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Was the ICO boom just a sideshow of the Bitcoin and Ether Momentum?

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ABSTRACT

We investigate whether the market for ICOs in 2017–2018 and 2021 showed signs of contagion from prices of Bitcoin and Ether. During phases of optimism, ICO daily returns display low correlations with those of Bitcoin or Ether. But when the bubble bursts, correlations jump to very high levels, signaling that the ICO market becomes a sideshow of the cryptocurrency dynamics. We demonstrate that this high correlation was not present during the Nasdaq bubble in the 1990s, signaling that the price dynamics of digital tokens seems to be driven by a common factor, much more than in previous bubbles.

1. Introduction

Initial coin offerings (ICOs) were born as distant relatives of the Bitcoin family. They shared with the cryptocurrencies much of the technology of blockchain and they shared the motivation to decentralize and disintermediate parts of the financial sector. At the same time, ICOs and cryptocurrencies were very different. Bitcoin and other cryptocurrencies were created to substitute one "business model", central banks. ICOs were created as crowdfunding vehicles for very different business ideas and as a better way to fund new ventures. They could be in the platform/technology area but did do not have to be: ICOs were issued in industries ranging from health care to education, energy, and mining. Thus, each ICO should be very different from the other ICOs and behave differently from others in the world of cryptocurrencies.

This paper investigates whether there was any "contagion" from Bitcoin and Ether prices to ICO prices. We study the correlation between the largest (50) ICOs issued in 2017/18 and the price of Bitcoin and Ether. We find that ICO returns initially did not correlate highly with Bitcoin and Ether, but this changed during the 2017 Bitcoin boom and bust: In this period the correlation between Bitcoin or Ether returns and ICOs returns jumps to levels as high as 0.8 and stays there during the Bitcoin lull of 2018 to 2020. Then the pattern

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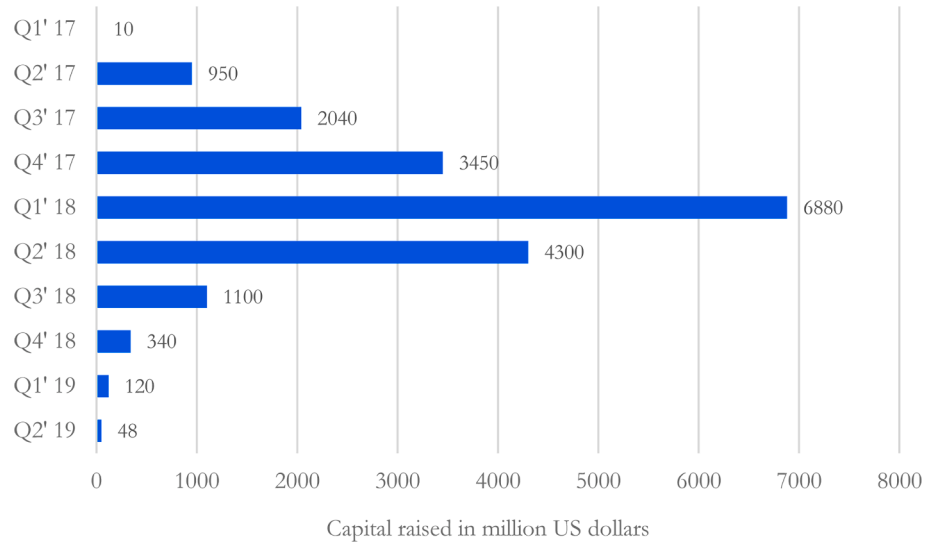

Fig. 1. ICO Issuance in 2017–2019.
Source: https://www.statista.com/statistics/804748/worldwide-amount-crytocurrency-ico-projects/

Table 1
Largest ICOs by amount raised in 2017–2018.

ICO Name	Amount Raised (millions USD)	Start Date
EOS	$4,197.96	Jun 26, 2017
Telegram ICO	$1,700.00	Feb 28, 2018
Petro	$735.00	Feb 20, 2018
TaTaTu	$575.00	Jun 11, 2018
Dragon	$420.00	Feb 15, 2018
Hdac	$258.00	Nov 27, 2017
Filecoin	$257.00	Feb 15, 2018
Tezos	$232.00	Jul 1, 2017
HetaChain	$190.05	Oct 1, 2018

Source: https://bitni.com/site/coin-schedule/stats/.

repeats in the second Bitcoin price rally and fall of 2021. This suggests that the dynamics of price discovery were relevant only during times where investors are excited and optimistic about the success of these new technologies, not in times of pessimism and fall in the price of Bitcoin and Ether. We find that ICOs' returns do not exhibit a similar correlation with the S&P500, the Nasdaq or gold. Ratings data show some signs of discrimination between the quality of (a constant panel of) ICOs, which might be a sign of a slowly maturing market.

This paper contributes to the literature on ICOs an additional reason for their limited success as an asset class, namely that they acted largely as surrogates of Bitcoin and Ether and were driven by the dynamics of the large cryptocurrencies.

The paper is structured as follows: The next section traces the development of the ICO market, the third section reviews the literature on ICOs, the fourth section presents our results and the fifth concludes.

2. A short history of the ICO market

The first ICO was launched in 2013, called Mastercoin (later renamed Omni) but the market only took off in 2017 and in the early days it seemed to have only one direction, namely upward. Issuance peaked in June 2018 at above 6 billion US dollars (USD) and since then has been very subdued. Nevertheless, since 2016 more than a thousand new coins or tokens were created through ICOs raising over 31 billion USD (See Fig. 1). The two largest ICOs (pre-sale), Telegram and EOS raised 1.7 and 4.2 billion USD, respectively, and the next three largest were all more than 500 million (see Table 1). However, the failure rate of projects was high, and the vast majority of the projects never even reached the point where they could be actively traded on one of the cryptocurrency exchanges.

While ICOs were competing with venture capital or angel investors, in practice ICOs often tapped into funding from smaller private investors. ICOs could be an alternative way of raising funding from a wider public at a stage when the project is only an idea. In principle, they should have the advantage that they are liquid from the start if the coin becomes listed on an exchange. This contrasts with traditional venture capital where the investment is usually illiquid for several years until there is an Initial Public Offering (IPO) or a sale of the business.

ICOs start by explaining the idea in a white paper, which can be very brief and generic or very specific, and to announce the sale of a new coin to investors. Coins can then be purchased on a website of the issuer and the buyer receives them into her wallet. There are two types of coins called security tokens and utility tokens. Security tokens offer participation in governance and future earnings and are thus more akin to equity. Regulators have increasingly taken the view that the issuance of these tokens should be subject to the same regulations as securities, which face high regulatory costs. To avoid potential regulation, most of recent ICOs have been of the utility token type where no ownership or dividends are granted to token holders. Utility tokens promise their holders access to future services of the venture. Most of the projects are about building a platform that requires a community of users that trade certain services (for example, Filecoin is a platform to sell decentralized electronic storage services). Therefore, in theory, the ICO not only creates the funding of the project but also the network of dedicated future users of the platform.

In the initial boom of ICOs hundreds of projects were being launched and advertised to consumers, many of them with unrealistic business models. In fact, fraud was prevalent due to the combination of hype around Bitcoin and blockchain and the complete lack of transparency. Based on a 5-page white paper it would have been impossible for most buyers to evaluate whether the project was backed by a valid business model. It was literally a wild west in which projects without any substance, not even a team member identification or legal entity could raise millions. It is hard to get reliable studies on ICO fate in those early days, but most reports point to failure rates around 80 %. A 2018 study by the Satis group for Bloomberg suggests that 78 % of the ICOs were "scams" and only 15 % were being traded but about half of them were barely active or dwindling.[1] The vast majority of ICOs did not manage to be listed on an exchange and therefore the buyers of the coin had no choice but to hold on to them.

To help guide investors though this maze, several rating sites emerged that offer qualifications to new projects along several dimensions. For instance, ICOChamps rates new ICOs by a hype factor, a risk factor, and the expected profitability.[2] In fact, a large number of rating agencies for ICOs emerged in the boom time, which meant that investors faced the higher order problem of choosing the right rating site.[3]

As the market grew, exchange platforms (i.e., sites where coins and cryptocurrencies are traded) started in 2018 to partner with good projects and offer them direct access and distribution of coins through an initial exchange offer (IEO). IEOs are similar to ICOs but they are directly listed on a virtual asset exchange. The advantage of IEOs is that they should serve as a filtering device since the exchange is partly committing its own reputation to the project. Conversely, projects that want to differentiate themselves and are serious would choose to benefit from the credibility of the exchange and partner in an IEO.[4]By far the largest IEO was in 2019, (Bitfinex, 1 billion USD) but otherwise IEOs have remained very small, mirroring the ICOs. In April 2022 there were only 2 IEOs.[5] IDOs (Initial Decentralized Exchanges or IDEXOs) were introduced in 2019. With an ICO, tokens are sold before listing on exchange. With an IDO, the coins are launched via Decentralized Exchanges (DEXs) and are immediately listed. The largest IDO at the time of writing was BitDAO, which raised 379.3 million USD in 2021. The next five largest IDOs raised 73.3 million USD so the total funds raised are again not that large.[6]

With an increasing scrutiny of regulators such as the US *SEC* taking the view that ICOs should be treated like securities, the next innovation was Security Token Offerings (STOs). The idea of STOs is to comply with all regulatory requirements in order to be able to offer an investment contract under securities law. STOs can be debt or equity assets. The difference with ICOs is that STOs represent a claim on an asset or a new business idea (they are "asset backed"). The regulatory constraints on STOs have made them closer to standard securities and limited the possibility of regulatory arbitrage.[7] Thus STOs are very distant relatives of ICOs and IEOs. While the latter were created to disrupt venture funding, STOs are issued by many established firms like Tesla, Moderna and Société Generale.[8]

These methods are used to fund projects in a wide number of industries. If markets are efficient, tokens should be priced according to the potential of the project being funded as well as the prospects of its industry. As shown below, in practice their pricing is affected heavily by the prices of Bitcoin and Ether when prices are falling.

3. Literature on the rationale for ICOs

There is a small literature that studies the characteristics of ICOs both from the perspective of corporate finance and from the perspective of ICOs as an asset class.

ICOs have some relationship with P2P lending and crowdfunding. P2P lending also promises to reduce intermediation costs and help savers access a more favorable return while keeping the cost of borrowing down. At the same time, ICOs are closely related to crowdfunding platforms, because in both cases the investment is linked to the use of the company's product in a way that helps companies and markets better gauge the potential demand for the service and it also creates a degree of customer commitment (Howell, Niessner, and Yermack, 2020 and Cong and He, 2019).

Another feature of ICOs is that they can fund Decentralized Autonomous Organizations (DAOs). These are decentralized firms on

[1] See https://research.bloomberg.com/pub/res/d28giW28tf6G7T_Wr77aU0gDgFQ.
[2] See https://www.icochamps.com/ico/ongoing.
[3] See https://www.trickyenough.com/top-reliable-ico-rating-sites/.
[4] https://medium.com/@konstantin_98196/are-ieos-the-new-icos-what-is-an-initial-exchange-offering-ieo-c1aa76a8aac4.
[5] https://coinmarketcap.com/ico-calendar/.
[6] See https://news.cryptorank.io/top-6-idos-by-amount-of-funds-raised/.
[7] See https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/audit/deloitte-cn-audit-security-token-offering-en-201009.pdf.
[8] https://stomarket.com.

multiple computers in different locations that can operate without human intervention. If one computer has technical problems or is eliminated this does not prevent the firm from operating. This kind of firm has arguably not existed before. They have the interesting feature that they do not require governance protocols and keep operating as the computer programs they are based on specify (Karjalainen, 2020).

Utility token sales – like crowdfunding – promise investors who fund the development of the project access to future services and product. However, in the case of utility tokens there is always the question about the commitment of the number of tokens or the price of the service (both of them related). The lack of a credible commitment technology could reduce the potential additional funding that the business might need and undermine the value of the ICO (Catalini and Gans, 2018).

While crowdfunding aims at funding new venture using traditional fiat currencies the novelty of ICOs is that they promise "exclusive" access to a service that is restricted in use by holders of a new currency, called a token. For users of the platforms, tokens are the only way to purchase the service. But because demand is uncertain and possibly increasing as the venture becomes successful, holders of tokens can obtain returns through increases in the value of the token.

Why is a new currency or token needed? Many ICO projects are related to platforms with strong network effects. By having investors committing to be also customers, it can create the necessary critical mass to make the project successful (Li and Mann, 2018). That's what we observe empirically, as many ICOs are willing to underprice tokens in the initial phases with the hope of creating the necessary liquidity and critical mass (Momtaz, 2020). Underpricing also provides the incentives for the promoters of the project to finish the creation of the firm provided they retain a large enough proportion of the coins. A second reason why tokens might be needed is that these platforms need to engage in transactions. Incorporating payments using regular currencies requires integration with payment networks which can be cumbersome and costly. Using a token created via a standard platform (such as Ethereum) allows for the immediate and almost costless creation of the necessary payment infrastructure.

As noted above, the success rate of ICOs has been slim. Howell, Niessner, and Yermack (2020) provide evidence that successful ICOs have characteristics that are similar to successful projects that raise funds using alternative methods, reporting that "liquidity and trading volume are higher when issuers offer voluntary disclosure, credibly commit to the project, and signal quality". Similarly, Adhami, Giudici, and Martinazzi (2018) show that ICO's success is higher when they are more transparent both about the code and the benefits it provides and when the presale is properly structured. Amsden and Schweizer (2018) also identify a set of factors that are correlated with success. Among them is less venture uncertainty, better connected founders, and larger team size. On the other hand, Fisch (2019), using a similar methodology, finds mixed results.

4. Correlation of ICO returns with cryptocurrencies, equity, and ratings?

The ICO boom of 2017–2018 took place at a time when enthusiasm for Bitcoin was accelerating. Given the strong connection between the technology behind the ICOs and the world of cryptocurrencies, one of the hypotheses was that investors' appetite for ICO tokens was simply driven by the interest in cryptocurrencies in general and ICOs were seen as a quick source of high returns. We now investigate whether this hypothesis is supported by the data. Were ICOs just a sideshow of the Bitcoin and Ether hype or were they driven by different fundamentals?

Our starting assumption is that there will be a positive correlation between ICOs and returns on other cryptocurrencies because ICOs tend to rely on a similar infrastructure (many ICOs are built on the Ethereum platform, for example). At the same time, the correlation should not be too high given that the business model of Bitcoin or Ether, as alternative payment systems or token platforms, is quite different from the business models of most ICOs. As we have shown above, we find ICOs in a variety of sectors. In other words, we expect the correlation between cryptocurrencies to be high as they all can be seen as part of the same alternative asset class. But ICOs are different, they combine the technology of those cryptocurrencies to a claim in either the flow of profits of a company or in the future services that the company will provide or both.

We study this correlation empirically by collecting data on the pricing of the largest 50 ICOs of the 2017–2018 wave and test whether their returns were correlated to the returns of Bitcoin and Ether. These were the peak years in ICO issuance. We focus on the top 50 ICO tokens because we are looking for a long sample of data.[9] Many of the least-popular tokens have a much shorter history and do not allow us to analyze the changing correlations over time.

By analyzing the correlation between ICO returns and Bitcoin and Ether prices we can test whether ICO business models were independently priced of other cryptocurrency trends. If the market is truly pricing their unique business models, we would expect their returns to be idiosyncratic with low(er) correlations. If, on the other hand, they are simply seen as an investment vehicle to generate excess returns based on a 'cryptocurrency bubble', we would expect them to be highly correlated to prices of the major cryptocurrencies.

We collect daily prices from those ICOs from coinmarketcap.com.[10] We calculate the correlation between the daily return of the ICOSs and the return of both Bitcoin and Ether using a 30-day rolling window.[11] The results are shown in Fig. 2, where we also plot the evolution of the price of the two cryptocurrencies in the same charts to understand whether the correlation has changed over time as

[9] See Table A1 in the appendix for details. Our original list came from a web site that has since then be shut down, but the list can still be found here: https://web.archive.org/web/20180829000514/https://www.coinist.io/biggest-icos-chart/.

[10] Not all 50 ICOs had available prices. We found available data for 43 out of the 50. Table A2 in the Appendix provides a statistical summary of the variables used in our analysis.

[11] We then apply a three-month centered moving average to smooth the correlation.

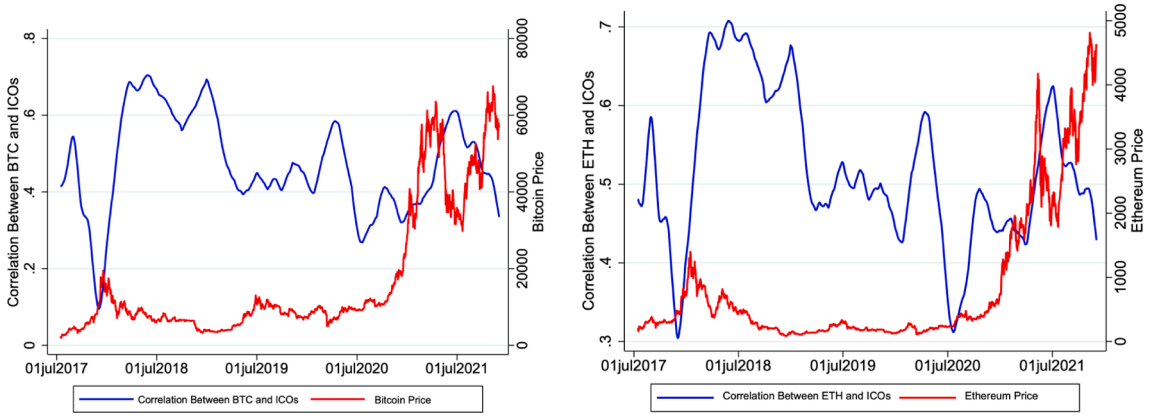

Fig. 2. Correlation between ICO returns and BTC and ETH. Daily price data on top 50 ICOs. Correlation using a 30-day window between the price of ICOs and the price of major cryptocurrencies (Bitcoin and Ether). Correlation smoother using a 3-month centered moving average.

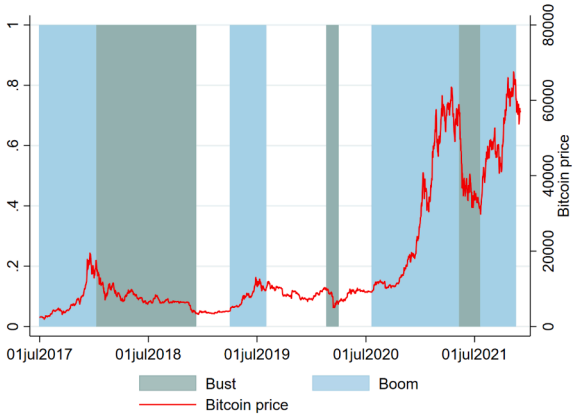

Fig. 3. Boom and bust periods in Bitcoin prices.

the sentiment towards these currencies has changed.

Both panels of Fig. 2 tell a similar story. In the early days, the correlation was positive, and it reached low levels, as low as 0.2–0.4 when the price of Bitcoin and Ether were climbing. But by the end of 2017 both cryptocurrencies see a dramatic fall in values. Bitcoin drops from a peak of $19,000 at the end of 2017 to below $4,000 a year later. In these months the correlation between Bitcoin or Ether returns and ICOs returns jumps to levels as high as 0.8. In this period, it is evident that the daily news on the future of Bitcoin and Ether seems to be moving the price of all ICO tokens. In other words, the price-discovery mechanism of ICOs collapses and all their prices just track the value of Bitcoin or Ether. A possible explanation for this pattern might be that the trading volume of the ICOs simply collapsed to virtually zero after the bitcoin bubble burst. However, while the volume of trade of the ICOs decreased compared to peak, it remains large.

The correlation remained high during the following years when the price of Bitcoin or Ether remained subdued. By 2020 both prices start increasing once again and we see the same asymmetric behavior that we witnessed in 2017–2018. When the prices are going up, the correlation between ICO returns and Bitcoin or Ether decline to levels that are close to the 2017 periods, around 0.4–0.5. But then by early March we observe a second large reversal in the price of both cryptocurrencies and, once again, the correlation increases in response to these dynamics. Correlations are falling during the run up and then they jump to high levels as the price of Bitcoin or Ether crash.

To test for this difference in correlation depending on the state of the Bitcoin market, we split our sample into “boom” and “bust” periods. A “boom” period is characterized by increasing Bitcoin prices until we identify a peak in the series and the “bust” period starts. We then identify a trough when the price settles down at a much lower level. There are some periods where the price is not displaying a trend and we simply exclude those from our classification. Fig. 3 displays the results of our classification.

We then calculate the average correlation between ICOs and bitcoin during booms and busts, and we do a simple test of means. Table 2 displays the average correlation of the two subsamples and provides a test of the differences in means. The correlation is much higher in boom periods than in bust periods and the test clearly rejects the hypothesis that the two means are equal.

Our interpretation of this result is that the dynamics of price discovery are relevant during times where investors are excited and

Table 2
Boom and bust, ICO - Bitcoin correlation.

	Observations	Mean	Standard Error	Standard Deviation	[95 % Confidence Interval]	
Correlation in Boom	714	0.493	0.007	0.189	0.479	0.507
Correlation in Bust	446	0.740	0.005	0.095	0.731	0.749
	Mean	Standard Error	*t*-test	p value	[95 % Confidence Interval]	
Difference	−0.247	0.010	−25.662	0.000	−0.266	−0.228

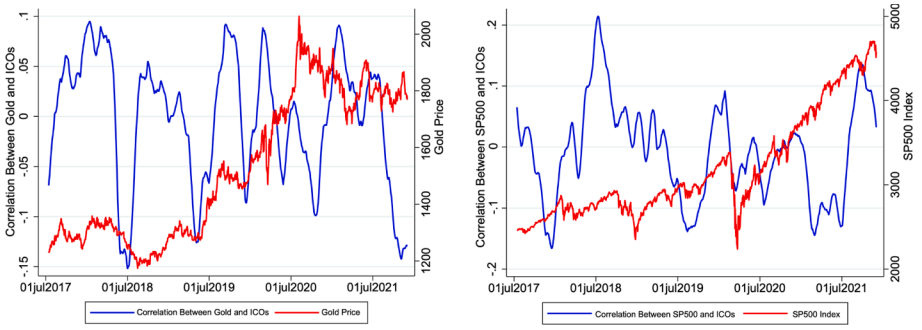

Fig. 4. Correlation between ICO returns, gold and S&P 500. Daily price data on top 50 ICOs. Correlation using a 30-day window between the price of ICOs and the price of gold (left) and the S&P500 index (right). Correlation smoothed using a 3-month centered moving average.

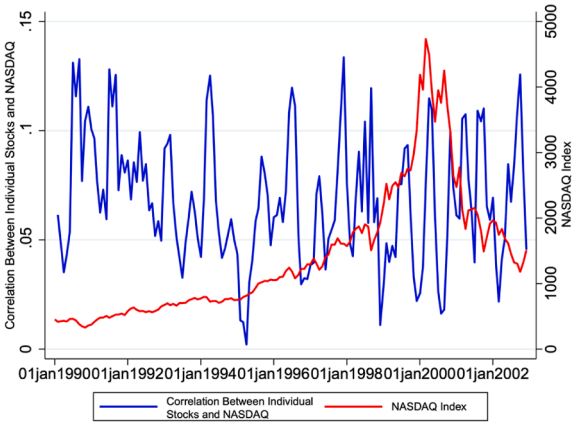

Fig. 5. Correlation between individual stocks and NASDAQ. Daily price data on NASDAQ stock prices. Correlation using a 30-day window between the price of each stock and the index. Correlation smoothed using a 3-month centered moving average.

optimistic about the success of these new technologies, but once panic dominated the market, these dynamics disappear, and pessimism is spread across all tokens and driven by the dynamics of the large cryptocurrencies.

Our results are consistent with those of Masiak, Block, Masiak, Neuenkirch and Pielen (2020) that show the connection between market cycles in ICOs and the market for Bitcoin and Ether. Also, as shown in King and Koutmos (2021), the strong correlation between ICOs and Bitcoin is also present among the major cryptocurrencies (Bitcoin, Ether, XRP, Bitcoin Cash, EOS, Litecoin, Stellar, Cardano and IOTA). Their results suggest the presence of herding among investors in these assets. But in their study, one could argue that the business model behind all the tokens is similar (they are all cryptocurrencies) so a much higher correlation is expected.[12]

Some of the patterns that we have shown could potentially be present with other assets or with other episodes where asset prices have followed bubble-type dynamics. To better understand and calibrate our results on ICOs, we next look to other episodes or asset classes where this behavior might be present. We start by looking at ICO returns and other assets such as stocks or gold.

Our prior is that the correlation should be low since the projects underlying ICOs are very different from the stock market index and even more so from Gold. Fig. 4 shows that correlations with gold as well as with the S&P 500 were indeed very low over the entire period, always remaining below 0.4 and in several periods close to zero. In addition, there is no obvious pattern during any episode

[12] Corbet, Lucey, Urquhart and Yarovaya (2019) provide a review of the academic literature on cryptocurrencies as assets.

Table 3
ICO ratings and the correlation with Bitcoin returns.

	(1)	(2)	(3)	(4)	(5)
	Full	Pre-2017 Peak	Post-2017 Peak	Pre-2021 Peak	Post-2017 Peak
Expert Rating	−0.0349	−0.0397	−0.0104	−0.0280	−0.120*
	(0.0388)	(0.0723)	(0.0454)	(0.0430)	(0.0609)
Constant	0.490***	0.266	0.516***	0.404***	1.066***
	(0.118)	(0.235)	(0.137)	(0.135)	(0.181)
Observations	36	26	36	33	33
R-squared	0.025	0.016	0.002	0.014	0.116

Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

where the price of those assets displayed a large increase or decrease.

We now provide a second benchmark by studying an episode of an asset price bubble, unrelated to cryptocurrencies. We want to understand whether during bubble-type episodes we observe similar dynamics between the returns of individual assets and the overall market return. Could it be that the aftermath of any bubble investor pessimism (or liquidity constraints) infects other assets and drives the correlation up? The episode we select is the Nasdaq bubble of the 1990 s where the price collapsed from above 5,000 to 1,300 after March 2000.

We collect daily prices of all the stocks included in the Nasdaq index and we calculate the average correlation of individual stocks with the overall index using the same 30-day window as above (we also smooth the series). Fig. 5 shows the results.

We see that the correlation of individual stocks with the index remains similar during the run up of the Nasdaq bubble and there is no clear increase in correlation during the period when the bubble burst. In other words, the phenomenon we have described for ICOs is not present in other asset price bubbles.

Our sample of ICOs was chosen based on the amount of funds being raised in the years 2017–2018. These were seen as some of the most successful ICOs during that wave so from the perspective of investors those were the high-quality tokens being offered. At the same time, these were early days for ICOs and there were probably differences among our top 50 ICOs in the way they were perceived by investors. Did high quality ICOs in our sample behave differently than low quality ICOs?[13]

To answer this question, we collect ratings of ICOs and check if the pattern is different from ICOs with high and low ratings. We make use of the web site icobench.com and we select the global rate by experts. We want to see whether the correlation between Bitcoin and the returns of ICOs is different depending on the rating of an ICO.

Results are presented in Table 3.[14] In the full sample we see a negative correlation, as expected. Higher rated ICOs seem to be less correlated with Bitcoin prices but the coefficient is not significant. There is no pattern before or after the 2017 episode with negative coefficients that are not significant (the coefficient decreases during the burst of the bubble). The coefficient becomes larger in the last episode and marginally significant post May 2021, after the second run up in prices has crashed.

The overall pattern suggests that the bubble-type behavior is too strong to be affected by these ratings or that the informativeness of the ratings is low (which is partly confirmed by the analysis of ICO ratings in Rhue (2021) although Lee, Li, and Shin (2022) find that some analysts' information was useful to predict ICO success). The fact that ratings become more meaningful at the end could be the result of a survivor bias. Only the successful ICOs are surviving and for those their return is also driven by the fundamentals behind their business models.

In summary, our evidence suggests that there is something curious about ICOs and their relationship with their big brothers, Bitcoin and Ether. The moment the Bitcoin/Ether bubble burst, the correlation with ICOs increased and remained very high even when prices had fallen.

One example that can provide a clue regarding the unusual behavior of ICO prices and Bitcoin and Ether prices is the similar dynamics that have been observed in sovereign debt and currency crises, where a crisis in one country rapidly spreads to other countries. Here the increase in correlation is again associated with down markets. Such financial contagion has been explained partly through direct or indirect spillovers from one country to another. For instance, the Asian financial crisis spread across the region because of linkages in trade but also because of financial linkages in common creditors' balance sheets (Van Rijckeghem and Weder, 2001 and 2003). Another explanation for financial contagion in sovereign crises is a wakeup call: the incidence of a crisis in one country alerts investors to some risk factor they had so far ignored. They then run from other markets with similar fundamentals. Alternatively, the wakeup call simply heightened investors' risk aversion, triggering a run on the whole asset class (Forbes and Rigobon, 2002).

These ideas can also be applied to the ICO correlations with Bitcoin and Ethereum in down markets. If investors in ICOs also invest in Bitcoin and Ether using borrowed money, then a fall in price of Bitcoin and Ether can lead to sales of the ICO coins to rebalance their

[13] While not the focus of our paper, some ICOs delivered large returns to early investors. See Benedetti and Kostovetsky (2021) and Dean, Jayasuriya and Marsden (2020) for an analysis of ICO returns and some of the factors that drove them.

[14] We produce results for the full sample as well as the following subsamples: prior to December 15, 2017 as the pre-2017 peak; from December 15, 2017 to April 6, 2018 as the post-2017 peak; from October 1, 2020 to March 12, 2021 as the pre-2021 peak; from May 7, 2021 to June 11, 2021 as the post-2021 peak.

portfolio and reduce their leverage. This will lead falls in Bitcoin and Ether to be correlated with falls in ICO coins. Similarly, the wakeup call theory is also consistent with the findings in this paper. Falls in Bitcoin and Ether may lead to investors reassessing all cryptocurrency investments and selling the ICO ones as a result.

5. Conclusions

ICOs, IEOs and STOs are part of the big family of innovative new instruments that issue coins and promise to use blockchain technology to fundamentally change the way business is conducted in almost all sectors. In the hope of the believers, ICOs might one day replace intermediaries, tokenize assets, and "democratize" finance.

In principle, the idea that virtually anybody with an internet connection could participate in the market for entrepreneurial venture was indeed novel. The venture capital and private equity industry tends to be restricted to qualified investors and access is controlled by a series of intermediaries, partly because lumpy and illiquid assets require investors to be able to tolerate a higher degree of risk. Moreover, the innovation of utility tokens is that they are the means for accessing the service or platform that the project is proposing. So, the investor is also a user and therefore had a double interest in the success of the platform, all without diluting ownership.

However, the difference between an ICO and a crowdfunding project is that the former sells a tradable participation (the token or coin). Thus, investors may be purchasing the tokens not because they believe in the project and eventually want to use its services but rather because they believe they can gain from an increase in the price of the coin. Thus, they may easily be lured by false promises, greed and the hype around blockchain. Moreover, the unregulated nature of the early ICO market – where ideas without any substance would offer coins to small time investors was prone to attract fraudsters.

We show that the ICO market behaved very curiously in the wake of bitcoin bubbles. In theory, the price of bitcoin (which is supposed to be a means of payment) should not have any particular relationship with various ICOs. ICOs promise to fund new venture in a wide number of industries and therefore should be priced according to the potential of the project as well as the fundamentals of the respective industry. A priori, we would not expect a high correlation among ICO price and certainly not with Bitcoin. Yet, we find that the correlation of the largest ICOs among each other all of a sudden became very high after the bitcoin bubble crashed. This supports the hypothesis that investors were not evaluating ICO projects on their own merits but rather saw them as speculative vehicles and close relatives of Bitcoin and Ether.

Furthermore, we document this pronounced asymmetry in correlations for all instances of booms and bust of bitcoin prices. When Bitcoin prices increase the correlation with ICOs falls but it jumps when bitcoin prices fall. Our interpretation is that price discovery is relevant during times where investors are excited and optimistic about the success of these new technologies, but this enthusiasm may quickly flip into pessimism on the whole asset class. In a sense we observe the reverse of Tolstoy's famous observation on families and happiness: In the crypto world, all unhappy crypto families are alike, while happy families are happy in their own way.

The evidence reviewed here suggest that regulators are well advised to take a very cautious approach to ICOs and their relatives. Their first concern should be for consumer protection since these instruments are sold to a wide public. This suggests that most tokens that are sold with the promise of capital gain should come under the regulatory net of securities laws. anti-money laundering concerns should be addressed by subjecting the exchange platform to regulation. There may be space for leaving narrowly defined utility tokens under light regulation since they may catalyze innovation through their unique feature of investor/user complex, and they may play some role in the funding for new technology ventures. However, such a niche role seems difficult to reconcile with the grand promise that ICOs and their relatives had come to revolutionize the world.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Table A1.Table A2.

Table A1
List of top 50 ICOs including the starting date for their market price as well as the end date. Those without starting and ending dates are the ones not included in our study.

Name	Code	Start date	End date	Name	Code	Start date	End date
AirSwap	AST	17/10/17	2/12/21	Paragon	PRG		
Ambrosus	AMB	23/10/17	2/12/21	Polybius	PLBT	6/7/17	2/12/21
Aragon	ANT	18/5/17	2/12/21	Powerledger	POWR	1/11/17	2/12/21
Bancor	BNT	18/6/17	2/12/21	QASH	QASH	21/11/17	2/12/21
Bankex	BKX			Raiden Network Token	RDN	8/11/17	2/12/21
Bread	BRD	24/12/17	2/12/21	Request	REQ	20/10/17	2/12/21
Chainlink	LINK	20/9/17	2/12/21	Ripio Credit Network	RCN	26/10/17	2/12/21
CRYPTO20	C20	22/1/18	2/12/21	SALT	SALT	29/9/17	2/12/21
DomRaider	DRT	19/10/17	2/12/21	SingularityNET	AGIX	19/1/18	2/12/21
Enigma	ENG	13/10/17	2/12/21	SIRIN LABS Token	SRN	28/12/17	2/12/21
Etherparty	FUEL	30/10/17	2/12/21	Sonm	SNM	16/6/17	7/9/20
Filecoin	FIL	13/12/17	2/12/21	Speed Mining Service	SMS		
Gnosis	GNO	1/5/17	2/12/21	Status	SNT	28/6/17	2/12/21
Grid	GRID	1/11/17	2/12/21	Storj	STORJ	2/7/17	2/12/21
ICON	ICX	27/10/17	2/12/21	StormX	STMX	20/12/17	2/12/21
indaHash	IDH	24/1/18	2/12/21	Stox	STX	5/8/17	7/9/20
Insolar	INS	12/1/18	7/9/20	TenX	PAY	27/6/17	2/12/21
Kyber Network CL	KNCL	24/9/17	2/12/21	Tezos	XTZ	2/10/17	2/12/21
LatiumX	LATX			TRON	TRX	13/9/17	2/12/21
Loopring	LRC	30/8/17	2/12/21	Unikoin Gold	UKG	6/11/17	7/9/20
MobileGo	MGO	11/6/17	2/12/21	United Traders Token	UTT	11/1/18	2/12/21
NAGA	NGC	23/12/17	2/12/21	WAX	WAXP	21/12/17	2/12/21
Nebulas	NAS	23/8/17	2/12/21				

Table A2
Summary Statistics.

	Obs.	Mean	St. Dev.	25th percentile	50th percentile	75th percentile
Correlation between BTC and ICOs	1,616	0.4732	0.1820	0.3688	0.4744	0.6054
Correlation between ETH and ICOs	1,616	0.5187	0.1427	0.4283	0.5077	0.6316
Correlation between Gold and ICOs	1,616	−0.0017	0.1390	−0.0865	0.0082	0.0913
Correlation between SP500 and ICOs	1,616	−0.0076	0.1597	−0.1210	−0.0053	0.1068
Expert Rating	39	3.19	0.59	2.70	3.20	3.70

Note: Correlations are calculated using a 30-day window between the price of ICOs and the prices of major cryptocurrencies (Bitcoin and Ether), Gold, and SP500. The sample period is from July 1st, 2017 to December 2nd, 2021.

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