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Initial coin offerings and ESG: Allies or enemies?

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ABSTRACT

Initial Coin Offerings (aka ICOs) have gained a prominent interest in the FinTech world as an alternative way to fundraising for innovative and cutting-edge business ideas. So far, academics have studied drivers of success without posing specific attention to the products or activities proposed by the ICOs. In this paper, we investigate the possible nexus between ICOs and Environmental, Social and Governance (ESG) indicators, by studying a set of 871 ICOs. Specifically, we extract keywords related to ESG from whitepapers associated with each ICO using neural networks language models and build a variable which acts as a signal of attention to sustainability topics. Our research hypothesis concerns the evaluation of whether ICOs oriented towards ESG are more likely to successfully raise expected funds. Preliminary results confirm such a hypothesis.

1. Introduction

Nowadays themes like Environment, Social Change, and Governance are becoming more and more important. Over 90% of CEOs believe that ESG indicators are critical to their company's earnings and progress. Indeed, the inclusion of environmental, social, and governance aspects is important in investment and emission processes, promoting innovation and the expansion of sustainable finance (Hoffman, 2018). We could state that for a company, Environmental, Social, and Governance investments and reporting represent one of the ways to keep up with the market. As a matter of fact, companies with stronger ESG propositions tend to have higher growth, higher worker efficiency, lower volatility, cost decrease, and fewer institutional interventions. Furthermore, in recent years, start-ups and the most innovative businesses turn to alternative sources of capital instead of classic channels, such as Initial Coin Offerings (ICOs). An ICO is a new way to fund businesses and initiatives, it is one of the blockchain-based processes that allow the emission of a utility token rather than a security or equity token. The growing popularity of the ICOs is clearly due to several related benefits, such as the high level of offered return on investment, high liquidity, fast financing, cost minimization and high availability, which are increasingly encouraging innovative investors and businesses to abandon traditional financing methods. However, it is also a young and ever-changing market full of significant risks.

2. Literature review

Previous literature on this topic is still scarce. Most relevant papers that consider the effect and success of environmental initial coin offerings were published in recent years, and the studies examine the success of environmental ICO measured by the total funding in the actual ICOs and the long-term survival of the projects (Guzmán et al., 2021; Cerchiello et al., 2019; Bitetto et al., 2023). Moreover, some articles study how environmental issues have led to many new trends in technology and financial management. They analyse the relationship between Fintech and sustainability. These studies explain how, in recent years, investors'

attention to environmental issues is increased and how investors, that are concerned about such issues, reduce the probability of long-term failure. Such considerations are consistent with the fact that investors' concern regarding climate change influences investment decisions and resource allocation. Moreover, the trends in the fintech sector regarding the environmental, sustainable, and governance factors boost the business performance of financial institutions (Nizam et al., 2019; Bitetto et al., 2021). As stated in the McKinsey article,[1] it is proven that a strong ESG proposition can guarantee long-term success for the company. Therefore, those ESG plans are not only a feel-good exercise but are important for the growth of the company (Feldman, 2007). Some studies, for example, found that a company's ESG performance is positively related to stock market returns during the financial crisis and, furthermore, they suggest that ESG may play a significant role in company success during the Covid-19 pandemic.[2] It is worth mentioning that in recent years, the obligatory tools have been enhanced based on the issuer's sustainability performance, with characteristics that may change depending on the achievement of specific goals. Green Bonds, for example, are relatively new financial instruments that have experienced extraordinary growth since 2007. They are obligations and their emission is linked to projects that have a positive impact on the environment, such as energy efficiency, renewable energy production, and sustainable land use. Moreover, since 2020, other types of instruments were going to be added. Among those, there are the sustainability-linked bonds, which have amassed a total value of 120 million euros as of December 2021, equal to 12% of the annual volume of ESG emissions. Sustainability-Linked Bonds (SLB) are obligations with financial and structural characteristics that vary depending on the achievement of predefined goals related to the issuer's sustainability performance. However, when it comes to making a financial decision, Europe is not in the first place in terms of environmental sustainability. In Indonesia, India, and China, on the other hand, when a financial institution is selected for supporting a new product or service, it is evaluated also in terms of environmental sustainability.

Although the limited literature on the nexus between ESG and ICOS, a recent paper by Guzmán et al. (2020) investigates whether the attention to global warming increases the total funding raised in an environmental ICO by leveraging a set of 324 ICOs and Google trends information. Another recent relevant paper is from Mansouri and Momtaz (2022). Upon a collected dataset on ICOs, they found a positive effect of ESG indicators on the funding valuation and a negative effect on the long-term performance of the start-up. Our paper differs from the latter in the following: we create our own collected dataset by employing the most up-to-date scraping techniques for a larger number of years (7 versus 5) and the most recent data (up to early 2023 instead of 2020). Moreover, we employ the state-of-the-art approaches to sentiment analysis, based upon proper neural network embedding representation that limits the amount of subjectivity and bias typically induced by dictionary-based approaches like those used by Mansouri and Momtaz (2022). Overall, in the present paper, we aim at improving previous analysis and at confirming or disproving the nexus between ESG and ICOs success, by analysing a wider data set composed of 871 ICOs and extracting specific references to ESG pillars from whitepapers through appropriate deep learning methods.

Our paper, therefore, puts a special emphasis on whether ESG dimensions influence ICOs' performances. Thus, we propose to investigate the role played by an ESG flag covariate, appropriately built as described in the following sections, in predicting the probability of success when collecting the expected amount of funds during the funding round. To this end, we use textual analysis techniques for creating a proper sustainability flag variable; afterwards, we fit logistic models with different specifications along the ESG dimensions and controls.

3. Data

For the database, we scraped data from the website , through Python Selenium[3] and downloaded 8279 between 7574 Initial Coin Offerings (ICO), 177 Security Token Offerings (STO) and 528 Initial Exchange Offerings (IEO). The available information includes *ICO details*, such as Website, Whitepaper, Whitelist and MVP, Bounty and Bonus, start/end date, country, *ICO classification*, such as Category (Tech, Finance, Energy, Infrastructure), *ICOmarks rating*, *Token details*, such as Ticker, Platform, Amount available for sale, Technology involved, *Financials*, such as ICO's Token price, (crypto)-currency accepted, Total funds raised, Hard/Soft cap for the funding round, *Team and Advisors size* and *Social Media details*, such as media on which the ICO is advertised or where the investors can discuss. We decided to focus only on ICO and we downloaded all the available whitepapers.

Then, we cleaned the downloaded data because of typos and different decimal/thousands separator and we converted all ICO prices reported in fiat or crypto money or in terms of ICO's tokens to U.S. Dollars, using the average FX rate of the ICO's start date.

3.1. Dependent variable

Our target variable *ICOSUCCESS*, similar to previous literature (for example Meoli and Vismara, 2022), is the binary flag of ICOs success/failure, evaluated as the ratio of raised funds and the hard cap, i.e. the maximum amount of funding expected to be raised. If the ratio is above 0.5, we assign success, failure otherwise.

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[1] https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/five-ways-that-esg-creates-value
[2] https://helda.helsinki.fi/dhanken/bitstream/handle/10227/413914/Reijonen_Jaana.pdf?sequence=1
[3] Selenium allows to automate the interaction with websites, simulating the actions usually performed by human users. The downloaded HTML code is then processed through the BeautifulSoup package.

Table 1
Predicting ICOSUCCESS with logit model in the Baseline scenario.

Variable	1	2	3	4	5	6
ESGFLAG	0.129**	0.159**	0.151**	0.105**	0.189**	0.171**
	(0.0727)	(0.0723)	(0.0720)	(0.0739)	(0.0720)	(0.0723)
DURATION	−0.461**	−0.442*	−0.444**	−0.460**	−0.411*	−0.400*
	(0.192)	(0.230)	(0.205)	(0.187)	(0.246)	(0.242)
RATING	0.126***	0.105**	0.137***	0.129***	0.123**	0.127**
	(0.0403)	(0.0473)	(0.0512)	(0.0389)	(0.0569)	(0.0551)
TEAMSIZE	0.0461***	0.0362***	0.0486***	0.0456***	0.0387***	0.0383***
	(0.00756)	(0.00787)	(0.00677)	(0.00842)	(0.00663)	(0.00697)
ADVISORSIZE	0.0441***	0.0356*	0.0428***	0.0456***	0.0327	0.0350
	(0.0144)	(0.0186)	(0.0146)	(0.0153)	(0.0203)	(0.0216)
WHITELIST	0.149***	0.162	0.276**	0.218**	0.0428	0.0947
	(0.0553)	(0.138)	(0.122)	(0.0926)	(0.130)	(0.121)
BOUNTY	−0.238**	−0.195	−0.224**	−0.271*	−0.176	−0.201
	(0.109)	(0.121)	(0.113)	(0.162)	(0.124)	(0.173)
BONUS	−0.0916	−0.0281	−0.0527	−0.125	0.00844	−0.0469
	(0.148)	(0.116)	(0.128)	(0.155)	(0.102)	(0.118)
MVP	−0.366***	−0.246**	−0.362***	−0.372**	−0.232**	−0.220
	(0.135)	(0.110)	(0.137)	(0.159)	(0.116)	(0.159)
PRESALE	−0.273***	−0.0950	−0.287***	−0.274***	−0.103	−0.0943
	(0.0894)	(0.0801)	(0.0815)	(0.0700)	(0.0925)	(0.0918)
KYC	−0.175***	−0.0155	−0.121**	−0.148*	0.0726	0.108
	(0.0598)	(0.0686)	(0.0582)	(0.0789)	(0.0446)	(0.0710)
ERC20	−0.0277	−0.0857	−0.0313	−0.0148	−0.0646	−0.0542
	(0.0879)	(0.124)	(0.0894)	(0.0744)	(0.138)	(0.113)
LOGWORDS	0.177	0.194	0.165	0.188	0.183	0.198
	(0.162)	(0.156)	(0.165)	(0.162)	(0.156)	(0.161)
FINSENTIMENT	−0.0110	−0.0736	−0.0585	−0.0262	−0.124	−0.131
	(0.472)	(0.476)	(0.493)	(0.547)	(0.525)	(0.623)
Observations	871	869	869	871	866	866
Pseudo R^2	0.043	0.067	0.051	0.051	0.076	0.083
Quarter-Year effects	No	Yes	No	No	Yes	Yes
Country effects	No	No	Yes	No	Yes	Yes
Category effects	No	No	No	Yes	No	Yes
Clustered Std. Err.	Country	Country	Country	Country	Country	Country

Notes: The table reports coefficients and their standard error (in parentheses). The outcome variable is the binary flag of ICO's success/failure and all variables are defined in Section 3. Data span over the period 2017–2023. Estimation method is OLS with standard errors clustered by ICO's country. The bottom part of the table reports which fixed effects are used in each model specification. Variables' legend is reported in Section 3.

*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

3.2. Whitepaper variables

By examining each whitepaper, we are able to learn about the company's industry, the number of words, the level of technical and financial expertise and, most importantly, whether it is compliant with the ESG principles or carrying a related business idea. Indeed, we analyse each document searching for the ones which are related to sustainability and environment topics, looking both at those having as final purpose sustainability and/or the environment. Therefore, the downloaded whitepapers have been converted into readable text through Optical Character Recognition (OCR) tool and then fully analysed through advanced textual analysis techniques based on Bidirectional Encoder Representations from Transformers (BERT) architecture (Devlin et al., 2019), in order to extract information about the characteristics of the proposed business idea. In particular, we use pre-trained models specifically tailored to ESG indicators and financial-related vocabularies (Huang et al., 2022).[4] [These models are firstly trained on thousands of documents to learn the (dis)similarities between words, sentences, and paragraphs and to define their numerical representation. This task is performed through a self-supervised approach, where no subjective input is required. Then, the models are fine-tuned on a smaller set of documents, after being manually labelled according to the topic the document is dealing with.] The outcome of the model is a probability score for each classification class, e.g. Environmental, Social, Governance, estimating how much pertinent the whitepaper's text is with the topic, plus a fourth one assessing the non-relevance with the previous topics. In this way, we do not perform a topic-independent analysis and we elicit the possible presence of sustainability-related keywords. Such a step is crucial for building the *ESGFLAG* covariate used in the analysis. In our case we assign the value of 1 if at least one of the three probabilities (E, S or G) is greater than the probability of non-relevance with the topics. Other BERT models are used to extract the continuous

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[4] https://huggingface.co/yiyanghkust/finbert-esg-9-categories

Table 2
Predicting ICOSUCCESS with logit model in the Control scenario.

Variable	1	2	3	4	5	6
ESGFLAG	0.162**	0.183**	0.185**	0.138**	0.214*	0.197*
	(0.0738)	(0.0721)	(0.0730)	(0.0748)	(0.111)	(0.116)
DURATION	−0.428**	−0.444*	−0.388**	−0.418**	−0.403	−0.394*
	(0.180)	(0.231)	(0.190)	(0.173)	(0.245)	(0.239)
RATING	0.113***	0.116**	0.131**	0.118***	0.135**	0.139**
	(0.0416)	(0.0465)	(0.0520)	(0.0413)	(0.0561)	(0.0555)
TEAMSIZE	0.0410***	0.0347***	0.0440***	0.0408***	0.0372***	0.0368***
	(0.00842)	(0.00884)	(0.00716)	(0.00925)	(0.00751)	(0.00794)
ADVISORSIZE	0.0411***	0.0370**	0.0373***	0.0435***	0.0330*	0.0356*
	(0.0127)	(0.0163)	(0.0140)	(0.0138)	(0.0191)	(0.0199)
WHITELIST	0.00978	0.198	0.0935	0.0634	0.0141	0.0304
	(0.0581)	(0.129)	(0.102)	(0.0726)	(0.117)	(0.115)
BOUNTY	−0.235**	−0.230*	−0.214*	−0.266	−0.215	−0.245
	(0.116)	(0.124)	(0.126)	(0.170)	(0.132)	(0.188)
BONUS	−0.101	−0.0363	−0.0628	−0.148	−0.00663	−0.0615
	(0.132)	(0.0995)	(0.122)	(0.146)	(0.0959)	(0.115)
MVP	−0.247**	−0.233**	−0.231**	−0.241*	−0.206**	−0.192
	(0.112)	(0.109)	(0.106)	(0.133)	(0.105)	(0.147)
PRESALE	−0.214**	−0.130	−0.218***	−0.205***	−0.139	−0.130
	(0.0854)	(0.0795)	(0.0833)	(0.0707)	(0.0884)	(0.101)
KYC	−0.112	−0.0306	−0.0420	−0.0707	0.0416	0.0765
	(0.104)	(0.0664)	(0.100)	(0.131)	(0.0417)	(0.0760)
ERC20	−0.0311	−0.0626	−0.0344	−0.0116	−0.0509	−0.0349
	(0.0913)	(0.129)	(0.0898)	(0.0724)	(0.136)	(0.108)
LOGWORDS	0.195	0.184	0.180	0.207	0.173	0.189
	(0.165)	(0.168)	(0.165)	(0.170)	(0.166)	(0.174)
FINSENTIMENT	−0.0249	−0.0967	−0.0450	0.0162	−0.159	−0.158
	(0.437)	(0.431)	(0.447)	(0.531)	(0.451)	(0.544)
CRYPTOFEARGREED	−0.00947	−0.0000498	−0.00838	−0.00962*	−0.00135	−0.00138
	(0.00576)	(0.00730)	(0.00592)	(0.00580)	(0.00761)	(0.00819)
ICORESTRICTION	−0.0665	−0.0833	−0.00504	−0.0699	−0.0126	−0.0231
	(0.0548)	(0.0592)	(0.0506)	(0.0489)	(0.0566)	(0.0544)
ICEA	0.0610*	0.243*	0.0484	0.0605	0.333**	0.323*
	(0.0756)	(0.0814)	(0.0632)	(0.0789)	(0.157)	(0.177)
UCRYPOLICY	−0.0331	−0.285***	−0.0221	−0.0329	−0.300***	−0.305**
	(0.0520)	(0.105)	(0.0600)	(0.0537)	(0.0993)	(0.131)
CBDCUNCERTAINTY	0.265*	0.391***	0.237	0.281*	0.332***	0.355***
	(0.157)	(0.119)	(0.157)	(0.147)	(0.121)	(0.137)
GREENHOUSEEMISS	−0.255*	−0.0517	−0.309*	−0.280**	−0.153	−0.153
	(0.152)	(0.261)	(0.171)	(0.138)	(0.264)	(0.277)
Observations	871	869	869	871	866	866
Pseudo R^2	0.058	0.074	0.066	0.067	0.082	0.089
Quarter-Year effects	No	Yes	No	No	Yes	Yes
Country effects	No	No	Yes	No	Yes	Yes
Category effects	No	No	No	Yes	No	Yes
Clustered Std. Err.	Country	Country	Country	Country	Country	Country

Notes: The table reports coefficients and their standard error (in parentheses). The outcome variable is the binary flag of ICO's success/failure and all variables are defined in Section 3. Data span over the period 2017–2023. Estimation method is OLS with standard errors clustered by ICO's country. The bottom part of the table reports which fixed effects are used in each model specification. Variables' legend is reported in Section 3.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Financial Sentiment[5] *FINSENTIMENT* (1 for positive, 0 for neutral, −1 for negative). Additionally, the length of the whitepaper *LOGWORDS* indicates the logarithm of the number of words in each paper.

3.3. Independent variables

From the scraped data we collected 11 independent variables. The variable *DURATION* reports the logarithm of the duration (in days) of the ICO funding round. The variable *RATING* indicates the overall project rating on ICOmarks and it is based on the consensus of industry experts. It ranges from 1 to 10 ("poor quality" to "good quality"). The variables *TEAMSIZE* and *ADVISORSIZE*

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[5] https://huggingface.co/yiyanghkust/finbert-tone

Table 3
Predicting LOGRAISEDFUND with OLS model in both Baseline and Control scenarios.

Variable	1	2	3	4
ESGFLAG	0.1459**	0.1704*	0.139**	0.189*
	(0.0248)	(0.0103)	(0.0191)	(0.00985)
DURATION	−0.164**	−0.113*	−0.128**	−0.108*
	(0.0541)	(0.0577)	(0.0434)	(0.0508)
RATING	0.0924***	0.0774**	0.0802***	0.0794**
	(0.0245)	(0.0270)	(0.0225)	(0.0261)
TEAMSIZE	0.0262***	0.0227***	0.0228***	0.0218***
	(0.00279)	(0.00277)	(0.00315)	(0.00297)
ADVISORSIZE	0.0269***	0.0192***	0.0246***	0.0202***
	(0.00130)	(0.00338)	(0.00174)	(0.00356)
WHITELIST	0.256*	0.101	0.150	0.0914
	(0.113)	(0.111)	(0.0867)	(0.114)
BOUNTY	−0.130**	−0.0896	−0.101	−0.0771
	(0.0536)	(0.0786)	(0.0592)	(0.0802)
BONUS	−0.0104	0.000108	−0.0255	−0.0134
	(0.0933)	(0.109)	(0.0896)	(0.106)
MVP	−0.204**	−0.0639	−0.127	−0.0714
	(0.0735)	(0.0647)	(0.0693)	(0.0605)
PRESALE	−0.0159	−0.133**	−0.0445	−0.127*
	(0.0335)	(0.0547)	(0.0411)	(0.0619)
KYC	−0.0374	−0.187***	−0.110**	−0.187***
	(0.0229)	(0.0486)	(0.0387)	(0.0490)
ERC20	−0.0644	−0.101*	−0.0650	−0.101
	(0.0392)	(0.0473)	(0.0378)	(0.0553)
LOGWORDS	0.0108	0.00231	0.0170	0.00254
	(0.0140)	(0.0209)	(0.0193)	(0.0213)
FINSENTIMENT	−0.0263	−0.0652	−0.00955	−0.0474
	(0.189)	(0.175)	(0.184)	(0.173)
CRYPTOFEARGREED			−0.00511**	−0.00337
			(0.00174)	(0.00238)
ICORESTRICTION			−0.0146	−0.00388
			(0.0448)	(0.0592)
ICEA			0.129***	0.0876
			(0.0234)	(0.0493)
UCRYPOLICY			−0.0541	−0.00693
			(0.0303)	(0.0514)
CBDCUNCERTAINTY			0.198**	0.183*
			(0.0681)	(0.0839)
GREENHOUSEEMISS			−0.175***	−0.0397
			(0.0374)	(0.0307)
Observations	871	871	871	871
R^2	0.119	0.208	0.165	0.217
Quarter-Year effects	No	Yes	No	Yes
Country effects	No	Yes	No	Yes
Category effects	No	Yes	No	Yes
Clustered Std. Err.	Country	Country	Country	Country

Notes: The table reports coefficients and their standard error (in parentheses). The outcome variable is the logarithm of ICO's raised funds and all variables are defined in Section 3. Data span over the period 2017–2023. The estimation method is OLS with standard errors clustered by ICO's country. The bottom part of the table reports which fixed effects are used in each model specification. Variables' legend is reported in Section 3.

*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

report the total number of people in the core team and in the advisor staff, respectively. The variable *WHITELIST* is a dummy that indicates whether the ICO has a list of registered and approved participants that are given exclusive access. The variables *BOUNTY* and *BONUS* are dummies that report if the ICO allows a bounty and a bonus schema, respectively. The variable *MVP* is a dummy that states whether the ICO has already developed a Minimum Viable Product. The *PRESALE* variable is a dummy stating whether the ICO had a pre-sale round or not. The variable *KYC* is a dummy that indicates if the ICO has a Know Your Customer procedure that checks the mandatory process of identifying and verifying the client's identity when opening an account and periodically over time. The *ERC20* variable is a dummy one that indicates whether the token offering adheres to the technical ERC20 standard. The technical standard is known as Ethereum Request for Comment 20 (or ERC20), and it specifies a set of rules that a token built on the Ethereum blockchain must follow (Mansouri and Momtaz, 2022). So, in other words, ERC-20 establishes a standard for token fungibility. These tokens have a property that makes each token identical (in type and value) to another token.
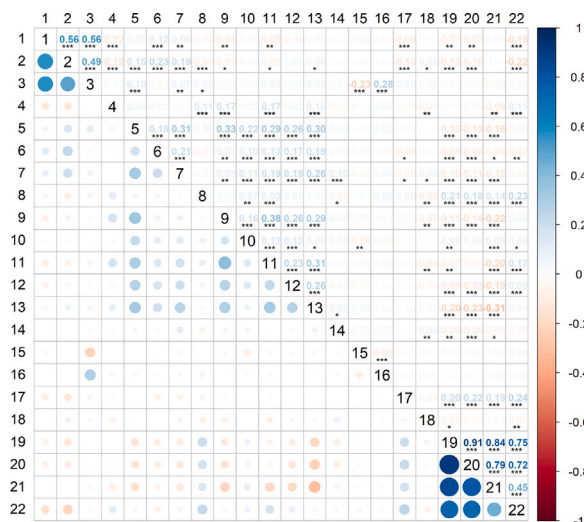
Fig. A.1. Correlation matrix of dependent and independent variables. P-values significance level for each correlation coefficient is reported with the following legend: ∗ if $p < 0.1$, ∗∗ if $p < 0.05$, ∗∗∗ if $p < 0.01$. Variables' legend is reported in Section 3 of the main document.

3.4. Control variables

We include a set of control variables to both include fixed effects in our analysis and take into account market, crypto-related sentiment and climate information. In particular, we used the country in which each ICO is based, the quarter-year in which the ICO funding round started and the category that ICOmarks.com assigned to ICO (Business, Energy, Finance, Infrastructure, Manufacturing, Social, Tech, Other). *ICORESTRICTION*[6] is a country-wise variable that reports the regulatory constraints for ICO, ranging from 1 (no restrictions) to 4 (ICO are banned). The emotions and sentiment on Bitcoin and other large cryptocurrencies are captured by the Fear & Greed Index[7] and the variable *CRYPTOFEARGREED* ranges from 0 (fear) to 100 (greed). The *ICEA* variable is the Index of Cryptocurrency Environmental Attention (ICEA) by Wang et al. (2022b) and aims to capture the relative extent of media discussion around the environmental impact of cryptocurrencies. The *UCRYPOLICY* variable is the Cryptocurrency Policy Uncertainty Index (UCRY) by Lucey et al. (2022) and aims to assess how cryptocurrency returns and volatility are affected by policy and regulatory debates affect and reaction to Bitcoin attention. The *CBDCUNCERTAINTY* variable is the Central Bank Digital Currency (CBDC) Uncertainty Index by Wang et al. (2022a) and aims to capture the uncertainty in the discussion about CBDC in news articles. Finally, the *GREENHOUSEEMISS* variable reports the annualized emission of CO_2 by Bitcoin-related activities in the 3 months before the ICO's start, provided by Cambridge Bitcoin Electricity Consumption Index (CBECI).[8]

4. Methodology and results

After screening for available whitepapers and relative ICOs with no missing data for the other variables of interest, we ended up with a database containing 871 ICOs, spanning from 2017 to early 2023. 558 (64%) ICOs are flagged as successful and 281 (25%) are flagged as ESG-related. Table A.1 and Fig. A.1 in the Appendix present the summary statistics of the variables described in the previous section and their pairwise correlations, respectively. 208 of the 281 ESG-related ICOs have information on the country, therefore Figs. B.2–B.4 and Table B.2 in the Appendix report the geographical density of ICOs, their percentage of success, the share of ESG-related ones and how many ESG-related ICOs succeeded in raising the expected funds. Singapore is the country with the highest number of ICOs, followed by United Kingdom, Estonia, United States, Switzerland, Cayman Islands and Hong Kong.

We then fit a logit model with OLS estimation, taking into account year-quarter, country and category fixed effects, as well as clustering the error by country. We divide our analysis into two scenarios: in the first (referred to as *Baseline*) we only consider the impact of ICOs' technical and financial specifications and the information extracted from the whitepapers and in the second (referred to as *Control*) we include the control variables. Both scenarios include the key variable *ESGFLAG*, in order to validate our research hypothesis. Tables 1 and 2 report the results of Baseline and Control scenarios, respectively. Results are stable over the two scenarios. In particular, we observe that the success of an ICO is promoted when the project shows an interest in the ESG topic. This hypothesis finds support in the literature, motivating the importance of ESG signalling as a source of trust with investors (Kraus et al., 2018; Momtaz, 2021), especially among young ones, creating a better sense of identification compared to older generation

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[6] https://www.bitcoinmarketjournal.com/ico-regulations/
[7] https://alternative.me/crypto/fear-and-greed-index/
[8] https://ccaf.io/cbnsi/cbeci/ghg

Table A.1

List of variables used in the analysis, the total number of non-missing observations and descriptive summary statistics. Variables' legend is reported in Section 3 of the main document.

Variable	Obs	Mean	S.D.	Min	P25	Median	P75	Max
1 - ICOSUCCESS	871	0.64	0.48	0	0	1	1	1
2 - LOGRAISEDFUND	871	6.41	0.86	2.28	6.01	6.53	7.01	8.76
3 - ESGFLAG	871	0.25	0.43	0	0	0	1	1
4 - DURATION	871	1.64	0.46	0	1.48	1.66	1.91	3.26
5 - RATING	871	8.03	1.29	2.3	7.7	8.4	8.7	10
6 - TEAMSIZE	871	10.8	6.18	1	7	9	13	48
7 - ADVISORSIZE	871	4.37	4.2	0	0	4	7	22
8 - WHITELIST	871	0.05	0.22	0	0	0	0	1
9 - BOUNTY	871	0.43	0.5	0	0	0	1	1
10 - BONUS	871	0.17	0.37	0	0	0	0	1
11 - MVP	871	0.29	0.45	0	0	0	1	1
12 - PRESALE	871	0.47	0.5	0	0	0	1	1
13 - KYC	871	0.57	0.5	0	0	1	1	1
14 - ERC20	871	0.78	0.41	0	1	1	1	1
15 - LOGWORDS	871	3.32	0.58	0.6	3.45	3.45	3.45	4.83
16 - FINSENTIMENT	871	0.03	0.17	0	0	0	0	1
17 - CRYPTOFEARGREED	871	33.97	14.16	6	24	30	40	88
18 - ICORESTRICTION	871	1.81	0.88	1	1	2	3	4
19 - ICEA	871	0.93	1.45	−0.53	0.15	0.44	1.29	12
20 - UCRYPOLICY	871	0.82	2.02	−0.73	−0.19	0.06	0.8	14.65
21 - CBDCUNCERTAINTY	871	0.55	0.91	−0.7	−0.12	0.34	1.04	4.82
22 - GREENHOUSEEMISS	871	2.1	0.85	0.42	1.7	2.02	2.3	5.62
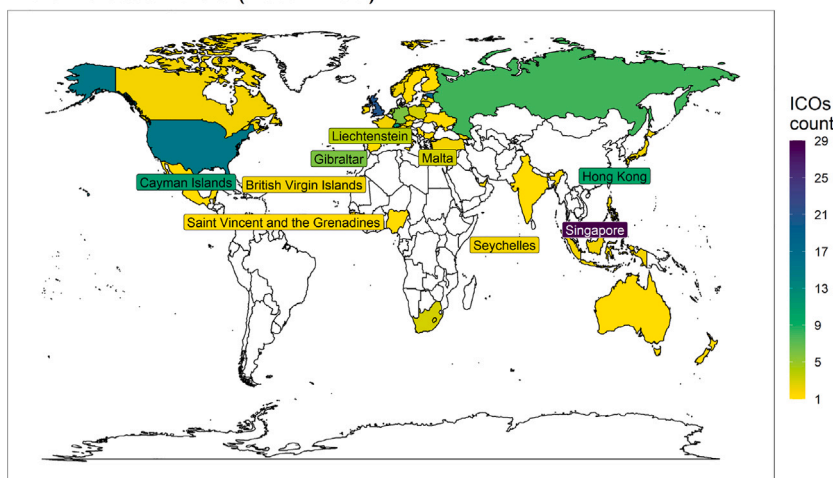
Fig. B.2. Distribution of ESG-related ICOs over the world.

investors (Fisch et al., 2021). Moreover, ESG can be viewed as a differentiation strategy in startup investment, increasing the ICO's probability of success and subsequent profit margins (Albuquerque et al., 2019). Additionally, the attention to ESG topic has been proved to be correlated with alternative types of capital, such as human, social and intellectual, that are considered of utmost importance for the success of funding rounds for startups (Ahlers et al., 2015; Fisch, 2019; Spence et al., 2011). Among the other variables, we notice the negative correlations of ICO's success and the financial topics in the content of the whitepaper as well as the negative sign of the duration variable, suggesting that shorter funding rounds may lead to unsuccessful outcomes (Fisch et al., 2021). On the control variables, clearly the lower restrictions on ICOs regulation increase the probability of success. Similarly, the increase in greenhouse emissions due to crypto-currency seems to negatively affect the probability of success. Indeed, this reflects a sort of contradiction among the ESG-aware investors and the environmental impact of crypto-mining (Rabbani et al., 2021). On the other side, the rise in global attention to the environmental impact of crypto-currencies (ICEA, Wang et al., 2022b) favours the trust in the ESG-related topic ICOs and increases their success odds.

Finally, we perform a robustness test checking whether the results still hold switching the binary outcome ICOSUCCESS with the logarithm of total amount of raised funds, LOGRAISEDFUND. Table 3 reports the results of Baseline and Control scenarios, respectively. Results are stable over the two scenarios and consistent with the ones obtained with the binary target variable.
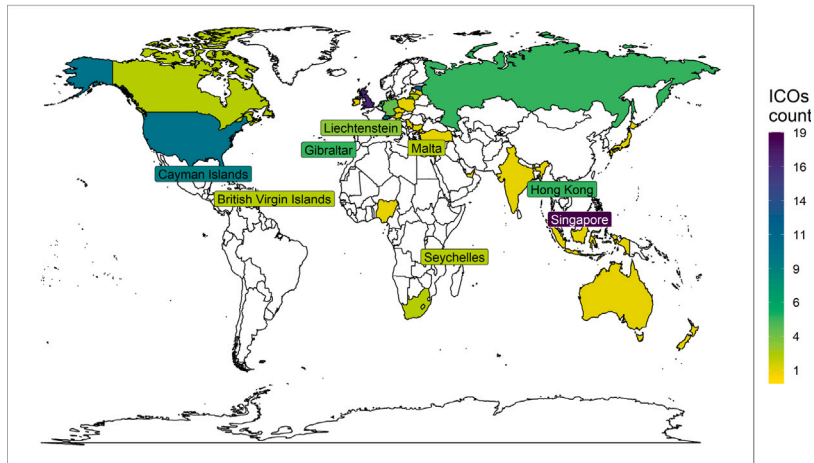
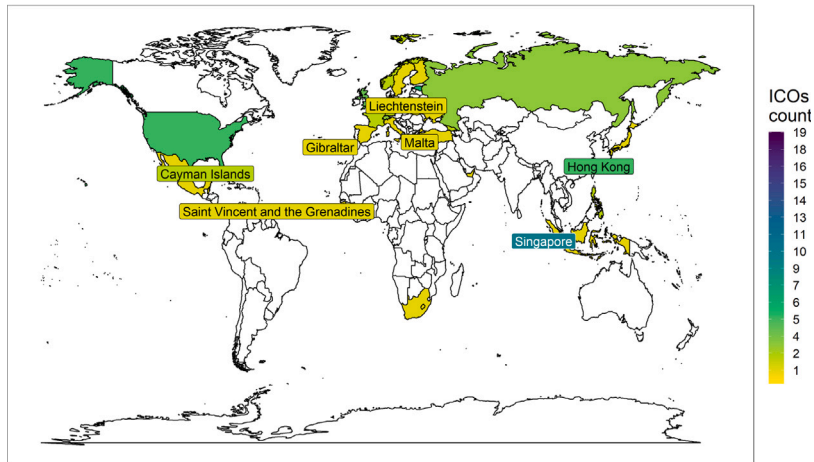**Fig. B.3.** Distribution of Successful ESG-related ICOs over the world.

Fig. B.4. Distribution of Failed ESG-related ICOs over the world.

5. Final remarks

In this paper, we address the emerging need to understand the nexus between the attention to Environment, Social Change, and Governance topics and the funding round of Initial Coin Offering which a startup's product deals with the same topics. However, although ICOs are attracting more and more investors, their market is also young and ever-changing and, therefore, full of significant risks.

We contribute to the research field by investigating whether the attention to ESG topics may increase the probability of raising the expected funds for a startup, during its financing round. To this aim, we leverage Natural Language Processing tools to evaluate the pertinence of ICO's whitepaper to ESG subjects and to create the relative binary flag. The flag is used, in addition to other independent and control variables, to predict the binary outcome of ICO's success.

Our preliminary results appear to confirm the nexus between ICOs' success and ESG. The attention towards sustainability-related topics in general seems to favour fundraising activities. This is in line with a public audience's tendency to better evaluate every activity connected to ethics and responsible behaviour.

Such analysis will be further improved and robustified by enlarging the dataset, recovering more and more whitepapers, and testing more control variables and scenarios, possibly identifying a stronger economic channel for ESG attention. Lastly, it would be interesting to evaluate the connection between ESG-related ICOs and the fraudulent behaviour of startups.

Table B.2

List of total ICOs for each country over the world, including counts of successful, ESG-related and successful ESG-related ones.

Country	Total ICOs	Success	ESG-Related	Success: ESG-Related
Singapore	114	77 (67.5%)	29 (25.4%)	19 (24.7%)
United Kingdom	84	56 (66.7%)	21 (25%)	17 (30.4%)
Estonia	67	39 (58.2%)	19 (28.4%)	13 (33.3%)
United States	63	44 (69.8%)	15 (23.8%)	10 (22.7%)
Russia	46	26 (56.5%)	8 (17.4%)	5 (19.2%)
Switzerland	43	26 (60.5%)	12 (27.9%)	9 (34.6%)
Hong Kong	26	16 (61.5%)	10 (38.5%)	5 (31.2%)
Cayman Islands	23	17 (73.9%)	11 (47.8%)	9 (52.9%)
Malta	18	9 (50%)	3 (16.7%)	2 (22.2%)
Netherlands	17	15 (88.2%)	5 (29.4%)	5 (33.3%)
British Virgin Islands	15	11 (73.3%)	2 (13.3%)	2 (18.2%)
Australia	14	11 (78.6%)	1 (7.1%)	1 (9.1%)
Germany	14	6 (42.9%)	6 (42.9%)	4 (66.7%)
Gibraltar	12	11 (91.7%)	6 (50%)	5 (45.5%)
Slovenia	12	10 (83.3%)	3 (25%)	3 (30%)
United Arab Emirates	12	8 (66.7%)	2 (16.7%)	1 (12.5%)
Belize	11	6 (54.5%)	1 (9.1%)	0 (0%)
France	11	6 (54.5%)	2 (18.2%)	0 (0%)
Lithuania	10	9 (90%)	2 (20%)	2 (22.2%)
Canada	9	8 (88.9%)	2 (22.2%)	2 (25%)
Cyprus	9	3 (33.3%)	4 (44.4%)	1 (33.3%)
Seychelles	9	7 (77.8%)	2 (22.2%)	2 (28.6%)
Spain	9	4 (44.4%)	1 (11.1%)	0 (0%)
Czech Republic	8	6 (75%)	2 (25%)	1 (16.7%)
Liechtenstein	7	6 (85.7%)	4 (57.1%)	3 (50%)
Poland	7	5 (71.4%)	3 (42.9%)	1 (20%)
Bulgaria	6	2 (33.3%)	1 (16.7%)	1 (50%)
India	6	4 (66.7%)	1 (16.7%)	1 (25%)
Latvia	6	5 (83.3%)	1 (16.7%)	1 (20%)
Nigeria	6	3 (50%)	1 (16.7%)	1 (33.3%)
South Africa	6	4 (66.7%)	3 (50%)	2 (50%)
China	5	3 (60%)	0 (0%)	0 (0%)
Georgia	5	2 (40%)	2 (40%)	0 (0%)
Indonesia	5	2 (40%)	2 (40%)	1 (50%)
Japan	5	3 (60%)	2 (40%)	1 (33.3%)
Saint Kitts and Nevis	5	3 (60%)	0 (0%)	0 (0%)
Ireland	4	2 (50%)	1 (25%)	1 (50%)
Philippines	4	0 (0%)	2 (50%)	0 (0%)
Romania	4	2 (50%)	0 (0%)	0 (0%)
Thailand	4	2 (50%)	0 (0%)	0 (0%)
Turkey	4	2 (50%)	2 (50%)	1 (50%)
Ukraine	4	2 (50%)	1 (25%)	0 (0%)
Costa Rica	3	1 (33.3%)	0 (0%)	0 (0%)
Italy	3	2 (66.7%)	1 (33.3%)	0 (0%)
Mexico	3	2 (66.7%)	1 (33.3%)	0 (0%)
Norway	3	0 (0%)	2 (66.7%)	0 (0%)
Sweden	3	1 (33.3%)	1 (33.3%)	0 (0%)
Argentina	2	2 (100%)	0 (0%)	0 (0%)
Austria	2	2 (100%)	1 (50%)	1 (50%)
Brazil	2	0 (0%)	0 (0%)	0 (0%)
Cambodia	2	1 (50%)	0 (0%)	0 (0%)
Colombia	2	1 (50%)	0 (0%)	0 (0%)
Isle of Man	2	1 (50%)	0 (0%)	0 (0%)
Israel	2	2 (100%)	1 (50%)	1 (50%)
New Zealand	2	2 (100%)	1 (50%)	1 (50%)
North Korea	2	1 (50%)	0 (0%)	0 (0%)
Peru	2	0 (0%)	0 (0%)	0 (0%)
Portugal	2	1 (50%)	0 (0%)	0 (0%)
South Korea	2	0 (0%)	0 (0%)	0 (0%)
Vietnam	2	1 (50%)	0 (0%)	0 (0%)
Worldwide	2	0 (0%)	1 (50%)	0 (0%)
Zimbabwe	2	2 (100%)	0 (0%)	0 (0%)
Bahamas	1	0 (0%)	0 (0%)	0 (0%)
Belarus	1	1 (100%)	0 (0%)	0 (0%)
Bermuda	1	1 (100%)	0 (0%)	0 (0%)
Finland	1	0 (0%)	1 (100%)	0 (0%)
Greece	1	1 (100%)	0 (0%)	0 (0%)
Guinea-Bissau	1	0 (0%)	1 (100%)	0 (0%)
Jamaica	1	1 (100%)	0 (0%)	0 (0%)
Kenya	1	1 (100%)	0 (0%)	0 (0%)
Luxembourg	1	1 (100%)	0 (0%)	0 (0%)
Malaysia	1	1 (100%)	0 (0%)	0 (0%)
Marshall Islands	1	0 (0%)	0 (0%)	0 (0%)
Montenegro	1	0 (0%)	0 (0%)	0 (0%)
Morocco	1	0 (0%)	0 (0%)	0 (0%)
Pakistan	1	0 (0%)	0 (0%)	0 (0%)
Panama	1	1 (100%)	0 (0%)	0 (0%)
Saint Vincent and the Grenadines	1	0 (0%)	1 (100%)	0 (0%)
Samoa	1	1 (100%)	0 (0%)	0 (0%)
Serbia	1	1 (100%)	1 (100%)	1 (100%)
Slovakia	1	1 (100%)	0 (0%)	0 (0%)
Taiwan	1	1 (100%)	0 (0%)	0 (0%)
Uzbekistan	1	0 (0%)	0 (0%)	0 (0%)
Unknown	56	41 (73.2%)	10 (17.9%)	6 (14.6%)
TOTAL	871	558 (64.1%)	218 (25%)	142 (25.4%)

Notes: *Success* and *ESG-related* percentages are evaluated over each country's *Total ICOs*, *Success: ESG-related* percentages are evaluated over each country's *Success*.

CRediT authorship contribution statement

Alessandro Bitetto: Conceived the experiment(s), Conducted the experiment(s), Analysed the results, Reviewed the manuscript.
Paola Cerchiello: Conceived the experiment(s), Conducted the experiment(s), Analysed the results, Reviewed the manuscript.

Data availability

Data will be made available on request.

Acknowledgements

Appendix A. Descriptive statistics and correlation

See Fig. A.1 and Table A.1.

Appendix B. Geographical density of ESG-related ICOs

See Figs. B.2–B.4 and Table B.2.

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