The Relationship Between Sustainability Information Represented by ESG and IPO Pricing: Evidence from the US NASDAQ

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Abstract. As investor interest in corporate sustainability increases and its influence on socioeconomic development becomes more pronounced, socially responsible investing (SRI) has emerged as a prominent investment trend, especially regarding the potential effects of environmental, social, and corporate governance (ESG) factors on a firm's short-term financial performance and long-term value. The incorporation of sustainability principles into corporate plans has progressively influenced all facets of the enterprise, including the initial public offering (IPO) process. This study examines the influence of sustainability information, as indicated by ESG, on the pricing bias of initial public offerings (IPOs). This research conducts an empirical examination of data from Nasdaq-listed businesses to demonstrate a substantial negative association between ESG performance and IPO pricing bias, indicating that companies with superior ESG performance display reduced price bias during the IPO pricing process. A greater frequency of ESG-related information disclosure aids in alleviating over- or under-valuation resulting from knowledge asymmetry. Investors can more precisely evaluate the market value of companies that exhibit greater transparency and sustainability. This outcome corroborates the 'information asymmetry theory,' which posits that firms can mitigate investor uncertainty and hence diminish pricing bias by comprehensively reporting ESG information. This research study offers a novel perspective on IPO pricing within the capital market, particularly on the growing significance of ESG information in the corporate financing process.

Keywords: IPO pricing, ESG, sustainable development, information asymmetry.

1. Introduction

Since 2020, numerous 'black swan' events have occurred, including the global dissemination of COVID-19, the US stock market's four crashes within two weeks, and the African locust infestation. The concept of sustainable and comprehensive development represented by ESG issues has once again become a hot topic of global discussion [1].

At the same time, going public marks an important watershed in the life of a young company, signalling its transition from private ownership to public ownership and providing access to external capital, thereby reducing the financial cost of company operations and investment. It also creates channels for the circulation of equity, making it easier for existing shareholders to diversify their investments and receive returns on their support of the company [2]. In layman's terms, an initial public offering (IPO) is an important way for a company to enter the public capital market. It is not only a core part of corporate financing, but also a key process for companies to achieve external evaluation of their intrinsic value. For investors, an IPO provides an opportunity to share in the benefits of a company's growth. For companies, an IPO not only allows them to efficiently obtain the capital needed for development, but also significantly enhances their visibility and market influence in the public eye, thereby strengthening brand value, optimising their capital structure, and laying the foundation for long-term sustainable development. From a macro perspective, IPOs are also considered to be an important indicator of the health of the securities market. The successful listing of large-scale and continuous IPOs indicates a vibrant market and positive market sentiment, while the opposite may indicate a bearish trend [3]. These aspects explain why IPO activity is a core cycle in the life of business activities, closely watched and favoured by stakeholders such as the market, the media and the government.

Influenced by practical factors, systematic research on IPOs not only has important theoretical significance, but also provides important policy implications and operational guidance for practice. Therefore, related research is booming, trying to unravel the veil and explore its internal operating mechanism. IPO pricing can be considered a top priority, which has formed four key research streams: information asymmetry, agency problems, legal, regulatory and social environment, and behavioral finance [4]. The theory of information asymmetry is relatively mature and has been adopted and refined by most people. Hu et al. (2021) studied the correlation between reputable underwriters reducing information asymmetry and reducing the phenomenon of IPO pricing [5]. Chen et al. (2022) and Gupta et al. (2021) explore the role of social secrecy and media sentiment on information asymmetry and the impact of underpricing in IPOs, respectively [6, 7].

At the same time, this paper also finds that the correlation between ESG-related information disclosure and IPO pricing is inadequate and warrants more investigation. Considering that the concept of sustainable development represented by ESG is being given more consideration in corporate IPOs, some studies have pointed out that in the public capital market, ESG investment strategies have become an important measure of enterprises, and investors will include ESG factors when making investment choices than ever before [8]. In addition, stock exchanges, regulators and investors are working together to integrate ESG into IPO activities. Following the publication of the United Nations Principles for Responsible Investment (UNPRI), ESG has been systematically integrated into the investment decision-making process. Today, regulators and stock exchanges around the world are promoting the disclosure of ESG-related information by companies. For example, the EU requires financial institutions and companies to clearly disclose ESG data in the Sustainable Finance Disclosure Regulation (SFDR), and China has also strengthened the regulation of ESG disclosure through the Measures for the Administration of Information Disclosure by Listed Companies, which was revised in 2022. According to data from the Sustainable Stock Exchange Initiative (SSE), as of November 2024, 134 stock exchanges around the world had become members, of which 38 exchanges required listed companies to disclose ESG information, and 73 exchanges had issued ESG disclosure guidelines. These activities affirm that the principle of sustainable development influences the realization of firm value and affects transactions in the public market.

In summary, it is not difficult to find from previous research that in the capital market, companies as well as underwriters and investors can be regarded as two forces: internal and external. The internal force can influence the external force by observing market trends and sentiments, disclosing relevant financial and non-financial information, reducing information asymmetry, and reducing misunderstandings between the two sides, so that the value of the company can be more truly reflected, forming a virtuous cycle. And ESG-represented sustainable development information has become an important part of non-financial information for companies nowadays. Therefore, this study aims to explore the correlation between the two, represented by pricing deviation. This analysis selected companies listed on the Nasdaq in the United States in the two years after the post-epidemic era (2022-2023) as the sample, and searched whether they had announced ESG or sustainable development-related information during the IPO stage. The mixed multiple regression model and significance test found that the disclosure of ESG information is negatively correlated with IPO pricing deviation, which shows investors' sensitivity to non-financial information during the IPO stage. This study supplements and contributes to research in related fields and provides partial theoretical support for companies in their future practices.

2. Literature Review and Hypotheses

2.1. IPO and Information Asymmetry

Initial public offerings (IPOs) are an important way for enterprises to raise funds through the capital market, and they are also a key link for investors to obtain high-quality assets. However, the IPO process is usually accompanied by significant information asymmetry, which is mainly reflected in the differences in perceptions of enterprise value among issuers, underwriters and investors, which

leads to deviations in IPO pricing. This information asymmetry directly affects the pricing efficiency and market performance of IPOs. Akerlof's (1970) 'Lemon Market' theory laid the foundation for the study of information asymmetry, arguing that information asymmetry may lead to the underestimation of high-quality assets due to incomplete recognition, while low-quality assets may benefit from risk-obscuring [9].

2.1.1. Development of asymmetric information theory

Early stage: Early research on asymmetric information focused on the differences in information between investors. Rock (1986) pointed out in his 'winner's curse theory' that external investors often face asymmetric information in the capital market, and it is particularly challenging for them to evaluate the genuine worth of a company in comparison to internal investors [10]. In order to attract investors, issuers often choose to issue at a discount, which explains the widespread 'discount phenomenon' in IPOs.

Mid-term development: In the 21st century, with the globalization of capital markets and the informatisation brought about by technological progress, researchers have begun to pay attention to the dynamic changes in information asymmetry. For example, Loughran and Ritter (2002) discussed the game of interests between issuers and underwriters from the perspective of behavioural finance, arguing that the discount of IPOs is not only the result of information asymmetry, but also affected by the issuer's strategy and market sentiment [11]. At the same time, some scholars have introduced the theory of reputation to explore how the reputation of underwriters affects the degree of information asymmetry.

Current research: In recent years, the widespread use of information technology and the trend towards data transparency have provided new perspectives for the study of information asymmetry. Researchers have gradually expanded the scope of information asymmetry to the field of non-financial information, which now has a multi-dimensional character. For example, Gao et al. (2024) point out that the gender characteristics of the board of directors, which manifest themselves in different leadership traits, should also be considered as a potential factor, which in turn affects IPO operation [12]. In addition, the introduction of big data analysis and artificial intelligence has made the processing and presentation of information more convenient, allowing investors to more efficiently identify the potential value of a company, further changing the mechanism of the impact of information asymmetry on the IPO market.

2.1.2. Interpretation of information asymmetry on IPO pricing

The impact mechanism of information asymmetry on IPO pricing can be broadly divided into the following three categories:

Risk compensation: Investors usually demand a higher risk premium due to information asymmetry, which leads to a depressed IPO price, which is the common 'discount phenomenon' of IPOs.

Signalling effect: Companies can convey their true value to the market by releasing positive information or hiring underwriters with high reputations. These signals can reduce investor uncertainty and optimise IPO valuations.

Price discovery efficiency: Markets with high levels of information asymmetry usually have low price discovery efficiency, causing IPO pricing to deviate from the actual value of the company.

2.2. ESG and Sustainable Development

The evolution of the ESG idea is widely regarded to have commenced in the 1900s, characterized by religious organizations prioritizing investments aligned with their beliefs, as a social justice initiative aimed at alleviating 'guilt'. The field gained prominence in the 1970s and 1980s, marking a formal transition from faith-based initiatives to public awareness and social responsibility. In the 2000s, the ESG sector experienced rapid expansion, with business activities increasingly adopting and implementing consistent ESG investment strategies [13].

By the 2010s, the financial and regulatory communities had also focused on responsible investment and ESG [13], demonstrating the irreplaceable importance of sustainable development represented by ESG in modern business. Several research indicates that the global disease event seriously impacted corporate operations, this has not affected the fact that companies are committed to ESG practices. The reason is that ESG practices are always closely related to the company's stakeholders, which can effectively mitigate the negative impact of exogenous uncontrollable factors. [1]. Chen et al. (2023) further demonstrated that a strong ESG proposition helps to improve the financial system, which can help companies achieve a 'talent attraction effect', improve return on assets, reduce market sinking costs, exercise strategic freedom, and create a synergistic effect to enhance overall productivity [14]. According to data from the Global Sustainable Investment Alliance (GSIA) in 2022, the total amount of ESG-related investments worldwide has reached 30.3 trillion US dollars, accounting for more than a quarter of the total amount of assets under management worldwide. These show that ESG factors have become an important variable affecting corporate value, especially in the capital market, where ESG performance is increasingly influencing corporate financing decisions and investor behaviour.

2.3. IPO and ESG

In the IPO pricing process, the value of non-financial information is attracting increasing attention, and ESG is a core component in this area. ESG provides key information on a company's environmental, social responsibility and governance capabilities and the concept of sustainable development, thereby helping investors assess the actual value and long-term development potential of the company.

Ferri et al. (2023) used IPO discounts as an entry point to explore the relationship between ESG and IPO pricing [8]. Although underpricing is a star in the field of IPO pricing and has received widespread attention and research, this paper believes that overpricing is also a phenomenon that occurs under the influence of information asymmetry. In view of this, this study attempts to use the variable of IPO discount to uniformly measure the pricing deviation caused by overpricing or underpricing. At the same time, considering the obvious negative correlation between sustainable development information disclosure represented by ESG and information asymmetry, this paper reasons that IPO pricing deviation and the disclosure of the above information are negatively correlated. Therefore, this paper can hypothesise that IPO companies with a high rate of sustainable development information disclosure represented by ESG are expected to receive more fair market feedback, that is, to exhibit a lower level of price deviation. Therefore:

H1: Sustainable development information disclosure represented by ESG is negatively correlated with the company's IPO pricing deviation.

3. Data and Methods

3.1. Data

The sample in this paper includes all companies listed on the Nasdaq in the two years (2022-2023) after the pandemic (companies with missing data are deleted). This time frame is chosen because the negative impact of the pandemic announcement on global stock markets is significant [15]. Therefore, this paper hopes to explore the new situation in the capital market that is gradually emerging from the impact of the pandemic. All data were obtained using the WIND Economic Database (https://www.wind.com.cn, accessed on 30 November 2024).

3.2. Modeling

In order to define both underpricing and overpricing as the same variable, this paper introduces the IPO discount as a measure of pricing deviation. To be precise, the formula is as follows:

$$\text{IPO discount} = \text{Abs}\left(\frac{\text{the closing price on the first day} - \text{the issue price}}{\text{the closing price on the first day}}\right) \quad (1)$$

As the main independent variable, this paper creates a dummy variable 'sustainable development information represented by ESG' (hereinafter referred to as 'ESG'), which is assigned a value of 1 if the company has released an ESG report or exhibited sustainable development practices prior to the IPO, and 0 in all other cases. The variable is calculated by searching for documents published by companies during the IPO stage in the WIND economic database and the SEC.

As control variables, this paper uses:

Total assets (TA): as one of the indicators of enterprise scale, it can reflect the company's resource allocation ability and production capacity. Large enterprises usually have higher market visibility and stability, thereby reducing the degree of information asymmetry in the IPO process.

Operating income (OI): an important financial indicator that measures the core profitability of an enterprise. Enterprises with higher revenue usually exhibit stronger market competitiveness and sustained profitability, thereby being more attractive to investors. At the same time, stable operating income can also reduce the risk of information asymmetry and provide strong support for IPO pricing.

Total equity(TE): An important variable reflecting the capital structure of a company, its size directly affects the market's assessment of the company's value. Companies with larger equity capital usually have higher market liquidity, and controlling total equity can better measure the independent impact of ESG information on IPO pricing.

Age: Reflects the maturity and development stage of the company in the market. More mature companies usually have more management experience and higher information transparency, thereby reducing the risk of information asymmetry in the IPO process.

For this model, this paper establishes an MLR model , as follows:

$$IPO\ discount = \beta_0 + \beta_1 ESG + \beta_2 TA + \beta_3 OI + \beta_4 TE + \beta_5 Age \quad (2)$$

4. Results

4.1. Descriptive Statistics

The summary statistics in Table 1 highlight the characteristics of the dataset. The IPO discount has a high average of 29.78% with considerable variability, reflected by a standard deviation (SD) of 30.499. The discount ranges widely from 0% to 144.33%, suggesting substantial dispersion among IPO firms. The ESG score shows a mean of 0.194, indicating that only a small proportion of firms actively engage in ESG practices. Firm size, represented by TA (total assets), averages 17.855, while OI (operating income) and TE (total equity) have averages of 16.680 and 17.145, respectively. The firms are relatively young, with an average age of 1.743 years.

In Table 2, the correlation matrix reveals significant negative relationships between the IPO discount and firm-level factors like ESG (-0.243), TA (-0.210), OI (-0.200), and TE (-0.190) at the 1% significance level. This suggests that higher firm size, operating income, and ESG performance are associated with lower IPO discounts, reflecting reduced investor uncertainty. ESG is positively correlated with TA (0.361) and TE (0.377), indicating that larger firms tend to have better ESG performance. Notably, OI and TA show a strong positive correlation (0.803), suggesting firms with higher total assets tend to report greater operating income. However, Age does not exhibit significant correlations with other variables. These patterns emphasize the role of firm fundamentals and ESG performance in reducing IPO underpricing.

Table 1. Summary statistics

	N	Mean	Median	Min	Max	SD
IPO discount	196	29.780	21.515	0.000	144.332	30.499
ESG	196	0.194	0	0	1	0.396
TA	196	17.855	17.332	14.552	24.441	2.282
OI	196	16.680	16.549	6.856	23.919	3.053
TE	196	17.145	16.837	14.959	20.980	1.275
Age	196	1.743	1.609	0.000	3.932	0.921

Table 2. Correlation matrix

	ESG	TA	OI	TE	Age	
IPO discount	1					
ESG	-0.243***	1				
TA	-0.210***	0.361***	1			
OI	-0.200***	0.286***	0.803***	1		
TE	-0.190***	0.377***	0.613***	0.471***	1	
Age	-0.0650	0.0150	0.0610	-0.0830	0.105	1

*** $p < 0.01$.

The correlation study results align with the paper's assumptions, revealing a negative correlation of -0.243 between 'ESG' and IPO discount, indicating a price divergence. This indicates that when ESG is the primary variable, a company's ESG performance can substantially influence IPO pricing.

4.2. Regression Results

Table 3. MLR model

	(1)	(2)
	IPO discount	IPO discount
ESG	-18.662***	-14.165**
	(-3.482)	(-2.417)
TA		-0.172
		(-0.097)
OI		-1.195
		(-1.002)
TE		-1.176
		(-0.545)
Age		-2.188
		(-0.923)
_cons	33.398***	79.516***
	(14.152)	(2.610)
N	196	196
r2	0.059	0.085

t statistics in parentheses; ** $p < 0.05$, *** $p < 0.01$.

As Table 3 shown, the findings of this study align with expectations and validate that ESG exerts a substantial negative influence on IPO discounts at the 10% significance threshold.

These results suggest that companies that disclose sustainability information represented by ESG generally face lower discounts in the IPO pricing process, implying that the market has higher trust in such companies and considers them to be less risky. Considering the numerous ESG-related scandals in recent years, investors are paying more and more attention to the disclosure of ESG information in order to assess the potential risks and long-term value of companies.

Therefore, companies looking to go public should follow this trend and publish high-quality information about their ESG strategies and sustainability practices. This will not only help to increase the attractiveness of the company in the capital market, but may also play a positive role in reducing the cost of capital. By strengthening the disclosure of relevant information, companies can demonstrate their sustainable development strategies in the long-term competition in the future, thereby enhancing the transparency and credibility of their market pricing.

4.3. Robustness Tests

In order to strengthen the results and further verify them, this paper also conducts relevant robustness tests. Specifically, the VIF test was conducted, as shown in Table 4.

Table 4. VIF test

Variable	VIF	1/VIF
TA	3.660	0.273
OI	2.960	0.338
TE	1.690	0.591
ESG	1.200	0.830
Age	1.060	0.941

The VIF analysis indicates that there is no substantial issue of multicollinearity among the independent variables in the regression model. The primary variable 'ESG' exhibits a low VIF value, confirming its independence within the model. This establishes a solid foundation for analyzing its effect on the IPO discount, so ensuring the reliability of the regression analysis and the validity of the conclusions.

5. Conclusion

This study concludes that sustainability information, represented by ESG, significantly negatively affects IPO pricing bias (IPO discount). This outcome indicates that firms that reveal pertinent information can more precisely represent market value throughout the IPO process, hence bolstering market confidence.

The findings of this paper have some implications for companies that are about to go public: As capital markets attach increasing importance to ESG information disclosure, companies that publish transparent and detailed ESG reports and practice sustainable development can not only improve their credibility among investors, but also help reduce pricing bias in the IPO process. Therefore, companies hoping to go public should actively disclose their ESG data to attract long-term investors and obtain a more fair market valuation. Meanwhile, investors are gradually realising the importance of the long-term sustainability of enterprises to their investment returns, and companies that disclose ESG information are often able to attract more capital inflows. The publication of ESG reports helps to reduce the risk premium in the capital market, thereby reducing the capital cost of enterprises. In order to help investors better understand the company's performance in sustainable development, regulators may consider promoting more standardized ESG reporting disclosure requirements to ensure that investors have access to high-quality, comparable ESG data.

However, this study also has some limitations. First, the model fitting is not high. Although this paper finds that ESG reporting has a significant impact on IPO pricing bias, the model fitting in this study is relatively low (e.g., the R^2 value is small), which indicates that the control variables selected in this paper may not fully cover all factors affecting IPO pricing. Future research could consider introducing more control variables, such as macroeconomic factors, industry characteristics or other financial indicators, to improve the model's fit and further verify the impact of ESG reporting on IPO pricing. Second, this study only used company data from the Nasdaq market. Future research could consider expanding the sample to other regions and markets, such as European and Asian markets, to verify the universality of ESG reporting in different capital markets around the world. In addition, considering the different legal and regulatory requirements for ESG information disclosure in various countries, cross-country comparisons of research results would also provide broader insights in this area. At the same time, this study focuses on the new situation after the pandemic and does not consider the possible impact of the year of the IPO on the relationship between ESG reporting and IPO pricing deviation. The economic environment, capital market conditions and investor preferences in different years may affect the market effect of ESG reporting. Therefore, future research can

control for the year effect and further examine the lasting impact of ESG reporting on IPO pricing. Finally, companies in different industries may differ significantly in the quality and impact of ESG reporting. For example, the energy industry and the artificial intelligence industry may face different ESG risks and opportunities. Future research can consider industry as a moderating variable to explore the different impacts of ESG information on IPO pricing in different industries.

In short, this study provides new empirical evidence to understand the role of sustainability information represented by ESG in IPO pricing. It shows that companies' disclosure of transparent and detailed ESG-related information can significantly reduce the deviation in IPO pricing and enhance investor trust. As the global capital market's focus on sustainable development continues to increase, future research is expected to build on this foundation to further explore the long-term impact of ESG information disclosure and provide more targeted practical recommendations for companies.

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