Challenges and Insights for US Initial Coin Offerings Landscape

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Abstract

Initial Coin Offerings (ICOs), based on blockchain technology, has been used for crowdfunding ventures since 2015. Blockchain technology promises to address many challenges faced by the financial sector, however, in the past few years, many fraudulent undertakings in this space have raised concerns and diminished the enthusiasm for blockchain-based crowdfunding activity. Using a hand-collected dataset from several

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different sources, we study a range of characteristics of 943 US-based ICO tokens, for the period of 2015 to April 2020. These bouts of enthusiasm in this space point to the fact that a systematic review and a rigorous assessment of each ICO project remains a challenge, both for investors and regulators.

Our detailed assessment of more than 900 US-based ICOs indicates that successful tokens are associated with higher expert ratings as well as higher number of social media followers. Know-Your-Customer (KYC) and whitelist due diligence procedures lend an ICO a higher expert-rating and a greater social media attention. On the other hand, an ICO's utilization of an incentive program, such as offering bonuses and bounties, yields a higher expert-rating, but doesn't positively influence social media following. Many more ICO teams provide incentives to investors than those that demand investor KYC disclosures, whereas tokens lacking KYC mandates tend to more often be fraudulent compared to fraudulent tokens that did not offer incentives. After the 2018 crypto-slump, ICO teams increased lock-up features of ICOs to signal a long-term commitment to their project.

Keywords: Initial Coin Offerings, FinTech, Financial Regulation, Blockchain, and Data Analysis

JEL Codes: G32, G23, L26.

1 Introduction

Initial Coin Offerings (ICOs) remain mostly unregulated crowdfunding ventures launched on a blockchain platform, although oversight, guidance and even need for registration re-

quirement by the regulators continues to grow[1]. In exchange for capital, participants in an ICO are rewarded with tokens, either to derive a utility or acquire a security representing ownership of the offering. In either case, the token carries some intrinsic value. Once issued, a token can be used in the future to exchange it for a product or be sold for its intrinsic value in exchange for a fiat currency.

ICOs are decentralized, scalable and operate using cryptographic hashing functions for verification of ownership and transfer, thus offering an attractive and efficient alternative to financing facilitated by large and costly financial intermediaries. ICO activity peaked in 2017, and remains vulnerable to bouts of enthusiasm due to the fact that a systematic review and a rigorous assessment of each ICO project remains a challenge, both for investors and regulators.

In this paper, we develop a comprehensive descriptive analysis of 943 token-offerings launched in the United States since the inception of the first coin launched in 2015 through April 2022 using a hand-collected dataset constructed using various different sources. Absence of systematically collected, comprehensive data on ICOs is the first major hurdle in their rigorous assessment. Our meticulously collected data and analysis furnishes insights regarding ICO success, fundraising achieved by the tokens, role of ratings in guiding investors, the most popular lines of business supported by the ICO issue, degree of stringency in investor disclosure, and the levels of incentives provided to investors to entice them.

The cryptocurrency domain was expected to "explode" for reasons that, (i) it was expected to "democratize" capital raising for early-stage entrepreneurs [26] [1], (ii) it is decentralized with the advantage of not being controlled by any government or large organization,

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[1]https://www.sec.gov/ICO

and (iii) blockchain being an immutable database, due to the provision of a cryptographic hashing function and digital signatures, supports secure and transparent transactions [34]. Decentralization in ICOs removes the reliance on third-party financial intermediaries, since the transfer, transaction payments, and storage of tokens occur on a digital ledger [29]. However, many impediments exist that hinder blockchain-based solutions from realizing their potential as a tamper-proof, censorship-resistant solution.

Annually, Bitcoin mining accumulates a carbon footprint equivalent to that of New Zealand[2]. The price swings of cryptocurrencies seen since 2017 through the covid pandemic indicates that these tokens don't yet provide price stability due to speculations surrounding the asset class, as well as get swung by one-off comments made by significant personalities on social media [6]. Figure 1 displays the price volatility during the late-2017 crypto-asset bubble, which saw a repeat during the covid pandemic crisis. The likelihood of ICOs being used fraudulently to circumvent securities and other laws under the pretense of assisting entrepreneurs to achieve their innovative goals severely damages investors' trust [8, 14].

Blockchain technology holds the promise to solve several technological and business-related problems, once the hurdles to mass adoption are surmounted. In order to evaluate the promise of ICOs using blockchain technologies[3], it is essential to closely examine the crowd-sales events to date, including evaluating the related deleterious episodes and the remedies required to support ICO utilization and necessary regulatory interventions. Access to good quality data to enable this examination remains an additional challenge.

ICOBench.com, one of many data providers for ICOs, currently lists nearly 5,726 ICO

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[2]Bitcoin Energy Consumption Index, https://digiconomist.net/bitcoin-energy-consumption
[3]New ICOs continue to be issued listed at: https://coinmarketcap.com/ico-calendar/upcoming/

4

projects published globally, of which 943 ICO tokens were US–based at the time of data collection. The total funds raised are stated to be $27B, as of June 10, 2021. On the other hand, the market capitalization of cryptocurrencies peaked at $2.56T on May 11, 2021 during the surge around the covid pandemic crisis[4]. Our dataset provides a comprehensive overview of the 943 US-based ICO token-offerings. The first and only token launched in 2015, the Augur token, was followed by five tokens in 2016, 270 tokens in 2017, and 494 in 2018, which was the highest number of tokens launched in a single year. This was followed by a steep decline in 2019, with only 94 projects launched.

Tempered ICO activity could be a sign of more maturity and stability in the cryptocurrency space, a tighter screening process, impending regulatory changes, or a consequence of a large number of failed ventures. Lack of mandatory revenue disclosures stemming from minimal levels of regulation exacerbates the information asymmetry problem in ICOs. Expert ratings provide a channel to reduce the impact of project uncertainty while generating confidence in the legitimacy of the token-offering. However, the confidence in the experts' ability to remain impartial is questionable; experts can potentially hold bias towards tokens they are themselves invested in due to the lack of regulatory oversight that prevents them from doing so, or they may fall prey to bribery and other cases US SEC has pursued in recent years. In our dataset, tokens that have successfully been listed on crypto-exchanges have a higher rating on average when compared to other tokens, indicating a positive correlation between quality of the token offering and its assigned rating. Ratings and prices show contradictory characteristics, where blockchain infrastructure, healthcare, and marketplace domain tokens attracted the lowest prices while being rated the highest, whereas the converse was true for

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[4]As seen at https://coinmarketcap.com/charts/

energy tokens.

The number of social media followers a project attracts highlights the token's marketing success and ability to target various demographics. In our sample, the most financially successful ICO projects on average garner the highest social media following. Presence of KYC and whitelist due diligence procedures are associated with an ICO receiving a higher expert rating and a greater social media following. On the contrary, an ICO's utilization of an incentive program (offering discounts and bounties), is associated with higher expert rating, but a lower social media following.

We observe that the proportion of US-based tokens that do not verify their investors is larger than the proportion that offers incentives for investor participation. The reason for this could be that the ICO teams place a higher importance on attracting capital from investors through discounts rather than protecting themselves from undesirable events like hacking or money laundering; or it could also be that the ICO teams are highly committed to the anonymous and decentralized nature of the cypherpunk movement[5].

Entrepreneurs can choose from many alternatives for financing a new venture, such as government agencies, traditional bank lending, private equity offering, angel investors, venture capitalists, going the Initial Public Offering (IPO) route, crowd-funding platforms, and now, crowd-sales on a platform using blockchain technology. While entrepreneurs have multiple options for access to capital, many frictions exist for all the options, such as the need to satisfy stringent requirements imposed by the creditors. The traditional channels for raising capital are highly costly, to the tune of roughly \$7.3M for firms looking to raise \$25-100M[6].

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[5]https://nakamotoinstitute.org/static/docs/cypherpunk-manifesto.txt

[6]PwC Deals, *Considering an IPO to fuel your company's future?* (November 2017), https://www.pwc.com/us/en/deals/publications/assets/cost-of-an-ipo.pdf

ICO token offering can be a viable, less costly alternative to these high costs of participation in the capital markets, provided the related regulatory requirements are adhered to and the unethical ICO practices and fraudulent activities are identified and kept in check.

Our paper contributes to the FinTech and entrepreneurial finance literature on crowd-sales by linking the parameters for ICO success with their ratings, incentive programs, verification procedures, and the business domain they serve, with the aim to inform regulators' policy making and investors' objective of project selection to seek profits as well as to make a positive impact on the society. Additionally, our dataset and analysis can assist researchers in identifying parameters by which to better design technological and business solutions for ICO success. Even if blockchain were to fail to make an impact in the financial industry through the ICO financing model, an in-depth analysis of features of the ICO events occurred so far will assist in deepening our knowledge of bubbles created from financial technologies innovations [8], and formulating remedial measures for a better success with future financial technologies innovations for capital formation and entrepreneurial financing.

The rest of the paper is organized as follows. In the next section, we discuss the extant literature measuring parameters for project success and current regulatory status of popular ICO hotspots around the world with a focus on the United States. Section 3 describes our hand-collected dataset and the characteristics of the 943 US-based ICO tokens in our sample, followed by a detailed descriptive analysis of the tokens in Section 4. Section 5 concludes and outlines future scope for the ICO domain.

2 Literature Review

Extant ICO literature has paid the greatest attention to analyzing the parameters for ICO success, followed by examining and suggesting amends to crypto-regulations. Machine learning, specifically Natural Language Processing, has been employed to extract information from ICO white papers, the crypto equivalent of IPO prospectuses and regulatory filings made by publicly-traded firms. In this section, we provide a brief overview of these three strands of ICO literature, along with a comparison of ICOs with IPOs and the role information asymmetry plays in determining ICO popularity.

2.1 Success in ICO Fundraising

The highest fundraising tokens in USD terms are more likely to those issued in North America, with a larger supply of tokens, higher acceptance of payment in fiat currency, higher cap on funding limits and advisors guiding the issue. Tokens globally tend to fail to attract funding when they utilize lock–in periods, and surprisingly, if a bonus incentive plan is associated with the issue [44]. As would be expected, there is a positive link between success of an ICO and the expert rating it received on ICObench.com [21]. The literature is split on the impact of public availability of an ICO's source code, while Adhami et.al [2] find a positively significant relationship with success and Howell et.al [26] find a positive correlation with trading volume and liquidity, Amsden [4] find no evidence of such a relation. Fisch [22] finds that projects with high quality codes and technical white papers are more likely to achieve fundraising success.

For social media presence of ICOs, a higher transparency through Twitter following

8

is seen to result in higher fundraising [7][37] and a higher Telegram presence relates with higher trading volumes [26]. Results are, however, inconclusive for the link between Telegram following and fundraising success of ICOs [4]. White papers accompanying an ICO are not found to statistical significantly affect the project's success, but in cases where a white paper accompanies an ICO issue, ICO's fundraising success is positively influenced by the length of the white papers [4]. Well–connected CEOs, CEOs with longer duration of experience in leadership roles, and larger ICO teams are all factors that contribute to higher ICO fundraising [32], [4], [12]).

Momtaz [32] finds a negative correlation between fundraising performance and 'highly-visionary' projects. These projects are perceived to have a greater likelihood of getting delisted and failing. A high, positive correlation also exists between management team quality and fundraising performance. An et.al [5] find that projects with better disclosure of team structure and quality measured in terms of education and social networks to achieve higher fundraising by $1.75M, which is also seen for ICO teams where investors obtain rights to vote and receive dividends. Tokens launched in countries offering better legal protection to their businesses are more likely to succeed in fundraising. Fenu et.al [21] claim that tokens launched in the US and Slovenia achieve higher success when compared to other countries. Success of ICOs in the US may be attributed to an increasing regulatory attention on token offerings (refer to Section 2.2). The Blockchain Think Tank Slovenia[7] works closely with regulators and informs all stakeholders of the latest developments, which have supported a mutual understanding to prevent "frustrating innovation" in the ICO domain. Bourveau et.al [9] find that better voluntary disclosure leads to better ICO fundraising success.

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[7]https://blockchainthinktank.si/

2.2 Regulatory Perspective

The key mission of financial regulators is to prevent market participants from defrauding American investors, and the public. However excessive regulatory interference can stifle the markets, and specifically the cryptocurrency domain, and prevent the innovations from benefiting firms in their need for capital [17]. In December 2016, in order to prevent "frustrating innovation," the chairman of the Commodity Futures Trading Commission (CFTC), Christopher Giancarlo, outlined a "do-no-harm" approach, wherein there would be minimal regulatory interference in blockchain based innovations, to allow them to develop and provide benefits to entrepreneurs [13]. According to research by the Satis Group[8], nearly 78% of ICOs are fraudulent in nature. Fortunately, most fraudulent ICOs have failed to raise substantial amount of funds [31].

The regulatory landscape for ICOs differs by country. In the US, while not yet a legal tender, crypto-currencies are accepted as payment by some retailers. In December 2019, Congressman Paul Gosar introduced a bill called 'Crypto-Currency Act of 2020' that proposed (i) the CTFC to regulate commodities in the crypto domain; (ii) the SEC to regulate securities tokens if the tokens were to pass the Howey Test [3] and be identified as a security; and (iii) the Financial Crimes Enforcement Network (FinCEN) to regulate the tokens that are exclusively cryptocurrencies [27]. Despite the discussions surrounding federally regulating cryptocurrencies in the US, there is no such regulation in place yet [11]; decisions regarding regulating cryptocurrencies continue to be left to the discretion of each State.

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[8]S. Dowlat, *Cryptoasset Market Coverage Initiation: Network Creation* (July 11, 2018), available at https://research.bloomberg.com/pub/res/d28giW28tf6G7T_Wr77aU0gDgFQ

2.3 ICOs versus IPOs

ICOs are blockchain-enabled equivalent of an IPO. Beyond purpose, there is additional evidence highlighting the similarities between ICOs and IPOs, namely, both offerings display similar fund-raising mechanisms for entrepreneurial ventures, there is documented evidence of information asymmetry, and consequently, the phenomenon of underpricing is exhibited in both stocks as well as tokens wherein tokens are issued for half their market price [7], [19], there are similarities in post-ICO and post-IPO trends of cumulative returns, and evidence of correlation between investor optimism and success of the venture [35], [16], [30]. The similarities between highly regulated IPO securities and their weakly regulated ICO counterparts highlight the need for due consideration for regulations required for crypto-assets' success.

	IPO	ICO
Regulation	Legal and regulatory compliance requirements are higher	Only security tokens are regulated by the SEC in the US.
Documentation	IPO Prospectus (legal filing), mandatory filings with the SEC	Teams release whitepapers (not considered a legal filing everywhere), and Github source code in some cases.
Advertising	Roadshows & investor meetings	ICOs rely on social media.
Product Maturity	Firms with proven revenues, reliable statements	Promise of a product, a source code, or a prototype are sufficient.
Guarantee	Investment banks underwrite IPOs	ICOs are announced by teams on social media without bank underwriting.
Cost	Legal fees, advisory-fees, filing-related fees	ICOs are less costly.
Share Dilution	Firm can issue new equity	No token dilution.
Exchange-listing	Listed on a stock exchange	Listed on a crypto-exchange.
Length	IPOs take on average, 2 years to complete	ICOs take anywhere between 1-3 months, on average.

Table 1: Summary of comparison of ICOs with IPOs

11

While similarities between ICOs and IPOs do exist, there are also some key differences, summarized in Table 1 [28], [16].

3   Description of the Dataset

Crowdsales and related regulations are in their infancy, which is why credible sources of information on token issuance does not exist yet, even though several ICO aggregator websites exist. We identify the US-based tokens using websites that allow sorting by countries, namely ICOrating.com, ICOBench.com, trackICO.com, and foundICO.com. Additionally, we obtain social media statistics, daily trading/market variables, and other ICOs intrinsic characteristics data from over **twenty** different ICO aggregator websites, focusing specifically on projects that are originated and registered in the United States. A summary of these aggregator websites along with specific information retrieved from each is summarized in Table 3 of the Appendix. If the data are conflicting between different sources, we allow the literature to guide us on the more reliable source of data. In some cases, we refer to timestamped communication between the project teams and investors on Bitcointalk.org. This process of meticulous data collection ensures that we capture, as best we know, all ICOs launched within the United States until April 2020, and with the best possible degree of accuracy.

As per existing literature, Coinmarketcap.com, coinpaprika.com, cryptoslate.com and coingecko.com are considered the most reliable sources for daily trading data [32], [30]. We obtain variables such as current trading price, market cap, 24-hour volume, total token supply, and the circulating supply. Only 30% of all tokens are ultimately traded on an

exchange [40], due to high barriers to entry, expense of launching a token on an exchange, regulatory pressures, and due to the highly risky nature of ICOs which leads to failure before it can be listed on an exchange. Consistent with this figure, a little over 25% of the US–based ICOs are listed on exchanges and traded on a daily market.

We collect other ICO characteristics variables relying on the information content of ICOBench.com, ICOrating.com, and ICOmarks.com, as suggested in the existing literature [2]. We obtain data for the start and end date of the ICO fundraising cycle, the ICO's blockchain platform, the current status, project ratings, token purpose, and technical specifications from ICObench.com, ICOmarks.com, and trackICO.com, while collecting information on the accepted forms of payment, minimum investment, hard and soft cap, restricted areas, and total token supply from ICOrating.com, foundICO.com, coindesk.com, longcatchain.com, tokendata.io, and tokenmarket.net. We obtain the details regarding a project's discounts from crcurrency.com. We additionally refer to websites such as ICOdrops.com, ICOwatchlist.com, and ICOholder.com, cryptocompare.com, and ICO.coincheckup.com to validate and enhance the informational content and completeness of our dataset. We incorporate social media statistics for the ICOs in our dataset using coingecko.com, which provides data on Telegram users, Twitter followers, Facebook likes, and Reddit followers, and validate this information using trackICO.com, ICOdata.io, and ICOwhitelists.com. Coingecko.com updates software developer-related statistics, such as code commits and code changes in last 7 days. We obtain scores for how much hype a certain project generated and how risky it is perceived to be from ICOrating.com and ICOdrops.com. Eidoo.io provides a list of US-based tokens that subscribe to the ERC-20 technical specification.

Some inconsistency is introduced into the dataset on account of ICObench.com, which

13

provides several different purposes for some of the listed token-offerings. Using a careful evaluation of the description of the project provided and our own discretion, coupled with the assistance of the tag for the purpose of the token available on icorating.com and trackico.net, we arrive at the most appropriate category for each token. We incorporate information on fraudulent tokens in our dataset using deadcoins.com, anotherscamcoin.com, and coinopsy.com. Fraudulent token-offerings are further sub-categorized as parody coins, scams, fraudulent schemes, hacked, deceased, abandoned, or suspicious. Our dataset includes 107 US-based ICOs that failed in their fundraising or have been tagged as fraudulent since their inception. Approximately 10% of US-based ICOs failing spells the volatile nature of the cryptocurrency domain, especially in light of infancy of crypto-regulation and implementation in comparison to traditional fundraising options through financial intermediaries or using the IPO pathways. For instance, only 10% of all ICOs listed on ICObench have a Minimum Viable Product or a prototype available prior to launch, and only 21% of the ICOs on ICObench.com implement KYC procedures. This implies that the remaining more than 70% of ICOs are vulnerable to fraud, security issues, hacking, or scam [41]. Although ICOs provide benefits like added security, decentralization, and privacy, they are currently highly vulnerable to scams and failures.

Table 2 reports the total number of non-missing observations, mean, standard deviation, minimum value, median, and maximum value for selected variables from our ICO dataset. The token price at the time of ICO issuance is available for more than 88% of ICOs in our sample, but the total capital raised is only available for 37% of the ICOs in our dataset. On average, a token is priced at $7.70, but a closer inspection due to the level of the median ($0.20) reveals that many tokens are priced in cents at issuance. Some larger ICOs skew

14

the sample by attracting hundreds of dollars per token. On average, an ICO project raises $28.4M capital, with the largest project (EOS) in terms of financial success raising $4.2B. A median project stipulates 37 days as the duration of the ICO fundraising cycle.

In Table 5, we report the mean (with median in parenthesis) values for variables based on their differing degrees of success. Over 50% of ICO tokens are not reported as either successful or unsuccessful. Some of these unreported tokens are still currently in the fundraising phase, or are upcoming ICOs. It is noteworthy that fraudulent tokens have been able to raise $14.8M on average in comparison to the $3.4M raised by tokens that achieved their fundraising goal. Failed tokens in the 50th percentile raised only $0.18M, the lowest across all degrees of success. The median for these tokens for their minimum fundraising goal at $12.5M is the highest across all degrees of success. Their failure or abandonment of the ICO mission is likely a consequence of their low actual fundraising coupled with ambitious funding targets. Fraudulent tokens last 54 days in the ICO issuance phase compared to the 50 days exchange-traded tokens take. Tokens that raise funds but do not reach their goals take 80 days on average. This can be attributed to teams keeping their ICOs active in the hope of ultimately reaching their goal.

Tokens that achieve exchange-traded status are rated the highest by experts, however, fraudulent tokens come in a close second. Disconcertingly, fraudulent tokens and failed tokens set a very high hard cap, which is the upper limit on maximum amount of funding sought, at $22.5M and $33.86M, respectively. This is potentially indicative of schemes of defrauding the investors by trying to raise as much capital as possible and exiting the project. Even though they acquire an exchange-listed status, these tokens on average have the fewest percentage tokens in circulation (48.74%). Token teams seem to limit the percentage of tokens in

Table 2: Summary Statistics

The table reports the summary statistics of variables representative of ICOs. There are 943 ICOs in our dataset. The reported statistics are the total number of non-missing observations, the mean, standard deviation, minimum value, median, and the maximum value for the Price at ICO, capital raised, fund-raising duration, expert ratings, social media followers, the circulating and total supply of tokens, the fund-raising goal, and the hard cap. The last observation specifies the number of ICOs in our dataset.

	Number	Mean	Median	S.D.	Min	Max	Confidence Interval	
ICO Price	833	7.7	0.2	109.3	0	3,000	[.27	15.15]
Amount Raised ($ million)	346	28.4	5.5	227.5	0.00042	4,200	[4.4	52.6]
Fund-raising duration (days)	844	65.9	37	78.8	0	761	[60.6	71.26]
Expert Ratings	834	2.83	2.8	0.78	0.6	4.6	[2.77	2.88]
Social Media (1000s)	870	12.72	2.4	40.3	.0001	969	[10.05	15.42]
Circulating Supply (millions)	820	10.98M	150	310M	.005	9,007.2M	[-10.6M	32.6M]
Total Supply (millions)	818	11.15M	342.8	310M	.005	9,007.2M	[-10.5	32.8]
Fund-raising Goal ($ million)	541	76.6	5	772.2	.0001	12,500	[11.4	142]
Hard Cap ($ million)	597	150.3	21	1,399.5	.012	30,000	[37.8	263]
Total Number of tokens	943							

circulation in efforts to bring about stability in the price and to signal their commitment toward the project to investors. Unreported tokens have the highest percentage of tokens in circulation (65.5%) - which could be indicative of a lack of seriousness in the project, which introduces an element of skepticism in future pronouncements for the success of the unreported tokens.

ICOs have a purpose defined by a few categories. We provide a brief description of set of purposes in Table 4 in the Section 6 - Appendix for various types of projects launched as ICOs. These brief descriptions bucket ICOs into 14 unique categories. For instance, projects that provide access to financing, financial intermediation, currency trading, securities trading and hedging, foreign remittances, or projects that accommodate money transfer are all categorized under the umbrella of 'Financial Services.' In the next section, we delve deeper into our dataset to conduct an in-depth descriptive analysis to extract insights regarding US-based ICOs from their inception to April 2020.

16

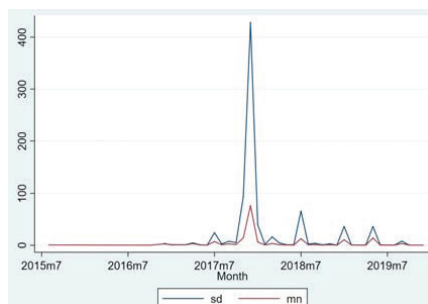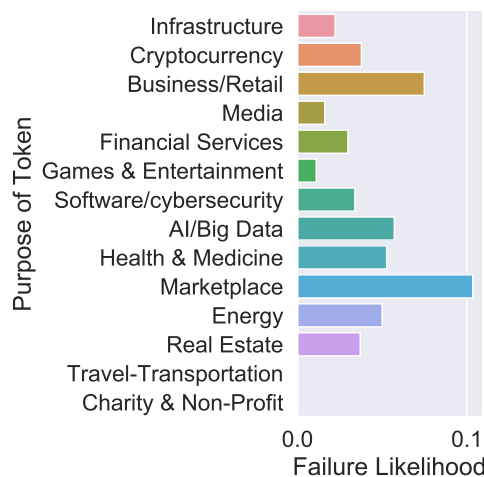Figure 1: Variance and Mean of token Prices over time

Figure 2: Failure by Purpose

4   Descriptive Analysis

Several studies have attempted to assess the factors contributing towards the success of ICOs across the globe. In this paper, as a first effort from a US perspective, we comprehensively analyze the characteristics intrinsic to ICOs issued in the US. We start by analyzing the variations in ICO success by category of offering, the number of days to complete fundraising, and popularity gained with prospective investors in terms of number of social media followers. We analyze the effect of expert ratings on attractiveness of ICOs for investors, and how regulatory KYC and Whitelist mandates compare with incentives offered to attract investors at ICO issuance. In our dataset, there is a decreasing trend in fundraising per project, while ratings are steadily increasing. We ultimately measure the effect of all these contributing factors on the success of ICOs. Finally, we provide an indication on the insights additional research can extract from ICO white papers, which can be important source of information on the ICOs for the benefit of investors and regulators.

17
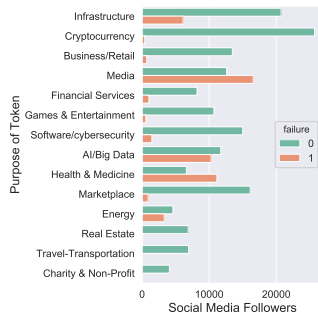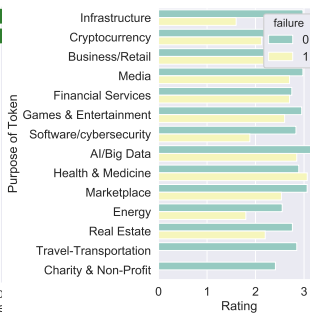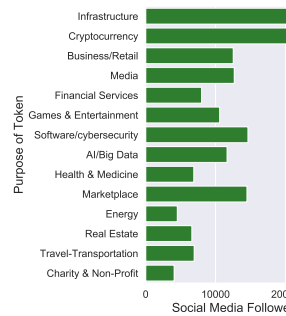
Figure 3: Social Media Users by Success   Figure 4: Ratings by Purpose and Success

4.1 ICO Purpose and Social Media Interest

Higher social media following is expected to signal better transparency and ICO experience varies by the purpose of the token. Blockchain infrastructure-based tokens have the highest social media followers, followed by retail offerings. Marketplace and healthcare tokens take the longest to complete their fundraising cycle. Figure 2 shows that tokens tagged as marketplaces or retailers have the highest likelihood of failure, followed by AI tokens. Interestingly, charitable organizations with the lowest average rating, have not suffered any failures yet. Games, including sports and AR/VR video games and viewing devices, have the lowest failure rates among all categories that include failed coins. Successful token-offerings garner much higher social media attention compared to failed ventures, except for artificial intelligence-based tokens, which have nearly equal level of social media following between success and failure groups (refer to Figure 3).

4.2 ICO Expert Rating

Bourveau et.al [10] find that "third party information certification agents" reduce the impact of information asymmetry. Therefore, higher ratings should lead to higher fundraising

18

success and a higher likelihood of getting listed on a crypto-exchange [10]. There are several ICO aggregators, such as ICOBench.com, ICOrating.com, ICOmarks.com, which provide subject matter experts' ratings to tokens. However, it appears it is possible to purchase favorable ratings from rating sites [25]. The 2008 global financial crisis was exacerbated by the credit rating agencies, where the big three agencies, Standard & Poor's, Moody's, and Fitch Ratings, provided unwarranted ratings to structured products due to underlying incentive structures [15]. The rating agencies were also reported to be understaffed and lacking accountability due to lack of liabilities in the face of a crisis. In the aftermath of the crisis, 83% of the highly rated products were downgraded [33]. Therefore, how ratings are offered for crypto-assets would be an immediate concern to avoid meltdowns. The Russian ICO aggregator ICORating.com, which claims to be independent in its analysis of token-offerings, was ordered to pay the SEC $269k in charges. The fine was levied for failure to disclose payment received from firms to publicize their token offerings on their website[9].

Projects with artificial intelligence and machine learning-related products, with average rating of 3.07/5, and marketplace tokens, with average rating of 3.01/5, are the highest rated tokens, followed by projects that provide blockchain infrastructure, as seen in Figure 4. Charitable organizations are the lowest rated (2.41/5.00 on average), which could indicate that these projects are likely not well implemented, may lack stringent disclosures, and the project teams' inability to leverage charitable nature of the project as a signal for project's quality [46]. On average, for each ICO purpose category, the failed ventures were rated lower than their successful counterparts (refer to Figure 4). This signals a reasonably reliable

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[9]SEC Press Release, (20 Aug 2019). *SEC Charges ICO Research and Rating Provider With Failing to Disclose It Was Paid to Tout Digital Assets*, available at https://www.sec.gov/news/press-release/2019-157

efficacy of ICO ratings. The highest contrast between completed and failed projects remains for software and cybersecurity-related tokens.

4.3   Know-Your-Customer and Whitelist

Know-Your-Customer, or KYC in short, is the identity verification of every participant in an ICO to ensure legitimacy in the process. Approximately 55% of the US-based ICO tokens do not list any KYC requirements utilized in their token issuance. When a project has a limited supply of coins, they require participants to register in advance in a whitelist. A whitelist is similar to buying show tickets; it guarantees access to the event at the door.

We group the data into four levels by ICOs KYC and whitelist specifications, namely, '0' for no KYC or whitelist programs; '1' for KYC only; '2' for whitelist only; and '3' for both KYC and whitelist. In Figures 5 and 6, the different levels of KYC are plotted on the y-axis against the number of social media followers for ICOs by category and ICO project ratings by category, respectively. The category refers to the general purpose the ICO is issued for and size of marker for each ICO indicates the ICO funds raised.

Interestingly, some of the largest projects by ICO funds raised did not have large social media following or any KYC mandates. Some ICOs that issued a digital currency and had no KYC mandates were most successful with fund-raising, likely indicating a high demand for digital currencies and other mechanisms for their marketing, since they also happen to have the highest numbers of social media followers. It is plausible that ICO projects can demand higher amount of funds from backers exactly when their identity is not being verified, as seen in Figure 8.

Figure 5: KYC and Whitelist programs versus Social Media Users (The size of the markers indicate the price at token issuance)
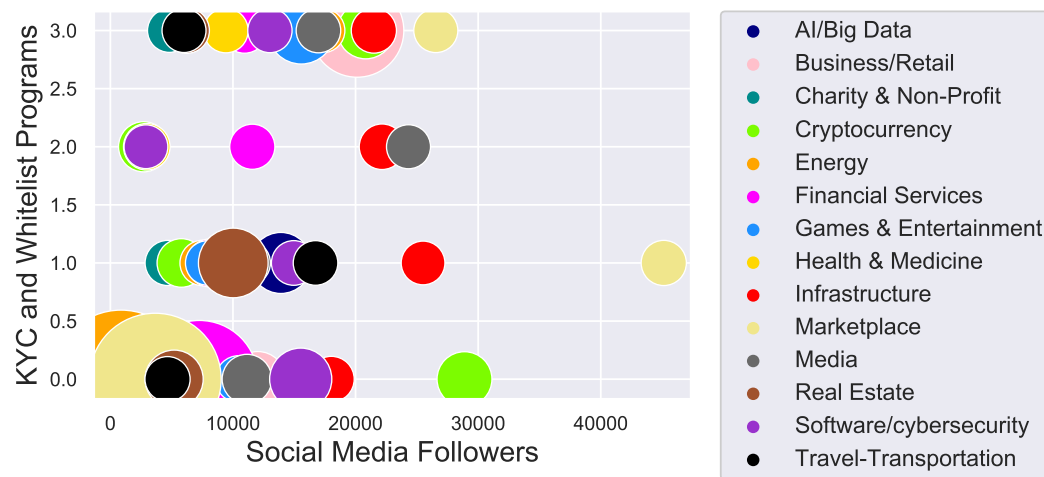
Projects with KYC requirements and both KYC & whitelist mandates are on average rated highly. Business and online retailers with both KYC and whitelist mandates have the highest rating, and highest social media following among their KYC & whitelisted peers. Projects with some level of monitoring have an average rating of 3.13, compared with projects with no KYC or whitelist mandates' average rating of 2.69. Ratings as such are managed by subject matter experts, and presence of KYC and whitelists is one of the criteria experts factor into token ratings. Similarly, tokens with some level of KYC or whitelist mandate have on average 11,477 social media followers, compared to an average 7,705 social media followers for those with no KYC stipulation.

4.4 Bounties and Bonuses Incentive Programs

Bounty programs are rewards to participants for performing certain tasks, like following the project on social media platforms like Telegram and Twitter, or promoting them through an article. The rewards are usually in the form of free coins or tokens [43]. Bonus programs are

Figure 6: KYC and Whitelist programs versus project Ratings (The size of the markers indicate the price at token issuance)
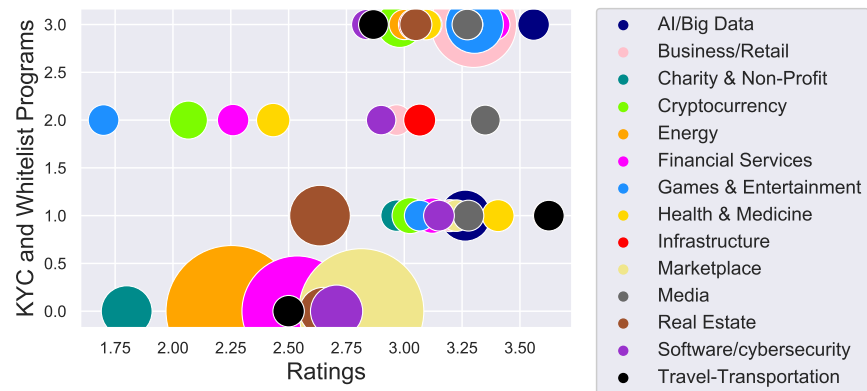

Figure 7: KYC and Whitelist programs versus Social Media Users (The size of the markers indicate the amount of funds raised)
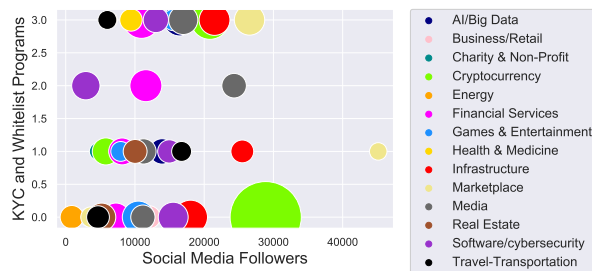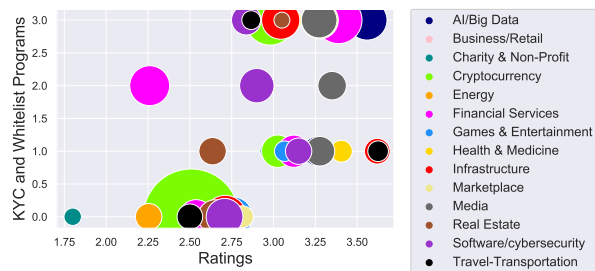
Figure 8: KYC and Whitelist programs versus project Ratings (The size of the markers indicate the amount of funds raised)

22

regarded as discounts to incentivize early stage participants and be compensated for their risk taking. Very high bonus programs may be potentially misused by early investors as pump-and-dump schemes to the detriment of future investors [4]. The SEC has warned the public about ICOs that offer heavy discounts and pre-sale incentives by launching a fake project called "Howeycoins" [38]. Tomahawkcoin, a US-based token, was handed a lifetime ban and fined for a fraudulent bounty program and misleading advertising [39]. Vitalik Buterin, one of the founders of Ethereum platform, has warned against high bonus offerings, calling them contradictory to the "egalitarian spirit of crypto" [36]. We group our data into four levels of incentives offered by an ICO, '0' for no bonus or bounty programs listed/unknown; '1' for only bonus available; '2' for only bounty available; '3' for both bonus and bounty available.

Figures 9 and 10 show various levels of bonus/bounty programs, social media followers and project ratings, respectively, with the size of markers indicating the total amount of funds raised by a token. Marketplace tokens with only bounties in place have the highest social media following, while travel and transportation tokens that offer both bonuses and bounties have the highest ratings. The variation in social media followers is low among the different ICO purpose categories when the projects offer both bonuses and bounties. Real estate projects have the highest ratings among projects with only bonus discounts as incentives. Projects with these incentives command a higher rating on average when compared to projects with no incentives. Among tokens that only offer bounties, games & entertainment tokens raised the highest amount of funds. Travel-transportation tokens achieved the highest ratings among projects with both bounties and discounts, even though they did not relatively raise very high amount of funds. Apart from games & entertainment tokens, fund-raising level was not very different between various levels of incentive programs, thus suggesting that

Figure 9: Bonus and Bounty programs versus Social Media Users (The size of the markers indicate the amount of funds raised)
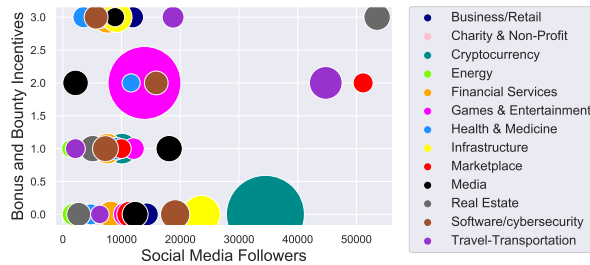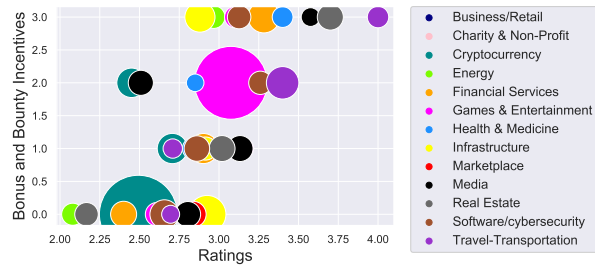

Figure 10: Bonus and Bounty programs versus project Ratings (The size of the markers indicate the amount of funds raised)

these programs were generally not very effective. Interestingly, cryptocurrencies had higher funding levels when they offered no incentives compared to those that did. In terms of ratings, projects that do not have incentives are rated lower than those with bonus programs, a finding consistent with the earlier discussion. Token-offerings with incentives, bonuses, bounties or both, have an average rating of 3.02/5.00, compared with an average rating of 2.56/5.00 for tokens that do not offer any incentives. Tokens with pre-sale incentive offerings have an average 9,590 social media followers, while those lacking any incentives have an average 14,525 social media following. Incentives being inversely proportional to social media following is a surprising observation.

4.5   Fundraising Amounts

The amount of funds raised by a token highlights its popularity, the promise of the technology, or the demand for the product offered. Figure 11 shows the amount raised by tokens per year in bar plots, while the dots represent the social media followers in that year. The year 2017 saw very high amounts of fundraising, which can be labelled as *ICO bubble* with inflated prices of cryptocurrencies and hype around digital coins [42], [45], after which there was a

24

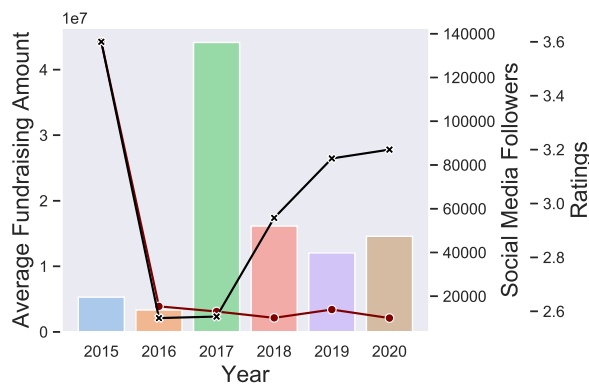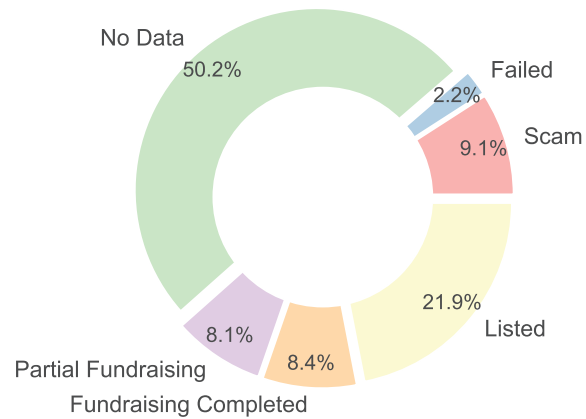Figure 11: Fundraising, Social Media Followers, and Ratings

Figure 12: Token Outcome

drastic drop. Even though the amount raised dipped slightly in 2019 compared to 2018, the number of tokens issued fell drastically, indicating that 2019 comprised of healthier token issuances. Despite the unprecedented levels of funds raised, these projects were actually rated very low. The ratings have since increased substantially annually, even in face of lower fundraising, which indicates a certain pace of maturing of the crypto-domain after the bubble period. This could imply that ICO projects have improved in terms of quality and cryptocurrencies are evaluated more soundly by experts and other participants alike. A more pessimistic viewpoint would suggest that higher ratings are a signal of lowered standards for constructing the ratings to revive interest in the domain after the 2018 cryptocurrency slump, or that ratings are being bought by team members to inflate interest in their offerings.

4.6 Outcome of the ICO Project

With various characteristics of token-offerings analyzed, it is imperative to assess how each of these characteristics correlate with the eventual outcome of the token project. We group

our data into six levels of outcome offered by an ICO based on varying definitions of success in extant literature, '-2' if the project was found to be fraudulent or hacked, although we note that some good projects also get hacked and subsequently bounce back; '-1' if the project failed in fundraising or had to be taken down due to lack of regulatory support; '0' when the success of the token-offering was unreported; '1' when partial fundraising was achieved; '2' when the token-offering was able to raise at least the amount stipulated as the fundraising goal; and '3' for tokens that choose to list themselves on a crypto-exchange.

Figure 12 shows a breakdown of the outcome of token-offerings. We find that more than half of token-offerings in our dataset do not report their final fund-raising tally, despite most of them being past the stipulated end date of their fundraising cycle. This severe under-reporting of the updated status of ICOs is a major 'red flag' and would require regulatory scrutiny. Roughly 11% of the tokens are either failures or scams, 22% are listed on exchanges, and a combined 16% have either successfully raised an amount equivalent to their fundraising goal or have partially reached their goal. Note that we stated earlier that 25% of tokens in our dataset get listed on an exchange. This discrepancy in Figure 12 stems from the fact that roughly 3% of listed tokens get delisted and are taken down due to projects being abandoned or projects failing. In our categorization, precedence is given to the final, failed state of those projects versus their once-exchange listed status.

Coin offerings that were ultimately found to be a scam or a fraudulent venture attracted the most social media following. Apart from scam coins that are outliers, coin offerings experience higher social media following as the level of success becomes higher (refer to Figure 13) [37]. The size of the marker indicates the token price that was set during the ICO. An interesting trend we observe is that the fraudulent coins (for example, Substratum,
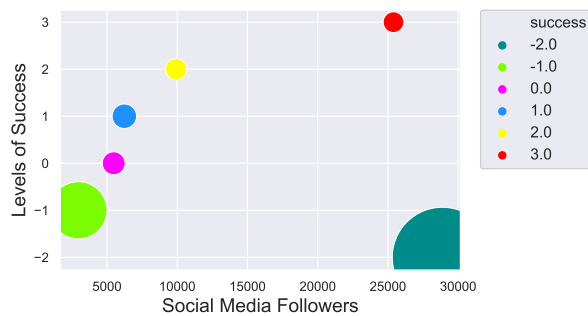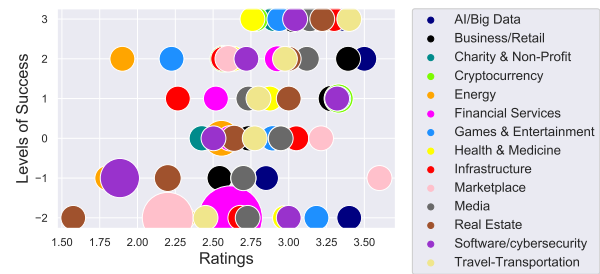
26

Figure 13: Token Outcome and Social Media

Figure 14: The Rating of tokens by Outcome

Atlas Protocol, Bytecoin, Opporty, which were identified as scams, and District0X, Jboxcoin, which were deemed to likely be scams) and failed coins (for example, Embermine, Rhovit, Astra) have larger markers than their more successful counterparts. It is highly likely that these tokens were vehicles for *pump-and-dump scams*, with teams trying to defraud the public by setting as high a price as possible for the tokens at ICO.

Fraudulent token offerings are rated anywhere between 1.5 for real estate projects to nearly 3.50 for artificial intelligence-related projects. Rating of token offerings that are successfully listed on an exchange never fall below 2.75 across all token purposes, thus remaining the highest rated with least variation as a group across all levels of outcomes (refer to Figure 14). This is consistent with findings in Feng et.al [20], who claim that higher rated projects raise more funds and are more likely to raise more than the minimum required funding.

To further analyse incentives and disclosures, we will discount token offerings with unreported outcomes. An interesting pattern is observed in Figure 15 and Figure 16. Nearly 300 token-offerings do not impose any KYC or whitelist requirements on their investors, while only 200 token-offerings do not offer incentives to their investors. 65 coin offerings with no

27

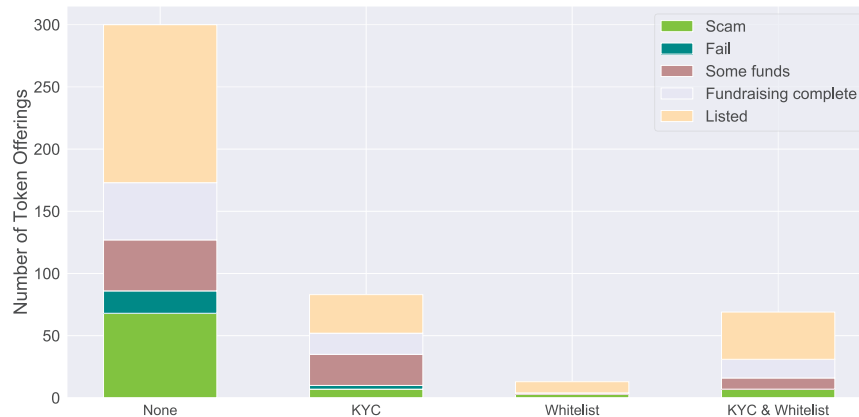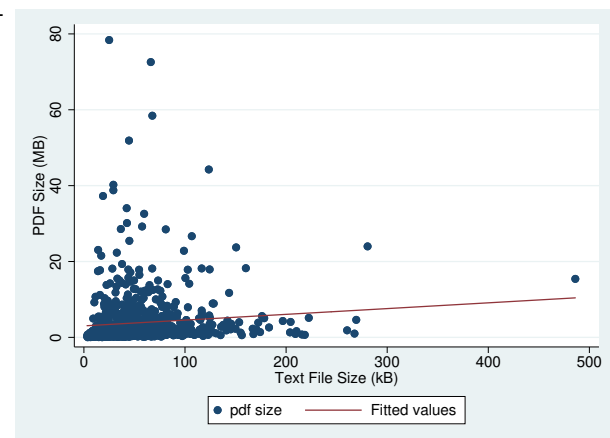Figure 15: Outcome by KYC and Whitelist Specifications

Figure 17: Size of PDF files versus Text files

Figure 16: Outcome by Incentive Specifications
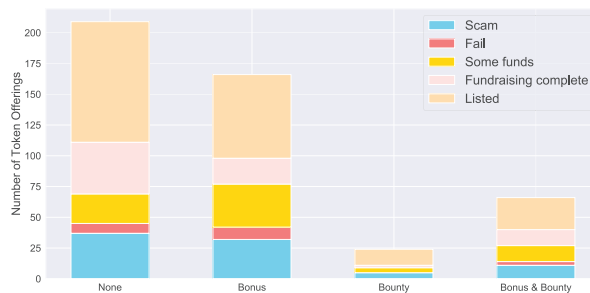
required KYC or whitelist are eventually revealed to be fraudulent, as opposed to only 36 fraudulent schemes among coin offerings with no discounts and bounty programs in place. 50% of non–incentivized coin offerings get listed on an exchange, as opposed to 42% of coin offerings with no investor disclosure requirements. These observations highlight a pattern of investor appeasement by the teams. A need for regulatory insight to correct these imbalances is imminent.

28

4.7　Circulating Supply of Tokens

The circulating supply of an ICO is the number of tokens circulating in the market at a time. The total token supply includes the circulating token supply plus the coins that are mined but not in circulation.

In our sample of US token offerings, the total supply of tokens peaked in 2017 and then dropped in the subsequent year. Coins may not be in circulation due to token lock-ups (vesting periods). While the coins in circulation are increasing every year, the ratio of circulating coins to total coins is dropping every year. The ICO teams are choosing to withhold a greater ratio of mined tokens from circulation every year. These increased vesting periods is likely being used to signal to the investors that the team is "vested" in the projects for the long-term, and to prevent market fluctuations stemming from price instability [18].

4.8　ICO White Paper

Most token-offerings are accompanied by release of a white paper that details the characteristics of the token and serves the purpose of informing investors about the product or service underlying the token. White papers are a source of descriptive material (or textual data) that can prove to be an important supplement to the information available through the aggregator websites. Florysiak et.al [23] follow the Hanley et.al [24] methodology of separating the redundant content of white papers from the information content, which helps highlight the essential characteristics inherent in token-offerings.

We analyze some features of the white paper text documents for a sample of 826 ICOs. We compare the size of the original PDF documents against their text-only extracted version
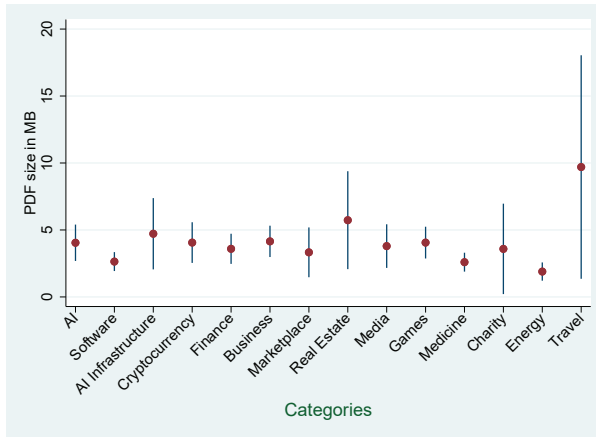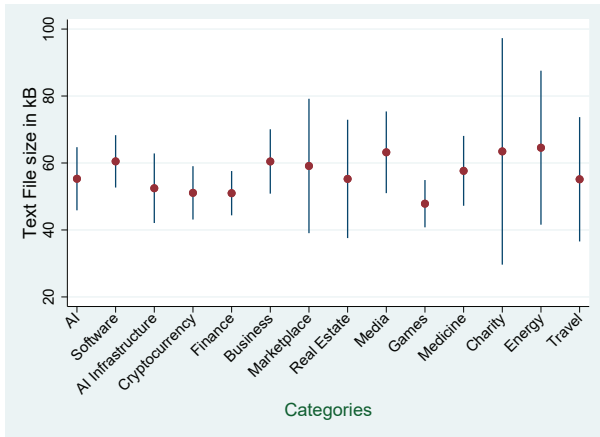
Figure 18: Size of PDF files by Purpose   Figure 19: Size of Text files by Purpose

of files in order to evaluate the complexity of content beyond text, such as photos, plots and graphics. We see that some PDF white papers in our sample condense into much smaller text file after parsing, while some smaller PDF white paper files translate into comparatively larger text files (refer to Figure 17). While PDF file size and text-extracted file size for ICO white papers are positively correlated, the outliers from the trend line in the direction of very large PDF files is dominant. These ICO white papers are using richer visual content in their white papers beyond the textual content. Figures 18 and 19 show the size of raw PDF files and the text-parsed files by purpose of tokens. Software, Artificial Intelligence/Big Data, Finance and crypto-tokens exhibit smaller confidence intervals. Charity and energy tokens have the smallest PDFs, but correspondingly larger text files. Media-purposed tokens have some of the largest text files, despite the smaller than average PDF file sizes. Business and marketplace tokens also have some of the largest text files, without having excessively wide confidence intervals.

5 Conclusion

While ICOs are crucial for providing capital to entrepreneurs through platforms that are secure from hacking and other privacy concerns, the domain still faces challenges from a high level of uncertainty and fraud. In past years, ICOs have seen high price variability, high failure rates and fraud since the 2018 cryptocurrency slump. Using a novel, meticulously collected dataset, we provided a comprehensive description of all token-offerings originated in the United States since 2015. A thorough descriptive analysis of token-offerings was used to highlight the potential sources of hurdles for blockchain technology to realize its game-changing promise for entrepreneurial fundraising, and the extent of need to counteract with regulatory influence or mandatory disclosure protocol remedies.

We find that presence of KYC and whitelist due diligence procedures in the ICO domain are associated with higher popularity in terms of higher social media followers and higher expert ratings. On the other hand, incentive programs, such as bonuses and bounties, are associated with higher expert ratings, but lower social media following. Token-offerings with no investor disclosure mandates outnumber the tokens with no investor incentives, thus highlighting a pattern of investor appeasement. Nearly twice the number of tokens with no KYC and whitelist requirements are fraudulent in comparison to the tokens offering no incentives. On the other hand, tokens lacking incentives are more likely to get listed on an exchange in comparison to tokens lacking KYC requirements. Subsequent to the 2018 cryptocurrency slump, project teams have increased the percentage of tokens kept in lock-up periods to convince investors of their long-term commitment to the project and to prevent market price volatility. Moreover, ICOs' ratings and prices show contradictory characteris-

31

tics; blockchain infrastructure, healthcare, and marketplace domain tokens attracted lowest prices while being rated the highest, whereas the converse was true for energy tokens.

Based on the findings of our descriptive analysis, regulators can consider developing methods to control fraudulent undertakings by enhancing KYC and white-listing practices. Beyond enhancing practices that improve investor confidence, ICO projects should improve their incentive programs to achieve better market launches. Increased trust and better information regarding ICO projects will prevent stifling their success and assist entrepreneurs to access capital through these efficient and innovative technologies.

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Table 3: A list of web resources and token information retrieved

Token Characteristics	Source Websites
US-based tokens	ICOBench, ICOrating, foundICO, trackICO.
Token Price & Total Supply	ICOBench, ICOmarks, ICOholder.
Trading Price, volume, market cap	Coinmarketcap, coinpaprika, cryptoslate, coingecko, cryptocompare.
Fundraising cycle & amount, platform, status	ICOBench, ICOrating, trackICO, longcatchain, tokenmarket, ICOdata.
Ratings & Hype	ICOrating, ICOBench, ICOholder, ICOmarks, foundICO, ICOdrops.
KYC/Whitelist	ICOBench, foundICO, ICOwatchlist, ICOwhitelists.
Social Media	Coingecko, TrackICO, ICOdata, ICOwhitelists.
Fraud & Scam	deadcoins, anotherscamcoin, coinopsy.
Bonus & Bounty	ICOBench, ICOholder, crcurrency.
Accepted Payments & Cap	ICO.coincheckup, ICOtracker, tokendata.
General news	coindesk, bitcointalk, news.bitcoin, cryptonews.
Technical Specifications	Eidoo.io.

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6   Appendix

Table 4: Projects types and description under different Product Categories

Purpose	Description
AI/Big Data	Internet of Things, fraud detection, Artificial Intelligence-reliant innovations.
Business/Retail	Education, home services, art, product auctions, club memberships, restaurants, wholesale purchasing, and smart contract platforms.
Charity & Non-Profit	Donation-based projects in the areas of education, agriculture, and building infrastructure with the aim of improving the quality of life via crowdsales.
Cryptocurrency	Blockchain platforms that also launch their own cryptocurrency.
Energy	Renewable energy, energy infrastructure, water management, power sector, clean energy.
Financial Services	Banking, trading, foreign remittances, currency exchange, insurance providers, auditing, financial consulting, crypto-exchanges, investing and asset management platforms.
Health & Medicine	Cannabis industry, fitness apps, secure patient records storage and sharing, online patient diagnostics.
Games & Entertainment	Video games, gambling, VR content, television entertainment management, sweepstakes, virtual resorts.
Infrastructure	Framework for improving transaction speeds, building decentralized applications, instituting smart contracts, tightening privacy controls, and improving other functionalities of blockchain platforms.
Marketplace	An e-commerce presence where buyers and sellers can electronically meet each other. Supports businesses like education, retail, and for collaborators to solve software-related problems.
Media	Communications, advertising, music industry, social media, digital content, publishing.
Real Estate	Renting, time-share, purchasing of real estate for commercial real estate as well as personal.
Software/Cyber-security	Cloud storage, IT solutions, computer architecture, Software as a Service (SaaS), cyber-security solutions, web design, telecommunication.
Travel-Transportation	Ride-sharing, trucking, maps, hotel booking, tourism.

Table 5: Summary Statistics by Categorical Degree of Success

The table reports the mean (median) price during the token sale, the capital raised, duration of the ICO, expert rating, social media following, circulating and total supply, fundraising goal, and hard cap for the 943 tokens in our dataset. The last observation specifies the number of ICOs for the specified degree of success in our dataset.

	Fraudulent	Failed	Unreported	Partial Funding	Funding completed	Listed
ICO Price	50	16.8	3.3	3.6	3.0	2.8
	(0.15)	(0.5)	(0.2)	(0.2)	(0.2)	(0.13)
Amount Raised ($ million)	128	5.7	20	9.1	12.2	21.8
	(14.8)	(.18)	(20)	(1)	(3.4)	(10)
Fund-raising Duration (days)	54	50.4	74.5	80.3	60.0	50.3
	(31)	(40.0)	(46.0)	(43.0)	(44.0)	(31.0)
Expert Rating	3	2.4	2.7	3.0	2.8	3.1
	(3)	(2.6)	(2.7)	(3.0)	(2.7)	(3.0)
Social Media (1000s)	28.9	2.9	5.5	6.2	9.9	25.4
	(3.3)	(1.1)	(.81)	(2.5)	(2.3)	(12.5)
Circulating Supply (million)	3,930.64	1,360.72	24.02M	1,521.89	2,490.19	2,012.08
	(150)	(56.5)	(150)	(150)	(109.8)	(176.72)
Total Supply (million)	10,884.28	3,636.55	24.09M	2,590.14	8,609	.53M
	(348.5)	(490)	(290.7)	(400)	(210)	(450)
Percentage in Circulation	53.47	55.68	65.5	61.26	60.72	48.74
	(50)	(52.5)	(65)	(64.28)	(59.66)	(49.80)
Fund-raising Goal ($ million)	33.9	15.4	129.27	23.6	8.34	26.5
	(5)	(12.5)	(4)	(8)	(2)	(8)
Hard Cap ($ million)	92.73	60.63	240.06	39.66	25.17	71.14
	(22.5)	(33.86)	(20)	(21)	(17)	(25)
Number of tokens	85	21	469	77	78	205