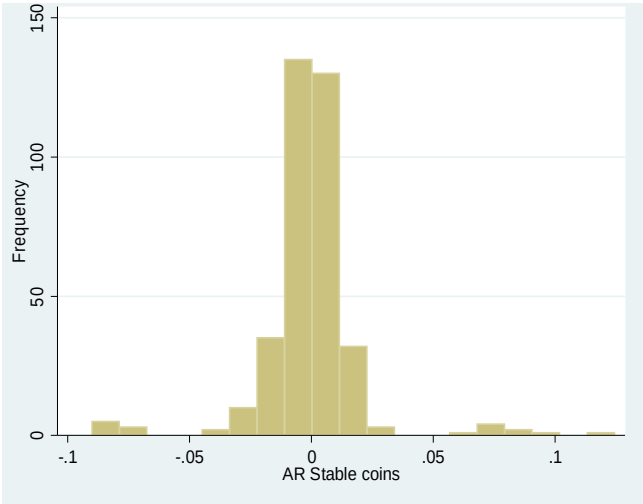

Figure 2: Histogram of Stable Coin Average AR

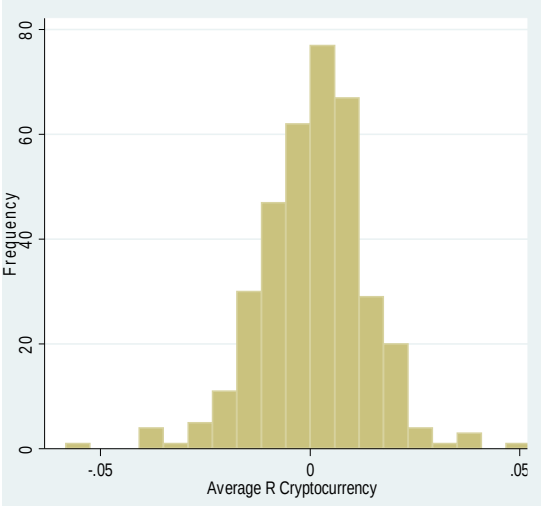

Figure 3: Histogram of Cryptocurrency Returns

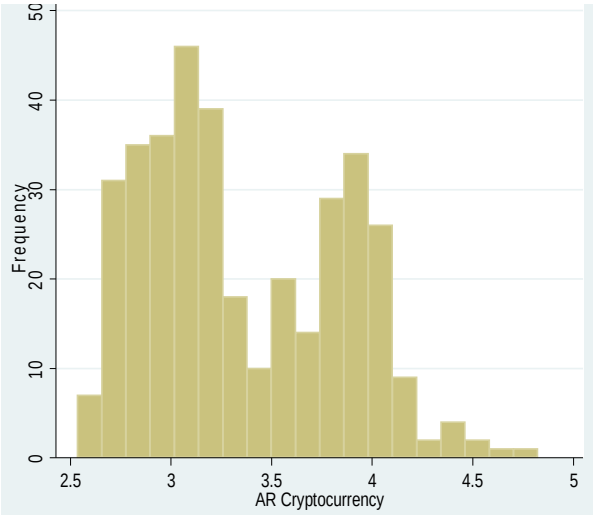

Figure 4: Histogram of Cryptocurrency Average AR

The study also utilized normal probability plots (standardized) to identify whether the data have substantive departures from normality (including identifying outliers, skewness, and kurtosis). Figures 5 to 8 display the normal probability plots for the data under the study. The normal probability plot displayed in Figure 7 is straight implying the cryptocurrency returns are normally distributed. However, in Figures 8 the normal probability plot of the cryptocurrency average abnormal returns displays a S-shape showing a multimodal and roughly symmetric distribution (see Figure 4). Figures 5 and 6 show that there is presence of skewness in both stable coin returns and abnormal returns.

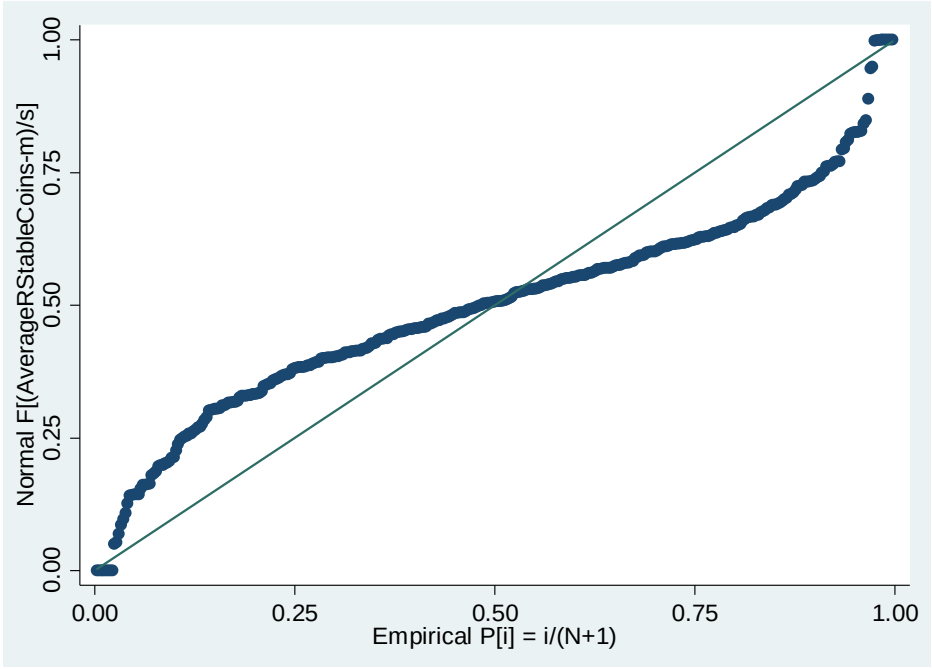

Figure 5: Normal Probability Plot, Standardized of Stable Coin Returns

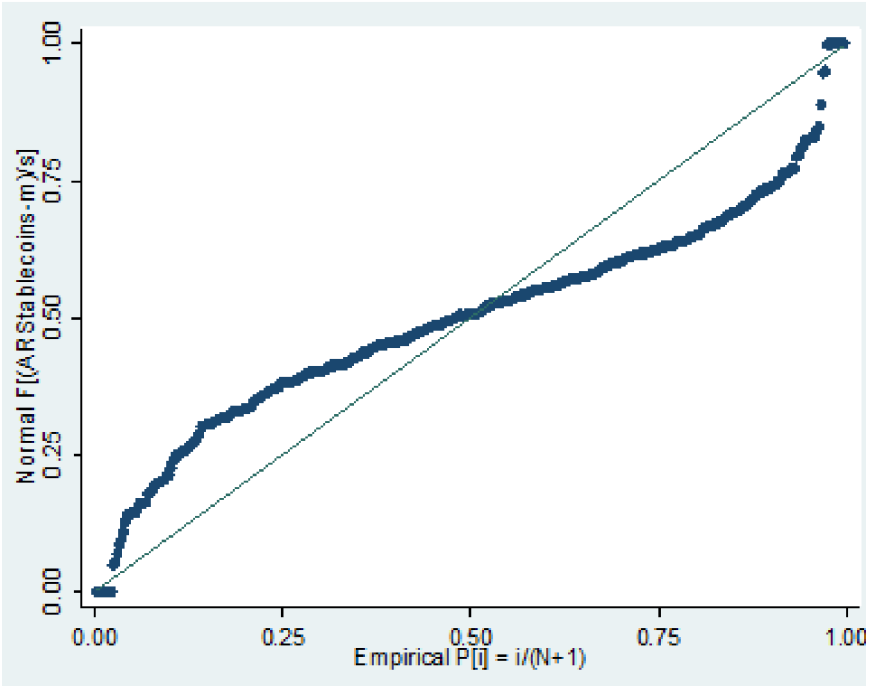

Figure 6: Normal Probability Plot, Standardized of Stable Coin Average AR

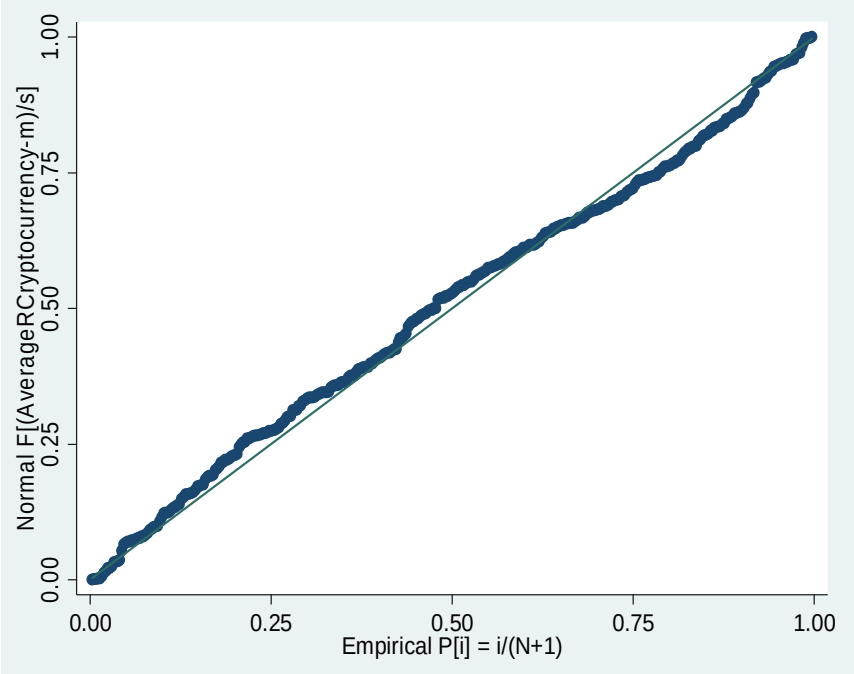

Figure 7: Normal Probability Plot, Standardized of Cryptocurrency Returns

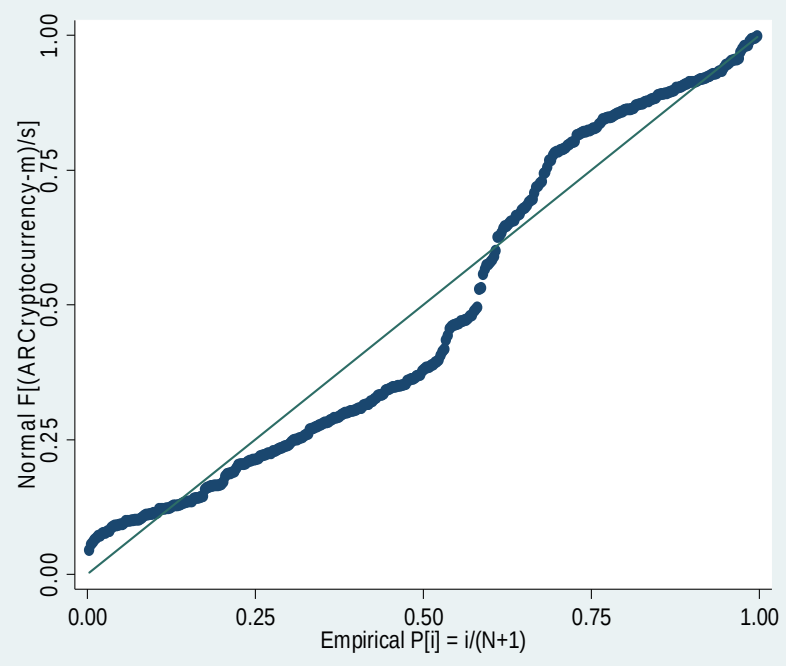

Figure 8: Normal Probability Plot, Standardized of Cryptocurrency Average AR

6.2. Univariate Analysis and Event Study Results

Tables 3, 4 and 5 give the descriptive statistics of returns, abnormal returns (AR) and cumulative abnormal returns (CAR) of stablecoins in the sample. Tabe 6 displays the 5-day average AR and CAR of the sampled stable coins. Of the 19 stable coins in the sample, 7 of them show negative average returns (see Table 2). Eleven of the 19 sampled stable coins have negative abnormal returns (see Table 4), and 9 of them show negative CAR (see Table 5). A possible reason for this could be the impact of de-pegging that occurred in 2022 and 2023. The high values of kurtosis for both returns and abnormal returns imply that the distribution of returns and

abnormal returns are leptokurtic (having fat tails), implying the presence of frequent outliers. There is negative skewness for 7 stable coins in the sample for abnormal returns and 6 for cumulative abnormal returns. Negative, or skewed left, means the left tail is long relative to the right tail and points in the direction of zero and negative. From a crypto investor's perspective, this indicates that an investor may expect frequent small gains and a few large losses. The skewness could also be the result of outliers. The univariate results, thus, confirm our contention that by and large de-pegging has impacted stablecoins adversely. These results provide valuable insights to both traders who use stable coins as a means of payment and crypto investors who patronize DeFi for yield farming and staking for better returns.

Figures 9 and 10 display the 5-day CAR and abnormal returns (AR) of stablecoins for the entire sample period respectively. In Figure 9, the de-pegging event of USDC on 15 March, 2023 is denoted as period zero (even day) and the trend of CAR is shown both in the pre and post period of the event. The figure demonstrates that the average stablecoin CAR shows sharp decline prior to the event, however, registers fast recovery in the

Table 3: Descriptive Statistics of Returns of the Sample of Stable Coins

Stable Coins	ALCH-R	BNB-R	CELO-R	CRV-R	DAI-R	DGX-R	FEI-R	FLEX-R	GUSD-R	LQTY-R
Average	0.0007	0.0008	0.0016	-0.0011	0.0000	0.0001	-0.0001	-0.0002	0.0000	-0.0004
Variance	0.0026	0.0005	0.0019	0.0016	0.0000	0.0007	0.0004	0.1181	0.0000	0.0030
SD	0.0508	0.0232	0.0433	0.0396	0.0018	0.0266	0.0209	0.3436	0.0040	0.0545
Minimum	-0.1914	-0.1132	-0.1651	-0.1612	-0.0254	-0.1045	-0.1262	-1.5972	-0.0174	-0.2059
Maximum	0.2844	0.1085	0.1851	0.1095	0.0190	0.1282	0.1625	1.8127	0.0169	0.2503
Skewness	1.2138	-0.1397	0.1999	-0.3537	-4.6152	0.3543	0.7167	0.0765	0.3809	0.2868
Kurtosis	6.3978	4.6016	1.8981	1.1381	152.7919	3.8783	14.0549	16.0667	3.2410	4.1906
Stable Coins	PAXG-R	SPA-R	SUSD-R	TOR-R	USDC-R	USDK-R	USDP-R	USDT-R	USTC-R	
Average	0.0003	0.0014	0.0000	0.0000	0.0000	-0.0005	0.0000	0.0000	0.0009	0.0003
Variance	0.0000	0.0062	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0052	0.0000
SD	0.0063	0.0790	0.0031	0.0026	0.0019	0.0083	0.0034	0.0005	0.0722	0.0063
Minimum	-0.0295	-0.2170	-0.0096	-0.0089	-0.0284	-0.0935	-0.0117	-0.0033	-0.1899	-0.0295
Maximum	0.0317	0.4026	0.0121	0.0405	0.0210	0.0339	0.0113	0.0046	0.9461	0.0317
Skewness	0.6088	1.5715	-0.0117	10.0050	-5.4170	-3.6386	-0.2994	2.2307	6.4405	0.6088
Kurtosis	4.3323	5.7372	1.2320	159.0306	179.6138	43.6865	0.6999	33.2714	81.0937	4.3323

Table 4: Descriptive Statistics of Abnormal Returns (AR) of the Sample of Stable Coins

Stable Coins	ALCH-R	BNB-R	CELO-R	CRV-R	DAI-R	DGX-R	FEI-R	FLEX-R	GUSD-R	LQTY-R
Average	0.0000	0.0000	0.0008	-0.0018	-0.0007	-0.0006	-0.0008	-0.0009	-0.0007	-0.0011
Variance	0.0026	0.0005	0.0019	0.0016	0.0000	0.0007	0.0004	0.1181	0.0000	0.0030
SD	0.0508	0.0232	0.0433	0.0396	0.0018	0.0266	0.0209	0.3436	0.0040	0.0545
Minimum	-0.1921	-0.1139	-0.1658	-0.1619	-0.0262	-0.1052	-0.1269	-1.5979	-0.0182	-0.2066
Maximum	0.2837	0.1078	0.1844	0.1088	0.0183	0.1275	0.1618	1.8120	0.0162	0.2496
Skewness	1.2138	-0.1397	0.1999	-0.3537	-4.6152	0.3543	0.7167	0.0765	0.3809	0.2868
Kurtosis	6.3978	4.6016	1.8981	1.1381	152.7919	3.8783	14.0549	16.0667	3.2410	4.1906
Stable Coins	PAXG-R	SPA-R	SUSD-R	TOR-R	USDC-R	USDK-R	USDP-R	USDT-R	USTC-R	
Average	-0.0004	0.0007	-0.0007	-0.0007	-0.0007	-0.0012	-0.0007	-0.0007	0.0001	
Variance	0.0000	0.0062	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0052	
SD	0.0063	0.0790	0.0031	0.0026	0.0019	0.0083	0.0034	0.0005	0.0722	
Minimum	-0.0302	-0.2178	-0.0103	-0.0096	-0.0291	-0.0942	-0.0124	-0.0040	-0.1906	
Maximum	0.0310	0.4019	0.0114	0.0398	0.0202	0.0332	0.0106	0.0039	0.9454	
Skewness	0.6088	1.5715	-0.0117	10.0050	-5.4170	-3.6386	-0.2994	2.2307	6.4405	
Kurtosis	4.3323	5.7372	1.2320	159.0306	179.6138	43.6865	0.6999	33.2714	81.0937	

post-event period. There could be three possible reasons for this. Frist, there was a build-up in the crypto market towards de-pegging of USDC and this could have exerted a downward pressure on stable coin returns. Second, the de-pegging process could not be confined to one day event and the process commenced on 10 March and culminated on 15 March, 2013. Third, another important reason could be that both USDC and DAI recovered to their pegged values fast, and the de-pegging did not impact several stable coins including Tether, which did not have any reserves with the failed banks (Silicon Valley Bank (SVB), Signature Bank and Silver -gate Bank). However, after a period of fast recovery, there appears to be a sharp decline in CAR in the post-de-egging period.

Table 5: Descriptive Statistics of 5-Day Cumulative Abnormal Returns (CAR) of the Sample of Stable Coins

Stable Coins	ALCH-R	BNB-R	CELO-R	CRV-R	DAI-R	DGX-R	FEI-R	FLEX-R	GUSD-R	LQTY-R
Average	0.0141	0.0297	0.0259	0.0145	-0.0015	0.0030	-0.0003	0.0047	-0.0008	0.0719
Variance	0.0060	0.0022	0.0037	0.0068	0.0001	0.0003	0.0006	0.0103	0.0001	0.0256
SD	0.0772	0.0468	0.0610	0.0824	0.0120	0.0171	0.0237	0.1017	0.0091	0.1600
Minimum	-0.1293	-0.0349	-0.0525	-0.1055	-0.0278	-0.0157	-0.0396	-0.1901	-0.0165	-0.1781
Maximum	0.1143	0.1042	0.1219	0.1249	0.0240	0.0417	0.0385	0.1496	0.0149	0.3270
Skewness	-0.3670	0.4424	0.3960	-0.2763	-0.0974	1.3077	-0.0912	-0.3932	-0.1219	0.0668
Kurtosis	-0.6400	-1.1846	-1.0907	-1.2655	3.9048	1.6959	-0.6865	-0.4030	-0.0279	-1.0427
Stable Coins	PAXG-R	SPA-R	SUSD-R	TOR-R	USDC-R	USDK-R	USDP-R	USDT-R	USTC-R	
Average	0.0129	0.0562	-0.0018	-0.0015	-0.0014	0.0021	-0.0014	-0.0009	-0.0029	
Variance	0.0002	0.0186	0.0000	0.0000	0.0002	0.0002	0.0000	0.0000	0.0024	
SD	0.0157	0.1362	0.0039	0.0027	0.0131	0.0133	0.0035	0.0034	0.0494	
Minimum	-0.0055	-0.1208	-0.0094	-0.0059	-0.0303	-0.0150	-0.0074	-0.0053	-0.0609	
Maximum	0.0490	0.3611	0.0040	0.0050	0.0264	0.0314	0.0039	0.0063	0.0793	
Skewness	1.2149	1.0338	-0.8977	1.1486	-0.1517	1.1365	-0.1951	0.7935	0.1742	
Kurtosis	1.6809	1.3583	0.6297	3.0711	3.9172	1.2071	-0.2695	0.7414	-1.5444	

Table 6: 5-Day Average AR and Average CAR (Stable Coins)

Event Day	5-Day Average AR	5-Day Average CAR
-5	-0.0094	-0.00018322
-4	0.0092	0.027837942
-3	0.0186	0.036110135
-2	0.0175	0.037529339
-1	0.0200	0.010649335
0	-0.0094	-0.009375308
1	0.0092	-0.000161277
2	0.0141	0.023287363
3	0.0117	0.025773691

The discussion so far concentrated on the impact of the March 2023 USDC de-pegging event in the stable coin market. The de-pegging of DAI was a fall out of USDC de-pegging as it was backed by USDC reserves. However, it is also important to examine the effect in the crypto currency market because since many stable coins keep cryptocurrencies as reserves. Although the immediate trigger for the de-pegging of USDC might be attributed to the collapse of the three US banks, however, the earlier crises related to Terra (May 2022) and

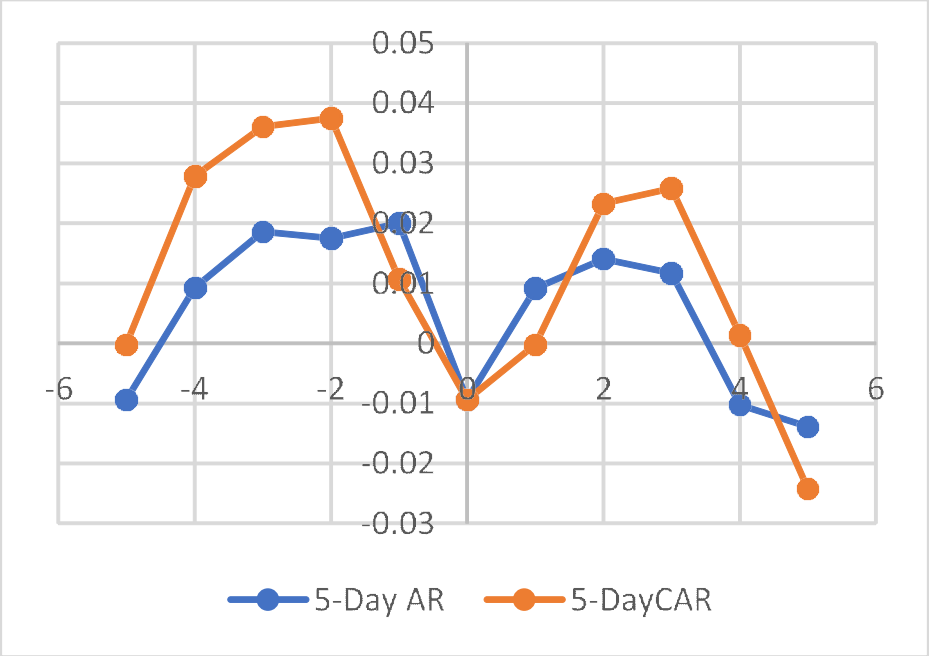

Figure 9: 5-Day Average AR and Average CAR (Stable Coins)

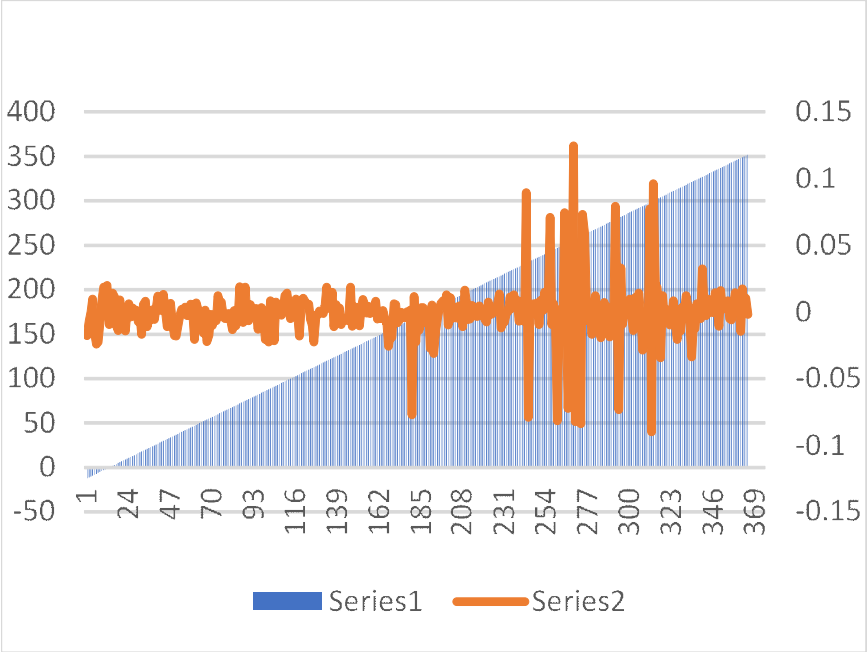

Figure 10: Average Abnormal Returns (AR) of the Sample of Stable Coins for the Sample Period

Celsius (July 2022) (collapse of Anchor on the Terra blockchain and Celsius' restrictions on withdrawals), have been linked to the institutional features of DeFi lending. The problem gets magnified and has spillover effects when borrowed crypto assets are used as collateral for additional loans (rehypothecation) in DeFi lending platforms. Considering these linkages, it is likely that any crisis in the stable coin market spills over to the crypto currency market.

Tables 7, 8, 9 and 10 display the descriptive statistics of the returns, abnormal returns, and 5-day cumulative abnormal returns of the cryptocurrencies in the sample respectively. Of the 17 cryptocurrencies

in the sample, only five of them have negative returns. However, 12 of them show negative abnormal returns. The number of cryptocurrencies in the sample showing 5-day negative cumulative abnormal returns is only three. The negative abnormal returns clearly demonstrate the de-pegging event affected the cryptocurrency market adversely. The opposite result in case of CAR could possibly be due to averaging and short-window period. Table 10 and Figure 11 display the CAR trend in the 5-day event window. Like the stable coins (see Table 6, Figure 9), the 5-day CAR of cryptocurrencies also shows a sharp decline prior to the de-pegging event day and then a fast recovery in the post event period. However, the abnormal returns show a declining trend both in the pre and post event periods. The CAR uptrend in the post de-pegging event period could be due to the intervention of FED in preventing a run on the US banks which might have mitigated the adverse effect to some extent. Also, both USDC and DAI recovered fast and were able to achieve their pegged values in a very short period.

Table 7: Descriptive Statistics of Returns of the Sample of Cryptocurrencies

Cryptocurrencies	CARDANO-R	AVAX-R	BCH-R	BNB-R	BTC-R	DASH-R	DOGE-R	ETH-R	FIL-R
Average	0.0023	-0.0027	-0.0037	0.0010	-0.0031	0.0024	0.0024	0.0023	0.0013
Variance	0.0012	0.0017	0.0022	0.0005	0.0005	0.0036	0.0013	0.0006	0.0019
SD	0.0351	0.0413	0.0472	0.0231	0.0234	0.0600	0.0362	0.0243	0.0432
Minimum	-0.0931	-0.1933	-0.4601	-0.1132	-0.0981	-0.4593	-0.1163	-0.0833	-0.1855
Maximum	0.2140	0.1644	0.1199	0.1085	0.0788	0.3996	0.1946	0.1155	0.1692
Skewness	1.1000	-0.3286	-3.8711	-0.1638	-0.5741	-0.0785	1.1345	0.3708	0.2138
Kurtosis	5.6309	3.1393	29.7859	4.6526	2.9352	16.4099	6.1374	2.4266	2.9954
Cryptocurrencies	LINK-R	LTC-R	MATIC-R	STX4847-R	TRX-R	XLM-R	XPM-R	XRP-R	LINK-R
Average	0.0050	0.0000	0.0000	0.0038	0.0020	0.0015	-0.0004	0.0015	0.0050
Variance	0.0047	0.0011	0.0013	0.0033	0.0004	0.0014	0.0025	0.0017	0.0047
SD	0.0688	0.0337	0.0362	0.0572	0.0208	0.0378	0.0504	0.0418	0.0688
Minimum	-0.6146	-0.1429	-0.1735	-0.1349	-0.1152	-0.1309	-0.3610	-0.1485	-0.6146
Maximum	0.2427	0.2436	0.1457	0.3519	0.1014	0.4615	0.2782	0.5486	0.2427
Skewness	-1.7319	0.3886	-0.1492	1.4954	-0.3222	5.0666	-0.4826	6.3684	-1.7319
Kurtosis	18.5804	9.0810	2.2208	6.1355	7.6803	61.3975	12.8064	82.9569	18.5804

Table 8: Descriptive Statistics of AR of the Sample of Cryptocurrencies

Cryptocurrencies	CARDANO-R	AVAX-R	BCH-R	BNB-R	BTC-R	DASH-R	DOGE-R	ETH-R	FIL-R
Average	-0.0002	-0.0049	-0.0059	-0.0013	-0.0051	0.0002	-0.0003	-0.0001	-0.0008
Variance	0.0012	0.0017	0.0022	0.0005	0.0005	0.0036	0.0012	0.0006	0.0019
SD	0.0351	0.0413	0.0473	0.0232	0.0230	0.0601	0.0352	0.0243	0.0432
Minimum	-0.0953	-0.1955	-0.4623	-0.1155	-0.1004	-0.4616	-0.1186	-0.0855	-0.1878
Maximum	0.2117	0.1622	0.1176	0.1063	0.0766	0.3974	0.1923	0.1132	0.1669
Skewness	1.1121	-0.3299	-3.8657	-0.1603	-0.5287	-0.0815	0.9690	0.3767	0.2091
Kurtosis	5.7281	3.1248	29.6960	4.6391	2.9727	16.3734	5.8382	2.4725	3.0121
Cryptocurrencies	LINK-R	LTC-R	MATIC-R	STX4847-R	TRX-R	XLM-R	XPM-R	XRP-R	LINK-R
Average	0.0028	-0.0022	-0.0023	0.0015	-0.0002	-0.0008	-0.0027	-0.0008	0.0028
Variance	0.0047	-0.0011	-0.0010	0.0010	-0.0018	-0.0008	0.0003	-0.0005	0.0047
SD	0.0689	0.0315	0.0340	0.0549	0.0185	0.0355	0.0481	0.0395	0.0689
Minimum	-0.6168	-0.1451	-0.1757	-0.1372	-0.1174	-0.1332	-0.3632	-0.1508	-0.6168
Maximum	0.2404	0.2414	0.1435	0.3497	0.0991	0.4593	0.2759	0.5463	0.2404
Skewness	-1.7300	0.3863	-0.1515	1.4931	-0.3245	5.0643	-0.4849	6.3661	-1.7300
Kurtosis	18.5233	9.0787	2.2186	6.1333	7.6780	61.3952	12.8041	82.9546	18.5233

Table 9: Descriptive Statistics of 5 Day CAR of the Sample of Cryptocurrencies

Cryptocurrencies	CARDANO-R	AVAX-R	BCH-R	BNB-R	BTC-R	DASH-R	DOGE-R	ETH-R	FIL-R
Average	0.0179	-0.0326	-0.0352	0.0358	-0.0641	0.1407	0.0199	0.0324	0.0216
Variance	0.0031	0.0047	0.0027	0.0019	0.0029	0.0521	0.0025	0.0026	0.0149
SD	0.0556	0.0688	0.0523	0.0435	0.0536	0.2282	0.0499	0.0515	0.1220
Minimum	-0.0642	-0.1287	-0.1100	-0.0108	-0.1639	-0.1499	-0.0490	-0.0201	-0.1534
Maximum	0.1099	0.0744	0.0362	0.1010	-0.0094	0.6378	0.0879	0.1206	0.2438
Skewness	-0.0512	0.0131	-0.1772	0.2426	-0.6584	0.9343	0.0875	0.5546	0.3352
Kurtosis	-0.8195	-1.1657	-1.6204	-1.6790	-0.9606	0.9504	-1.5764	-1.1923	-0.4248
Cryptocurrencies	**LINK-R**	**LTC-R**	**MATIC-R**	**STX4847-R**	**TRX-R**	**XLM-R**	**XPM-R**	**XRP-R**	**LINK-R**
Average	0.0511	0.0289	0.0080	0.1103	0.0107	0.0220	0.0527	0.0298	0.0511
Variance	0.0448	0.0261	0.0044	0.1003	0.0002	0.0216	0.0492	0.0326	0.0448
SD	0.0470	0.0135	-0.0023	0.0852	-0.0108	0.0191	0.0369	0.0341	0.0470
Minimum	0.0501	0.0066	-0.0118	0.0700	-0.0140	0.0162	0.0311	0.0376	0.0501
Maximum	0.0509	0.0151	-0.0145	0.0691	-0.0118	0.0131	0.0367	0.0450	0.0509
Skewness	0.0554	0.0227	-0.0089	0.0826	-0.0101	0.0156	0.0391	0.0515	0.0554
Kurtosis	0.0650	0.0135	-0.0060	0.0614	-0.0145	0.0213	0.0285	0.0511	0.0650

Table 10: 5-Day Average AR and Average CAR (Cryptocurrencies)

Event Day	5-Day Average AR	5-Day Average CAR
-5	3.1040	0.0644
-4	3.0453	0.0970
-3	3.3215	0.0613
-2	3.5519	0.0566
-1	3.6414	0.0490
0	3.3237	0.0568
1	3.4504	0.0661
2	3.7135	0.0481
3	3.6231	0.0729

Despite the timely intervention of the regulators like FED which prevented a banking crisis spilling over to the crypto market, the univariate analysis by and large supports the predictions in hypotheses (1) and (2) that the de-pegging event triggered a crisis both in the stablecoin and cryptocurrency markets. The positive FED effect is evident immediately in the post-event period in terms of an uptrend in CAR (see Figures 1 and 3), however, after a 2-day window, the de-pegging effect caused a further decline in CAR. Furthermore, Figures 10 and 12 displaying the abnormal returns of stable coins and cryptocurrencies respectively, showed persistent downtrend in the post-event periods.

6.3. Robustness Test Results

The logistic model was estimated, using the STATA programme. The de-pegging dummy, taking a value of 1 for observations in the post-USDC repegging event and 0 otherwise, was regressed on by a set of independent variables including average and abnormal returns of stable coins and cryptocurrencies in the sample. The results shown in Table 11 indicate that the cryptocurrency returns were adversely affected by the de-pegging event of USDC with a very high negative coefficient value (-57.85977), and it is statistically significant at the

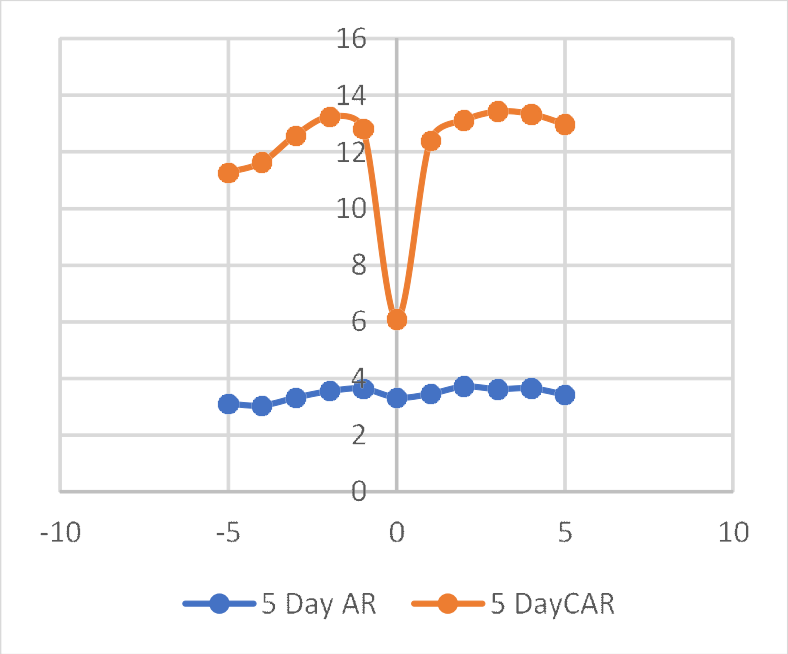

Figure 11: 5-Day Average AR and Average CAR (Cryptocurrencies)

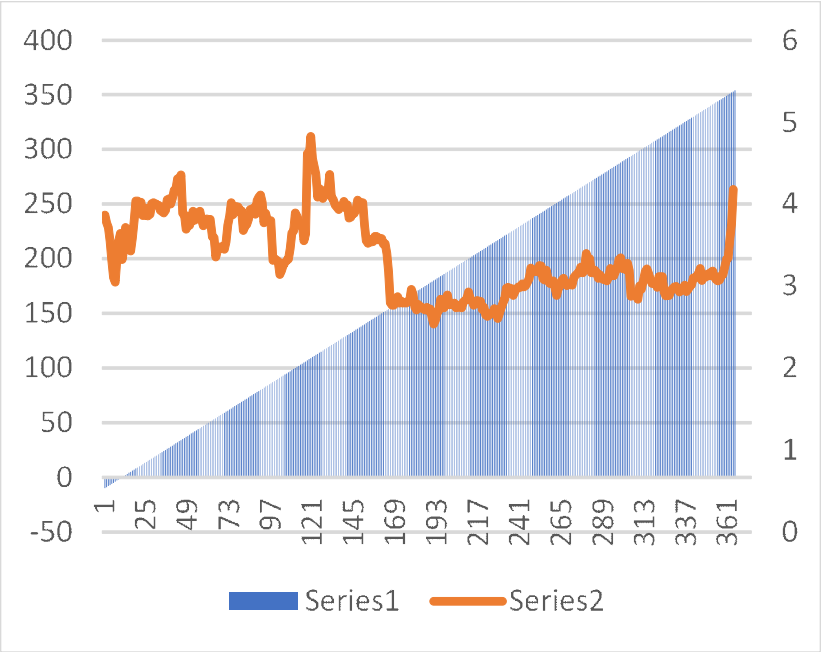

Figure 12: Average AR of the Sample of Cryptocurrencies for the Sample Period

1% level (0.013). The coefficient on cryptocurrency average abnormal returns (-0.1298704) is also negative, however, the adverse impact is not statistically significant (0.758).

However, the results are on expected line considering that many of the stable coins have cryptocurrency reserves as back-up and any adverse effect in the stable coin space is likely to have a negative outcome in the cryptocurrency market. The statistically insignificant effect on cryptocurrency abnormal return coefficient could be due to two reasons. First, some of the stablecoins were not affected by the March 2023 USDC de-pegging event on account of their design. Second, due to the timely intervention of FED in the U.S. banking

Table 11: Logistic Regression Results

Independent Variables	Coefficient	Standard Error	z-value	p-value
Average Cryptocurrency Returns	-5.85977	2.6854	-2.50	0.013***
Average Stable Coin Returns	0.8782092	0.6185883	-0.18	0.854
Average Cryptocurrency AR	-0.1298704	0.422373	-0.31	0.758
Average Stable Coin AR	1.65356	1.28387	1.2879	0.270
Constant	4.402872	2.441502	1.80	0.071*
LR chi2 (5)	20.10	Prob > chi2	0.0012***	
Log likelihood	-42.659135	No of observations	363	

Note: *** and * refer to statistical significance at the 1% and 10% levels respectively. AR = Average abnormal return estimated from event study analysis.

crisis and the fast recovery of stablecoins which were badly affected by the de-pegging event including USDC and DAI, might have mitigated some of the adverse effects in the crypto market. The same arguments could be advanced for the positive coefficients for stablecoin returns and average AR with no statistical significance (unexpected results).

The prob > chi2 statistic is statistically significant at the 1% level, indicating that overall, the model is a good fit. The prob > chi2 statistic tests the joint null hypothesis that all the regression coefficients (other than the constant term) are zero. LR chi2(5) is the likelihood ratio (LR) chi-square test, and the number in the parenthesis indicates the number of degrees of freedom. In the estimated model, there are five predictors (see Table 11), and hence there are five degrees of freedom.

7. Conclusion

Stablecoins have grown in popularity and use, and they are expected to exert a higher influence in the crypto market as they evolve alongside cryptocurrencies. While stablecoins claim to maintain a stable value, and therefore counter the high volatility of crypto currencies, the recent de-pegging events have eroded this confidence to some extent. The de-pegging events have demonstrated that stablecoins are not immune to fluctuations in price, market capitalization and liquidity. The univariate, event study estimations and the logistic regression results support our predictions that the de-pegging event of USDC affected the crypto market adversely including the cryptocurrencies. Despite the claim of maintaining a pegged value, the stable coins are prone to volatility mainly due to their involvement in DeFi lending.

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