

INITIAL COIN OFFERINGS: DISRUPTOR OR IMPOSTER?

Joey Biasi and Sujit "Bob" Chakravorti



FUNCAS Social and Economic Studies, 6

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Joey BIASI

Sujit "Bob" CHAKRAVORTI

Abstract

In this report, we study the rapidly growing although extremely volatile initial coin offering (ICO) market. We identify which traditional markets are being disrupted by ICOs. We discuss the necessary infrastructure needed to support this market. We analyze market dynamics in terms of volatility, global presence, the impact of news events, and types of industries that are issuing or considering to issue ICOs. We discuss some specific ICOs to focus on key lessons learned. We discuss the regulatory landscape and challenges for this market. We conclude that ICOs along with the underlying technology hold great promise to disrupt various types of intermediaries while acknowledging that the financial and regulatory infrastructure needs to be further developed.

* We thank the Funcas foundation (www.funcas.es) for funding this project. The opinions expressed in this report are those of the authors and not of Funcas or any of its staff. For comments and suggestions, please contact Bob Chakravorti at bob.chakravorti@chakradvisors.com. We thank Lisa Binmoeller, Santiago Carbo Valverde, Suman Ray, Francisco Rodriguez Fernandez, and Shourin Roy for comments on previous drafts. All remaining errors are our own. Chakra Advisors does not provide investment or legal advice. Nothing in this report should be interpreted as investment or legal advice.

I. INTRODUCTION

Initial coin offerings (ICOs) are dramatically changing how firms raise funds enabling less costly, more transparent, more accessible, and faster access to capital. By issuing tokens, ICOs offer firms an alternative means to raise funds from venture capital, crowdfunding and initial public offering (IPO). In this report, we will follow the widely accepted industry convention and include token generating events (TGE) in our definition of ICOs.¹ However, the global ICO market (excluding cryptocurrencies) is quite volatile as evidenced by the fluctuation in market capitalization so far in 2018. For example, the global market capitalization (market cap) on January 13 was \$57 billion but fell to \$15 billion on August 26.

The emergence of ICOs shows great promise in improving the efficiency of markets. In some cases, ICOs are used to sell goods and services in advance and are categorized as utility tokens.² Other ICOs have similarities to equity in the sense that their investors may receive dividend streams based on the revenue streams of the issuing firms. However, unlike equity holders, token owners do not have ownership interests. These types of tokens are called security tokens. The difference between utility and security tokens is intensely debated globally by ICO issuers and regulators.

Before discussing ICOs, some background regarding the infrastructure required to host ICOs would aid in understanding this asset class. While initially developed primarily as a replacement for payment instruments that use intermediaries to process online payments, Bitcoin created protocols that are being used in many different contexts.³ Specifically, Nakamoto, the developer of Bitcoin, solved the double-spend problem: the same bitcoin or fraction thereof cannot be used to make multiple purchases by the same buyer.⁴ The three main features of Bitcoin are: (i) digital native currency with no central authority, (ii) incentive structure to verify transactions, and (iii) immutable blockchain that makes it nearly impossible to change past transactions.

¹ Some industry participants differentiate between coins and tokens. They argue that coins are more money like whereas tokens are either investments or enable token owners to participate in the token sellers' ecosystem. Token generation events refer to token sales that for the most part occur on the Ethereum network and not coin sales. For the ICO data that we report, we exclude cryptocurrencies from ICOs.

² The preselling of goods and services is not new to fund firm operations. For example, 29 percent of Starbucks sales came from orders that were prepaid during the first quarter of 2017 according to Wattles (2017).

³ For more details on the motivation of Bitcoin, see Nakamoto (2008).

⁴ Following convention, we will refer to Bitcoin as the platform including the infrastructure and protocols and refer to bitcoin as the currency that resides on the Bitcoin platform.

Cryptocurrencies differ from fiat currencies such as the U.S. dollar and the euro in several ways. First, they are not government-issued and do not have a physical form but reside only in digital form. Second, the most popular cryptocurrencies have their own infrastructure (e.g. Bitcoin and Ethereum), that allow for the exchange of digital assets in a decentralized ledger globally without centralized authorities.⁵ Third, in some cases such as bitcoin, there is a preset maximum number of currency units that can be created unlike fiat currencies.

Despite rapid global recognition, we still have a long way to go to classify bitcoin and other cryptocurrencies as a form of money (for more discussion, see Chakravorti, 2017). Generally, money serves as a medium of exchange, store of value and unit of account. For the most part, we will not discuss the speculative nature of cryptocurrencies that receives the lion's share of coverage in the popular press. Some use cases for cryptocurrencies are emerging such as peer-to-peer (P2P) payments, cross-border payments, and access to electronic payments for the unbanked. Two growing specialized use cases for cryptocurrencies include payments for using decentralized computer networks and purchasing ICOs.

Using a proof of work protocol and an immutable blockchain, Bitcoin developed technology that has been repurposed and expanded.⁶ Ethereum expanded upon the benefits of the Bitcoin blockchain by integrating easy to code state-contingent, verifiable, storable, contracts for delivery of funds in exchange for goods and services in the future based on the realized state.⁷ These contracts are commonly referred to as smart contracts.⁸ In addition, Ethereum made it relatively easy to introduce dApps (decentralized applications) on their platforms. These applications enable the creation of ICOs.

Based on our research of ICOs, we offer the following conclusions. First, from a technology standpoint, cryptocurrencies along with the new infrastructure connecting computers that host dApps will enable more efficient allocation of goods and services. Second, as the infrastructure continues to develop, these platforms must be able to overcome challenges such as achieving scale in terms of faster transactions times. Third, ICOs will disrupt traditional ways to raise funds but will not eliminate other more established means to raise funds. Fourth, in our section on case studies, we conclude that the internal governance

⁵ Similar to Bitcoin, Ethereum refers to the platform where the native currency ether resides.

⁶ For more discussion of the underlying technology of Bitcoin and other cryptocurrencies, see Halaburda and Sarvary (2016) and Tapscott and Tapscott (2016).

⁷ Ether is the native currency or often referred to as the gas that is needed to participate on the Ethereum platform.

⁸ For more discussion about smart contracts, see Nosikov (2017) and Szabo (1996).

of these systems is still in its infancy and governance challenges will need to be overcome. Fifth, given the global nature of this market, coordination among regulators across countries will be necessary.

Our report is organized in the following sections. In the next section, we discuss how ICOs are disrupting funding markets. In section III, we discuss the process to issue ICOs and the necessary underlying infrastructure. In section IV, we discuss the current state of the global ICO market in terms of trends and market cap. In section V, we discuss the regulatory landscape for ICOs. In section VI, we discuss several individual ICOs to better understand challenges and opportunities of this emerging market. In sections VII and VIII, we discuss challenges going forward and offer some conclusions, respectively.

II. DISRUPTING TRADITIONAL FUNDING SOURCES

The ability for firms to raise funds has evolved over time especially for technology firms. Having its roots in Silicon Valley, venture capital has become a main source of funds for technology and other types of firms.⁹ Venture capital offers a means to raise funds in exchange for ownership and control. Venture capital still remains a major source of funding for young technology firms although crowdfunding and, more recently, ICOs have started to challenge venture capital as a source of funding. In the first two quarters of 2018, venture capital raised \$119.8 billion globally compared to \$12.0 billion for ICOs during the same period.¹⁰

In the 1990s, technology firms tended to have an initial public offering (IPO) within 4 to 5 years after being formed. However, after the 2008-2009 financial crisis, the time increased to 9 to 11 years in 2014 according to Evans (2015), an analyst at Andreessen Horowitz. Bowden and White (2018) cite various reasons why firms delayed their IPOs. These include increased cap on investors from 500 to 2,000 (JOBS Act); larger investors into the venture market such as SoftBank; private equity; and mutual funds.¹¹ In addition, many venture-backed firms are acquired by incumbents instead of building their businesses organically.

Evans (2015) stated that most of the profits from newer technology firms went to private money compared to traditional technology firms. Private money

⁹ The estimates of years to IPO are from Bowden and White (2018) and Burniske and Tatar (2018). The history of venture capital and rise of ICOs as a broader means to raise funds are based on Burniske and Tatar (2018).

¹⁰ For global venture capital raised, see KPMG (2018). ICO data is from tokendata.io.

¹¹ In 2012, U.S. President Obama signed into law the Jumpstart Our Business Startups (JOBS) Act. For more details, see U.S. Congress (2012).

is generally comprised of venture capital firms, private equity firms, and wealthy individuals or pre-IPO investors. IPOs are open to the broader public and are part of public money. For example, Microsoft private money grew 20,000 percent versus its public money at 60,000 percent. In contrast, Facebook, private money grew at 80,000 percent compared to public money at less than 1,000 percent.

Crowdfunding platforms such as Kickstarter, Indiegogo, and CircleUp provided outlets for greater participation of the public without incurring the high cost of IPOs.¹² So far in 2018, crowdfunding platforms raised \$9.4 billion according to statista.com on September 4, 2018 compared to \$12.5 billion for ICOs. Via the Internet, these crowdfunding platforms match investors and entrepreneurs where products are sold in advance, donations are made, or shares in firms are purchased.

Unlike venture capital and similar to crowdfunding platforms, ICOs are available to the broader public with certain restrictions that we will discuss below. ICOs have started to compete with venture capital for early investment in certain sectors. From January 2017 to the end of February 2018, ICOs delivered 3.5 times more capital than venture capital firms (VCs) for blockchain and blockchain-adjacent deals according to Rowley (2018). Furthermore, VCs have become more selective. Therefore, not every entrepreneur is able to secure VC funding.

III. NECESSARY INFRASTRUCTURE

Although Bitcoin introduced the technology, it was not well suited to host dApps. Ethereum and EOS were developed to improve upon the infrastructure.¹³ The introduction of Ethereum led to the creation of thousands of dApps that issue their own native tokens. Most of these tokens are not supported by their own blockchain but reside on Ethereum and other established platforms. Generally, these tokens are sold in exchange for cryptocurrencies such as bitcoin and ether. In our report, we define ICOs as cryptotokens.

Today, the rise of cryptoassets –cryptocurrencies, cryptocommodities, and cryptotokens– has expanded the potential investor universe.¹⁴ Burniske and Tater

¹² For more details on these crowdfunding platforms differ, see Olson (2017). Not surprisingly, Indiegogo has now expanded into becoming an exchange for ICOs (based on a presentation by Mayra Ceja of *Indiegogo* at *Blockchain Economic Forum* in San Francisco in June 2018).

¹³ In section VI, we discuss Ethereum and EOS and how they have or plan to improve the hosting and functioning of dApps.

¹⁴ We borrow this taxonomy from Burniske and Tater (2018).

(2018) describe cryptocommodities as digital commodities that provide raw digital resources (e.g. Bitcoin and Ethereum). Cryptotokens can be exchanged for finished digital goods and services or represent digital securities issued by firms that reside on cryptocommodities.

To issue ICOs, firms generally follow these steps. Firms issuing ICOs make announcements via different channels such as social media, websites, conferences, and emails. Following the announcement, a white paper is issued detailing senior management, advisory board, the purpose of the firm, its goals, and its products and services. The structure and timing for token sales are clearly defined. To create critical mass, early investors or users are given greater incentives to join. Generally, there are preset minimum and maximum quantities of tokens for each ICO presale. Some platforms will not release funds to firms unless a minimum number of tokens are presold. The firm should disclose how the funds raised will be used and how the coins will be distributed. Investors use ether (accepted by 97 percent of ICO issuers), another cryptocurrency, or fiat currency (not common) to purchase the tokens. At the end of the presale, investors receive tokens in their digital wallets, if minimum presale requirements are satisfied. Once created, ICOs can then be traded on exchanges subject to certain restrictions depending on the country.

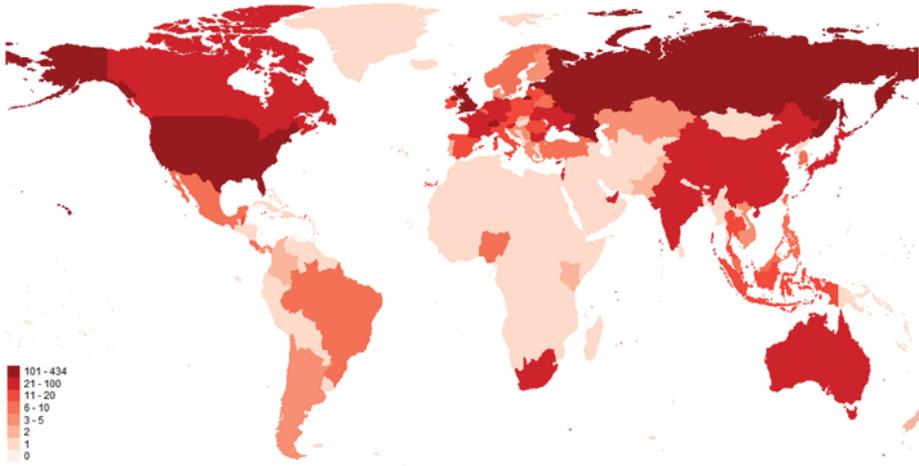
IV. ICO MARKET STATISTICS

In this section, based on various data sources, we analyze the ICO market. Because of the global nature and a lack of a uniform database, we caution about the total number ICOs in existence.¹⁵ We expect our estimates to be lower than the actual ICO market. However, we are confident about the emerging trends. We discuss the geographic distribution of ICOs and the market size in terms of number of ICOs and total value outstanding. To better understand the volatility of the market cap of ICOs, we consider actions taken by governments along with market dynamics. Furthermore, ICOs are bought and sold with cryptocurrencies which are also highly volatility. Using econometric techniques, we disentangle the impact of the underlying cryptocurrency volatility from the fundamentals of the ICOs.

As we have mentioned above, ICOs are issued in many countries. In Map 1, we provide a global snapshot of where ICOs are currently issued from. The top 5 countries by number of ICOs are the United States, Russia, the United Kingdom, Singapore, and Switzerland, respectively. By amount raised (Map 2), the top five countries are the United States, Switzerland, Singapore, the United Kingdom, and Russia, respectively.

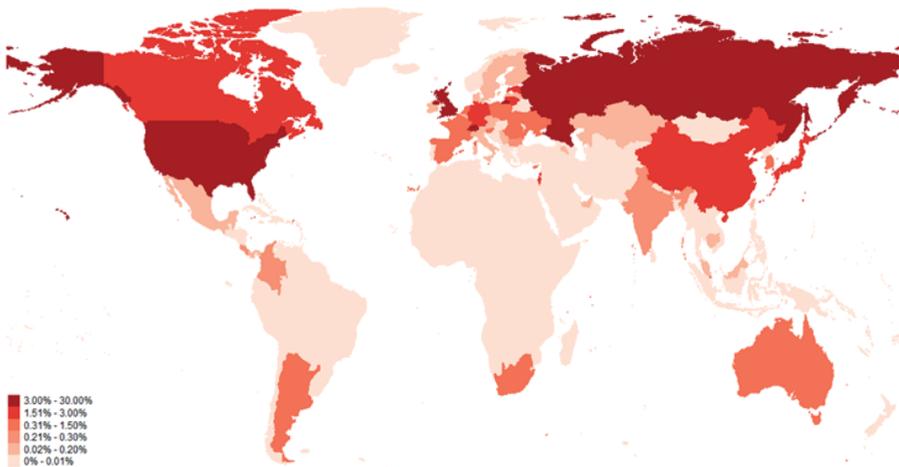
¹⁵ We have described our data sources in the data appendix at the end of this report.

MAP 1
ICO COUNTS ACROSS THE GLOBE



Source: ICOmarks.com as of 8/26/2018.

MAP 2
ICO AMOUNT RAISED BY COUNTRY

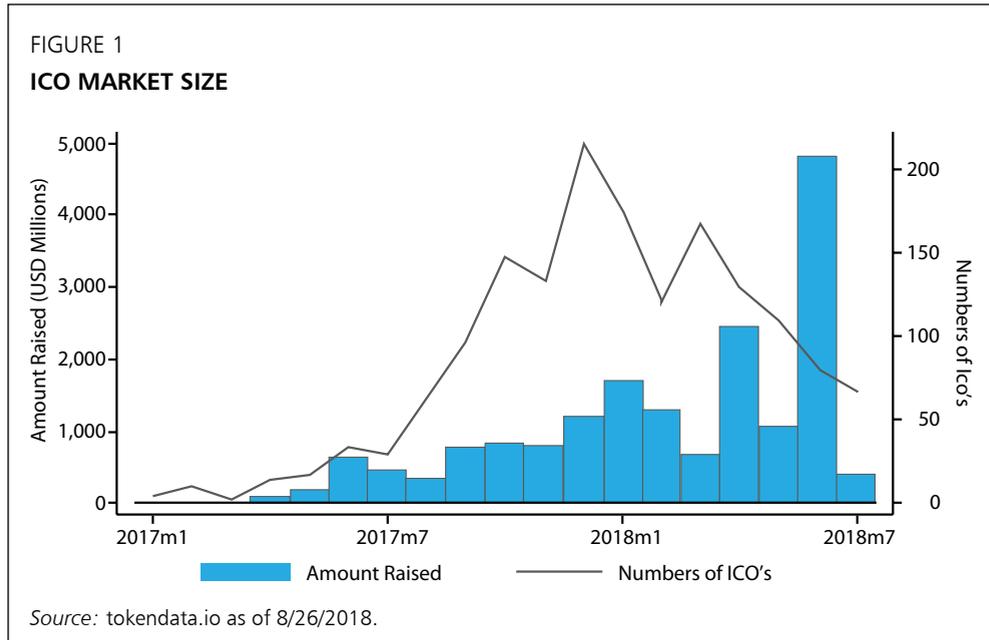


Source: ICOmarks.com as of 8/26/2018.

Although not exhaustive, we suggest some reasons why these five countries are the most popular to issue ICOs. The United States, United Kingdom, and Singapore are regional financial centers. In addition, the United States and United Kingdom are global financial centers known for financial innovation. Furthermore, venture capital and crowdfunding also have strong roots in the United States.

We provide some insights into why Switzerland and Russia are attractive for ICO issuers. Although a relatively small country, Switzerland has traditionally been a global money center for deposits. It also remains a neutral country with a stable government where local jurisdictions (cantons) have significant influence in setting their own laws.¹⁶ In addition, Zug, a small town not too far from Zurich, has encouraged the creation of a global hub for the crypto ecosystem. However, in February 2018, similar to other countries, Switzerland’s securities regulator indicated that many ICOs will be treated as securities.

There are a few reasons Russia is a popular issuer of ICOs.¹⁷ Many suggest that Russia has talented programmers and mathematicians, giving them an



¹⁶ For more discussion on why Switzerland is an attractive location to issue ICOs, see del Castillo (2016) and Ozelli (2018).

¹⁷ For more on the attractiveness of Russia for ICO issuers, see Detrixhe (2018) and Tassev (2018).

advantage in the crypto space. Given relatively undeveloped financial markets for startup firms, ICOs provide an alternative to VC funding in Russia. Some also point to a weak economy and the willingness to take big bets. According to Detrixhe (2018), Moscow is the number one city where founders come from followed by Silicon Valley and New York. However, as in other jurisdictions, Russian financial regulators have increased their scrutiny of crypto assets.

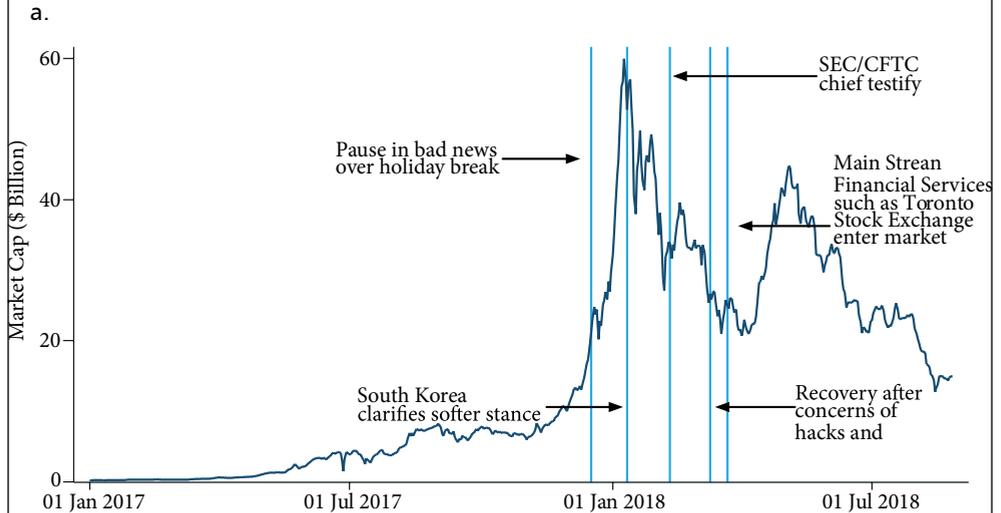
In Figure 1, we plot the amount raised and the number of ICOs issued monthly from January 2017 to July 2018. The amount raised for presale ICOs often shows up in the data in one month instead of during the whole period of the presale. Most of the activity in the ICO market started to pick up late in 2017 and with the number of ICOs peaking in January 2018 at 176 ICOs and the amount issued peaking at \$4.8 billion in June primarily due to the \$4 billion EOS presale that ended in June.

In figures 2 (a and b) and 3 (a and b), we plot the ICO market cap from January 1, 2017 to August 26, 2018. Investors and regulators are concerned about such volatility especially given the newness of these markets. There are different drivers contributing to the volatility. In addition to the fundamentals of the specific market such as supply and demand for goods and services, expectations of future earnings, and other firm specific factors, we study the impact of news events such as government actions and the volatility of the cryptocurrency used to buy ICOs. We discuss three drivers –government regulatory announcements regarding the market, other newsworthy developments, and volatility of cryptocurrencies.¹⁸ In figures 2 and 3, we identify positive and negative events from January 1, 2017 to August 26, 2018. While we are unable to explain all the major increases and decreases in the ICO market cap, we are able to identify some upward and downward movements from noteworthy news items. Additionally, government announcements to regulate the industry including outright bans are associated with decreases in the market cap.

A key driver of the volatility of the ICO market cap is the price fluctuation of cryptocurrencies vis-à-vis the U.S. dollar used to purchase ICOs. Although bitcoin was initially the cryptocurrency used for ICOs, today ether is the main cryptocurrency used to purchase ICOs primarily because of the ease to create smart contracts on the Ethereum platform. In Figure 4, we show the percentage of ICO issuers that accept a type of cryptocurrency or fiat currency. Ether is accepted by 97 percent of ICO issuers whereas bitcoin is accepted by 45 percent of ICO issuers.

¹⁸ When we asked an operator of a crypto exchange what drives volatility in the ICO and cryptocurrency market, he stressed that the number one factor was news. As markets mature, the impact of news on volatility generally reduces.

FIGURE 2
POSITIVE EVENTS CORRELATED WITH RISE IN ICO MARKET CAP



b.

Date	Possible Reason for Change	Link
12/17/2017	A pause in bad news after a large correction	https://www.bloomberg.com/news/articles/2017-12-23/bitcoin-climbs-finding-floor-after-worst-selloff-since-2015
1/11/2018	South Korea attempts to clarify a softer than understood stance on crypto	https://www.forbes.com/sites/elaineramirez/2018/01/18/south-korea-wants-to-ban-crypto-trade-while-government-officials-and-big-banks-make-millions/#2eb35abed9e1
2/10/2018	SEC and CFTC chairs testify, underline cryptos importance after tough week in market	https://www.coinspeaker.com/2018/02/07/bitcoin-price-raises-8000-cftc-sec-cryptocurrency-senate-hearing/
3/10/2018	Recovery after Japanese warnings and hacks	http://money.cnn.com/2018/03/08/investing/japan-cryptocurrency-exchanges-crackdown/index.html
3/22/2018	Pro-crypto legislation passed in Japan, driving large volumes in Japan and Korea	https://www.cnn.com/2017/05/19/bitcoin-price-record-high-japan-fork.html

Source: coinmarketcap.com as of 8/26/2018.

FIGURE 3
NEGATIVE EVENTS CORRELATED TO DECREASES IN MARKET CAP

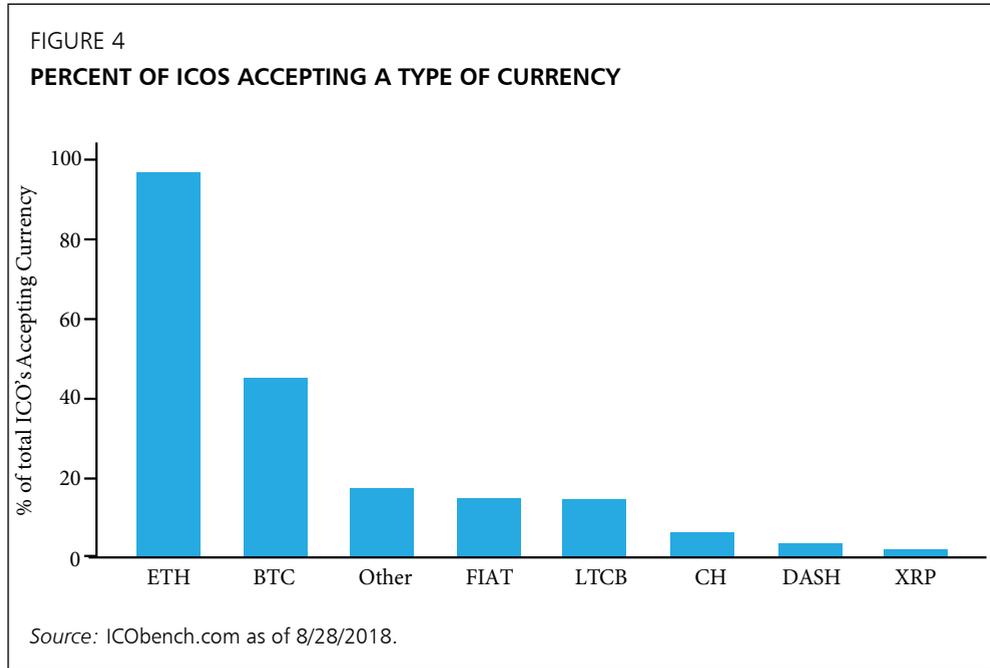
a.



b.

<i>Date</i>	<i>Possible Reason for Change</i>	<i>Link</i>
1/17/2018	Threats of Regulation in Asia after a steep increase/SEC and CFTC announce counter-fraud efforts	http://www.businessinsider.com/bitcoin-ethereum-ripple-cryptocurrency-prices-fall-on-january-16-2018-1?r=UK&IR=T
2/6/2018	A list of private and public entities restricting/regulating Crypto	https://www.cnbc.com/2018/02/05/bitcoin-price-drops-below-8000-over-60-billion-wiped-off-cryptocurrencies.html
3/18/2018	Announcement of Japanese crackdown and SEC regulation	https://www.cnbc.com/2018/02/02/bitcoin-ethereum-ripple-price-falls-over-100-billion-wiped-off-global-cryptocurrency-market.html
6/13/2018	Coinrail, a popular Korean cryptocurrency exchange, is hacked	https://www.theguardian.com/technology/2018/jun/11/bitcoin-price-cryptocurrency-hacked-south-korea-coincheck
8/13/2018	Investors selling after frustration of little progress of mainstream adoption	https://www.wsj.com/articles/cryptocurrency-market-plumbs-new-depths-in-2018-1534241274

Source: coinmarketcap.com as of 8/26/2018.



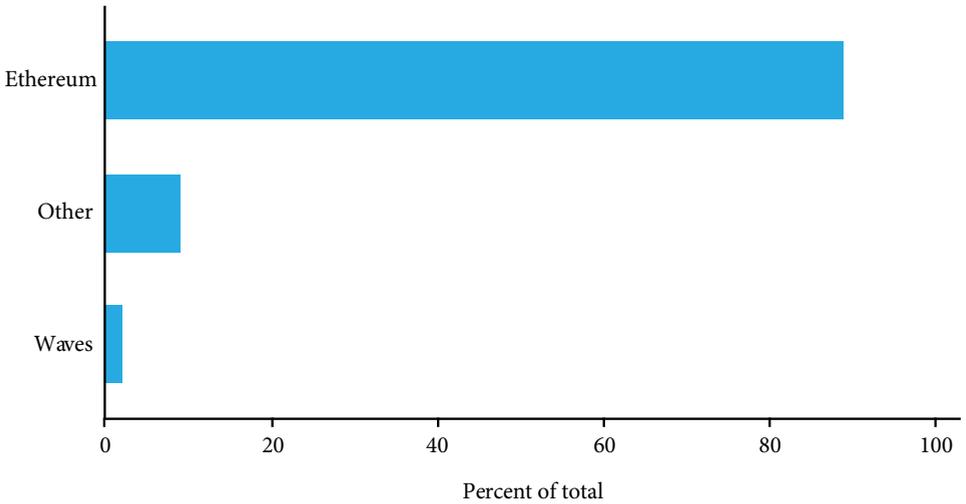
In addition to the accepted currency, there is a choice of which platform ICO issuers use. A firm can accept ether but use another platform such as Waves to issue ICOs. In Figure 5, we show the percent of the ICO universe for each type of platform. Ethereum is by far the most dominant platform with close to 90 percent.

In Figure 6, we plot an ICO market cap where we index January 1, 2017 as 100. The red line is the ICO market cap in U.S. dollars. The difference in volatility of the ICO market and the volatility of ether can be attributed to three different factors. First, it can be caused by the volatility of the underlying cryptocurrency versus the U.S. dollar. Second, the volatility could be caused by greater issuance by some ICOs along with failures of other ICOs. Third, the volatility of the ICO market cap could be due to the volatility of existing ICOs.

Using simple econometric techniques, we disentangle the volatility of the ether market cap, the main cryptocurrency used, from the volatility of the ICO market. We find that the volatility of the ICO market cap is significantly reduced compared to the volatility of ether, as indicated by the blue line in Figure 6.¹⁹

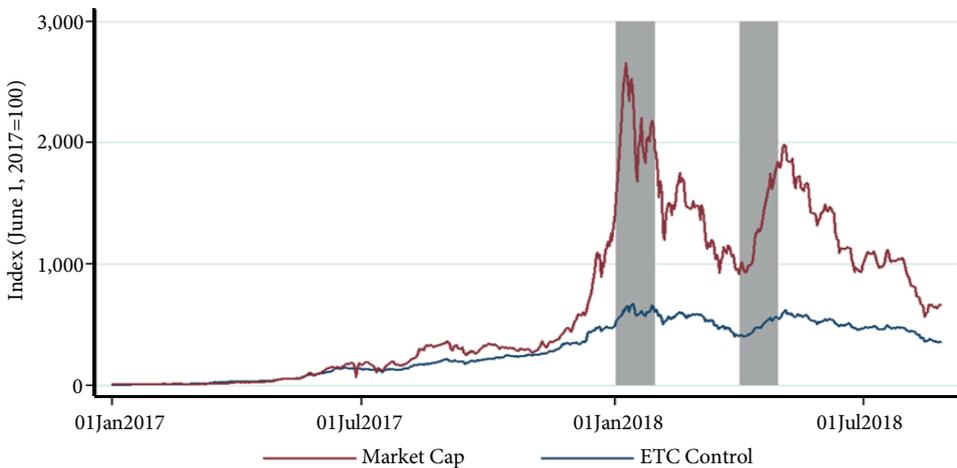
¹⁹ To extract the impact of ether volatility on ICO market cap volatility, we regress the market cap of ICOs on the ether market cap volatility. We then estimate the ICO market cap by subtracting the predicted ether market volatility.

FIGURE 5
PERCENT OF ICOS ON A GIVEN PLATFORM

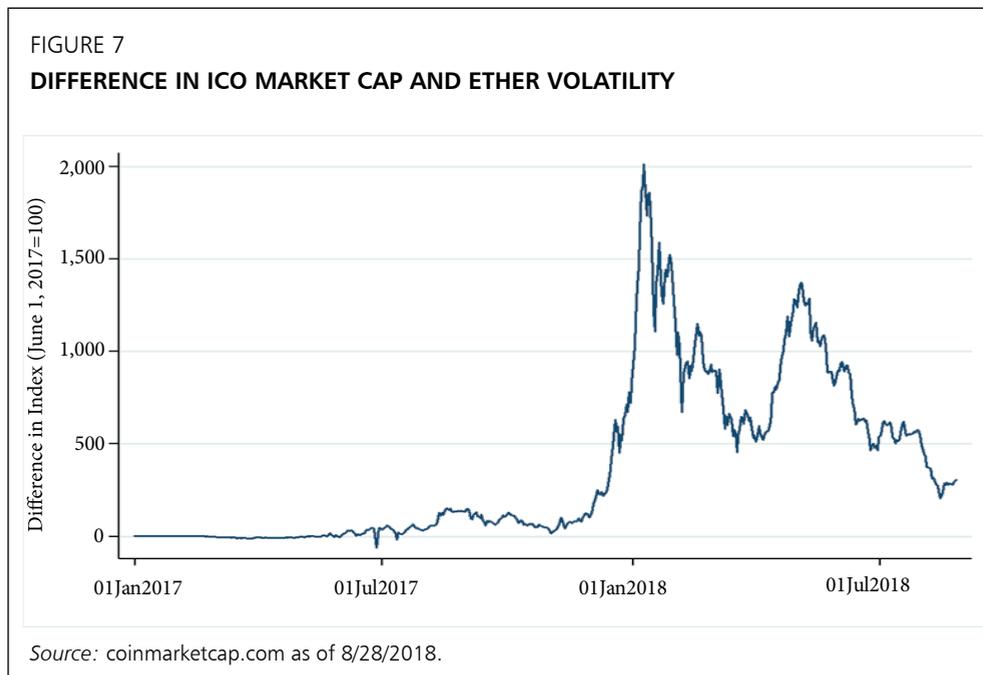


Source: ICObench.com as of 8/28/2018.

FIGURE 6
ICO MARKET CAP VOLATILITY CORRELATED AND UNCORRELATED TO ETHER VOLATILITY



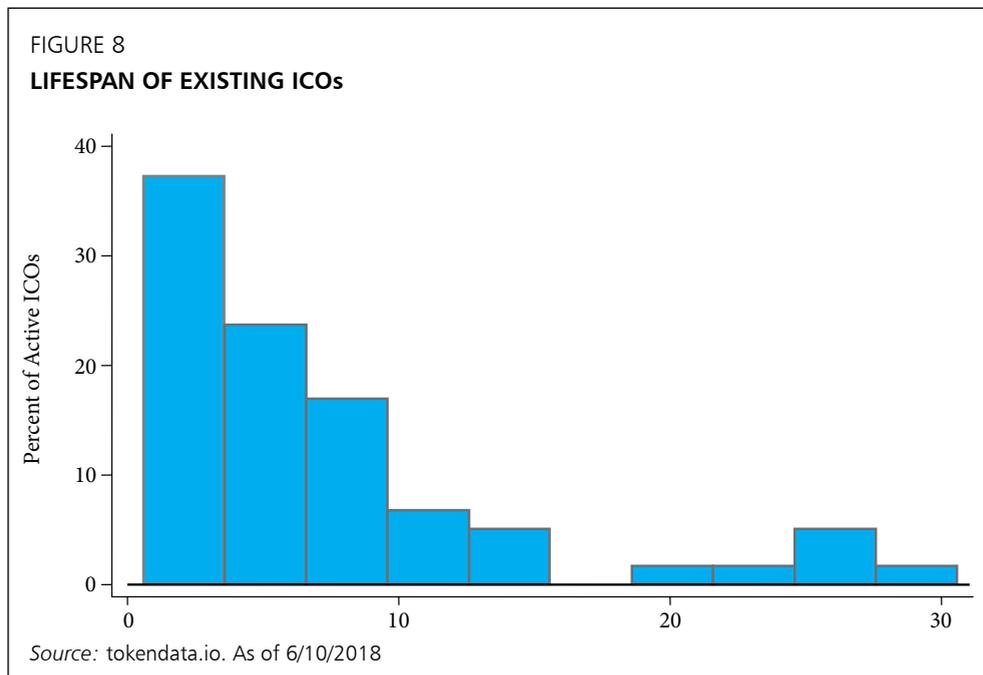
Note: Bars denote months of January and April, 2018.
Source: coinmarketcap.com as of 8/28/2018.



There are two months of rapid rise in the market cap of ICOs: January 2018 and April 2018. In Figure 1, we observe that these months were associated with the greatest amount of funds raised. Thus, the ICO market cap increased partly because of greater number of ICOs being issued. However, the corrected ICO market cap did not rise in June although the highest amount of issuance in terms of dollars occurred in that month because of the \$4 billion raise for EOS.

Figure 7 shows the difference between the two lines plotted in Figure 6. There are periods where there is significant difference and this difference is not constant. In some instances, in addition to the underlying volatility of the cryptocurrency, there is greater issuance of ICOs. Because the increase in demand for ICOs will increase the demand for cryptocurrencies, disentangling the two effects is difficult.

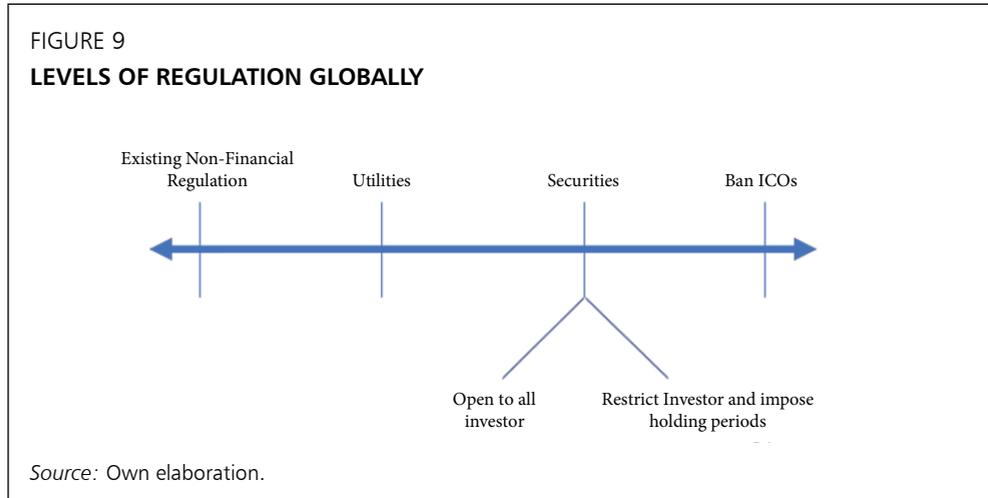
Most ICOs have existed less than a year, as seen in Figure 8. We caution the reader that most ICOs fail, resulting in survivorship bias. Furthermore, in 2018 many new ICOs came into existence. Each vertical bar represents 3 months. Over 50 percent of ICOs have been in existence less than six months and close to 80 percent less than nine months.



V. REGULATION

As with most financial innovations, regulation follows. ICOs are no different. In some countries, there are outright bans on ICOs such as China and South Korea. However, there are discussions to remove the ban in South Korea soon. In other countries, regulators have restricted the issuance of ICOs. Several agencies generally regulate cryptoassets within a country. These agencies may include the central bank, the securities regulator, the anti-money laundering regulator, and the consumer protection agency.

In Figure 9, we diagram the spectrum of the types of regulation. Starting from the left, certain industries such as agriculture, retail, manufacturing may have their own sets of regulations that ICO issuers must adhere to. The second point on this spectrum is that of a utility token where the issuer is selling goods and services in the future or are allowing payment for services in their ecosystem, such as a subway or transit ticket purchased in advance. These are not considered securities generally and do not have to adhere to securities laws. The third point on the spectrum is to regulate ICOs as securities. There are different regulations that depend on types of investors and holding periods along with other characteristics. We show the separation of types of investors below. Lastly, countries may choose to ban ICOs. We do not show in



the figure that countries may ban cryptocurrencies and necessary infrastructure resulting in no active ICO market. In addition, regulators may prevent financial institutions from participating in this market even though ICOs are not banned along with advising its residents to not participate in these markets.

In some countries, regulators and the industry are working together to create a regulatory framework. Some ICO issuers have told us that they would encourage proper regulation sooner rather than later to remove regulatory uncertainty. Regulators have encouraged the industry to engage with them in various jurisdictions. In addition, many ICOs are reaching out to top-notch law firms to assist them to create regulatory compliant ICOs.

Regulation in the United States, similar to other countries, was not swift and tended to follow existing rules. Initially, to circumvent U.S. securities laws, many ICOs were self-classified as utility tokens. In other words, these firms were claiming to merely preselling goods and services similar to Starbucks. Recently, the Securities and Exchange Commission (SEC) stated that almost all ICOs should be treated as securities unless proven otherwise.²⁰ As far as our knowledge, no ICO has been registered with the SEC to date.

In the United States, the Howey test, based on the investors' potential earnings from an orange orchard in Florida and decided by the U.S. Supreme Court in 1946, remains the standard on what constitutes a security. Under the Howey test, an investment is defined as a security if:

²⁰ Recently, the SEC ruled that ether was not a security.

- It is an investment of money;
- There is an expectation of profits from the investment;
- The investment of money is in a common enterprise; and
- Any profit comes from the efforts of a promoter or third party.²¹

If the Howey test is satisfied, then the security must be registered with the SEC unless it falls under an exemption. There are several exemptions that fall under Regulation D (Reg D) of the U.S. Securities Act. These exemptions are private placements with limits on the characteristics of investors (accredited versus unaccredited), amount that can be raised, and lock up periods.²² Many firms use the Reg D exemption for issuing ICOs in the United States.

For comparison purposes, we provide a brief overview of some countries. A common theme emerges across regulatory agencies: more regulation and cautious monitoring of market developments. We examined the following countries and their regulations:

- *United Kingdom* – the Financial Conduct Authority determined that ICOs may be regulated as securities but some ICOs may fall outside of the regulated purview. In addition, other ICOs may be introduced in a regulatory sandbox without being licensed.
- *Switzerland* – the government including at the canton level is trying to attract ICOs. However, FINMA, the financial watchdog is keeping a close eye on market developments.
- *Russia* – ICOs are not banned but the government recently issued five orders to make it difficult to raise funds through ICOs. In addition, the Ministry of Finance introduced a draft federal law to regulate ICOs. Finally, the government increased disclosure details.
- *Singapore* – the Monetary Authority of Singapore has issued guidelines for determining when ICOs are considered securities. ICOs may be considered as securities if the tokens are capital market products under the Securities and Futures Act.

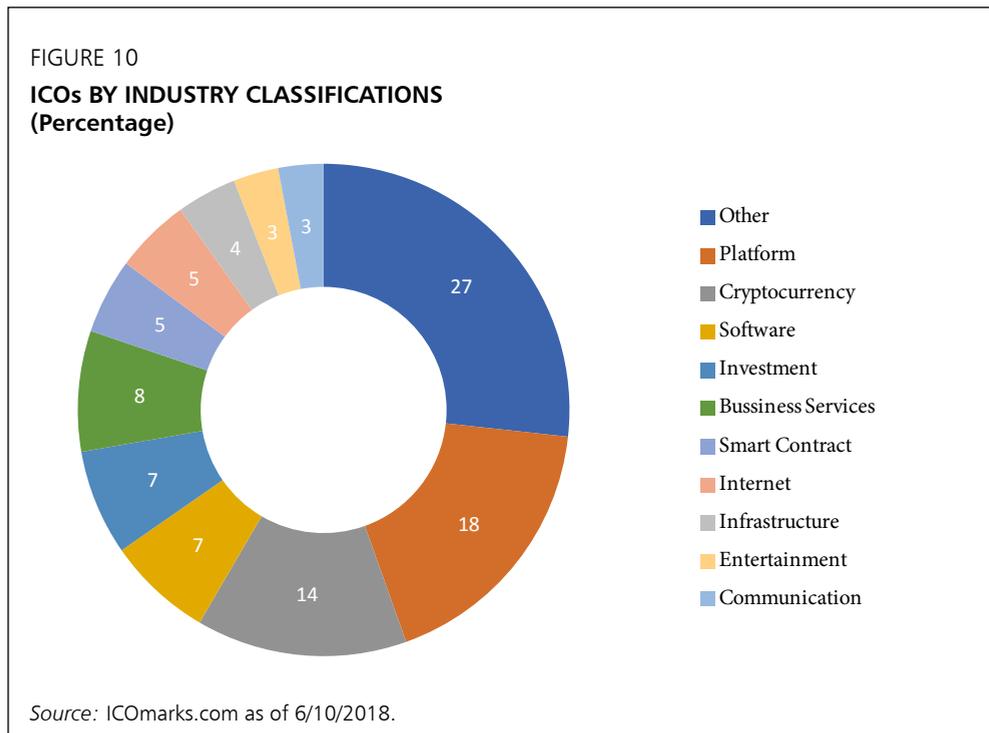
²¹ See FindLaw.com (accessed on 8/6/2018).

²² Accredited investors in the United States are those that have incomes that exceed \$200,000 per year in each of the two preceding years and expectation for the same in the current year or net worth above \$1 million according to SEC Office of Investor Education and Advocacy.

- *The European Union* – the European Security Markets Authority warned investors of the risks of investing in ICOs and warned firms involved in ICOs to adhere to regulatory and licensing requirements. Countries within the European Union differ in their approach to ICO regulation.
- *Spain* – ICOs are not regulated directly but depending on the industry, ICOs may need to follow certain regulations. Some press reports suggest that the government would like to encourage ICOs (see Duarte, 2018).
- *France* – based on comments to a consultation paper on ICOs, the majority of the public and entrepreneurs preferred specific ICO regulation (see Arika, 2018).

VI. CASE STUDIES

In this section, we focus on specific ICOs. First, we discuss various ICOs which are intended to improve the underlying infrastructure that can be used by decentralized apps. Second, we discuss a few other types of industries.



The types of industries issuing ICOs are extremely broad. Unfortunately, it is beyond the scope of this report to cover all the different types. We illustrate the diversity in Figure 10. While it is difficult to categorize ICOs and some may fall into more than one category, this figure illustrates the high level of diversity. With improvements in underlying technology, we expect the types of industries issuing ICOs to continue to expand. In the rest of this section, we provide some examples to illustrate lessons learned and the challenges that remain.

1. Ethereum

Ethereum was founded by Vitalik Buterin in January 2014. Ethereum enables access to a world computer called the Ethereum Virtual Machine (EVM), a shared computer where anyone is able to see any programs running on the platform from anywhere.²³ Developers are able to write applications that operate on the decentralized computer in exchange for ether, Ethereum's native currency.

This platform allows for greater ease in expanding the types of decentralized actions including non-monetary transactions, financial derivatives, identity and reputation systems, decentralized file storage, and decentralized autonomous organizations.²⁴ Bitcoin is a more protected system in terms of information flow and types of transactions by design because of its primary focus on hosting a decentralized currency.²⁵

A key aspect of the Ethereum platform is the ease of integration of smart contracts, state contingent contracts that have different payouts in different states. One of the simplest examples of a state contingent contract is an insurance contract. For an insurance contract, if a bad event happens, the insurer pays out based on the specific event subject to the terms of the contract. If a bad event does not happen, there is no payout. These contracts are written into the computer code and payouts are triggered when certain events occur. The Ethereum white paper describes this advantage: "A blockchain with a built-in Turing-complete programming language, allowing anyone to write smart contracts and decentralized applications where they can create their own arbitrary rules for ownership, transaction formats and state transition functions."

To raise funds, Ethereum had a 42-day presale of ether from July 23, 2014 to September 2, 2014. Ether was sold in the range of 1,337 to 2,000

²³ Much of the historical description of Ethereum is taken from Burniske and Tatar (2018) chapter 5.

²⁴ These were some of the applications listed in the Ethereum White Paper downloaded on July 6, 2018.

²⁵ For a comparison of Bitcoin and Ethereum, see Thobhani (2018).

ether/bitcoin under the supervision of Ethereum Foundation based in Zug, Switzerland. Ethereum raised 31,591 bitcoin at the time worth close to \$18.5 million (approximately \$198 million based on bitcoin's price on August 8, 2018). At the time the value of ether was \$.31 whereas it is currently worth around \$359 according to coinmarketcap.com on August 8, 2018. According to the Ethereum white paper, the profits from this sale would be "used entirely to pay salaries and bounties to developers and invested into various for-profit and non-profit projects in the Ethereum and cryptocurrency ecosystem" as cited in Burniske and Tatar (2018).

Ethereum was launched a year after the presale closed. A key part of the launch was creating a community that was involved in the development of the platform which is a model that has been replicated by others. In addition, the Ethereum foundation battle tested its network through formal security audits and grassroots bounty programs (Burniske and Tatar, 2018: chapter 5).

As with Bitcoin, scalability was a major concern with Ethereum since every transaction needs to be updated by every node in the network. To utilize Ethereum for regular business activity, the number of transactions per second would have to increase significantly. To achieve such increase, a less decentralized approach may be necessary.

2. EOS

Block.one, based in the Cayman Islands and led by Brendan Blumer and Dan Larimer, tackles the limitations of current blockchains to provide developers and end-users better ability to contract together on large-scale businesses. Block.one has created EOS, a self-governing blockchain that greatly improves performance of existing blockchains. The EOS.IO Technical White Paper v2 (EOS white paper) (2018) describes its software as providing accounts, authentication, databases, asynchronous communication, and scheduling of applications across many of CPU cores or clusters. Grigg (2017) suggests that popular use cases for the EOS blockchain include: supply chain management, resource management, user-messaging such as social media, asset issuance and trading, accounting for remittances, and gaming.

EOS improves upon scalability by increasing the 15 transactions per second speed of Ethereum. The EOS white paper (2018) claims the resulting architecture may eventually scale to millions of transactions per second and eliminate user fees. Other platforms, such as BitShares decentralized exchange and Steem social media platform, have attracted large number of daily active users by performing thousands of transactions per second or greater according to EOS.IO Technical White Paper v2 (2018).

The increase in speed results from a new decentralized consensus algorithm known as delegated proof of stake (DPOS). Token holders on the EOS blockchain continuously elect block producers. Blocks are produced every half second and only one producer can produce a block from 21 producers that are elected for a given length of time. In comparison, Grigg (2017) describes the Bitcoin proof of work where all parties hold a complete ledger and there is a lottery among many miners who mine each block. Bitcoin miners compete for lottery tickets by solving Secure Hash Algorithm 2 (SHA2) puzzles.

Block.one raised over \$4 billion through its year-long token presale, making it the largest ICO raise to date ahead of Telegram Group's \$1.7 billion raise.²⁶ However, U.S. residents, citizens, and entities along with Chinese investors are not allowed to participate in EOS. In addition, investors must agree that they "do not have any rights, uses, purpose, attributes, functionalities, or features" (see Vigna and Rudegeair, 2017). Moreover, EOS tokens are non-transferable (see Bullock, 2018). For 2018 so far, EOS is only behind one or two IPOs in terms of dollar value raised. EOS tokens were sold for ether mainly through daily auctions over the year.

Block.one no longer has ownership of the platform. After the June of 2018 launch, the company discontinued developing the platform. However, the lack of control led to some disagreements among the more than 200 volunteer developers working on the launch. On August 28, 2018, EOS' market cap was at \$5.3 billion which is significantly less than its peak of \$17.7 billion on April 28, 2018 according to coinmarketcap.com.

3. The DAO (Decentralized Autonomous Organization)

One of the early tokens that resided on the Ethereum network was the The DAO short for decentralized autonomous organization.²⁷ The concept behind The DAO was to allow holders to vote on projects. Winning project developers would receive funds for their projects. The DAO raised over \$168 million which was held in 11.5 million ether which accounted for 15 percent of the ether created at that time.

On June 17, 2016, there was a major hack on The DAO resulting in the hackers controlling 3.6 million ether –about a third of the ether that was committed to the project– almost bringing down the Ethereum network. This

²⁶ Figures for EOS are based on the following news stories: Vigna (2018a and 2018b), Vigna and Redegear (2017), and Bullock (2018).

²⁷ Burniske and Tatar (2018) discuss The DAO in chapter 5.

hack was caused by a flaw in The DAO software. Buterin, founder of Ethereum, and others stepped in to reverse the hack. They ended up using a hard fork, a radical change in the protocol invalidating previous transactions, to return funds to their rightful owners. However, forks are frowned upon by the community because a key feature of crypto transactions is immutability which eliminates the need for a central authority. The hard fork has resulted in two Ethereum networks—Ethereum Classic (the original network) and Ethereum (the newer network). The question remains: Can self-regulation address such risks or is government intervention necessary in some states of the world?²⁸

While The DAO failed, there are some critical lessons that were learned. First, before going public, make sure the code for new tokens is safe and secure beyond being able to be hacked. Second, the creators of Ethereum and The DAO worked together to make investors whole suggesting some governance structure may be necessary for certain instances. Third, hard forks have costs and may lead to greater regulation and oversight by public authorities which is not desired by the crypto community.

4. Filecoin

On September 7, 2017, Filecoin ended its initial coin offering of FIL with more money raised than any other ICO before it. It raised \$205 million in a little less than a month, with an additional \$52 million collected in a presale (see Higgins, 2017). The goal of Filecoin is to create a cloud storage system that uses an “algorithmic market” concept to match clients (those that want to store files) with miners or storage providers.

The actual token –Filecoin– functions within an ecosystem that encrypts files for users. Essentially, users pay a small fee to store a file that they wish to upload on to the Filecoin exchange. Miners set prices in a competitive market for the right to store the encrypted file. Once a bid and ask are matched, the file is encrypted and the key is stored on the blockchain, which can only be accessed by the user. Miners are paid for the files they store and receive additional newly minted coins as rewards, proportional to the storage they provide.²⁹

According to Filecoin’s whitepaper, the mining protocol works on a novel concept called “proof-of-spacetime.” In crypto mining, most tokens use either proof of work or proof of stake protocols. The proof of work protocol, used by Bitcoin, requires miners to solve complex mathematical problems to verify

²⁸ Too Big to Fail is an example of the state of the world where government intervention is the perceived best option ex post for certain states of the world although policymakers try to limit the probability of these states of the world.

²⁹ Filecoin Technical White Paper.

transactions. The first miner to verify a transaction is rewarded. Proof of stake, used by Ethereum, determines mining power by the amount of cryptocurrency held. Filecoin's protocol is similar to proof of stake, however instead of mining power determining how much Filecoin a miner holds, it is based on the storage they have available. As the storage that miners have increases, the higher fees that they are able to collect.

Filecoin is an example of a utility coin meant to work within a specific ecosystem. Generally, these tokens are only meant to work within a certain system and are not intended to increase in value over time. Filecoin is attempting to create a marketplace that provides miners with excess storage capacity incentives to rent it to people who need secure storage.

5. Dogecoin

On December 8, 2013, Dogecoin, based on the Japanese Shibu Inu breed of dog and which became a popular Internet meme, was created as joke. Jackson Palmer, who worked in Adobe's Sydney marketing department, tweeted, "Investing in Dogecoin, pretty sure it's the next big thing" (for details, see Burniske and Tatar, 2018; Wile, 2013) Upon seeing this tweet, Billy Markus, who wanted to create his own cryptocurrency, contacted Palmer and created a partnership that created Dogecoin.

The purpose of Dogecoin's ICO was not clear in the beginning but has evolved. Initially, it was used for tipping on social media sites such as Reddit and Twitter instead of giving a like. In addition, Dogecoin was used to fund special events such as sending the Jamaican bobsled team to the Olympics (\$50K), sponsor a NASCAR driver with the Dogecoin logo at Talladega Speedway (\$55K) and raised money for the Kenyan clean water projects. Its market cap grew to \$70 million in only seven weeks after launch.³⁰ On August 28, 2018, Dogecoin's market cap was around \$301 million with around 116 billion Doge in circulation according to coinmarketcap.com. With a good marketing campaign and active community support, ICOs can survive even if their mission is not clearly stated.

6. Munchee

Munchee, Inc. created a token to reward restaurant reviewers. These tokens, called MUNS, could be redeemed at any participating restaurant for food. A month before the planned launch of their ICO, Munchee released a

³⁰ All historical data on Dogecoin and its investment projects are from Burniske and Tatar (2018), chapter 5.

whitepaper where they claimed their token was a utility token and not a security token. Therefore, its token was not subject to U.S. securities laws.³¹

The SEC disagreed and stated that Munchee token holders had a reasonable expectation of profits from their investment in the future and therefore, stated the tokens were securities. Munchee shut down its ICO and returned 15 million dollars to the MUN token investors. According to the SEC's cease and desist letter sent to Munchee on December 11: "Even if MUN tokens had a practical use at the time of the offering, it would not preclude the token from being a security. Determining whether a transaction involves a security does not turn on labelling—such as characterizing an ICO as involving a "utility token"—but instead requires an assessment of "the economic realities underlying a transaction" (see U.S. SEC, 2017).

The SEC's shut down of the MUN ICO sent a message to the market. ICOs cannot simply circumvent securities regulation by calling their token a "utility" and must be compliant with securities laws going forward if they pass the Howey test. The SEC is willing to work with companies to issue compliant ICOs. They decided not to fine Munchee despite their lack of compliance. In a statement released the same day as Munchee's cease and desist letter, SEC chairman Jay Clayton (2017) warned about the risks posed by a new market but encouraged main street investors to "be open to these opportunities, but to ask good questions, demand clear answers and apply good common sense when doing so."

7. Property Coin

Aperture, a firm based in El Segundo, California, buys distressed properties and sells the same properties after refurbishing them. Seeing an opportunity to capitalize on an emerging market, Aperture set up Property Coin, or PCX. Figure 11 shows the funds raised from property coin, which are used to buy houses that require updating or repairs and are later resold at a profit: commonly referred to as flipping. The profit from flipping homes is reinvested to grow the fund created by PCX investors. The tokens are backed by the properties purchased and the profits are reinvested into other properties.³² Investors are able to cash out a portion of the fund's gains by selling the tokens.

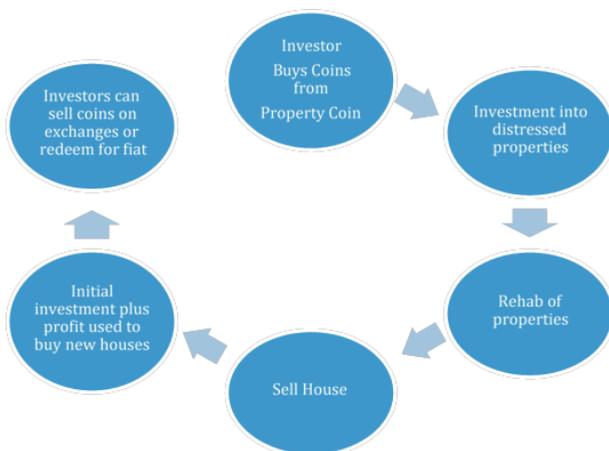
Unlike most ICO issuers, Aperture fully embraces the security token label.³³ Quoting their white paper: "Property Coin is a security token, and that's ok with

³¹ As discussed above, the Howey test lays out a simple framework for determining whether a financial asset falls under the definition of a security. For more information, see Coinist (visited 2018).

³² Property Coin Technical White Paper V1.2.

³³ See Pymts.com (2018) for greater discussion on ICOs trying to circumvent U.S. securities laws.

FIGURE 11
PROPERTY COIN INVESTMENT AND EXIT CYCLE



Source: Based on authors' interpretation of property coin's description on its website.

us! We firmly believe that security tokens, like Property Coin, will be the future of both the traditional securities markets and token markets.”³⁴ Compliance with securities laws also removes the regulatory uncertainty that has been associated with some utility tokens receiving cease and desist orders. Many tokens have used Simple Agreement for Future Tokens (SAFT) agreements to sell tokens, but the SAFT framework is facing increasing regulatory scrutiny (see Batiz-Benet, Santori and Clayburgh, 2017; Kaplan, 2018).

VII. CHALLENGES

As with any new financial products, there are challenges. In this section, we touch upon a few of these challenges. First, a key aspect of cryptocurrencies and ICOs is decentralization. The example of the hack of The Dao and the subsequent Ethereum fork that we discussed above illustrates that sometimes a central authority may be necessary to act swiftly to correct a bad outcome. The issue of governance cannot be ignored in a decentralized system. Who sets the rules and adjudicates when things go wrong? We are optimistic that there exists a compromise in terms of the level of decentralization and necessary governance structures.

³⁴ Property Coin Technical White Paper V1.2 (pg. 9).

From a technological perspective, complete decentralization has high costs in terms of transaction speed although there are continuous improvements on this front as well. Delegated proof of stake protocol may provide a compromise that allows for the benefits of decentralization while having a delegated system. However, to reduce the risks of bad actors controlling some key aspects of the network because of a more concentrated decision making structure, disincentives are being developed to impose high costs on actions detrimental to the system.

Second, while one of the greatest benefits of ICOs is the ability to raise funds globally, there remains a lack of global standards regarding these new financial products. Furthermore, determining legitimate firms from fraudulent ones is difficult. As a result, some countries such as China and South Korea have banned ICOs because the risks that they pose.

Third, innovations in financial markets generally integrate into existing infrastructure at some level. Many incumbent firms have dismissed the crypto market altogether although the larger financial institutions are closely monitoring developments and, in some instances, entering the market and are becoming significant players. Furthermore, many financial institutions are reluctant to be associated with firms that raise funds through ICOs or trade cryptocurrencies.³⁵ For this market to become mainstream, existing infrastructure such as payment and settlement systems that are needed to convert fiat currency to cryptocurrencies and vice versa should be seamless.

Fourth, for various reasons, ICO markets are not very liquid. Exchanges that allow for ICO trading improve liquidity generally. We spoke to an U.S. ICO exchange that is SEC compliant that told us that no trades had occurred on their exchange because there were no Regulation A compliant ICOs and most ICOs that were Regulation D compliant were still in their year lock up period. In addition, custodians that hold ICOs would enable greater ease in trading and settlement reducing transactions costs. Some participants would prefer not to hold these assets directly.

Fifth, another key part of financial markets is who gets paid and who does not in bankruptcy. Shareholders of the firm are residual claimants meaning that if there is anything left after other firm obligations are paid out such as payroll and debt, shareholders would be paid. Where would ICO owners be in the bankruptcy line? Would these tokens have residual value even if the issuer is bankrupt?

³⁵ In our discussion with ICO issuers, we learned that prospective ICO issuers were denied access to financial services by banks.

Sixth, clearly, the volatility of cryptocurrencies along with the ICOs themselves is a concern for investors and regulators alike. Futures contracts that are currently offered on certain exchanges can offer more stability. However, these markets remain thin. Despite these concerns, large traditional financial market players are starting to enter these markets.

VIII. CONCLUSION

While it is difficult to predict the future, ICOs are here to stay although the form and function along with its regulation will evolve. The immutable recording of transactions on decentralized systems offers the potential to disintermediate centralized institutions such as banks, and retail and supply-chain platforms. However, there are underlying risks with any new asset class. The challenges of protecting unsophisticated investors, managing systemic risks, and resolving a new class of disputes remain challenging. As the Internet has proven, open systems provide greater opportunities for innovators, consumers, and businesses although there are always growing pains.

ICOs offer an alternative to raise capital using state-of-the-art technology that promises to provide more accessibility globally with less intermediation resulting in greater efficiency and transparency. However, the rules of the road are still being established and global cooperation will be necessary. As with any technology, there will be bad actors looking to exploit chinks in the armor. With cryptoassets broadly being community based in which power is not concentrated, it would be in their best interest to prevent nefarious actors from causing harm. However, the ideal of self-regulation may prove to be difficult and greater oversight by public authorities may be necessary especially in terms of transparency, protecting unsophisticated investors, and containing systemic risk.

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DATA APPENDIX

Data was taken from multiple websites using web scrapers. All observations are as of August 26, 2018. Different websites were used because ICO data is not aggregated in one common database. For example, coinmarketcap.com has data on token price over time, while ICOmarks.com has information on the country of origin. Unfortunately, these websites often contain different samples of ICOs and while we are confident we have data that covers a large portion of the universe of ICOs, it is impossible to tell how large that universe is.

ICOmarks.com has data for 2,700 ICOs across the globe. 2,430 ICOs have country of issuance identified. Country data should be considered with caution however, as ICOs are not usually meant for a single country and do not always need to go through a registration process. 437 ICOs have total amount raised data. The low amount raised observations is because they only report for ICOs that have ended their ICOs and still have tokens outstanding.

Similarly, Tokendata.io contains data for 2,186 ICOs and ICOdata.io contains information on 1,896 ICOs. Tokendata.io gives the status of each ICO, of which 3.34 percent are active, 10.21 percent are planned, 16.98 percent failed, and 69.47 percent met their funding goals and are still in operation. The website also provides information on amount raised and the return of a token, with 42 percent of observations having a negative return. ICOdata.io holds information on both circulating supply and total supply of tokens. The ratio of circulating supply to total supply is important to a token as it gives investors an idea of where the token is in its life cycle and how much is left to mine or held by the development team.

For our time series data, we used coinmarketcap.com, which is as close to an industry standard as there is. It provides price, market cap, and trading volume for currently trading tokens, which means they are not included if they are in the active stage or are not trading on an exchange, so only 686 tokens are listed. However, it is the largest aggregator of crypto time series data. They also list the price of each token in ether and bitcoin.

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