Unveiling the Dynamics of ICO Underpricing: An Analysis of Regulatory Changes and Female Leadership

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Submitted in fulfilment of the requirements of the Degree of MPhil

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Abstact:

Providing funding for innovative enterprises is a primary focus in entrepreneurial finance. Initial Coin Offering (ICO) constitutes a novel mechanism for raising funds for highly innovative enterprises utilizing Distributed Ledger Technology (DLT). The most common type of DLT is blockchain technology. In an ICO, companies raise funds by issuing tokens and selling them to a group of investors. Typically, these tokens are cryptocurrencies designed to serve as currency within the company's ecosystem. While ICOs share similarities with Initial Public Offerings (IPOs) and crowdfunding, there are distinctions. In contrast to IPOs, investors purchasing stocks gain equity, whereas investors acquiring tokens in ICOs do not obtain equity. Another distinguishing feature from crowdfunding is the use of DLT, which is essential for token issuance and constitutes the core of these enterprises. DLT, especially blockchain technology, represents a revolutionary and disruptive technological innovation. Therefore, providing funds for these enterprises is crucial in the field of entrepreneurial finance.

ICO, being a new financing method, faces incomplete regulatory frameworks across various countries and regions. This preliminary study aims to investigate the impact of ICO regulations on token depreciation and whether the presence of female leaders in companies amplifies or mitigates this impact.

Our multiple regression analysis, conducted on a sample of 377 ICOs from 2016 to 2020, indicates that ICO depreciation is reduced in the presence of ICO regulations. Additionally, when companies have female leaders, ICO depreciation becomes more severe. However, the interaction between regulation and female leadership mitigates ICO depreciation, meaning that female leaders exacerbate the impact of regulations on ICOs.

By integrating regulation, female leadership, and ICO depreciation, this study fills a gap in the research field. Furthermore, we provide relevant recommendations

in the conclusion, offering guidance for establishing regulatory systems and ensuring fair pricing.

Authors Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

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Acknowledgment

I extend my gratitude to Dr. Ufuk Gucbilmez and Professor Evangelos Vagenas-Nanos for their invaluable guidance during the course of my MPhil studies. Their patient and meticulous supervision played a crucial role in shaping the outcome of this thesis. I appreciate their support and mentorship over the past two years.

I am thankful to my parents, Liangbing Yang and Aiqing Pan, for their unwavering support and hard work to provide me with better educational opportunities. Their encouragement and understanding in every decision I made have been a constant source of strength.

I also acknowledge the companionship of my friends throughout my academic journey. Their support has been instrumental in making this experience more fulfilling.

In conclusion, I express my appreciation to all individuals who have contributed to my academic development. Their influence has left a lasting impact on my journey, and I am grateful for your support.

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1. Introduction

The rise of financial technology is one of the most critical developments in the financial sector in the past decade. Distributed ledger technology represents a groundbreaking technological innovation, possessing significant potential (Yermack, 2017). Blockchain technology is often linked with positive changes like security and transparency. However, it can also disrupt traditional systems. In the case of finance, blockchain introduces ways to manage and transfer money that do not rely on usual banks or processes. This can be challenging for traditional financial institutions which have to adapt to this new technology that operates outside of their control. It may lead to changes in how they operate, possibly making some of their services outdated. Tapscott and Tapscott (2016) note that finance as a key industry that has been disrupted by blockchain, which refers to the digital ledger technology behind cryptocurrencies like Bitcoin. They suggest that the influence of blockchain is significant and reshaping the finance sector.

Blockchain technology decentralizes transaction and contract data by removing the necessity for intermediaries, ensuring that no individual or entity holds control over the information within the blockchain (Iansiti and Lakhani, 2017). The evolution of blockchain has also given rise to a novel form of financing: initial coin offerings.

ICOs are a new form of fundraising in which companies can raise money by selling tokens to investors (Fisch, 2019; Lee et al., 2022). ICOs are an alternative to traditional methods of fund raising (such as venture capital and angel finance) for early-stage ventures (European Parliament, 2021; Jongsub et al., 2022; Schuckes and Gutmann, 2021). Instead of getting loans or selling shares, companies sell digital tokens to people who want to invest. These tokens are like special coupons that can be used later, maybe to buy something the company makes or to get a share of the company's profits. People buy these tokens hoping the company will

do well and the tokens will be worth more later. Everything is done using blockchain, which is a secure online record-keeping system. It is like a big digital ledger that everyone can see, so it is clear who owns what. This way of raising money is fast and does not give away part of the company's ownership like when selling shares. But it is also risky for the people who buy tokens because the rules are not always clear and token prices can change a lot.

Initial Coin Offerings represent a fundraising approach leveraging blockchain technology. The surge in ICOs is propelled by advancements in blockchain and Distributed Ledger Technology (DLT), crucial for generating and disseminating digital tokens. These technological enhancements have established ICOs as a favored option for companies seeking capital (Fisch, 2019). The benefits offered by blockchain, including transparency and security, have significantly contributed to the growing acceptance of ICOs over time.

Initial coin offerings are seen as a different method for startups and projects related to blockchain to raise funds without turning to venture capitalists. This approach is viewed as a combination of traditional crowdfunding methods, like Kickstarter, and the initial public offering (IPO) process used by companies to go public. Generally, it is difficult for newly established companies to be listed on traditional exchanges. In addition, only an exceedingly small number of venture capital funds invest in blockchain startups, because most of these startups are in the seed stage, and it is often difficult to evaluate their business models and market opportunities. Therefore, token sales are one of the few options for most projects in the industry (Yuryev, 2018).

Fisch (2019) concurs that both the quantity of Initial Coin Offerings and the total funds amassed experienced a notable surge since 2017. However, there was a decline in 2019 following the peak in 2018 (Jongsub et al., 2022; De Andrés et al., 2022). According to Lee et al. (2022), the capital raised by ICOs in the first quarter of 2019 amounted to just $902 million, constituting approximately 14% of the total

funds raised in the first quarter of 2018. Lee et al. (2022) attribute this downturn in the ICO market to heightened regulatory measures and the diminishing values of major cryptocurrencies, notably Bitcoin (BTC) and Ethereum (ETH). Despite the considerable number of ICOs in 2018, the success rate was relatively modest. Benedetti and Kostovetsky (2021) discovered that out of a sample of 2390 ICOs from January 2017 to March 2018, only 48% were successful in raising funds, and merely 26% managed to list their tokens on cryptocurrency exchanges.

Joo (2019) asserts that the primary objective behind the evolution of Initial Coin Offerings is to offer investors entry into private markets, addressing the void resulting from the contraction of public capital markets. In a scenario where the count of public companies in the U.S. stock market diminished by nearly half between 1996 and 2016, and the annual number of Initial Public Offerings (IPOs) decreased from 700 to a mere 100, ICOs emerged as an alternative avenue for investment in the private market.

According to ICOdata.IO (2021), both the fundraised and ICO numbers were increasing from 2015 to 2018 and reached the top (especially 13.56 billion and 1602). Jongsub et al. (2022) support that the main reasons for the decline in ICO activity are regulatory uncertainty and adverse cryptocurrency market conditions. In addition, De Andrés et al. (2022) state that ICOs will be replaced by similar but more specialized funding models such as security token offering (STO) and initial exchange offering (IEO). After two years of decline, the fund raised increased to around 1378 billion and ICO numbers increased to 136. Although STOs and IEO have taken center stage since late 2018, the surge in cryptocurrency prices during the COVID-19 pandemic has revived the ICO market (Lee et al., 2022).

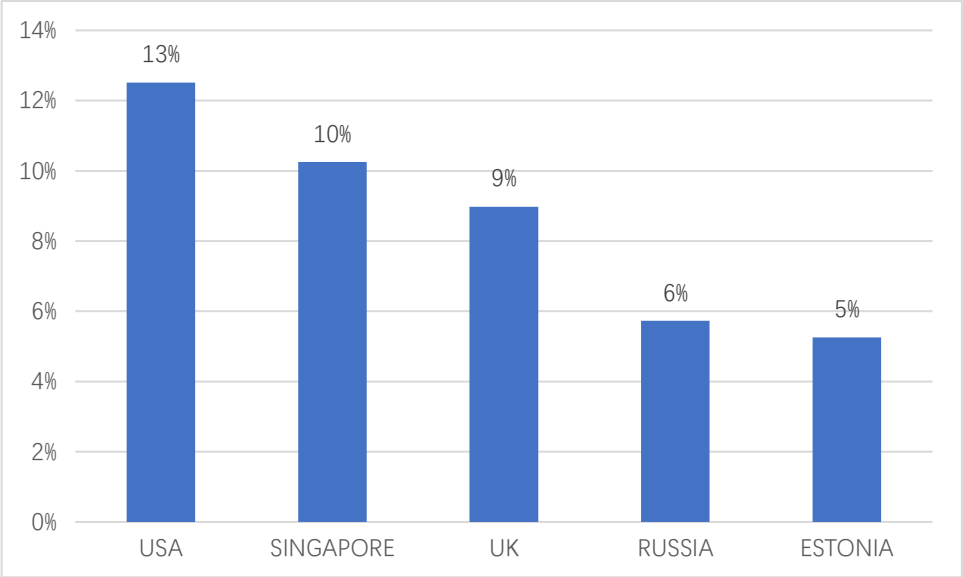

Figure 1: Percentage of ICOs' number in top 5 countries (Note: data source is from ICObench, 2021)

Initial Coin Offerings are more prevalent in nations possessing well-established financial systems, robust public stock markets, and advanced digital technologies (Huang et al., 2020). In addition, Benedetti and Kostovetsky (2021) state that the countries' above-average World Bank Rule of Law rankings and exacting standards of living would result in ICOs being mostly located in. The most ICOs issued in the USA about 13% (there are 5728 ICO in the ICObench platform and 717 ICOs issued in the USA). There are around 10% ICOs issued in Singapore and 9% in the UK. The amount of these 5 countries accounts for almost half of the total amount.

In today's ever-evolving global financial markets, the role of regulatory authorities is becoming increasingly significant. For Initial Public Offerings (IPOs) and Initial Coin Offerings, two methods of fundraising, regulation not only affects their operational legality and transparency but also has a profound impact on companies' market access, investor confidence, and the overall health of the market. With the rise of digital currencies and the development of blockchain technology, traditional financial regulatory frameworks are facing unprecedented challenges and need to adapt to the unique requirements of this emerging field.

IPOs have been the traditional method for companies to enter public markets and obtain funding, with stringent regulations in place to protect investors and ensure market stability. The scrutiny from regulatory bodies during an IPO is thorough, involving detailed review of a company's financials, market conduct, and compliance with regulations to safeguard the investment community and uphold market order (SEC, 2023). In contrast, ICOs are a relatively new fundraising mechanism and have not yet reached a global consensus in terms of regulation. Different nations exhibit a range of regulatory stances towards ICOs. For instance, the Swiss Financial Market Supervisory Authority (FINMA) has adopted a proactive and clear approach by publishing guidelines that bring clarity to market participants (Planet Compliance, 2021). Similarly, Japan has developed a structured regulatory framework for cryptocurrencies and ICOs, considering their legal tender status and exchange operation authorization (Brave New Coin, 2017). The UK's Financial Conduct Authority (FCA) has indicated that many ICOs fall outside the regulated space and that the regulatory status of each ICO is assessed individually (Brave New Coin, 2017). In Hong Kong, cryptocurrencies may be considered securities, depending on their nature, bringing them under the purview of the Hong Kong Securities and Futures Commission (SFC) (Brave New Coin, 2017). Singapore's Monetary Authority of Singapore (MAS) has also stated that while cryptocurrencies themselves are not regulated, ICOs that qualify as securities under the Securities and Futures Act are subject to regulation (Brave New Coin, 2017). In conclusion, while IPOs have a well-established regulatory framework, ICOs are navigating a dynamic regulatory environment with significant international variations, from Switzerland's open approach to the more cautious and case-by-case assessments in the UK and Japan. These varying stances illustrate the diverse perspectives on digital token offerings and their evolving role in corporate finance (Planet Compliance, 2021; Brave New Coin, 2017).

The rapid advance of financial technology, particularly the rise of Initial Coin Offerings, has challenged existing regulatory frameworks, necessitating adjustments to address new market phenomena. The core of this issue centers on

the regulatory impact on price suppression within ICO markets, a significant concern as it straddles the line between investor protection and market innovation.

At the crux of this evolution is the role of women in leadership, which has become a focal point for redefining corporate finance strategies. As more women occupy key positions traditionally held by men, their influence extends beyond adding diversity; it reshapes how companies strategize and operate within the ICO domain. Their leadership is characterized by ethical decision-making and a risk-aware approach, potentially leading to regulatory strategies that effectively curb price manipulation while allowing market dynamism.

Moreover, the increasing presence of women in leadership roles could catalyze a shift towards more prudent pricing practices within ICOs, influencing the development of regulatory policies aimed at preventing price manipulation. The multifaceted impact of female leadership on ICO regulation and price suppression underscores the importance of their role in establishing transparent pricing mechanisms and advocating for regulatory clarity.

By examining how women in fintech leadership positions navigate regulatory complexities, it becomes clear that they can provide fresh insights into compliance and governance, thereby offering a balanced perspective on maintaining market integrity without inhibiting innovation.

The exploration of female leadership's intersection with regulation to address price suppression in ICOs transcends mere compliance. It touches on broader issues of diversity, equity, and the integration of ethical considerations into financial innovation. Understanding this dynamic is critical for creating well-informed regulatory policies that support both ethical leadership and a fair financial market, benefiting a wide array of stakeholders and contributing to the market's overall health and progress.

In essence, the research into the confluence of female leadership and regulation within ICO markets is a testament to the evolving landscape of financial technology, where diverse leadership can lead to more equitable and robust market practices.

This study explores the impact of regulations on the pricing of Initial Coin Offerings. Additionally, it investigates how the interaction between female leadership and regulatory policies affects the underpricing of ICOs when the company's leadership includes women. ICOs represent a contemporary fundraising method that challenges traditional approaches and prompts a reevaluation of leadership diversity in well-known companies. The discourse on women holding senior positions, particularly in finance and technology sectors, is gaining momentum. ICOs provide an opportunity to observe the effectiveness of female leadership unaffected by traditional biases.

Our study makes significant contributions to the academic discourse on Initial Coin Offerings by providing nuanced insights into the interplay between regulatory environments, gender diversity in leadership, and ICO underpricing. This research extends beyond existing literature, as it empirically validates three key hypotheses:

Firstly, we contribute to the understanding of the regulatory landscape's influence on ICO pricing dynamics. Our findings indicate that regulatory oversight diminishes underpricing, highlighting the positive impact of regulatory frameworks on investor confidence and market stability.

Secondly, the study delves into the gender dimension of ICO underpricing, revealing a positive correlation between female leadership and increased underpricing. This adds a new layer to the discussion by uncovering biases and challenges faced by companies led by women during ICOs.

Finally, by exploring the interaction between regulation and female leadership, our study unveils a nuanced relationship. Contrary to the direct positive impact brought about by female leadership, the combination of female leadership and regulation results in a reduction in underpricing. This highlights the necessity of jointly considering these factors for a comprehensive understanding.

This academic contribution sets the stage for a comprehensive examination of ICO pricing dynamics, emphasizing the multifaceted nature of the factors at play. As we delve into these insights, we aim to provide a foundation for further research in the field, offering valuable knowledge for academics, practitioners, and policymakers alike. The subsequent sections will elaborate on each contribution, providing a thorough analysis of the findings and their implications.

In the following sections, this study unfolds as follows. Firstly, we delve into pertinent literature, establishing the theoretical foundation for the empirical investigation that ensues. Secondly, we provide meticulous details regarding the sources and methods employed for data collection. Thirdly, we present the primary findings of the empirical research, accompanied by an in-depth analysis. Subsequently, in the next step, we apply robust testing methods to further validate the results. Then, a comprehensive discussion is undertaken, thoroughly dissecting the significance and implications of the research findings. Finally, we summarize the key discoveries of this study and propose suggestions for future research.

2. Background:

Initial Coin Offerings, offer a unique and innovative avenue for blockchain companies to secure funding, adding a distinctive layer to the realm of digital currency and token-based financing. This fundraising method enables blockchain companies to sell tokens at a discounted rate, providing a means to finance innovative projects. Although these tokens do not confer ownership rights like traditional shares, they function as a form of currency for the issuer's upcoming products and services. Investors are drawn to the fixed token supply, and the prices of these tokens are often impacted by the growth of the platform, as noted by Athey et al. (2016).

The value of these tokens closely correlates with the market's perception of the associated product or technology and the overall performance of the issuing entity. Regulatory considerations in the ICO space require careful understanding, as highlighted by Athey et al. (2016). Unlike traditional coins used mainly as currency, tokens offer a broader range of utilities and rights linked to the issuing company's services or assets.

While most ICO tokens do not have equity-like characteristics, their issuance presents an innovative fundraising approach for blockchain-focused companies. ICOs offer a diverse range of tokens with various functions, necessitating thoughtful regulatory navigation. This trend is notably evident in Bitcoin, where speculative trading plays a significant role, as discussed by Böhme et al. (2015), Yermack (2017), and Howell et al. (2020).

Companies and individuals are increasingly turning to Initial Coin Offerings for capital raising or investment opportunities, as highlighted by the SEC in 2021. Benedetti and Kostovetsky (2021) point out that the first-ever ICO, called MasterCoin, was launched by JR Sweezy in 2013, marking the beginning of the ICO market's development in early 2014. Although ICOs were initially uncommon, they started gaining traction steadily until mid-2017. Schuckes and Gutmann (2021)

observe a slow early growth, followed by rapid expansion in 2017. Adhami et al. (2018) provide a detailed overview, reporting that by the end of 2017, startups globally had raised over $5.3 billion through ICOs.

Investors engage in ICOs for two primary reasons (Liu et al., 2019). First, they may prefer basic ICO-related products, such as utility tokens that provide access to products or services. Howell et al. (2020) found that 68% of ICOs offer practical value. Second, some participants purchase tokens for speculation, anticipating future increases in token value. Sockin and Xiong (2019) theoretically demonstrate that investor sentiment can influence cryptocurrency prices.

ICOs, examined by Lyandres et al. (2019) and Momtaz (2020), have sparked controversy in the financial realm due to their often lack of regulation (Chen and Bellavitis, 2020; Huang et al., 2019). The absence of regulatory oversight allows startups to raise significant capital without compliance costs and intermediaries. However, the regulatory vacuum raises investment risks, as tokens may lack a current counter-value and legal entitlement, increasing the potential for fraud (Momtaz, 2020).

Momtaz (2020) sheds light on the moral hazard associated with signaling in ventures. This occurs when businesses may overstate their quality, leading to potential harm for retail investors. In response to the perceived high investment risk and the possibility of fraud, certain jurisdictions, like China and South Korea, have enforced bans on Initial Coin Offerings (Russell, 2018). The consequences of these regulatory measures on the market are explored in Momtaz's (2020) event study.

Despite the regulatory uncertainties, the number of ICOs and the funds raised have witnessed remarkable growth since 2017, surpassing the volumes seen in crowdfunding (Fisch, 2019).

Regulators are confronted with a complex challenge in understanding the diverse nature of tokens. This involves a thorough evaluation of their utility, value

proposition, and the legitimacy of the underlying technology. Such scrutiny is crucial to ensure that tokens adhere to financial laws, offer adequate protections for investors, and do not become conduits for fraudulent activities.

Howell et al. (2020) emphasize the increasing interest in ICOs among stakeholders, highlighting the pressing need for regulatory clarity. This clarity is crucial not only for maintaining market integrity but also for supporting the sustainable growth of this innovative fundraising mechanism. As the ICO landscape continues to evolve, the establishment of clear regulatory frameworks becomes imperative to strike a balance between fostering innovation, ensuring investor protection, and maintaining market stability.

In the realm of Initial Coin Offerings, significant research has delved into understanding the factors shaping their success. The evaluation of ICO triumph revolves around two key elements: the effective raising of funds during the ICO and the listing of tokens on an exchange (Lyandres et al., 2022). For a comprehensive assessment of ICO success in token sales, additional metrics like the total number of contributors and achieving the hard cap play vital roles (Boreiko and Risteski, 2021). Noteworthy findings indicate that ICOs with a higher high-tech index are more likely to succeed and less susceptible to delisting (Lyandres et al., 2022).

Exploring the human capital characteristics of founders, An et al. (2019) revealed that these traits are not consistently linked to ICO success. In a parallel vein, Huang et al. (2019) delved into the geographical determinants of ICOs, unveiling a higher frequency in countries boasting advanced financial systems, robust public stock markets, and prevalent digital technology. Shams (2020) contributed to the discourse by discussing market segmentation, discovering a close connection between user and investor groups, resulting in expanded demand shocks.

Examining the landscape of Initial Coin Offerings, Momtaz (2019) uncovered significant underpricing. Benedetti and Kostovetsky (2021) further delved into the relationship between ICO underpricing and Twitter activity, while Florysiak and Schandlbauer (2022) explored the connection between whitepaper content and ICO underpricing.

However, there exists a gap in research concerning the impact of regulation and female leadership in ICOs. Momtaz (2019) conducted an analysis of cryptocurrency pricing and performance, emphasizing substantial underpricing in ICOs. Benedetti and Kostovetsky (2021) extended their exploration to the underpricing of ICOs in relation to Twitter activity, and Florysiak and Schandlbauer (2022) delved into the relationship between the content of whitepapers and ICO underpricing. Despite these insights, the exploration of the role of regulation and female leadership in ICOs is still in its early stages.

In shedding light on regulatory frameworks, Bellavitis, Fisch, and Wiklund (2021) conducted a review of ICO regulations across different regions. Their findings noted substantial variations in regulatory levels, nature, and rapid changes over time. Interestingly, in the face of fewer regulations and heightened uncertainty, investors tend to use an ICO's country of origin as a heuristic for its unobserved trustworthiness (Shrestha et al., 2021). However, the study of female leadership in the context of ICOs remains largely unexplored.

3. Literature review:

3.1 Block chain:

Within the vast landscape of blockchain technology, researchers have dedicated their attention to a complex framework involving distributed ledger, cryptography, consensus protocol, and smart contracts (Dinh et al., 2018). This intricate field has captured considerable interest, drawing contributions from various scholars offering unique perspectives and innovative solutions.

Momtaz (2018) underscores the broad recognition and innovation associated with blockchain, specifically citing applications like bitcoin that eliminate the need for trusted intermediaries. Building upon this, Adhami et al. (2018) explore the impact of cryptocurrencies, particularly in the context of Initial Public Offerings. In these situations, subscribers can acquire varied rights, such as a medium of exchange, access to services or products, dividends, and voting power.

Turning our focus to the technical aspects, Dinh et al. (2018) introduce BlockBench, a traditional blockchain framework tailored for the quantitative evaluation of private blockchains. Despite its strengths, Dai et al. (2018) provide a critical perspective, highlighting concerns about its heavy node architecture. They suggest the NC-DS framework as an alternative, incorporating network coding-based distributed storage to solve the prevalent "bloat problem."

In addressing trust concerns related to storage, Wang, Zhang, and Zhang (2018) amalgamate a decentralized storage system, the Ethereum blockchain, and the attribute-based encryption technology. This amalgamation establishes fine-grained data access control. Conversely, Yuan, Xu, and Si (2017) introduce a privacy-preserving framework using an aggregate signature mechanism to manage nodes with excessive data.

Dunphy and Petitcolas (2018) contribute to the current discussion by contributing a framework centered on the use of distributed ledger technology (DLT) for identity management. Their emphasis is on self-sovereign identity and decentralized trusted identity. Assessments are carried out to gauge the effectiveness of these frameworks within the realm of DLT, offering a comprehensive exploration of the diverse applications of blockchain technology.

3.2 Cryptocurrencies: Coins and tokens

Cryptocurrency represents a decentralized digital currency operating on a peer-to-peer network. Blockchain technology serves as the foundation for cryptocurrencies, ensuring heightened privacy, durability, and scalability. Firstly, blockchain technology establishes robust security independently of financial intermediaries, enabling peer-to-peer transactions and encrypted communications. Secondly, all transaction records are immutably documented in a publicly distributed ledger, impervious to manipulation by any user. Thirdly, the blockchain framework allows for extensive data storage and database expansion through the addition of new blocks to the network. Scalability is a pivotal aspect of contemporary financial systems. Hu and Rajan (2019) contend that coins and tokens serving as alternatives to Bitcoin are sometimes termed "altcoins."

Coins usually have their blockchains such as Litecoin or Ether. They are often similar to fiat currencies. First, they could be used to send money. Then as a store of value, the holders could save them and exchange them for something useful later. Finally, it could as a unit price for the goods or services.

While tokens are created on the existing blockchain. The most common blockchain token platform is Ether. Fahlenbrach and Frattaroli (2021) support that More than 90% of sample ICOs sold crypto tokens hosted on existing blockchains, most commonly Ethereum. The tokens built on the Ether platform are called ERC-20

tokens. Tokens created on other platforms will also have different names, for example, a token created on top of NEO is called NEP-5.

There are three main types of tokens: they are currency tokens, equity tokens, and utility tokens respectively (Momtaz, 2020, Masiak et al., 2020;). In the context of Initial Coin Offerings, tokens are categorized into "utility tokens" and "security tokens" (e.g., Fich, 2019; Bourveau et al., 2021; Fisch et al., 2021). Utility tokens offer access to services or products provided by the issuer without transferring ownership or control of the issuing company (Momtaz, 2020). According to Fisch (2019), the majority of ICOs in his study issued utility tokens, constituting 83% of the sample. Although tokens can be utilized as securities, ICOs commonly pertain to the sale of utility tokens (Bellavitis et al., 2021). However, Fisch (2019) observed no significant difference in the amount raised between security tokens and utility tokens.

Utility tokens can be used to purchase products or services in the future or as a medium of exchange between users on ICO enterprise platforms. Howell et al. (2020) found that utility token issuers are much less likely to fail. Such as Tycoon which is the first fully automatic social crypto trading platform with real cryptocurrency. In addition, it starts from the first August 2020 to 31st Mar 2021 in the US (United States), and its price is 0.1000 USD.

While security tokens are similar to traditional security investments. Fisch (2019) states that security tokens derive their value from tradable assets and are primarily used as investment vehicles. It confers ownership, dividends, or other economic benefits on its holders (Fisch and Momtaz, 2020). Momtaz (2020) illustrates that currency tokens store value or medium of exchange tokens. Like EGX which is a kind of security token issued by Enegra Group. Enegra enables commodity miners in emerging markets to compete on a global scale through world-class trading expertise, risk management, logistics, and governance. It starts on 12th April, and it aims to raise $12.750 billion.

Moreover, several coins exhibit both utility and security features. For instance, certain cryptocurrency exchanges like Binance, BitMEX, or KuCoin offer tokens not only tradable on the exchange but also providing token holders the opportunity to earn revenue linked to the overall trading volume (Gryglewicz et al., 2021). Despite possessing both utility and security attributes, tokens are typically classified based on their primary function.

Most tokens cannot be used during the ICO periods, instead offering token holders the promise of future rewards (Fisch,2019; Fisch and Momtaz,2020) . Tokens are of interest to speculators and depend on an increase in the value of the tokens issued (Romero-Castro et al., 2022). Tokens can also grant the right to purchase goods and services provided by companies.

3.3 ICO success

Understanding the success factors of Initial Coin Offerings involves a comprehensive examination of various elements, as highlighted by a range of studies. Adami et al. (2018) concentrated on 253 ICO campaigns, discovering that factors like code availability, pre-sales, and profit-sharing mechanisms contributed to enhanced ICO fundraising. Amsden and Schweizer (2018) discovered, in a study of 1009 ICOs, that higher entrepreneurial risk, indicated by factors like a lack of social media activity, shorter whitepapers, and a higher proportion of externally distributed tokens, diminishes the likelihood of ICO success. Conversely, a well-connected CEO and a larger team were found to correlate positively with ICO success.

The technological orientation of an Initial Coin Offering constitutes another pivotal factor in its success. Boreiko and Risteski (2021) observe that ICOs with a higher high-tech index are more likely to succeed and less prone to delisting. On the other hand, An et al. (2019) delved into the human capital characteristics of founders and concluded that these factors do not consistently correlate with ICO success.

Geographical determinants also play a significant role. Huang et al. (2019) found that ICOs tend to be more prevalent in countries with well-developed financial systems, mature public stock markets, and advanced digital technologies. Shams (2020) explores market segmentation, highlighting intrinsic linkages between user and investor groups that amplify demand shocks.

Research by Lyandres et al. (2022) suggests that judging the success of ICOs can be based on whether funds were successfully raised and whether the tokens are listed on an exchange. However, other metrics related to token sales, such as the total number of contributors and whether the hard cap was reached, can also be considered (Boreiko and Risteski, 2021).

A comprehensive study involving 453 ICOs reported by Howell et al. (2020) suggests that the success of ICOs, measured by liquidity and trading volume, is associated with various factors. These include voluntary disclosures such as whitepapers, budgets, and source code published on Github. Other indicators of success include the issuer's credible commitment to the project, demonstrated through factors like Telegram group membership, internally distributed stocks based on smart contracts, prior venture capital equity investments, pre-sales, tokens with explicit utility value, and the introduction of new blockchain protocols.

In conclusion, the success of ICOs is influenced by a combination of technological factors, geographical considerations, market segmentation, disclosure practices, and various indicators of commitment, quality, and value creation. This understanding is crucial for both ICO issuers and potential investors navigating the complex landscape of token offerings.

3.4 White paper

When a startup intends to launch an Initial Coin Offering, it typically releases a white paper online to present the ICO campaign to potential investors (Fisch, 2019). A white paper is a digital document that furnishes essential details about the offering (Fisch, 2019). Additionally, likened to an IPO prospectus, a white paper encompasses information commonly found in financial statements or business plans (Florysiak and Schandlbauer, 2022; Bourveau et al., 2022). This includes details about the business, management, executive compensation and governance, as well as information related to the offering (Bourveau et al., 2022). Furthermore, ICO white papers specifically emphasize financing aspects, the project team, or the product itself, elucidating the project's purpose and the resulting product (Masiak et al., 2020).

However, some white papers contain detailed information about the technology. The technical white paper is normally illustrating the technology the firms used in their project. While only the firms with high technology could publish it due to the technical white paper needing prohibitive costs (Florysiak and Schandlbauer, 2022). Fisch (2019) find that technology white papers increase the amount raised, and it would be more expensive for lower quality firms to produce technical white papers. Liu et al. (2019) constructed a modern technology index (Tech) for each cryptocurrency from the ICO white paper.

In addition, Marciak et al. (2020) illustrate that white papers are voluntarily published and are not constrained by specific standards or guidelines. Despite being unaudited and released without specific legal, regulatory, or exchange-related requirements, issuing a white paper is generally deemed necessary, if not mandatory, from the perspective of an ICO issuer (Florysiak and Schandlbauer, 2022). According to Bourveau et al. (2021), almost all ICOs have a white paper as the primary, and sometimes sole, source of information, with 6% of these white papers being purely technical documents (technical white papers). Empirical

findings reveal that high-quality ICO issuers distinguish themselves by providing more informative content in their white papers (Florysiak and Schandlbauer, 2022).

Moreover, Lyandres and Schandlbauer (2022) contend that ICO analysts and white paper information positively influence the success of ICOs. Analysts assign significantly lower ratings to ICOs lacking a white paper (Lee et al., 2021). Whitepapers serve as a means for issuers to introduce their projects.

As there is no or little regulation of ICOs investors mainly rely on the white paper and the analyst rating to make an investment decision. Lyandres et al. (2022) support that ICO information would be obtained from online resources and the most ICO information are retrieved from white paper. Florysiak and Schandlbauer (2022) agree that white papers may be the primary source of information for potential initial ICO investors in platform-based businesses, and ICO issuers could demonstrate whether they are a high-quality business by providing a white paper with more informative content.

Certain studies investigate white paper disclosures by examining variables such as their presence (Howell et al., 2020), length (Amsden and Schweizer, 2018), and textual content (Momtaz, 2021; Florysiak and Schandlbauer, 2021). Additionally, the research conducted by Bourveau et al. (2021) represents one of the initial comprehensive descriptive analyses of projects detailed in white papers.

3.5 The ICO process

ICOs are typically conducted in two phases (Fahlenbrach and Frattaroli, 2021). Masiak et al. (2019) divide the ICO process into the pre-ICO stage, main ICO stage, and post-ICO stage. Lee et al. (2021) agree that ICO would have three steps, and ICO would be traded in the secondary market after it is listed.

Howell et al. (2020) concentrate on the pre-sale period, contending that it is advantageous for ICO issuance. During the pre-sale phase, investors are offered discounts (Lee et al., 2021; Howell et al., 2020). Fahlenbrach and Frattaroli (2021) discover that pre-sale investors enjoy a 34% discount from the "list price," whereas early (or major) crowdfunding investors receive a 17% discount after the pre-sale. Howell et al. (2020) reveal that nearly 43% of ICOs incorporate a pre-sale period before their official launch. According to Fisch (2019), approximately 65% of companies opt to allocate some tokens to early investors before the actual ICO. Li et al. (2021) endorse the notion that offering bonuses or discounts serves the purpose of compensating early buyers for the higher risk they undertake.

Lyandres et al (2022) first analyzed the pre-ICO venture-initiated social media activity and ICO hardcap impact on ICO success, and they found that both pre-ICO social media activity and ICO hardcap on the extensive and intensive margins of ICO funding success. In addition, Lyandres et al (2022) show that both post-ICO production and platform are positive for ICO funding success. Adhami et al. (2018) analysis of 253 samples concluded that the pre-sale of tokens has a positive impact on the success of ICOs.

De Andrés et al. (2022) state that these investors benefit from discounted prices in exchange for involvement in publicity and marketing during the launch. ICO presales serve multiple functions such as providing the capital for their promotion activities, certifying the issuer, and determining demand and the appropriate price (Masiak et al, 2020). As most companies rising funding from ICO are start-up

companies, the presale could cover the upfront costs. Due to there being many restrictions on fundraising for start-up companies, ICO would be a good option for them. Start-up companies are different from mature companies which have accumulated many capitals and have many funding raising methods.

Although an ICO is normally a fund-raising method for start-up companies, it is not only for start-up companies but also for large companies, whether private or public (Joo et al, 2019). Large companies have the possibility through ICO to rising capital to a new ideal due to the lower barriers and lower fees. Florysiak and Schandlbauer (2022) agree that ICOs are not limited to technology start-ups; any business can use them to raise outside funding.

Moreover, Presales are usually aimed at larger investors, many of them institutional (Lee et al., 2021). Once the ICOs are invested or certified by the institutional or experts, it would be raising more capital in the main-ICO period. In addition, issuers could make a suitable price for the tokens according to the market reaction during the pre-sale period.

Investors who would like to invest in an ICO need to use fiat currencies to buy coins such as Bitcoin or Ethereum. Then the investors would use the coins to buy the ICO tokens. However, in this pre-sale period, investors could use fiat currencies to buy the tokens rather than coins, which could simplify the process (Howell et al., 2020).

On the other side, in the main period, investors need to change the fiat currencies to cryptocurrency, then they use the currencies to buy the tokens. In this period, the tokens would be sold to all the investors.

In addition, after the ICO is listed and the tokens' value is increased in the post-ICO phase, issuers and token holders would like to sell the coins or tokens (Masiak et al, 2020). Early investors who would like to sell the tokens are aimed to obtain

more money back. The goal for the contributors to sell the tokens is to change the tokens to revenues provided to the firms. For the issuers, they need to sell the coins or tokens to obtain fiat currency to devolve their business. If the funds are raised to meet the minimum target of the issue, tokens are listed on an exchange, and the ICO process is completed successfully. However, if the minimum fundraising requirement is not met, the funds are returned to investors, and the ICO is terminated.

3.6 The benefits of conducting an ICO

ICOs have gained popularity due to several compelling factors, including their cost-effectiveness, swift funding processes, regulatory flexibility, and the ability to bypass expensive financial intermediaries such as venture capitalists, banks, and stock exchanges (Florysiak and Schandlbauer, 2022).

A comprehensive survey conducted by Fisch et al. (2019) involving 517 ICO investors revealed diverse investment motivations. It was found that investors engage in ICOs not solely for financial gains but are also influenced by ideological, technological, and financial considerations. Howell et al. (2020) highlight the advantages of ICOs in financing the development of decentralized networks, securing future customer commitments, understanding customer needs, establishing immutable governance terms, providing rapid liquidity, and accelerating network effects. These six aspects collectively contribute to the attractiveness of ICOs as a fundraising method.

Examining the entrepreneur's perspective, Schückes and Gutmann (2021) identify economic and behavioral factors motivating startups to utilize ICOs for funding. Their analysis reveals four key aspects influencing the decision to conduct an ICO: funding, community building, token economics, and personal and ideological drivers. ICOs not only come with low transaction costs (Schuckes and Gutmann, 2021; De Andrés et al., 2022) but also enable risk-sharing without dilution of control (Chod and Lyandres, 2021).

Regardless of investors' choices and the motivations of entrepreneurs opting for ICOs, the primary driving force remains the perceived advantages and benefits associated with this fundraising method. ICOs offer a unique combination of financial efficiency, quick liquidity, and the potential for community engagement and support.

3.6.1 Fewer costs and more gains

The widespread popularity of ICOs can be attributed to various advantages, prominently among them being the elimination of intermediaries and the resultant reduction in capital costs (European Parliament, 2021; Schuckes and Gutmann, 2021; De Andrés et al., 2022). The absence of intermediaries, such as underwriters or banking institutions, translates to saved fees for the related issuer.

De Andrés et al. (2022) emphasize the mutual benefits reaped by both investors and issuers in a scenario without intermediaries. Investors stand to gain reasonable yields at remarkably low investment costs, while ICO issuers can secure capital at favorable rates. Kher et al. (2021) concur, highlighting that the absence of intermediaries in ICOs can lead to higher returns for entrepreneurs compared to traditional equity financing.

Schuckes and Gutmann (2021) further emphasize that the advantages of ICOs extend beyond cost reduction. Not only do ICO issuers benefit, but investors also enjoy unrestricted access without the limitations imposed by crowdfunding platforms, underscoring the freedom and flexibility associated with ICOs in a no-intermediary environment. This autonomy can contribute to a more favorable investment landscape for both parties involved.

3.6.2 Lower barriers for the market participant and higher liquidity

On the flip side, the accessibility of technology for market entry is highlighted as a key advantage (European Parliament, 2021). This ease of access simplifies the process for issuers to enter the markets swiftly. Consequently, participation in the ICO market becomes more straightforward and rapid for both issuers and investors compared to traditional methods. The simplicity of entering the ICO market has the dual effect of attracting more investors and facilitating increased funding, thereby aiding issuers in raising more capital and enhancing liquidity.

Notably, the liquidity aspect stands out as a distinctive feature of ICOs in comparison to traditional fundraising methods (Block et al., 2021; Kher et al., 2021). The ICO model provides a platform with greater liquidity, offering enhanced opportunities for investors and contributors. This increased liquidity further contributes to the attractiveness and efficiency of ICOs as a fundraising mechanism, aligning with the overarching trend of simplicity and speed associated with this innovative approach.

3.6.3 High control right for entrepreneurs

Additionally, in comparison to Initial Public Offerings (IPOs), financiers engaging in Initial Coin Offerings do not relinquish control rights over their firms (Kher et al., 2021). Unlike the traditional IPO process where companies often need to sell a portion of their control rights to secure funding, ICOs offer an alternative mechanism. In the context of IPOs, the extent of control that investors acquire is determined by the number of stocks they hold. However, ICOs introduce a unique avenue for fundraising by enabling companies to sell tokens, providing investors with an opportunity to profit from alterations in products, services, and token sales.

In the realm of ICOs, the control dynamics differ from traditional IPOs. Companies can raise capital without ceding a portion of their decision-making authority. This deviation from the IPO norm represents a distinctive feature of ICOs, appealing to entrepreneurs who wish to maintain a higher level of control over their ventures.

Furthermore, in contrast to the stock-based ownership structure associated with IPOs, ICOs involve the issuance of tokens. These tokens serve as a form of digital asset and represent the investor's stake in the project. The potential for profit in ICOs arises not only from the value appreciation of the tokens but also from the ability of investors to participate actively in the evolution of the company's offerings.

It is essential to highlight that the control mechanism in ICOs is not tied to the number of tokens held, as is the case with stocks in IPOs. Instead, control in ICOs is often associated with the influence investors can exert through active engagement with the project. This decentralized nature of control distinguishes ICOs, providing a novel avenue for companies to raise funds while preserving a greater degree of operational autonomy.

In summary, the contrast between IPOs and ICOs lies not only in the fundraising mechanism but also in the retention of control rights. ICOs emerge as an attractive option for entrepreneurs seeking capital infusion without compromising their decision-making authority, fostering a unique dynamic in the landscape of contemporary fundraising strategies.

3.7 The Issues with conducting an ICO

3.7.1 information asymmetry

Information asymmetry means that the information held by each subject in the transaction is different. Information asymmetry occurs between outside investors and entrepreneurs (Fassin and Drover, 2017). The reason ICO is a high-risk investment is that there is a high degree of information asymmetry. Similar to crowdfunding, companies try to send positive signals to attract investors. Companies will public the information which are they want investors to see. For investors, most of the information comes from the white paper issued by companies, but because of the voluntary and non-regulatory nature of the white paper, the information obtained by investors is whitewashed.

ICOs could reduce the information asymmetry the entrepreneurs with investors could be connected by the internet (Kher et.al, 2021). Fisch et al. (2019) support that these online platforms directly connect start-ups and individual investors, making fundraising and investment activities more efficient.

However, information asymmetry is a critical issue for ICOs (Block et al.; 2021, De Andrés et al., 2022). Boreiko and Risteski (2021) did the first research on the types of investors in ICO, they found that absence of mature intermediaries would greatly exacerbate the information asymmetry problem and greatly increases the value of peer investor activities. ICO issuers are mostly small, opaque, emerging growth companies (Florysiak and Schandlbauer,2022). Most issuers are start-up companies, so it is hard for investors to obtain information from the firms' history data like the financial statement. Thus, the most information the investors should get from the white papers or the social media. Nevertheless, the information disclosure is unaudited (De Andrés et al., 2022). European Parliament (2021) supports that as there are no regulatory requirements result in the information that issuers published possibility not be true.

On the other hand, due to the low barriers for investors entering the ICO market, the investors would be difficult to obtain information from the white papers or social media. Since most companies are involved in blockchain technology, ICO investors need to have some technical expertise (Momtaz,2021). In addition, the ICOs are more based on investors' positive emotions rather than the market fundamentals (European Parliament, 2021). So that, the capital raised by ICOs possibility will not be used in the product as the issuers announced. In addition, Momtaz (2021) states that the absence of private and public institutions contributes to information asymmetry. Florysiak and Schandlbauer (2022) support that experts who rate the ICO market can be viewed as financial intermediaries, reducing information asymmetry by using their expertise to generate information about ICOs.

3.7.2 ICOs meet higher risks and tax

Jongsub et al. (2022) emphasize that one of the notable drawbacks of Initial Coin Offerings is their susceptibility to price manipulation, coupled with a lack of transparency regarding the identity of investors and issuers. Unlike traditional markets, where transparency and regulatory oversight play a crucial role, ICOs operate in a less regulated environment, making them more prone to fraudulent activities and market manipulation (Block et al., 2021). The opacity surrounding investor and issuer information further exacerbates these concerns, raising questions about the integrity and reliability of the ICO market.

Cryptocurrencies, often associated with ICOs, have garnered a negative reputation due to their links to illicit activities such as money laundering and drug trafficking (Schuckes and Gutmann, 2021). This association adds another layer of risk to ICO investments, as the potential for involvement in illegal activities can have legal implications for both investors and issuers.

In addition to these risks, the European Parliament (2021) highlights the high volatility inherent in ICOs. The liquidity provided by ICOs can lead to rapid and unpredictable price fluctuations, exposing investors to substantial market risks. Moreover, the increased liquidity and success of ICOs make them attractive targets for hackers (Castonguay and Smith, 2020). De Andrés et al. (2022) emphasize the heightened risk of cyberattacks on ICOs, particularly due to variations in security levels across different blockchain networks. This risk poses a threat to both the integrity of the ICOs and the security of investor funds.

Furthermore, the tax implications of ICOs add another layer of complexity. Kher et al. (2021) highlight that token sales in ICOs are regarded as revenues, subjecting them to taxation. This taxation model contrasts with traditional equity financing, where companies do not incur income tax on the proceeds raised by selling equity. The imposition of taxes on ICOs increases the overall funding cost, potentially diminishing the attractiveness of this fundraising method for both companies and investors. On the other hand, firms raising funds through debt financing benefit from a tax shield, further emphasizing the less favorable tax treatment associated with ICOs.

In conclusion, the risks associated with ICOs are multifaceted, encompassing issues of transparency, susceptibility to manipulation, ties to illegal activities, high volatility, cyber threats, and tax implications. Investors engaging in ICOs must carefully weigh these risks against the potential benefits before participating in this relatively unregulated and dynamic fundraising avenue.

3.7.3 Regulation problems of ICOs

The regulation of Initial Coin Offerings has emerged as a pivotal factor shaping the growth and transformation of the ICO industry. Adami et al. (2018) observed that ICOs have gained popularity as a financing method for startups, owing to their lower costs and time requirements in comparison to traditional entrepreneurial financing avenues. However, the absence of regulation in the ICO industry could elevate investment risks, as it may foster opportunistic or malicious behavior, ultimately contributing to the prevalence of fraudulent activities (Fisch, 2019; Howell et al., 2020; Momtaz, 2020).

The challenge of striking a balance between the advantages and disadvantages of ICO regulation is heightened by the growing competition among countries to position themselves as hubs for ICOs and blockchain ventures. This situation poses the risk of a "race to the bottom" (Howell et al., 2020). Additionally, the inception of Bitcoin and the subsequent ICO movement aimed to diminish the influence of central financial institutions and governments, intensifying the difficulties that national regulators encounter in addressing this emerging global entrepreneurial finance phenomenon (Chen and Bellavitis, 2020).

The absence of regulation can give rise to malicious behavior, heightening investment risks and increasing the likelihood of fraud (Montaz, 2020; Howell et al., 2020). While cryptocurrencies offer various potential benefits, such as faster and more efficient payments and settlements, regulatory concerns primarily focus on their potential use in illicit activities, including but not limited to drugs, hacking, theft, illegal pornography, and even illicit services like murder-for-hire. Additionally, there are concerns about cryptocurrency's involvement in financing terrorism, money laundering, and its potential to evade capital controls (Foley et al., 2019). The oversight of Initial Coin Offerings has consistently been a significant challenge and a key source of various drawbacks. Regulatory issues are a subject of interest for governments and researchers alike.

To mitigate the potential negative impact of Initial Coin Offerings, several regulatory actions were taken. In 2017, the European Securities and Markets Authority (ESMA) issued two statements, one highlighting the risks associated with ICOs for investors, and the other outlining rules applicable to ICO firms. In 2018, the European Commission called for an assessment of the applicability of the European Union (EU) regulatory framework regarding ICOs. In 2019, ESMA published advice on ICOs, stating that if they could provide adequate safeguards, they could serve as a viable funding resource.

By early 2018, the U.S. Securities and Exchange Commission (SEC) publicly warned investors about the risks of cryptocurrencies and hinted at forthcoming regulations. The SEC also established a dedicated website to educate and caution individual investors about potential fraud in ICOs (Fisch et al., 2021). ICOs offering shares and securities in the United States are required to undergo registration and licensing with the SEC, and related transactions are subject to SEC rulings.

Different countries have embraced diverse regulatory approaches toward Initial Coin Offerings, spanning from complete bans as observed in China and South Korea, to relatively lenient safety regulations in countries like Singapore and Switzerland. Momtaz (2020) investigates the ICO market's responsiveness to adverse industry events, including China's ban on ICOs, master ledger hacks, and Facebook's marketing ban. Studies indicate that the ICO market is notably vulnerable to such environmental shocks, leading to substantial welfare losses for investors.

Harwick (2016) delves into the technical, legal, and economic obstacles associated with cryptocurrencies, examining potential financial intermediation and governance solutions. Yermak (2017) establishes a connection between the adoption of blockchain technology and enhanced corporate governance. Yermak suggests that corporate adoption of blockchain will result in reduced costs, increased liquidity, improved accuracy of record-keeping, and greater transparency of ownership. These improvements, in turn, are anticipated to

enhance shareholder voting processes and ensure accurate tracking of asset ownership.

Pilkington (2018) engages in a broad conversation about Initial Coin Offerings and advocates for stringent regulation to prevent incidents similar to the hacking of decentralized autonomous organizations (DAOs). Kim et al. (2018) delve into the regulatory landscape surrounding cryptocurrencies and formulate a framework for cryptocurrency valuation. Kyle et al. (2021) conduct a review of 152 pertinent literature articles, outlining a comprehensive research agenda on regulatory policy and governance. However, de Andres et al. (2022) observe that the current ICO market appears to be largely unaffected by the regulatory fervor and may still operate without significant regulatory oversight.

Moreover, Foley et al. (2019) find that developed technology can be used for cryptocurrency monitoring in a number of ways, including monitoring trends in illegal activity, responses to regulatory intervention, and how its characteristics change over time. An et al. (2020) show that cyber-attack risks are strongly and negatively associated with both the number of, and the amount raised through ICOs.

De Andres et al. (2022) argue that the self-regulation of ICOs is not up to scratch and is always a huge challenge for ICO regulation due to the globalization and digitization of the ICO market. Kher et al. (2021) point out that recent developments in ICOs, tokens, and coins have challenged many countries to enact regulations and blur the lines between real and crypto assets.

Opponents of regulation worry that government regulation would slow down fintech innovation (Kher et al, 2021). However, Huang et al. (2020) argue that countries with tighter regulations can encourage the growth of fintech companies by reducing entry costs and ensuring contract certainty. This suggests that countries that actively express their intention to regulate ICOs, rather than

banning or not acting, will attract more ICOs. As the various places with different regulations and laws for the ICOs, and the investors from different countries. Thus, it is hard to regulate the ICOs. In the United States, since every state regulates currency transactions, the laws are different from state to state, creating the unique situation of companies having to comply with fifty different laws (Kher et al, 2021). De Andres et al. (2022) believe that uniform global regulation of ICOs would bring multiple benefits: regulate the market, reduce market volatility, tax avoidance and tax arbitrage will be curbed and regulation will be strengthened.

3.8 ICOs and traditional funding raising

3.8.1 ICOs versus IPOs

Leandres et al. (2019) discovered that tokens exhibit behaviors akin to traditional securities. De Andres et al. (2022) concur, identifying various similarities between Initial Coin Offerings and Initial Public Offerings (IPOs). The trading of tokens in the aftermarket mirrors the post-IPO trading of newly issued shares (Fisch and Momtaz, 2020). Given this resemblance, prior research on post-ICO performance heavily draws on IPO research (e.g., Momtaz 2021).

De Andres et al. (2022) conducted a comparative analysis of ICOs and IPOs across five main aspects: security, legal requirements, information disclosure, development stage, investor access, and risk. Meanwhile, Momtaz (2020) compares ICOs with traditional financing methods such as incentive and equity crowdfunding, venture capital, and IPOs, considering startup or company characteristics, investor characteristics, transaction characteristics, and post-transaction characteristics.

Both IPO and ICO could help firms raise capital. Moreover, Both IPOs and ICOs would underprice (Fisch and Momtaz, 2020). Florysiak and Schandlbauer (2022) illustrate that ICO price suppression could be a potential way for quality issuers

to indicate their type; there is a positive correlation between information content and pricing. However, Momtaz (2020) states that ICO underpricing could reduce investor disappointment with ICOs and reduce the likelihood of investors filing lawsuits. Lowry and Shu (2002) support that underprice will reduce the risk of lawsuits as underprice could reduce the plaintiff's potential recoverable damages.

Although some studies (e.g., Fisch and Momtaz, 2020; Momtaz, 2020) document similarities between IPOs and ICOs (e.g., underprice), there are significant differences.

ICO is used at the early stage of companies (European Parliament, 2021; De Andres et al., 2022). Fisch and Momtaz, (2020) agree that ICO investors provide enterprises with early-stage financing. Moreover, ICO can raise funds for small businesses, especially for capital-intensive, high-tech start-ups (Schuckes and Gutmann, 2021). However, IPOs are suitable for enterprises mature enough for a public offering (De Andrés, 2022). In addition, the fundamental reasons for conducting an ICO differ from those for undertaking an IPO. The firms raising funding by ICO would like to use the capital to start their business ideals or business, but the firms that would like to obtain the funding by IPO would like to enlarge their production and increase the value of their firms.

Compared with IPO, the supervision of ICO is not as strict as that of IPO. As far as ICO issuers still could completely avoid regulation (De Andrés et al, 2022). The white paper is voluntary to publish by companies and the information of ICO is voluntary to disclosure without audit, but IPO needs to issue a prospectus, and there is more information that has been audited needs to be disclosed such as financial information, valuation, but also all information that can affect the IPO. Moreover, the IPO prospectus needs to follow a standard structure.

In addition, compared to IPOs, ICOs will have a lower barrier to entry for investors. There are few restrictions for ICO investors except blockchain restrictions, but

investors in IPO need to be limited by many things or institutions (e.g., scarcity of securities, investment banks, and brokers) (De Andrés et al, 2022). European Parliament (2021) states that the traditional methods would suit specific investors, but ICO would suit all types of investors.

What is more, Liu et al (2022) support that many of the known properties of the stock market form successful long-short cryptocurrency trading strategies. However, they also find that the returns cannot be predicted by Fama-French and Carhart four-factor. Liu and Tsyvinski (2021) agree that the returns of ICO are mainly predicted by investor attention and momentum, which is different from the risk-return trade-off of traditional assets.

3.8.2 ICO and Crowdfunding (CF)

Momtaz (2020) shows that the motivation is similar, and both with low transaction costs, and a low degree of regulation; but they suit different stage companies, different investors, etc. Block et al. (2021) focus on crowdfunding (CF) and ICO, they offer a comparison of CF and ICO, focusing on stakeholders, microstructure, regulatory environment, and market development. Moreover, they find that although both segments are crowd-based, they are fundamentally different in terms of the role of their platforms and the motivations of their supporters.

ICO and crowdfunding are quite similar. Both take place on internet-based platforms and have two main types. Utility tokens ICOs and security tokens ICOs have similar features to reward-based CFs and equity CFs, respectively. Huang et al. (2020) state that both ICOs and crowdfunding are designed to help businesses grow, but at various stages. European Parliament (2021) shows that crowdfunding normally occurs at the seed or early growth stage of the firms. However, ICOs tend to take place at the idea stage of the firms.

Similar to reward-based CFs, utility token ICOs can be initiated by companies or individuals. While STO (security token offering) is similar to equity CFs, it only could be issued by companies because they are associated with the issuance of debt or equity (Block et al., 2021).

In addition, ICOs are the same as equity crowdfunding in that ICO investors must assume all uncertainty until they sell their tokens on the secondary market because investors only could obtain the revenues when they sell their shares (Huang et al., 2020). reward-based CFs similar to ICOs, both of them would not need an intermediary. However, equity CFs need the platform to conduct due diligence and screening. Due diligence is the first line of defense for projects, investors, and equity-based crowdfunding platforms. A series of checks are carried out to ensure that the investment opportunity is as safe as possible and that investors can participate. Typically, equity crowdfunding screens project companies, and they select only those that have done due diligence. This is not only in line with the interests of the platform, but also can build a good trust relationship between the platform and investors. Therefore, equity CFs would be more secure than ICOs.

3.8.3 ICO, STO and IEO

De Andrés et al. (2022) believe that one reason for the decline in ICOs after 2018 is the emergence of new models for public offerings of crypto assets, such as STO and Initial Exchange Offerings (IEO). STO is a natural extension and evolution of the ICO process, enabling blockchain organizations to issue tokens or other local cryptocurrencies while complying with existing regulations (Castonguay and Stein Smith, 2020). Similar to ICOs, in STOs cryptocurrencies or tokens representing their investments are issued to investors. The Security tokens are sold in STOs the same as traditional financial investment methods, and it has the investors acquire underlying investment assets; in addition, STOs can authorize token holders to receive stock, debt, income, or interest (Bellavitis et al., 2021). Furthermore, in

STOs, security tokens represent contracts to invest in the underlying investment assets, such as stocks, bonds, funds, and real estate investment trusts. Thus, security tokens represent ownership information about investment products, recorded on the blockchain. STOs are also seen as a hybrid method between ICOs and IPOs.

Furthermore, an Initial Exchange Offering represents a novel form of token offering, where tokens are sold through an intermediary platform, typically a cryptocurrency exchange (Bellavitis et al., 2021). Cryptocurrency exchanges like Binance, CoinBene, and LBANK actively participate in the selection and issuance of projects, distributing tokens to verified investors directly on their trading platforms (Myalo, 2019). In contrast to Initial Coin Offerings, where the process for ordinary users can be intricate, involving setting up their own websites and sending crypto assets to smart contract addresses, IEOs simplify the process for investors. In an IEO, tokens are initially issued on an exchange, and investors only need to send funds to the exchange wallet, streamlining the overall process and reducing the risk of fraud associated with limited background information on some projects.

Although ICO, IEO, and STO share many characteristics, IEO and STO are an evolution of ICOs that attempt to improve on them or fill in their gaps (Romero-Castro et al., 2022). Castonguay and Stein Smith (2020) support that the next iteration of ICOs is IEO. Both STO and IEO that ensure compliance and indirectly indicate issue quality, focus primarily on security tokens (De Andrés, 2022)

3.9 Analysts in ICOs

An unregulated Initial Coin Offering market may attract numerous low-quality issuers (Florysiak and Schandlbauer, 2022). Additionally, the lack of regulation raises concerns among investors and countries regarding ICOs. Nevertheless, analysts can play a crucial role by leveraging their professional knowledge to rate firms and provide guidance to investors, thereby mitigating risks for investors. Bourveau et al. (2022) argue that having a rating can alleviate investor skepticism and add credibility to voluntary disclosures by joint ventures. Lee et al. (2022) demonstrate that ratings from analysts with advanced expertise significantly predict fundraising success. Bourveau et al. (2021) posit that ratings not only help overcome information asymmetry but are also positively associated with the likelihood of successful fundraising. Florysiak and Schandlbauer (2022) find that ratings exert more influence during the ICO compared to the post-ICO period.

On the other hand, as the risk of ICOs has been decreased, there would be more investors attending the high-quality ICOs. Lee et al. (2021) support that favorable headline ratings can stimulate active early token subscriptions from outside investors. Florysiak and Schandlbauer (2022) agree that experts can promote ICOs more easily with impartial ratings.

Lee et al. (2021) highlight that analysts do not receive direct payment for ICO ratings, diminishing their incentive to provide accurate ratings. Instead, their primary motivation lies in enhancing their reputation for identifying successful ICOs (Lee et al., 2021; Florysiak and Schandlbauer, 2022; Bourveau et al., 2021). The study by Lee et al. (2021) further notes that experts generating ratings are driven to enhance their track record, increasing the likelihood of being hired as consultants for future ICOs.

However, as emphasized by Liu et al. (2021), the exact role and incentives of rating experts remain unclear, leading to an optimism bias in ratings. The quality

of assessments by freelance ICO analysts varies and exhibits bias due to reciprocal interactions between analysts and ICO team members. Expert ratings to predict the success of ICOs achieve a 50% correct rate (Barth, 2021).

ICObench, a prominent rating platform, integrates ICO analyst ratings with algorithmic ratings to formulate an overall rating for each ICO it covers, disseminating these ratings through its website (Bourveau et al., 2022). On ICObench, ratings scale from 1 to 5, with higher ratings indicating a better ICO rating (Florysiak and Schandlbauer, 2022). Analysts on the ICObench platform are not conflicted by this interest, as reputable analysts indirectly receive compensation through consulting positions related to future ICOs (Lee et al., 2021).

3.10 ICO Underpricing

Initial Coin Offerings have emerged as a novel fundraising method that allows companies to raise capital by issuing digital tokens. However, the question of whether ICOs are underpriced, has been a topic of ongoing debate. In recent years, several studies have investigated the phenomenon of ICO underpricing.

Felix and Eije (2019) provide evidence that ICOs are, on average, significantly underpriced. They suggest that this may be due to information asymmetry, the lack of regulation, and the difficulty of assessing the quality of ICO projects. Their findings suggest that the ICO market is inefficient, which may pose challenges for investors and issuers. Florysiak and Schandlbauer (2022) agree that white papers are an important source of information for investors to evaluate ICO projects. They suggest that more informative white papers can help reduce information asymmetry and improve price discovery, potentially reducing underpricing.

In addition, Momtaz (2021) examines the impact of CEO loyalty on ICO underpricing and finds that companies with more loyal CEOs tend to underprice their ICOs less than companies with less loyal CEOs. The author suggests that this

may be because loyal CEOs have a stronger incentive to ensure the long-term success of their companies. Benedetti and Kostovetsky (2021) also find that ICOs are underpriced, but the degree of underpricing varies across ICOs. They attribute this heterogeneity in underpricing to differences in project quality and investor sentiment. They suggest that investors need to carefully assess the quality of ICO projects before investing to maximize their returns. Aslan et al. (2022) investigate the determinants of ICO success and post-ICO performance, including underpricing. They find that underpricing is negatively associated with post-ICO performance, indicating that underpriced ICOs may face challenges in the secondary market.

3.10.1 The impact of female leadership on ICO underpricing

In the last two decades, scholarly research on the impact of board gender diversity on firm value has yielded mixed results. The study by Rau et al. (2021) suggests that despite widespread social and policy advocacy, there is insufficient evidence to conclusively assert that gender diversity positively enhances firm value. This is echoed by the findings of Chen et al. (2016) and Eagly & Karau (2002), who propose that the presence of female leadership might negatively influence company development and value.

Part of these adverse impacts may stem from biases against female leaders, particularly evident within financial institutions. Research by Thebaud and Sharkey (2015) shows that small businesses led by women face greater challenges in securing external funding compared to those led by men, especially post-economic downturn. Similarly, Cozarenco and Szafarz (2018) find that women borrowers in the microcredit market are subjected to stricter scrutiny than their male counterparts.

The initial stages of entrepreneurship also seem to pose distinct challenges for women. Becker-Blease & Sohl (2007) and Carter et al. (1998) note that evaluators tend to perceive a mismatch between women's gender roles and the professional

roles of entrepreneurs, potentially hindering female entrepreneurs from accessing financial capital. Female CEOs may be viewed as "inappropriate" or "less legitimate" for leadership roles due to cultural stereotypes that associate women with being "less aggressive, less risk-taking, and less competitive," contrary to the typical image of a leader (Chen et al., 2016; Eagly & Karau, 2002).

A phenomenon related to the pricing of Initial Public Offerings (IPOs) may offer further insights. Eagly & Karau (2002) suggest that IPOs with gender-diverse boards might be systematically undervalued due to biases against female leadership. Reutzel and Belsito (2015) and Rau et al. (2021) also state that an increase in the number of female directors is correlated with negative investor perception, leading to more pronounced underpricing as the number of female directors rises. Therefore, based on the existing literature, the following hypothesis is proposed:

In the IPO market, female leadership has been shown to have a significant impact on a company's market performance. Gender diversity, as a signal of good corporate governance, can boost investor confidence, reduce information asymmetry, and influence a company's pricing strategy. However, in a more uncertain and dynamic environment like the ICO market, can female leadership play a similar role? This question has not yet been thoroughly explored.

In IPOs, female leadership is seen as a signal of improved corporate governance, which reduces the risks investors face from information asymmetry (Huang & Kisgen, 2013). Similarly, in ICOs, the background and abilities of the leadership team also have a significant impact on investor trust.

Female leadership in the ICO market may have a positive effect on underpricing. In projects with female leadership, investors may trust the project more and perceive lower information asymmetry, leading to higher initial pricing. Like in IPOs, gender diversity in the team can signal strong governance and enhance

investor confidence. This signaling effect may be even more pronounced in the highly uncertain ICO market (Guzmán, Pinto-Gutiérrez and Trujillo, 2021).

Research shows that gender diversity in ICO teams has a positive impact on success. Guzmán et al. (2021) analyzed over 875 ICO projects and found that those with female participation, particularly in leadership or financial roles, raised more funds and were less likely to fail. They suggest that investors see female leadership as a signal of ethical governance, which can reduce risk in less regulated markets like ICOs.

H1: The presence of female leadership is positively correlated with ICO underpricing.

3.10.2 How will regulation effect to Underpricing

In capital markets, the phenomenon of initial public offering underpricing is extensively studied. IPO underpricing refers to the pattern where the issue price of new stocks is typically set below the closing price on the first trading day. Research suggests that this is partly due to information asymmetry regarding the value of the IPO firm. Early studies like those of Beatty and Ritter (1986) and Rock (1986) highlight a positive correlation between information asymmetry and IPO underpricing, with greater uncertainty leading to higher underpricing.

Over time, scholars have explored the impact of corporate governance and regulatory environments on IPO underpricing. For instance, Johnston and Madura (2009) found a decrease in IPO underpricing levels in the United States following the implementation of the Sarbanes Oxley (SOX) Act. This indicates that enhanced transparency and governance standards may reduce information asymmetry, thereby diminishing IPO underpricing. Similarly, research by Ekkayokkaya and Pengniti (2012) in Thailand revealed a significant drop in IPO underpricing following governance reforms.

Shi et al. (2013) demonstrate a negative correlation between stringent information disclosure regulations and the phenomenon of IPO underpricing, implying that more comprehensive disclosures can mitigate the risks and uncertainties typically associated with IPOs. Similarly, Chambers and Dimson (2009) identify that enhanced regulation and listing standards contribute to a reduction in IPO underpricing over time. Specifically, their comparative analysis of UK IPOs across different regulatory eras suggests that increased transparency and stricter listing requirements may lead to more accurately priced IPOs, which could enhance market efficiency and investor confidence.

Moreover, with the aim of increasing transparency and disclosure for IPO firms listed in the EU regulated markets, reforms such as the Prospectus Directive have been implemented to ease capital raising across the EU, potentially aiding in the reduction of IPO underpricing. Studies such as those by Leone et al. (2007) and Hanley and Hoberg (2010) align with this view, showing a correlation between increased disclosure and a decrease in underpricing.

In conclusion, the existing literature indicates that improving corporate governance and regulatory standards can increase market transparency, decrease information asymmetry, and positively affect the containment of IPO underpricing. Future research could further investigate the impact of different regulatory reforms on IPO underpricing across various markets, and how these reforms may improve the overall efficiency of capital markets on multiple dimensions. Hence, drawing from the extant scholarly works, we posit the ensuing hypothesis:

H2: ICO underpricing is negatively related to the stringency of ICO regulations.

H3: The impact of the stringency of ICO regulations on ICO underpricing is stronger in the presence of female leadership.

4. Methodology and Data

4.1 Model:

Underpricing is measured as the difference between the price at which the coin is offered to investors during the ICO and its price in the market after the ICO. Here's a simplified explanation of a basic formula used to calculate ICO underpricing.

Model 1: Measuring underpricing

$$\boldsymbol{underpricing_i = \frac{price_{i1} - price_{i0}}{price_{i0}}} \quad \textbf{(1)}$$

The formula provided calculates the $underpricing_i$ for an Initial Coin Offering. In the formula, $price_{i1}$ represents the closing price on the ICO's listing day, and $price_{i0}$ represents the ICO's offer price. ICO and IPO exhibit distinctions. Stocks halt trading at the end of each trading day when local stock exchanges close, adhering to specific closing times. In contrast, cryptocurrencies trade continuously without a designated closing time. Furthermore, the timing of the first trading day of an Initial Coin Offering may differ across various stock exchanges where it is listed. The initial trading day with a cryptocurrency listed on the initial exchange is associated with risks. To mitigate this risk, the study opted for the closing price of coinmarketcap.com on its first day of listing as a more dependable reference point (Felix and Eije, 2019).

Model 2: Gender Leadership and ICO Pricing Model

$$\boldsymbol{underpricing_i = \beta_0 + \beta_1\ (\text{Female Leadership}) + \beta_2\ (\text{Control Variables}) + \delta_i + \varepsilon_i} \quad \textbf{(2)}$$

In this statistical model, 'ICO Underpricing' is what we're trying to predict. We start with a basic level of underpricing, represented by beta zero. We then look at how 'Female Leadership' might change this underpricing, which is shown by beta one. Alongside this, we include 'Control Variables' as beta two, which are other factors that could affect underpricing, like the size of the company or market trends. Lastly, epsilon is the error term, accounting for the unpredictability in underpricing that our model can't explain.

Model 3: Regulatory Impact on ICO Pricing Model

$$\boldsymbol{underpricing_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\ \textbf{(Regulation)} + \boldsymbol{\beta_2}\ \textbf{(Control Variables)} + \boldsymbol{\delta_i} + \boldsymbol{\varepsilon_i} \quad (3)$$

In this model, we're trying to understand how regulation affects the pricing of ICOs, often known as 'underpricing'. beta zero is the starting point of our model before considering any effects. beta one measures how much regulation impacts the ICO pricing. beta two includes other factors that might also play a role in ICO pricing, like the size of the ICO or the market conditions. Lastly, epsilon represents the random fluctuations in underpricing that our model does not explain.

Model 4: Interaction Effects Model

$$\boldsymbol{underpricing_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\ \textbf{(Regulatory)} + \boldsymbol{\beta_2}\ \textbf{(Female Leadership)} + \boldsymbol{\beta_3}\ \textbf{(Regulatory * Female Leadership)} + \boldsymbol{\beta_4}\ \textbf{(Control Variables)} + \boldsymbol{\delta_i} + \boldsymbol{\varepsilon_i} \quad (4)$$

Model 3 aims to discern the interaction effect between regulatory stringency and female leadership on ICO underpricing, thereby probing whether the impact of female leadership varies with regulatory stringency levels. This model endeavors

to identify the moderation role of regulatory stringency in the relationship between female leadership and ICO underpricing.

4.2 Introduction of the variables

Adhami et al. (2017) studied the factors that determine the success of ICOs, mainly focusing on project characteristics. Momtaz (2018) also explored the factors influencing ICO underpricing, using project features as well. Felix and Eije (2019) tested several variables in relation to ICO underpricing, including "issuer retention," "rating," and "token sale rate" as indicators of information asymmetry. They also added dummy variables specific to the offering, such as the presence of a "Pre-ICO" and the use of a "bonus scheme." Dolati (2022) confirmed that these variables do influence ICO underpricing. Kostovetsky and Benedetti (2018) examined the factors affecting ICO underpricing and found that pre-sales, also known as Pre-ICOs, have become increasingly common over time. These variables help reduce underpricing, possibly by addressing information frictions. The higher the level of information asymmetry, the more severe the underpricing (Rock 1986). Grégoire (2022) showed evidence that information disclosure tools, such as having a whitepaper, are related to ICO pricing and success.

4.2.1 Independent Variable:

Female Leadership: The primary independent variable examined in this research is the presence of female leaders within the ICO project team. This is operationalized by assigning a value of '1' if there is at least one woman in a leadership position and '0' if not. The study aims to discern whether female leadership has a statistically significant effect on ICO underpricing, hypothesizing that the diverse leadership styles associated with female executives may influence pricing strategies.

Female percentage: The "female percentage" variable in the dataset represents the proportion or percentage of females in a particular context, such as within the leadership or team of a company undergoing an Initial Coin Offering. This variable provides insight into the gender diversity of leadership, specifically the percentage of females involved in the decision-making or executive roles within the context of ICOs.

Regulation (dummy): Whether the ICO was conducted in a period of ICO regulation. Our assessment of regulatory oversight for ICOs primarily hinges on the content of the issued documents and whether they impose binding constraints on ICOs. If the documents are merely advisory, we do not consider them regulatory. However, if they possess legal and enforceable characteristics, we acknowledge the presence of regulatory oversight. ICOs launched when regulations are in place are marked with '1' and are hypothesized to have less underpricing due to perceived regulatory oversight.

Regulation and Female Leadership Interaction: The interaction between the regulatory environment and female leadership is another independent variable. This is operationalized by creating an interaction term in the regression model that multiplies the binary indicator of female leadership with the binary indicator of regulatory presence. This allows for the assessment of whether the impact of female leadership on ICO underpricing differs in a regulated versus an unregulated environment.

Regulation and Female percentage Interaction: The interaction between regulation and female percentage in the context of ICOs refers to the combined impact of regulatory oversight and the proportion of females in leadership roles on the underpricing of ICOs. This interaction term considers how these two factors jointly influence the dependent variable, underpricing. The coefficient associated with the interaction term in the regression analysis provides information about the magnitude and direction of this combined effect. In simpler terms, it helps to

understand how the relationship between regulation and underpricing may vary based on the percentage of females in leadership positions during ICOs.

4.2.2 Dependent Variable:

ICO Underpricing: The dependent variable in this study, ICO underpricing, is assessed by the degree to which the token's offering price is set below its potential market value. The objective is to evaluate how the independent variable, along with various control variables, collectively influences the extent of underpricing in ICOs.

4.2.3 Control Variables:

Whitepaper(dummy): A document that provides comprehensive details about the ICO project. A white paper resembles an IPO prospectus, encompassing details typically found in financial statements or business plans (Florysiak and Schandlbauer, 2022; Bourveau et al., 2022). It is posited that a well-crafted whitepaper can lead to less underpricing due to enhanced transparency.

Rating Score: A rating assigned by a rating agency reflects the potential of an ICO project. According to Bourveau et al. (2022), having a rating can alleviate investor skepticism and enhance the credibility of voluntary disclosure by joint ventures. This serves as a tool to address the issue of information asymmetry during the ICO process, as highlighted by Şensoy, and Akdeniz (2023). A higher score indicates a more favorable perception of the ICO, potentially leading to a reduction in underpricing.

Pre-Sale (dummy): The Pre-ICO phase represents an initial investment round where tokens are offered at a discounted price to early investors before the

official ICO launch. This early investment opportunity serves the purpose of securing initial funds and generating momentum for the project. The hypothesis suggests that offering tokens at a reduced rate during this phase could be linked to a decrease in underpricing during the main ICO. This potential correlation may be attributed to the early demonstration of project viability and investor commitment. Momtaz (2020) supports this notion, stating that engaging in a pre-ICO can increase market sentiment and reduce the rate of return, indicating a possible relationship between early investment strategies and the subsequent level of underpricing during the main ICO.

KYC (dummy): Implementing thorough "Know Your Customer" (KYC) procedures for verifying investors can help mitigate underpricing by demonstrating a dedication to due diligence. As suggested by Aslan, Şensoy, and Akdeniz (2023), a robust KYC process acts as a signal of commitment to regulatory compliance. This, in turn, serves as a deterrent for investors seeking anonymity to engage in illicit activities. Consequently, a more regulated approach to Initial Coin Offering activities is likely to contribute to a reduction in ICO underpricing.

Distribution: The proportion of tokens retained by the issuer compared to the total token supply is known as the retention ratio. According to Felix and Eije (2019), a lower retention ratio suggests a larger supply of tokens available for purchase, potentially leading to increased underpricing. The authors point out that retention is a critical factor indicating the perceived value. A substantial proportion of cryptocurrency being held by the issuer implies confidence in the long-term performance, assuming an anticipated increase in the cryptocurrency's value.

Bounty (dummy)： This variable represents the existence of a reward mechanism within the ICO, designed to incentivize and promote the project. The bounty program typically involves tasks that supporters can complete to receive rewards, often in the form of tokens. The presence of a bounty program is anticipated to

correlate with a reduction in underpricing, as it can enhance community engagement and increase the project's visibility, thereby potentially elevating the perceived value of the tokens.

4.3 Data:

The present study draws on a dataset developed by Momtaz (2021), which serves as the primary database and provides information on a wide range of variables for 6,410 tokens which include 5,973 ICOs, 437 IEOs and 89 STOs. Moreover, there are 79 tokens not only belong to ICOs but also belong to STOs. However, some data of variables (such as date of the ICO start, whitepaper, teamsize etc.) we need pertaining to initial coin offerings were missing. The dataset of Fahlenbrach and Frattaroli (2021) include 306 ICOs' data. We used this dataset to fill the data missing of Momtaz's include the variables are start date, end date, ICO distributed, teamsize, whitepaper, etc.). Moreover, we used the ICOdrops.com and ICOmarks.com fill the missing data like ICO distributed, kyc, bonus, restrictions, bounty, PreICO, whitepaper, teamsize and ERC20. We used the ICOholder.com filled the missing ICO rating as well.

To capture the first-day opening and closing prices of the tokens, the study utilized historical data from CoinMarketCap and CoinCodex. We are searching the ICOs' historical data manually and finally obtain 725 ICO's underpricing's data.

To augment the dataset on ICO policies, the study consulted various government websites from jurisdictions of interest, as well as sources such as Bitcoin Market Journal, legalink.com, multilaw.com charltonsquantum.com and Pricewaterhouse Coopers (PwC). This approach enabled a comprehensive analysis of ICO policies across different regions. Due to some token's start date missing and the country or regions unknow, we find 4,630 ICO's regulation information.

However, there are some ICOs not listed, we can not find the ICOs' historical data. It makes the sample drop a lot. Moreover, due to other variables' data missing as well, the final sample size for analysis was reduced to 377 observation samples, which encompassed all relevant variables we needed.

Country / Region	Number	percentage
EU	70	18.57%
USA	64	16.98%
Singapore	61	16.18%
UK	32	8.49%
Switzerland	25	6.63%
Others	125	33%

Table1：Distribution of Country or Region Data in the Database. This table provides a comprehensive overview of Initial Coin Offerings based on data from our database. The first column lists the names of various countries or regions, followed by the corresponding number of ICOs conducted in each location. The last column highlights the percentage representation of ICOs from each country or region within the total sample dataset.

The dataset encompasses ICO information across 34 nations. Predominant shares are observed in the EU, USA, Singapore, the UK, and Switzerland. The EU's ICOs constitute the highest proportion, reaching 18.57%. The USA and Singapore both exceed a share of approximately 16%. The UK and Switzerland's ICO shares stand at 8.49% and 6.63%, respectively. Collectively, these five regions account for over half of the ICOs in the sample.

4.4 The ICO regulation in the countries:

In examining the global landscape for Initial Coin Offerings, we observe a tapestry of regulatory responses that reflect the diversity of legal philosophies and enforcement priorities.

In Australia, the Australian Securities and Investments Commission (ASIC) set an early precedent by issuing guidance for ICOs on September 28, 2017, emphasizing the need for adherence to financial services laws and anti-money laundering (AML) standards (Legalink, 2019). The guidance was indicative of Australia's nuanced approach to financial innovation, emphasizing both the protection of investors and the encouragement of technological advancement.

Canada's response, articulated through the Canadian Securities Administrators (CSA) Staff Notice 46-307 issued on August 24, 2017, and Staff Notice 46-308 on June 11, 2018, highlighted the application of securities laws to ICOs and delineated the parameters for compliance within the existing legal framework (Canadian Securities Administrators, 2017；Canadian Securities Administrators，2018).

In contrast, countries such as Belize, Brazil, and the British Virgin Islands have yet to formalize their regulatory stance on ICOs, indicating a wait-and-see approach that is prevalent among many jurisdictions that are still grappling with the implications of blockchain technology.

The European Union, via the European Securities and Markets Authority (ESMA), took a cautionary position on November 13, 2017, urging firms engaged in ICOs to conform to the regulatory obligations that safeguard investors (ESMA, 2017).

Asia presents a varied regulatory picture. China's decision to ban ICOs in September 2017 showcased a stringent regulatory approach (Xinhua, 2017). Conversely, Hong Kong has opted for a more measured response, with its Securities and Futures Commission (SFC) issuing statements and guidance from as early as September 5, 2017, to clarify the applicability of securities laws to digital tokens (SFC, 2017).

Japan's Financial Services Agency (FSA) also requires ICOs to adhere to established financial laws, as evident from its April 2018 directives that ICOs be compliant with the Payment Services Act and the Financial Instruments and Exchange Act (FSA, 2018).

Gibraltar's implementation of a regulatory framework on January 1, 2018, specifically for Distributed Ledger Technology (DLT), positioned it as a leader in regulatory innovation, demanding that ICO issuers meet certain principles and obtain a license from the Financial Services Commission (GFSC) (GFSC, 2018).

Countries like Malaysia, the Philippines, Russia, Singapore, South Korea, Switzerland, the United Kingdom, the United Arab Emirates, and the United States have introduced or refined regulations that directly address the operations of ICOs, often with a focus on investor protection and the necessity for financial transparency (Monetary Authority of Singapore, 2017; SEC, 2017).

Other nations, including India, Indonesia, Israel, Ukraine, and Turkey, continue to operate in a regulatory vacuum, with no formal guidelines yet established for ICOs, reflecting the nascent stage of legal and financial consideration for digital asset frameworks in these regions.

This multifaceted regulatory environment underscores the essential need for ICO issuers to deftly navigate the complex global landscape. Compliance with diverse legal frameworks must be balanced with the drive to foster innovation within the burgeoning digital asset ecosystem.

The dynamic nature of ICO regulations, as disparate as the nations enacting them, is a testament to the evolving dialogue between the financial sector and regulatory authorities. As the digital asset sector matures, further clarification of regulatory positions is anticipated, potentially leading to a more unified global approach to ICO governance.

When a country or region does not have any regulation on ICO, the ICO market will be full of fraud and uncertainty. The risk of ICO will be great, thus causing ICO underpricing.

When a country or region restricts ICOs with existing laws and regulations, it will have a certain positive effect on the issuance and environment of ICOs and will reduce the issuance of irregular or deceptive ICOs. This can help to reduce uncertainty and increase confidence in the market, which may lead to a reduction in underpricing.

For those countries or regions that adopt specific laws and regulations to regulate ICOs, the laws adopted may be more targeted and can also effectively regulate the market.

However, the impact of regulations on underpricing can vary depending on the specific regulations and how they are implemented. For example, overly restrictive regulations may discourage investment and reduce demand for ICOs, while overly permissive regulations may create a flood of low-quality ICOs that can drive down prices. It is therefore important for regulators to strike a balance between protecting investors and fostering innovation in the market.

5. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
underpricing	377	1.385	2.42	-0.999	9.766
regulation	377	0.679	0.467	0	1
Female leader	377	0.584	0.494	0	1
Female percentage	377	0.175	0.201	0	0.778
distribution	377	0.523	0.424	0.02	7.318
KYC	377	0.35	0.478	0	1
bounty	377	0.218	0.413	0	1
Preico	377	0.377	0.485	0	1
whitepaper	377	0.952	0.214	0	1
rating	375	3.269	0.695	0	5

Table 2: Initial Coin Offering Dataset Summary Statistics. This table presents the results of summary statistics for the data. It displays the variable names along with the total count, mean, standard deviation, minimum value, and maximum value for each variable.

In our examination of 377 ICOs, we conducted a detailed statistical analysis. The average underpricing rate is 138.5%, with a standard deviation of 242%. It is indicating a significant variation in how these ICOs are priced. For comparison, Felix and Eije (2019) report mean underpricing of 108.5% for their sample of ICOs.

Turning to the regulatory aspect, the average score of 0.679, with a deviation of 0.467, suggests that a majority of ICOs operate within a regulatory framework. This implies varied levels of regulatory involvement, ranging from no oversight to comprehensive regulation. The diverse regulatory engagement underscores the intricate nature of regulatory approaches within the ICO domain.

The "Female percentage" variable in our dataset provides insights into the gender composition of leadership within ICOs. With a mean value of approximately 0.175,

this variable indicates that, on average, around 17.5% of ICO leadership positions are occupied by females. The standard deviation of 0.201 suggests some variability in the gender distribution, highlighting instances where female representation in leadership roles may vary across different ICOs. The minimum value of 0 and the maximum value of 0.778 indicate the range of female leadership percentages observed in the dataset, emphasizing the diversity in gender representation among ICOs.

The presence of female leaders, identified by the Female leader variable. The average, represented by the mean of 0.584 indicates an almost equal distribution of genders in leadership positions within ICOs. Moreover, the deviation of 0.494 underscore the balanced gender representation in the leadership roles of initial coin offerings.

On average, companies sell approximately 52.3% of their coins, a figure closely aligned with the findings of 0.578 from Felix and Eije's (2019) study, and 0.57 reported by Benedetti and Kostovetsky (2021). This consistency indicates a prevalent trend in the proportion of coins sold by companies in initial coin offerings.

The implementation of Know Your Customer (KYC) policies is evident in about 35% of ICOs, indicating a selective approach to investor verification, as found in the study of Aslan, Şensoy, and Akdeniz (2023). Bonuses are not commonly used in ICOs, with a mean bonus rate of 0.042, and bounty programs have a moderate average of 0.218. Florysiak and Schandlbauer's study in 2022 and Aslan, Şensoy, and Akdeniz's (2023) study reported similar averages.Approximately 37.7% of ICOs conduct a pre-ICO sale to generate early interest, consistent with the findings of Benedetti and Kostovetsky (2021) and Florysiak and Schandlbauer (2022). Moreover, the prevalence of whitepapers underscores the importance of documentation, with an average occurrence of 0. 952.

Lastly, ICO quality, measured by rating agencies, has an average rating of 3.269 out of 5, with moderate approval and consensus, supported by Florysiak and Schandlbauer's (2022) study, Felix and Eije's (2019) study, and Aslan, Şensoy, and Akdeniz's (2023) Study.

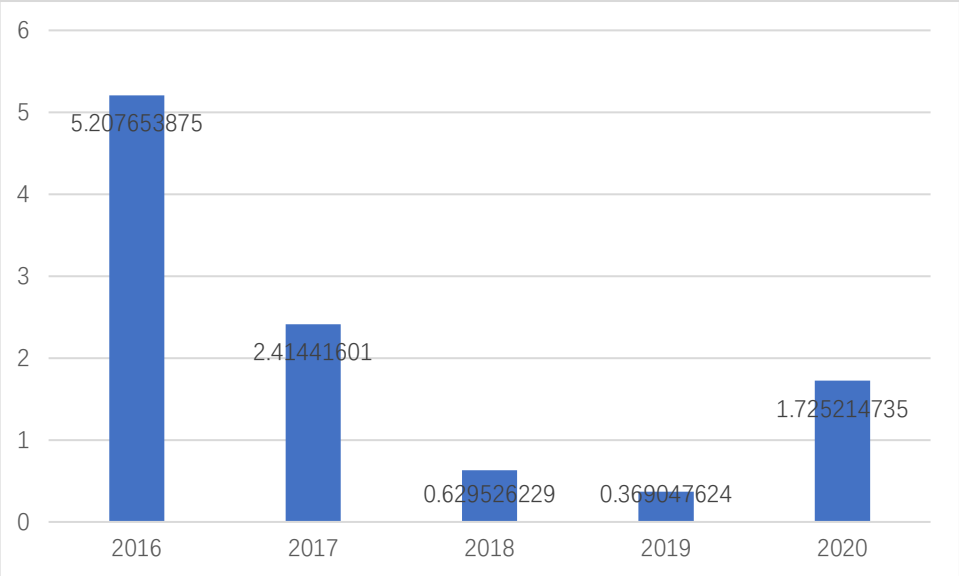

Figure2: The average underpricing of Initial Coin Offerings across different years. The horizontal axis represents the average underpricing values (before percentage conversion), while the vertical axis corresponds to the respective years.

The Figure2 displays the trend in underpricing levels over a five-year period from 2016 to 2020. Each bar represents a year, and the y-axis is a numerical scale with values marked at the top of each bar, suggesting the average underpricing for that year. The x-axis is time, with yearly increments.

In 2016, the bar reaches the highest point on the graph at approximately 521%, indicating a very high level of underpricing for ICOs in that year. The following year, 2017, shows more than a 50% reduction in underpricing, with the bar at about 241%. The trend continues downward in 2018 and 2019, with the bars at roughly 63% and 36%, respectively, showing a diminishing degree of underpricing.

However, in 2020, there is a reversal of this trend with a slight increase to around 175%, suggesting that the average underpricing level has gone up from its lowest point in 2019. This could be attributed to a loss of market confidence during the pandemic, resulting in an increased underpricing of Initial Coin Offerings. Such circumstances might have led to an elevation in the levels of underpricing. Zhang and Neupane (2024) support that through a sample analysis of 6113 IPOs across 32 countries, we observed that companies issued during the pandemic exhibited an underpricing rate 17.6% higher than those issued before the pandemic.

6. Correlation analysis

	underpricing	regulation	Female leader	Female percentage	bounty	distribution	whitepaper	KYC	rating	preICO
underpricing	1									
regulation	-0.7792***	1								
Female leader	0.01800	0.0647	1							
Female percentag	-0.2804***	0.4188***	0.836***	1						
bounty	-0.1718***	0.2385***	0.041	0.140**	1					
distribution	-0.0134	-0.0041**	0.014	0.013***	0.0083	1				
whitepaper	-0.1437**	0.1392**	0.1389**	0.1395**	0.0879	-0.0006	1			
KYC	-0.3071***	0.3498***	0.1463**	0279***	0.3678***	-0.069	0.0861	1		
Rating	-0.1687**	0.2049***	0.2153***	0.2607***	0.2765***	-0.0144	0.11098**	0.4428***	1	
PreICO	-0.1342**	0.1944***	0.0126	0.0656	0.2536***	-0.0399	0.0970	0.2327***	0.2348***	1

Table3: ICO table Influencing Factors Correlation Matrix. shows a correlation matrix for Initial Coin Offerings, presenting correlation coefficients between different factors. Each cell displays a Pearson correlation coefficient between the variables listed in the respective row and column. The coefficient values range from -1 to +1, where +1 signifies a perfect positive correlation, -1 indicates a perfect negative correlation, and 0 implies

no correlation.Significance levels are represented by asterisks: *** for 0.01, ** for 0.05, and * for 0.1. These asterisks indicate the likelihood that the observed correlation is not by chance but reflects a genuine relationship.

The correlation matrix reveals several significant relationships among the key variables in this study. There is a strong negative correlation between underpricing and regulation ($r = -0.7792$, $p < 0.01$), indicating that higher regulatory measures are associated with lower underpricing. This suggests that stricter regulatory environments may help stabilize ICO pricing.

Bounty programs show a weak but significant negative correlation with underpricing ($r = -0.1718$, $p < 0.01$). This relationship suggests that bounty offerings, as part of ICO promotional strategies, may have a slight effect in reducing underpricing, potentially by enhancing project visibility and investor engagement.

Distribution shows a very weak yet statistically significant negative correlation with regulation ($r = -0.0041$, $p < 0.05$), though the strength of this relationship is limited. This suggests that regulation may have minimal direct influence on the distribution mechanisms used in ICOs.

KYC (Know Your Customer) requirements are moderately negatively correlated with underpricing ($r = -0.3071$, $p < 0.01$), implying that ICOs implementing KYC protocols may experience reduced underpricing, likely due to increased investor trust and regulatory compliance.

The rating variable is positively correlated with female leadership ($r = 0.2153$, $p < 0.01$), female percentage ($r = 0.2607$, $p < 0.01$), and KYC ($r = 0.4428$, $p < 0.01$). These associations suggest that ICOs with higher ratings tend to have structured governance practices, including gender diversity and compliance mechanisms.

The Pre-ICO variable exhibits significant positive correlations with regulation ($r = 0.1944$, $p < 0.01$), bounty ($r = 0.2536$, $p < 0.01$), and KYC ($r = 0.2327$, $p < 0.01$). This pattern indicates that ICOs with Pre-ICO phases are often associated with formal regulatory and compliance structures, which may contribute to investor confidence.

Overall, the correlation analysis highlights the interconnectedness of regulation, gender diversity, compliance mechanisms, and market outcomes in ICOs. These findings suggest that governance and compliance factors may play a crucial role in influencing ICO underpricing, potentially affecting investor perception and market performance.

Variable	VIF	1/VIF
Female leader	1.07	0.933635
regulation	1.19	0.843559
KYC	1.47	0.679350
Bounty	1.23	0.812326
pre_ico	1.13	0.883432
rating	1.33	0.750000
whitepaper	1.05	0.955699
distribution	1.01	0.992131
Mean VIF	1.18	

Table 4: VIF test

The VIF test results in Table 4 show minimal multicollinearity among the variables included in the model. All variables have VIF values close to 1, with the highest VIF being 1.47 for KYC. This low VIF range indicates that the variables do not significantly overlap in the information they provide, allowing for reliable and independent interpretation of each predictor in the model.

The mean VIF of 1.18 further confirms that multicollinearity is not a concern in this model, suggesting that the regression estimates should be stable and not distorted by high correlations among the variables. Overall, these results support the robustness of the model in terms of multicollinearity.

7. Empirical Analysis

7.1 Hypothesis 1 Regression analysis

	(1)	(2)
regulation	-3.72	-1.515**
	(-13.59)	(-3.95)
Distribution		-0.349
		(-1.43)
KYC		-0.508**
		(-3.080)
bounty		0.222*
		(2.38)
pre_ico		-0.262**
		(-3.44)
whitepaper		-0. 332
		(-1.650)
rating		-0.200**
		(-2.920)
Constant	3.886***	3.938***
	(8.92)	(8.100)
Control variables	No	Yes
observations	369	367
R-squared	0.628	0.794

Table 5: Regulation Influencing Initial Coin Offering Underpricing - Regression Analysis. This table explores the relationship between regulation and ICO underpricing using the model: ICO Underpricing = ß0 + ß1(Regulation) + ß2(Control Variables) + ε. Fixed Effects were introduced through the command "absorb (region and quarters of year)." Clustering was implemented using the command cluster(region). This was done to address potential heteroscedasticity in the data. Clustering, with region as the clustering variable, acknowledges that observations within the same country may exhibit correlation. This clustering technique aids in obtaining more accurate standard error estimates, particularly when there is variability in the data across different countries. The incorporation of Fixed Effects and Clustering through the reghdfe command aims to control for country-specific and temporal variations, contributing to a more rigorous and reliable regression analysis. This approach involved absorbing the fixed effects associated with region and year. By incorporating these fixed effects, the model controlled for inherent variations in different countries and over time, enabling a more precise examination of the impact of other explanatory variables on the dependent variable (underpricing). The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The regression results offer insights into how regulation affects underpricing in ICOs across two models, one without and one with control variables, shedding light on underlying mechanisms.

In Model (1), only regulation is included as an independent variable with underpricing as the dependent variable. Regulation has a strong and statistically significant negative coefficient of -3.72, suggesting a substantial direct effect on underpricing. This implies that stricter regulatory measures are strongly linked to lower underpricing. One possible explanation is that strong regulatory frameworks increase investor confidence, reduce information gaps, and discourage speculative behavior, thereby stabilizing ICO pricing.

In Model (2), control variables are added to account for other influences on underpricing. With these variables included, the coefficient for regulation

decreases to -1.515 but remains statistically significant. This reduction suggests that some of regulation’ s effect overlaps with other factors, but it still has an independent influence. This consistent significance indicates a robust relationship between regulation and underpricing, suggesting that regulatory actions help create a fairer pricing environment, possibly by enforcing transparency, promoting due diligence, and reducing fraud risks.

Several control variables in Model (2) also show significant associations with underpricing, indicating their roles in the ICO pricing process. KYC (Know Your Customer) has a negative and significant coefficient of -0.508, suggesting that ICOs with KYC requirements tend to have lower underpricing. KYC may reduce underpricing by building investor trust and screening out potentially fraudulent participants. By verifying identities, KYC can create a safer environment, attracting a more stable investor base and reducing speculative behavior.

Pre-ICO shows a negative and significant effect of -0.262 on underpricing. The pre-ICO phase often involves early investor screening and may offer discounts to selected investors, which can reduce underpricing later. Additionally, a pre-ICO phase may indicate a more organized project approach, with steps taken to secure early capital and build credibility, reducing the need for large price adjustments during the ICO.

Rating has a negative coefficient of -0.200 and is significant in Model (2). Higher ratings may signal quality and reliability to investors, reducing information gaps. Projects with high ratings are likely to have undergone evaluations by third-party analysts, which may boost investor confidence and reduce speculative underpricing. This suggests that highly-rated ICOs are seen as less risky, stabilizing prices and lessening the need for major price corrections.

Bounty has a positive and statistically significant coefficient of 0.222, indicating that ICOs offering bounty programs may experience higher underpricing. Bounty programs, used as marketing tools to increase visibility, may attract many short-term participants focused on quick returns, which can amplify speculative activity and lead to higher underpricing. The positive relationship may reflect the presence of non-professional investors or bounty hunters who are more likely to sell tokens early, increasing price volatility.

Whitepaper and Distribution are not significant in this model, suggesting that while these elements are part of the ICO structure, they may not directly influence underpricing when stronger predictors like regulation, KYC, and rating are included.

The R-squared value increases significantly from 0.628 in Model (1) to 0.794 in Model (2), indicating the improved explanatory power of the model when control variables are added. This improvement suggests that underpricing is influenced by various factors beyond regulation. While regulation plays an important role, factors such as investor trust, pre-ICO structuring, and rating as a market signal collectively help explain variations in ICO underpricing.

In summary, Model (2) shows that regulation, KYC, pre-ICO, and rating all contribute to reducing underpricing, likely by promoting transparency, enhancing investor confidence, and signaling project quality. In contrast, bounty programs may increase underpricing by attracting speculative, short-term participants. These findings highlight the complexity of factors affecting ICO pricing and underscore the importance of regulatory and governance mechanisms in achieving stable pricing.

	USA	EU
regulation	-1.495***	-1.952***
	(-3.62)	(-2.67)
Distribution	-0.0418	-1.272**
	(-0.32)	(-2.66)
KYC	-0.740***	-0.332*
	(-3.73)	(-1.69)
bounty	0.356	0.248
	(0.70)	(0.67)
pre_ico	-0.434**	-0.176
	(-2.24)	(-1.02)
whitepaper	0.0748	0.108
	(0.19)	(0.2)
rating	-0.0262	-0.389*
	(-0.15)	(-1.97)
Constant	2.199***	5.251***
	(2.93)	(6.14)
observations	62	68
R-squared	0.782	0.842

Table 6: Comparative Regression Analysis - Impact of Regulation on ICOs in the USA and EU. In this table, we employed the same regression model as in Chart 3, but the presented results are specific to the United States and the European Union. Fixed Effects were incorporated into the regression model using the "absorb (quarter of year)" command, absorbing effects

associated with each individual year. This adjustment effectively controlled for variations specific to different years. The inclusion of Fixed Effects in this manner allowed the model to account for inherent fluctuations across various years, resulting in a more nuanced and precise analysis of how independent variables influence the dependent variable. The symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

The regression results highlight differences in factors affecting ICO underpricing between the USA and the EU markets, with distinct levels of significance and impact observed across variables.

The regression results reveal differences in factors affecting ICO underpricing between the USA and the EU markets, showing distinct levels of significance and impact across variables.

For regulation, both regions display a significant negative effect on underpricing, with a coefficient of -1.495 (t = -3.62) for the USA and -1.952 (t = -2.67) for the EU, both significant at the 1% level. This indicates that regulatory frameworks strongly influence underpricing by enhancing investor confidence and reducing perceived risk, with a slightly stronger effect in the EU.

Distribution is not significant in the USA (coefficient = -0.0418, t = -0.32), while it shows a significant negative effect in the EU (coefficient = -1.272, t = -2.66), significant at the 5% level. This result suggests that distribution methods may play a more substantial role in influencing underpricing within the EU, potentially due to differences in investor perceptions or market norms.

KYC requirements show a significant negative effect on underpricing in both markets, with a stronger impact in the USA (coefficient = -0.740, t = -3.73) than in the EU (coefficient = -0.332, t = -1.69). This indicates that KYC practices enhance credibility and investor trust in both regions, though the effect is more pronounced in the USA.

The bounty variable does not show significant effects in either region (USA coefficient = 0.356, t = 0.70; EU coefficient = 0.248, t = 0.67), suggesting that bounty programs may not substantially impact underpricing, likely due to varied investor responses to such incentives.

Pre-ICO phases have a significant negative effect on underpricing in the USA (coefficient = -0.434, t = -2.24) but are not significant in the EU (coefficient = -0.176, t = -1.02). This may imply that pre-ICO rounds are more effective in stabilizing prices in the USA, potentially due to differences in how pre-ICO funding is perceived by investors in each region.

The whitepaper variable is not significant in either region (USA coefficient = 0.0748, t = 0.19; EU coefficient = 0.108, t = 0.20), suggesting that having a whitepaper alone may not be a strong determinant of underpricing.

Rating is not significant in the USA (coefficient = -0.0262, t = -0.15), but it shows a weakly significant negative effect in the EU (coefficient = -0.389, t = -1.97). This indicates that within the EU, higher ratings might reduce underpricing to some extent as they provide a quality signal to investors, though the effect remains modest.

The model’s R-squared values indicate strong explanatory power in both regions, with 0.782 for the USA and 0.842 for the EU, suggesting that the model explains approximately 78.2% and 84.2% of the variance in underpricing, respectively. This emphasizes the importance of regulatory factors, KYC, distribution methods, and pre-ICO phases in understanding ICO underpricing across these regions.

7.2 Hypothesis 2 Regression analysis

	(1)	(2)
Female leader	0.657***	0. 445**
	(3.17)	(3.05)
Distribution		-0.429
		（-1.47）
KYC		-0.528**
		（-3.97）
bounty		0.232*
		（2.420）
pre_ico		-0.330*
		（-3.81）
whitepaper		-0.535***
		(-2.58)
rating		-0.298**
		(-4.43)
Constant	0.9168***	3.327***
	(5.880)	(11.730)
Control variables	No	Yes
observations	369	367
R-squared	0.4408	0.779

Table 7: Regression Analysis - Female Leadership Impact on ICO Underpricing. This table presents the regression results for the relationship between female leadership and ICO underpricing, primarily utilizing the model: ICO Underpricing = ß0 + ß1(Female Leadership) + ß2(Control Variables) + ε. The implementation of Fixed Effects was carried out using the command "absorb (region and quarters of year)," absorbing fixed effects associated with both regions and years. This technique effectively mitigates inherent variations across countries and time periods. Simultaneously, Clustering was implemented using the command "cluster(region)," addressing potential heteroscedasticity in the data. Recognizing that

observations within the same country might exhibit correlation, this clustering technique, utilizing the region as the clustering variable, enhances the accuracy of standard error estimates. This proves particularly beneficial when dealing with variations in data across different countries. In essence, the incorporation of Fixed Effects and Clustering via the "reghdfe" command serves the purpose of controlling for country-specific and temporal variations. This robust approach contributes significantly to the precision and reliability of the regression analysis. By doing so, the model becomes more adept at isolating and assessing the specific influence of other explanatory variables on the dependent variable (underpricing). The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The table shows regression results from two models examining the effect of female leadership on the dependent variable. Model (1) does not include control variables, while Model (2) includes them.

In Model (1), the coefficient for female leadership is positive and statistically significant (0.657), suggesting that female-led projects are linked to higher values of the dependent variable. This may indicate that projects with female leaders have certain characteristics that positively influence the outcome.

In Model (2), control variables are added, and the coefficient for female leadership decreases to 0.445 but remains significant. This reduction suggests that some of the effect of female leadership overlaps with other factors, but it still has an independent positive impact. This indicates that female leadership has a lasting influence on the outcome, even when other project factors are considered.

The control variables in Model (2) show important effects. KYC has a negative and significant coefficient (-0.528), suggesting that projects with KYC requirements have lower dependent variable values, possibly due to increased trust and compliance, leading to more stable outcomes. Pre-ICO also has a negative and significant effect (-0.330), suggesting that having a pre-ICO phase reduces the dependent variable, perhaps due to early support and stronger project structure.

Whitepaper has a negative and significant effect (-0.535), suggesting that projects with detailed whitepapers tend to have lower dependent variable values, likely due to greater transparency and less information asymmetry. Rating also has a negative and significant coefficient (-0.298), indicating that higher-rated projects may achieve more stable outcomes due to increased investor confidence and perceived quality.

Bounty has a positive and significant coefficient (0.232), indicating that projects with bounty programs may have higher dependent variable values. This may be because bounty programs attract participants interested in short-term gains, which can increase volatility.

The R-squared value rises from 0.4408 in Model (1) to 0.779 in Model (2), showing that adding control variables improves the model ' s ability to explain the dependent variable.

In summary, Model (2) suggests that female leadership has a positive effect on the dependent variable, while KYC, pre-ICO, whitepaper, and rating are linked to lower values, likely due to better governance and investor trust. Bounty programs, on the other hand, may increase the dependent variable, possibly by attracting speculative participants. These results highlight the role of leadership and project features in influencing ICO outcomes.

	USA	EU
Female leader	0.531**	0.622**
	(2.19)	(2.11)
Distribution	-0.0375	-1.180*
	(-0.30)	(-1.83)
KYC	-0.415**	-0.376*
	(-2.04)	(-1.89)
bounty	-0.472	-0.259
	(-0.99)	(-0.70)
pre_ico	-0.500***	-0.168
	(-2.87)	(-0.93)
whitepaper	0.316	-1.062***
	(0.47)	(-4.67)
rating	0.362*	-0.0418
	(1.68)	(-0.16)
Constant	1.520**	3.342***
	(0.054)	(3.94)
observations	62	68
R-squared	0.805	0.831

Table 8: Gender Dynamics in ICOs - A Regression Analysis of the USA and EU. The regression results presented in this table are derived from the same model as in Table 4. Our primary focus is on investigating the relationship between female leadership and ICO underpricing in the United States and the European Union. To incorporate Fixed Effects into the regression model, the command "absorb (quarters of year)" was employed. This command facilitated the absorption of effects associated with individual years, thereby controlling for variations specific to each time period. Through the incorporation of Fixed Effects in this manner, leading to a more refined and precise analysis of how independent variables influence the

dependent variable. The symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

The regression results indicate differences in the effects of leadership, KYC, distribution, and documentation on ICO underpricing in the USA and EU markets, with notable variations in significance levels and impact across the variables.

The presence of a female leader (leaderf) has a significant positive effect on underpricing in both the USA and the EU, with coefficients of 0.531 (t = 2.19) and 0.622 (t = 2.11), respectively, both significant at the 5% level. This suggests that ICOs led by female leaders may experience higher underpricing in both regions, potentially reflecting investor biases or heightened risk perceptions.

Distribution methods are not significant in the USA (coefficient = -0.0375, t = -0.30) but show a marginally significant negative effect in the EU (coefficient = -1.180, t = -1.83), suggesting that distribution choices may influence underpricing more in the EU context. This could be due to market differences in how distribution methods affect investor confidence and demand.

KYC requirements display a significant negative effect on underpricing in both regions, with a stronger effect in the USA (coefficient = -0.415, t = -2.04) compared to the EU (coefficient = -0.376, t = -1.89). This indicates that KYC measures contribute to reducing underpricing by enhancing credibility and trust among investors, though the impact is slightly more pronounced in the USA.

The bounty variable is not significant in either region (USA coefficient = -0.472, t = -0.99; EU coefficient = -0.259, t = -0.70), suggesting that bounty programs do not have a consistent or strong impact on underpricing across these markets.

Pre-ICO phases show a significant negative effect on underpricing in the USA (coefficient = -0.500, t = -2.87), significant at the 1% level, but are not significant

in the EU (coefficient = -0.168, t = -0.93). This may imply that pre-ICO rounds are more effective in stabilizing prices and reducing underpricing in the USA, possibly due to differences in investor perceptions or the structure of pre-ICO investments in each region.

The whitepaper variable is not significant in the USA (coefficient = 0.316, t = 0.47), but it shows a strong negative effect on underpricing in the EU (coefficient = -1.062, t = -4.67), significant at the 1% level. This finding suggests that in the EU, the presence and quality of a whitepaper may play a critical role in reducing underpricing, likely by enhancing transparency and project credibility for investors.

The rating variable shows a marginally positive effect on underpricing in the USA (coefficient = 0.362, t = 1.68), significant at the 10% level, while it is not significant in the EU (coefficient = -0.0418, t = -0.16). This indicates that higher ratings may be associated with slightly higher underpricing in the USA, which could reflect differences in how ratings are perceived or utilized in investment decisions across the regions.

The model’s R-squared values of 0.805 for the USA and 0.831 for the EU indicate strong explanatory power, explaining approximately 80.5% and 83.1% of the variance in underpricing, respectively. These findings emphasize the relevance of leadership, KYC requirements, distribution methods, pre-ICO phases, and whitepapers in explaining underpricing across both regions, with some region-specific variations in significance.

7.3 Hypothesis 3 Regression analysis

	(1)	(2)
regulation	-3.149***	-0.982*
	(-18.7)	(-2.19)
Female leader		1.105***
		(10.07)
regulation#		-0.964***
Female leader		(-8.150)
Distribution		-0.103
		(-1.6)
KYC		-0.486**
		(-3.870)
bounty		0.261**
		(2.850)
pre_ico		-0.268**
		(-3.95)
whitepaper		-0.510**
		(-2.780)
rating		-0.270**
		(-3.36)
Control variables	No	Yes
Constant	3.244***	3.651***
	(2.78)	(9.19)
observations	369	367
R-squared	0.650	0.803

Table 9: Regression Analysis - Interplay of Female Leadership, Regulation, and ICO Underpricing. This table presents the regressions for 367 ICOs. In this table, our primary focus

is on examining the interaction term between regulatory stringency and female leadership and its impact on ICO underpricing. The main model employed is expressed as follows: ICO Underpricing = ß0 + ß1(Regulatory) + ß2(Female Leadership) + ß3(Regulatory * Female Leadership) + ß4(Control Variables) + ε. Fixed Effects were introduced to absorb specific effects related to regions and years using the command "absorb (region and quarters of year)." This approach effectively controlled for inherent variations across different countries and over time. Additionally, the introduction of Clustering was facilitated through the command cluster(region). This approach was implemented to address potential heteroscedasticity in the data, recognizing that observations within the same country might exhibit correlation. Clustering, with 'region' as the designated variable, was instrumental in obtaining more precise standard error estimates, particularly when there was variability in the data across diverse countries. In summary, the integration of Fixed Effects and Clustering via the reghdfe command aimed at mitigating the influence of country-specific and temporal variations, thereby enhancing the robustness and reliability of the regression analysis. By incorporating these fixed effects into the model, we achieved a more nuanced examination of how the various explanatory variables impact the dependent variable (underpricing). The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

This table shows regression results that examine how different factors affect the dependent variable. One model does not include control variables, while the other does.

The coefficient for regulation is negative and significant in both models. It decreases from -3.149 in the model without controls to -0.982 in the model with controls. This suggests that regulation is linked to a reduction in the dependent variable, meaning more regulatory measures may lead to more stable outcomes. The drop in the coefficient when controls are added indicates that part of the effect of regulation overlaps with other factors.

Female Leader has a significant positive effect, with a coefficient of 1.105 when no controls are included. However, when combined with regulation (shown as

regulation#Female Leader), the coefficient becomes -0.964 and remains significant. This interaction suggests that the positive effect of female leadership is reduced when regulation is stronger, meaning that the impact of female leadership on the outcome weakens as regulatory intensity increases.

Among the control variables, KYC has a negative and significant coefficient (-0.486), suggesting that projects with KYC requirements tend to have lower values of the dependent variable. This may be because KYC builds investor trust and improves compliance, leading to more stable outcomes. Bounty has a positive and significant coefficient (0.261), indicating that projects with bounty programs tend to have higher values of the dependent variable, possibly due to interest from short-term participants.

Pre-ICO and Whitepaper have significant negative coefficients (-0.268 and -0.510), suggesting that projects with a pre-ICO phase or a detailed whitepaper tend to have lower dependent variable values. This implies that early support (Pre-ICO) and project transparency (Whitepaper) help create stability.

Rating has a negative and significant coefficient (-0.270), suggesting that higher-rated projects are associated with lower values of the dependent variable. This may indicate that high ratings increase investor confidence, which reduces speculative behavior.

The R-squared value rises from 0.650 in the model without control variables to 0.803 in the model with controls, showing that adding control variables improves the model’ s ability to explain the dependent variable.

In summary, regulation and female leadership interact in complex ways to affect the dependent variable. Regulation generally leads to more stability, while female leadership has a positive effect that decreases with stronger regulation. KYC, Pre-ICO, Whitepaper, and Rating are associated with lower values, likely due to better

transparency and investor trust, while Bounty is linked to higher values, possibly due to speculative interests. These results highlight the importance of regulation, leadership, and project characteristics in shaping the outcome.

	USA underpricing	EU underpricing
1.regulation	0.157	-0.951
	(0.31)	(-1.35)
Female leader	2.225***	1.625***
	(4.22)	(3.32)
1.regulation#c. female leader	-2.062***	-1.404**
	(-3.53)	(-2.48)
bounty	0.0383	0.115
	(0.09)	(0.37)
distribution	-0.0574	-0.841*
	(-0.58)	(-1.89)
whitepaper	-0.627***	-0.601***
	(-3.76)	(-2.87)
kyc	-0.392**	-0.209
	(-2.19)	(-1.19)
rating	0.109	-0.307*
	(0.75)	(-1.72)
pre_ico	-0.278*	0.180
	(-1.74)	(0.65)
_cons	0.794	4.249***
	(1.18)	(5.93)
observations	62	68
R-squared	0.861	0.880

Table 10: Regression Analysis - Interaction of Female Leadership, Regulation, and ICO Underpricing in the US and EU. The results presented in this table are derived from the same regression model as shown in Table 5. Table 8 illustrates the relationship between the interaction term of regulation and female leadership, and ICO underpricing in the United States and the European Union. Fixed Effects were introduced into the regression model using the command "absorb (quarter of year)." This involved absorbing the effects specific to each year, effectively controlling for variations associated with time. Through the incorporation of Fixed Effects in this manner, the model adjusted for inherent fluctuations over different years, offering a more nuanced and precise analysis of the impact of independent variables on the dependent variable. The symbols ***, **, and * signify significance at the 1%, 5%, and 10% levels, respectively.

The regression analysis provides insights into the factors affecting ICO underpricing in the USA and EU markets. The results highlight differences in how variables such as regulation, female leadership, and control factors influence underpricing across regions.

The regulation variable does not have a significant impact on underpricing in either region. In the USA, regulation shows a small positive effect (coefficient = 0.157, t = 0.31), while in the EU, it has a negative but non-significant effect (coefficient = -0.951, t = -1.35). This suggests that regulatory frameworks alone may not be a strong factor in explaining underpricing differences.

Female leadership shows a significant positive effect on underpricing in both regions. The coefficient for female-led ICOs is 2.225 (t = 4.22) in the USA and 1.625 (t = 3.32) in the EU, both significant at the 1% level. This implies that ICOs led by female leaders tend to have higher levels of underpricing, possibly due to investor biases or increased perceived risk in the market.

The interaction between regulation and female leadership shows a significant negative effect on underpricing. In the USA, this interaction has a coefficient of -2.062 (t = -3.53), while in the EU, it has a coefficient of -1.404 (t = -2.48). This suggests that regulation can help reduce the additional underpricing observed in female-led ICOs, possibly by alleviating perceived risks or biases among investors.

The bounty variable does not show significant effects in either market, with coefficients of 0.0383 (t = 0.09) in the USA and 0.115 (t = 0.37) in the EU. This indicates that bounty programs do not play a major role in determining underpricing in these regions.

The variable distributed in ICO is not significant in the USA (coefficient = -0.0574, t = -0.58) but shows a marginally significant negative effect in the EU (coefficient = -0.841, t = -1.89). This finding suggests that distribution methods may have a larger impact on underpricing in the EU, possibly due to different investor preferences or regulatory expectations.

The presence of a whitepaper has a significant negative effect on underpricing in both regions, with coefficients of -0.627 (t = -3.76) in the USA and -0.601 (t = -2.87) in the EU, both significant at the 1% level. This suggests that having a comprehensive whitepaper helps lower underpricing by providing transparency and increasing investor trust in the project.

KYC (Know Your Customer) requirements show a significant negative effect on underpricing in the USA (coefficient = -0.392, t = -2.19), but this effect is not significant in the EU (coefficient = -0.209, t = -1.19). This finding implies that KYC practices may be more effective in reducing underpricing in the USA, likely due to greater investor confidence in regulated, transparent projects.

The rating variable has no significant effect on underpricing in the USA (coefficient = 0.109, t = 0.75) but shows a marginally significant negative effect in the EU

(coefficient = -0.307, t = -1.72). This result suggests that ratings may slightly reduce underpricing in the EU by acting as a signal of project quality.

The pre-ICO variable has a marginally significant negative effect on underpricing in the USA (coefficient = -0.278, t = -1.74) but is not significant in the EU (coefficient = 0.180, t = 0.65). This indicates that pre-ICO rounds may help reduce underpricing in the USA, possibly by stabilizing the market and securing early investor commitment.

The constant term is not significant in the USA (coefficient = 0.794, t = 1.18) but is significant in the EU (coefficient = 4.249, t = 5.93), showing different baseline levels of underpricing between the two markets.

The model’s R-squared values are high, with 0.861 for the USA and 0.880 for the EU, indicating that the model explains approximately 86.1% and 88.0% of the variance in underpricing, respectively. This suggests a strong model fit and that factors such as female leadership, regulation, whitepaper presence, and KYC play important roles in influencing ICO underpricing, with some regional variations.

8 Robustness test:

	Coefficient	Std. Error	t	p-value	
regulation	-1.138	0.367	0.036	0.000	***
Female percentage	4.867	0.971	5.010	0.007	**
regulation# Female percentage	-4.604	0.903	-5.10	0.007	*
distribution	-0.074	0.049	-1.50	0.208	
KYC	-0.486	0.146	-3.33	0.029	**
bounty	0.245	0.087	2.82	0.048	
pre_ico	-0.270	0.075	-3.62	0.022	
whitepaper	-0.452	0.183	-2.48	0.068	

rating	-0.268	0.085	-3.14	0.035	
Constant	3.735	0.357	10.47	0.000	***
observations	367				
R-squared	0.781				

Table 11: Robustness Check - Evaluating the Stability of Regulatory and Gender Percentage Effects on Outcomes. In this robustness check, the model employed is expressed as follows: ICO Underpricing = ß0 + ß1(Regulatory) + ß2(Female Percentage) + ß3(Regulatory * Female Percentage) + ß4(Control Variables) + ε. To assess stability, we substituted the variable "female leader" with the proportion of female leaders. Fixed Effects were applied to absorb specific effects associated with regions and years, accomplished through the implementation of the command "absorb (region and quarter of year)." This approach effectively controlled for inherent variations observed across different countries and over time. By integrating these fixed effects into the model, we conducted a more nuanced analysis of how various explanatory variables influence the dependent variable (underpricing). The symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

The robustness test provides further evidence on the factors influencing ICO underpricing, confirming the significance and direction of several variables.

The regulation variable shows a strong and significant negative effect on underpricing, with a coefficient of -1.138 and a p-value of 0.000. This result suggests that regulatory frameworks are associated with lower underpricing, likely because they reduce information asymmetry and increase investor confidence.

The female percentage variable, representing the proportion of female leadership, has a significant positive effect on underpricing, with a coefficient of 4.867 and a p-value of 0.007. This suggests that ICOs with higher female leadership tend to have higher underpricing, which may reflect biases or perceived risks related to female-led projects.

The interaction between regulation and female percentage is significant and negative, with a coefficient of -4.604 and a p-value of 0.007. This interaction suggests that regulation can reduce the higher underpricing associated with female-led ICOs, possibly by counteracting investor biases when regulatory oversight is in place.

The distribution variable not have a significant effect on underpricing, with a coefficient of -0.074 and a p-value of 0.208. This indicates that distribution methods alone may not strongly impact underpricing.

KYC (Know Your Customer) requirements show a significant negative effect on underpricing, with a coefficient of -0.486 and a p-value of 0.029. This suggests that KYC practices reduce underpricing by adding transparency and lowering perceived risks.

The bounty variable has a significant positive effect on underpricing, with a coefficient of 0.245 and a p-value of 0.048. This result indicates that bounty programs may attract speculative investors, increasing initial price volatility and thus leading to higher underpricing.

The pre-ICO variable has a significant negative effect on underpricing, with a coefficient of -0.270 and a p-value of 0.022. This finding suggests that pre-ICO rounds help to secure committed investors and stabilize pricing, which reduces the need for substantial underpricing.

The whitepaper variable shows a marginally significant negative effect on underpricing, with a coefficient of -0.452 and a p-value of 0.068. This result suggests that having a comprehensive whitepaper may reduce underpricing by enhancing transparency and credibility, though the effect is not highly significant.

The rating variable has a significant negative effect on underpricing, with a coefficient of -0.268 and a p-value of 0.035. This implies that higher ratings are associated with lower underpricing, likely because they signal project quality and attract more stable investors.

The constant term is also significant, with a coefficient of 3.735 and a p-value of 0.000, reflecting the baseline level of underpricing when other factors are not considered.

The model’s R-squared value is 0.781, indicating that approximately 78.1% of the variation in underpricing is explained by this model. This high R-squared value confirms the robustness of the model and the explanatory power of these variables in understanding ICO underpricing.

In summary, the robustness test supports the importance of regulation, female leadership, KYC, bounty programs, pre-ICO rounds, and ratings in explaining ICO underpricing. Regulation significantly reduces underpricing, especially for female-led ICOs. While bounty programs and higher female leadership are linked to increased underpricing, factors such as KYC, pre-ICO participation, and ratings help to reduce it.

9 Discussion:

9.1 Findings

In our analysis, the inverse relationship between regulatory oversight and ICO underpricing becomes more pronounced when we consider the dynamics of investor confidence. When ICOs operate within a regulated framework, investors tend to have greater faith in the legitimacy and transparency of the projects. This increased confidence leads to a diminished reliance on underpricing as a mechanism to attract investments. The comprehensive disclosure requirements

imposed by regulatory bodies contribute significantly to reducing information asymmetry, making investors more informed and less hesitant, ultimately resulting in lower underpricing.

This insight enhances our understanding of the pivotal role played by regulatory frameworks in shaping investor perceptions and pricing dynamics within the ICO market. It provides valuable insights for academics, practitioners, and policymakers regarding the positive outcomes of regulatory oversight on ICO pricing.

Delving deeper into the influence of gender diversity, our study sheds light on the nuanced relationship between female leadership and ICO underpricing. The positive correlation discovered implies that companies led by women experience a higher degree of underpricing during ICOs. This phenomenon may be attributed to prevailing biases against female leadership in certain sectors, impacting investor perceptions and valuation metrics. The study by Rau et al. (2021) underscores the complexity of the relationship between gender diversity and firm value, emphasizing the need for a more nuanced understanding of these dynamics.

Moreover, the findings align with the research by Cozarenco and Szafarz (2018), revealing that women borrowers in the microcredit market face stricter scrutiny compared to their male counterparts. This heightened scrutiny translates into a relative difficulty in securing financing, prompting companies with female leadership to opt for lower token prices during ICOs to overcome these challenges.

This finding introduces a novel perspective to the discussion on leadership diversity and its consequences for the ICO market. It underscores the need for a nuanced comprehension of leadership variables in the cryptocurrency domain.

Expanding on the regulatory aspect, within a regulated ICO environment, companies led by women exhibit a noteworthy reduction in underpricing. This can

be attributed to the observed tendencies of female leaders to be more responsive to regulatory changes. Research by Becker-Blease & Sohl (2007) and Carter et al. (1998) highlights that women, on average, may display a more cautious and risk-averse approach. Consequently, when confronted with new regulatory policies, female leaders are more likely to adopt proactive measures, ensuring a higher degree of compliance. This proactive stance further contributes to a stronger regulatory framework, effectively curbing ICO underpricing.

This discovery enriches existing literature by emphasizing the intricate interplay between gender diversity in leadership and regulatory landscapes. It stresses the importance of considering these factors jointly for a comprehensive grasp of ICO pricing dynamics.

In summary, our comprehensive analysis underscores the multifaceted influences of regulatory environments and gender diversity on ICO underpricing. Regulatory oversight enhances investor confidence, while the impact of female leadership introduces additional complexity, incorporating biases, scrutiny, and regulatory responsiveness into ICO underpricing dynamics. This study contributes to academic knowledge, empirically validating hypotheses and offering insights into factors influencing ICO pricing for industry stakeholders and policymakers.

9.2 Suggestions

Enhance Regulatory Clarity and Consistency: Policymakers should focus on providing clear and consistent regulatory frameworks for ICOs. Clarity in regulations reduces uncertainty, instilling confidence in investors and contributing to a more stable ICO market.

Promote Gender Diversity Awareness: Industry stakeholders and regulatory bodies should actively promote awareness regarding gender biases and stereotypes.

Encouraging gender diversity in leadership positions fosters a more inclusive environment, potentially mitigating biases that impact ICO underpricing.

Tailor Regulations to Support Female-Led Ventures: Policymakers should consider tailoring regulations to support female-led ventures. Understanding the challenges faced by women leaders and implementing supportive measures can contribute to a more equitable ICO landscape.

Encourage Transparent Reporting: Regulations should emphasize transparent reporting practices for ICOs. Comprehensive whitepapers and disclosures positively influence market perception. Encouraging transparent reporting ensures that investors have access to vital information, reducing information asymmetry.

Address Biases in Funding Processes: Efforts should be made to address biases in funding processes. Recognizing and addressing biases against female-led projects can contribute to fairer valuation metrics, reducing the observed underpricing associated with gender diversity in leadership.

Facilitate Educational Initiatives: Educational initiatives should be promoted to enhance understanding of the cryptocurrency market dynamics. This includes educating investors, entrepreneurs, and policymakers on the unique factors influencing ICO pricing, such as regulatory impacts and gender diversity.

Periodic Regulatory Reviews: Regular reviews of regulatory frameworks are essential to adapt to the evolving cryptocurrency landscape. Periodic assessments allow policymakers to identify gaps, address emerging challenges, and ensure that regulations remain effective in curbing underpricing.

Collaboration with Industry Experts: Policymakers should collaborate with industry experts, researchers, and practitioners to gain insights into the ever-changing

dynamics of ICOs. Such collaboration facilitates the development of regulations that are practical, effective, and aligned with industry needs.

These recommendations aim to create a more conducive environment for ICOs, fostering investor confidence, addressing gender biases, and ensuring the effectiveness of regulatory measures. Implementing these policies can contribute to a healthier and more sustainable ICO ecosystem.

10 Conclusion:

As ICOs continue to evolve, the associated challenges, especially those related to regulatory oversight, become increasingly apparent. The regulation of ICOs varies significantly across different regions, with some countries implementing specific regulatory measures while others lack any form of ICO regulation. Furthermore, there are nations that outright prohibit ICOs.

The regulatory landscape for ICOs is dynamic and subject to continuous changes, much like any emerging phenomenon. For instance, South Korea initially imposed a complete ban on ICOs but later permitted their existence. In this paper, we primarily focus on the impact of regulatory policies on ICO underpricing. Additionally, we delve into the influence of female leadership on ICO underpricing. The interaction between female leadership and regulatory policies and its effect on ICO underpricing is also explored. Our regression results subsequently confirm the hypotheses we put forward. Finally, to validate the robustness of our findings, we utilize the proportion of female leadership as a stability check, further corroborating the accuracy of our results.

The first aspect investigated in our study delves into the relationship between regulatory supervision and ICO underpricing. The positive correlation observed

between regulatory supervision and investor confidence underscores the pivotal role regulatory agencies play in shaping perceptions within the ICO market. Investors tend to exhibit greater confidence in projects operating within regulated frameworks, thereby reducing reliance on underpricing as a mechanism to attract investment. Consequently, policymakers should prioritize the establishment of clear and consistent regulatory frameworks, fostering a more stable and confidence-filled ICO market. The regulatory framework, through comprehensive disclosure requirements, plays a crucial role in reducing information asymmetry and shaping investor perceptions, underscoring the importance of clear and consistent regulatory structures for a stable and trustworthy ICO market.

A deeper exploration of gender diversity reveals the complex relationship between female leadership and ICO underpricing. The identified positive correlation suggests that companies led by women experience a higher degree of underpricing during ICOs. This phenomenon is attributed to biases against female leadership, influencing investor perspectives and valuation metrics. Aligning with existing research in related fields, our study emphasizes the need for a nuanced understanding of how gender diversity impacts company valuations. Industry stakeholders and regulatory bodies should actively work towards promoting gender diversity in leadership roles, creating an inclusive environment to reduce biases influencing ICO pricing. Additionally, our research aligns with existing studies, highlighting that women borrower, particularly in sectors such as microfinance, face stricter scrutiny, making fundraising relatively challenging. This scrutiny prompts companies led by women to opt for lower token prices during ICOs to overcome these challenges. Policymakers should acknowledge these challenges and consider regulations to support female-led enterprises, fostering a more equitable ICO environment.

However, our findings indicate a significant reduction in underpricing among companies led by women in regulated ICO environments. This highlights the interaction between gender diversity in leadership and regulatory frameworks.

The observed trend of female leaders being more sensitive to regulatory changes contributes to establishing robust regulatory frameworks, effectively curbing ICO underpricing. This sensitivity is attributed to the cautious and risk-averse approach exhibited by female leaders. The proactive measures taken by female leaders contribute to building a stronger regulatory framework, effectively mitigating ICO underpricing. This encourages policymakers to consider these findings when formulating regulations to support female-led enterprises, recognizing the positive attitude of female leaders towards regulatory compliance and emphasizing the importance of incorporating gender diversity into regulatory frameworks. This approach facilitates the establishment of a more robust regulatory framework, effectively curbing ICO underpricing.

In conclusion, our research provides a comprehensive examination of the intricacies surrounding Initial Coin Offerings, revealing compelling insights into the interplay between regulatory supervision, gender diversity in leadership, and the pricing dynamics within the ICO market. These findings contribute nuanced perspectives that hold significant implications for both industry stakeholders and policymakers, fostering substantial contributions to academic discourse and practical considerations.

Our research comprehensively explores the multifaceted impacts of regulatory environments and gender diversity on ICO pricing. Policymakers should consider the interactions between regulatory supervision, investor confidence, and gender diversity to create a conducive environment for ICOs. The proposed policy recommendations, including enhancing regulatory transparency, promoting gender diversity awareness, formulating regulations to support female-led enterprises, encouraging transparent reporting, addressing biases in the fundraising process, and promoting educational initiatives, collectively contribute to establishing a healthier and more sustainable ICO ecosystem. Ongoing collaboration with industry experts, regular regulatory reviews, and a commitment to adapting to the evolving cryptocurrency landscape are crucial for

developing robust and effective regulations. Additionally, the policy recommendations in our study aim to address key issues that could significantly impact the dynamics of ICO pricing. Enhancing regulatory clarity and consistency serves as the cornerstone for instilling investor confidence, necessitating policymakers' focus on providing clear and consistent regulatory frameworks for ICOs. This approach not only reduces uncertainty but also cultivates an environment that enables investors to make informed decisions. The stability brought about by regulatory clarity is paramount for the credibility and long-term sustainability of the ICO market.

The limitations of this thesis primarily revolve around challenges in acquiring ICO data. Obtaining ICO data is notably difficult, necessitating manual collection of substantial amounts of information. This presents research challenges, as manual collection may result in incomplete or inaccurate data. Additionally, the relative novelty of ICOs contributes to a shortage of related research materials, further complicating the study.

In the current research, our analysis heavily relies on experiences from studying IPOs and other issuance methods. However, ICOs, as a unique financing model, may have distinct features and influencing factors. Therefore, a more in-depth study of ICOs, rather than solely relying on experiences from other issuance methods, would enhance our understanding of ICO operations and effects.

Future research could focus on four aspects. First, exploring the relationship between ICO regulation and long-term returns is essential. Given the highly decentralized nature of the ICO market and its lack of regulation, investigating the impact of regulation on long-term returns is a valuable direction. This exploration includes assessing the influence of regulatory measures on ICO project quality, investor confidence, and market performance.

Secondly, investigating ICO market trends is crucial. Understanding the developmental trends of the ICO market, including the emergence of new ICO models and changes in investor participation, provides insights into the evolutionary process of the ICO market, guiding future research.

Thirdly, evaluating ICO project quality is imperative. Assessing project quality from the project team's perspective, considering factors such as team composition, whitepapers, and technical capabilities, aids in understanding the potential relationship between project quality and long-term returns.

Lastly, researching market participant behavior is essential. Examining the behavior of investors, project teams, and other relevant participants in the ICO market provides a deeper understanding of decision-making processes, information acquisition methods, and market responses. This contributes to a comprehensive understanding of the workings of the ICO market.

11 References:

1. Adhami, S., Giudici, G., & Martinazzi, S. (2018). Why do businesses go crypto? An empirical analysis of initial coin offerings. *Journal of Economics and Business, 100*(November–December), 64–75.

2. Aslan, A., Şensoy, A., & Akdeniz, L. (2023). Determinants of ICO success and post-ICO performance. *Borsa Istanbul Review, 23*(1), 217-239.

3. Amsden, R., & Schweizer, D. (2018). Are blockchain crowdsales the new'gold rush'? Success determinants of initial coin offerings. *Success determinants of initial coin offerings (April 16, 2018)*.

4. An, J., Duan, T., Hou, W., & Xu, X. (2019). Initial coin offerings and entrepreneurial finance: the role of founders' characteristics. The Journal of Alternative Investments, 21, 26–40.

5. An, J., Duan, T., Hou, W., & Xu, X. (2020). Cyber Risks and Initial Coin Offerings: Evidence from the World.

6. Athey, S., Parashkevov, I., Sarukkai, V. and Xia, J., 2016. Bitcoin pricing, adoption, and usage: Theory and evidence.

7. Barth, A., Laturnus, V., Mansouri, S., & Wagner, A. F. (2021). ICO analysts. *DP16200*.

8. Beatty, R. P., & Ritter, J. R. (1986). Investment banking, reputation, and the underpricing of initial public offerings. *Journal of financial economics*, *15*(1-2), 213-232.

9. Bellavitis, C., Fisch, C., & Wiklund, J. (2021). A comprehensive review of the global development of initial coin offerings (ICOs) and their regulation. *Journal of Business Venturing Insights*, *15*, e00213.

10. Brave New Coin. (2017). ICOs and cryptocurrencies – a 'rough' guide to global regulation. Retrieved from https://bravenewcoin.com/insights/icos-and-cryptocurrencies-a-rough-guide-to-global-regulation

11. Block, J.H., Groh, A., Hornuf, L. *et al.* The entrepreneurial finance markets of the future: a comparison of crowdfunding and initial coin offerings. *Small Bus Econ* 57, 865–882 (2021). https://doi.org/10.1007/s11187-020-00330-2

12. Bourveau, T., De George, E. T., Ellahie, A., & Macciocchi, D. (2022). The role of disclosure and information intermediaries in an unregulated capital market: evidence from initial coin offerings. *Journal of Accounting Research*, *60*(1), 129-167.

13. Boreiko, D., & Risteski, D. (2021). Serial and large investors in initial coin offerings. *Small Business Economics*, *57*(2), 1053-1071.

14. Böhme, R., Christin, N., Edelman, B. and Moore, T., 2015. Bitcoin: Economics, technology, and governance. *Journal of economic Perspectives*, *29*(2), pp.213-238.

15. Becker-Blease J. R., Sohl J. E. (2007). Do women-owned businesses have equal access to angel capital? *Journal of Business Venturing*, 22(4), 503–521.

16. Castonguay, J. J., & Stein Smith, S. (2020). Digital Assets and Blockchain: Hackable, Fraudulent, or Just Misunderstood?. *Accounting Perspectives*, *19*(4), 363-387.

17. Carter R. B., Dark F. H., Singh A. K. (1998). Underwriter reputation, initial returns, and the long-run performance of IPO stocks. *Journal of Finance*, 53(1), 285–311.

18. Chambers, D., & Dimson, E. (2009). IPO underpricing over the very long run. *The Journal of Finance*, *64*(3), 1407-1443.

19. Chen G., Crossland C., Huang S. (2016). Female board representation and corporate acquisition intensity. *Strategic Management Journal*, 37(2), 303–313.

20. Chen, Y., & Bellavitis, C. (2020). Blockchain disruption and decentralized finance: The rise of decentralized business models. Journal of Business Venturing Insights, 13, e00151.

21. Chod, J., & Lyandres, E. (2021). A theory of icos: Diversification, agency, and information asymmetry. *Management Science*, *67*(10), 5969-5989.

22. Cozarenco, A., & Szafarz, A. (2018). Gender biases in bank lending: Lessons from microcredit in France. *Journal of Business Ethics*, *147*, 631-650.

23. Dai, M., Zhang, S., Wang, H. and Jin, S., 2018. A low storage room requirement framework for distributed ledger in blockchain. *IEEE access*, *6*, pp.22970-22975.

24. De Andrés, P., Arroyo, D., Correia, R., & Rezola, A. (2022). Challenges of the market for initial coin offerings. *International Review of Financial Analysis*, *79*, 101966.

25. Dinh, T.T.A., Liu, R., Zhang, M., Chen, G., Ooi, B.C. and Wang, J., 2018. Untangling blockchain: A data processing view of blockchain systems. *IEEE transactions on knowledge and data engineering*, *30*(7), pp.1366-1385.

26. Dunphy, P. and Petitcolas, F.A., 2018. A first look at identity management schemes on the blockchain. *IEEE security & privacy*, *16*(4), pp.20-29.

27. Dolati, S., & Grégoire, V. (2022). *ICOs Underpricing* (Doctoral dissertation, HEC Montréal).

28. Eagly A. H., Karau S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological Review*, 109(3), 573–598.

29. Ekkayokkaya, M., & Pengniti, T. (2012). Governance reform and IPO underpricing. *Journal of Corporate Finance*, *18*(2), 238-253.

30. European Parliament | Understanding initial coin offerings, A new means of raising funds based on blockchain (2021) Retrieved 31 March 2022, from https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/696167/EPRS_BRI(2021)696167_EN.pdf

31. Fassin, Y., & Drover, W. (2017). Ethics in entrepreneurial finance: Exploring problems in venture partner entry and exit. Journal of Business Ethics, 140(4), 649-672.

32. Fahlenbrach, R., Frattaroli, M. ICO investors. *Financ Mark Portf Manag* **35,** 1–59 (2021). https://doi.org/10.1007/s11408-020-00366-0

33. Fisch, C. (2019). Initial coin offerings (ICOs) to finance new ventures. *Journal of Business Venturing*, *34*(1), 1-22.

34. Fisch, C., & Momtaz, P. P. (2020). Institutional investors and post-ICO performance: an empirical analysis of investor returns in initial coin offerings (ICOs). *Journal of Corporate Finance*, *64*, 101679.

35. Fisch, C., Masiak, C., Vismara, S., & Block, J. (2021). Motives and profiles of ICO investors. *Journal of Business Research*, *125*, 564-576.

36. Florysiak, D., & Schandlbauer, A. (2022). Experts or Charlatans? ICO Analysts and White Paper Informativeness. *Journal of Banking & Finance*, 106476.

37. Foley, S., Karlsen, J. R., & Putniņš, T. J. (2019). Sex, drugs, and bitcoin: How much illegal activity is financed through cryptocurrencies?. *The Review of Financial Studies*, *32*(5), 1798-1853.

38. Gryglewicz, S., Mayer, S., & Morellec, E. (2021). Optimal financing with tokens. *Journal of Financial Economics*, *142*(3), 1038-1067.

39. Guzmán, A., Pinto-Gutiérrez, C., & Trujillo, M. A. (2021). Signaling value through gender diversity: Evidence from initial coin offerings. *Sustainability*, *13*(2), 700.

40. Hanley, K. W., & Hoberg, G. (2010). The information content of IPO prospectuses. *The Review of Financial Studies*, *23*(7), 2821-2864.

41. Hu, A. S., Parlour, C. A., & Rajan, U. (2019). Cryptocurrencies: Stylized facts on a new investible instrument. *Financial Management*, *48*(4), 1049-1068..

42. Huang, W., Meoli, M. & Vismara, S. The geography of initial coin offerings. *Small Bus Econ* 55, 77–102 (2020). https://doi.org/10.1007/s11187-019-00135-y

43. Huang, J., & Kisgen, D. J. (2013). Gender and corporate finance: Are male executives overconfident relative to female executives?. *Journal of financial Economics*, *108*(3), 822-839.

44. Howell, S. T., Niessner, M., & Yermack, D. (2020). Initial coin offerings: Financing growth with cryptocurrency token sales. *The Review of Financial Studies*, *33*(9), 3925-3974.

45. Iansiti, M., Lakhani, K. (2017). The Truth About Blockchain. Harvard Business Review.

46. Jongsub Lee, Tao Li, Donghwa Shin, The Wisdom of Crowds in FinTech: Evidence from Initial Coin Offerings, *The Review of Corporate Finance Studies*, Volume 11, Issue 1, February 2022, Pages 1–46, https://doi.org/10.1093/rcfs/cfab014

47. Joo, M. H., Nishikawa, Y., & Dandapani, K. (2019). ICOs, the next generation of IPOs. *Managerial Finance*.

48. Johnston, J., & Madura, J. (2009). The pricing of IPOs post-sarbanes-oxley. *Financial Review*, *44*(2), 291-310.

49. Kher, R., Terjesen, S. & Liu, C. Blockchain, Bitcoin, and ICOs: a review and research agenda. *Small Bus Econ* 56, 1699–1720 (2021). https://doi.org/10.1007/s11187-019-00286-y

50. Kim, S., Sarin, A., & Virdi, D. (2018). Crypto-assets unencrypted. *Journal of Investment Management, Forthcoming*.

51. Leone, A. J., Rock, S., & Willenborg, M. (2007). Disclosure of intended use of proceeds and underpricing in initial public offerings. *Journal of Accounting Research*, *45*(1), 111-153.

52. Liu, Y., Tsyvinski, A., & Wu, X. (2022). Common risk factors in cryptocurrency. *The Journal of Finance*, *77*(2), 1133-1177.

53. Liu, Y., & Tsyvinski, A. (2021). Risks and returns of cryptocurrency. *The Review of Financial Studies*, *34*(6), 2689-2727.

54. Liu, B., McConnell, J. J., & Wang, J. (2021). The ICO Rating Game: Biased Ratings of Crypto Experts in Initial Coin Offerings. *Available at SSRN 3776935*.

55. Lyandres, E., Palazzo, B., & Rabetti, D. (2019). Do tokens behave like securities? An anatomy of initial coin offerings. *SSRN Electronic Journal*.

56. Lyandres, E., Palazzo, B., & Rabetti, D. (2022). Initial Coin Offering (ICO) Success and Post-ICO Performance. *Management Science*.

57. Masiak, C., Block, J. H., Masiak, T., Neuenkirch, M., & Pielen, K. N. (2020). Initial coin offerings (ICOs): market cycles and relationship with bitcoin and ether. *Small Business Economics*, *55*(4), 1113-1130.

58. Momtaz, P. P. (2021). Entrepreneurial finance and moral hazard: evidence from token offerings. *Journal of Business Venturing*, *36*(5), 106001.

59. Momtaz, P. P. (2020). Initial coin offerings. *Plos one*, *15*(5), e0233018.

60. Momtaz, P. P. (2021). The pricing and performance of cryptocurrency. *The European Journal of Finance*, *27*(4-5), 367-380.

61. Momtaz, P.P. (2021) Token Offerings Research Database (TORD), available at: https://www.paulmomtaz.com/data/tord

62. Myalo, A., & Glukhov, N. (2019). Comparison analysis of ICO, DAOICO, IEO and STO. Case study. *Case Study.(September 4, 2019)*.

63. Planet Compliance. (2022). *How Blockchain and ICO Regulation divide Regulators around the World*. Retrieved from https://www.planetcompliance.com

64. Pilkington, M. (2018). The emerging ICO landscape-some financial and regulatory standpoints. *Available at SSRN 3120307*.

65. Rau, P. R., Sandvik, J., & Vermaelen, T. (2021). *Are Women Underpriced?: Board Diversity and IPO Performance*. INSEAD.

66. Reutzel, C. R., & Belsito, C. A. (2015). Female directors and IPO underpricing in the US. *International Journal of Gender and Entrepreneurship*, *7*(1), 27-44.

67. Rock, K. (1986). Why new issues are underpriced. *Journal of financial economics*, *15*(1-2), 187-212.

68. Romero-Castro, N., Pérez-Pico, A. M., & Ulrich, K. (2022). ICOs, IEOs and STOs: Token Sales as Innovative Formulas for Financing Start-Ups. In Financing Startups (pp. 117-147). Springer, Cham.

69. Sabrina T Howell, Marina Niessner, David Yermack, Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales, *The Review of*

Financial Studies, Volume 33, Issue 9, September 2020, Pages 3925–3974, https://doi.org/10.1093/rfs/hhz131

70. Schückes, M., Gutmann, T. Why do startups pursue initial coin offerings (ICOs)? The role of economic drivers and social identity on funding choice. *Small Bus Econ* 57, 1027–1052 (2021). https://doi.org/10.1007/s11187-020-00337-9

71. SEC.gov | Spotlight on Initial Coin Offerings (ICOs). (2021). Retrieved 31 March 2022, from https://www.sec.gov/ICO

72. Shams, A. (2020). The structure of cryptocurrency returns. *Fisher College of business working paper*, (2020-03), 011.

73. Shi, C., Pukthuanthong, K., & Walker, T. (2013). Does disclosure regulation work? Evidence from international IPO markets. *Contemporary Accounting Research*, *30*(1), 356-387.

74. SingularDTV. (2017). What is the Difference Between an ICO and a Token Launch?

75. Tapscott, D., & Tapscott, A. (2016). Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world. Penguin.

76. Thébaud, S., & Sharkey, A. J. (2015). Unequal hard times: The influence of the great recession on gender bias in entrepreneurial financing. *Sociological Science*, *3*, 1-31.

77. U.S. Securities and Exchange Commission. (2023). Cryptocurrency/ICOs. Retrieved from https://www.sec.gov/securities-topics/ICO

78. Wang, S. , Zhang, Y. , & Zhang, Y. (2018). A blockchain-based framework for data sharing with fine-grained access control in decentralized storage systems. *IEEE Access* , *6* , 38437–38450.

79. Yermack, D. (2017). Corporate governance and blockchains. *Review of finance*, *21*(1), 7-31.

80. Yuan, C., Xu, M.X. and Si, X.M., 2017. Research on a new signature scheme on blockchain. *Security and Communication Networks*, *2017*.

81. Yuryev, G. (2018). What can explain the performance of Initial Coin Offerings? (Master's thesis, University of Stavanger, Norway).

82. Zhang, Z., & Neupane, S. (2024). Global IPO underpricing during the Covid-19 pandemic: The impact of firm fundamentals, financial intermediaries, and global factors. *International Review of Financial Analysis*, *91*, 102954.

10. Data sources references:

1. Bitcoin Market Journal. (2018). ICO regulations: A global map of digital token offerings regulation. Retrieved March 22, 2023, from https://www.bitcoinmarketjournal.com/ico-regulations/

2. Canadian Securities Administrators. (2017). CSA Staff Notice 46-307 Cryptocurrency Offerings. Retrieved March 22, 2023, from https://www.securities-administrators.ca/aboutcsa.aspx?id=1698

3. Canadian Securities Administrators. (2018). CSA Staff Notice 46-308 Securities Law Implications for Offerings of Tokens. Retrieved March 22,

2023, from https://www.securities-administrators.ca/aboutcsa.aspx?id=1734

4. CoinMarketCap. (2023). Cryptocurrency Market Capitalizations. Retrieved March 22, 2023, from https://coinmarketcap.com/

5. European Securities and Markets Authority. (2017). ESMA alerts firms involved in Initial Coin Offerings (ICOs) to the need to meet relevant regulatory requirements. Retrieved March 22, 2023, from https://www.esma.europa.eu/press-news/esma-news/esma-alerts-firms-involved-initial-coin-offerings-icos-need-meet-relevant

6. Fahlenbrach, R., & Frattaroli, M. (2021). ICO investors. *Financial Markets and Portfolio Management*, *35*(1), 1-59.

7. Financial Services Agency Japan. (2018). FSA's Strategy on FinTech. Retrieved March 22, 2023, from https://www.fsa.go.jp/en/news/2018/20180427-1/01.pdf

8. Gibraltar Financial Services Commission. (2018). DLT Regulatory Framework. Retrieved March 22, 2023, from https://www.gfsc.gi/dlt-framework

9. Legalink. (2019). ICOs and token sales: Legalink guide (2nd ed.). Retrieved March 22, 2023, from https://www.legalink.ch/xms/files/PUBLICATIONS/Legalink_ICOS_and_Token_Sales_2nd_Edition_2019.pdf

10. Momtaz, P.P. (2021) Token Offerings Research Database (TORD), available at: https://www.paulmomtaz.com/data/tord

11. Monetary Authority of Singapore. (2017). A Guide to Digital Token Offerings. Retrieved March 22, 2023, from

https://www.mas.gov.sg/regulation/guidelines/a-guide-to-digital-token-offerings

12. Securities and Futures Commission. (2017). Statement on initial coin offerings. Retrieved March 22, 2023, from https://www.sfc.hk/edistributionWeb/gateway/EN/news-and-announcements/news/doc?refNo=17PR117

13. U.S. Securities and Exchange Commission. (2017). SEC Issues Investigative Report on ICOs and Digital Assets. Retrieved March 22, 2023, from https://www.sec.gov/news/press-release/2017-131

14. Xinhua News Agency. (2017). China bans initial coin offerings calling them 'illegal fundraising.' Retrieved March 22, 2023, from http://www.xinhuanet.com/english/2017-09/04/c_136583396.htm

11. Appendix

Variable	**Definition**
Female percentage	Proportion or percentage of females in a particular context

Whitepaper (dummy)	A document that outlines the details and objectives of the project
Rating Score	A score assigned by a rating agency based on the potential of the project
Pre-ICO (dummy)	A discounted phase of the ICO offered to early investors
Bonus (dummy)	Additional tokens offered to investors for early investment
Female Leadership (dummy)	If the leader members with female, we mark as 1 otherwise we mark as 0
Regulation	If ICO in the period with ICO regulation, we mark as 1. If ICO issued in the period without regulation, we marked it as 0.
KYC (dummy)	Know Your Customer, a verification process for investors
Social media	The number of social media platforms where the project has a presence
Distribution	Ratio of the number of tokens offered in sales to total supply of tokens.
Bounty (dummy)	A reward program for promoting the project

Table 12: the definition of control variables and predictions of their impact on ICO underpricing. This table shows the definitions of the independent variables and control variables.

Country/Region	ICO Regulation	Regulation Description	Date

Australia	Yes	On September 28, 2017, the ASIC issued guidance for both issuers and investors involved in Initial Coin Offerings (ICOs) in Australia. The guidance outlined the regulatory approach of the ASIC and offered recommendations for compliance with Australian laws. It emphasized that ICOs might be subject to financial services laws in Australia, advising issuers to seek legal and financial counsel to ensure adherence. On April 30, 2018, the ASIC released an information sheet specifically addressing initial coin offerings and cryptocurrency. This document provided clear guidance on the legal and regulatory requirements applicable to ICOs and cryptocurrency activities in Australia. Subsequently, on September 30, 2020, the ASIC updated its guidance on ICOs and cryptocurrency. The revised guidance included additional information on the regulatory framework and underscored the significance of complying with Anti-Money Laundering (AML) and Know Your Customer (KYC) regulations.	2017/9/28
Belize	No	-	-
Brazil	No	-	-
British Virgin Islands	No	-	-

Canada	Yes	On August 24, 2017, the CSA (Canadian Securities Administrators) issued Staff Notice 46-307, offering guidance on how securities laws apply to Initial Coin Offerings (ICOs). The notice clarified that certain tokens issued in ICOs might be regarded as securities, making them subject to applicable securities laws. Subsequently, on June 11, 2018, the CSA released Staff Notice 46-308, which provided further guidance on the regulatory framework governing ICOs. This notice detailed the regulatory obligations for ICOs and underscored the significance of adhering to securities laws.	2017/8/24
Cayman Islands	No	-	-
China	Yes	In September 2017, China implemented a ban on Initial Coin Offerings (ICOs) and cryptocurrency exchanges.	2017/9/4
EU	Yes	On November 13, 2017, the European Securities and Markets Authority (ESMA) adopted a more rigorous stance on Initial Coin Offerings (ICOs). ESMA expressed concern that ICOs posed a significant risk to investors. Consequently, the authority mandated that firms involved in ICOs must adhere to applicable regulatory obligations. This statement reflected ESMA's commitment to addressing the potential risks associated with ICOs and ensuring compliance with established regulations for investor protection.	2017/11/13

Gibraltar	Yes	Gibraltar's Financial Services Commission (GFSC) implemented a regulatory framework for Distributed Ledger Technology (DLT) on January 1, 2018. This framework applies to entities engaging in Initial Coin Offerings (ICOs) and necessitates compliance with specific principles. To operate within the legal framework, ICO issuers are required to obtain a license from the GFSC. The regulatory principles encompass various aspects, including the obligation to provide comprehensive disclosure to investors about the ICO project and associated risks. Additionally, ICO issuers must demonstrate the possession of sufficient financial and technical resources to sustain the project. Further, the framework mandates the implementation of measures to prevent financial crimes and ensure the protection of customer assets. ICO issuers are also required to maintain adequate insurance coverage, addressing both operational and cybersecurity risks associated with their projects. In the event of project failure, ICO issuers must have a clear and effective strategy for winding down operations. This comprehensive regulatory appro	2018/1/1

Hong Kong	Yes	On September 5, 2017, the Securities and Futures Commission (SFC) of Hong Kong issued a cautionary statement, alerting investors to potential risks associated with Initial Coin Offerings (ICOs). The advisory highlighted concerns such as fraud, lack of transparency, and the potential illicit use of tokens. It also acknowledged the possibility of ICOs falling under the purview of securities laws in Hong Kong. Subsequently, on November 1, 2018, the SFC released a second statement articulating its regulatory approach towards virtual assets, including those offered through ICOs. This statement clarified that virtual assets, including ICO tokens, might be categorized as "securities" under Hong Kong's securities laws, subjecting them to SFC regulation. The statement introduced a framework for evaluating whether an ICO could be considered a security and therefore subject to regulatory oversight. On March 31, 2021, the SFC issued updated guidance pertaining to licensing requirements for cryptocurrency exchanges and ICO issuers. This guidance provided clarity on the licensing criteria for cryptocurrency exchanges operating in Hong Kong. Additionally, it offered further insight into the regulatory obligations for ICO issuers, emphasizing the necessity of obtaining a license from the SFC if the tokens offered in the ICO are deemed securities.	2017/9/5
India	No	-	-
Indonesia	NO	-	-
Israel	No	-	-

Japan	Yes	The oversight of Initial Coin Offerings (ICOs) in Japan falls under the purview of the Financial Services Agency (FSA). The FSA regulates ICOs in accordance with the Payment Services Act and the Financial Instruments and Exchange Act. In April 2018, the FSA mandated that all enterprises involved in cryptocurrency exchange and ICO activities must register with the agency. Since then, the FSA has implemented various regulations to govern the practices associated with ICOs. These regulations encompass aspects such as the disclosure of information, safeguarding investor interests, and the utilization of escrow accounts in ICO processes. This regulatory framework underscores Japan's commitment to ensuring transparency, investor protection, and responsible conduct within the ICO sector.	2017/10/27
Liechtenstein	Yes	In August 2018, the Financial Market Authority (FMA) of Liechtenstein issued a statement providing guidance on the regulatory framework for Initial Coin Offerings (ICOs). The FMA emphasized that ICOs in Liechtenstein would be governed by the nation's existing financial market laws and regulations. The regulatory approach takes into consideration the unique features of the tokens offered in the ICOs, reflecting a tailored regulatory perspective to address the evolving landscape of digital assets within the country.	2018/8/8

Malaysia	Yes	In Malaysia, the Securities Commission Malaysia (SC) has introduced guidelines to regulate digital assets, encompassing initial coin offerings (ICOs). Published on January 15, 2019, and enforced from January 31, 2019, these guidelines delineate the regulatory obligations for ICO issuers. Key aspects of the guidelines include the imperative for ICO issuers to seek approval from the SC before commencing an ICO. Furthermore, compliance with anti-money laundering and counter-terrorism financing regulations is mandated. ICO issuers are also obligated to disclose specific information to investors. This disclosure encompasses project details and the rights and obligations associated with the tokens offered, ensuring transparency and investor protection in the digital asset space.	2019/1/15
Philippines	YES	In August 2018, the Securities and Exchange Commission (SEC) of the Philippines introduced draft regulations concerning initial coin offerings (ICOs). These regulations categorized ICOs as securities, necessitating their registration with the SEC. ICO issuers were mandated to furnish extensive information about their projects, encompassing whitepapers and risk disclosures. Ongoing surveillance of the ICO market in the Philippines by the SEC led to additional guidance on virtual currencies and ICOs in 2019. This guidance emphasized the imperative for compliance with anti-money laundering (AML) and counter-terrorism financing (CTF) regulations, underscoring the SEC's commitment to ensuring regulatory adherence and financial integrity in the virtual asset space.	2018/8/2

Russia	Yes	In October 2017, the Kremlin issued five directives concerning cryptocurrencies. These directives mandated the registration and taxation of altcoin miners, as well as the application of securities laws to Initial Coin Offerings (ICOs). In January 2018, the Russian Ministry of Finance published a draft bill on digital financial assets, aiming to establish a legal framework for ICOs and cryptocurrencies. The bill defined a digital financial asset as an electronically held property right, tradable on specialized platforms. It outlined requirements for conducting ICOs, stressing the necessity for issuers to furnish comprehensive information to potential investors. By July 2018, a revised version of the bill was introduced, offering more clarity on the legal status of cryptocurrencies and ICOs. The revised bill defined cryptocurrencies as property, acknowledging their usability as a means of payment but not as legal tender. It also specified ICO requirements, including issuer registration with the Central Bank of Russia. The bill was signed into law in August 2019, becoming effective on January 1, 2021. This legislation provides a legal framework for digital financial assets, encompassing cryptocurrencies and ICOs. It outlines the requirements for their issuance and circulation, establishes the rights and obligations of issuers and investors, and delineates procedures for dispute resolution.	2017/10/10
Saint Kitts and Nevis	No	-	-
Seychelles	No	-	-

Singapore	Yes	On November 14, 2017, the Monetary Authority of Singapore issued a guide aiming to clarify the regulatory treatment of Initial Coin Offerings (ICOs) or token offers in Singapore. The guide highlighted that if an ICO or token offer is categorized as a capital market product, such as a share with associated liability and covenants, or a debenture or collective investment scheme unit, it falls under licensing requirements pursuant to the Securities and Futures Act and its regulations. In August 2019, the Monetary Authority of Singapore (MAS) issued a statement providing additional guidance on its regulatory approach to digital tokens. This guidance extended to ICO issuers and cryptocurrency exchanges, mandating compliance with anti-money laundering and countering the financing of terrorism (AML/CFT) regulations. MAS emphasized the significance of investor education and stressed the need for ICO issuers to furnish investors with clear and accurate information. This regulatory framework reflects Singapore's commitment to maintaining integrity and security in the digital token space while prioritizing investor protection.	2017/11/14

South Korea	Yes	In 2017, South Korea implemented a ban on domestic Initial Coin Offerings (ICOs). However, a significant shift occurred in July 2021 when the Financial Services Commission (FSC) took steps to categorize various virtual assets. The initiative aimed to create classification standards based on the types of virtual assets, paving the way for the establishment of tailored regulatory measures for each category. This marked a change in approach, indicating a move towards a more nuanced and differentiated regulatory framework for virtual assets in South Korea.	2017/9/29
Switzerland	Yes	In February 2018, FINMA, the Swiss Financial Market Supervisory Authority, issued guidelines outlining the regulatory framework for Initial Coin Offerings (ICOs). These guidelines established the necessary conditions for ICO issuers to adhere to anti-money laundering (AML) and know-your-customer (KYC) regulations. Additionally, the guidelines highlighted the fundamental principles of securities laws that ICOs needed to comply with. In September 2019, FINMA updated its guidelines to provide greater clarity on the application of the existing Swiss regulatory framework to stablecoins and other digital assets. The updated guidelines stressed the principle of technology neutrality, underscoring that the legal classification of a token depends on its economic function rather than solely on its technology. This approach demonstrated Switzerland's commitment to adapting its regulatory framework to the evolving landscape of digital assets.	2018/2/16

UK	YES	In the United Kingdom, the Financial Conduct Authority (FCA) has issued guidance on the regulatory framework for Initial Coin Offerings (ICOs). In September 2017, the FCA issued a warning to investors about the associated risks of ICOs, highlighting that ICOs might fall under existing UK financial regulations, particularly those related to securities and investments. In January 2019, the FCA published a consultation paper proposing guidance for crypto assets, which included ICOs. The proposed guidance outlined requirements for ICO issuers, such as providing detailed information to investors, including a white paper detailing the project, an explanation of the rights and risks associated with the tokens, and information on the management team and the project's financial status. The proposed guidance also specified requirements for issuers to comply with anti-money laundering and counter-terrorism financing regulations. In October 2020, the FCA announced its decision to prohibit the sale of cryptocurrency derivatives to retail consumers, reflecting the authority's ongoing efforts to ensure consumer protection and address potential risks associated with cryptocurrency-related financial products.	12/09/2017
Ukraine	NO	-	-
United Arab Emirates	YES	In 2017, the Securities and Commodities Authority (SCA) of the United Arab Emirates (UAE) issued a statement cautioning investors about the potential risks associated with Initial Coin	2017/10/9

		Offerings (ICOs). The SCA emphasized that any fundraising activities involving ICOs would be subject to existing securities regulations within the UAE. In November 2017, the Abu Dhabi Global Market (ADGM) also provided guidance on ICOs, stating that ICO issuers must be licensed, and investors must be furnished with appropriate disclosures and safeguards. In June 2018, the UAE Securities and Commodities Authority (SCA) reiterated its warning to investors about the risks linked to ICOs, advising them to exercise caution. Subsequently, in August 2020, the SCA introduced its own regulations for crypto assets. These regulations mandate issuers to obtain approval from the SCA before conducting an ICO and require the provision of disclosures to investors. This regulatory framework reflects the UAE's commitment to ensuring investor protection and proper oversight in the realm of crypto assets and ICOs.	
USA	YES	On July 25, 2017, the U.S. Securities and Exchange Commission (SEC) issued a report stipulating that if an Initial Coin Offering (ICO) involves the offering and sale of securities, those offers and sales	2017/7/25

		of virtual coins or tokens must be registered with the SEC or conducted under an exemption from registration. In December 2017, the SEC took its first enforcement action against an ICO by issuing a cease-and-desist order against the Munchee ICO, which it deemed to be an unregistered securities offering. In March 2018, the SEC issued a statement emphasizing that ICOs and cryptocurrencies might be subject to U.S. securities laws. The statement further noted that exchanges and other market participants could also be subject to regulation. Simultaneously, the SEC launched a new cyber unit dedicated to investigating ICO fraud and other cyber-related securities violations. In April 2019, the SEC provided a framework for analyzing whether a digital asset qualifies as a security. This framework offers a detailed guide for market participants to evaluate the regulatory status of a specific digital asset, contributing to increased clarity and understanding in the evolving landscape of digital securities.	
Argentina	NO	-	-
Cambodia	No	-	-
Costa Rica	No	-	-
Georgia	No	-	-
Marshall Islands	No	-	-
Nigeria	YES	In September 2020, the Securities and Exchange Commission (SEC) of Nigeria issued a statement categorizing virtual	2020/9/14

		assets, including cryptocurrencies, as securities subject to regulation under Nigerian securities laws. The statement outlined that individuals or organizations intending to conduct an Initial Coin Offering (ICO) or any other form of digital asset offering are required to obtain prior approval from the SEC. Furthermore, they must adhere to applicable securities laws and regulations in Nigeria. This regulatory stance reflects the SEC's commitment to overseeing and ensuring compliance within the evolving landscape of virtual assets in the country.	
Taiwan	YES	In June 2018, there was an acknowledgment that Initial Coin Offerings (ICOs) could be classified as securities, contingent on specific circumstances. This recognition implied that ICOs might be subject to compliance with securities laws, highlighting a growing awareness of the potential regulatory implications associated with these fundraising activities.	2018/6/22
Turkey	NO	-	-

Table 13: provides a concise summary of ICO regulations across various countries and regions. It outlines regulatory changes and actions taken, with a focus on the existence of regulatory policies for Initial Coin Offerings (ICOs). The "ICO Regulation" column indicates whether a country has implemented regulatory measures for ICOs. The dates specified in the table reflect the commencement of regulatory actions by each respective country or region. This information aims to present a clear overview of the evolving ICO regulatory landscape.

Type regulation	Countries
No regulation	Belize, Brazil, British Virgin Islands, Cayman Islands, India, Indonesia, Israel, Saint Kitts and Nevis, Seychelles, Ukraine, Argentina, Cambodia, Costa Rica, Georgia, Marshall Islands, Turkey
Use the existing regulations	Australia, Canada, EU, Hong Kong, Liechtenstein, Malaysia, Philippines, Singapore, South Korea, Switzerland, United Arab Emirates, USA, Nigeria, Taiwan
New regulations	Gibraltar, Japan, Russia, UK
banned	China, South Korea

Table 14: Classification according to different regulatory measures. Different countries have adopted various regulatory approaches. Some countries or regions prohibit all Initial Coin Offerings. In contrast, others regulate ICOs based on their previous Initial Public Offering policies. However, another group of countries or regions is in the process of establishing new regulatory measures specifically for ICOs.