

# Twitter and cryptocurrency pump-and-dumps

D. Ardia, K. Bluteau

G-2023-69

December 2023

---

La collection *Les Cahiers du GERAD* est constituée des travaux de recherche menés par nos membres. La plupart de ces documents de travail a été soumis à des revues avec comité de révision. Lorsqu'un document est accepté et publié, le pdf original est retiré si c'est nécessaire et un lien vers l'article publié est ajouté.

**Citation suggérée :** D. Ardia, K. Bluteau (Décembre 2023). Twitter and cryptocurrency pump-and-dumps, Rapport technique, Les Cahiers du GERAD G- 2023-69, GERAD, HEC Montréal, Canada.

**Avant de citer ce rapport technique**, veuillez visiter notre site Web (<https://www.gerad.ca/fr/papers/G-2023-69>) afin de mettre à jour vos données de référence, s'il a été publié dans une revue scientifique.

The series *Les Cahiers du GERAD* consists of working papers carried out by our members. Most of these pre-prints have been submitted to peer-reviewed journals. When accepted and published, if necessary, the original pdf is removed and a link to the published article is added.

**Suggested citation:** D. Ardia, K. Bluteau (December 2023). Twitter and cryptocurrency pump-and-dumps, Technical report, Les Cahiers du GERAD G-2023-69, GERAD, HEC Montréal, Canada.

**Before citing this technical report**, please visit our website (<https://www.gerad.ca/en/papers/G-2023-69>) to update your reference data, if it has been published in a scientific journal.

---

La publication de ces rapports de recherche est rendue possible grâce au soutien de HEC Montréal, Polytechnique Montréal, Université McGill, Université du Québec à Montréal, ainsi que du Fonds de recherche du Québec – Nature et technologies.

Dépôt légal – Bibliothèque et Archives nationales du Québec, 2023  
– Bibliothèque et Archives Canada, 2023

The publication of these research reports is made possible thanks to the support of HEC Montréal, Polytechnique Montréal, McGill University, Université du Québec à Montréal, as well as the Fonds de recherche du Québec – Nature et technologies.

Legal deposit – Bibliothèque et Archives nationales du Québec, 2023  
– Library and Archives Canada, 2023

# Twitter and cryptocurrency pump-and-dumps

David Ardia <sup>a</sup>

Keven Bluteau <sup>b</sup>

<sup>a</sup> *Department of Decision Sciences, HEC Montréal & GERAD, Montréal, (Qc), Canada, H3T 2A7*

<sup>b</sup> *Department of Finance, Université de Sherbrooke, Sherbrooke (Qc), Canada, J1K 2R1*

david.ardia@hec.ca

keven.bluteau@usherbrooke.ca

December 2023  
Les Cahiers du GERAD  
G–2023–69

Copyright © 2023 Ardia, Bluteau

---

Les textes publiés dans la série des rapports de recherche *Les Cahiers du GERAD* n'engagent que la responsabilité de leurs auteurs. Les auteurs conservent leur droit d'auteur et leurs droits moraux sur leurs publications et les utilisateurs s'engagent à reconnaître et respecter les exigences légales associées à ces droits. Ainsi, les utilisateurs:

- Peuvent télécharger et imprimer une copie de toute publication du portail public aux fins d'étude ou de recherche privée;
- Ne peuvent pas distribuer le matériel ou l'utiliser pour une activité à but lucratif ou pour un gain commercial;
- Peuvent distribuer gratuitement l'URL identifiant la publication.

Si vous pensez que ce document enfreint le droit d'auteur, contactez-nous en fournissant des détails. Nous supprimerons immédiatement l'accès au travail et enquêterons sur votre demande.

The authors are exclusively responsible for the content of their research papers published in the series *Les Cahiers du GERAD*. Copyright and moral rights for the publications are retained by the authors and the users must commit themselves to recognize and abide the legal requirements associated with these rights. Thus, users:

- May download and print one copy of any publication from the public portal for the purpose of private study or research;
- May not further distribute the material or use it for any profit-making activity or commercial gain;
- May freely distribute the URL identifying the publication.

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

**Abstract :** We study the relation between the promotion of a cryptocurrency on Twitter and its return dynamics around pump-and-dump events. By analyzing abnormal returns, trading volume, and tweet activity, we uncover that Twitter effectively garners attention for pump-and-dump schemes, leading to notable effects on abnormal returns before the event. Our results indicate that investors relying on Twitter information exhibit delayed selling behavior during the post-dump phase, resulting in significant losses compared to other participants. We also find that, while tweets directly promoting pump schemes align with anticipated market phases, a noteworthy portion of indirect, non-pump-aware tweets significantly influence market movements post-event.

**Keywords :** Cryptocurrencies, event-study, pump-and-dump, Twitter

---

**Acknowledgements:** We thank Kris Boudt, Carlos Ordas and Rosnel Sessinou for their comments. We acknowledge the *Centre d'intelligence en surveillance des marchés financiers* for its financial support.

# 1 Introduction

The rapid growth of the cryptocurrency market has attracted significant attention from investors, regulators, and researchers. As the market evolves, new forms of market manipulation emerge, posing challenges to market integrity and investor protection. One such manipulation strategy that has gained prominence is the “pump-and-dump” scheme, where a targeted cryptocurrency’s price is artificially inflated through coordinated buying, followed by a sudden sell-off to unsuspecting investors. In recent years, the rise of social media platforms, particularly Twitter, has provided an avenue for promoting and coordinating these pump-and-dump events (see, *e.g.*, Li et al., 2021; Nizzoli et al., 2020; Mirtaheeri et al., 2021). Due to the relatively young age of the cryptocurrency market, Twitter is also one of the primary sources of (legitimate) information for cryptocurrency investors (see, *e.g.*, Kraaijeveld and Smedt, 2020).

This research paper investigates the role of Twitter promotion in pump-and-dump events within the cryptocurrency market. By examining the interplay between abnormal returns, trading volume, and tweets, we aim to shed light on the dynamics of these events and their relationship with social media activity. Specifically, we seek to determine the impact of Twitter promotion on attracting participants to pump-and-dump events and its influence on participant behavior before, during, and after the events.

Most of the efforts of the literature have been regarding the identification of pump-and-dump events using statistical and machine-learning methodologies. Several approaches use time-series anomaly detection (see, *e.g.*, Kamps and Kleinberg, 2018; Mansourifar et al., 2020), or classification models based on market features (see, *e.g.*, Victor and Hagemann, 2019; Xu and Livshits, 2019), and social media data (see, *e.g.*, Nghiem et al., 2021). Recently Li et al. (2021) analyze the behavior of price, volume and volatility around cryptocurrency pump-and-dump events while Dhawan and Putniņš (2023) propose a theoretical framework on why people participate in cryptocurrencies pump-and-dump scheme. However, to our knowledge, no study has investigated the role of Twitter promotion on participant behavior around pump-and-dump events. We employ a comprehensive methodology that combines graphical analysis and regression modeling to accomplish our research objectives. Our analysis begins with visually examining the cumulative abnormal return, volume, and tweets, providing a visual depiction of their evolution leading up to, during, and following pump-and-dump events. This graphical analysis serves as a foundation for our subsequent regression analysis, which proceeds in three steps.

Our investigation initially focuses on the contemporaneous relationship between the abnormal influx of tweets preceding a pump-and-dump event and the corresponding abnormal returns observed in the market. Specifically, we concentrate on the final 30 minutes of the pre-event period to ascertain whether a surge in Twitter activity is concomitant with elevated abnormal returns. This analysis is predicated on the hypothesis that Twitter promotion catalyzes enhanced attention towards the targeted cryptocurrency, potentially triggering increased buying activity. Our findings confirm this hypothesis, revealing a robust and statistically significant positive correlation between the volume of anomalous tweets and the magnitude of abnormal returns.

Subsequently, we probe into the more intricate dynamics characterizing pump-and-dump events. This involves examining the relationship between the aggregate abnormal number of tweets prior to the event and the abnormal returns during the dump phase. In this context, we consider two distinct scenarios: one where investors, informed through Twitter, are cognizant of the impending sell-off and accordingly adjust their investment strategies, and another where they remain oblivious and their investment decisions remain unaltered. Our analysis uncovers a significant negative correlation between the cumulative abnormal returns leading up to and including the event and those observed during the dump phase. This pattern suggests a direct correlation: a more pronounced pump phase typically precedes a more substantial dump phase. However, an intriguing aspect emerges in the absence of a significant correlation between the pre-event tweet volume and the cumulative abnormal returns



during the dump phase, indicating that Twitter-informed investors do not engage in a sell-off during this period.

Our study extends to examining the relationship between the cumulative abnormal volume of tweets prior to the event and the abnormal returns in the post-dump phase. Here, we observe a predominantly negative and statistically significant correlation between the post-dump abnormal returns and the pre-event tweet volume. This finding implies that the price escalation witnessed prior to the event, which correlates with the surge in Twitter activity, undergoes a reversal, typically commencing at least 30 minutes after the dump phase. This suggests that investors who rely on Twitter for information about pump-and-dump events tend to exhibit a delayed response in offloading their cryptocurrency holdings, as compared to those who are informed via alternative channels. Furthermore, this lag in response not only negates the initial gains but also leads to a reversal effect that is markedly more pronounced than the contemporaneous effect, indicating that Twitter-informed investors who delay their sell-off during a pump-and-dump event, on average, incur losses on their investments.

In the final segment of our analysis, we distinguish between two categories of tweets: those that explicitly signal an imminent pump-and-dump event and those that solely serve as generic promotions for a cryptocurrency. This differentiation is pivotal, as it posits that Twitter users—or algorithms mining for positive sentiment or heightened attention towards specific cryptocurrencies—might unwittingly engage in pump-and-dump schemes, lacking explicit cognizance of the underlying manipulative strategy. Such inadvertent participation stands in stark contrast to reacting to promotions on platforms like Telegram or Discord, where information about the pump and dump event and subsequent involvement by participant in these schemes is typically more conscious and deliberate.

To delineate these categories, we classify tweets into two distinct groups. The first encompasses tweets referencing keywords associated with pump-and-dump events, indicating direct and informed promotion. The second group comprises tweets lacking explicit references, representing indirect and possibly uninformed promotion. We derive an abnormal tweet activity measure for each category from this classification.

Our empirical findings reveal a nuanced dynamic between these tweet categories and market reactions. For tweets explicitly related to pump-and-dump events (direct promotion), we observe a significant and positive correlation with the cumulative abnormal return preceding the event, followed by a reversal post-event (dump phase), which we did not observe in our initial results when combining all tweets into a single category. This pattern aligns with the expected behavior of participants who are aware of the pump-and-dump scheme and actively engage in it. Conversely, for tweets that do not overtly acknowledge the pump-and-dump scheme (indirect promotion), there is a discernible positive correlation shortly after the event, during the dumping phase. This suggests that indirect promotion can inadvertently sustain or even elevate prices during the dump phase, potentially facilitating more favorable exit positions for participants privy to the pump-and-dump scheme.

Our article contributes to the understanding of pump-and-dump schemes in the cryptocurrency market. Previous studies, such as Hamrick et al. (2021) and Li et al. (2021), have examined the factors influencing price jumps during cryptocurrency pumps, highlighting the prevalence of these schemes, their short-lived price distortions, and the substantial wealth transfers among market participants. In our study, we build upon these analyses by investigating the impact of pump-and-dump schemes on Twitter activity surrounding these events. This analysis is particularly relevant due to Twitter's significance as a prominent source of relevant information about cryptocurrencies (Kraaijeveld and Smedt, 2020).

Furthermore, our research contributes to the literature on the utilization of social media for market manipulation. Renault (2017) finds that abnormally high message activity on social media is associated with significant price increases on the event day, followed by sharp price reversals in the subsequent week, aligning with the patterns observed in pump-and-dump schemes. Fan et al. (2020), focusing on tweets mentioning companies in the FTSE 100 composite, identify substantial relationships between

bot-generated tweets and stock returns, volatility, and trading volume at both daily and intraday levels. By leveraging precise timestamps of pump-and-dump announcements on Telegram, our study discerns the influence of Twitter activity on cryptocurrency price movements around pump-and-dump event.

Lastly, our research contributes to the existing literature on utilizing promotional strategies to enhance the success of market manipulation schemes. Massoud et al. (2016) investigate OTC companies that hire promoters for secret stock promotions, thereby increasing their stock price and trading volume. Other studies explore various data sources associated with promotional intent. For example, Frieder and Zittrain (2007) utilize a compiled database of email spams to demonstrate the dramatic rise in trading volume of Pink Sheets stocks during periods of heavy spam activity, a pattern that extends to contemporary technologies such as social media and Twitter. In particular, Cresci et al. (2018), by comparing tweets with financial data from Google Finance, detect coordinated groups of bots likely engaged in promoting low-value stocks by exploiting the popularity of high-value ones. Our findings suggest that Twitter is extensively used as a tool to entice participants into pump-and-dump events.

The rest of the paper is as follows. Section 2 provides an introduction to pump-and-dump groups and events. Section 3 describes the various datasets used in the study. We present the methodology and the empirical results in Section 4. Section 5 concludes.

## 2 Pump-and-dump groups and events

This section provides an overview of pump-and-dump groups and events in cryptocurrency markets. First, we introduce Telegram, one of the preferred instant messaging services for organizing pump-and-dumps. We will rely on Telegram in our study to identify pump-and-dump events. Second, we explain how pump-and-dump groups are organized and operate on Telegram. Finally, we provide an illustrative introduction to pump-and-dump events.

### 2.1 Telegram

Telegram was introduced to the public in 2013 as an instant messaging service and has achieved a substantial global user base exceeding 700 million as of June 2022.<sup>1</sup> This platform, offered free of charge, operates on a cloud-based infrastructure and boasts robust safeguards to protect user data, ensuring the confidentiality and integrity of personal information. Telegram facilitates communication through various means, including one-on-one messaging, group chats accommodating an impressive capacity of up to 200,000 participants, and channels with limitless subscriber capacity. Recognized widely for its strong encryption protocols, Telegram has earned a reputation as one of the leading messaging platforms. Moreover, Telegram allows its users to employ aliases, thereby introducing an additional layer of complexity in identifying any individual user. Furthermore, Telegram’s multi-device compatibility enhances its convenience and accessibility for users. Additionally, the platform permits the deletion of entire groups and individual messages. It is important to note that while most groups on Telegram can be accessed without restrictions, enabling users to access extensive message histories and associated metadata such as timestamps and message views, certain groups and channels operate exclusively through invitation-based membership.

Overall, these features make Telegram a preferred choice for organizing market manipulation activities such as pump-and-dumps (see, *e.g.*, Li et al., 2021).<sup>2</sup> The utilization of Telegram’s platform (<https://telegram.org/>) by organizers engaged in cryptocurrency pump-and-dump practices therefore serves as a means to coordinate their activities and cultivate a substantial community (see, *e.g.*, La Morgia et al., 2020; Hamrick et al., 2021; Mirtaheri et al., 2021).

<sup>1</sup>See <https://telegram.org/blog/700-million-and-premium>.

<sup>2</sup>It is pertinent to acknowledge that Discord, another similar platform, is also widely used for cryptocurrency pump-and-dump schemes, albeit predominantly among the gaming community. Due to its greater user base, our study focuses solely on Telegram.

## 2.2 Pump-and-dump groups

The formation of cryptocurrency pump-and-dump groups necessitates many participants to achieve significant price movements. However, assembling such a community is a complex and time-consuming process. In the early stages, these groups typically share signals from more established counterparts. Group members then promote their group on platforms like Reddit or within existing groups. Once a certain threshold of members is reached, the group can begin organizing events while striving for continued growth.

Within a pump-and-dump group, a hierarchical structure emerges. Administrators hold privileged information and serve as the primary communicators, exclusively posting messages. Participants seek any pertinent updates, while VIP members, who often pay a subscription fee, receive information slightly earlier through an invite-only channel.

Administrators regularly disseminate promotional messages, share past event returns using price curves, offer advice to newcomers, and focus on a specific exchange to maximize potential gains. To initiate a pump-and-dump, administrators share an announcement specifying the date, time, and targeted exchange. They continuously remind participants to engage, promote the group, and encourage VIP membership. Eventually, they distribute the signal, typically mentioning only the name of the cryptocurrency. Administrators benefit most from the pump-and-dump by possessing advanced information, allowing them to enter the market ahead of VIP and regular users, maximizing profits.

Group members await the signal, prepared to trade their tokens on the designated platform. Prompt execution is crucial. However, many participants need more time to enter the market, purchasing inflated cryptocurrencies and often struggling to sell them promptly (with the event) and thus face losses. Ultimately, group members bear the brunt of losses associated with participating in pump-and-dump activities.

VIP members pay a subscription fee to gain early access to information, sometimes receiving it more than 24 hours before regular members, which affords them a significant advantage. VIPs also gain access to exclusive events inaccessible to others. In addition, in certain groups, non-subscribing participants can attain different membership levels by inviting a specified number of people.

The organizers of pump-and-dump activities select exchanges for their operations. Popular choices include Binance, Bittrex, Coinbase, Hotbit, and KuCoin, with Binance being the most frequently utilized. Despite the negative consequences of pump-and-dump schemes, exchanges have little incentive to ban them. Such events generate high transaction volumes, leading to increased costs for exchanges. Additionally, exchanges often hold cryptocurrencies that can yield profits post-pump-and-dump while attracting more users to their platforms. Furthermore, exchanges possess important user information, enabling them to monitor participants or engage in insider trading during future pump-and-dumps. For instance, YoBit openly admitted to engaging in token pumping and dumping, earning the moniker of the “king of pump-and-dumps” in October 2018.<sup>3</sup>

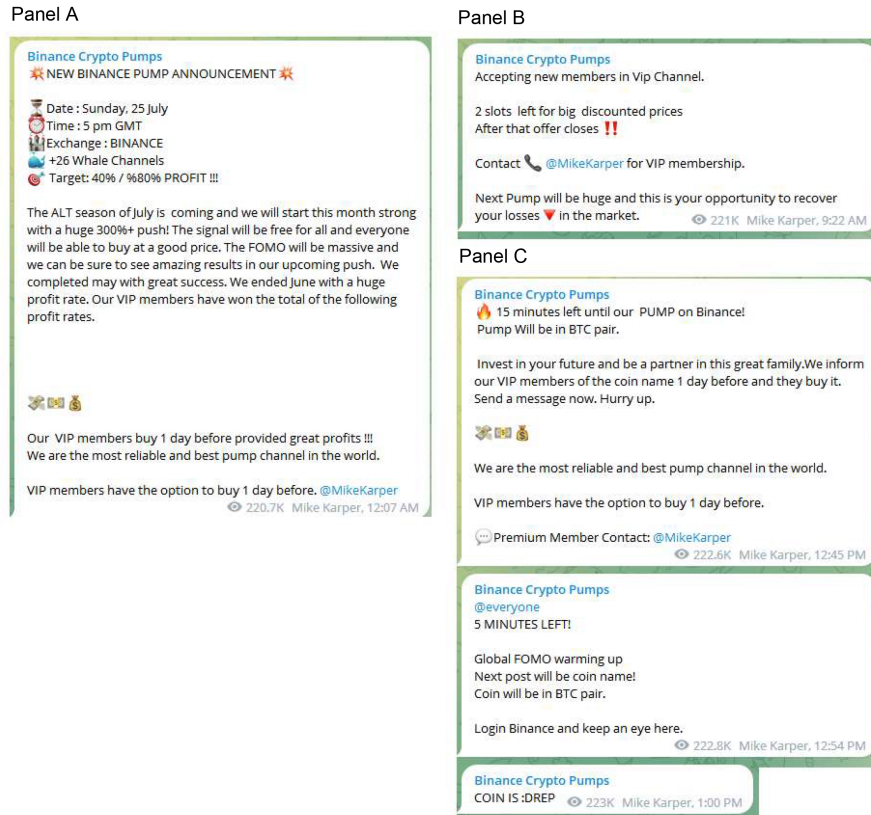
## 2.3 Pump-and-dump events

The initial step in a pump-and-dump scheme entails the event’s announcement, typically occurring a few days or even just a few hours beforehand. A longer interval between the announcement and the signal allows group members to prepare their capital for the opportune moment. The announcement includes the specific date and time of the event, along with the targeted exchange. Furthermore, it is accompanied by motivational and promotional messages designed to attract a more exclusive circle of users.

For example, Figure 1 illustrates a series of messages from the “Big\_Pumps\_Signals” channel on Telegram, showcasing the announcement for a pump-and-dump event involving the cryptocurrency

<sup>3</sup>Refer to <https://fullycrypto.com/like-it-or-not-yobit-is-still-the-pump-and-dump-king> for details.

“DREP” on July 25, 2021, at 5 PM GMT on the Binance exchange. The first mention corresponds to the announcement of a new pump, issued several days or even hours before the event, as observed in this case, four days beforehand on July 21, 2021. The announcement specifies the event’s date, time, and targeted exchange.



**Figure 1: Example of a pump-and-dump event.** This figure displays a series of messages from the “Big\_Pumps\_Signals” channel on Telegram, showcasing the announcement for a pump-and-dump event involving the cryptocurrency “DREP” on July 25, 2021, at 5 PM GMT on the Binance exchange.



In addition to the announcement, promotional messages may be reiterated leading up to the event. As shown in Figure 2 with an example that highlights the benefits of VIP membership (in this instance, for the “BestBinancePumps” channel).<sup>4</sup> It reveals that VIP members gain access to the coin name 12-24 hours before the pump signal release.

Finally, at the specified event time, the coin name is announced. A single event can be shared across multiple groups, as observed in the example above detected in at least 12 groups used in this study, as demonstrated in Figure 3.

Figure 4 showcases the cumulative abnormal returns and cumulative abnormal volume (refer to Section 4.2) of the DREP events. The graph illustrates the remarkable success of this event, with cumulative abnormal returns reaching 35.36% at the peak (at time 0). A substantial surge in volume accompanies the price reaction. Moreover, there were notable increases in returns before the event, indicating the involvement of VIP members, as evidenced by the preceding volume activity. However, these increases are minimal (or at least more gradual) compared to the surge observed during the event.

It is worth noting that other services within the Telegram infrastructure may assist in identifying cryptocurrency pump events before their occurrence, owing to price and volume fluctuations initiated

<sup>4</sup>At the time of writing, the complete VIP member form was accessible at: <https://shorturl.at/hkSUZ>

 **Crypto Pump VIP Access** 

- ✅ VIP membership costs 199 USD for one year access, for that price you will get coin name 12 - 24 hours before every pump + All the VIP Services. We make around 2 pumps per week using Binance.com or Kucoin.com or Hotbit.io or Lbank and we offer our VIP group 10 Daily Signals (+95% Success rate)
- ✅ Requirements before you can join our VIP Group :
  - ❌ You should not be from China (Banned for security reasons).
  - ❌ Knowing how pumps are working.
  - ❌ Anyone who share private content from our Group will be banned automatically.
- ✅ VIP Service Includes :
  - ◆ VIP Pre-Pump Signals ( Coin name is announced 12 - 24 Hours before each pump to our VIP members only! ◆)
  - ++ Professional TA
  - ++ 10 Daily Signals (+95% Success rate)
  - ++ Insiders Coin News
  - ++ Breakout Signals Alerts
  - ++ 10x-100x Hold
  - ++ Top Level Insider Info
  - ++ Premium Educational Content
  - ++ Support Available 24/7

**Figure 2: Example of VIP access advantages.** This figure highlights the benefits of VIP membership (in this instance, retrieved from the “BestBinancePumps” Telegram channel). This screenshot was taken directly from the VIP member link in the Telegram channel, which, at the time of this writing, was available at <https://shorturl.at/hkSUZ>. We note that this page changes over time.

by VIP members. For instance, the “cointrendz\_pumpdetector” channel (see Figure 5) monitors the market continuously, detecting unusual activity and pumps in multiple exchanges. This service issued two alerts related to DREP before the pump events, one five minutes before the event and another two hours and 14 minutes prior. However, it is uncertain whether the pump will indeed materialize, thus utilizing such a service may entail risks for non-VIP members. Notably, in this particular detection, the identified pair was DREP/USDT instead of DREP/BTC, as specified in the pump announcement. As USDT is a primary currency for transactions, it is possible that VIP members were either purchasing DREP using USDT obtained from fiat money (e.g., US dollars) or selling BTC for USDT and subsequently purchasing DREP.

### 3 Data













This section provides an overview of the data utilized in this study and outlines the process of constructing our pump-and-dump events database.

#### 3.1 Pump-and-dump groups and events

To assemble a comprehensive dataset, we initially compiled a list of approximately 100 pump-and-dump groups sourced from various forums on platforms such as Reddit and Discord. Additionally, we consulted websites that curate lists of cryptocurrency Telegram channels.<sup>5</sup> Subsequently, we conducted an extensive search within the messages of these groups to identify links to other relevant groups, thereby expanding our list to encompass more than a hundred distinct groups.

The Telegram API, which is publicly accessible, facilitated downloading all messages from the groups or channels we had subscribed to or joined. Consequently, we extracted all messages along with their corresponding publication dates. To detect group-specific patterns, we implemented keyword searches within user conversations. However, it is worth noting that communication styles vary across groups. For example, some groups restrict participation solely to administrators, while others foster

<sup>5</sup>For instance, refer to <https://coingape.com/best-telegram-crypto-channels-list/>.

	📢 Whales - Pumping Cryptocurrency 📌 THE COIN IS \$DREP 📌	2021-07-25
	📢 CRYPTO INSIDERS 🚀 The coin we have picked to pump is : #drep. Drep is looking perfect for a pump right now	2021-07-25
	📢 [Official]Binance Pump 247 [Annoucement] The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Binance Crypto Pumps COIN IS :DREP	2021-07-25
	📢 WallStreetBets Events 🚀 The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Today We Push 🚀 The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Crypto Hub ® The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Mega Signals Group The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Crypto Trading Bitcoin   Signals & Pumps The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Coin Coach Signals The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 WallStreetBets - Pumps The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25
	📢 Crypto Coin Pump Signals The coin we have picked to pump today is : #DREP DREP is looking perfect for a pump right now the target is 500%	2021-07-25

**Figure 3: One event on multiple groups.** This figure is a screenshot of Telegram search functionality when looking for the “DREP” pump-and-dump event on July 25th, 2021, among the various pump-and-dump groups considered in this study.

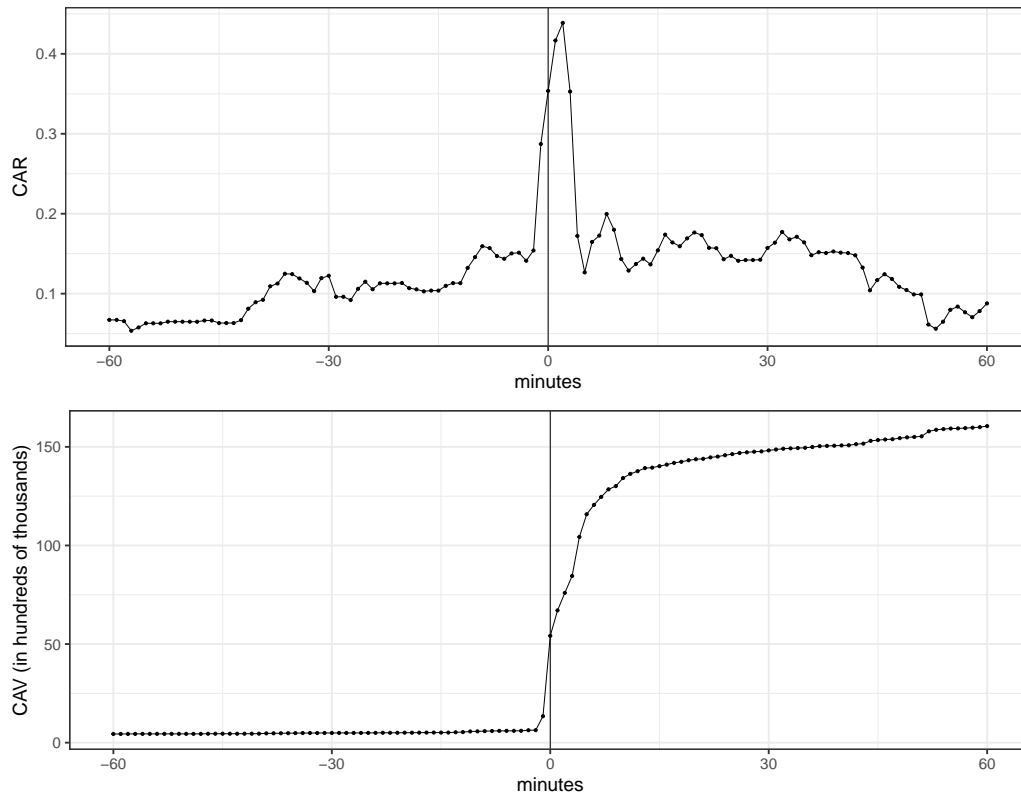
open discussions among multiple users. Although groups exhibit heterogeneity in their communication dynamics, certain groups adhere to well-defined patterns: (1) an announcement of a future event, (2) frequent reminders, and (3) the dissemination of a buy signal. Based on these discernible patterns, we manually compiled the events.

Our data collection focuses exclusively on events occurring on the Binance exchange using the Bitcoin (BTC) trading pair. We justify this choice by postulating that Bitcoin, as a highly speculative asset, is unlikely to be the primary target of pump-and-dump schemes. While Bitcoin may have been targeted in the past, our study period did not uncover any events involving this cryptocurrency. Furthermore, we limit our scope to the Binance exchange due to access limitations, whereby we only have historical minute-level price data from Binance rather than multiple competing exchanges. Moreover, we exclude events related to Dogecoin, Litecoin, Ethereum, and Cardano, as their widespread popularity posed challenges in collecting data from Twitter, given the limitations on the number of tweets we could collect. In total, our dataset comprises 1,160 pump-and-dump events.

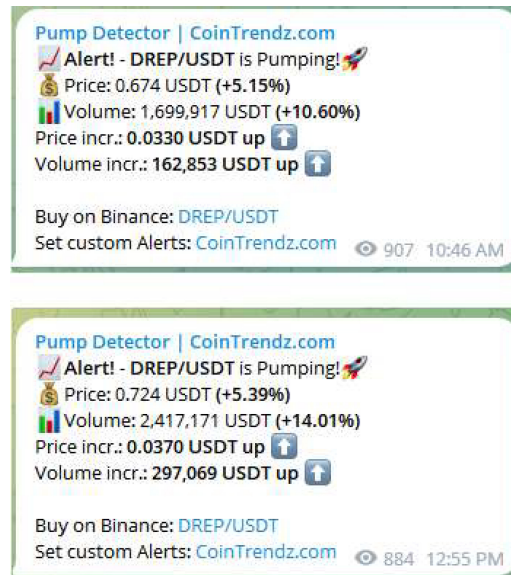
### 3.2 Price and volume data

We gather volume and closing price data for cryptocurrencies at a one-minute frequency from the website [www.cryptoarchive.com.au](http://www.cryptoarchive.com.au). This data originates from the Binance API, ensuring that our analysis reflects the price and volume information available on the Binance trading platform.





**Figure 4: Market reaction around a successful pump-and-dump event.** This figure reports the cumulative abnormal return and the cumulative abnormal volume of “DREP” around its July 25th, 2021, pump-and-dump events. Minute 0 is the exact announcement time reported on the “Big\_Pumps\_Signals” channel, at 5 pm GMT.



**Figure 5: Example of an automated pump detection service.** This figure showcases an example of the DREP event detected by the automated pump detection service provided in the channel “cointrendz\_pumpdetector”.

### 3.3 Twitter data

Twitter is a microblogging social network enabling users to share posts with a maximum length of 280 characters. As of 2023, the platform boasts more than 450 million active users, and it was reported in 2020 that over 500 million messages are posted daily.

The distinction between Twitter and other platforms such as Telegram or Discord lies in their functionalities and user dynamics. As observed by Dhawan and Putniņš (2023), platforms like Discord and Telegram allow the creation of closed public groups where only administrators can broadcast messages. Participation in these groups is explicit and restricted, making them suitable for organizing and coordinating pump-and-dump schemes. In contrast, Twitter operates as an open platform where information is publicly accessible and can be posted or viewed by anyone. This transparency fundamentally alters the dynamics of how pump-and-dump schemes operate and are perceived by potential participants.

Our study posits that users on Twitter—or algorithms scanning for positive sentiment or increased attention to specific cryptocurrencies—could inadvertently participate in a pump-and-dump event without explicit awareness of the scheme. This nuanced participation is distinctly different from Telegram or Discord, where participation is usually more overt and informed. We hypothesize that the promotional content on Twitter can indirectly influence users into buying a targeted cryptocurrency while keeping them uninformed about the underlying pump-and-dump scheme. This form of manipulation is akin to conventional fraud, subtly diverging from the direct approach observed on other platforms.

To obtain Twitter data relevant to our study, we employ the Twitter Search API. Specifically, we search for tweets associated with each event, employing either the event's hashtag (*e.g.*, #BTC) or the cashtag (*e.g.*, \$BTC) corresponding to the targeted cryptocurrency. For each event, we download tweets spanning a period from two days before the event to 12 hours after the event's scheduled time. Our focus primarily lies on tweets posted in English, and we include retweets in our dataset. Furthermore, we exclude tweets containing more than five hashtags or cashtags. This criterion allows us to filter out tweets that attempt to garner increased visibility by utilizing unrelated cashtags and hashtags. Such tweets often lack a specific association with the underlying cryptocurrency of interest, that is, the one expected to undergo a pump-and-dump event in the immediate future.<sup>6</sup>

## 4 Empirical analysis

This section employs an event study methodology to examine the dynamics surrounding pump-and-dump events. The primary objective is to investigate whether an abnormal level of Twitter activity preceding the event is associated with any abnormal return movement during the event, including the periods before, during, and after the pump-and-dump event. To accomplish this, we first refine our event database to focus on “successful pump-and-dump events.” We then define the variable used in the event study and conduct our empirical analysis to address two key questions: (1) Is there promotion of pump-and-dump events on Twitter? (2) Does Twitter promotion influence the return dynamics surrounding the pump-and-dump event?

### 4.1 Qualifying the success of events

A pump-and-dump event can be classified as either successful or unsuccessful. Several factors can contribute to a failure, such as organizational errors, insufficient participation from active members during the pump stage, or a lack of synchronization. For instance, consider the pump-and-dump event

<sup>6</sup>For example, consider the tweets in the following link: <https://twitter.com/CoinLegs/status/1381557851697582087>. These tweets reference 24 different cryptocurrencies and do not necessarily pertain to a specific cryptocurrency that will experience a pump-and-dump event in the near future.



publicized by the channel [https://t.me/crypto\\_pump\\_island](https://t.me/crypto_pump_island) on January 8, 2020, at 17:05 GMT, involving the cryptocurrency EDO. Figure 6 displays the chat, which reveals an error in posting the coin name. Examining the abnormal return and abnormal volume movement of the EDO/BTC pair in Figure 7, we observe that the price spike occurred five minutes before the event announcement. This observation suggests the presence of VIP users but minimal participation from non-VIP members at the time of the announcement. After the event, we note a marginal increase in volume and price, as indicated in the Crypto Pump Island chat in Figure 6. Consequently, this event would be classified as a failure.

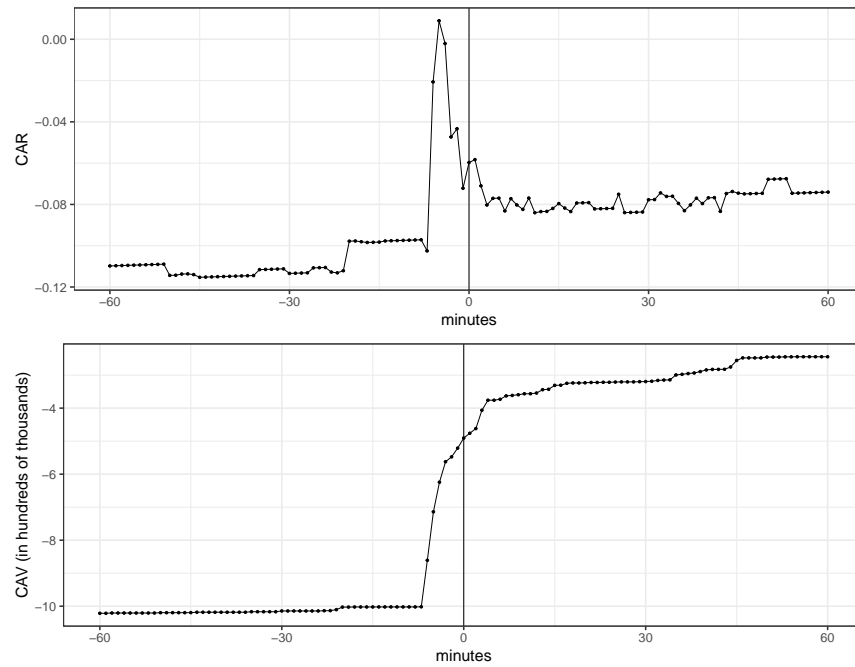


**Figure 6: Example of an unsuccessful pump-and-dump event.** This figure displays the discussion around an unsuccessful event.

Our strategy to identify successful events and determine the precise start time of an event involves two steps. First, we ascertain the success of an event. For each event, we collect volume data for one day before and one day after the event.<sup>7</sup> Subsequently, we aggregate the minute-by-minute data into five-minute intervals, with the event minute serving as the starting point.<sup>8</sup> If the volume within the five-minute interval encompassing the event ranks among the top three highest five-minute volumes over the two-day period (equating to 0.001% of all observations), we classify the event as successful. In other words, if there is a significant abnormal volume during and shortly after the event announcement, indicating the participation of non-VIP members, we deem the event successful. Overall, this procedure identifies 322 successful events.

<sup>7</sup>We choose a two-day span around the event as it is uncommon for a cryptocurrency to be targeted for a pump-and-dump scheme within a single day of events concerning that cryptocurrency.

<sup>8</sup>For example, if the event starts at 12:07, the initial five-minute chunk that sets the reference for subsequent chunks spans from 12:07 to 12:11.



**Figure 7: Market reaction around an unsuccessful pump-and-dump event.** This figure reports the cumulative abnormal return and the cumulative abnormal volume of “EDO” around its January 8, 2020, pump-and-dump events. Minute 0 is the exact announcement time reported on the “crypto\_pump\_island” channel, at 5:05 pm GMT.

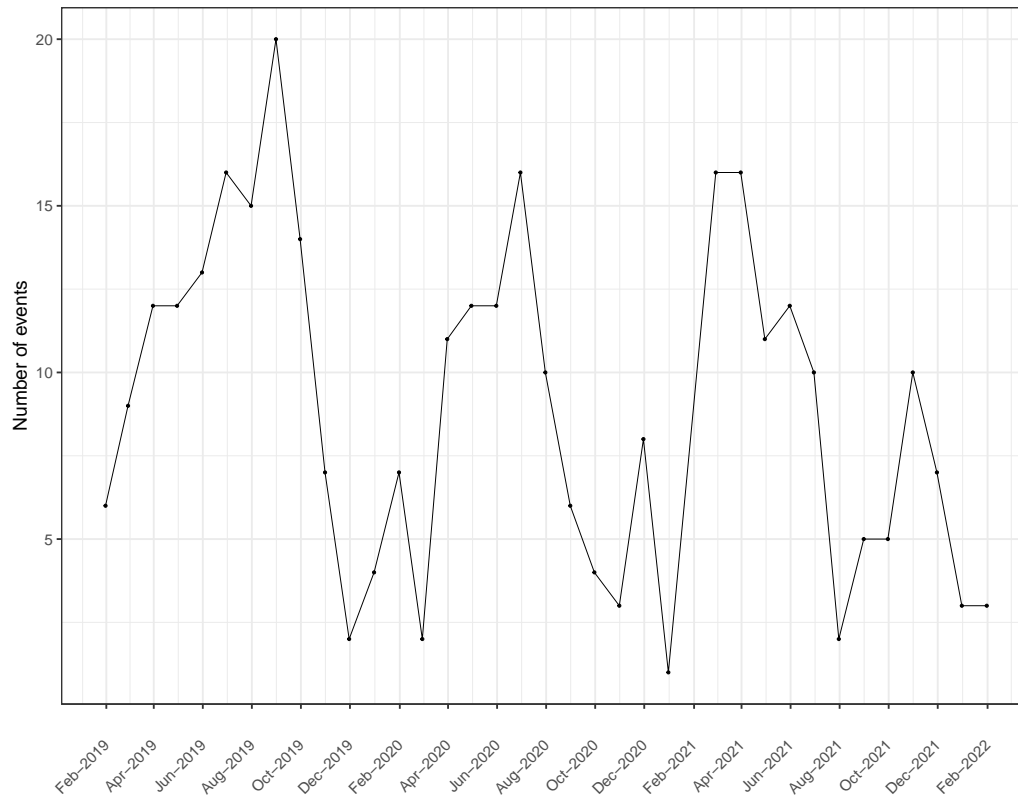
In Figure 8, we present the number of events per week. Our dataset spans from February 2, 2019, to February 2, 2022, and exhibits considerable variability in the frequency of pump-and-dump events. Each week contains at least one event, ensuring a well-distributed dataset over time and mitigating the potential influence of specific time periods on subsequent analyses.

Table 1 displays the number of events per cryptocurrency and the corresponding percentage across our dataset. No single cryptocurrency dominates significantly as a target for pump-and-dump events.

**Table 1: Number of events per cryptocurrency.**

Cryptocurrency	Events	%
BRD	13	4.04
NEBL	11	3.42
NXS	11	3.42
OAX	10	3.11
RDN	9	2.80
GVT	8	2.48
NAV	8	2.48
VIA	8	2.48
VIB	8	2.48
APPC	7	2.17
BNT	7	2.17
QSP	7	2.17
SNM	7	2.17
BLZ	6	1.86
CDT	6	1.86
CTXC	6	1.86
DLT	6	1.86
EDO	6	1.86
GRS	6	1.86
HC	6	1.86

This table reports the 20 cryptocurrencies with the largest number of pump-and-dump events. It shows the number of events and the percentage of occurrence among all events.



**Figure 8: Number of successful pump-and-dump event per week.** This figure displays the number of weekly successful pump-and-dump events in our database from February 2019 to February 2022.

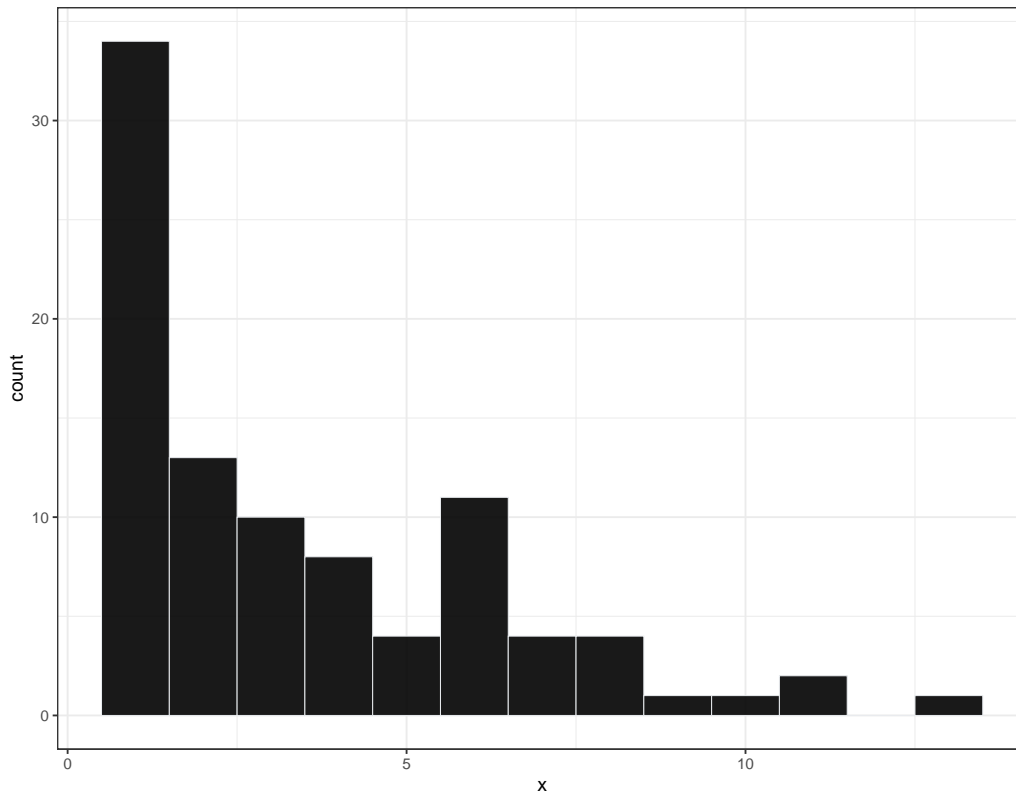
To supplement the information provided in Table 1, Figure 9 presents a histogram illustrating the distribution of the number of events per cryptocurrency. While Table 1 indicates that no cryptocurrency exhibits significant dominance in our database, it is evident that several of the 93 unique cryptocurrencies featured in our dataset (of which there was a successful event) have only been associated with a single event. The average number of events per cryptocurrency is 3.46, with a median of 2.

Table 2 presents summary statistics regarding the number of tweets surrounding a pump-and-dump event. On average, there are 187.81 tweets associated with each event, accompanied by a substantial standard deviation of 1,119.05. The median number of tweets is 15, indicating a highly skewed distribution.

**Table 2: Number of tweets around events.**

Statistics	Tweets
Mean	187.81
Std	1,119.05
Min	0
25th	5
50th	15
75th	53
Max	20,439

This table shows the statistics of the number of tweets around pump-and-dump events (from 2 days before to 12 hours after the announcement time of each event). The statistics include the mean, standard deviation, minimum, 25th percentile, median, 75th percentile, and maximum number of tweets.



**Figure 9: Number of successful event Per cryptocurrencies.** This figure displays a histogram of the number of successful events in our database per cryptocurrency.

## 4.2 Event-study methodology

This section presents the methodology employed to analyze pump-and-dump events, focusing on identifying and measuring abnormal returns, volume, and tweets. Additionally, the concept of cumulative measure is introduced to assess the cumulative impact of these factors during specific time intervals. This section closely follows the typical event study setup performed in the economic and financial literature (MacKinlay, 1997).

### 4.2.1 Event periods

We divide the analysis into five periods to capture the dynamics surrounding pump-and-dump events. First, the *training period* encompasses the two days preceding the event up to 12 hours before its occurrence. This period serves as a reference for estimating “normal” market behavior. The *pre-event period* extends from 12 hours (720 minutes) before the event to 1 minute before its initiation and is characterized by the possibility of VIPs initiating purchases of the targeted cryptocurrency. The subsequent period is the *pump window*, spanning from 1 minute before the event to 1 minute after it. During this phase, non-VIP members receive the signal from the event organizers and start purchasing the cryptocurrency. The *dump window* follows the pump window and lasts from 1 to 31 minutes after the event. In this interval, both VIPs and non-VIPs may commence selling their holdings. Finally, the *post-dump window* extends from 32 minutes to 12 hours after the event and allows for further trading activity, including selling by late participants and potential buying by new investors. Notably, the pump’s effects may not be wholly reversed during the dump window, indicating the presence of less efficient or informed investors. This occurs when less knowledgeable participants sell late after the price peak, reflecting their lack of understanding of the event dynamics.

### 4.2.2 Abnormality measures

The analysis of pump-and-dump events focuses on abnormal returns, abnormal volume, and abnormal tweets as market activity indicators. The computation process for abnormal returns and abnormal volume is similar. For a given event  $i$  and a specific time  $t$ , the abnormal return  $AR_{i,t}$  is defined as the difference between the observed return  $r_{i,t}$  and the expected return  $E[r_{i,t}]$ :

$$AR_{i,t} = r_{i,t} - E[r_{i,t}], \quad (1)$$

where  $r_{i,t}$  represents the one-minute logarithmic return of the cryptocurrency targeted by event  $i$  at time  $t$ . Similarly, the abnormal volume  $AV_{i,t}$  is computed as the difference between the observed volume  $V_{i,t}$  and the expected volume  $E[V_{i,t}]$ :

$$AV_{i,t} = V_{i,t} - E[V_{i,t}], \quad (2)$$

with  $V_{i,t}$  denoting the one-minute volume of the targeted cryptocurrency at time  $t$ . The expected return  $E[r_{i,t}]$  and expected volume  $E[V_{i,t}]$  are estimated based on the average one-minute log return and volume, respectively, calculated using the training period data.

Abnormal tweets,  $AT_{i,t}$ , are determined by comparing the number of tweets  $T_{i,t}$  discussing the targeted cryptocurrency at time  $t$  with the expected number of tweets  $E[T_{i,t}]$ . Here also, the expected value is estimated based on the average number of tweets in one minute on the training window. The abnormal tweets are then normalized by dividing the difference by the standard deviation  $\sigma_{T_{i,t}}$  of the number of tweets published during the training period:

$$AT_{i,t} = \frac{T_{i,t} - E[T_{i,t}]}{\sigma_{T_{i,t}}}. \quad (3)$$

The normalization of abnormal tweets accounts for the significant variability in the number of tweets published across different cryptocurrencies. It is important to note that the normalization does not qualitatively affect the results.

### 4.2.3 Cumulative abnormality

In addition to assessing abnormality at specific time points, we define cumulative measures to assess the cumulative impact of abnormal returns, volume, and tweets over certain time intervals. For a given event  $i$ , with the pump announcement time set as  $t = 0$ , the cumulative abnormal return ( $CAR_i$ ) between relative times  $\tau_1$  and  $\tau_2$  is calculated as the sum of the abnormal returns  $AR_{i,\tau}$  over this interval:

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i,\tau}. \quad (4)$$

Similarly, the cumulative abnormal volume ( $CAV_i$ ) and cumulative abnormal tweets ( $CAT_i$ ) are computed as the sums of the abnormal volume  $AV_{i,\tau}$  and abnormal tweets  $AT_{i,\tau}$ , respectively, over the specified time interval:

$$CAV_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AV_{i,\tau}, \quad (5)$$

$$CAT_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AT_{i,\tau}. \quad (6)$$

These cumulative abnormality measures allow us to analyze the aggregated impact of abnormal returns, volume, and tweets over specific periods, providing insights into the overall market behavior surrounding pump-and-dump events.

### 4.3 Graphical analysis

In this section, we present a graphical analysis to examine the evolution of cumulative abnormal return, volume, and tweets over a range of relative time intervals. Specifically, we start from  $\tau_1 = -720$  (12 hours before) and increment by one minute to  $\tau_2$ , covering the period from  $\tau_2 = -720$  to  $\tau_2 = 720$ . The graphical representations are displayed in Figure 10, with Panel A, B, and C illustrating the average cumulative abnormal return, volume, and tweets, respectively.

Our analysis reveals several noteworthy patterns. First, we observe a positive and increasing trend in abnormal returns during the pre-event window (from 12 hours before the event to 1 minute before). This upward trend becomes more pronounced towards the end of the window, approximately 1 hour before the event. As for abnormal volume, we observe an overall decreasing trend, with a shift towards positive values also evident towards the latter part of the pre-event window, around 2 hours before the event. In terms of tweets, a significant negative trend is observed approximately 5 hours before the event, followed by a shift towards a positive trend. These observations suggest that successful pump-and-dump events tend to be initiated on cryptocurrencies that exhibit positive trends, accompanied by abnormal trading volume and promotion on Twitter.

We observe a substantial spike in abnormal return, volume, and tweets during the pump window. This surge reflects the involvement of both VIP and non-VIP users and may indicate further promotion or increased awareness of the event on Twitter.

In the dump window, we observe a rapid and significant decrease in abnormal returns, indicating the dumping of the targeted cryptocurrency. The positive trend in abnormal volume further supports this observation. Interestingly, abnormal positive activity on Twitter persists during this window, which could be related to the dump itself or an attempt to attract additional buyers.

Moving to the post-dump window, we still observe a negative trend in abnormal returns, although to a lesser extent than the dump window. However, a positive trend in abnormal volume accompanies this decline. These findings suggest the presence of participants who continue to sell their cryptocurrency during this stage, which can be considered “late” participation given the nature of the event. Regarding tweets, we observe a positive trend until approximately 5 hours after the event, after which the trend becomes flat, indicating the absence of further abnormal activity on Twitter.

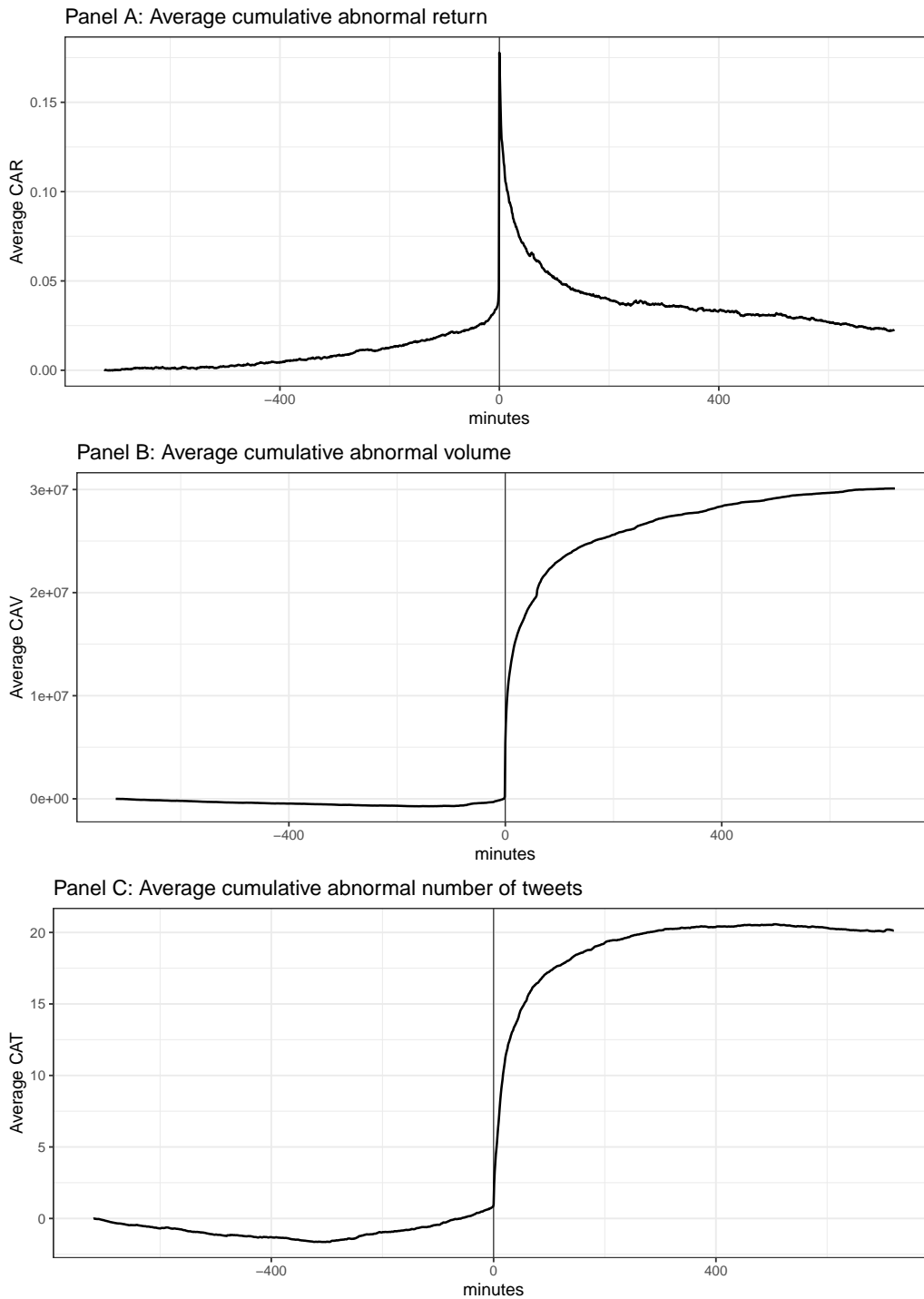
Based on these results, we can conclude that Twitter serves as a platform for promoting pump-and-dump events. However, it is important to note that this analysis does not conclusively establish whether such promotion successfully attracts additional participants to engage in the pump-and-dump event. This aspect will be further investigated in our subsequent analysis.

### 4.4 Regression analysis

We posit that promoting a cryptocurrency targeted by a pump-and-dump event on Twitter can attract investors, primarily due to increased attention directed towards that specific cryptocurrency. In the presence of promotion, we anticipate a contemporaneous relationship between the abnormal number of tweets before the event and the abnormal return leading up to the event.

Some investors may not be privy to the exact timing of the pump and subsequently find themselves delayed in selling their tokens during the dump phase. These investors would only become aware of the dump when examining their portfolios. Consequently, even if they purchased the cryptocurrency before the pump, their ability to profitably sell their tokens may be compromised due to their late entry into the dump phase. In this scenario, we expect to observe a relationship between the abnormal number of tweets before the event and the post-dump abnormal return, with the post-dump period commencing 30 minutes after the pump window.

Alternatively, these investors could possess full awareness of the nature of the event, providing them with an advantage over other participants (non-VIPs). In such cases, we anticipate a relationship



**Figure 10: Graphical analysis of the pump-and-dump event study.** This figure displays the average cumulative abnormal return (CAR), average cumulative abnormal volume (CAV), and average cumulative abnormal tweets (CAT) across all successful events in our dataset. Minute 0 is the identified announcement time.

between the abnormal number of tweets before the event and the abnormal return during the dump phase, which encompasses the period up to 30 minutes after the pump.

We employ regression analysis to ascertain whether Twitter promotion effectively attracts additional participants to engage in the pump-and-dump event. Our analysis starts by investigating the

existence of a contemporaneous relationship between the abnormal number of tweets preceding the event and the cumulative abnormal return leading up to the event. Specifically, we focus on the last 30 minutes of the pre-event window. To conduct this analysis, we estimate the following regression model:

$$CAR_i(-31, -2) = \alpha + \beta CAT_i(-31, -2) + \varepsilon_i. \quad (7)$$

All variables in our analysis, except for the one about the cumulative abnormal return, are standardized to have a mean of 0 and a standard deviation of 1. The regression results are presented in the first column of Table 3.<sup>9</sup>

Consistent with the notion that promotion on Twitter engenders heightened attention towards the targeted cryptocurrency, subsequently generating increased buying pressure, we observe a positive and statistically significant relationship between the abnormal number of tweets and abnormal returns. Specifically, during the pre-event window, a one standard deviation increase in the cumulative abnormal number of tweets corresponds to a contemporaneous increase of 0.821% in cumulative abnormal returns.

**Table 3: Regression results**

	<i>CAR</i> (-31,-2)	<i>CAR</i> (2,31)	<i>CAR</i> (2,31)	<i>CAR</i> (32,720)	<i>CAR</i> (32,720)
Intercept	1.009*** (0.101)	-9.616*** (0.781)	1.378* (0.759)	-5.804*** (0.515)	-1.759** (0.712)
<i>CAT</i> (-31,-2)	0.821*** (0.122)	-0.842 (0.938)	-0.043 (0.647)	-2.297*** (0.619)	-1.638*** (0.607)
<i>CAT</i> (-1,1)			-0.043 (0.875)		1.113 (0.821)
<i>CAR</i> (-31,-2)			-1.143*** (0.283)		-0.399 (0.266)
<i>CAR</i> (-1,1)			-0.713*** (0.037)		-0.261*** (0.034)
<i>CAV</i> (-31,-2)			-0.703 (0.848)		-2.423*** (0.795)
<i>CAV</i> (-1,1)			-0.504 (0.674)		0.34 (0.633)
Adj. R <sup>2</sup> (%)	12.16	-0.06	59.86	3.83	21.92

This table reports the various regression results. Figures in parentheses denote the standard deviation of the estimated differences. \*\*\*, \*\*, \* indicate that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels.

Subsequently, we investigate the influence of the cumulative abnormal number of tweets before the event on the abnormal returns during the dump phase. As previously mentioned, if investors informed via Twitter about the pump-and-dump event exhibit awareness of its nature, we anticipate a negative relationship between the abnormal number of tweets before the event and the abnormal return during the dump phase. Conversely, in the alternate scenario where investors are unaware, we expect the relationship to be statistically insignificant. To explore this, we estimate the following regressions:

$$CAR_i(2, 31) = \alpha + \beta CAT_i(-31, -2) + \varepsilon_i, \quad (8)$$

and an additional regression where we incorporate control variables related to the pump-and-dump event environment:

$$\begin{aligned} CAR_i(2, 31) = & \alpha + \beta CAT_i(-31, -2) + \lambda_1 CAT_i(-1, 1) \\ & + \lambda_2 CAR_i(-31, -2) + \lambda_3 CAR_i(-1, 1) \\ & + \lambda_4 CAV_i(-31, -2) + \lambda_5 CAV_i(-1, 1) + \varepsilon_i. \quad (9) \end{aligned}$$

<sup>9</sup>It is worth noting that incorporating a cryptocurrency fixed effect did not significantly alter the qualitative outcomes of our analysis. However, due to the limited frequency of most cryptocurrencies in our database, including a cryptocurrency fixed effect would impose substantial constraints on our analysis.



In particular, the control allows us to account for the observation that pump-and-dump typically target securities with low trading volume as observed in Aggarwal and Wu (2006) for stocks and Hamrick et al. (2021) for cryptocurrencies. Columns 2 and 3 of Table 3 present the results of these two regressions. Our findings reveal a significant negative relationship between the cumulative abnormal return at and preceding the event and its equivalent during the dump window. This indicates that a substantial pump event corresponds to a sizable dump event. However, we do not observe a significant relationship between the abnormal number of tweets before the event and the cumulative abnormal return during the dump window. This outcome suggests that investors informed via Twitter are not selling their investments during the dump period.

Finally, we examine whether the cumulative abnormal number of tweets before the event impacts abnormal returns during the post-dump phase. Considering the absence of a relationship between these variables during the dump period, we now expect that investors who receive information from Twitter will sell their cryptocurrencies after the dump period. Hence, we anticipate a negative relationship between the cumulative abnormal number of tweets before the event and the cumulative abnormal return during the post-dump phase. To explore this, we estimate the following regressions:

$$CAR_i(31, 720) = \alpha + \beta CAT_i(-31, -2) + \varepsilon_i, \quad (10)$$

and, similar to the previous analysis, a regression with additional control variables:

$$\begin{aligned} CAR_i(31, 720) = & \alpha + \beta CAT_i(-31, -2) + \lambda_1 CAT_i(-1, 1) + \lambda_2 CAT_i(2, 31) \\ & + \lambda_3 CAR_i(-31, -2) + \lambda_4 CAR_i(-1, 1) + \lambda_5 CAR_i(2, 31) \\ & + \lambda_6 CAV_i(-31, -2) + \lambda_7 CAV_i(-1, 1) + \lambda_8 CAV_i(2, 31) + \varepsilon_i. \quad (11) \end{aligned}$$

Columns 4 and 5 of Table 3 present the results of these regressions. Notably, we observe a predominantly negative and statistically significant relationship between the post-dump abnormal return and the cumulative abnormal number of tweets before the event. This indicates that the price increase observed before the event, which is associated with abnormal tweets, only reverses at least 30 minutes after the dump phase. This finding suggests that investors who receive information from Twitter regarding a pump-and-dump event tend to be delayed in selling their cryptocurrencies compared to investors who receive information through other channels related to the event's announcement. Moreover, after controlling for other variables, a one standard deviation increase in the number of abnormal tweets before the event leads to a negative cumulative abnormal return of -1.638%. This reversal is substantially larger than the contemporaneous effect, implying that investors informed via Twitter who are late in selling their cryptocurrencies during a pump-and-dump event tend to experience, on average, a loss on their investment.

Overall, our regression analysis provides evidence that the cumulative abnormal number of tweets before the event influences the abnormal returns before, during, and after the pump-and-dump event. These results support the notion that Twitter promotion attracts participants to the event and influences their trading behavior.

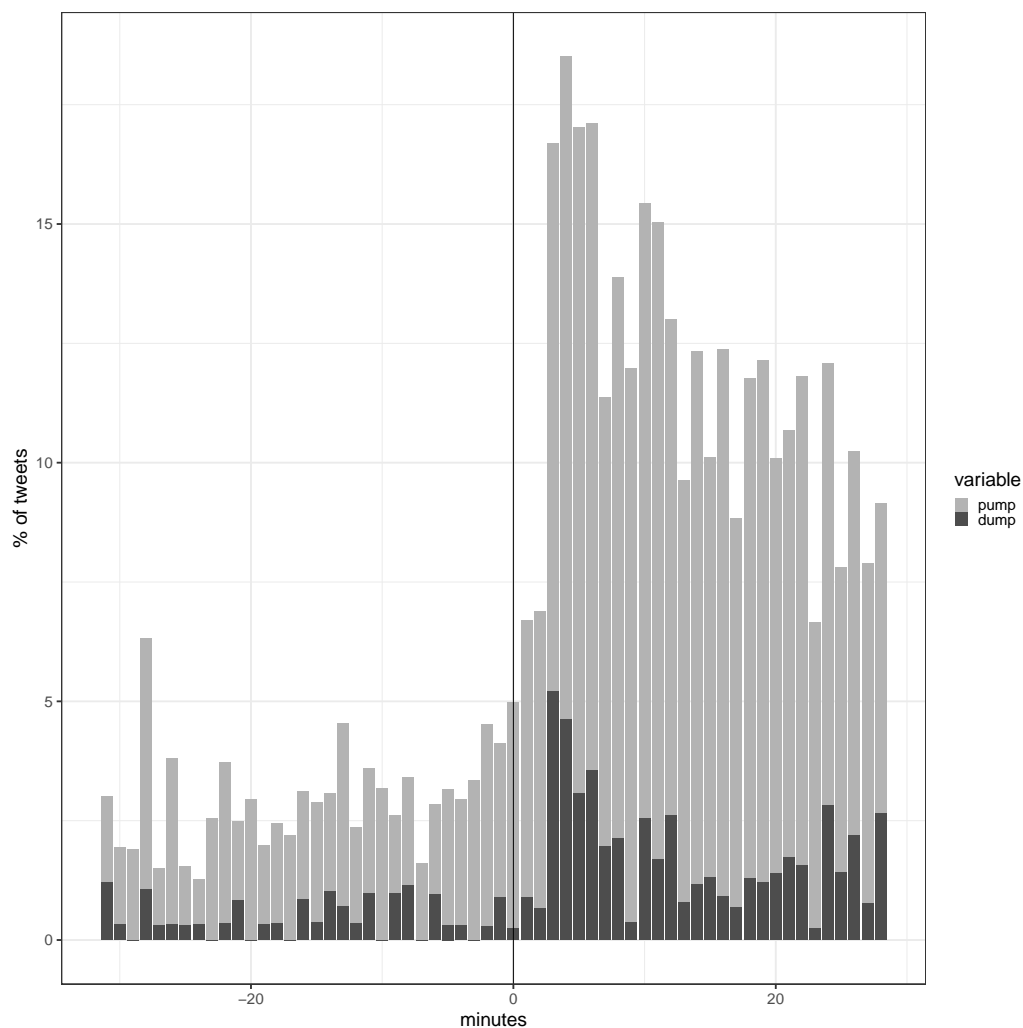
#### 4.5 Results for different categories of tweets

In the preceding section, we established that Twitter promotion plays a significant role in attracting participants to pump-and-dump events. However, the analysis did not differentiate between direct promotion (where participants are aware of the pump-and-dump scheme) and indirect promotion (where participants are unaware of the scheme).

To address this, we first analyze the general content of tweets surrounding the event, paying close attention to those that could inform users about the nature of the event. Our hypothesis centers on the notion that while promotion on Twitter exists, it might be indirect, leading users to invest in the targeted cryptocurrency without alerting them to the underlying pump-and-dump scheme.

This scenario parallels traditional fraud mechanisms, where manipulators entice investors without disclosing the manipulative intent. Contrarily, studies have shown that some pump-and-dump schemes explicitly encourage direct participation in the manipulation, blending elements of both conventional and unconventional schemes.

To discern the possibility of unconventional manipulation via Twitter, we examine the prevalence of tweets explicitly discussing the pump-and-dump scheme. Conversely, if conventional manipulation is at play, we expect to find tweets not directly related to the pump-and-dump event. Figure 11 illustrates the percentage of tweets containing “pump” or “dump” within a 30-minute window around the event announcement. We notice tweets with the word “pump” before the event (approximately 2.5% to 5%) and a minimal mention of “dump.” The frequency of both terms increases shortly after the event, particularly during the dump phase. This pattern suggests the coexistence of conventional and unconventional manipulation in these events.



**Figure 11: Percentage of tweets containing “pump” or “dump”.** This figure displays the percentage of tweets containing “pump” or “dump” words within a 30-minute window around the event announcement.

To further dissect the effects of these two promotional strategies, we devise three metrics for abnormal tweet activity: one excluding tweets with “pump” or “dump,” the second focusing on “pump” tweets, and the third on “dump” tweets. We then reapply the regression analysis of the previous section using these refined metrics. If unconventional direct promotion significantly influences market behavior, a correlation between abnormal returns and the “pump” tweet metric should emerge. In con-

trast, if conventional (indirect) promotion is influential, a link between the metric excluding “pump” and “dump” tweets and abnormal returns should be observed. Regarding the latter, if users remain unaware of the pump-and-dump scheme, a reversal post-dump is unlikely, as these users would not participate knowingly in the dump phase. The outcomes of this analysis are detailed in Table 4.

First, we focus on tweets explicitly related to the pump phase of the event. We find that the volume of pump-related tweets before the event positively correlates with abnormal returns in the pre-event phase and negatively with abnormal returns in the post-event phases (including both the dump and post-dump periods). This pattern aligns with the typical behavior in pump-and-dump schemes, where participants actively inflate the price of a cryptocurrency before rapidly offloading it, causing a subsequent price decline.

Second, we examine tweets that do not directly reference the pump-and-dump event. Here, we observe a distinct pattern: these tweets, posted prior to the event, show a positive correlation with abnormal returns after the event but not before it. This suggests that such tweets contribute to sustaining or even increasing the target cryptocurrency’s price following the event. Consequently, this provides an advantageous exit point for participants who are dumping their holdings. This phenomenon aligns with a form of direct manipulation, where uninformed participants inadvertently bolster the market, providing liquidity that benefits those who are privy to the pump-and-dump scheme.

**Table 4: Regression results for different categories of tweets**

	$CAR(-31,-2)$	$CAR(2,31)$	$CAR(2,31)$	$CAR(32,720)$	$CAR(32,720)$
Intercept	1.052*** (0.103)	-9.977*** (0.738)	0.328 (0.766)	-6.006*** (0.505)	-2.106*** (0.747)
$CAT(-31,-2)_{no\ pump\ or\ dump}$	-0.044 (0.149)	1.806* (1.069)	1.479** (0.707)	0.456 (0.731)	0.383 (0.689)
$CAT(-31,-2)_{pump}$	1.271*** (0.225)	-8.074*** (1.614)	-3.402*** (1.245)	-5.301*** (1.104)	-2.966** (1.214)
$CAT(-1,1)_{no\ pump\ or\ dump}$			0.228 (0.78)		0.19 (0.761)
$CAT(-1,1)_{pump}$			-1.233 (1.436)		0.349 (1.401)
$CAT(-1,1)_{dump}$			1.452 (2.451)		3.465 (2.391)
$CAR(-31,-2)$			-0.778*** (0.269)		-0.318 (0.263)
$CAR(-1,1)$			-0.673*** (0.036)		-0.239*** (0.035)
$CAV(-31,-2)$			0.056 (0.824)		-2.31*** (0.804)
$CAV(-1,1)$			-0.863 (0.648)		0.329 (0.632)
Adj. $R^2$ (%)	11.09	11.66	62.95	8.73	22.13

This table reports the various regression results when considering different categories of tweets. Figures in parentheses denote the standard deviation of the estimated differences. \*\*\*, \*\*, \* indicate that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels.

## 5 Conclusion

Our study provides compelling evidence that Twitter promotion is pivotal in attracting participants to pump-and-dump events in the cryptocurrency market. Analyzing abnormal returns, trading volume, and tweets offers valuable insights into the temporal dynamics of these events. Our regression analysis further confirms the influence of Twitter activity on abnormal returns before, during, and after the event, highlighting the significance of social media in shaping participant behavior.

We have identified distinct patterns of Twitter promotion, both direct and indirect, and their differential impacts on market behavior. Our findings reveal that direct pump-aware tweets correlate with the expected phases of these schemes, while a significant portion of indirect, non-pump-aware tweets, contribute to market movements post-event. This nuanced understanding of social media's role in financial market manipulation highlights the complexities of online influence and raises important considerations for market regulators and participants. By delineating the nature of these promotional strategies, our study contributes to a deeper understanding of the mechanisms behind market manipulations in the digital age, particularly in the volatile and emerging realm of cryptocurrencies.

## References

- Aggarwal, R.K., Wu, G., 2006. Stock market manipulations. *The Journal of Business* 79, 1915–1953.
- Cresci, S., Lillo, F., Regoli, D., Tardelli, S., Tesconi, M., 2018. Fake: Evidence of spam and bot activity in stock microblogs on twitter, in: *Proceedings of the International AAAI Conference on Web and Social Media*.
- Dhawan, A., Putniņš, T.J., 2023. A new wolf in town? pump-and-dump manipulation in cryptocurrency markets. *Review of Finance* 27, 935–975.
- Fan, R., Talavera, O., Tran, V., 2020. Social media bots and stock markets. *European Financial Management* 26, 753–777.
- Frieder, L., Zittrain, J., 2007. Spam works: Evidence from stock touts and corresponding market activity. *Hastings Communications & Entertainment Law Journal* 30, 479.
- Hamrick, J., Rouhi, F., Mukherjee, A., Feder, A., Gandal, N., Moore, T., Vasek, M., 2021. An examination of the cryptocurrency pump-and-dump ecosystem. *Information Processing and Management* 58, 102506.
- Kamps, J., Kleinberg, B., 2018. To the moon: defining and detecting cryptocurrency pump-and-dumps. *Crime Science* 7, 1–18.
- Kraaijeveld, O., Smedt, J.D., 2020. The predictive power of public twitter sentiment for forecasting cryptocurrency prices. *Journal of International Financial Markets, Institutions and Money* 65, 101188.
- La Morgia, M., Mei, A., Sassi, F., Stefa, J., 2020. Pump and dumps in the bitcoin era: Real time detection of cryptocurrency market manipulations, in: *2020 29th International Conference on Computer Communications and Networks (ICCCN)*, IEEE.
- Li, T., Shin, D., Wang, B., 2021. Cryptocurrency pump-and-dump schemes. Working Paper.
- MacKinlay, A.C., 1997. Event studies in economics and finance. *Journal of Economic Literature* 35, 13–39.
- Mansourifar, H., Chen, L., Shi, W., 2020. Hybrid cryptocurrency pump and dump detection. Working paper.
- Massoud, N., Ullah, S., Scholnick, B., 2016. Does it help firms to secretly pay for stock promoters? *Journal of Financial Stability* 26, 45–61.
- Mirtaheri, M., Abu-El-Haija, S., Morstatter, F., Steeg, G.V., Galstyan, A., 2021. Identifying and analyzing cryptocurrency manipulations in social media. *IEEE Transactions on Computational Social Systems* 8, 607–617.
- Nghiem, H., Muric, G., Morstatter, F., Ferrara, E., 2021. Detecting cryptocurrency pump-and-dump frauds using market and social signals. *Expert Systems with Applications* 182, 115284.
- Nizzoli, L., Tardelli, S., Avvenuti, M., Cresci, S., Tesconi, M., Ferrara, E., 2020. Charting the landscape of online cryptocurrency manipulation. *IEEE Access* 8, 113230–113245.
- Renault, T., 2017. Market manipulation and suspicious stock recommendations on social media. Available at SSRN 3010850 .
- Victor, F., Hagemann, T., 2019. Cryptocurrency pump and dump schemes: Quantification and detection, in: *2019 International Conference on Data Mining Workshops (ICDMW)*, IEEE.
- Xu, J., Livshits, B., 2019. The anatomy of a cryptocurrency pump-and-dump scheme, in: *Proceedings of the 28th USENIX Conference on Security Symposium*, USENIX Association. p. 1609–1625.