Are Tokens Securities? An Anatomy of Initial Coin Offerings

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ICOs: Overview

Views on cryptocurrencies and ICOs

- Warren Buffet in May, 2018: *Bitcoin is probably rat poison squared.*

- Charlie Munger (Warren Buffet's deputy) in May, 2018: *Suppose you could make a lot of money trading freshly harvested baby brains. Would you do it? ... bitcoin is almost as bad.*

- Bill Gates in May, 2018: *As an asset class, you're not producing anything and so you shouldn't expect it to go up. Bitcoin and ICOs, I believe completely [they're some] of the crazier, speculative things.*

What is an ICO?

- An **Initial Coin Offering (ICO)** – also known as token (or coin) sale – is a new form of venture financing, whereby an entrepreneur
    - Issues a certain (pre-determined) number of tokens
    - Commits to accept these tokens as the sole means of payment
    - Sells some of these tokens to "investors"

- A **token** gives the owner cryptographically secured rights:
    - Right to use software/network/platform or to redeem the token for currency/good ("utility tokens")
    - Right to a future share of earnings ("securities tokens")
    - However, usually no voting rights

- **Differences** from reward-based **crowdfunding**
    - No price, quantity, or product/service commitment
    - Tokens are traded in secondary markets
        - Investors $\neq$ users

ICO market

- Over 5,500 ICOs, mostly since 2017
- Volume of ICOs:
    - < 100 million in 2016
    - $4 billion in 2017
    - $26 billion in 2018
- 5 times more financing of blockchain startups through ICOs than through VC investments in the last two years

ICOs over time
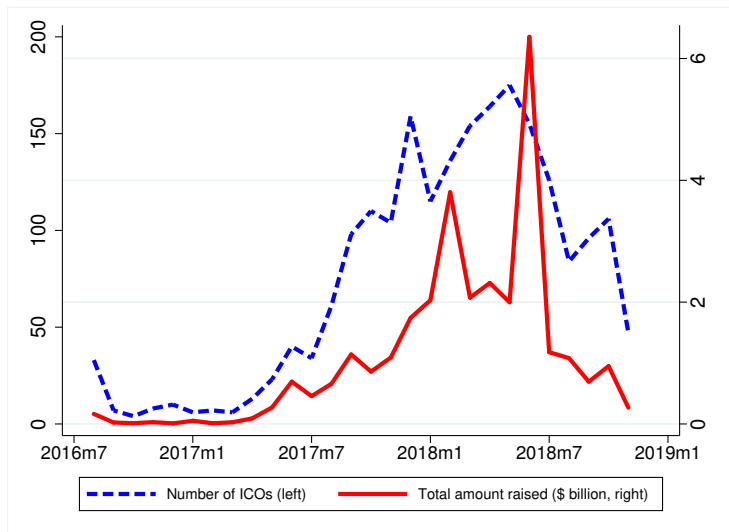
Advantages and disadvantages of ICOs

- **Benefits**
  - Speed
  - Low transaction costs
  - Low/absent regulatory requirements (sometimes)
  - Global investor outreach
  - Ability of combining financing with building a customer base
- **Costs**
  - Large information asymmetry
  - Vulnerability of property rights
  - Inadvertent participation in illegal activities

ICO (and related) literature

- Crowdfunding ...
- Economic effects of blockchain technology ...
- Theoretical literature on ICOs
    - Sockin and Xiong (2018), Li and Mann (2018), Cong, Li and Wang (2018), Catalini and Gans (2018), Chod and Lyandres (2018), Malinova and Park (2018)
- Optimal regulation of ICOs
    - Chohan (2017), Robinson (2017), Kaal (2018), Zetsche et al. (2018) ...
- Empirical literature on determinants and consequences of ICOs
    - Adhami, Giudici and Martinazzi (2018), Amsden and Schweizer (2018), Benedetti and Kostovetsky (2018), Borveau, De George, Ellahie and Macciocchi (2018), Davydiuk, Gupta and Rosen (2018), de Jong, Roosenboom, and van der Kolk (2018), Fisch (2018), Florysiak and Schandlbauer (2018), Howell, Neissner, and Yermack (2018), Hu, Parlour and Rajan (2018), Huang, Meoli, and Vismara (2018), Lee, Li and Shin (2018), Momtaz (2018)

ICO regulation

ICO regulation

- **Regulation of ICOs** is difficult
  - Currently ranges from a complete ban (China, South Korea) to relatively lax treatment and occasional case-by-case examination (Switzerland, Singapore)
  - In many countries, US in particular, regulators are moving to **view ICOs as securities:**
    - Jay Clayton (SEC Chairman) in December 2017: *The structures of initial coin offerings that I have seen promoted involve the offer and sale of securities and directly implicate the securities registration requirements and other investor protection provisions of our federal securities laws.*
    - Robert Cohen (SEC cyber unit chief) in February 2019: *Companies must comply with the securities laws when issuing digital tokens that are securities.*
  - On the other hand, most tokens are described as "utility tokens" as opposed to "security tokens", i.e. **may not be classified as securities according to the Howey test**
- **Our research question: Are tokens securities?**

Are tokens securities?

- A philosophical question ...

- A policy-relevant question: **Do tokens resemble (i.e. behave like) securities?**

- Or: **Do characteristics of ICOs and post-ICO performance suggest that ICO investors behave similarly to investors in financial instruments that we consider securities?**

- We draw parallels between ICOs and IPOs of equity

  - Most empirical regularities around ICOs are consistent with what we know about IPOs, both theoretically and empirically

  - Some of the discrepancies between ICOs and IPOs may be traced to differences in institutional settings

- This evidence supports the view that **ICOs should be treated as issuance of securities**

Data and its quality

Data

- ICO data: 10 ICO aggregators
  - `www.etherscan.io`, `www.coindesk.com`, `www.coingecko.com`, `www.cryptocompare.com`, `www.icobench.com`, `www.icodrops.com`, `www.icorating.com`, `www.icomarks.io`, `www.icodata.io`, and `www.foundico.com`
  - Matching among them is a big issue
- Auxiliary variables:
  - White papers and project websites
- Prices and trading volume:
  - `www.coinmarketcap.com`
- Social media data:
  - Twitter, Reddit, Medium, BitcoinTalk
- Code revision data:
  - Github
- Blockchain transaction data:
  - `www.ethplorer.io`, `www.etherscan.io`

ICO data coverage

Number of Matches	1	2	3	4	5	6	7	8	9	10
Number of Projects	1,642	989	827	704	498	353	289	131	57	5
Percent of Projects	30%	18%	15%	13%	9%	6%	5%	2%	1%	0%

- Overall, over 4,400 ICOs with (some) information on crucial variables
- This is the most comprehensive ICO dataset to date

ICO data quality

Source	Amount raised		Hardcap		Token supply		Tokens for sale	
	Obs	Mean deviation	Obs	Mean deviation	Obs	Mean deviation	Obs	Mean deviation
www.etherscan.io	242	0.068	0	NA	811	0.128	0	NA
www.coindesk.com	813	0.085	0	NA	0	NA	0	NA
www.coingecko.com	1,033	0.079	1,440	0.103	1,332	0.087	948	0.141
www.cryptocompare.com	525	0.132	562	0.129	627	0.147	605	0.181
www.icobench.com	1,340	0.093	1,623	0.089	1,704	0.063	2,112	0.088
www.icodrops.com	447	0.074	415	0.083	393	0.112	365	0.126
www.icorating.com	1,012	0.115	1,438	0.106	0	NA	1,800	0.147
www.icomarks.io	0	NA	811	0.060	1,609	0.053	1,897	0.081
www.icodata.io	1803	0.322	1803	0.314	373	0.313	0	NA
www.foundico.com	0	NA	676	0.130	0	NA	1,600	0.162

ICO data quality: Bancor example

Source	Amount raised	Hardcap	Token supply	Tokens for Sale
`www.etherscan.io`			77,566,371	
`www.coindesk.com`	153,000,000			
`www.coingecko.com`			75,783,855	
`www.cryptocompare.com`	153,000,000	36,000,000	79,320,000	39,660,000
`www.icobench.com`	153,000,000			
`www.icodrops.com`	153,000,000			
`www.icorating.com`	153,000,000			
`www.icomarks.io`				
`www.icodata.io`	153,000,000	0	56,889,807	
`www.foundico.com`				
Average	153,000,000	36,000,000	72,390,008	39,660,000
Consistency	1.000	0.333	0.944	1.000

ICO data quality: Bancor example

Source	Amount raised	Hardcap	Token supply	Tokens for sale
www.etherscan.io			0.414	
www.coindesk.com	0.800			
www.coingecko.com			0.609	
www.cryptocompare.com	0.515	0.465	0.361	0.448
www.icobench.com	0.731			
www.icodrops.com	0.919			
www.icorating.com	0.591			
www.icomarks.io				
www.icodata.io	0.211	0.191	0.169	
www.foundico.com				
Sum	3.768	0.656	1.553	0.448
Adjusted quality	3.768	0.219	1.466	0.448
ICO data quality	1.475			

ICO data quality
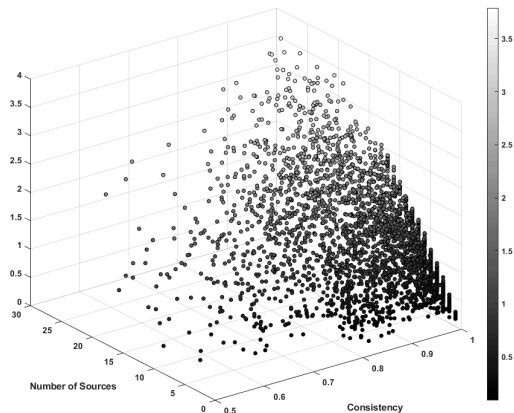
- We confirm all our empirical tests on a subsample of ICOs with highest data quality

Summary statistics

Summary statistics: ICO characteristics and outcomes

	Mean	Std. Dev.	Min	Median	Max	Obs.
ICO characteristics						
hardcap	69.75	989.41	0.00	20.00	48,093.76	3,207
% for sale	0.56	0.24	0.00	0.57	1.00	2,815
presale	0.04	0.20	0.00	0.00	1.00	4,411
whitelist	0.30	0.46	0.00	0.00	1.00	4,411
kyc	0.49	0.50	0.00	0.00	1.00	4,411
team size	10.67	8.14	1.00	9.00	74.00	3,230
white paper	0.26	0.44	0.00	0.00	1.00	4,411
# nlp words	1,673	752	93	1,562	5,062	1,136
tech ratio	0.29	0.06	0.04	0.28	0.65	1,136
ICO Outcomes						
raised dummy	0.45	0.50	0.00	0.00	1.00	4,411
amount raised	14.70	103.96	0.00	4.57	4,197.96	2,040
raised-to-hardcap	0.44	0.39	0.00	0.30	1.00	1,711
ICO length	47.42	39.67	0.00	31.00	575.00	4,411
listing	0.39	0.49	0.00	0.00	1.00	2,040
# exchanges	5.39	8.31	1.00	3.00	100.00	764

Summary statistics: ICO industry and location

	Mean	Std. Dev.	Min	Median	Max	Obs.
		Industry				
industry	0.52	0.50	0.00	1.00	1.00	4,411
finance	0.31	0.46	0.00	0.00	1.00	2,310
business services	0.22	0.41	0.00	0.00	1.00	2,310
entertainment	0.22	0.42	0.00	0.00	1.00	2,310
other software	0.15	0.36	0.00	0.00	1.00	2,310
blockchain	0.09	0.29	0.00	0.00	1.00	2,310
		Location				
location	0.79	0.41	0.00	1.00	1.00	4,411
West. Europe, Can., Austr.	0.31	0.46	0.00	0.00	1.00	3,469
Eastern Europe	0.20	0.40	0.00	0.00	1.00	3,469
Asia	0.19	0.39	0.00	0.00	1.00	3,469
USA	0.15	0.36	0.00	0.00	1.00	3,469
rest of the world	0.15	0.35	0.00	0.00	1.00	3,469
crypto friendly	0.31	0.46	0.00	0.00	1.00	3,469

Summary statistics: Token holdings

	Mean	Std. Dev.	Min	Median	Max	Obs.
Total Wallets (log)						
at ICO start (log)	4.63	2.29	0.69	4.78	10.35	348
at ICO end (log)	5.51	2.38	0.69	5.93	11.34	450
at first trade (log)	6.73	1.67	1.61	6.80	11.83	637
30 days after first trade (log)	7.28	1.46	1.10	7.33	11.99	636
90 days after first trade (log)	7.66	1.40	1.10	7.71	11.99	590
180 days after first trade (log)	7.93	1.28	3.53	8.01	11.39	463
365 days after first trade (log)	7.88	1.33	3.91	7.93	11.39	215
Wallet Concentration						
at ICO start (log)	0.48	0.36	0.00	0.44	1.00	348
at ICO end (log)	0.44	0.35	0.00	0.36	1.00	450
at first trade (log)	0.33	0.27	0.00	0.26	1.00	637
30 days after first trade (log)	0.29	0.25	0.00	0.22	1.00	636
90 days after first trade (log)	0.26	0.23	0.00	0.20	1.00	590
180 days after first trade (log)	0.25	0.23	0.00	0.19	1.00	463
365 days after first trade (log)	0.24	0.22	0.01	0.17	0.87	215

Summary statistics: ICO and post-ICO returns

	Mean	Std. Dev.	Min	Median	Max	Obs.
End-to-open ICO returns						
ICO return (%)	269.18	405.91	4.23	108.98	1,625.06	801
First-day ICO returns						
First day return (%)	11.85	25.86	-20.86	2.45	86.15	878
Longer-term cumulative post-ICO returns						
30-day return (%)	0.75	89.73	-81.48	-30.51	258.38	835
90-day return (%)	9.09	140.55	-93.43	-46.38	448.70	771
180-day return (%)	32.04	230.04	-97.55	-68.90	796.31	615
365-day return (%)	60.30	295.98	-98.78	-66.12	1,095.33	302
Return volatility						
30-day average vol (%)	18.94	11.37	6.56	15.53	50.72	857
90-day average vol (%)	17.48	10.08	7.61	14.25	46.72	790
180-day average vol (%)	16.28	8.69	7.80	13.32	41.71	623
365-day average vol (%)	17.21	9.36	9.06	13.69	45.90	305

Empirical results

Determinants of ICO success:
1) raising a minimal amount
2) log amount raised
3) raised-to-hardcap
## 4) exchange listing
5) avoiding post-listing disaster

- ICO success ↑ in project team size, white paper availability and informativeness, social media presence and coverage, source code repository presence and number of code revisions
  - $\surd_{IPO}$ IPO success ↑ in the amount of information (Theory: Benveniste and Spindt (1989), Welch (1992); Empirics: Dunbar (1998), Busaba, Benveniste and Guo (2001), Dunbar and Foerster (2008))

- ICO success ↑ in presale
  - $\surd_{IPO}$ IPO success ↑ in the number of institutional/sophisticated investors

Determinants of ICO success:
1) raising a minimal amount
2) log amount raised
3) raised-to-hardcap
4) exchange listing
## 5) avoiding post-listing disaster

- ICO success $\downarrow$ in proportion of tokens for sale
  - $\sqrt{}_{VC}$ Entrepreneurial venture's success $\uparrow$ in the "skin in the game (Conti, Thursby and Rothaermel (2013))

- ICO success $\uparrow$ in kyc
  - $\sqrt{}_{IPO}$ Book building is conducive of IPO success

- Raised-to-hardcap $\downarrow$ in hardcap
  - $\sqrt{}_{IPO}$ Large offerings may send a negative signal to the market (Theory: Leland and Pyle (1977), Miller and Rock (1985), Empirics: (Hanley (1993), Dunbar (1998), Dunbar and Foerster (2008))

Evolution of code production around ICOs
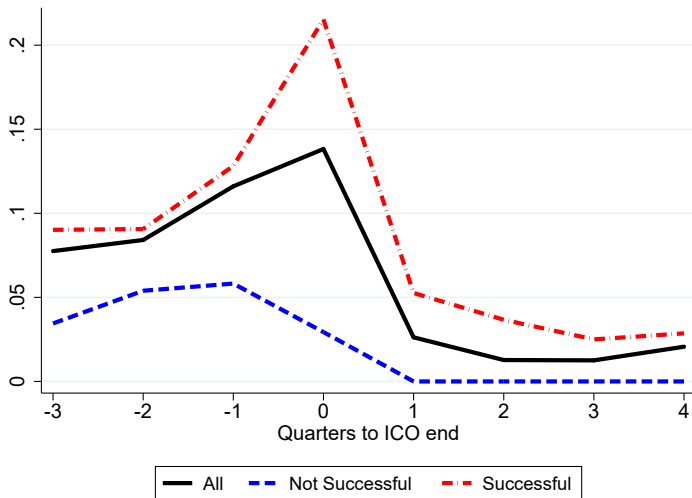
- $\sqrt{IPO}$ Decline in productivity/operating performance following IPOs (Jain and Kini (1994), Chemmanur, He and Nandy (2008))

Evolution of social media activity around ICOs
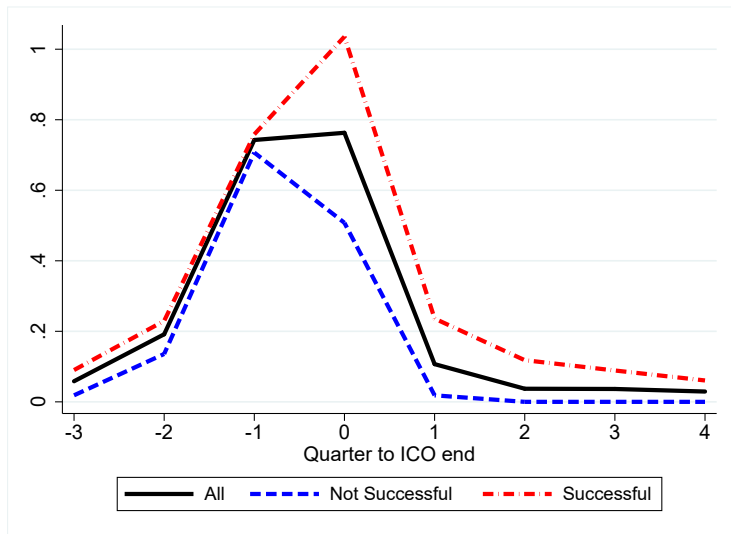
Determinants of ICO returns

- End-to-open ICO return ↓ in ICO size (amount raised)
  - $\sqrt{}_{IPO}$ IPO underpricing ↓ IPO issue size (Beatty and Ritter (1986), Megginson and Weiss (1991), Michaely and Shaw (1994))

- End-to-open ICO return ↑ in social media activity at ICO start
  - $\sqrt{}_{IPO}$ IPO underpricing ↑ in the extent of information asymmetry

- First-day return ↓ in end-to-open return
  - X_{IPO} IPO first-day return ↑ in offer price revision (Hanley (1993), Bradley and Jordan (2002))

Determinants of post-ICO longer-term returns and volatility

- Longer-term returns ↓ in ICO returns
  - $\sqrt{}_{IPO}$ Long-term post-IPO returns ↓ in IPO underpricing (Theory: Ljungqvist, Nanda and Singh (2006), Empirics: Ritter (1984), Ritter (1991), Ofek and Richardson (2003))

- Longer-term returns ↓ in ICO size
  - X_{IPO} IPO long-term returns ↑ in IPO proceeds (Brav and Gompers (1997), Carter, Dark and Singth (1998))
  - Possible reason for the difference: In IPOs, more reputable banks underwrite larger offerings (Chemmanur and Fulghieri (1994)), while in ICOs raising a large amount may be a sign of overvaluation

- Post-ICO return volatility ↓ in end-to-open ICO return
  - X_{IPO} IPO long-term returns ↑ in IPO underpricing (Beatty and Ritter (1986))

Conclusions

Conclusions

1. **ICO data quality is terrible**
   - Imposing discipline on the determination of which data are most reliable is crucial
   - We propose data quality measures both at the data source/variable level and at the ICO level
   - We verify all results using only ICOs with highest-quality data

2. Determinants of ICO success, ICO returns, and post-ICO longer-term returns are, for the most part, reminiscent of those of IPOs
   - This suggests that investors in crypto tokens are driven by similar considerations and behave similarly to investors in equity
   - This provides a **justification for treating tokens as securities**