The Anatomy of a Cryptocurrency Pump-and-Dump Scheme

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Abstract—While pump-and-dump schemes have attracted the attention of cryptocurrency observers and regulators alike, this paper is the first detailed study of pump-and-dump activities in cryptocurrency markets. We present a case study of a recent pump-and-dump event, investigate 220 pump-and-dump activities organized in Telegram channels from July 21, 2018 to November 18, 2018, and discover patterns in crypto-markets associated with pump-and-dump schemes. We then build a model that predicts the pump likelihood of a given coin prior to a pump. The model exhibits high precision as well as robustness, and can be used to create a simple, yet very effective trading strategy, which we empirically demonstrate can generate a return as high as 80% on small investment within a span of three weeks.

Index Terms—cryptocurrency, trading, pump-and-dump, market manipulation, Telegram

I. Introduction

While pump-and-dump schemes are an old, well-trodden ruse in conventional financial markets, the old-fashioned ploy has found a new playground to thrive — cryptocurrency exchanges.

The relative anonymity of the crypto-space has lead to it becoming a fertile ground for unlawful activities, such as currency theft (e.g. the DAO hack [1]), Ponzi schemes [20], and pump-and-dump schemes that have risen in popularity in cryptocurrency markets over the last few years. Due to their end-to-end encryption, programmability, and relative anonymity, new social media tools such as Telegram[1] and Discord have become cryptocurrency enthusiasts' preferred communication vehicles. While pump-and-dump schemes have been discussed in the press [23], we are not aware of a comprehensive study of this phenomenon to date.

Regulation: In February 2018, the CFTC (Commodity Futures Trading Commission) issued warnings to consumers [7] about the possibility of cryptocurrency pump-and-dump schemes. It also offered a substantial reward to whistle-blowers around the same time [11].

In October 2018, the SEC (Securities and Exchange Commission) filed a subpoena enforcement against an investment company trust and trustee for alleged pump-and-dump ICO scheme [21].

Clearly, regulators are aiming to find perpetrators of pump-and-dump schemes and to actively prosecute them.

This paper: In this paper, we trace the message history of over 300 Telegram channels from July to November 2018, and identify 220 *pump events* orchestrated through those channels. We analyze features of pumped coins and market movement of coins before, during, and after pump-and-dump. We develop a predictive random forest model that gives the likelihood of each possible coin being pumped *prior* to the actual pump event. With an AUC (area under curve) of the ROC (receiver operating characteristic) curve of over 0.9, the model exhibits high accuracy and is indicative of the "pumpability" of coins.

Contributions: This paper has the following contributions:

- **Longitudinal study:** This paper is the *first* study of pump-and-dump schemes in the wild, which we base on our analysis of price and volume histories across multiple crypto-exchanges, as well as Telegram groups dedicated to pump-and-dump activities.

- **Analysis:** Our analysis shows that pump-and-dump activities are a lot more prevalent that previously believed. Specifically, around 100 organized Telegram pump-and-dump channels coordinate on average 2 pumps day which generates an aggregate artificial trading volume of 7 million USD a month. We discover that some exchanges are also active participants in pump-and-dump schemes.

- **Prediction:** We develop machine learning models that, given pre-pump market movements, can predict the likelihood of each coin being pumped with an AUC (Area Under Curve) of over 0.9 both in-sample and out-of-sample. The models confirm that market movements contain hidden information that can be utilized for monetary purposes.

- **Trading strategy:** We formulate a simple trading strategy which, when used in combination with our trained model, demonstrates to produce a return of 80% over a period of three weeks, even under strict assumptions.

Paper organization: The paper is structured as follows. In Section II we provide background information on pump and dump activities organized by Telegram channels. In Section III we present a pump-and-dump case study. In Section IV we investigate a range of coin features. In Section V we build a predicting model that estimates the pump likelihood of each coin for each pump, and propose a trading strategy along with the model. In Section VI we summarize the related literature. In Section VII we outline our conclusions.

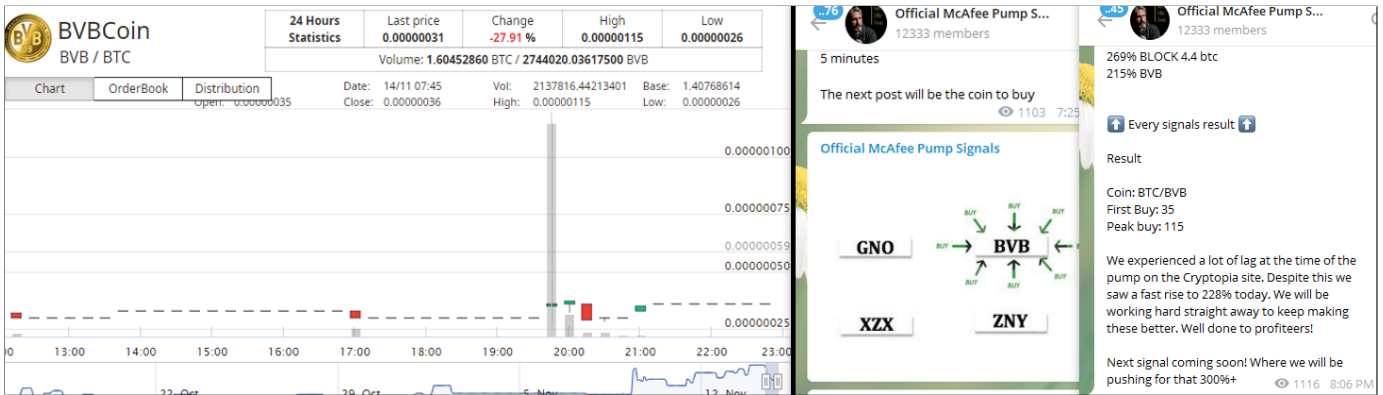[1]Note that not all Telegram traffic is end-to-end encrypted.

Fig. 1: A successfully organized pump event. On the right hand side of the screenshot is the message history of a Telegram channel. The first message is the final countdown; the second message is the coin announcement; the last message presents the pump result. On the left hand side is the market movement of the corresponding coin around the pump time.

II. BACKGROUND

A pump is a coordinated, intentional, short-term increase in the demand of a market instrument — in our study, cryptocurrency — which leads to a price hike. Thanks to the features of encryption and anonymity offered by chat applications such as Telegram and Discord, various forms of misconduct in cryptocurrency trading is burgeoning on those platforms.

A pump organizer, which can be an individual, or, more likely, an organized group, typically uses those social media tools to coordinate a pump event as follows.

Set-up: The organizer creates a publicly accessible group or channel, and recruits as many group members or channel subscribers as possible by advertising and posting invitation links on major forums such as Bitcointalk, Steemit, and Reddit. Telegram *channels* only allow subscribers to receive messages from the channel admin, but not post discussions in the channel. In a Telegram *group*, members can by default post messages, but this function is usually disabled by the group admin to prohibit members' interference. We use henceforth *channel* and *group* interchangeably.

Pre-pump announcement: The group is ready to pump once it obtains enough members (typically above 1,000). The pump organizer, who is now the group or channel admin, announces details of the next pump a few days ahead. The admins broadcast the exact time and date of the announcement of a coin which would then precipitate a pump of that coin. Other information disclosed in advance includes the exchange where the pump will take place and the pairing coin[2]. The admins advise members to transfer sufficient funds (in the form of the pairing coin) into the named exchange beforehand.

While the named pump time is approaching, the admin sends out countdowns, and repeats the pump "rules" such as: 1) buy fast, 2) "shill"[3] the pumped coin on the exchange chat box and social media to attract outsiders, 3) "HODL"[4] the coin at least for several minutes to give outsiders time to join in, 4) sell in pieces and not in a single chunk, 5) only sell at a profit and never sell below the current price. The admin also gives members a pep talk, quoting historical pump profits, to boost members' confidence and encourage their participation.

Pump: At the pre-arranged pump time, the admin announces the coin, typically in the format of an OCR (optical character recognition)-proof image to hinder machine reading (Fig. 1). Immediately afterwards, the admin urges members to buy and hold the coin in order to inflate the coin price. During the first minute of the pump, the coin price typically surges, increasing by several fold.

Dump: A few minutes (sometimes tens of seconds) after the pump starts, the coin price will reach its peak. While the admin might shout "buy buy buy" and "hold hold hold" in the channel, the coin price still can't resist dropping. As soon as the first fall in price appears, pump-and-dump participants start to panic-sell. While the price might be re-boosted by the second wave of purchasers who buy the dips (as encouraged by channel admins), chances are the price will rapidly bounce back to the start price, sometimes even lower. The coin price declining to the pre-pump proximity also signifies the end of the dump, since most investors would rather hold the coin than sell at a loss.

A few minutes later, when the coin price and trading volume recover to approximately the pre-pump level, the admin posts an analysis that showcases how much the coin price increased by the pump.
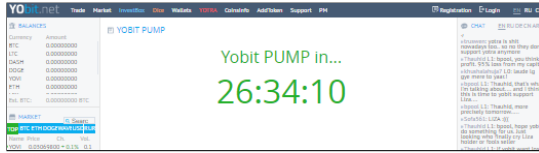
The role of exchanges: Some exchanges are themselves directly associated with pump-and-dump. Yobit, for example, has openly organized pumps multiple times (see Fig. 2). The benefit for an exchange to be a pump organizer is threefold:

1) With coins acquired before a pump, it can profit by dumping those coins at a higher, pumped price just as Telegram channel admins;

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[2]A pairing coin is a coin that is used to trade against other coins. Bitcoin (BTC) is a typical pairing coin.

[3]Crypto jargon for "advertise", "promote".

[4]Crypto jargon for "hold".

(a) Tweets from `@YobitExchange`.

(b) Pump timer from the Yobit website.

Fig. 2: The screen-shots demonstrate that the exchange Yobit is actively involved in pump-and-dump activities.
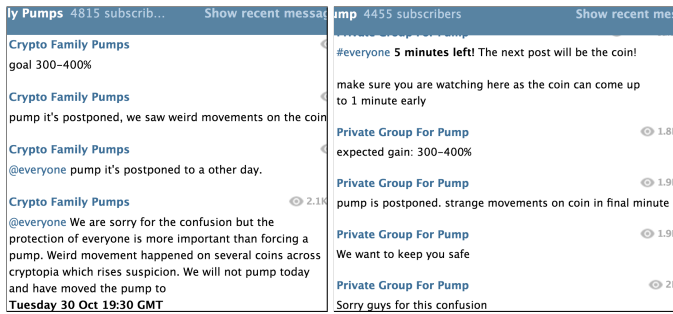

Fig. 3: A pump attempt coordinated by multiple channels not executed due to unanticipated price movement of the to-be-pumped coin.

2) It earns high transaction fees due to increased trading volume driven by a pump-and-dump;
3) Exchanges are able to utilize their first access to users' order information for front-running during a frenzy pump-and-dump.

Failed pump-and-dump attempts: Note that not every pump attempt is successful. Fig. 3 shows that the admins decided not to carry through a pre-announced pump due to unanticipated price movements of the to-be-pumped coin.

While it is unknown what caused the movements, the case evidences that the admin is aware of the coin choice before the pump (as opposed to the coin being randomly selected and immediately announced at the pump time purely by algorithm), and hence has the time advantage of hoarding the coin at a low price before the coin announcement, whereas group members only purchase the coin after the coin announcement and slow buyers risk acquiring the coin at an already (hyper)inflated price. It is generally known to pump participants that admins benefit the most from a pump. So why are there still people enthusiastic about partaking a pump, given the risk of being ripped off by the admins? Because people believe that they can sell those coins at an even higher price to other "greater fools". The greater fool theory also forms the foundation of many

other schemes, such as pyramid scams or ponzi games [4].

We can also hypothesize from this case that, someone might have worked out the pattern of the coin selection and pre-purchased a bucket of coins with high pump likelihood that happens to contain the actual to-be-pumped coin, which might explain why the admin observed peculiar movements of the coin. In the next section, we study the features of pumped coins and their price movements, to understand if it is indeed possible to predict the pumped coin.

III. A Pump-and-Dump Case Study

We further study in depth the pump-and-dump event associated with Fig. 1(a). The pump-and-dump was organized by at least four Telegram channels, the largest one being **Official McAfee Pump Signals**, with a startling 12,333 members. Prior to the coin announcement, the members were notified that the pump-and-dump would take place on one of the Cryptopia's BTC markets (i.e., BTC is the pairing coin).

Announcement: At 19:00 GMT, on Novermber 14, 2018, the channels announced the target coin in the form of a OCR-proof picture, but not quite simultaneously. **Official McAfee Pump Signals** was the fastest announcer, having the anouncement message sent out at 19:00:04. **Bomba bitcoin "cryptopia"** was the last channel that broadcast the coin, at 19:00:23.

The target coin was BVB, a dormant coin that is not listed on CoinMarketCap. The launch of the coin was announced on Bitcointalk on August 25, 2016.[5] The coin was claimed to be made by and for supporters of a popular German football club, Borussia Dortmund (a.k.a. BVB). The last commit on the associated project's source code on GitHub was on August 10, 2017.[6]

Although it has an official Twitter account, `@bvbcoin`, its last Tweet dates back to 31 August, 2016. The coin's rating on Cryptopia is a low 1 out of possible 5. This choice highlights the preference of pump-and-dump organizers to go after coins associated with projects that are not active and cannot resist the pump-and-dump activity.

During the first 15 minutes of the pump, BVB's trading volume exploded from virtually zero to 1.41 BTC (illustrated by the tall grey bar towards the right end of the price/volume chart), and the coin price increased from 35 Sat[7] to its threefold, 115 Sat (illustrated by the thin grey vertical line inside the tall grey bar).

Price fluctuations: Further dissecting the tick by tick transactions (Fig. 4), we notice that the first buy order was placed and completed within 1 second after the first coin announcement. With this lightning speed, we conjecture that such an order might have been executed by automation. After a mere 18 seconds of a manic buying wave, the coin price already skyrocketed to its peak. Note that **Bomba bitcoin "cryptopia"** only announced the coin at the time when the coin price was

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[5]https://bitcointalk.org/index.php?topic=1596932.0

[6]https://github.com/bvbcoin/bvbcoin-source

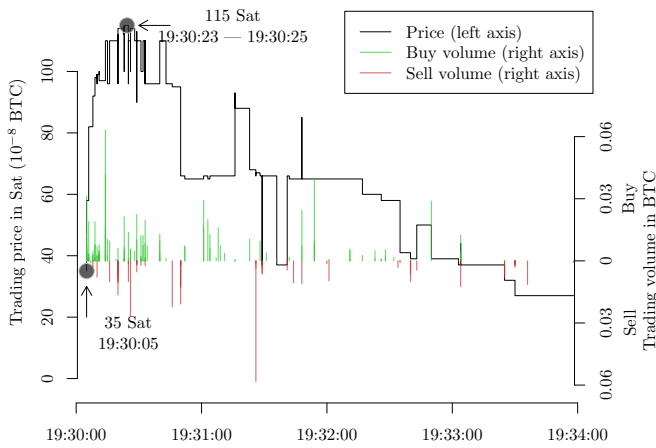[7]One Satoshi (Sat) equals 10^{-8} Bitcoin (BTC).

Fig. 4: Tick-by-tick movement of the BVB/ BTC market during the first four minutes after the coin announcement.
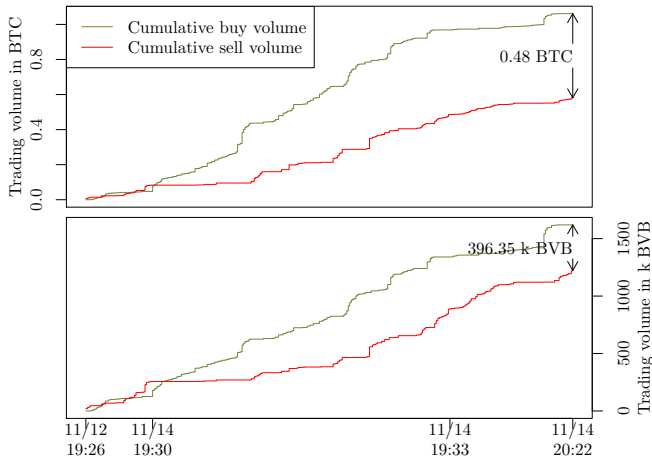

Fig. 5: Gap between buy volume and sell volume caused by the BVB pump-and-dump. The figure shows a timeline of 48 hours before up to 1 hour after the pump-and-dump. For the illustration purposes, the timeline is scaled with non-linear transformation to better display the development of volume gaps during the pump-and-dump.

already at its peak, making it impossible for investors who solely relied on their announcement to make any money.

Not being able to remain at this high level for more than a few seconds, the coin price began to decrease, with some resistance in between, and then plummeted. Three and half minutes after the start of the pump-and-dump, the coin price had dropped below its open price. Afterwards, transactions only occurred sporadically.

Volume: Fig. 5 shows that the pump-and-dump induces fake demand and inflates buy volume. While every pump-and-dump participant would hope for a quick windfall gain during a minute-long pump, the majority would not manage to act fast enough to sell at a high price. Those investors would either end up selling coins at a loss, or, if reluctant to sell low, would hold the virtually worthless coins. This can be demonstrated by Fig. 5 which shows that the buy volume exceeds the sell volume, whether measured by the target coin BVB or by BTC.

Exchange	Volume (30d)	No. markets	Launch	Country
Binance	$21,687,544,416	385	Jul 2017	China
Bittrex	$1,168,276,090	281	Feb 2014	U.S.A.
Cryptopia	$107,891,577	852	May 2014	New Zealand
YoBit	$797,593,680	485	Aug 2014	Russia

Fig. 6: Exchanges involved in pump-and-dump schemes, sorted by 30-day volume: No. markets is the number of trading pairs (eg. DASH/BTC, ETC/USDT) in the exchange. Volume and No. markets were extracted from CoinMarketCap on November 5, 2018.

The figure also shows small volume movements shortly before the pump-and-dump, also observable in Fig. 4(a), which can be indicative of organizers' pre-purchase conduct. Note again that the BVB blockchain is not being actively maintained and the coin itself is extremely illiquid, so any market movement can be deemed unusual.

Fig. 5 illustrates that the total buy volume (also including the pre-purchased volume, though negligible) in BTC associated with the pump-and-dump amounts to 1.06 BTC, the sell volume only 0.58 BTC; the total buy volume measured in BVB is 1,619.81 thousand BVB, the sell amount 1,223.36 thousand BVB. This volume discrepancy between the sell and the buy sides indicates a higher trading aggressiveness on the buy side.[8] This further suggests that many investors may be "stuck" with BVB which they are unwilling to liquidate at the low market price after the pump-and-dump. Those coin holders can only expect to reverse the position in the next pump, which might never come.

Low participation ratio: It is worth noting that the total count of trading transactions associated with this pump-and-dump is merely 322. That number appears very low compared to the 1,376 views of the coin announcement message, let alone the over 10,000 channel members. This indicates that the majority of group members are either observers, who want no skin in the game, or have become aware of the difficulty in securing profit from a pump-and-dump.

IV. ANALYZING PUMP-AND-DUMP SCHEMES

In this section we explain how we obtain data from both Telegram and the various exchanges, which allows us to analyze and model pump-and-dump schemes.

A. Collecting Pump-and-Dump Events

Telegram channels are the primary medium for pump-and-dump activity and announcements.

Our primary source on pump-and-dump Telegram channels and events is provided by PumpOlymp,[9] a website that gleans information across Telegram channels and publishes pump-and-dump agendas on a continuous basis. They also host

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[8]Note that Cryptopia is a peer-to-peer trading platform which lets users trade directly with each other; the exchange takes no risk position and only profits from charging trading fees. Therefore, buying volume implies that the trade is initiated by the buyer, which typically drives the market price up; similarly, sale volume is initiated by the sell side and would drive the price down.
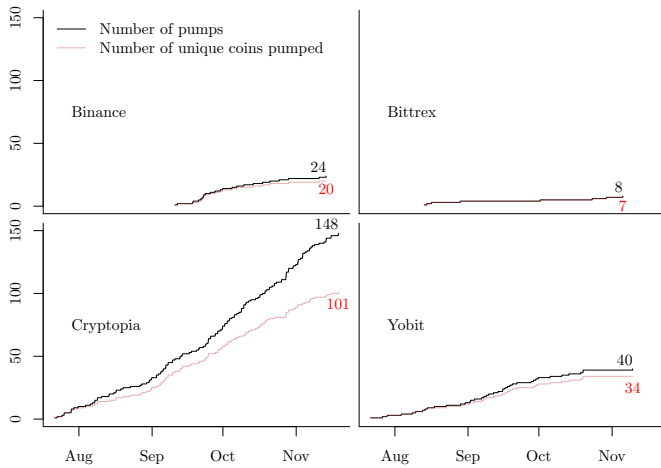
[9]https://pumpolymp.com/analytics/bestChannels

Fig. 7: Cumulative counts of pumps and pumped coins over time on four exchanges.

Fig. 8: Aggregate trading volume of pumped coins before and during a pump.

a comprehensive directory of hundreds of pump-and-dump channels.

With the channel list from PumpOlymp as the starting point, we use the official Telegram API to retrieve message history from those channels regarding their status and activity examination. We also employ hand collection (e.g. by searching channels with keyword "pump") to cross-check for missing and incorrect data.

Telegram channels: In the end, we arrive at a list of 358 Telegram channels that exhibit traits of being a pump-and-dump organization, e.g. the word "pump" contained in screen name or user name. Among those channels, 43 have been deleted from the Telegram sever, possibly due to inactivity for an extended period of time. Among the existing ones, over half (168/315) have not been active for a month, possibly because cautious admins delete pump-and-dump messages to not leave any trace behind. This might also imply that the Telegram channels have the "hit-and-run" characteristic. As described in the section above, one learns from participation in pump-and-dump activities that quick bucks are not easy to get. Therefore, curious newcomers might be fooled by pump-and-dump organizers' advertising and lured into the activity. After losing money a few times, participants may lose faith and interest, and cease partaking. This forms a vicious circle, since with fewer participants, it would be more difficult to pump a coin. Therefore, channel admins might desert their channel when the performance declines, and start new ones to attract the inexperienced.

Pump-and-dump history: PumpOlymp also has a continuously updated web page that lists Telegram organized pump-and-dump's not older than 3 months. By scraping the coin pump history listed on PumpOlymp multiple times, we acquire an initial list of historical pump-and-dump activities that include the pumped coin, the target exchange, the organizing Telegram channel, and the start time. We run plausibility checks to ensure each record's qualification as a pump-and-dump. For example, if an alleged pump-and-dump is recorded
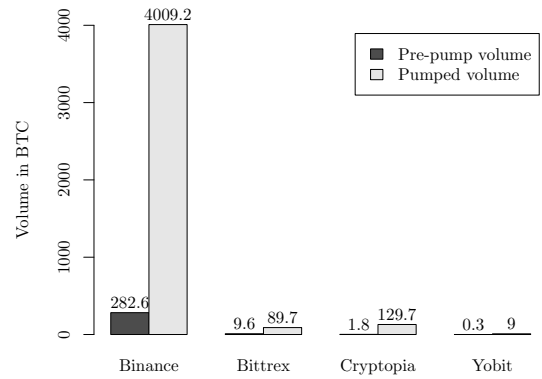
to have started at a time that is far from a full hour (6:00, 7:00, etc.) or a half hour, then we would be suspicious, because an organizer would normally not choose a random time for a pump-and-dump. If there is no significant increase in volume or high price around the pump time, we would also be skeptical. In such a circumstance, we manually check the message history to make a final judgment. In most cases, the message either discusses the potential of a coin (as opposed to a coin announcement in a pump-and-dump) or the record is simply a mistake.

In total, we trace 236 pump-and-dump coin announcements from July 21, 2018 to November 18, 2018, each of which is characterized by a series of messages similar to those presented in Fig. 1(a). One pump-and-dump can be co-organized by multiple channels; if two coin announcements were broadcast within 3 minutes apart from each other and they target the same coin at the same exchange, then we consider them to be one pump-and-dump event. In total, we have collected 220 unique pump-and-dump events.

Excluded data points: All the pumped coins in our sample are paired with BTC. We also observed and manually collected a few ETH-paired pumps, most of which took place in other exchanges.[10] Inclusion of those cases would demand data collection with other methods and resources. Due to their rarity, we do not consider ETH-paired pump-and-dump's in our study.

B. Obtaining Coin Data

Apart from consulting the online pump-and-dump information center PumpOlymp, we retrieve additional information on features and price movements of coins from other sources, in order to establish a connection between the information and the pump-and-dump pattern.

Specifically, we use the public API from CryptoCompare[11] for coins' hourly OHLC (open, high, low, close) and volume data on 189 exchanges, including Binance, Bittrex, Cryptopia and Yobit. The website also provides historical minute-level data but they are restricted to a 7-day time window and thus not

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[10]For example, PLX on October 10 in CoinExchange, ETC on April 22 in Bibox.

[11]https://min-api.cryptocompare.com/

utilized. We further use the public API from CoinMarketCap to collect coins' market data. While it might be useful to also collect coins' historical market cap before each pump-and-dump, we have not found a public source that provides this type of data. Therefore, we purposefully chose to retrieve the data at 08:42 GMT, November 5, when we believe the market cap would not be influenced by any Telegram organized pump-and-dump, since they typically start on the hour or the half hour and last only a few minutes.

In addition to market trading data, we also retrieve coins' non-financial features. Specifically, we use exchanges' public API[12] to collect information on coins' listing status, algorithm, and total supply. We also collect coins' launch date using CryptoCompare's public API. For information that is not contained in the API but viewable online (such as coins' rating data on Cryptocurrency), we use either page source scraping or screen scraping, depending on the design of the desired webpage. All our data are from publicly accessible sources.

C. Role of Exchanges

Pump-and-dump schemes take place within the walled gardens of crypto-exchanges. Binance, Bittrex, Cryptopia, and Yobit are among the most popular exchanges used by pumpers (see Fig. 6). While those exchanges differ vastly in terms of their volume, markets, and user base, each of them has its own appeal to pumpers. Large exchanges such as Binance and Bittrex have a large user base, and abnormal price hype caused by pump activities can quickly attract a large number of other users to the exchange. Smaller exchanges such as Cryptopia and Yobit tend to host esoteric coins with low liquidity, whose price can be more easily manipulated compared to mainstream coins such as Ether (ETH) or Litecoin (LTC).

Activity distribution by exchange: Among the 220 pump-and-dump activities, 24 (11%) took place in Binance, 8 (4%) in Bittrex, 148 (67%) in Cryptopia and 40 (18%) in Yobit. In aggregate, 25% (56/220) of the time, the selected coin has been pumped in the same exchange before (see Fig. 7).

Fig. 8 compares the aggregate three-hour trading volume in BTC of pumped coins before and during a pump-and-dump and the artificial trading volume generated by those pump-and-dump activities is astonishing: 4,238 BTC (95% of which come from Binance), roughly equivalent to 25 million USD, of trading volume during the pump hours, 14 times as much as the pre-pump volume (294 BTC), and that only over a period of three and half months.

Fig. 9 illustrates the occurrence and the effectiveness of individual pump-and-dump activities. In terms of frequency, Bittex is most rarely chosen; Binance started to gain traction only since September, but still witnesses much less pump-and-dump occurrence than Yobit and Cryptopia. Comparing Yobit with Cryptopia, we find that the former is becoming more inactive with the passage of time, while the latter is
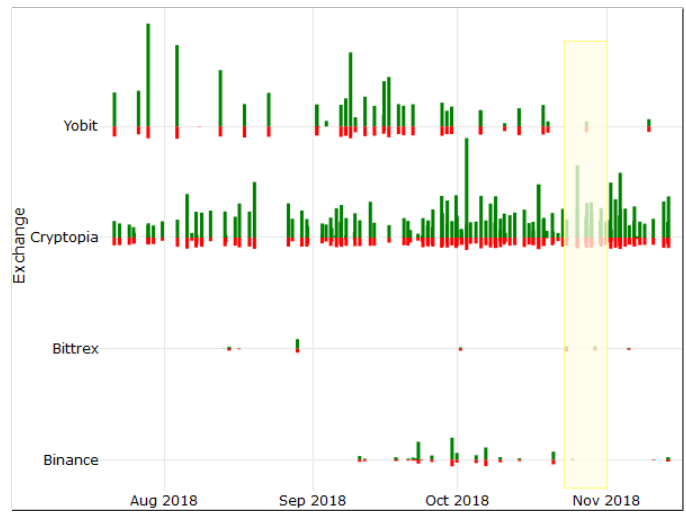
(a) Pump and dump activities from July to November 2018
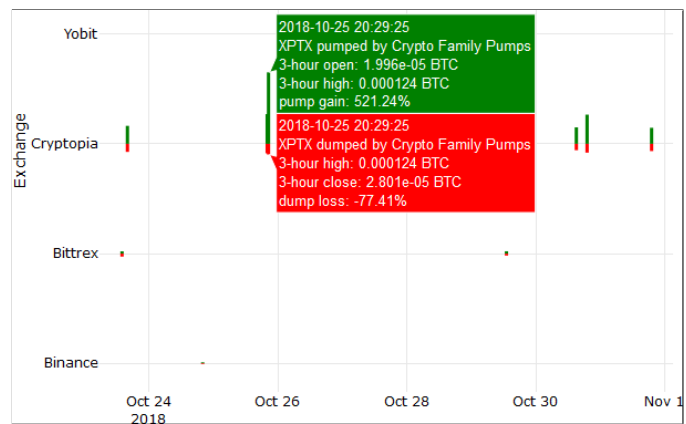
(b) Enlarged section of the highlighted area in (a) that shows one of the most recent pump-and-dump

Fig. 9: Pump and dump timeline. A green bar represents price increase through pump, calculated as $\frac{\text{high price} - \text{open price}}{\text{open price}}$; a red bar represents price drop after pump, calculated as $\frac{\text{close price} - \text{high price}}{\text{close price}}$. All prices are denominated in BTC, and from a 3-hour window around pump activities. Visit http://rpubs.com/xujiahuayz/pd for the full, up-to-date, interactive chart.

increasingly gaining more traffic. In terms of percentage of coin price increase, pumps in both Yobit and Cryptopia appear to be more powerful than those in Bittrex and Binance. What goes hand in hand with price surge is price dip: coin prices also drop more dramatically during the dump in Yobit and Cryptopia compared to their peer exchanges.

Coin announcement views: While investigating the degree of exposure in coin announcement messages distributed by Telegram channels, we find a negative correlation (-0.162) between number of views of coin announcement and pump gain, which is quite counter-intuitive, because one would think that more views would indicate more participation, which would result in higher pump gain. Two extreme examples: the coin announcement of the pump on MST has 325 views and the pump gain was 12.6%; another coin announcement of the pump on PARTY had only 18 views, and the pump gain was a whopping 533.3%. This suggests the use of bots to
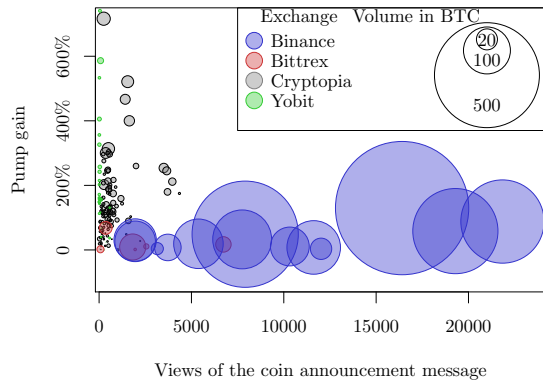
Fig. 10: Views of coin announcement message versus coin price increase during the pump. The figure illustrates the relationships between coin price increase through pump, views of coin announcement message, pump volume, and pump exchange.
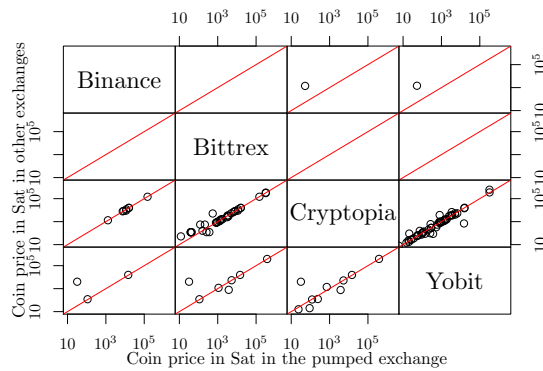

Fig. 11: Arbitrage opportunities: coin price (highest during the pump hour) in pumped exchange versus price in other exchanges

read the coin announcement message (which does not require membership of the group) is involved in trading.

Price increase: We further notice that although significantly more people participated in pump-and-dump in Binance (participation proxied by views of coin announcement message) — because of its large user base — and generated more trading volume during the pump hour,[13] coin price increase through pumps is generally at a much smaller scale than its equivalent in Cryptopia and Yobit (Fig. 10). This is possibly caused by high bid and sell walls on the order book that are typical to large crypto exchanges like Binance, which prevent the price from fluctuating significantly even at coordinated pump-and-dump events.

Arbitrage: Pump-and-dump activities not only engender abnormal returns within the pumped exchange, but also arbitrage opportunities across different exchanges. Fig. 11 shows the presence of a price discrepancy of the same coin during the pump hour across different exchanges. Interestingly, coin price can sometimes be higher in exchanges other than the pumped one. It is also worth noting that most coins pumped in Cryptopia are also listed in Yobit but not in Bittrex or Binance,

[13]A pump hour refers to the clock hour during which a pump occurs. Due to constraints with data availability, we are only able to obtain hourly market data.
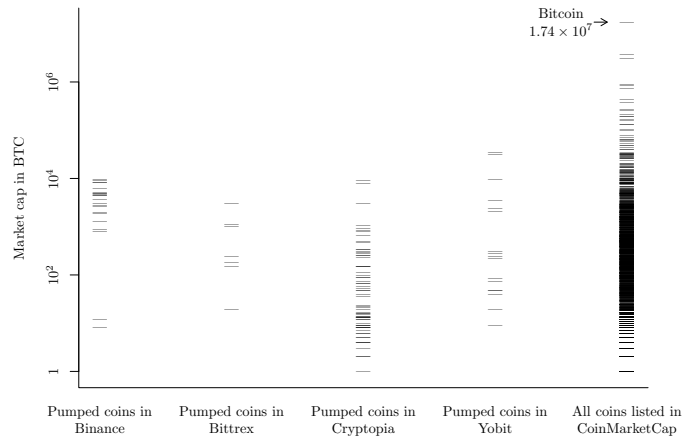
Fig. 12: Distribution of coin market caps. Market cap information was extracted from CoinMarketCap on November 5, 2018.

and vice versa. This is because the former two have more conservative coin listing strategies, which results in a different, more mainstream portfolio of listed coins compared to the latter two. While there may be trading strategies resulting from these arbitrage opportunities, they are outside the score of this work.

D. Capturing Features

Fig. 12 presents the market cap distribution of coins pumped in different exchanges. Pumped coins' market cap ranges from 1 BTC (Royal Kingdom Coin (RKC), pumped in Cryptopia) to 27,600 BTC (TrueUSD (TUSD), pumped in Yobit). Half of those coins have a market cap below 100 BTC, most of which were pumped in Cryptopia.

Pump-and-dump organizers who favor Cryptopia are attracted by the wide range of coins with low market cap listed on the exchange. Unsurprisingly, small coins are more likely to be associated with scams, leading to potential delisting. As of November 25, 2018, 20 (21%) coins among the 99 pumped in Cryptopia between July 21, 2018 and November 18, 2018, have already been delisted. Coins pumped in other exchanges remain listed.[14]

Fig. 13 depicts time series of coin returns up to 48 hours before and 3 hours after a pump. We detect unusual return signals even an hour before the announcement of the pumped coin. The return signal before the pump is the strongest with Cryptopia, where in numerous pumps, coin prices were elevated to such an extent that the hourly return before the pump even exceeds the hourly return during the pump. This can be explained by the assumption that pump organizers might utilize their insider information to purchase the to-be-pumped coin before the coin announcement, causing the coin price elevation and usual return volatility before the pump. The analysis above provides grounds for predicting the pumped

[14]ICONOMI (ICN), a coin that has been pumped on Binance, was delisted from the exchange for a brief period before being re-listed. The delisting occurred after the announcement that ICN would be converted into a security token, which is not allowed to be traded on Binance. As far as we know, no coin-specific reasons are quoted for the delisting decisions on Cryptopia.

Fig. 13: Time series of coin returns before and after pump. In each subplot, the hourly log return of each pumped coin before and shortly after the pump is superimposed on each other. The vertical red line represents the pump hour during which the coin was announced.

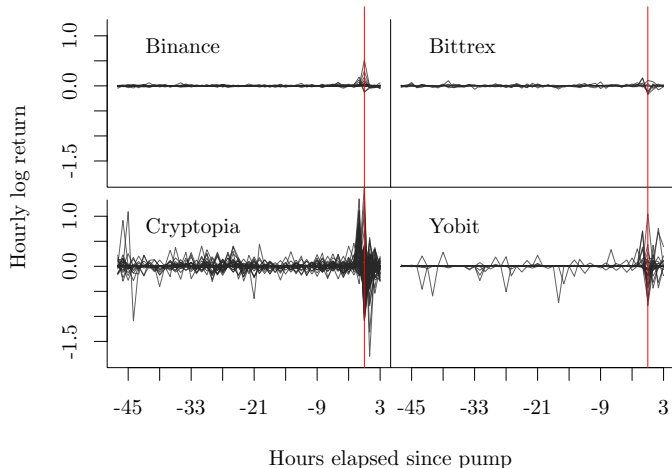coin before coin announcement using coin features and market movement.

V. Predicting Pump-and-Dump Schemes

A. Feature Selection

Based on the preliminary analysis in the last section, we believe it would be possible to reverse engineer pump-and-dump organizers' coin selection criteria using coin features and market movements. For the ease of data standardization and due to its high pump-and-dump frequency, we focus on predicting coins pumped in Cryptopia.

For each coin before a pump event, we predict whether it will be pumped (TRUE) or not (FALSE). The formula for the prediction model is:

$$Pumped = M(feature_1, feature_2, \dots)$$

where the dependent variable $Pumped$ is a binary variable that equals 1 (TRUE) when the coin is selected for the pump, and 0 (FALSE) otherwise. Fig. 14 lists the features considered in the prediction model.

Previous analyses indicate unusual market movements prior to the pump-and-dump might signal organizers' pre-pump behavior, which could consequently give away the coin selection information. Therefore, we place great emphasis on features associated with market movements, such as price, returns and volatilities covering different lengths of time span. Those features, 46 in total, account to 85% of all the features considered.

B. Model Application

Sample specification: We consider all the coins listed on Cryptopia at each pump-and-dump event. On average, we have 358 coin candidates at each pump, out of which one is the actual pumped coin. The number of coins considered varies for each event due to constant listing/delisting activities on

the part of exchanges. The full sample contains 47,487 pump-coin observations, among which 133 are pumped cases,[15] accounting for 0.3% of the entire sample population. The sample is apparently heavily skewed towards the unpumped class and needs to be handled with care at modelling.

For robustness tests, we split the whole sample into three chronologically consecutive datasets: training sample, validation sample and and test sample:

Pumped?	Training	Validation	Test	Total	
TRUE	78	28	27	133	(0.3%)
FALSE	27,681	10,078	9,728	47,487	(99.7%)
Total	27,759	10,106	9,755	47,620	(100.0%)

The training sample covers the period of July 21 to October 10 and consists of 27,759 data points (58.3% of full sample), among which 78 are pumped cases; the validation sample covers October 10 to October 29 and consists of 10,106 data points (21.2% of full sample), among which 28 are pumped cases; the test sample covers October 29 to November 18 and consists of 9,755 data points (20.5% of full sample), among which 27 are pumped cases.

Model selection: We test both classification and logit regression models for the prediction exercise. Specifically, for the classification model, we choose random forest (RF) with stratified sampling; for the logit regression model, we apply generalized linear model (GLM). Both RF and GLM are widely adopted in machine learning and each has its own quirks.

RF is advantageous in handling large quantities of variables with no overffiting issues. In addition, RF is resilient to correlations, interactions or non-linearity of the features, and one can be agnostic about the features. On the flip side, RF relies upon a voting mechanism based on a large number of bootstrapped decision trees, which can be time-consuming, and thus challenging to execute. In addition, RF provides information on feature importance, which is less intuitive to interpret than coefficients in GLM.

GLM is a highly interpretable model [22] that can uncover the correlation between features and the independent variable. It is also highly efficient in terms of processing time, which is a prominent advantage when coping with large datasets. However, the model is prone to overfitting when fed with too many features, which potentially results in poor out-of-sample performance.

Hyperparameter specification: Due to the heavily imbalanced nature of our sample, we stratify the dataset when using RF [8], such that the model always includes TRUE cases when bootstrapping the sample to build a decision tree. Specifically, we try the following three RF variations:

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[15]Due to missing data on several delisted coins, this number deviates from the total number of 148 pump events in Cryptopia, as presented in Fig. 7.

Feature	Description	Notation
Market cap	Market cap information extracted from CoinMarketCap at 08:42 GMT, November 5, 2018 when no pump-and-dump activity in Telegram channels was observed	$caps$
Returns before pump	x-hour log return of the coin within the time window from $x+1$ hours to 1 hour before the pump	$return[x]h$ †
Volumes in coin before pump	Total amount of the coin traded within the time window from $x+1$ hours to 1 hour before the pump	$volumefrom[x]h$ †
Volumes in BTC before pump	Total trading volume of the coin measured in BTC within the time window from $x+1$ hours to 1 hour before the pump	$volumeto[x]h$ †
Return volatilities before pump	Volatility in the hourly log return of the coin within the time window from $x+1$ hours to 1 hour before the pump	$returnvola[y]h$ ‡
Volume volatilities in coin before pump	The volatility in the hourly trading volume in coin within the time window from $x+1$ hours to 1 hour before the pump	$volumefromvola[y]h$ ‡
Volume volatilities in BTC before pump	The volatility in the hourly trading volume in BTC within the time window from $x+1$ hours to 1 hour before the pump	$volumetovola[y]h$ ‡
Last price before pump	Open price of the coin one hour before the coin announcement	$lastprice$
Time since existence	The time difference between the time when the first block of the is mined and the pump time	age
Pumped times before	Number of times the coin been pumped in Cryptopia before	$pumpedtimes$
Coin rating	Coin rating displayed on Cryptopia, 0 being the worst, 5 being the best. The rating considers the following criteria wallet on {Windows, Linux, Mac, mobile, web, paper}, premine ratio, website and block explorer	$rating$
Withdrawal fee	Amount of coin deducted when withdrawing the coin from Cryptopia	$WithdrawFee$
Minimum withdrawal	Minimum amount of coin that can be withdrawn from Cryptopia	$MinWithdraw$
Maximum withdrawal	Daily limit on the amount of coin that can be withdrawn from Cryptopia	$MaxWithdraw$
Minimum base trade	Minimum base trade size of the coin	$MinBaseTrade$

Fig. 14: Features included in the prediction model. † $x \in \{1, 3, 12, 24, 36, 48, 60, 72\}$. ‡ $y \in \{3, 12, 24, 36, 48, 60, 72\}$.

Model	Sample size per tree			Number
	TRUE	FALSE	Total	of trees
RF1	60	20,000	20,060	5,000
RF2	60	5,000	5,060	20,000
RF3	60	1,000	1,060	40,000

Model	Shrinkage parameter (λ)
GLM1	10^{-8}
GLM2	10^{-3}
GLM3	5×10^{-3}

We fix the number TRUE's at 60 for each RF variation, so that the model may use the majority of TRUE's to learn their pattern when building each tree. Model RF1 stays loyal to our sample's original TRUE/FALSE ratio, with 0.3% of TRUE's contained in each tree-sample. RF2 and RF3 raise the TRUE/FALSE ratio to 1.2% and 6%, respectively. Note that while the sample size per tree decreases from RF1 to RF2 to RF3, we are mindful to increase the number of trees accordingly to ensure that whichever model we use, every input case is predicted a sufficient number of times. We use the R package randomForest to model our data with RF1, RF2 and RF3.

With conventional binomial GLM, problems can arise not only when the dependent variable has a skewed distribution, but also when features are skewed. With heavy-tailed coin price distribution and market cap distribution, conventional binomial GLM can be insufficient to handle our sample. Therefore, we apply LASSO (least absolute shrinkage and selection operator) regularization to the GLM models. After preliminary testing, we choose to focus on three representative LASSO-GLM models with various shrinkage parameter values (λ):

Higher values of λ causes elimination of more variables. We use the R package glmnet to model our data with GLM1, GLM2, and GLM3.

Variable assessment: By applying the specified models on the training sample, we are able to assess the features' relevance to coin prediction. Fig. 15 presents features' importance based on mean decrease in Gini coefficient with RF models. We find that:

- Coin market cap $caps$ and last hour return before the pump $return1h$ appear to the two most important features in predicting pumped coin using RF models;
- Features describing market movements shortly before the pump, e.g. $return1h$, $volumeto1h$ and $volumefrom1h$, appear to be more important than features describing longer-term movements.
- Among all the features related to market movements, return features are generally more important than volume or volatility features.
- Exchange-specific features including $MinBaseTrade$, $MinWithdraw$, $MaxWithdraw$, and $WithdrawFee$ are least important.

	RF1	RF2	RF3
caps	8.52	8.53	7.67
return1h	4.60	6.65	7.30
return3h	2.88	3.83	4.62
return12h	2.89	3.22	3.88
return24h	2.53	2.59	2.63
return36h	2.45	2.84	3.68
return48h	3.84	3.95	4.17
return60h	2.65	2.71	3.10
return72h	2.55	2.95	3.60
volumefrom1h	2.22	2.45	2.84
volumefrom3h	1.53	1.34	1.21
volumefrom12h	1.58	1.41	1.14
volumefrom24h	1.70	1.60	1.38
volumefrom36h	1.85	1.68	1.37
volumefrom48h	1.84	1.69	1.41
volumefrom60h	1.93	1.81	1.53
volumefrom72h	1.95	1.87	1.66
volumeto1h	2.64	3.27	3.19
volumeto3h	1.85	1.87	1.60
volumeto12h	1.86	1.70	1.45
volumeto24h	2.23	2.07	1.79
volumeto36h	2.42	2.18	1.87
volumeto48h	2.31	2.19	1.86
volumeto60h	2.40	2.30	2.01
volumeto72h	2.81	2.51	2.16
returnvola3h	2.02	2.30	3.07
returnvola12h	2.08	1.94	1.87
returnvola24h	2.17	1.96	1.73
returnvola36h	2.22	1.99	1.78
returnvola48h	2.44	2.10	1.69
returnvola60h	2.39	2.17	1.80
returnvola72h	2.30	2.09	1.67
volumefromvola3h	1.39	1.34	1.31
volumefromvola12h	1.57	1.42	1.16
volumefromvola24h	1.65	1.51	1.25
volumefromvola36h	1.75	1.55	1.21
volumefromvola48h	1.81	1.56	1.22
volumefromvola60h	1.79	1.56	1.25
volumefromvola72h	1.81	1.66	1.33
volumetovola3h	1.86	2.06	1.96
volumetovola12h	1.77	1.74	1.52
volumetovola24h	2.10	1.94	1.70
volumetovola36h	2.16	1.94	1.65
volumetovola48h	2.12	1.96	1.64
volumetovola60h	2.15	1.99	1.67
volumetovola72h	2.26	2.04	1.70
lastprice	2.14	2.02	1.66
age	2.20	1.88	1.69
pumpedtimes	1.31	1.65	2.52
rating	1.77	1.64	1.37
WithdrawFee	0.73	0.71	0.63
MinWithdraw	1.02	1.03	0.98
MaxWithdraw	0.43	0.36	0.28
MinBaseTrade	0.00	0.00	0.00

Fig. 15: Features' importance indicated by mean decrease in Gini coefficient. Higher importance is marked by darker cell color.

	GLM1	GLM2	GLM3
caps	0.00	-	-
return1h	2.76	4.75	5.02
return3h	-0.04	-	-
return12h	1.08	-	-
return24h	-4.81	-	-
return36h	1.41	0.11	-
return48h	3.64	2.33	-
return60h	0.07	-	-
return72h	1.21	-	-
volumefrom1h	0.00	-	-
volumefrom3h	-0.00	-	-
volumefrom12h	-	-	-
volumefrom24h	-	-	-
volumefrom36h	-	-	-
volumefrom48h	0.00	-	-
volumefrom60h	-	-	-
volumefrom72h	-	-	-
volumeto1h	1.61	-	-
volumeto3h	5.99	-	-
volumeto12h	-	-	-
volumeto24h	-	-	-
volumeto36h	-	-	-
volumeto48h	-	-	-
volumeto60h	-2.88	-	-
volumeto72h	-0.49	-	-
returnvola3h	3.94	-	-
returnvola12h	4.41	-	-
returnvola24h	-9.39	-	-
returnvola36h	10.40	-	-
returnvola48h	9.10	-	-
returnvola60h	-12.57	-	-
returnvola72h	-3.93	-	-
volumefromvola3h	-0.00	-	-
volumefromvola12h	0.00	-	-
volumefromvola24h	-	-	-
volumefromvola36h	-	-	-
volumefromvola48h	-	-	-
volumefromvola60h	-	-	-
volumefromvola72h	-0.00	-	-
volumetovola3h	-7.46	-	-
volumetovola12h	1.32	-	-
volumetovola24h	-9.96	-	-
volumetovola36h	-2.13	-	-
volumetovola48h	18.83	-	-
volumetovola60h	-	-	-
volumetovola72h	8.65	-	-
lastprice	-91.74	-	-
age	0.00	-	-
pumpedtimes	0.69	0.66	-
rating	-0.16	-	-
WithdrawFee	-0.00	-	-
MinWithdraw	-0.00	-	-
MaxWithdraw	0.00	-	-
MinBaseTrade	-	-	-
(Intercept)	-5.43	-6.15	-5.95

Fig. 16: Variable coefficients (unstandardized) using GLM. Coefficients of variables not selected by the model are shown as "-".
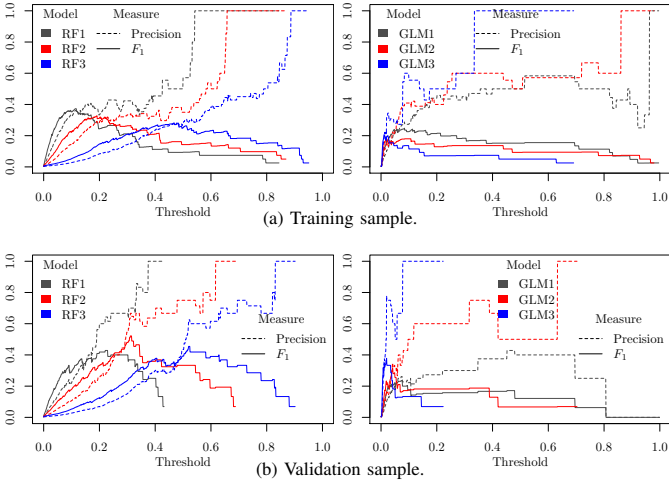
Fig. 17: Model performance measured by Precision and F_1 at different threshold levels.

Fig. 18: Model performance measured by ROC AUC at different threshold levels.

Fig. 16 presents the estimated coefficients of variables with GLM models, from which we can form several findings in line with what is indicated by RF models above. Specifically, we notice that:

- When only one variable is included, *return1h* appears to have the highest explanatory power on coins' pump likelihood;
- The positive coefficients of return features imply that the higher the return a coin shows before the pump, the more likely the coin is to be pumped;
- The positive coefficient of *pumpedtimes* implies that pumped coins are more likely to get pumped again.

C. Assessing Prediction Accuracy

Both the random forest model and GML are able to predict whether a given coin will be pumped as a likelihood ranging between 0 and 1. We apply thresholding to get a binary TRUE/FALSE answer.

Fig. 17 depicts the change in precision and the F_1 measure, as the threshold value changes. Fig. 17(a) describes models' in-sample fitting with the training sample and Fig. 17(b) their out-of-sample accuracy with the validation sample.

Precision represents the number of true positive divided by number of predicted positive, and the precision line ends when the denominator equals zero, i.e. when no TRUE prediction is produced. Fig. 17 shows that, among the three RF models, the threshold value at which the line ends is the lowest with RF1, and highest with RF3. This indicates that absent balanced bootstrapping, an RF model tends to systematically underestimate pump likelihood, leading to zero predicted TRUE cases even when the threshold value is small.

Similarly among the GLM models, GLM3 (with highest λ) seems to underestimate pump likelihood more severely than GLM2 and GLM1. Between the latter two, GLM2 exhibits higher Precision than GLM3.

In terms of F_1 measure, RF models in general appear superior to GLM models both with the training sample and
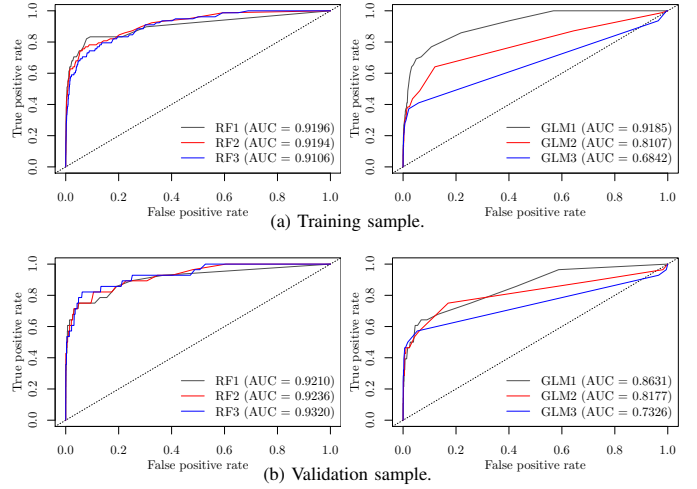
the validation sample. Among the three RF models, the RF1 performs best at a low threshold range (< 0.2), while RF3 performs best at a high threshold range (> 0.6). RF2 resides in between.

The RF models' superiority is further demonstrated by the ROC (Receiver operating characteristic) curve in Fig. 18. While GLM1's decent in-sample performance (AUC = 0.92) is comparable to RF models, its diminished out-of-sample performance (AUC = 0.86) indicates overfitting. This mirrors Fig. 17, where GLM1 is observed to fit the training sample relatively well, but poorly with the validation sample. Among the three RF models, no discernible difference can be found in terms of ROC AUC.

D. Testing an Investment Strategy

To explore the model's practical utility, we devise a simple investment strategy. At each pump, we check which coin's predicted pump likelihood surpasses a predetermined threshold, and we will purchase all those coins before the actual coin announcement (if no coin's vote exceeds the threshold, we will not pre-purchase any coin). Note that if we had the ability to short or use margin trading on the exchanges we use, potentially more options would open up for us.

Strategy: Specifically, for each coin that we pre-purchase, we buy the coin at the open price one hour before the coin announcement with the amount of BTC equivalent to k times the vote where k is a constant. That is to say, with all the coins we purchase, the investment, measured in BTC, on each coin is proportionate to its vote supplied by the random forest model. This is logical because a higher vote implies a higher likelihood of being pumped, and thus worth a higher investment.

We further assume that among all the coins we purchased, those coins that do not get pumped (false positive, "false alarms") will generate a return of zero, i.e. their price will remain at the same level as the purchase price; those coins that get pumped (true positive, "hits") will be sold at an elevated

Fig. 19: Investment return using different models at different threshold levels.

		Predicted		
		TRUE	FALSE	Total
Actual	TRUE	5	22	27
	FALSE	1	9,727	9,728
	Total	6	9,749	9,755

Fig. 20: Confusion matrix of RF2 with threshold value 0.6 applied to test sample.

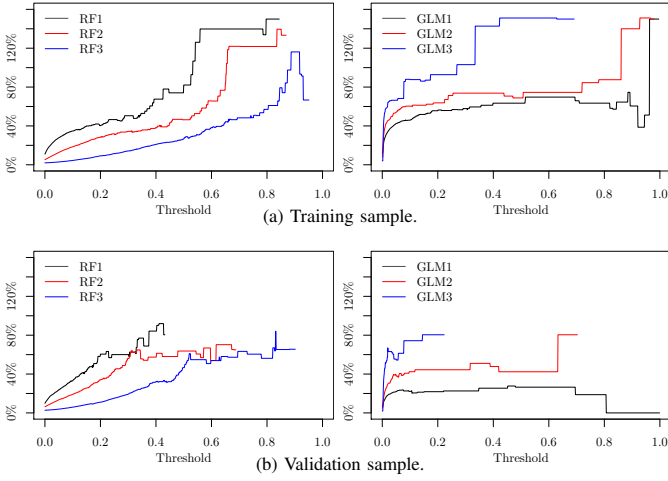| Coin	Date	Pumped?	Invest. weight wt	Pump gain pg	Assumed gain $ag = pg/2$	Assumed profit $ap = wt \cdot ag$
8BIT	Oct 31	TRUE	0.61	117%	58%	0.36
DRPU	Nov 1	TRUE	0.72	396%	198%	1.43
ERY	Nov 1	TRUE	0.72	57%	28%	0.20
EZT	Nov 6	TRUE	0.75	224%	112%	0.84
TAJ	Oct 30	TRUE	0.63	120%	60%	0.38
XWC	Nov 4	FALSE	0.61	-	-	-
Total			**4.04**			**3.21**

Fig. 21: Purchased coins based on pump likelihood predicted by RF2. Only coins with predicted pump likelihood of greater than 0.6 are purchased. Investment weight equals pump likelihood.

price during the pump. To be conservative, we assume that with each purchased coin that gets pumped we only obtain half of the pump gain, expressed as:

$$\text{pump gain} = \frac{\text{high price} - \text{open price}}{\text{open price}}$$

Returns: Fig. 19 presents the relationship between the aggregate return and the threshold choice. The figure shows that, in general, the *higher* the threshold, which means we buy coins with higher pump likelihoods and disregard others, the *higher* the return.

Note that the line shape for each model has a striking resemblance with the model's Precision line from Fig. 17. This is due to the fact that the strategy is prediction-based (so is the denominator of Precision) and rewards true positive scenarios (so is the numerator of Precision). This gives us guidance on the selection of performance measurements that should be aligned with the end goal. In our specific case, maximizing Precision is more important than maximizing the F_1 or AUC.

As already indicated by Fig. 17, every model has its own optimal threshold value and one should be mindful that if the threshold is set *too high* (e.g., greater than 0.9 with RF1, or greater than 0.8 with GLM3), then the investor might end up not buying any coins, and consequently gaining no profit. In terms of the magnitude of the profit, with the right combination of threshold and model, investors would theoretically enjoy a return of 140% with the training sample cases (covering 11 weeks), and a return of 100% with the validation sample cases (covering 3 weeks).

E. Final Test

Based on the training and validation results of specified models, we need to select one model and an accompanying threshold value to apply to the test sample. Our ultimate goal to maximize the trading profit using the selected model in combination with the proposed trading strategy (as opposed to e.g. maximizing F_1). Therefore, we base our decision primarily on Fig. 19.

As already established, all the specified models but GLM1 seem able to deliver high return with an appropriately chosen threshold value. For demonstration purposes, we arbitrarily choose RF2 as our final model. While Fig. 19(a) shows that with RF2, the return reaches its highest at the threshold of 0.8, Fig. 19(b) shows that with out-of-sample validation, the model further underestimates pump likelihood, and the optimal threshold would be around 0.7. While we understand the higher threshold is associated with higher return, to be conservative and to make sure that TRUE predictions will be produced, we choose a slightly lower threshold of 0.6.

Fig. 20 displays the confusion matrix of the model prediction with the test sample. The model suggests us to purchase 6 coins in total, among which 5 are actually pumped, and 1 not. Fig. 21 lists those 6 coins, their respective investment weight and assumed profit. The return on the investment amounts to 79.5% (3.21/4.04) over the test sample period of 3 week. The result is very similar to that with the validation sample as shown in Fig. 19(b), confirming the model's robustness.

F. Improvement Potential

Data: Upon availability, order book data, trade-by-trade data and traders' account information can also be included as features.

Modelling: Random forest with unsupervised anomaly detection has the potential to improve the model performance. In addition, other classification (e.g. k-NN) and regression (e.g. ridge) models are worth considering.

Trading strategy: Regarding investment weights, one may consider coin price increase potential (based on e.g. historical returns) in combination with coin pump likelihood. One must also determine an appropriate dollar amount for investment, and should beware that the trading strategy only applies to *small* investment, since big purchase orders prior to the pump

can move the market, such that pump organizers may cancel the pump or switch the coin last-minute.

VI. RELATED WORK

To the best of our knowledge, the only existing study with the same research subject — Telegram organized pump-and-dump activities — is a recent working paper by Li et al. [18], which, different from our study, focuses on the impact of pump-and-dump on the liquidity and price of cryptocurrencies.

Our paper is closely linked to the limits of literature on crypto trading. Gandal et al. [15] demonstrates that the unprecedented spike in the USD-BTC exchange rate in late 2013 is possibly caused by price manipulation. Makarov et al. [19] probe arbitrage opportunities in crypto markets. Aune et al. [2] highlights potential manipulation in the blockchain market resulting from the exposure of the footprint of a transaction after its broadcast and before its validation in a blockchain, and proposes a cryptographic approach for solving the information leakage problems in distributed ledgers.

Our paper is also akin to existing literature on cryptocurrencies' market movements. The majority of related literature still presses the focus on Bitcoin. Many scholars use GARCH models to fit the time series of Bitcoin price. Among them, Dyhrberg et al. [12] explore the financial asset capabilities of Bitcoin and suggests categorizing Bitcoin as something between gold and US Dollar on a spectrum from pure medium of exchange to pure store of value; Bouoiyour et al. [6] argues that Bitcoin is still immature and remains reactive to negative rather than positive news by the time of their writing; 2 years later, Conrad et al. [9] presents the opposite finding that negative press does not explain the volatility of Bitcoin; Dyhrberg [13] demonstrate that bitcoin can be used to hedge against stocks; Katsiampa [17] emphasize on modelling accuracy and recommend the AR-CGARCH model for price retro-fitting. Bariviera et al. [3] compute the Hurst exponent by means of the Detrended Fluctuation Analysis method and conclude that the market liquidity does not affect the level of long-range dependence. Corbet et al. [10] demonstrates that Bitcoin shows characteristics of an speculative asset rather than a currency also with the presence of futures trading in Bitcoin.

Among the few research studies that also look into the financial characteristics of other cryptocurrencies, Fry et al. [14] examine bubbles in the Ripple and Bicoin markets; Baur et al. [5] investigates asymmetric volatility effects of large cryptocurrencies and discover that in the crypto market positive shocks increase the volatility more than negative ones. Jahani et al. [16] assess whether and when the discussions of cryptocurrencies are truth-seeking or hype-based, and discover a negative correlation between the quality of discussion and price volatility of the coin.

VII. CONCLUSIONS

This paper presents the first detailed study of pump-and-dump schemes in cryptocurrency markets. We start by presenting the anatomy of a typical attack and then investigate a variety of aspects of real attacks on crypto-coins over a period of July 21, 2018 — November 18, 2018 on four crypo-exchanges. The study demonstrates the persisting nature of pump-and-dump activities in the crypto-market that are the driving force of tens of millions of dollars of phony trading volumes each month. The study reveals that pump-and-dump organizers can easily use their insider information to take extra gain at a pump-and-dump event at the sacrifice of fellow pumpers.

Through market investigation, we further discover market movements prior to a pump-and-dump events that frequently contains information on witch coin will be pumped. Using LASSO regularized GML and balanced random forests, we build various models that are predicated on the time and venue (exchange) of a pump-and-dump broadcast in a Telegram group. Multiple models display high performance (AUC > 0.9 for both the training and the testing samples), implying that pumped coins can be predicted based on market information.

We further propose a simple but powerful trading strategy that can be used in combination with the predicting models. Out-of-sample tests show that a return of as high as 80% over three weeks can be consistently exploited even under conservative assumptions. The study thus sheds light on the application of machine learning for crypto-trading.

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	Group name	Link to the group	Last message sent
1	SAFE BUNKER SIGNAL	https://t.me/FFK556FGUO15A4KX	2018-11-21 11:06:41
2	Palm Venice Beach	https://t.me/palmvenicebeach	2018-11-21 10:56:40
3	Trading Crypto Guide	https://t.me/TCGFORYOU	2018-11-21 10:36:24
4	SUB 4 SUB .	https://t.me/tccpublic	2018-11-21 10:21:42
5	TRADING CRYPTO KING	https://t.me/TRADINGKINGS	2018-11-21 10:18:58
6	Signal Express	https://t.me/signalexpresss	2018-11-21 10:05:40
7	Signal Expert	https://t.me/signalexpert	2018-11-21 09:25:59
8	Trading Crypto Coach	https://t.me/tradingcryptocoach	2018-11-21 08:58:42
9	Moonbow Signal	https://t.me/moonbowsignal	2018-11-21 07:24:43
10	Moon Team	https://t.me/moon_team	2018-11-21 07:24:42
11	Moonlight Signal	https://t.me/moonlightsignal	2018-11-21 07:24:42
12	OFFICIAL SIGNAL EXPERT	https://t.me/officialpumpexperts	2018-11-21 05:50:24
13	Premium Pump	https://t.me/premium_pump	2018-11-21 05:41:46
14	Pump Up	https://t.me/PumpUpProfit	2018-11-21 05:41:44
15	World Pumps	https://t.me/worledpump12	2018-11-21 05:41:39
16	Shark Pump Signals	https://t.me/Sharkpumpsignals	2018-11-21 05:41:28
17	Wall Street PUMPS	https://t.me/wallstreet_cryptotraders	2018-11-21 05:41:27
18	Optimus Pump	https://t.me/optimus_pump	2018-11-21 05:41:26
19	Yo Crypto Signals	https://t.me/Yocryptosignals	2018-11-21 04:10:17
20	Meg Blue Whale	https://t.me/MegBlueWhale	2018-11-21 01:27:18
21	Trading Crypto Assistant	https://t.me/TradingCryptoAssistant	2018-11-21 00:17:49
22	Whales Crypto Guide	https://t.me/Whalesguide	2018-11-20 23:48:14
23	Vip Trading Crypto	https://t.me/VipCryptoZ	2018-11-20 22:00:05
24	Official McAfee Pump Signals	https://t.me/officialmcafeepumpsignals	2018-11-20 20:57:49
25	Trades For Crypto Community	https://t.me/TradesForCryptoCommunity	2018-11-20 20:42:34
26	Crypto Coins	https://t.me/CryptoCoinCoach	2018-11-20 20:33:14
27	Crypto Experts Signal	https://t.me/cryptosignals_group	2018-11-20 19:52:52
28	Coopet	https://t.me/Coopet	2018-11-20 19:48:54
29	Bomba bitcoin "cryptopia"	https://t.me/bombabitcoin1	2018-11-20 19:48:04
30	Captain's signal - Bittrex	https://t.me/captainsignal	2018-11-20 19:04:39
31	Crypto Trade	https://t.me/tr4ding	2018-11-20 18:44:23
32	VICTOR'S - PUMP SIGNALS FOR THE CLASSES	https://t.me/victorspumpsignals	2018-11-20 18:19:01
33	Team Pumps	https://t.me/team_pumps	2018-11-20 18:06:00
34	Bittrex Super Signals	https://t.me/bittrexsignal1	2018-11-20 18:03:53
35	Cryptonians (Free Signals and News Update)	https://t.me/cryptofreesignal	2018-11-20 17:48:46
36	Binance Profit Signal	https://t.me/BinanceProfitSignal	2018-11-20 17:07:13
37	BigPumpGroup.com	https://t.me/bigpumpgroup_com	2018-11-20 17:07:13
38	Knh cp nht chin lc giao dch alt coin	https://t.me/kenhchienluoc	2018-11-20 17:04:28
39	WhalesCRYPTOOFFICIAL	https://t.me/whalesspump	2018-11-20 17:04:25
40	TOP TRADING	https://t.me/expertoptradinggroup	2018-11-20 16:42:11
41	Mega Pumps	https://t.me/mega1551	2018-11-20 16:34:19
42	Private Group For Pump	https://t.me/PrivateGroupforpump	2018-11-20 16:34:03
43	Crypto God	https://t.me/god_crypto	2018-11-20 16:34:03
44	Crypto Profits	https://t.me/cprofits	2018-11-20 16:34:03
45	Crypto Pump Island	https://t.me/crypto_pump_island	2018-11-20 16:23:50
46	Super Pump Bros	https://t.me/SuperPumpBros	2018-11-20 16:20:00
47	Bitcoin Pump group	https://t.me/bitcoinpumpgroup	2018-11-20 16:18:45
48	LEAK Signal	https://t.me/LeakSignal	2018-11-20 15:49:22
49	PumpMyWallet	https://t.me/PumpMyWallet	2018-11-20 15:34:20
50	Crypto pumpers	https://t.me/cryptorocker1	2018-11-20 15:34:09
51	CRYPTO DIAMOND SIGNALS	https://t.me/diamondsignals	2018-11-20 15:25:45
52	VSSN TOKEN	https://t.me/Pump_Yobit_Chat	2018-11-20 15:04:02
53	Is Pump	https://t.me/is_pump	2018-11-20 13:01:00
54	A+ Signals	https://t.me/APlusSignal	2018-11-20 11:34:48
55	WhalePump Reborn : Best signals ! (FREE)	https://t.me/WhalePump	2018-11-20 10:47:40
56	Crypto Green	https://t.me/CryptoGreenSignal	2018-11-20 09:27:07
57	Crypto Lion's	https://t.me/crypto_lions	2018-11-20 09:04:55
58	PumpinTime	https://t.me/pumpintime4you	2018-11-20 08:03:40
59	Bitcoin Pump VIP	https://t.me/BitcoinPD	2018-11-20 08:03:37
60	BIG PUMP SIGNAL	https://t.me/professorbtc	2018-11-20 08:03:36
61	Big signal	https://t.me/togetherwepump1	2018-11-20 08:03:34
62	Crypto Coinsultants	https://t.me/cryptocoinsultants07	2018-11-20 08:03:23
63	MoneyPumps	https://t.me/MONEY_GROUP	2018-11-20 08:03:21
64	Hot Signals Binance Bittrex	https://t.me/kikapump	2018-11-20 08:03:06
65	Big Pump channel	https://t.me/cryptopumpdzd	2018-11-20 08:03:05
66	SIG_NALS Fenix	https://t.me/be_crypto	2018-11-20 07:54:12
67	MEGA PUMP	https://t.me/yobitbtc	2018-11-20 07:54:11
68	Pump Club - Yobit	https://t.me/pump_club	2018-11-20 07:54:09
69	CryptoPump Empire	https://t.me/pumpempire	2018-11-20 07:54:08
70	Alarm! YOBA	https://t.me/AlarmPrivat	2018-11-20 07:54:07
71	Cryptopia Signal	https://t.me/cryptopiaPumpp	2018-11-20 07:30:50
72	CryptoCoinRankings Private Signals	https://t.me/Cryptocoinrankings	2018-11-20 07:00:44
73	STRONG SIGNALS	https://t.me/STRONGSIGNALS	2018-11-20 05:09:10
74	Bigpump24	https://t.me/bigpump24	2018-11-20 04:10:43
75	Crypto Insiders	https://t.me/BitcoinInsiders	2018-11-20 02:42:50
76	Crypto Elite Signals	https://t.me/ielitesignals	2018-11-20 02:42:50
77	Crypto Signals — Smart Investments	https://t.me/cryptosmartsignals	2018-11-20 02:42:50
78	PUMPandCASH .com — Crypto coin pumps ALERTS	https://t.me/pumpandcashcom	2018-11-20 01:10:51
79	Top Pump	https://t.me/TopPumpTop	2018-11-19 21:49:10
80	Crypto Single	https://t.me/cct55	2018-11-19 19:58:11
81	Fast Trading Signal	https://t.me/CGS_oc	2018-11-19 17:21:12

82	SPARTA PUMP TEAM	https://t.me/spartapumpers	2018-11-19 17:14:19
83	Creative Signals	https://t.me/CreativeSignals	2018-11-19 14:45:23
84	DAFT PUMP	https://t.me/daft_pump	2018-11-19 14:42:25
85	MasonPump	https://t.me/masonpump	2018-11-19 13:09:55
86	Exposure Pumps	https://t.me/exposurepumps	2018-11-19 11:59:50
87	Moon Crypto Team	https://t.me/dailypmp	2018-11-19 11:16:27
88	Crypto Rocket	https://t.me/cryptorocketr	2018-11-19 07:45:45
89	Crypto Signals & Pumps	https://t.me/cryptosignalsvipr	2018-11-19 07:45:41
90	Z (Zsignal)	https://t.me/sungtuz	2018-11-19 05:03:07
91	CAMP(Crypto Analysis & Market Perdictions)	https://t.me/ExeCrypto	2018-11-19 02:18:49
92	Crypto Yoda Signals	https://t.me/thecryptoyoda	2018-11-18 23:54:35
93	Hit Pump Signals & Strategies	https://t.me/hitpumpsandsignals	2018-11-18 23:53:26
94	Donald Pump	https://t.me/DonaldPumpCrypto	2018-11-18 23:19:59
95	Signal Plug	https://t.me/Signal_Plug	2018-11-18 23:02:18
96	Fast Crypto Signals.	https://t.me/fastcrypt	2018-11-18 19:37:26
97	True Crypto Guru.	https://t.me/true_signals	2018-11-18 17:56:53
98	Crypto Experts Signal	https://t.me/crypto_expert_signals	2018-11-18 15:43:25
99	Super Pumps & Signal Kings	https://t.me/superpumpssignalkings	2018-11-18 14:41:50
100	The pumping army	https://t.me/armypumppl	2018-11-17 23:49:32
101	Trading signals for crypto	https://t.me/Crypto4Pumps	2018-11-17 21:54:15
102	European Pumps	https://t.me/EuropeanPumps	2018-11-17 20:43:43
103	*Partners Of Cryptos*	https://t.me/betterpumps	2018-11-17 18:16:56
104	CoinExchange Whale	https://t.me/CEwhale	2018-11-17 07:39:47
105	Binance Pump Whales	https://t.me/Binance_Pump_Whales	2018-11-17 04:36:52
106	Pump'N'Pump - 2018	https://t.me/pumpn	2018-11-16 19:55:29
107	Caesar's Scalpers	https://t.me/Caecars_Scalpers	2018-11-16 18:47:05
108	Daily Crypto Profits	https://t.me/daily_crypto_profits	2018-11-16 18:34:36
109	YoBit Pump Team	https://t.me/yobitpumpteam2018	2018-11-16 16:53:11
110	Extreme_Pumps_CE	https://t.me/cryptocoinnow	2018-11-15 20:34:47
111	Pump Signal	https://t.me/Pumpingsignall	2018-11-15 19:55:27
112	Super Signals	https://t.me/pumpsxxx	2018-11-15 19:48:01
113	Inner Signals Circle - BITTREX / UPBIT	https://t.me/innersignalscircle	2018-11-15 18:54:31
114	Crypto Pump	https://t.me/cryptopump10q	2018-11-15 18:01:29
115	Biggest n Crypto ICO pools	https://t.me/Crypto_pump_team	2018-11-15 06:25:18
116	Anonymous Signals (Bittrex / Upbit)	https://t.me/AnonymousSignals	2018-11-15 02:59:33
117	Vote Pump	https://t.me/votepumps	2018-11-14 21:02:42
118	Rocket BINANCE Pump	https://t.me/rocketpumptrader	2018-11-14 21:02:32
119	Whale Crypto Signals	https://t.me/whale_signals	2018-11-14 19:43:14
120	OSNOVA PUMP	https://t.me/OsnovaFM	2018-11-14 18:08:58
121	Seales crypto	https://t.me/crypjer	2018-11-14 17:56:01
122	Tornado Signals	https://t.me/tornadosignals	2018-11-13 19:10:53
123	Crypto Advisor	https://t.me/cryptoadvisorchannel	2018-11-13 13:07:34
124	Ultra Profit Signal	https://t.me/UltraPumpsignal1	2018-11-13 12:48:50
125	Crypto experts signal testimonials	https://t.me/crypto_experts_testimonials	2018-11-13 09:24:42
126	Smart Crypto Trading	https://t.me/smartcryptotradingvip	2018-11-13 02:42:21
127	Crypto Warrior - Free Binance & Bittrex Signals	https://t.me/vipcryptowarriors	2018-11-13 02:42:21
128	PumpKings	https://t.me/PumpKings	2018-11-12 04:03:14
129	Coinexchange_Pump	https://t.me/coinexchange_pumping	2018-11-11 16:30:29
130	CryptoMoon Pumps	https://t.me/CryptoMoonPumpGroup	2018-11-11 01:47:54
131	Crypto Family Pumps	https://t.me/CryptoFamilyPumps	2018-11-10 10:32:03
132	MONEYMAKER	https://t.me/dark_business1	2018-11-10 06:02:26
133	COINEXCHANGE Pumping Group	https://t.me/CoinexchangeOfficialPumpingGroup	2018-11-09 22:31:51
134	CryptoPump	https://t.me/CryptoPumpPublic	2018-11-09 19:55:10
135	PumpIt To The Moon	https://t.me/pumpittothemoon1	2018-11-09 17:06:21
136	Pump Masters	https://t.me/PumpMasterss	2018-11-09 17:06:20
137	MassivePump	https://t.me/massivepump1	2018-11-09 17:06:17
138	Crypto Pumpers	https://t.me/cryptotradingppl	2018-11-09 17:06:15
139	BTTM	https://t.me/BTTM1	2018-11-09 17:06:12
140	CRYPTO BILLIONAIRE	https://t.me/Highestpump	2018-11-09 09:33:55
141	The Crypto Analyst	https://t.me/TheCryptoAnalysts	2018-11-08 21:22:14
142	Official Moonwalker Signals	https://t.me/moonsignalss	2018-11-06 11:47:47
143	Supreme Pumps	https://t.me/supreme_pumps	2018-11-05 19:32:46
144	Cryptopia Pump Squad	https://t.me/cryptoflashsignals	2018-11-05 00:41:59
145	Crypto Bulls Pump	https://t.me/cryptobullspump	2018-11-03 19:06:22
146	Crypto Toros	https://t.me/cryptotoros	2018-11-03 19:06:22
147	Crypto Pump	https://t.me/cryptosniper4	2018-11-03 19:06:21
148	Crypto Bulls Pump	https://t.me/cryptobullspumpvip	2018-11-03 19:05:56
149	BULL PUMP	https://t.me/BULLPUMP	2018-11-03 01:57:26
150	HITBTC PUMP	https://t.me/hitbtcpumps	2018-11-01 22:37:24
151	Big Pump Signals	https://t.me/Big_Pumps_Signals	2018-11-01 17:41:04
152	TO THE MOON	https://t.me/up_moon	2018-10-31 05:48:24
153	Crypto Pump	https://t.me/pumporiginal	2018-10-29 19:37:35
154	Crypto pump up channel	https://t.me/crypto_pump_up	2018-10-29 07:28:01
155	Big Pump Signal	https://t.me/bigpumpsignal	2018-10-27 00:40:22
156	Moon Crypto Pump Signals & Strategies	https://t.me/moonpumpteam	2018-10-26 20:12:51
157	Robin HOOD	https://t.me/robingoodsignal	2018-10-26 17:51:03
158	Mega Pump Group	https://t.me/mega_pump_group	2018-10-26 15:33:59
159	Crypto Trading (Free Signals)	https://t.me/CryptoTradingSignals01	2018-10-26 14:10:25
160	Crypto trading.	https://t.me/bestpumpss	2018-10-26 12:19:15
161	Ministry of Coins	https://t.me/theministryofcoins	2018-10-26 12:19:11
162	My Bitmex Paradise	https://t.me/Bitmexparadise	2018-10-26 10:18:23
163	Dynamic Signals	https://t.me/thedynamicsignals	2018-10-26 04:46:11
164	John McAfee Yobit Pump	https://t.me/cryptojohnmcafee	2018-10-24 23:55:10
165	Korean Super Pumps	https://t.me/superkoreanpumps	2018-10-24 20:11:15
166	Crypto Trading	https://t.me/pumpevrey	2018-10-24 19:00:21
167	NY Crypto Adviser	https://t.me/advisor9	2018-10-24 11:36:15

168	Smart Investor	https://t.me/smartinvestor555	2018-10-24 11:36:15
169	PUMP OFFICIAL CRYPTO	https://t.me/LuxuriousCrypto	2018-10-24 00:39:12
170	Pump family	https://t.me/pumpanddump247	2018-10-23 20:14:08
171	Omega Calls	https://t.me/omegacalls	2018-10-23 16:00:32
172	Tele Pumps	https://t.me/TelePumps	2018-10-20 18:08:10
173	PowerPumP	https://t.me/PowerofPumP	2018-10-20 13:59:44
174	YoBit Pumps	https://t.me/TheBestPumps	2018-10-19 08:50:28
175	Super pumps	https://t.me/superpumps21	2018-10-18 19:32:39
176	Yobit Pumping Crazy Community	https://t.me/cryptosignalcrazy	2018-10-18 19:13:45
177	Smarty Signals	https://t.me/smartysignals	2018-10-18 10:58:50
178	Money Machanics	https://t.me/DidPumps	2018-10-17 14:26:50
179	Whales Forex signals	https://t.me/whale_forex_signals	2018-10-15 22:24:43
180	WORLD CRYPTO COMMUNITY	https://t.me/CryptoWordT	2018-10-14 13:48:58
181	VIPSIGNAL Strategy	https://t.me/pump_signal_strategy	2018-10-14 13:48:54
182	HawkEye Bittrex Signals	https://t.me/he_signals	2018-10-14 13:48:51
183	Best pump group	https://t.me/pumpalone	2018-10-11 16:54:40
184	Yobit-2ch-Pumper	https://t.me/yobit2ch	2018-10-11 16:48:49
185	Genuine_Callz	https://t.me/Genuine_Callz	2018-10-09 22:33:14
186	DUTCH CRYPTO PUMPS!	https://t.me/nederlandsecryptopumps	2018-10-09 21:54:08
187	Pump Coin Today	https://t.me/pumpcointoday	2018-10-09 21:54:08
188	Ultra Pump Channel	https://t.me/Ultra_pump	2018-10-09 13:44:32
189	Binance Daily Signals!	https://t.me/BinanceDailySignals	2018-10-09 11:25:12
190	Goat Pumps	https://t.me/goatpumps	2018-10-08 23:53:33
191	BULLS PUMP	https://t.me/BullBulletin	2018-10-08 20:50:06
192	Great Big Pumps	https://t.me/pumppump	2018-10-07 15:07:48
193	YoBit-Pump-Community	https://t.me/yobit_pump_community	2018-10-07 00:52:20
194	EAGLE PUMPS	https://t.me/XCryptoPumpsX	2018-10-06 03:43:55
195	Yobit and Cyptopia pump group	https://t.me/yobitcryptopiapumpandump	2018-10-06 03:43:54
196	USS CALLISTER - PUMPS	https://t.me/usscallisterss	2018-10-06 03:43:53
197	YoPumps	https://t.me/Yopumps	2018-10-06 03:43:53
198	The Pump Room	https://t.me/ThePumpRoom	2018-10-06 03:43:52
199	crypto pump	https://t.me/cryptopump1108	2018-10-06 03:43:10
200	Crypto God's	https://t.me/cryptopumprr	2018-10-06 03:43:09
201	F14sH_Pumps	https://t.me/F14sHPumps	2018-10-06 03:42:58
202	Binance Pump Signal	https://t.me/BinancePump_Signal	2018-10-05 22:53:34
203	ToTheMoonPumps	https://t.me/TTMpumps	2018-10-05 18:07:41
204	BWP(baby whale pump)	https://t.me/babywhalepump	2018-10-02 19:00:40
205	Elite Crypto Group	https://t.me/elitecryptogroup	2018-10-02 00:13:59
206	Franklin Pump.	https://t.me/FranklinPump	2018-09-30 18:22:46
207	PUMPS MASTER ESP	https://t.me/pumps5	2018-09-30 02:41:15
208	Legendary Pumps	https://t.me/LegendaryPumps	2018-09-29 18:27:03
209	Pump Signals	https://t.me/Cryptopumps55	2018-09-28 19:09:08
210	Crypto signal channel	https://t.me/cpcryptosignals	2018-09-28 18:51:49
211	YOBIT Bitcoin Pumps	https://t.me/eth671	2018-09-25 15:05:00
212	Profitable Crypto Signals	https://t.me/procryptosignal	2018-09-25 13:03:52
213	COINLANCER PUMPER	https://t.me/coinlancer_pumper	2018-09-25 11:42:05
214	All Link new bot	https://t.me/ethvendingmachine_bot	2018-09-24 16:05:01
215	WePUMP	https://t.me/wepumprus	2018-09-23 23:28:18
216	Crypto Pump	https://t.me/cryptopumprf	2018-09-22 01:26:14
217	ELITE PUMP GLOBAL CHANNEL	https://t.me/ELITE_PUMP	2018-09-21 18:42:49
218	Crypto blasters	https://t.me/crypto_blaster	2018-09-21 10:30:27
219	World Pump Association	https://t.me/WorldPump_Association	2018-09-18 20:30:02
220	Kings Of Pump VIP	https://t.me/vipkingspump	2018-09-17 22:32:43
221	TOP PUMP VIP	https://t.me/top_pump_vip	2018-09-17 19:18:23
222	GAINS Private Group (G.P.P.G)	https://t.me/GPPGpumpVIPgroup	2018-09-15 15:40:35
223	SkyMoon Crypto Signals	https://t.me/SkyMoonPumpSignal	2018-09-15 12:08:59
224	PumpNationz	https://t.me/pumpnationz	2018-09-13 20:17:00
225	The Alt Pump	https://t.me/TheAltPump	2018-09-10 17:03:57
226	Trust PUMP	https://t.me/dpump	2018-09-10 11:41:01
227	Bitmex Pro Signals	https://t.me/pumpally	2018-09-08 21:21:39
228	Altcoins Booster	https://t.me/altcoinsbooster	2018-09-06 11:59:03
229	Altcoins Booster Community	https://t.me/altcoinsboostercommunity	2018-09-06 11:58:31
230	Big Crypto Pump	https://t.me/BigCryptoPump	2018-09-02 04:35:43
231	Superb Pumps	https://t.me/superbpumps	2018-09-01 18:48:04
232	Trading Crypto Coach Backup	https://t.me/tradingscryptocoachbackup	2018-09-01 10:32:19
233	20X Pump Actions	https://t.me/pumpingcoinscrypto	2018-08-30 07:28:53
234	McAfee Alt Signals	https://t.me/officialmcafeesignals	2018-08-26 05:24:19
235	MoonShot Pump	https://t.me/ms_pump	2018-08-24 11:18:12
236	Central Pumps	https://t.me/CentralPumps	2018-08-23 13:00:20
237	Fairwin Crypto News/Pump Signals	https://t.me/cryptopumping2	2018-08-20 18:23:43
238	Pump Latam	https://t.me/Pump_Latam	2018-08-18 04:33:10
239	Crypto of the Day	https://t.me/cryptooftheday	2018-08-16 21:36:35
240	Swiss Signals	https://t.me/swisssignals	2018-08-11 22:08:18
241	Cryptology	https://t.me/cryptotalk36	2018-08-10 16:57:47
242	Cryptonary VIP	https://t.me/cryptonarycoursee	2018-08-09 06:09:30
243	Call Of Pumps	https://t.me/CallOfPumps	2018-08-08 22:48:13
244	Arabic Big Pump	https://t.me/ArabicBigPump	2018-08-08 14:07:02
245	Pumper_chat	https://t.me/pumper_chat	2018-07-29 08:18:28
246	PUMP MASTERS	https://t.me/cryptopumpmasterss	2018-07-24 17:37:57
247	V-LA SGNALS	https://t.me/vlasignal	2018-07-17 23:14:24
248	Crypto_mania	https://t.me/goodpumpgo	2018-07-17 13:23:52
249	Crypto Watch	https://t.me/cryptosignal12	2018-07-17 04:08:21
250	Icenter LTC bot	https://t.me/pumpingcrypt	2018-07-14 23:28:08
251	Pump BTC	https://t.me/Pump_BTC	2018-07-14 14:03:25
252	Bulls Eye Signals	https://t.me/leakedsignalsbitcoin	2018-07-12 14:17:26
253	CryptoWorld	https://t.me/cryptaworId	2018-07-09 12:44:42

254	Majestic Pumps	https://t.me/gravitypumps	2018-07-05 19:00:20
255	Mega Pump Group	https://t.me/PumpTokenORG	2018-06-28 19:17:29
256	Phoenix Cryptopia Team	https://t.me/phoenixcryptopia	2018-06-27 20:35:34
257	Neon Pumps	https://t.me/neon_pumps	2018-06-27 12:08:44
258	Big Pump Signals	https://t.me/pumpccsignals	2018-06-25 11:42:30
259	Yobit international	https://t.me/international_yobit	2018-06-23 18:22:32
260	Mighty Whales	https://t.me/mightywhales	2018-06-21 16:00:11
261	Spartan pump group	https://t.me/spartapumpgroup	2018-06-21 15:07:21
262	ALL PUMPS	https://t.me/allpumps	2018-06-21 06:51:34
263	PUMP 2 Group	https://t.me/pump_x2	2018-06-18 13:00:23
264	Crypto Pump	https://t.me/big_pump_group	2018-06-17 21:24:37
265	Monster Signalz	https://t.me/Mpumpz	2018-06-15 19:59:59
266	Binance and Cryptopia Pumps	https://t.me/BinanceAndCryptopiaPump	2018-06-14 17:59:59
267	MidEarthCrypto Community	https://t.me/Midearthcryptogroup	2018-06-12 14:08:57
268	Phoenix Pump Team	https://t.me/bncpump	2018-06-08 20:44:56
269	Whales & BTC	https://t.me/CoinPumps2018	2018-06-05 20:17:48
270	Pump signal	https://t.me/pumpsignal1	2018-06-05 19:27:08
271	PIRATES PUMPS	https://t.me/PIRATEStheLEGION	2018-06-03 18:04:46
272	Coin To The Moon	https://t.me/pumptothemoontop	2018-05-31 09:58:35
273	PumpKings	https://t.me/pumpkings05	2018-05-28 18:02:58
274	Crypto Future Signs	https://t.me/cryptofuturesign	2018-05-28 10:25:49
275	ITpump	https://t.me/ITpump	2018-05-26 15:41:32
276	PumpingHard	https://t.me/PumpinHard	2018-05-25 22:26:34
277	Dragon Signals	https://t.me/xtreme_pumps	2018-05-23 17:57:56
278	Dragon Pumps & Signals	https://t.me/dragon_pumps_signals	2018-05-23 17:57:50
279	Explosive Pumps	https://t.me/ExplosivePumps	2018-05-22 18:37:20
280	PumpYobit24	https://t.me/pumpyobit24	2018-05-21 14:04:09
281	Unicorn Magic Signals	https://t.me/pumpactions	2018-05-20 23:04:19
282	Cryptopia Family Pumps	https://t.me/CryptopiaFamilyPumps	2018-05-20 18:00:14
283	Invest in Brokers Info	https://t.me/InvestInBrokersOfficial	2018-05-17 09:54:54
284	Wealthy Whale Pumps	https://t.me/WealthyWhalePumps	2018-05-15 22:12:42
285	Moon Pump	https://t.me/moon_pumps	2018-05-14 08:45:57
286	100x Cryptocurrency Signals	https://t.me/animepumps	2018-05-14 08:44:13
287	Easy Money	https://t.me/easy_money_pro	2018-05-13 10:48:44
288	YObit Pump Network	https://t.me/yobitpumpnetwork	2018-05-11 10:16:45
289	Y0 PumBit	https://t.me/yopumbit	2018-05-11 09:26:03
290	Crypto Signals Official	https://t.me/cryptosignalzofficial	2018-05-11 09:25:32
291	Smashing PumpKings	https://t.me/smashingpumpkings	2018-05-11 00:08:23
292	USA PUMP	https://t.me/usa_pump	2018-05-07 14:27:09
293	PumpWhales	https://t.me/PumpWhales	2018-05-06 18:58:53
294	Binance And Cryptopia Pumps espaol English	https://t.me/pumpbinan	2018-05-06 18:58:52
295	2 PUMPS EVERY DAY	https://t.me/wepumps	2018-05-06 18:58:51
296	WEB Pump YoBit	https://t.me/webpump_yobit	2018-05-06 12:47:21
297	Crypto Pump Signals	https://t.me/CryptoPumpTroop	2018-05-05 18:39:23
298	MPERIAL PUMP	https://t.me/imperial_pump	2018-05-04 18:30:18
299	Golden Ticket Pumps	https://t.me/goldenticketpumps	2018-05-03 17:05:42
300	Insane pumps	https://t.me/INSANEPUMPS	2018-05-01 12:39:38
301	Cryptoverse	https://t.me/Cryptoverses	2018-05-01 00:17:54
302	Pump Coin Signal	https://t.me/pumpcoinsignal	2018-04-30 20:53:45
303	0x	https://t.me/pumps_Ox	2018-04-27 11:17:34
304	CryptoHunter	https://t.me/hunter_up	2018-04-26 07:00:34
305	YoPump	https://t.me/yo_pump	2018-04-26 00:11:51
306	Crypto Pumps	https://t.me/c_pump	2018-04-26 00:11:50
307	Altcoin Pumps	https://t.me/altcoin_pump	2018-04-26 00:11:49
308	YoBit/Bittrex Pumps	https://t.me/ybpumps	2018-04-26 00:11:48
309	Good Pump Channel.	https://t.me/Pumpchannel2018	2018-04-23 17:54:42
310	Private Pump Signals	https://t.me/Honestpnd	2018-04-21 05:06:46
311	Pablo Pumps	https://t.me/pablopumps	2018-04-21 01:22:05
312	Eternal Crypto Pumps	https://t.me/eternalpumps	2018-04-19 14:27:32
313	GosPump	https://t.me/gospump	2018-04-18 21:20:11
314	Pump Channel	https://t.me/channelpump	2018-04-18 04:22:03
315	PUMPED!	https://t.me/MakeLamboGreatAgain	2018-04-18 00:13:30
316	McAfee group	https://t.me/theofficialmcafeegroup	2018-04-17 13:06:49
317	X5-PUMPING	https://t.me/X5_PUMPING	2018-04-17 08:52:14
318	Great pump 2018	https://t.me/greatpump2018	2018-04-13 17:04:06
319	YObit pump	https://t.me/yobit_pump_rus	2018-04-13 10:56:56
320	GALAXY PUMP	https://t.me/g_pump	2018-04-13 10:50:05
321	Robin Hood's Pump	https://t.me/robin_hood_pump	2018-04-10 21:07:08
322	Pump King	https://t.me/thepumpking2017	2018-04-10 13:00:25
323	Mooners.org - Announcements	https://t.me/pumpandholdcoin	2018-04-09 19:54:31
324	Cryptopia Pump	https://t.me/cryptopiapumppp	2018-04-08 20:00:03
325	Largest Pump Community	https://t.me/LargestPumpCommunity	2018-04-08 11:12:42
326	The Pumpers	https://t.me/thepumperz	2018-04-07 15:08:57
327	Sunrise Trend	https://t.me/SunriseTrend	2018-04-07 14:59:49
328	VIVUCoin Channel: Crypto Insight	https://t.me/VIVUCoin	2018-02-15 17:57:13
329	Crypto Mega Pumps Yobit	https://t.me/CryptoMegaPumps	2017-10-17 13:31:32

TABLE I: Pump-and-Dump channels on Telegram. Messages retrieved through Telegram API on November 21, 2018.